Trapper and Pendola Invasive Plant Removal
Statement of Work and Request for Proposals
Tahoe National Forest, CA

Background and Statement of Work: The National Forest Foundation (NFF) and the USDA Forest Service are working together to protect and restore the Tahoe National Forest through targeted efforts in NFF’s Tahoe Headwaters Treasured Landscape site. In 2020, NFF and Tahoe National Forest are collaborating on a number of projects, including the Trapper and Pendola Invasive Plant Removal Project. The project will help prevent the establishment and spread of invasive species on up to 185 acres.

Information Requested
If interested in this project, please provide a bid for the statement of work by providing approach, work experience, and cost. Please also include your capacity for this project and efficiency in invasive species removal projects in the past, if any.

This is a request for proposals only and quotations furnished are not offers. This request does not commit the National Forest Foundation to pay any costs incurred in the preparation of submission of the quotation or to contract for supplies or services.

General Specifications
(a) **Description of Work** – This Request for Proposals is for restoration services related to the flagging and manual removal of invasive plant species including, but not limited to Scotch and French broom. The specific work activities are identified in the Service Work Items listed below. Additional information, requirements, and specifications for each item are provided in the attached appendices.

1. **Trapper Project**: Flagging and removal of Scotch and French broom infestations on 89 acres.
2. **Pendola Project**: Flagging and removal of Scotch broom, French broom, and other invasive plant infestations on 95.38 acres.

The Contractor shall identify which efforts and materials they can supply in terms of materials, labor, equipment, supplies, supervision, quality control, and incidentals required to complete the work described. The Contractor shall perform all work in a safe and conscientious manner.

(b) **Project Location** - The Trapper Invasive Plant Removal Project is located along Highway 49 and east of New Bullards Bar Reservoir. The project is located in western Sierra County and eastern Yuba County on the Yuba River Ranger District of the Tahoe National Forest. The Pendola Invasive Plant Removal Project is located along the northern portion of the New Bullards Bar Reservoir on Garden Point, approximately seven miles west and south west of the community of Camptonville in northeastern Yuba County on the Yuba River Ranger District of the Tahoe National Forest. See APPENDIX 1 for maps and detailed invasive treatment unit locations.
(c) **Work Schedule** - This work will begin as early as ground conditions allow. The Trapper Invasive Plant Removal units must be completed no later than December 31st, 2021. The Pendola Invasive Plant Removal units must be completed no later than December 31st, 2025.

**Pricing Schedule**

Please provide a price to perform the following service work. Prevailing wages will be required per conditions of funding sources.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description</th>
<th>Unit</th>
<th>Unit Cost</th>
<th>Quantity</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Trapper Project: Flagging and Removal of Invasive Plants</td>
<td>Acres</td>
<td></td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Pendola Project: Flagging and Removal of Invasive Plants</td>
<td>Acres</td>
<td></td>
<td>95.38</td>
<td></td>
</tr>
</tbody>
</table>

**Other Project Requirements and Specifications**

(a) **Utilities** – In many locations there will be no or limited sanitation, water, electrical or housing services available. The Contractor shall make its own arrangements for temporary facilities if needed.

(b) **Specifications** – Invasive plant removal shall be conducted by mechanical and manual removal methods. Detailed specifications for each project location can be found in APPENDIX 2 and 3. Project work shall be accomplished in accordance with the following:
   i. APPENDIX 1 – Project Maps
   ii. APPENDIX 2 – Trapper Scotch and French Broom Treatment
   iii. APPENDIX 3 – Pendola Invasive Plant Treatment
   iv. APPENDIX 4 – Tahoe National Forest Preferred Invasive Plant Treatment Methods

**Contractor Qualifications**

(a) **References** – Please provide three references.

(b) **Past Experience** – Please provide a brief explanation of previous work experience with land management agencies.

**Contractor Selection Process**

The NFF will use the Evaluation Factors below to review each submitted bid. Based on the outcomes of that selection process, the NFF will notify successful and unsuccessful bidders by July 1, 2020, and will prepare a separate contract document.

**Insurance Requirements**

Upon selection of the winning bid, chosen contractor will be asked to affirm that it has and shall maintain State minimum workers’ compensation insurance coverage for its employees, if any. The selected contractor shall also maintain broad form general liability, property damage, and automotive liability insurance in the minimum amount of $1,000,000 for bodily injury, death, or damage to property of any person and $3,000,000 for bodily injury, death, or damage to property of more than one person. The Contractor shall name NFF an Additional Named Insured and provide NFF with documentation evidencing such coverages.
Point of Contact
For questions about the details of producing the bid, please contact:

Trevor Seck
National Forest Foundation, California Program Coordinator - Tahoe Area
530-760-7419
tseck@nationalforests.org

Bid Submission
Submit bids to tseck@nationalforests.org by July 1, 2020.

Evaluation Factors and Relative Importance

Level 3 Criteria
- Contractor must be a non-profit organization
- Price / cost
- Equipment and contractor capability
- Timing of when contractor can begin and/or finish the project
- Past performance, references, and USFS feedback

Level 2 Criteria
- Technical proposal / proposed approach to project
- Overall strategic benefits to meeting NFF goals and grant needs, requirements, and timelines

Level 1 Criteria
- Benefits to the local community
- Relationship to local community

Equal Opportunity Provider
In accordance with Federal law and U.S. Department of Agriculture policy, the National Forest Foundation is prohibited from discriminating on the basis of race, color, national origin, sex, age, religion, political beliefs, or disability.
Trapper Scotch and French Broom Removal Project

Tahoe National Forest, Yuba River Ranger District

Maps are for graphical purposes only. They do not represent a legal survey. NFF makes no warranty, expressed or implied, nor does the fact of distribution constitute such a warranty. This information was produced on 6/16/2020 by Bri Tiffany.
Maps are for graphical purposes only. They do not represent a legal survey. NFF makes no warranty, expressed or implied, nor does the fact of distribution constitute such a warranty. This information was produced on 4/28/2020 by Bri Tiffany.
APPENDIX 2
Trapper Scotch and French Broom Treatment

F.1 –Control of Operations

Under this agreement, “Contractor’s operations” shall include activities of or use of equipment of the Contractor, the Contractor’s employees, agents, subcontractors, or their employees or agents, acting in the course of their employment in operations hereunder on national forest lands or within Forest Service protection boundary (unless acting under the immediate supervision of Forest Service).

Contractor’s operations shall be conducted in a workmanlike and orderly manner. The timing of any required Forest Service or National Forest Foundation designation of work on the ground and the performance of other Forest Service or National Forest Foundation work shall not be such as to cause unnecessary delay to Contractor.

F.2 - Guidelines for Operations

The following Guidelines for Operations apply to activities under this Contract. These guidelines are intended to clarify the expectations of the Parties related to these specific areas of operations.

1. **Contract Area Map (Map).** This is the boundary of the Contract Area as shown in Appendix 1 and designated on the ground by the Forest Service to meet the anticipated needs of the parties. The following are identified on the Map:
   a. Boundaries of all contract treatment units.
   b. Location of roads.

2. **Use of Roads by the Contractor.** The Contractor is authorized to use existing National Forest system roads and specified roads. The Parties will determine that such use will not cause damage to the roads or National Forest resources.

3. **Manual treatment of target species:** The Contractor shall manually treat prioritized infestations of broom species within the Trapper project as described below:
   a. **Infestations shall be flagged** with orange and black “Noxious Weed” flagging for avoidance prior to project unit implementation and/or manual treatment of broom.
   b. **Manual weed wrench and manual hand removal** can be used by pulling plants at ground level to remove as much of root as possible. This tool is most effective from winter through mid-spring when there is a higher soil moisture.
   c. **Manual cutting** using a hand operated blade-type tool (e.g. loppers) at ground level. This method should only be utilized from late summer (July) to late fall (September) depending on rainy season when seasonal drought stress will hinder regrowth. Tools that cannot be placed close enough to the ground surface should not be considered.
d. **Removal of mature broom plants offsite** to approved disposal site to limit seed dispersal and fuels build up. Bag or tarp any plants parts with viable seed to avoid spread in transport.

e. **Infestations with mature invasive broom plants not accessible by road** will be piled for burning. Piles will be 80% covered by plastic and a minimum of 4 feet by 4 feet in size.

f. **Treatment method** of Scotch and French broom will be decided by the NFF and/or Forest Service Representative by unit. Treatment will be either by hand cut or manual pull methods. Coordination for individual unit treatment is required prior to implementation.

4. **Treatment deliverables and inspection**

   a. **Invasive plant treatment form** completed using the ESRI Collector app and ArcGIS Online. Data from repeated visits will be consolidated into a single form. All required fields will be completed. See attachment for required fields.

   b. **Work will be considered acceptable when** broom plants (mature and seedlings) are 100% removed from the entire mapped infestation area.

   c. **Follow up inspection** will follow notification within 1 month of completion or by end of accessible field season. Inspection and verification of data collected will confirm spatial extent, completeness, and appropriate removal technique/timing of treatment recorded.

5. **Government provided services and materials**

   a. **ArcGIS Online webmap and AGOL access** for data collection and navigation to infestation sites.

   b. **Broom infestation form documents** for infestation information to aid in identification and location of plants.

   c. **Weed identification tools and guides.**

   d. **Technical expertise on broom treatment.**

6. **Contractor provided materials**

   a. **Flagging.** Orange and black “NOXIOUS WEEDS”

   b. **Global positioning systems (GPS) enabled tablet or device** to collect data.

   c. **Treatment implementation tools** such as weed wrenches, gloves, blade type tools (loppers), and plastic bags/tarps for disposal.

   d. **Biological monitor** to train/oversee/and inspect quality of work completed.
APPENDIX 3
Pendola Invasive Plant Treatment

F.1 – Control of Operations

Under this agreement, “Contractor’s operations” shall include activities of or use of equipment of the Contractor, the Contractor’s employees, agents, subcontractors, or their employees or agents, acting in the course of their employment in operations hereunder on national forest lands or within Forest Service protection boundary (unless acting under the immediate supervision of Forest Service).

Contractor’s operations shall be conducted in a workmanlike and orderly manner. The timing of any required Forest Service or National Forest Foundation designation of work on the ground and the performance of other Forest Service or National Forest Foundation work shall not be such as to cause unnecessary delay to Contractor.

F.2 - Guidelines for Operations

The following Guidelines for Operations apply to activities under this Contract. These guidelines are intended to clarify the expectations of the Parties related to these specific areas of operations.

1. **Contract Area Map (Map).** This is the boundary of the Contract Area as shown in Appendix C and designated on the ground by the Forest Service to meet the anticipated needs of the parties. The following are identified on the Map:
   a. Boundaries of all contract treatment units.
   b. Location of roads.

2. **Use of Roads by the Contractor.** The Contractor is authorized to use existing National Forest system roads and specified roads. The Parties will determine that such use will not cause damage to the roads or National Forest resources.

3. **Manual treatment of target species:** The contractor shall manually treat prioritized infestations of invasive plant species within the Pendola project as described below:
   a. **Flag infestations** with orange and black “noxious weed” flagging for avoidance prior to project unit implementation.
   b. **Infestations with mature invasive broom plants not accessible by road** will be piled for burning. Piles will be 80% covered by plastic and a minimum of 4 feet by 4 feet in size.
   c. **Infestations with mature invasive broom accessible by road** will be removed and disposed of offsite. Plants with viable seed must be bagged or tarped to prevent seed dispersal.
   d. **Invasive plants other than broom species** with viable seed shall be bagged and disposed of offsite.
e. Manual weed wrench and manual hand removal can be used by pulling plants at ground level to remove as much of root as possible. This tool is most effective from winter through mid-spring when there is a higher soil moisture.

f. Manual cutting of broom species using a hand operated blade-type tool (e.g. loppers) at ground level. This method should only be utilized from late summer (July) to late fall (September) depending on rainy season when seasonal drought stress will hinder regrowth. Tools that cannot be placed close enough to the ground surface should not be considered.

g. Refer to TNF Preferred Invasive Plant Treatment Methods (APPENDIX 4) for appropriate timing and treatment of invasive plant species other than broom. Manual treatment for all invasive plant species is required.

4. Treatment deliverables and inspection
   a. Invasive plant treatment form completed using the ESRI Collector app and ArcGIS Online. Data from repeated visits will be consolidated into a single form. All required fields will be completed. See attachment for required fields.
   b. Work will be considered acceptable when invasive plants have been 100% treated within the entire mapped infestation area. Some invasive species (annual grasses and thistles) may require an additional follow up visit within the same season.
   c. Follow up inspection will follow notification within 1 month of completion or by end of accessible field season. Inspection and verification of data collected will confirm spatial extent, completeness, and appropriate removal technique/timing of treatment recorded.

5. Government provided services and materials
   a. ArcGIS Online webmap and AGOL access for data collection and navigation to infestation sites.
   b. Infestation form documents for infestation information to aid in identification and location of plants.
   c. Weed identification tools and guides.

6. Contractor provided materials
   a. Flagging: Orange and black “NOXIOUS WEEDS” flagging.
   b. Global positioning systems (GPS) enabled tablet or device to collect data.
   c. Treatment implementation tools such as weed wrenches, gloves, blade type tools (loppers and weed whackers), and plastic bags/tarps for disposal.
   d. Biological monitor to train/oversee/ and inspect quality of work completed.
## Preferred Invasive Plant Treatment Methods

**Note:** Herbicide use for invasive plant treatment is not currently authorized on TNF, excepting administrative areas. Chemical treatment of invasive plants will required additional NEPA analysis.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Cal-IPC</th>
<th>Known on TNF?</th>
<th>Map</th>
<th>Treat ARRD</th>
<th>Treat YRDD</th>
<th>Treat TKRD</th>
<th>Treat SVRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acroptilon repens</td>
<td>Russian knapweed</td>
<td>Moderate</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Aegilops triuncialis</td>
<td>barbed goatgrass</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alantus alissimina</td>
<td>tree-of-heaven</td>
<td>Moderate</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>Arundo donax</td>
<td>giant reed</td>
<td>High</td>
<td>No</td>
<td>X</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Bromus tectorum</td>
<td>cheatgrass</td>
<td>High</td>
<td>Yes</td>
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<td>O</td>
<td>O</td>
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<tr>
<td>Berteroa incana</td>
<td>hoary alyssum</td>
<td>N/A</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Carduus nutans</td>
<td>musk thistle</td>
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<td>X</td>
<td>X</td>
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<td>Carduus pyconecephalus</td>
<td>Italian thistle</td>
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<td>X</td>
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<tr>
<td>Centaurea diffusa</td>
<td>diffuse knapweed</td>
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<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centaurea melitensis</td>
<td>Maltese starthistle</td>
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<td>No</td>
<td>X</td>
<td>N/A</td>
<td>N/A</td>
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<td></td>
</tr>
<tr>
<td>Centaurea solstitialis</td>
<td>yellow starthistle</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Centaurea stoebbe</td>
<td>spotted knapweed</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>Centaurea squarrosa</td>
<td>Squarrose Knapweed</td>
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<td>No</td>
<td>X</td>
<td>N/A</td>
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<td>Chondrilla juncea</td>
<td>skeletonweed</td>
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<td>Yes</td>
<td>X</td>
<td>X</td>
<td>O</td>
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<tr>
<td>Cirsium arvense</td>
<td>Canada thistle</td>
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<td>Yes</td>
<td>X</td>
<td>X</td>
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<td>Cirsium vulgare</td>
<td>Bull thistle</td>
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<td>N/A</td>
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<td></td>
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<tr>
<td>Cortaderia selloana</td>
<td>pampasgrass</td>
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<td>No</td>
<td>X</td>
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<td>N/A</td>
<td></td>
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<tr>
<td>Cytisus scoparius</td>
<td>scotchbroom</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>O</td>
<td>X</td>
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<td></td>
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<td>Ditrichia graveolens</td>
<td>stinkwort</td>
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<td>N/A</td>
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<td></td>
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<tr>
<td>Elymus caput-mediae</td>
<td>medusahead</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td></td>
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<tr>
<td>Euphorbia oblongata</td>
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<td>No</td>
<td>X</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Foeniculum vulgare</td>
<td>fennel</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Genista monspessulana</td>
<td>French broom</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Hydrilla verticillata</td>
<td>hydrrilla</td>
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<td>Yes</td>
<td>X</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Hypericum perforatum</td>
<td>Johnswort</td>
<td>Moderate</td>
<td>Yes</td>
<td>X</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Isatis tinctoria</td>
<td>dyer’s woad</td>
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<td>No</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Lepidium appendicum</td>
<td>whitetop</td>
<td>Limited</td>
<td>No</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Lepidium chaldehyde</td>
<td>lenspod whitetop</td>
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<td>No</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Lepidium draba</td>
<td>Hairy whitetop</td>
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<td>X</td>
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<tr>
<td>Lepidium latifolium</td>
<td>tall whitetop</td>
<td>High</td>
<td>YES</td>
<td>X</td>
<td>O</td>
<td>X</td>
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<tr>
<td>Linaria dalmatica ssp. dalmatica</td>
<td>Dalmatic toadflax</td>
<td>Moderate</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
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<td>Lythrum salicaria</td>
<td>purple loosestrife</td>
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<td>X</td>
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<td>N/A</td>
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<tr>
<td>Myriophyllum spicatum</td>
<td>Eurasian water milfoil</td>
<td>High</td>
<td>Yes</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onopordum acanthium</td>
<td>Scotch thistle</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Phalaris arundinacea</td>
<td>reed canary grass</td>
<td>High</td>
<td>Yes</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Potamogeton crispus</td>
<td>Curlyleaf pondweed</td>
<td>Moderate</td>
<td>Yes</td>
<td>O</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Potentilla recta</td>
<td>Sulphur cinquefoil</td>
<td>N/A</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Rubus armeniacus</td>
<td>Himalayan blackberry</td>
<td>High</td>
<td>Yes</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spartium juncum</td>
<td>Spanish broom</td>
<td>High</td>
<td>Yes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tamarix spp.</td>
<td>Saltcedar</td>
<td>High</td>
<td>No</td>
<td>O</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulex europaeus</td>
<td>gorse</td>
<td>High</td>
<td>No</td>
<td>X</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cal-IPC:** California Invasive Plant Council Online Invasive Plant Inventory (2006) ([http://www.cal-ipc.org/g/i/inventory/weedlist.php](http://www.cal-ipc.org/g/i/inventory/weedlist.php)). **Map & Treat:** X—required; O—map and/or treatment is condition-dependent, usually limited to areas where ground-disturbing activities are proposed (check with district botanist on a per-species, per-project basis); N/A—not known on TNF, so no treatment method yet designated. Other non-native species found on TNF are not mapped or treated; however, infestations of species not previously known on TNF should be reported to district botanist or forest invasive species coordinator.
**SPECIES CURRENTLY KNOWN ON TNF**

**ANNUAL GRASSES**

barbed goatgrass (*Aegilops triuncialis*) (AETR); medusahead (*Elymus caput-medusae*) (ELCA13):

Both species are often confused with the native perennial squirrel tail grasses that are found throughout the forest. Confirm identification with trained botanist prior to treatment.

Manual (<1 ac): Pull plants in early spring; bag any seeds and dispose properly. Revisit infestations 2-3 times per season to control late-emerging plants. Well into the summer inflorescences will become drier and more brittle. At this point it will become too late for manual treatment because seeds readily fall to the ground when pulling plants. Schedule follow-up treatment for 2-4 years to verify control.

Mechanical, small-tool (>1ac): Ideal for larger infestations, but there is only a small effective timing window. Weed wrack or mow when seeds are between kernel and dough stages (R5-R8). Refer to UCANR guidelines for timed mowing: [https://anrcatalog.ucanr.edu/pdf/8567.pdf](https://anrcatalog.ucanr.edu/pdf/8567.pdf). Visits to known sites during spring can allow for better understanding of seed development stages, because development is dependent on yearly water availability and each years timing may be different. Changes happen relatively quickly, so preparation for eradication should be done before potential window. Make sure to clean tools at the end of use to prevent seed dispersal. Schedule follow-up treatment for 2-4 years to verify control.

**BIENNIAL THISTLES:**
musk thistle (*Carduus nutans*) (CANU4); italian thistle (*Carduus pyconocephalus*); scotch thistle (*Onopordum acanthium*) (ONAC)

Identification should be confirmed with trained botanist before eradication efforts, because there are multiple native thistles that appear similar. Efforts for eradication should target seed production. Post-treatment revegetation with native early seral grasses may improve resistance to reinvasion.

Manual: Thistles are tap rooted biennials and they can be controlled manually if enough root is removed and no seed is produced. Pull individual plants by hand once the flowering stems have bolted, but before flowers have produced. Digging has been seen to affectively kill Italian thistle, however it can cause soil disturbance which often results in more seed germination or recolonization. Remove 2-4 inches deep into the soil to effectively kill the plant. Vegetative plants can be left on site to decompose as long as roots are not in contact with soil. Plants in bud or flower should be bagged & disposed of properly. Revisit infestations 2-3 times per season to control late-emerging plants. Clean all equipment used when working with thistles (DiTomaso et al 2013). Musk thistle generally blooms in June and July, Italian thistle generally blooms from Feb-July, and Scotch broom generally blooms from May-Aug (Calflora.org 2018).

Chemical: Herbicide applications in spring followed by fall native grass seeding can be effective on thistles (DiTomaso). Chemical treatment of large infestations should be assessed in consultation with the Forest Botanist. Chlorsulfuron is preferred from postemergence to actively growing rosettes. Amminopyralid should be used between rosette and late-bolt stages (Creech and others 2010).

Cultural: Musk thistle (CANU4) Seed bank data is lacking, but seeds are thought to be viable from 10-15 years, though viability depends on depth in the soil. Fire must be very hot in order to kill. Fire creates conditions that are favorable for Musk thistle establishment, so post-fire monitoring is recommended.
Seedlings are intolerant of competition, especially light. If grazing is used for control, overgrazing should be avoided, because bare spots caused by overgrazing are prime spots for establishment of Musk thistle (Zouhar 2002).

**BROOM:**
Scotch broom (*Cytisus scoparius*) (CYSC4); French broom (*Genista monspessulana*) (GEMO2); Spanish broom (*Spartium junceum*) (SPJU4):

Broom has a high re-sprout potential; therefore, clipping, mowing, and blade-type mechanical treatments are not recommended, except in very specific conditions (see below) (Carla C. Bossard and others 2000; LeBlanc 2001). Plants without fruit may be left to decompose in the field, but fruiting plants should be bagged and disposed properly or piled and burned, due to long-lived seed bank (Mackenzie 2004). Revisit infestation at least twice during field season after initial treatment. Monitor treated site for at least 5-8 years due to long-lived seed bank (Mackenzie 2004). Scotch broom and French broom generally blooms from March to May, Spanish broom generally blooms from April to June (calflora.org 2018).

Manual (small plants): dig up or pull plants, removing as much of root system as possible.

Mechanical, weed wrench: Pull plants at ground level using weed wrench. Weed wrenches are most effective from winter through mid-spring, when there is higher soil moisture.

Mechanical, blade-type: Cut plants at or preferably below ground level using blade-type tools (e.g. loppers, brush blades). This method is only considered effective from late summer to late fall, when seasonal drought stress will hinder regrowth (C. C. Bossard and Rejmanek 1994). To limit seed dispersal, cut material should be removed or piled with fruiting stems in the center and then burned; do not lop and scatter. **WARNING:** do not use this method during the active growth season (winter to early summer) when broom has a high re-sprout potential. **Masticators are not considered effective treatment tools** because the blades cannot be placed close enough to the ground to inhibit regrowth.

**Dalmatian toadflax (Linaria dalmatica ssp. dalmatica)**

There are very few effective treatment methods for this species; both manual and chemical control methods yield erratic results. Additional NEPA analysis is required for chemical treatment. Clipping, mowing, and prescribed burning alone are not recommended as they can stimulate regrowth. Dalmatian toadflax generally blooms from April to Sep.

Manual (small infestations only): Remove lateral roots completely; they can tear and underground portions can survive to grow new plants. Bag and remove plants. Revisit infestation several times per season. Schedule 5-10 years of follow-up treatment. Revegetation with natives is highly recommended (Zouhar 2003).

Chemical: chlorsulfuron is preferred and secondly dicamba (Zouhar 2003).

**Whitetops**

**Perennial Pepperweed (Lepidium latifolium) (LELA2): Lenspod whitetop (Lepidium chalepensis); Hairy whitetop (Lepidium draba)**

These species are rhizomatous and are difficult to control by manual methods. **Chemical treatment is preferred**; however, additional NEPA analysis is required. Manual treatment should be attempted on newly discovered and small infestations. Blade tool treatment and prescribed burning alone are not
recommended as they can stimulate regrowth. When infestation have been properly controlled, grow desirable plants to avoid further germination (DiTomasso et al 2013). Perennial pepperweed generally blooms from May to July, Heart-podded hoary cress generally blooms from March to August, globe-podded hoary cress generally blooms from April to Sep (Calflora.org 2018).

Manual: Dig up plant, removing as much root as possible getting both lateral and vertical roots. If larger, pull plant. If soil is compacted, clip the plant at ground level. Bag any flowers, buds and any roots and dispose properly. Revisit infestation several times per season. Schedule follow-up treatment for 3-5 years to verify control.

Chemical: Chlorsulfuron is preferred. For large infestations, mowing or cutting weeks before chemical treatment to stimulate greater leaf area to absorb herbicide products is recommended. Revisit herbicide applications will most likely be necessary within the same year (Young et al 1995). Secondary preference is for glyphosate.

**HOARY ALYSSUM (BERTEROA INCANA)**

Hoary alyssum is an annual to short-lived perennial forb with a slender tap root (Jacobs & Mangold 2008). Hoary alyssum is poisonous to horses, so grazing should not include horses. Hoary alyssum generally blooms from May to Sept (Calfora.org 2018).

Manual: The most effective method of control is grubbing, digging or hand pulling. Hand pulling that removes the root crown is effective. This is most easily achieved when the soil is moist. Tillage is also an effective method of control.

Chemical control can be effective when using Chlorosulfuron, Metsulfuron, Sulforometuron or 2, 4-D. Spring applications when plants are actively growing and prior to bolting will be most effective for control.

Cutting or mowing can be effective methods of control, but not as effective as hand pulling. There are examples of how mowing has allowed for increased seed dispersal and regeneration of seed bank. Considering this, mowing should be done before seeding, though exact timing needs to be looked at further. Make sure to clean machinery (DiTomaso et al. 2013, Jacobs & Mangold 2008, Parkinson et al 2017).

**KNAPWEEDS:**

spotted knapweed (*Centaurea maculosa*)(CEMA4); diffuse knapweeds (*C. diffusa*)(CED1)

Prescribed burning, grazing and large mechanical treatment are not generally feasible on TNF. Blade tool treatment (e.g. mowing & weed-whacking) are not recommended because small plants can still produce seeds and repeated mowing is not feasible. Preferred treatment is manual. Spotted knapweed generally blooms from July to October, and diffuse knapweed generally blooms from June to Sept (Calflora.org 2018).

Manual: Time control during late summer as knapweeds are generally late-emerging. Pull or dig up plants getting as much root as possible. Vegetative plants can be left on site to decompose as long as roots are not in contact with soil. Plants in bud or flower should be bagged & disposed of properly. Schedule follow-up treatment for 3-5 years to verify control.

Chemical: picloram has been effective for control of knapweeds (DiTomaso et al 2013).
**Rush Skeletonweed (Chondrilla Juncea)** (CHJU):
This species is difficult to control manually due to a very deep tap root. **Chemical treatment is preferred**; however, additional NEPA analysis is required. Manual treatment should be attempted on newly discovered and small infestations. Blade tool treatment and prescribed burning alone are not recommended as they can stimulate regrowth. Seed bank is short lived surviving in the soil 6-18 months. Rush skeletonweed generally blooms from July to October (calflora.org 2018).

Manual: Dig plant, getting as much root as possible, as plants have a very deep taproot. Bag flowers, buds, and seeds and dispose properly; remaining plant material can be left onsite to decompose. Revisit infestation 2-3 times per season to control resprouts. 6 to 10 years of mechanical control is needed to eliminate populations (Zouhar 2003).

Chemical: Herbicide may need to be applied multiple times to be effective since soil preferred by the plant may reduce herbicide persistence in the soil. Herbicide (dicamba, 2,4-D, aminopyralid) may be the most effective control.

Continuous grazing using goats can be used to effectively control Rush Skeletonweed because it keeps plants in rosette stage (Panetta & Dodd 1987).

**Russian Knapweed (Acroptilon repens)** (ACRE3):
This species is difficult to control manually. **Chemical treatment is preferred**; however, additional NEPA analysis is required. Manual treatment should be attempted on newly discovered and small infestations. Russian knapweed generally blooms from May to Sept (calflora.org 2018).

Manual (small infestations only): Pull or dig plants; removal of all root and vegetative materials is necessary for effective treatment. Bag and dispose properly. Revisit infestation several times per season. Schedule 5-10 years of follow-up treatment. Revegetation with natives is highly recommended.

Chemical: early spring application of amminopryalid is preferred.

**Tree-of-heaven (Ailanthus altissima)**
This species is difficult to control manually because of easy regeneration from sprouts and roots. **Chemical treatment is preferred**; however, additional NEPA analysis is required. Although reproduction from seed is not rare, sprouting is the most common method of regeneration. Tree-of-heaven generally blooms in May and June (calflora.org 2018).

Manual: Cutting is a good first step in controlling Tree-of-heaven infestations. Mechanical treatment alone encourages both stump and root sprouts, so follow-up treatments are required.

Chemical: Root targeting herbicides are currently the most effective herbicides to control Tree-of-heaven (Fryer 2010). Triclopyr and glyphosate are effective in controlling tree-of-heaven (DiTomaso et al. 2013).

**Yellow Starthistle (Centaurea solstitialis)** (CESO3):
Preferred treatment is manual. Blade tool treatment (e.g. clipping, mowing, weed-whacking) are not recommended because small plants can still produce seeds and repeated mowing is not feasible. Yellow starthistle generally blooms from April until Sept (calflora.org 2018).

Manual (<1ac): Pull or dig up plants getting as much root as possible. Pull plant at base and pull steadily, straight up. Vegetative plants can be left on site to decompose. Plants in bud or flower should be bagged & disposed of properly. Revisit infestations 2-3 times per season to control late-emerging
plants. If you cannot pull up the plant, cut or twist it off at the base (DiTomaso et al. 2013, Mackenzie 2004). At the end of summer, seeds have either already been dispersed or are too dry to effectively pick up anymore, this will determine the end of the window for treatment (Observed on TNF). Schedule follow-up treatment for 2-4 years to verify control (DiTomaso et al. 2013). When planning to pull, bring proper PPE, because plants have thorns (Observed on TNF).

Mechanical, small-tool (>1ac): Weed wrack or mow when flowers are in the spiny to early flowering stage. Individuals have relatively thick stems, so heavier blades may be needed for proper treatment. Revisit infestations 2-3 times per season to control late-emerging plants via manual control. Schedule follow-up treatment for 2-4 years to verify control (Courtney’s).

Chemical: 1 percent dilution of glyphosate can be sprayed on plant at the bolting stage through spot application (Mackenzie 2004).

**SULPHUR CINQUEFOIL (POTENTILLA RECTA)**
Early detection is key to preventing invasions. Sulphur cinquefoil generally blooms from May until August (calflora.org 2018).

Manual: Hand-pulling or hand digging can be effective for smaller populations, but may be impractical for larger populations. The entire root crown must be removed in order to kill the plant.

Mowing is not effective for controlling sulfur cinquefoil because it responds by developing heavier, horizontal spreading roots increasing vegetation near ground level.

Chemical control is the most effective method of controlling sulfur cinquefoil. Selective broadleaf herbicides with the active ingredient 2, 4-D, picloram, clorsulfuron, aminopyralid or metasulforuon work well. Gaining control of initial or smaller infestations is doable, however herbicide may not be a feasible method for larger more established populations (Zouhar 2003, Old unknown year).

**SPECIES MANAGED ON TNF, BUT NOT ALWAYS TREATED**

**FENNEL (FOENICULUM VULGARE) (FOVU):**
Fennel generally blooms from May to Sept (calflora.org 2018).

Manual: Pull small seedling when soil is soft or moist. Use hand tools like soil knife, or trowel to uproot seedlings. Pulling adults may be infeasible because of thick taproot. Digging the plant can be an effective way of pulling up adults. Shovels, hand picks and Pulaski’s will work, preferable when soil is wet. If not able to remove whole root, make sure to remove the top 3-6 inches of the root crown.

Mowing fennel can be effective if done at least 4 times a year. Do not mow when seeded, however mowing too early will only encourage new growth. Eradication results have been seen with this mowing technique after 4 years.

For chemical application, glyphosate is recommended. If possible apply on seedlings, and applying on resprouts can be effective after mowing. If plants are growing near water, make sure to use appropriate glyphosate product (weed workers handbook).

On Santa Cruz Island Fennel has been controlled with burning and follow up triclopyr treatment (Klinger at al. 2000).

**REED CANARY GRASS (PHALARIS ARUNDINACEA)**
Reed canary grass generally blooms in May and June (calflora.org 2018).
Manual: Hand pulling is too labor intensive for larger infestations, however it may be effective for smaller stands.

Chemicals have been shown to provide short term reed canary grass control. Control may be more effective if managers take into account its vulnerable phenological stages. In Minnesota, 2 years of fall herbicide applications, timed to coincide with optimal carbohydrate accumulation in reed canary grass rhizomes, were twice as effective at controlling reed canary grass as 2 years of spring applications (Adams & Galatowitsch 2006, Waggy 2010).

BULL THISTLE (CIRSIUM VULGARE)

Bull thistle generally blooms from June to Sept (calflora.org 2018). Preferred treatment is manual. This tap-rooted biennial can be controlled manually if enough root is removed and seed production is avoided. Manual control is highly effective for small infestations (Carla C. Bossard and others 2000). Make sure to treat before the flowers open. To avoid spines, step on the stem and pull from the base (Mackenzie 2004). Chemical treatment is not authorized in TNF.

ST. JOHNSWORT (HYPERICUM PERFORATUM):

St. Johnswort generally blooms from May to September (calflora.org 2018).

Manual: Hand pulling or digging is often effective for isolated plants or smaller populations and has been seen to work in select habitats, but not considered effective for large populations with established deeply rooted plants. Observations of hand treated infestations have found further sprouting wherever segments were left in the soil, suggesting that hand pulling is in fact not effective.

Cutting and mowing are not effective. Tillage has seen to be an effective method of control, because it is not a problem among cultivated crops, however tillage may not be feasible in all natural areas.

Chemical methods are effective in gaining control of new invasions, but not a complete solution for infestations. (Zouhar 2004, DiTomaso et al. 2013).

CHEAT GRASS (BROMUS TECTORUM)(BRTE):

Management outside of project areas focuses on avoidance and prevention. When this species intersects proposed project activities, it is mapped and managed; recommended management will be project and site-specific. Manual treatment is preferred for small infestations. Pull plants prior to seed set. Plants without flowers can be left on site. Plants with flowers should be bagged and disposed properly. Repeat as new plants appear. Manual treatment may not be feasible for large infestations. In general, large infestations are managed to avoid spread (rather than treated), using a combination of the following techniques: 1) flag and completely avoid infestations; 2) lay down barriers over infestations during staging and construction; 3) work in infested areas first, then wash equipment before moving to un-infested areas; and/or 4) use manual or mechanical techniques (above) in staging or construction areas. Cheatgrass generally blooms in May and June (calflora.org 2018).

Mechanical treatment would involve disking or tilling live plants in spring (prior to seed set), repeating as new plants appear, and revegetating with native species. Cutting or mowing is not a recommended control method for cheatgrass unless it can be repeated several times per year, for several years (Zouhar 2003, Davison & Smith).
Chemical: One year of chemical application will only temporarily thin the cheatgrass population and may actually increase cheatgrass seed production. Treatment must be repeated from 2 to 5 years consecutively (Zouhar 2003).

Grazing can be used when timed properly (Zouhar 2003). In spring before seed heads develop cattle will eat. They will stop once the seeds develop because their awns are too stiff to eat. However over grazing or frequent soil disturbance can increase dominance of bromes by reducing more desirable forage species (DiTomaso et al 2013)

**Aquatic Invasive Plants:**
eurasian watermilfoil (*Myriophyllum spicatum*) (MYSP2); curlyleaf pondweed (*Potamogeton crispus*) (POCR3); Hydrilla/waterthyme (*Hydrilla verticillata*) (HYVE):
Collect a specimen. Currently, there is no treatment prescribed for these aquatic species, as there are few effective control methods. Management focuses on avoidance and prevention. They may be mapped, when they intersect proposed project activities. In the Lake Tahoe Basin, some agencies are treating infestations by placing bottom barriers over infestations or suctioning plants via divers, which is only effective for small infestations.

**Himalaya Blackberry (Rubus armeniacus)** (RUAR9):
This species is widespread on ARRD and YRRD where is not generally mapped or treated, but may be when it intersects proposed project activities. Dispersed seeds can remain viable in the soil for several years. Himalayan blackberry generally blooms from April until August (calflora.org 2018).

Manual: Cut stems close to ground, then dig up root ball because growth from root is common. Bag all plant materials and dispose properly. Brush cut when the flowers are in bloom. Make sure to get rid of all seeds, whether disposing or burning piles (Mackenzie 2004).

Chemical: In public recreation areas do not spray with herbicide in fruiting season, because humans will eat them. Glyphosate has been used to control *Rubus* species. Imazapyr can control *Rubus* species. Triclopyr has controlled similar Florida prickly blackberry (*Rubus argutus*) (Tu et al 2001, Mackenzie 2004).

**Species Not Currently Known on TNF**

If any of the following species are found, immediately notify the Forest Botanist. Collect detailed geospatial (GIS) and infestation information. The following treatment information is provided as rudimentary Early Detection and Rapid Response treatment options. Treatment of large infestations will require consultation with the Forest Botanist.

**Canada Thistle (Cirsium arvense)** (CIAR4):
This plant is rhizomatous and is difficult to control by manual methods. **Chemical treatment is preferred;** however, however, additional NEPA analysis is required. Manual treatment should be attempted on newly discovered and small infestations. Clipping, mowing, and prescribed burning alone are not recommended as they can stimulate regrowth. Seeds have been found to survive up to 22 years when they are buried more than 8 inches deep. Vegetative growth can occur from horizontal extension of the root system, from root fragments, or from subterranean stem tissue. Canada thistle generally blooms from June to Sept (calflora.org 2018).
Manual (small infestations only): clip all buds and flowers, bag, and dispose properly. During drought manual efforts can become more effective than herbicide applications.

Chemical: Amminopyralid is preferred. One suggestion for controlling Canada thistle is to till the infested ground and apply herbicide hopefully increasing the amount of herbicide in contact with the roots (Zouhar 2001b).

**GIANT REED (ARUNDO DONAX):**
Giant reed stems and leaves contain a wide array of chemicals that probably protect it from most native insects and grazers. In California, giant reed is restricted to elevations below 1,640 feet. Giant reed reproduces by fragmented rhizomes or stem nodes that take root. Giant reed generally blooms in May and June (calflora.org 2018).

Manual: The key to effective treatment of established giant reed is killing or removing the rhizomes (DiTomaso at al 2013, McWilliams 2004, Mackenzie 2004).

Chemical: Cutting stems and chemical application can be used together for successful removal. A mixture of cutting and chemical treatment can be effective (Mackenzie 2004).

**GORSE (ULEX EUROPAEUS):**
New infestations should be treated before older ones, because younger plants are easier to remove and prevents seed bank buildup. Gorse should be removed from roadsides to prevent spread by vehicles. Preferred method of control is manual. Gorse generally blooms from April until July (calflora.org 2018).

Manual: Seedlings should be pulled, not cut because cutting promotes new sprouting. Adult gorse plants can effectively be killed through hand pulling including the roots, however hand pulling may not be feasible in large infestations. Cut and uprooted plants should be removed from site to avoid fire hazard. Treated infestations must be monitored and maintained for sprouting. Treatments of infestation should be repeated for several years after initial treatment because depleting the seed bank could take several years (Zouhar 2005).

Chemical: Triclopyr is the best. Control with herbicides is temporary, revisits will be necessary (Zouhar 2005, Tu et al 2001).

**MALTESE STARThISTLE (CENTAUREA MELITENSIS):**
Maltese starthistle generally blooms from April until August (calflora.org 2018).

Manual: The best timing for manual removal is after plants have bolted but before they reduce viable seed. At this time, plants are also easiest to recognize. Pull or dig up plants getting as much root as possible. Vegetative plants can be left on site to decompose. Plants in bud or flower should be bagged & disposed of properly. Revisit infestations 2-3 times per season to control late-emerging plants. Schedule follow-up treatment for 2-4 years to verify control (DiTomaso et al 2013).

**OBLONG SPURGE (EUPHORBIA OBLONGATA):**
Oblong spurge is a perennial herb that produces up to 20 stems on a woody rootstalk with the plants reaching about three feet in height. Oblong spurge reproduces by seed and asexually through root fragments (Oregon Department of Agriculture 2008). Seeds can remain viable in the soil for 5-8 years
although 99% of the viable seeds will germinate in the first two years (Ruby pipeline project 2010). It is
inedible to wildlife and inhibits the growth of surrounding plants. Oblong spurge generally blooms form
May to August (calflora.org 2018).

Manual: Hoeing, grubbing or hand pulling can be effective if done before seed development. Must be
repeated for 2-3 years. Use gloves when handling plant because it can irritate skin.

Chemical: 2, 4-D can be used, but should be paired with establishment of native grass. Spot spraying
actively growing plants with a glyphosate product up to 3 times over the course of a growing season will
provide control. Both herbicide treatments may require follow up treatments over several years to
achieve complete control (DiTomaso et al. 2013, Tu et al 2001).

**PAMPASGRASS (CORTADERIA SELLOANA), JUBATAGRASS (CORTADERIA JUBATA):**
Pampas grass and Jubatagrass generally occur in coastal areas along California and Oregon, but Pampas
glass has been found to occur inland (DiTomaso at al 2013). Seed germination seems to be positively
effected by soil disturbance, so it is important to minimize disturbance or provide competition to
seedlings by either applying mulch to exposed bare ground or planting desirable seed. Use non-invasive
alternatives for ornamentals such as *Calamagrostis acutiflora* ‘Karl Foerster’ or *Stipa gigantean*, giant
needle grass (Washington State Noxious Weed Control Board 2018). Pampasgrass generally blooms
from Sept to May, and jubatagrass generally blooms from September to Feb (calflora.org 2018).

Manual: Hand pulling can prevent the spread of individuals. To prevent resprouting make sure to
remove the entire crown and top section of the roots. Bag and dispose of properly, because can
reestablish if left at site. Cutting plumes and disposing of properly can be affective for avoiding seed
dispersal. However individuals may develop more plumes later in the season. Make sure to protect
yourself because the plants leaves are very sharp. Pulaski, mattock and shovel are the safest modes for
removing established clumps.

Chemical: Treatment is effective and timing of application is based on the herbicide. Imazapyr, fall
applications of fluazifop-p-butyl, as well as glyphosate (DiTomaso at al 2013).

**PURPLE LOOSESTRIFE (**LYTHRUM SALICARIA**) (LYSA2):**
Purple loosestrife is a perennial wetland herb that can grow up to 8 ft tall. Land managers concerned
about invasive purple loosestrife should focus on eliminating small, recently-established populations
before tackling large, well-established populations. Any disturbance or management activity that
fragments live stem or root tissue is likely to result in the spread, rather than containment of purple
loosestrife. Live stems that are dislodged and buried can give rise to new shoots via adventitious buds.
Carp may play an important role where they co-occur with purple loosestrife. Carp eat the roots of
purple loosestrife, sometimes until the plants are dislodged and float away. These plants then become
potential propagules if they lodge on suitable substrate. Do not mow or graze. Purple loosestrife
generally blooms from June to Sept (calflora.org 2018).

Manual: Hand pull only as seedlings.

Chemical: chemical control is often effective. 2, 4-D, triclopyr, Glyphosate, Imazapyr have been seen to
work on purple loosestrife. However seedbank will most likely reestablish plant infestation, so revisits
will be required.

**SQUARROSE Knapweed (**CENTAUREA SQUARROSA**) (CESQ):**
These form rhizomatous roots and are very difficult to manually control. If small infestation is found, pull and dig up as much root as possible, getting both lateral and vertical roots (at least 8”). Squarrose knapweed generally blooms from June to Aug (calflora.org 2018).

**Manual:** Hand pulling is practical for scattered plants for areas where other methods are not feasible and sufficient labor is available. Repeated hand pulling is necessary 3 times a year, over 5 years. The entire taproot should be pulled with as little soil disturbance, or at least 2-4 inches below soil surface to remove the reproductive root crown. The best timing for pulling is before the plants produce viable seed. A proposed solution of cutting only bolted plants particularly at the early bloom state, for several consecutive years is expected to greatly suppress squarrose knapweed (DiTomaso et al 2013).

**Chemical:** It seems that squarrose knapweed may be more difficult to control with herbicide than other knapweeds, but can be controlled if used with other methods. Make sure to seed with natives for increased chances of control (Graham and Johnson 2004).

**STINKWORT (DITRICHIA GRAVEOLENS) (DIGR3):**

Stinkwort has a shallow root system; hoeing or pulling easily removes the plant. Wear protective gloves during treatment, as plant oils are irritating. Plants without flowers can be left on infestation. Plants with flowers should be bagged and disposed properly. Stinkwort generally blooms from Sept to Nov (calflora.org 2018).

For chemical application, many herbicides effectiveness may lower due to stinkworts sticky foliar oils. Many sources recommend using ester formulations of growth regulator herbicides (DiTomaso et al 2013).

**DYER’S WOAD (ISATIS TINCTORIA) (ISTI)**

Dyer’s woad can sprout following damage to the plant, however Dryer’s woad population is dependent on viable seed production. Seeds become viable quickly in production. Targeting seeds will be most effective. It has not been determined how long the seed bank lasts. Dyer’s woad generally blooms from April to July (calflora.org 2018).

**Manual:** Dig or pull plants. Plants without fruit may be left to decompose in the field, but any plants with fruit should be bagged and disposed properly. These plants can be controlled by repeated manual treatment and are currently known only from small infestations, so preferred treatment is manual. For large infestations target young rosettes because they are at greatest risk of mortality at this point. For after bolting, pulling can be effective, however must be done before seed development for effective treatment. Make sure to get the root crown. Follow up a 2 to 3 weeks later.

Mowing or cutting does not usually kill plant, but may prevent or delay flowering (DiTomaso at al 2013).

**TAMARISK/SALTCEDAR (TAMARIX CHINENSIS, T. RAMOSISSIMA, & T. PARVIFOLIA):**

When cut or disturbed, salt cedar sprouts aggressively from the root crown. Cutting tamarisk can also reduce consumption of ground water, through removal of transpiring leaves (Van Hylckama 1974, Carpenter 1998). If found as a young plant, pull or dig up the plant getting as much root as possible. If the plants have grown beyond small shrub size salt cedar is difficult to eradicate without the use of an herbicide (Carla C. Bossard and others 2000; Tesky 1992). Cutting combined with herbicide treatment can be a very effective integrated approach. Heavy equipment can be used to remove entire
plants, however, this is expensive, and any fragments that move into the water column may resprout and form new populations. This technique also causes considerable soil disturbance and ecosystem disruption (DiTomaso et al. 2013). For chemical application for larger areas that are mainly monotypic stands of tamarisk, the best methods would likely be foliar application of imazapyr herbicide to the intact plants or burning or cutting plants followed by foliar application of imazapyr or triclopyr to the resprouted stems (Carpenter 1998). *T. chinensis* blooms from Mar-Nov, *T. parvifolia* generally blooms in April and May, *T. ramosissma* generally blooms from April to Aug (calflora.org 2018).
References:


Fire Effects Information System (FEIS), https://www.feis-crs.org/feis/


Oregon Department of Agriculture Plant Pest Risk Assessment for Oblong Spurge, Euphorbia oblongata 2008 (Revised 2013)

Old, Rich, Washington State Noxious Weed Control Board, University of Nevada Cooperative Extension, King County Noxious Weed Control; www.fs.fed.us/database/feis. Lincoln County Noxious Weed Control Board


Washington State Noxious Weed Control Board: https://www.nwcb.wa.gov/weeds/pampas-grass


## Appendix 1: Summary of All Approved Treatment Methods

From the 2010 Terrestrial Invasive Plant Species (TIPS) Treatment Project

<table>
<thead>
<tr>
<th>Treatment Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manual Methods</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Hand Pulling              | Pulling uprooting plants can be effective against some shrubs, tree saplings, and herbaceous invasive plants. Annuals and tap-rooted plants are particularly susceptible to control by hand-pulling. It is not as effective against many perennial invasive plants with deep underground stems and roots that are often left behind to re-sprout.
The advantages of pulling include its small ecological impact, minimal damage to neighboring plants, and low (or no) cost for equipment or supplies. The key to effective hand-pulling is to remove as much of the root as possible while minimizing soil disturbance. For many species, any root fragments left behind have the potential to re-sprout, and pulling is not effective on plants with deep and/or easily broken roots. |
| Pulling Using Tools        | Most plant-pulling tools are designed to grip the plant stem and provide the leverage necessary to pull its roots out. Tools vary in their size, weight, and the size of the invasive plant they can extract. Some examples include The Root Talon, which is inexpensive and lightweight, and the Weed Wrench, which is available in a variety of sizes. Both tools can be cumbersome and difficult to carry to remote sites. Both work best on firm ground as opposed to soft, sandy, or muddy substrates. |
| Clipping                  | “Clipping” means to cut or remove seed heads and/or fruiting bodies to prevent germination. This method is labor-intensive and effective for small and spotty infestations. |
| Digging                   | Using hand tools such as shovels and sharp shooters (shovels with a narrow blade). This is the current method for TIPS treatment.                                                                                           |
| Mulching                  | Covering with certified “weed free and plastic free” mulch such as rice straw, grass clippings, wood chips, or newspaper.                                                                                         |
| Tarping                   | Placing tarps (visqueen, geocloth or similar material) to shade out weeds or solarize (to injure by long exposure to heat of the sun) them. Tarping is most effective when the soil is damp (Harris 2009). |
| **Mechanical Methods**    |                                                                                                                                                                                                           |
| Mowing, cutting, brushing, trimming | Mowing and cutting can reduce seed production and restrict invasive plant growth, especially in annuals cut before they flower and set seed. Some species, however, re-sprout vigorously when cut, replacing one or a few stems with many that can quickly flower and set seed. These treatments are used as primary treatments to remove above-ground vegetation in combination with herbicide treatments to prevent re-sprouting, or as follow-up treatments to treat target plants missed by initial herbicide use. Also, mowing and cutting can be used, in conjunction with herbicide treatments, to reduce vegetative materials and to promote vigorous growth in order to decrease the amount of herbicide application needed, and to increase herbicide effectiveness. |
| **Herbicide Methods**     |                                                                                                                                                                                                           |
| Herbicides                | Herbicides will be applied according to label directions. Herbicide treatments would include use of adjuvants such as surfactants and dyes. Adjuvants are materials that facilitate the activity of herbicides, such as the emulsifying, dispersing, spreading, wetting, or other surface modifying properties of liquids; and dyes assist the applicator in efficiently treating target TIPS and also avoiding contact with herbicide-treated plants by showing which plants have been treated already. Herbicide use must be timed to the growth stage and physiology of the target species. |
| Hand/Selective            | Treatment of individual plants using land-based equipment to avoid other non-target plants. There is a low likelihood of drift or delivery of herbicides away from treatment sites, because with these methods there should be no drift. These methods are used in sensitive areas, such as near water, to avoid getting any herbicide on the soil or in the water. Hand/Selective methods could be done under more variable conditions than spot spraying or broadcast spraying (Tu et al., 2001). Specific methods include: Dip & clip – similar to cut stump, where cutting tool is first dipped in concentrated herbicide, then used to cut target TIPS to be treated
Hack & Squirt, Cut & Squirt, Cut stump – herbicide is applied to cut surfaces to eliminate or greatly reduce re-sprouts; this is an individual target TIPS treatment
Wicking & wiping – herbicide is wiped onto the target TIPS with the wick of the applicator |
| Directed/spot spray       | Accomplished by land-based backpack sprayer with wand with regulated nozzle so that spray is concentrated at the target TIPS                                                                                                                                 |
| Limited broadcast spray   | Hand application with land-based backpack sprayer while wetting more than one target TIPS plant at a time; used for dense occurrences of target TIPS where individual plant application would not be effective. |
| **Other Methods**         |                                                                                                                                                                                                           |
| Thermal                   | Thermal methods are based on the systematic increase of plant temperature, reaching diverse thermal death points to eliminate the vegetation. Steaming, flaming, torching, infrared, microwave, and similar methods to be done only when weather conditions permit, such as in a wet season (spring). Equipment for these methods is produced by various companies and may include an open flame. However, flame/fire is not the prerequisite for this method, since temperatures to accomplish cell death are generally 50-70 degrees C (122-158˚F), significantly below the temperatures attained by some propane burners (e.g. 1,900 C - 3452˚F). Bladders and hand tools such as shovel and Pulaski are
<table>
<thead>
<tr>
<th>Treatment Method</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>required when using this method (see Design Features). This method is especially useful for small plants, plants in the rosette stage, or seedlings. Larger weeds that are removed using other methods often release the seeds in the seed bank to germinate, which results in a flush of seedlings at that location. Thermal treatment would be a possible choice in treating these seedlings. Fuels burning is not part of this project. Thermal would not be used within wilderness.</td>
</tr>
</tbody>
</table>
## Appendix 2: Table of general herbicide information (DiTomasso et al. 2013)

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Mode of action</th>
<th>Brand name</th>
<th>Remarks *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aminopyralid</td>
<td>Growth regulators</td>
<td>Milestone</td>
<td>can control broad-leafed species, generally safe with grasses, however can decrease seed production in some species</td>
</tr>
<tr>
<td>Clopyralid</td>
<td>Growth regulators</td>
<td>Transline</td>
<td>Injures plants in Asteraceae and Fabaceae, but is safe on most broadleaved and grass species</td>
</tr>
<tr>
<td>Clopyralid + 2,4-D</td>
<td>Growth regulators</td>
<td>Curtail</td>
<td>Injures plants in Asteraceae and Fabaceae, but is safe on most broadleaved and grass species</td>
</tr>
<tr>
<td>2,4-D</td>
<td>Growth regulators</td>
<td></td>
<td>Broadleaved selective and safe on grasses.</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>Aromatic amino acid inhibitors</td>
<td>Roundup, Accord XRT II, and others</td>
<td>Good for planned reseeding sites, can be used for spot treatment</td>
</tr>
<tr>
<td>Chlorosulfuron</td>
<td>Branched-chain amino acid inhibitors</td>
<td>Telar</td>
<td></td>
</tr>
<tr>
<td>Propoxycarbazone-sodium</td>
<td>Branched-chain amino acid inhibitors</td>
<td>Canter R + P</td>
<td>Broad-spectrum herbicide that will control many species</td>
</tr>
<tr>
<td>Sulfometuron</td>
<td>Branched-chain amino acid inhibitors</td>
<td>Oust and others</td>
<td>Mixed selectivity. Fairly safe on native perennial grasses, especially wheat grass. May injure, stress or stunt other desirable grasses.</td>
</tr>
<tr>
<td>Sulfometuron + chlorsulfuron</td>
<td>Branched-chain amino acid inhibitors</td>
<td>Oust and others</td>
<td>Mixed selectivity. Fairly safe on native perennial grasses, especially wheat grass. May injure, stress or stunt other desirable grasses.</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>Branched-chain amino acid inhibitors</td>
<td>Arsenal, Habitat, Stalker, chopper, Polaris</td>
<td>Soil residual herbicide. Must bear in ground for some time after treatment.</td>
</tr>
<tr>
<td>Clethodium</td>
<td>Lipid Synthesis Inhibitors</td>
<td>Select, Envoy</td>
<td>Grass-selective and safe on broadleaved species</td>
</tr>
<tr>
<td>Fluazifop</td>
<td>Lipid Synthesis Inhibitors</td>
<td>Fusilade</td>
<td>Grass-selective and safe on broad leaved species</td>
</tr>
<tr>
<td>Dicamba</td>
<td>Growth regulators</td>
<td>Banvel, clarity</td>
<td>Broadleaf-selective herbicide often combined with other species.</td>
</tr>
<tr>
<td>Rimsulfuron</td>
<td>Branched-chain amino acid inhibitors</td>
<td>Matrix</td>
<td>Broad-spectrum herbicide that will control many species.</td>
</tr>
<tr>
<td>Sulfosulfuron</td>
<td>Branched-chain amino acid inhibitors</td>
<td>outrider</td>
<td>Mixed selectivity, but fairly safe on native perennial grasses.</td>
</tr>
<tr>
<td>Hexazinone</td>
<td>Photosynthetic inhibitors</td>
<td>Velpar L</td>
<td>Has both foliar and soil activity</td>
</tr>
<tr>
<td>Fluroxypyr</td>
<td>Growth regulators</td>
<td>Vista 22K</td>
<td>Broadleaf-selective and safe on most grasses.</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>Growth regulators</td>
<td>Garlon 3A, Garlon 4 Ultra</td>
<td>Broadleaf-selective and safe on most grasses. Most effective on smaller plants.</td>
</tr>
<tr>
<td>Tebuthiuron</td>
<td>Photosynthetic inhibitors</td>
<td>Spike</td>
<td></td>
</tr>
</tbody>
</table>

*herbicides not registered for use in California not included.


