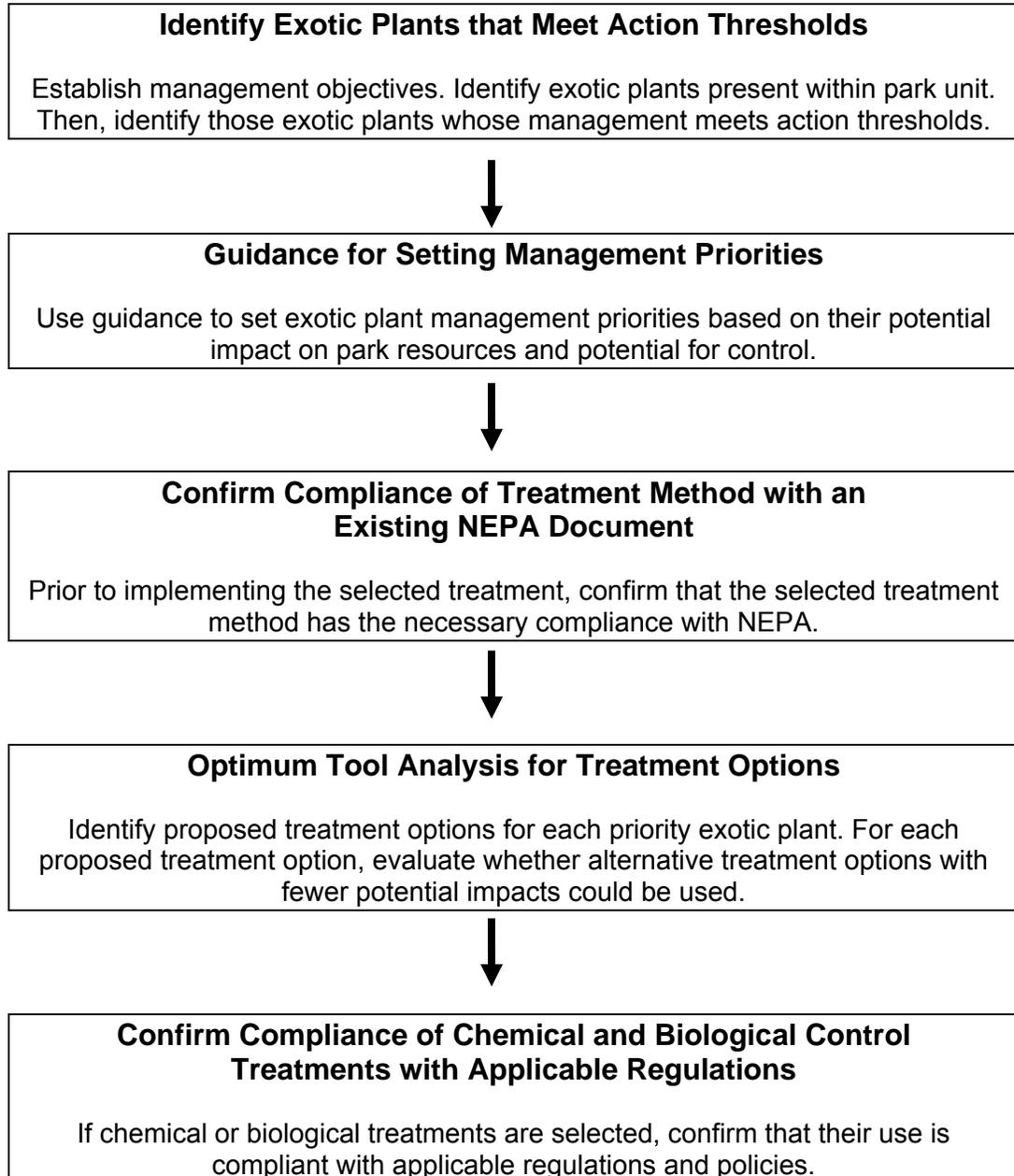
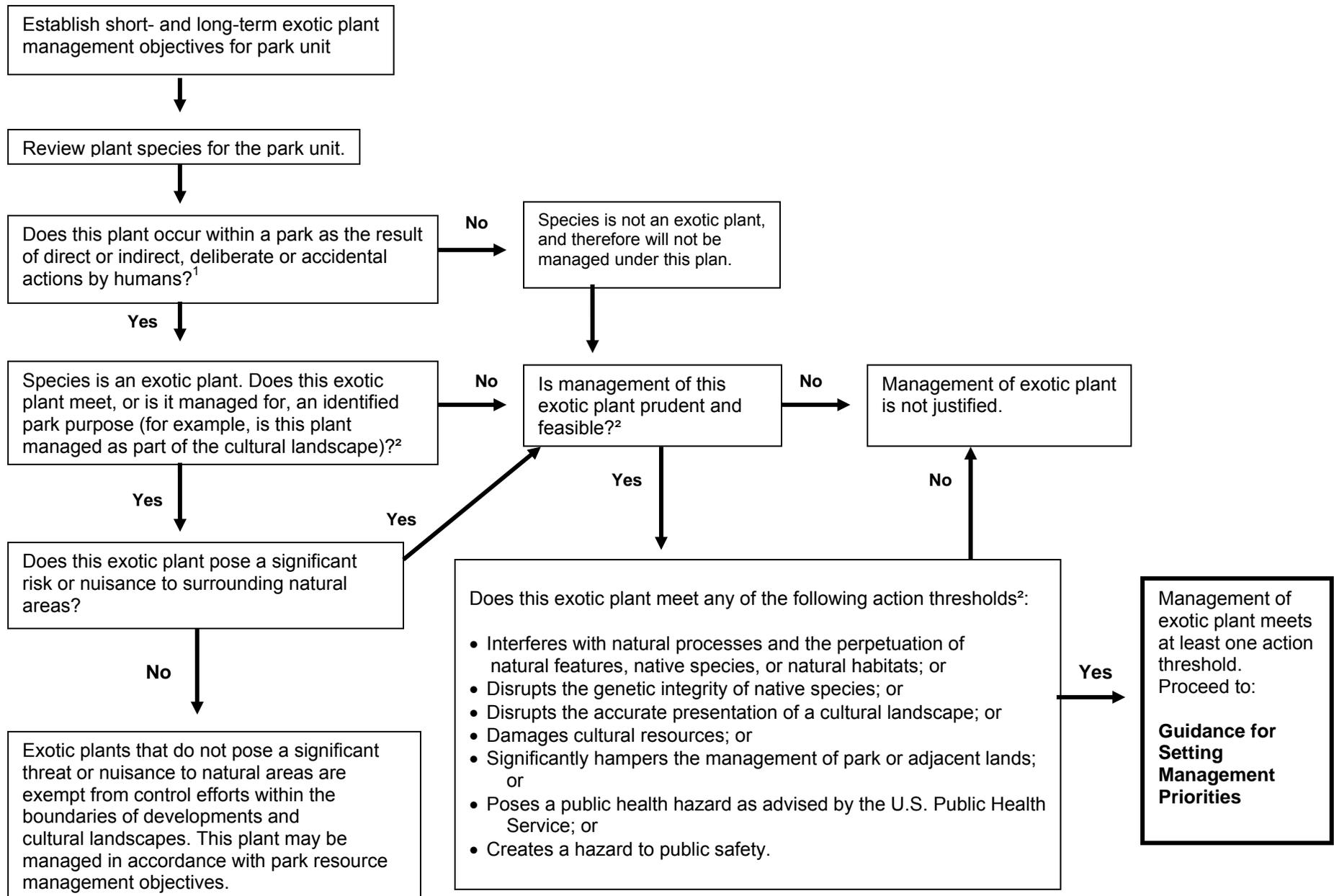


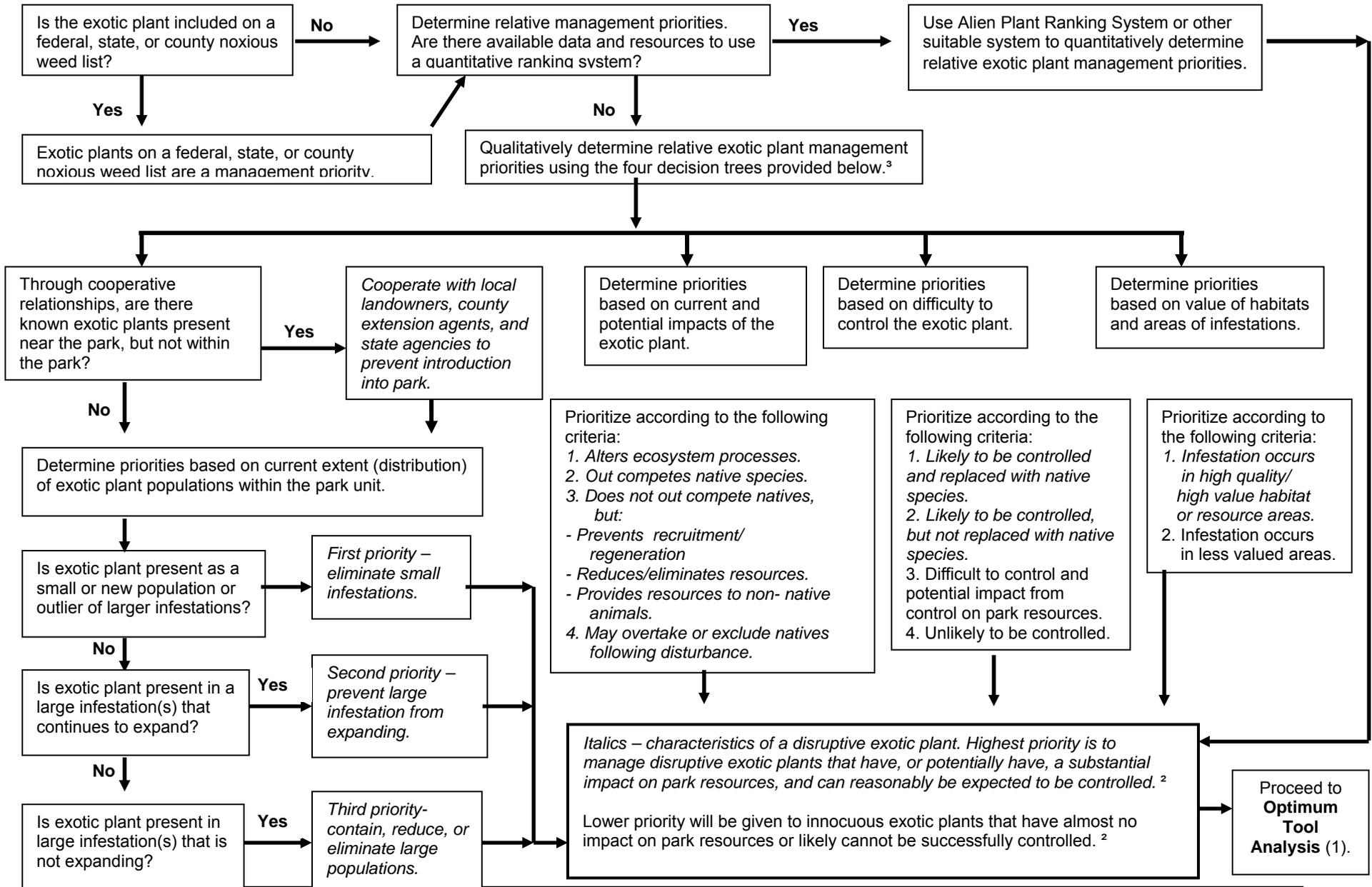
**Appendix A**  
**Southeast Utah Group**  
**Exotic Plant Management Plan**  
**Decision- Making Tree Overview**



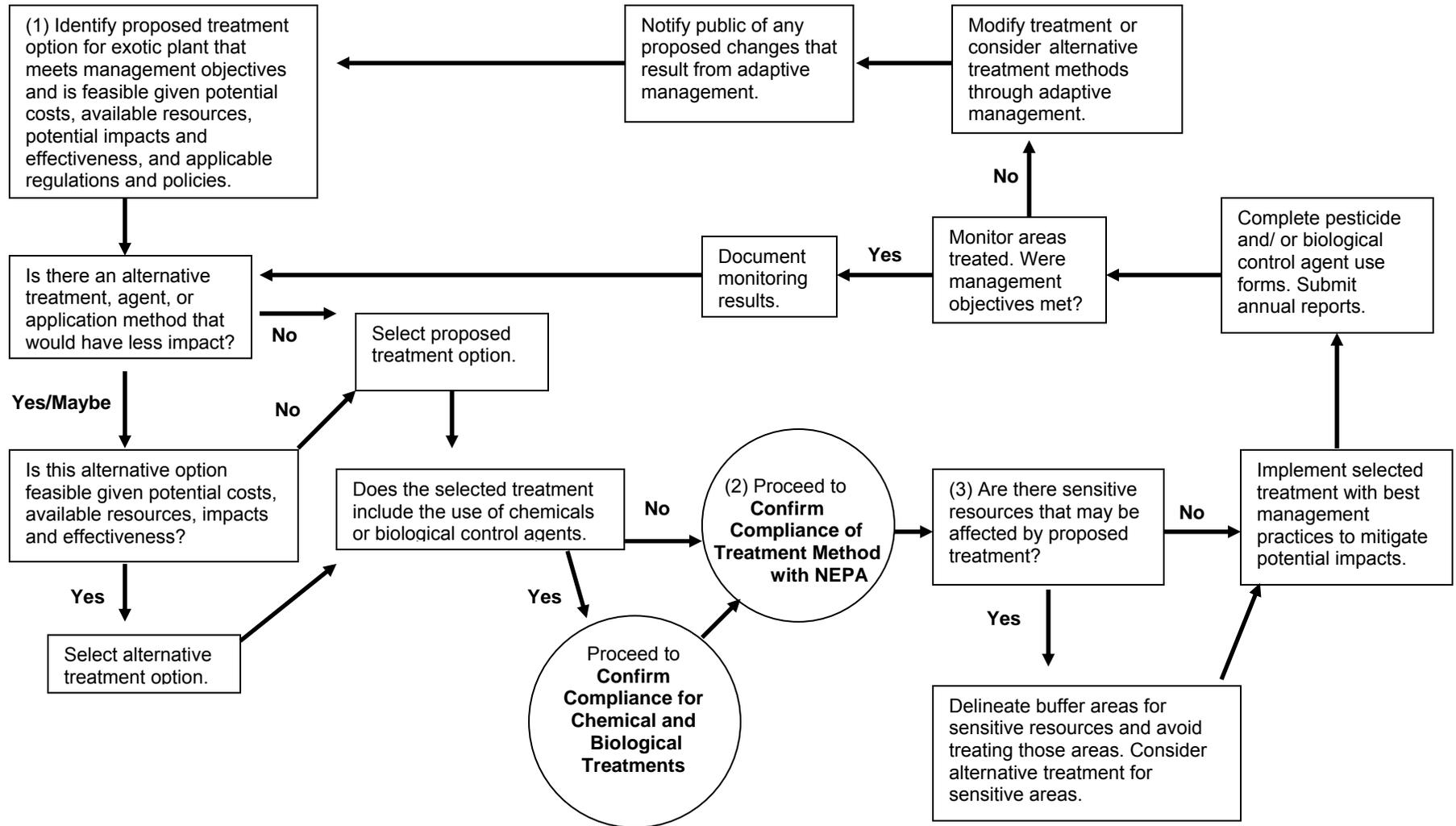
## Identify Exotic Plants that Meet Action Thresholds



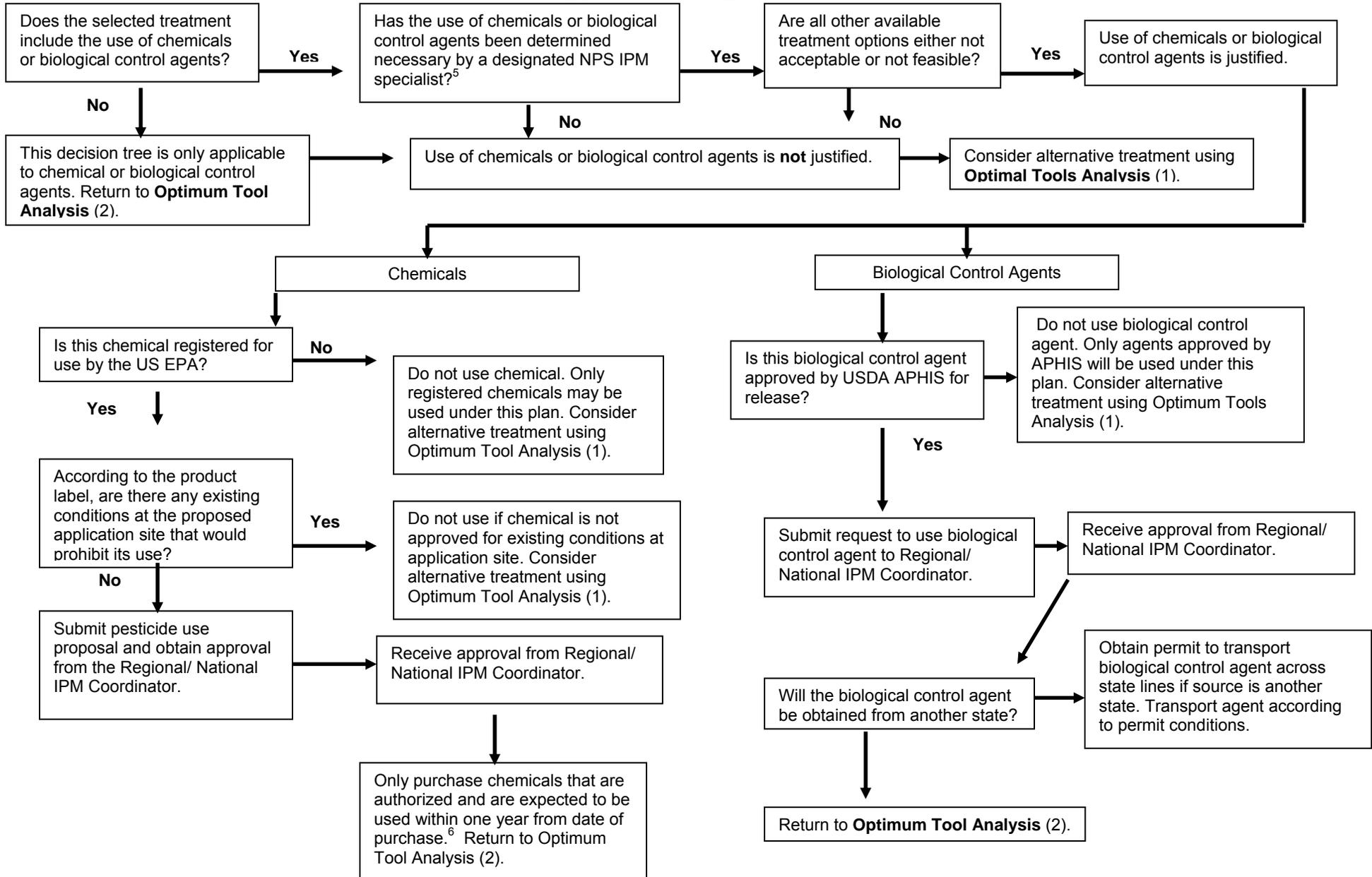
## Guidance for Setting Management Priorities



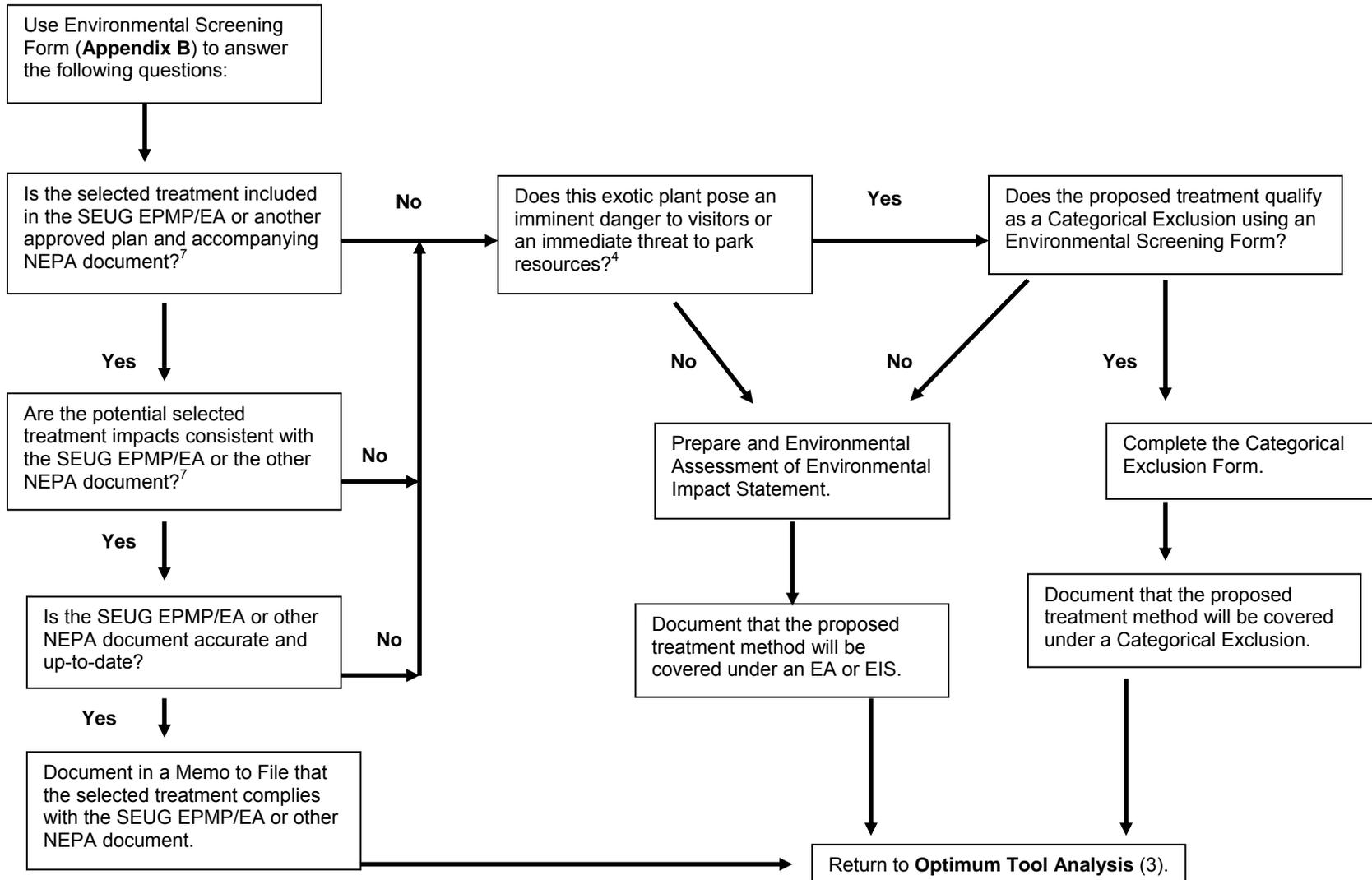
## Optimum Tool Analysis for Treatment



## Confirm Compliance of Chemical and Biological Control Treatments with Applicable Regulations



## Confirm Compliance of Treatment Method with an Existing NEPA Document



## Footnotes

- 1 National Park Service. 2006. Management Policies. Section 4.4.1.3.
- 2 National Park Service. Management Policies. 2006. Section 4.4.4.2.
- 3 Adapted from the Site Weed Management Plan for Middle Niobrara Weed Awareness Group, Middle Niobrara River Valley, Nebraska 2003- 2005 (Faulkenberry 2003) and Handbook for Ranking Exotic Plants for Management and Control (Hiebert and Stubbendieck 1993)
- 4 National Park Service. 2001. Director's Order #12. Conservation Planning, Environmental Impact Analysis, and Decision Making.
- 5 National Park Service. 2006. Management Policies. Section 4.4.5.3.
- 6 National Park Service. 2006. Management Policies. Section 4.4.5.5.
- 7 Adapted from Midwest Region and Intermountain Region Environmental Screening Forms.

## Appendix B

### Utah and Colorado State Noxious Weed List

Common Name	Scientific Name
Absinth wormwood†	<i>Artemisia absinthium</i>
African rue†	<i>Peganum harmala</i>
Bermudagrass	<i>Cynodon dactylon</i>
Black henbane	<i>Hyoscyamus niger</i>
Black nightshade	<i>Solanum nigrum</i>
Blue mustard	<i>Chorispota tenella</i>
Bouncingbet†	<i>Saponaria officinalis</i>
<b>Bull thistle</b>	<b><i>Cirsium vulgare</i></b>
Camelthorn†	<i>Alhagi pseudalhagi</i>
<b>Canada thistle*</b>	<b><i>Cirsium arvense</i></b>
<b>Chicory</b>	<b><i>Cichorium intybus</i></b>
Chinese clematis	<i>Clematis orientalis</i>
<b>Chufa flat-sedge</b>	<b><i>Cyperus esculentus</i></b>
Coast tarweed†	<i>Madia sativa</i>
<b>Common burdock</b>	<b><i>Arctium minus</i></b>
Common crupina†	<i>Crupina vulgaris</i>
Common groundsel	<i>Senecio vulgaris</i>
<b>Common mullein</b>	<b><i>Verbascum thapsus</i></b>
Common St. Johnswort	<i>Hypericum perforatum</i>
Common Tansy	<i>Tanacetum vulgare</i>
Common teasel†	<i>Dipsacus fullonum</i>
Cypress spurge	<i>Euphorbia cyparissias</i>
<b>Dalmatian toadflax, broad-leaved*</b>	<b><i>Linaria dalmatica</i></b>
Dalmatian toadflax, narrow-leaved*	<i>L. genistifolia</i>
Dame's rocket	<i>Hesperis matronalis</i>
<b>Diffuse knapweed*</b>	<b><i>Centaurea diffusa</i></b>
Downy brome	<i>Bromus tectorum</i>
Dyers woad†	<i>Isatis tinctoria L</i>
Eurasian watermilfoil†	<i>Myriophyllum spicatum</i>
<b>Field bindweed*</b>	<b><i>Convolvulus arvensis</i></b>
<b>Flixweed</b>	<b><i>Descurainia sophia</i></b>
Giant salvinia†	<i>Salvinia molesta</i>
Green foxtail	<i>Setaria viridis</i>
Hairy nightshade	<i>Solanum sarrachoides</i>
<b>Halogeton</b>	<b><i>Halogeton glomeratus</i></b>
Hoary cress*	<i>Cardaria draba</i>
Houndstongue	<i>Cynoglossum officinale</i>
Hydrilla†	<i>Hydrilla hydrilla</i>
<b>Johnson grass</b>	<b><i>Sorghum halepense</i></b>
<b>Kochia</b>	<b><i>Bassia scoparia</i></b>
Leafy spurge*	<i>Euphorbia esula</i>
Mayweed chamomile	<i>Anthemis cotula</i>
Meadow knapweed†	<i>Centaurea pratensis</i>
Mediterranean sage†	<i>Salvia aethiopsis</i>
Medusahead rye†	<i>Taeniatherum caput-medusae</i>
Moth mullein†	<i>Verbascum blattaria</i>
<b>Musk thistle*</b>	<b><i>Carduus mutans</i></b>

Common Name	Scientific Name
Myrtle spurget†	<i>Euphorbia myrsinites</i>
Orange hawkweed†	<i>Hieracium aurantiacum</i>
Oxeye daisy	<i>Chrysanthemum leucanthemum</i>
<b>Perennial pepperweed</b>	<b><i>Lepidium latifolium</i></b>
Perennial sorghum	<i>Sorghum halepense</i> L & <i>Sorghum alnum</i>
Perennial sowthistle	<i>Sonchus arvensis</i>
Plumeless thistle	<i>Carduus acanthoides</i>
Poison hemlock	<i>Conium maculatum</i>
<b>Puncturvine</b>	<b><i>Tribulus terrestris</i></b>
<b>Purple loosestrife</b>	<b><i>Lythrum salicaria</i> L.</b>
Quackgrass	<i>Agropyron repens</i>
Rush skeletonweed†	<i>Chondrilla juncea</i>
<b>Russian knapweed*</b>	<b><i>Centaurea repens</i></b>
<b>Russian olive</b>	<b><i>Elaeagnus angustifolia</i></b>
<b>Russian thistle</b>	<b><i>Salsola tragus</i></b>
<b>Saltcedar/Tamarisk</b>	<b><i>Tamarix chinensis</i></b>
Scentless chamomile	<i>Anthemis arvensis</i>
Scotch thistle	<i>Onopordum acanthium</i>
Sericea lespedeza†	<i>Lespedeza cuneata</i>
Shepherdspurse	<i>Capsell bursa-pastoris</i>
<b>Spotted knapweed</b>	<b><i>Centaurea maculosa</i></b>
Spurred anoda	<i>Anoda cristata</i>
Squarrose knapweed†	<i>Centaurea squarrosa</i>
Storksbill	<i>Erodium cicutarium</i>
Sulfur cinquefoil†	<i>Potentilla recta</i>
Swainsonpea	<i>Sphaerophysa salsula</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Velvetleaf	<i>Abutilon theophrasti</i>
Venice mallow†	<i>Hibiscus trionum</i>
Wild caraway	<i>Carum carvi</i>
Wild mustard	<i>Brassica kaber</i>
Wild oats	<i>Avena fatua</i>
Wild proso millet	<i>Panicum miliaceum</i>
Yellow foxtail	<i>Setaria glauca</i>
Yellow starthistle†	<i>Centaurea solstitialis</i>
Yellow toadflax	<i>Linaria vulgaris</i>

**Bold species**-Current exotics found in the SEUG units.

\* - Weeds marked with an asterisk (\*) are recognized as the top ten prioritized weed species for the State of Colorado. After analysis of a statewide survey of counties, these species are acknowledged to be the most widespread and to cause the greatest economic impact in the State of Colorado. These species shall be considered by each local advisory board and local governing body in the development, adoption and enforcement of their noxious weed list and noxious weed management plan.

† - Weeds marked with a cross (†) may not be present or are not yet widespread or causing great economic impact within the State of Colorado. However, counties and local advisory boards are encouraged to contain and eradicate these species before they proliferate and significantly impact the economic and environmental values of the lands of the State.

## Appendix C

### Summaries of Southeast Utah Group Exotic Plants of Concern

#### **Canada thistle (*Cirsium arvense*)**

Canada thistle is an herbaceous perennial with erect stems 1½-4 feet tall, prickly leaves and an extensive creeping rootstock. Stems are branched, often slightly hairy, and ridged. Leaves are lance-shaped, irregularly lobed with spiny, toothed margins and are borne singly and alternately along the stem. Rose-purple, lavender, or sometimes white flower heads appear from June through October, generally, and occur in rounded, umbrella-shaped clusters.

Canada thistle grows in barrens, glades, meadows, prairies, fields, pastures, and waste places. It does best in disturbed upland areas but also invades wet areas with fluctuating water levels such as stream bank sedge meadows and wet prairies.

As it establishes itself in an area, Canada thistle crowds out and replaces native plants, changes the structure and species composition of natural plant communities and reduces plant and animal diversity. This highly invasive thistle prevents the coexistence of other plant species through shading, competition for soil resources and possibly through the release of chemical toxins poisonous to other plants.

<http://www.nps.gov/plants/ALIEN/fact/ciar1.htm>

***Treatment Methods:*** Manual and mechanical treatments prior to seed set or application of a systemic herbicide such as glyphosate. Rhizomatous-herbicide treatment only.

#### **Common cocklebur (*Xanthium strumarium v. canadense*)**

Common cocklebur is a coarse bushy annual with stout, usually red-spotted stems, 2 to 3 feet high, reproducing by seed. The large rough glandular green leaves are long stalked and triangular, somewhat lobed, about 2 to 14 inches long, and 1 to 8 inches broad. The short flowering branches arise from the leaf axils along the main stems. The inconspicuous male flowers are grouped into several to many round clusters at the top, with the conspicuous brown female burs at the base. The football shaped burs, 1/2 to 1 inch or more long, enclose 2 female flowers, and are covered by about 400 stiff, glandular-hairy spines, 1/8 to 1/4 inch long, ending in a hook. The male flowers drop off quickly, but the burs persist, with the 2 blackish achenes. The 2 seeds inside, about 1/2 inch long, remain fertile for many years.

Common cocklebur grows in moist flooded soil of roadsides, cultivated fields, pastures, and flats throughout the state, particularly troublesome in wet years around water holes flowering June to October. The vicious burs form-tangled clots in the manes, tails, or wool of animals, often resulting in a lower value of the wool.

The seeds and the seedling plants of cockleburs are particularly poisonous to hogs; however, sheep, cattle, horses, and chickens have also been poisoned by eating the seedlings. The seeds are rarely eaten; the seedlings contain the poisonous principle that decreases rapidly as the seedling plant grows.

<http://www.uapress.arizona.edu/online.bks/weeds/cocklbur.htm>

**Treatment Methods:** Mechanical removal. Herbicidal treatment with Plateau, Transline, or Rodeo.

### **Common horehound (*Marrubium vulgare*)**

Horehound is a bushy spreading plant that grows to 75cm in height. The base of the stems is woody. The leaves are grey-green, hairy and crinkled in appearance. Fairly insignificant white flowers arranged in rings around the upper part of the stems. Flowers die off leaving a spiny burr. Each burr contains 4 small brown or black seeds.

Horehound was sold in Tasmanian nurseries as a garden or medicinal herb from as early as 1845. The plant now spreads when the burrs attach themselves to passing animals in fur and wool and on to peoples clothing. It is spread by water along drainage lines and creeks. It is drought tolerant and is able to quickly increase its range when hot dry conditions limit the growth of other plants. It does best in alkaline soils.

Horehound is very bitter. Grazing animals tend to concentrate on other plants in the paddock cutting down the competition and leaving Horehound to spread. If animals are forced to eat Horehound, their meat has a strong offensive smell and flavor. The most significant effect of the weed is that the burrs attach themselves strongly to wool and are difficult to remove. The sale price of the wool will then be down graded. Because the plant is drought tolerant, it can use the occasional drought to suddenly increase its range.

<http://weeds.tassie.net.au//txts/horehound.html>

**Treatments Methods:** Mechanical removal. Herbicide treatment with Plateau.

**Crested wheatgrass (*Agropyron cristatum*)**

Long-lived, moderately coarse perennial bunchgrass, 2 to 3 feet tall with a bright green, curing to straw color. Leaves are flat, 6 to 10 inches long. Seed heads are 1 1/2 to 2 1/2 inch-long spikes, borne singly on the ends of the stalks. The name refers to the flat inflorescence that somewhat resembles a head of wheat. The grass was often seeded after big Sagebrush (*Artemisia tridentata*) control measures.

[http://ag.arizona.edu/pubs/natresources/az97105/crested\\_wheatgrass.html](http://ag.arizona.edu/pubs/natresources/az97105/crested_wheatgrass.html)

**Treatments Methods:** Mechanical removal.

**Diffuse knapweed (*Centaurea diffusa*)**

Diffuse knapweed (*Centaurea diffusa*) is a biennial or, occasionally, an annual or short-lived perennial. It reproduces and spreads from seed. The plant develops a single shoot (stem), 1 to 2 feet tall, which is branched toward the top. Rosette and lower shoot leaves are finely divided. Leaves become smaller toward the top of the shoot and have smooth margins.

Many solitary flowering heads occur on shoot tips. They are about 1/8 inch in diameter and 1/2 to 2/3 inch long. Flowers usually are white but may be purplish. Involucre bracts are divided like teeth on a comb and tipped with a slender spine that makes them sharp to the touch.

Diffuse knapweed is native to degraded noncropland (waste places) and seashores from southern Europe to north-central Ukraine. It generally is found on dry, light, porous soils in Europe. Diffuse knapweed appears to occupy similar areas in the United States. Diffuse knapweed will not tolerate flooding or shade and thrives in the semiarid west (generally in 9- to 16-inch precipitation zones). Environmental disturbance (e.g., overgrazed pastures or rangeland, roadsides, rights-of-way, gravel piles, etc.) promotes its invasion.

<http://www.ext.colostate.edu/pubs/natres/03110.html>

**Treatments Methods:** Small patches treated by pulling and foliar spray with Transline (Clopyralid) with water carrier and a surfactant. Also, occasional late season use of Tordon (Picloram) with a water carrier and a surfactant.

**Field bindweed (*Convolvulus arvensis*)**

Field bindweed, *Convolvulus arvensis*, is a native of Eurasia and was first documented in California in 1884 when it was collected in San Diego. By the first quarter of the twentieth century, field bindweed was proclaimed the worst weed in California and many of the western states. Seed most likely arrived in the United States as a contaminant in farm and garden seeds. However, because of its flowers and climbing nature, some seed were probably planted as ornamentals, either as a ground cover or hanging basket. Field bindweed has

been given many names including perennial morning-glory, creeping jenny, and corn-bind.

Mature field bindweed plants have arrowhead-shaped leaves that can be between 0.5 to 2 inches long, depending on environmental conditions. Mature leaves at the base of the stem are larger than the young leaves at the stem terminal. The flowers are trumpet shaped, white to pink in color, and 1 to 1.5 inches in width. Field bindweed is a prostrate plant unless it climbs on an object for support. It is often found growing on upright plants, such as shrubs or grape vines, with its stems and leaves throughout the plant and the flowers exposed to the light. Under warm moist conditions, leaves are larger and vines more robust than under drought conditions. The root system has both deep vertical and shallow horizontal lateral roots. The vertical roots can reach depths of 20 feet or more. However, 70% of the total mass of the root structure occupies the top 2 feet of soil. Most of these lateral roots are no deeper than 1 foot. Experiments on bindweed have shown that its root and rhizome growth can reach 2.5 to 5 tons per acre.

<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7462.html>

**Treatments Methods:** Foliar spray with Transline (Clopyralid) with water carrier and a surfactant. Foliar spray with Rodeo (Glyphosate) with water carrier and a surfactant. Occasional late season use of Tordon (Picloram) with water carrier and a surfactant.

**Bio-control:** Bindweed Gall Mite (*Aceria malherbae*), Field Bindweed Moth (*Tyta luctuosa*)

### **Halogeton (*Halogeton glomeratus*)**

Halogeton is an annual herbaceous plant, typically six to twelve inches tall, with short, fleshy, sausage-like leaves less than half an inch long. One of its most distinctive features is the conspicuous, soft, slender spine at the bluntly rounded tip of each leaf. Plants are often bluish green in spring and early summer, turning yellow, salmon, pink, purplish, or even reddish by late summer or early fall. Stems often turn pink or red while leaves are still blue-green. Plants can resemble Russian thistle in early stages of growth, but are distinguished easily by the unique leaf tips and the presence of tiny, cotton-like hairs in the leaf axils.

Halogeton is found mainly on disturbed arid sites in saltgrass, salt desert shrub, mixed desert shrub, or pinyon-juniper plant communities. Annual weeds typically associated with halogeton include cheat grass (*Bromus tectorum*) and Russian thistle (*Salsola tragus*). It is especially common along roadsides, on the edges of alkaline flats, in livestock bedding or feeding areas, in abandoned dryland farms and townsites, and around desert watering sites.

**Treatment Methods:** Manual/mechanical methods. Foliar spray with Rodeo (Glyphosate), Transline, or Plateau with water carrier and a surfactant.

**Musk thistle (*Carduus nutans*)**

Musk thistle is a biannual plant, typically are 5-7 feet high with a long, fleshy taproot. Leaves of both rosettes and bolted plants are deeply segmented and dark green with a light green midrib. Each lobe has three to five points that end in a white or yellowish spine. Seedlings emerge only as a single leaf and grow into rosettes that can reach over 2 feet in diameter. It has deep reddish purple flowers that are large (up to 3 inches in diameter) and attractive. Blooming starts with the terminal head at the top of the plant about the first week in June and progresses to the lower branches over six to eight weeks. Musk thistle is a prolific seed producer and individual terminal heads can have as many as 1,500 seeds each a little over 1/8 inch long. Seed germination may run as high as 95% shortly after dissemination and most germinate in the first year, some will remain viable for more than 10 years in the soil.

Musk thistle is mainly found in pastures, rangeland, roadway ditches and wasteland. These areas that are not tilled or treated with herbicides can develop into a serious infestation. In pasture and rangelands thistles compete for the moisture, sunlight and nutrients needed to produce forage for livestock. On roadways and wastelands musk thistle does not provide sufficient protection from soil erosion, crowds out desirable vegetation, is unsightly, hinders movement of people and wildlife and produces seed that infests surrounding areas.

**Treatment Methods:** Mechanical removal. Herbicide treatment with Transline.

**Perennial pepperweed (*Lepidium latifolium*)**

Perennial pepperweed or tall whitetop is a member of the Mustard family. It was introduced from either southern Europe or western Asia. It is a deep-rooted perennial plant with an extensive, vigorous creeping root system that reproduces by seed rootstalks. Perennial pepperweed is similar to whitetop, however, it is taller. Perennial pepperweed stands 3 to 5 feet high with a heavy, sometimes woody, crown. The lower leaves are oblong with toothed margins. The upper leaves do not clasp the stem as whitetop. Flowers are white. Perennial pepperweed can be found in pastures, riparian areas, roadsides, and waste places.

[http://www.cwma.org/perr\\_pepperwood.html](http://www.cwma.org/perr_pepperwood.html)

***Treatments Methods:***

Foliar spray with Transline (Clopyralid) with water carrier and a surfactant. Foliar spray with Habitat (Imazapr) with water carrier and a surfactant.

**Puncturevine (*Tribulus terrestris*)**

Puncturevine is a member of the Caltrop family and is an introduced annual that reproduces by seeds. It is a prostrate, mat forming plant with trailing stems, each 1 to 6 feet long and hairy. The leaves are opposite, pinnate, one to two inches long with four to eight pairs of leaflets. The yellow flowers are 1/4 to 1/2 inches wide with five petals. The fruit is a hard, spiny bud that at maturity breaks into five tack-like sections.

Puncturevine, also known as goathead, grows in pastures, cultivated fields, and waste places. The burs may injure livestock and are the bane of bicyclists.

<http://www.cwma.org/puncturevine.html>

***Treatments Methods:*** Some mechanical removal and some heat treatment.

***Bio-control:*** Puncturevine Seed Weevil (*Microlarinus lareynii*), Puncturevine Stem Weevil (*Microlarinus lypriformis*)

**Purple loosestrife (*Lythrum salicaria*)**

Purple loosestrife is a tall, erect, perennial herb that grows to nearly 2 m tall when present in the most favorable wetland habitats. Plants tend to be covered with short hairs, at least in the upper part. A number of varieties have been recognized on the basis of the species' variability in the amount and distribution of hairs on the stem and leaves and differences in leaf shape. Its relatively stout and firm stems bear stalkless, opposite or whorled leaves that are generally lance-shaped but may be more oblong or relatively narrow and linear. The bases of the blades tend to be rounded or somewhat heart-shaped. Leaves vary in length from 3-10 cm. Those at the base of the flower spikes and within the spikes are commonly much reduced in size and tend to be attached alternately. In mid-summer, plants are very showy because each has several to many spikes of densely clustered, nearly stalkless, rose to red-purple flowers. In large plants, many flowering branches may be present giving the plant a bushy appearance.

Purple loosestrife is an herbaceous perennial that reproduces sexually by seed and vegetatively through the formation of adventitious shoots and through the rooting of buried and cut stems. Cultivated varieties formerly thought to be sterile are now known to produce fertile seeds when cross-pollinated by wild plants. The plant's widespread occurrence is due, in part, to the attractiveness of its showy flowering spikes in mid summer that make it a desirable addition to perennial gardens and, as well, to its prolific seed production. It has been estimated that a large robust plant could produce up to 2.7 million seeds. Seeds survive for a number of years within the soil seed bank. Disruption of the soil by mechanical removal of plants for control purposes results in buried seeds being brought to the surface. Seeds germinate over a wide range of environmental conditions.

The flowers of purple loosestrife are trimorphic, meaning that there are three forms of flowers present in the species, with only one type being present on a particular plant. Flowers may have short styles, medium styles or long styles. Each flower with a particular style length also has stigmatic papillae of a particular length suited to the germination of small, medium or large pollen grains. Each flower type also has two sets of stamens of different lengths that hold the anthers away from the stigmatic surface to minimize transfer of pollen within a flower.

<http://infoweb.magi.com/~ehaber/factpurp.html>

**Treatments Methods:** Small patches treated by pulling and foliar spray with Rodeo (Glyphosate) with water carrier and a surfactant.

**Bio-control:** Leaf Beetles (*Galerucella* spp.)

### **Ripgut brome (*Bromus diandrus*)**

Ripgut brome, also known as great brome, is a brome grass which is native to the Mediterranean but has been introduced to much of the rest of the world. It has naturalized in some areas and is considered a troublesome noxious weed in others. It does best in areas with a Mediterranean climate, such as California and parts of southern Australia, but it is quite tolerant of many climates. The adult plant is one to three feet in height with hairy, rough leaves about a centimeter wide. It has a tubular sheath on the seedling which distinguishes it from most other grass seedlings. Soft hairs cover the blades and sheaths. The membranous ligule is long, whitish, and jagged. No auricles present. Open panicles resemble oats. Large spikelets have awns that are 1 to 2 inches (2.5 - 5 cm) long, distinguishing it from another common brome grass, soft brome, which has much shorter awns. The floret parts have tiny, rough teeth that are injurious to livestock and pets. This is one of several grass species known to pet owners as "foxtails". To distinguish from wild oat, dig down and check for seed coat.

It is in flower from May to June. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Wind, Cleistogomy (self-pollinating without flowers ever opening). The plant is self-fertile. The plant prefers light (sandy), medium (loamy) and heavy (clay) soils, requires well-drained soil and can grow in nutritionally poor soil. The plant prefers acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It requires dry or moist soil and can tolerate drought. The plant can tolerate strong winds but not maritime exposure.

<http://plants.usda.gov/java/profile?symbol=BRDI3>

**Treatments Methods:** Pulling and removal of entire plant from area. Herbicidal treatment with Plateau.

**Russian knapweed (*Centaurea repens*)**

Russian knapweed (*Acroptilon repens*) is a creeping, herbaceous perennial of foreign origin that reproduces from seed and vegetative root buds. Shoots, or stems, are erect, 18 to 36 inches tall, with many branches. Lower leaves are 2 to 4 inches long and deeply lobed. Upper leaves are smaller, generally with smooth margins, but can be slightly lobed. Shoots and leaves are covered with dense gray hairs. The solitary, urn-shaped flower heads occur on shoot tips and generally are 1/4 to 1/2 inch in diameter with smooth papery bracts. Flowers can be pink, lavender or white. Russian knapweed has vertical and horizontal roots that have a brown to black, scaly appearance, especially apparent near the crown. The weed forms dense, single species stands over time due to competition and allelopathy (biochemicals it produces that inhibit the growth of other plants).

Russian knapweed emerges in early spring, bolts in May to June (elevation dependent) and flowers through the summer into fall. It produces seeds sparingly, approximately 50 to 500 per shoot. Seeds are viable for two to three years in soil. Its primary method of reproduction is from vegetative propagation, with seed of secondary importance. Roots from a recently established plant expand rapidly and may cover up to 12 square yards in two growing seasons. Russian knapweed is native to southern Ukraine, southeast Russia, Iran, Kazakhstan and Mongolia. It grows on clay, sandy or rocky prairies and sunny meadows; on saline soils; or clay, rocky or sandy shores of lakes and rivers; and on rocky and clay slopes of hills and bottomlands. It is a weed of cultivated land, dry pastures and degraded non-cropland (waste places) in its native land. Russian knapweed grows in most western states.

<http://www.ext.colostate.edu/pubs/natres/031111.html>

***Treatments Methods:*** Foliar spray with Transline (Clopyralid) with water carrier and a surfactant. Some previous use of Rodeo (Glyphosate) with water carrier and a surfactant. Occasional late season use of Tordon (Picloram) with water carrier and a surfactant.

**Russian olive (*Elaeagnus angustifolia*)**

The species is widely grown as an ornamental in North America because of its silvery-gray foliage. It is still being actively promoted as a suitable windbreak species, as living snow fences, for erosion control and as a food source, particularly in the form of the edible fruits, for birds and other wildlife. Plants are well adapted to open sunny locations, tolerate most soil types and are hardy in zones 2 to 7. Russian olive is known to be salt-tolerant. It is also promoted as a preferred species for sandy, alkaline and well-drained soils. In the western US,

where Russian olive has become most widely naturalized, it occurs commonly along floodplains, stream channels, riverbanks, marshes and irrigation ditches.

Russian olive begins flowering when plants are between 3 to 5 years old. Flowering occurs from May through June, with fruits maturing from August to October. Fruits remain on the plant throughout the winter, if they are not eaten by birds. The pulpy, sweet fruits are eaten by a variety of birds and small mammals. Ingested seeds are readily dispersed by birds. In the western states, seeds are commonly deposited along river courses where shrubs and trees are localized and provide perches for birds.

Seeds remain viable for up to three years. Once established, plants thrive over a broad range of soil textures and moisture levels from heavy clay soils with groundwater to within about .5 m of the surface to light, sandy, well-drained soils. Plants can withstand flooding and silting and are also drought resistant. They grow best in deep sandy or loamy soils with pH>6 and with low levels of salt and alkali. Russian olive, however, is also tolerant to elevated levels of salt. The species also tolerates temperature ranges from -45° C to +46° C and ranges from sea level to mountainous sites to at least about 2500 m. This exotic grows rapidly, as much as 1.8 m per year, and readily competes with other species, especially in riparian habitats. It is somewhat shade tolerant and, once established in disturbed sites being colonized, can persist through the various seral stages to become the dominant species replacing native cottonwoods and willows in western drainage systems.

In addition to sexual reproduction and the setting of abundant seeds and seedlings, Russian-olive also propagates itself vegetatively by sprouts from adventitious buds formed on the root crowns and by root suckers. Burned areas are readily re-colonized through the production of root crown sprouts and offsite seed sources.

<http://infoweb.magi.com/~ehaber/factoliv.html>

**Treatments Methods:** Cut stump treatment, stem is cut and stump is sprayed with a 1:4 mixture of Garlon 4 and JLB oil. Occasional direct spraying of small stems with the Garlon 4 mixture.

### **Russian thistle (*Salsola tragus*)**

Russian thistle, also known as tumbleweed, is in the goosefoot family (Chenopodiaceae). Its scientific name is *Salsola tragus*, but it also has been known as *S. iberica*, *S. kali*, and *S. australis*. It is a summer annual native to southeastern Russia and western Siberia and was first introduced into the United States in 1873 by Russian immigrants as a contaminant in flax seed in South Dakota. After its introduction, it spread by contaminated seed, threshing crews, railroad cars (especially livestock cars), and by its windblown pattern of seed

dissemination. In 1895 Russian thistle moved to the Pacific Coast in contaminated railroad cars that transported cattle to Lancaster in California's Antelope Valley. Today it is common throughout the western United States and is particularly well adapted to California's climate of winter rainfall and summer drought.

Russian thistle is primarily a weed in sites where the soil has been disturbed, such as along highways. It is also prevalent in vacant lots and other non-crop areas, in field and vegetable crops, and in poorly tended landscapes. It is rarely a problem in well-managed gardens or turfgrass. Russian thistle is a bushy summer annual with numerous slender ascending stems that become quite woody at maturity. Stems vary from 8 to 36 inches in length and usually have reddish to purplish stripes. Seedlings have very finely dissected leaves that almost look like pine needles. Leaves of young plants are fleshy, dark green, narrow, and about 1 inch in length. Young plants are suitable for livestock forage and are sometimes grazed. As the plant matures in July to October the older leaves are short and stiff with a sharp-pointed tip. The single, inconspicuous flowers lack petals and are borne in most leaf axils above a pair of small spine-tipped bracts. The bracts and spiny leaves prevent predation by herbivores as the plant nears maturity. The overall shape of the plant becomes oval to round and may attain a diameter of 18 inches to 6 feet at maturity. After the plant dries, the base of the stem becomes brittle and breaks off at soil level in fall and early winter. These round, thorny plants are capable of dispersing seed for miles as they tumble along in the wind.

In late fall and early winter, this troublesome pest becomes conspicuous as it breaks from the soil and is blown across highways and fields. Although Russian thistle, or tumbleweed, conjures up images of the old west, it can be a serious weed pest. In agricultural areas, Russian thistle can reduce yield and quality of numerous crops, particularly alfalfa and small grains. It depletes soil moisture, interferes with tillage operations, and serves as a shelter or food source to many insects, vertebrate pests, and crop diseases. Russian thistle can also threaten native plant ecosystems. Large plants can reduce highway safety by obstructing views along right-of-ways and causing drivers to swerve their cars in an attempt to avoid colliding with windblown plants. In many areas, plants accumulate along tree rows and fence lines, posing a serious fire hazard that necessitates hours of manual labor for cleanup and disposal. It has been reported that prairie wildfires can spread rapidly when ignited balls of burning Russian thistle blow through grasslands. Russian thistle is a major problem along the California aqueduct where it can interfere with water delivery and pumping systems. Many people are sensitive to Russian thistle and exhibit skin rashes and allergic reactions after exposure to the plant. A slight scratch or abrasion from the plant may result in itching or reddened patches of skin. The windblown pollen of Russian thistle can cause an allergic reaction in people during summer.

The Russian thistle seed is a naked, coiled embryo [22K] that begins to uncoil when it is exposed to the proper temperature (52° to 90°F) and moisture conditions. As it uncoils, the taproot extends into the soil within about 12 hours, making the germination period quite rapid and giving Russian thistle a decided advantage under limited moisture conditions. A minimum amount of moisture, lasting only a few hours, will allow germination and root growth to deeper, subsurface moisture.

Russian thistle normally will not germinate successfully in firm soil: the soil in the site must be loose. Likely sites for germination include vacant lots, abandoned gardens and agricultural fields, roadsides, fence lines—any open site with loosened soil. Germination normally occurs in late winter or early spring when the seed can take advantage of winter moisture. Seed viability is rapidly lost in soil. Over 90% of the seed either germinate or decay in the soil during the first year. Russian thistle is extremely drought tolerant. The taproot can extend several feet into the soil to reach subsurface moisture. Early leaves are linear and fleshy, much like pine needles, but as the plant matures, later leaves are short and spiny and much more capable of conserving moisture. Russian thistle normally matures in late summer. An abscission layer forms in the stem near the soil surface that allows the shoot to break off from the taproot in fall and early winter. The seed is spread when mature plants are blown along by the wind. A large Russian thistle plant may produce more than 200,000 seed. In spring, months after their dissemination, it is possible to trace the paths of tumbleweeds across plowed fields by the green trails of germinating Russian thistle seedlings.

Russian thistle can tolerate alkaline soil conditions. It is very competitive when moisture is a limiting factor to the growth of other vegetation, when soils are disturbed, or when competing vegetation is suppressed by overgrazing or poor crop establishment. If moisture is not limiting, Russian thistle is less competitive with other species. Seedlings of Russian thistle are suppressed when other plants become established first and shade out the sunlight.

<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7486.html>

**Treatments Methods:** Mechanical removal, heat treatment and foliar treatment with a 1:4 mixture of Garlon 4 and JLB oil or foliar treatment with Rodeo (Glyphosate) with water carrier and a surfactant.

### **Siberian elm (*Ulmus pumila*)**

Siberian elm is a fast-growing, small to medium-sized tree with an open, round crown of slender, spreading branches. It generally measures 50-70 feet (15-21 meters) tall with a spread equal to three-fourths its height. Its rough bark is gray or brown and shallowly furrowed at maturity. Both the small, blunt buds and slender, smooth twigs are nearly hairless. This elm is distinguished by its small, elliptic, smooth, singly-toothed leaves, that reach lengths of approximately 0.8-2.6 inches (2-7 cm). Blades of the alternate, simple leaves are short-pointed at

the tip and tapering or rounded at the asymmetrical base. The short-petioled leaves are dark green and smooth above, paler and nearly hairless beneath, and yellow in autumn. Foliage is slightly pubescent when young, and firm at maturity. Flowers are greenish, lack petals, and occur in small drooping clusters of 2-5. The winged fruit of this hardy tree is a 1-seeded, smooth, circular or rather obovate samara that is 0.4-0.6 inch (10-15 mm) wide and hangs in clusters. Siberian elm is native to northern China, eastern Siberia, Manchuria, and Korea, and was introduced to the U.S. in the 1860's. It is the hardiest of all elms and does well even in areas with cold winters and long periods of summer droughts. Often planted in recent decades because of its fast growth, it is now established at least from Minnesota south to Arkansas and west to Utah. Because this elm tolerates a variety of conditions, such as poor soils and low moisture, it is found in dry regions, along roadsides, in pastures, in grasslands, as well as in moist soils along streams. It invades dry and mesic prairies, including sand prairies.

The tree flowers in spring before leaves begin to unfold. The samaras follow quickly and are disseminated by wind, allowing the species to form thickets of hundreds of seedlings in bare ground. Seeds germinate readily and seedlings grow rapidly. If there is a nearby seed source, the tree can invade and, in a few years, dominate prairie areas, particularly if they have been subjected to past disturbance.

<http://www.inhs.uiuc.edu/edu/VMG/sibelm.html>

***Treatments Methods:*** Cut stump treatment, stem is cut and stump is sprayed with a 1:4 mixture of Garlon 4 and JLB oil. Occasional direct spraying of small stems with the Garlon 4, Remedy, or Tahoe 4E mixture. Cut stump treatment with Remedy (Triclopyr), Garlon 4, or Tahoe 4E with water carrier and a surfactant.

**Sweet clovers (*Melilotus albus* and *Melilotus officinalis*)**

Annual forms of white sweet clover exist, but the plant is primarily biennial. First-year plants are comprised entirely of vegetative growth (usually a single stem) and over winter as buds on the caudex. Second-year plants have a strongly developed taproot that may exceed 50 inches (120 cm) in depth, and 1 to 10 upright or ascending flowering stems from 3 to 8.5 feet in height. The inflorescence is a raceme with 40 to 80 white flowers. The fruit is a one-seeded pod.

White sweet clover is a good seed producer. Seed production estimates of 14,000 to 350,000 seeds per plant have been reported. Large plants growing in the open in Ontario produced between 200,000 and 350,000 seeds each. The fruits are shed in the fall, and are dispersed by gravity, strong winds, and water. The seeds float, and thus rain wash and stream flow may be an important means

of dispersal. A large percentage of the seeds have a hard seed coat and can remain viable in the soil for more than 20 years. Natural scarification occurs through fluctuating freezing and thawing temperatures or by heat from a fire. New seedlings are found almost any month during the growing season, but only spring-emerged seedlings survive the winter. Vegetative reproduction does not occur naturally. If second-year plants are cut, new growth must come from buds on the stems rather than the caudex.

White sweet clover is shade intolerant and grows in a wide variety of open habitats but is most common along roads and railways, and in prairies, arid rangelands, fields, and waste places. Its associates are too numerous to list, but it often grows with yellow sweet clover (*Melilotus officinalis*) in the West. It is not tolerant of continuous flooding but occasionally grows on open, gravelly riverbanks that experience brief spring flooding. White sweet clover grows on a wide range of soil types and textures from clay to dune sand and river gravels. It is most commonly found on calcareous soils. It grows poorly on acid soils. It requires sufficient moisture for establishment but is thereafter very drought tolerant. White sweet clover is an early colonizer of disturbed sites. It is common on strip-mined lands in the central and eastern United States.

<http://www.fs.fed.us/database/feis/plants/forb/melalb/all.html>

**Treatments Methods:** Small patches treated by pulling and foliar spray with Rodeo (Glyphosate), Transline or Plateau with water carrier and a surfactant. Heat treatment for larger areas.

### **Tamarisk (*Tamarix chinensis*)**

Tamarisk (a.k.a. salt cedar) is one of the most invasive, natural community altering, shrub-trees in the southwestern United States. Estimates of the tamarisk invasion in the southwest include over 600,000 ha of riparian habitats dominated by this species. One need only look to the Colorado River to see the potential that tamarisk has as an alien invader into natural ecosystems. Tamarisk is a superior competitor in the wetland ecosystems of the southwest, and we have helped it further by damming and increasing the salinity of those systems. Each tamarisk produces 500,000 wind-dispersed seeds per year. Once established, tamarisk acts as a facultative halophyte, tolerating salt concentrations up to 15,000 ppm, and secreting salt at 41,000 ppm, which is deposited on the soil surface. In addition to increased soil salinity, tamarisk increases fire frequency within the riparian habitats it dominates. The high levels of dead leaves and branches produced by the fast growing tamarisk provide ample fuels for wildfires. After the fires, tamarisk sprouts vigorously, while native riparian trees and shrubs generally do not. The result over time, as a result of both increased soil salinity and fire frequency is a riparian community dominated by tamarisk. Along with the invasive adaptations tamarisk possesses, human alteration of hydrologic regimes (i.e. dams) along streams and rivers has reduced the natural flood processes that

willows and cottonwoods thrive under, and that flush out salts accumulating at the soil surface, giving tamarisk one more advantage.

<http://www.caleppc.org/symposia/96symposium/barrows.html>

**Treatments Methods:** Cut stump treatment, stem is cut and stump is sprayed with a 1:4 mixture of Garlon 4 and JLB oil. Occasional direct spraying of small stems with the Garlon 4 mixture.

**Bio-control:** Chinese Leaf Beetle (*Diorhabda elongate deserticola*)

### **Tumble mustard (*Sisymbrium altissimum*)**

Tumble mustard is a winter annual or annual. The stems are simple below, much branched above having a bushy appearance. It grows 2 to 5 feet tall. Leaves are alternate and of 2 types; lower leaves are coarse and divided into broad lobes or leaflets. Upper leaves are much reduced and finer with narrow lobes or segments. Flowers are small, pale yellow, in racemes. Fruit is a slender 2-valved capsule 2 to 4 inches long. The seeds are small, numerous, yellow to brown and oblong.

It is a native of Europe, but is widely scattered throughout the United States. It is common in small grains, rangeland, waste areas, and along roadsides. This species often breaks off at soil level at maturity and scatters seeds as it tumbles in the wind.

**Treatment Methods:** Heat treatment. Herbicidal treatment with Transline.

**Bio-Control:** Musk thistle head weevil (*Rhinocyllus conicus*), musk thistle rosette weevil (*Trichosiocalus horridus*), and musk thistle tortoise beetle (*Cassida rubiginosa*).

### **Yellow salsify (*Tragopogon dubius*)**

Yellow salsify is an introduced biennial or an annual herb with milky sap. The stems are leafy, often branched and reach 30-100 cm tall. The stem is markedly swollen just below the heads. The alternate leaves clasp the stem at the base and are long, narrow, smooth-margined, and taper from the base to the tip. The solitary heads are composed of pale yellow ray flowers only with the involucre large (2.5-4 cm long) and cone-shaped in bud. Yellow salsify is common in relatively dry waste places such as railroad embankments, roadsides, and fields at low elevations.

[http://www.ups.edu/faculty/kirkpatrick/field\\_botany/family\\_pages/Asteraceae/tragopogon\\_dubius.htm](http://www.ups.edu/faculty/kirkpatrick/field_botany/family_pages/Asteraceae/tragopogon_dubius.htm)

**Treatments Methods:** Mechanical control. Herbicide treatment with Transline.

## Appendix D

### BRIEFING STATEMENT

National Park Service—Southeast Utah Group  
June 25, 2008

**Subject:** Notice of Intent to Prepare an Exotic Plant Management Plan and Environmental Assessment—Invitation to Participate

#### **What is the Exotic Plant Management Plan?**

Based upon recent exotic plant inventories, “the plan” will outline a long-term, fully integrated weed management program, including components of complying with regulations, educational programs, collaboration measures, planning, treatment methods, monitoring, prevention, and recommendations for least damaging treatment and restoration alternatives.

In addition, the National Park Service Director’s Order 12 (DO-12) requires a NEPA-compliant program for exotic weed management. The objective of the plan is to provide coordinated, sound integrated exotic plant management guidance to Southeast Utah Group parks within the framework and requirements of DO-12 and the NEPA process. The Southeast Utah Group (SEUG) consists of Arches National Park, Canyonlands National Park, Hovenweep National Monument and Natural Bridges National Monument.

#### **Why is the plan needed?**

Under Director’s Order 12, “need” is described as an existing condition that should be changed, problems that should be remedied, decisions that should be made, and policies or mandates that should be implemented. Under this definition, the following needs have been identified for this project:

- **Existing conditions that should be changed:**  
An exotic plant management plan is needed to reduce the threat of exotic plants to these natural and cultural resources.
- **Problems that should be remedied:**  
An EPMP/EA is needed to achieve compliance with NEPA for future exotic plant management projects. Resource managers need access to more exotic plant management tools. This EPMP/EA will provide clearance for a number of treatment options, thus resource managers will be able to select and implement the most appropriate management approach in the future.
- **Decisions that should be made:**  
A comprehensive evaluation of potential impacts associated with exotic plant management is needed to educate resource managers of the potential effects of various treatment methods. Resource managers also need standardized best management practices (BMP) to mitigate potential impacts associated with management.  
A standardized decision-making process is needed so that management decisions can be easily communicated and justified to the public. A

standardized process would also help park managers and their staff to educate the public about exotic plant management programs.

- **Policies or mandates that should be implemented:**

An EPMP/EA is needed to ensure that relevant policies and mandates are implemented.

Controlling exotic plant infestations is one of the most serious challenges facing SEUG managers, who are charged with the protection of natural and cultural resources. Exotic plants are infesting SEUG at an alarming rate. Of over 96 exotic trees, herbaceous plants and grasses occurring in the park, 19 species have been identified as a threat to SEUG natural resources.

The proposed plan will assist the parks in managing this threat to ecosystem health and function and will provide a framework for cooperation with land managers, neighbors, and partners with common concerns.

### **Goals of the Plan**

The goals of the Exotic Plant Management Plan are to:

- Develop an EPMP/EA that provides the necessary environmental compliance for exotic plant management treatments at the SEUG parks.
- Restore native plant communities to reduce the need for ongoing exotic plant management.
- Prevent unacceptable levels of exotic plant damage, using environmentally sound, cost effective management strategies that pose the least possible risk to people, park resources, and the environment.
- Standardize exotic plant management at SEUG so actions can be more effectively implemented and explained to the public.
- Inform resource managers about various treatment options and mitigation measures so they have a number of “tools in their toolbox”

### **Proposed Actions**

The proposed action of the Exotic Plant Management Plan will be:

- **Compliance with Regulatory Measures**

For future exotic plant management activities, the monument would use a Decision Making Tool that would confirm compliance with applicable policies and regulations through the use of this EPMP/EA.

- **Education Programs**

One of the objectives of the EPMP/EA is to standardize exotic plant management at SEUG so actions can be more effectively implemented and explained to the public.

- **Collaboration Measures**

Collaboration would be an ongoing process that would build consensus with interested parties (including adjacent landowners), decision makers, technical experts, and the general public. Several types of collaboration would be conducted under the preferred alternative, including:

- \* Collaboration between the monument, the general public, and neighboring landowners.
- \* Collaboration between NPS resource managers and exotic plant management experts.
- \* Collaboration with local, state, and federal officials involved in exotic plant management.

- **Planning**

Resource managers would use the Decision-making Tool, developed specifically for the EPMP/EA, for exotic plant management planning. In using this tool, resource managers would follow a standard decision-making process to identify exotic plants, determine exotic plant management priorities, identify and evaluate the efficacy and environmental effects of the proposed treatment, consider alternative treatments having less impacts, justify why a treatment was selected, and confirm compliance with applicable policies and regulations.

The Decision-making Tool includes a series of five decision trees. These decision trees include:

- \* Identify Exotic Plants and Justify Management Needs
- \* Guidance for Setting Management Priorities
- \* Optimum Tool Analysis for Treatment Options
- \* Justify and Confirm Compliance of Chemical and Biological Treatments (with applicable policies and regulations)
- \* Confirm Compliance of Proposed Treatment Method with NEPA

- **Treatment Methods**

In addition to current mechanical/manual, chemical and cultural treatments, biological control agents would be implemented. Biological treatments involve the use of “natural enemies” (including insects and microorganisms) to reduce the abundance of an exotic plant.

- **Monitoring and Record Keeping**

Record keeping would be used to provide a historical record of activities and also to provide information that can be used to justify future exotic plant management activities. Monitoring would be used to determine whether exotic plant management activities are effective in meeting management objectives.

## Suggested Alternatives

***Alternative 1: No Action Alternative, Continue with Current Management Practices***, would be a continuation of existing exotic plant management programs at each separate park.

The Southeast Utah Group parks currently use limited mechanical/manual, cultural and chemical treatments to control exotic plant infestations within the parks. Because these activities and projects have been relatively small in scale, they fall under a categorical exclusion (CE) under NEPA. In NPS, “CEs are applicable to actions that, under normal circumstances, are not considered major federal actions and that have no measurable

impacts on the human environment.” (NPS DO-12) The categorical exclusion used to perform these activities read as follows:

*“Removal of individual members of a non-threatened/ endangered species or populations of pests and exotic plants that pose an imminent danger to visitors or an immediate threat to park resources.” (NPS Director’s Order #12, §3.4.E(3)).*

If this alternative is selected, SEUG would continue to conduct exotic plant control work within the park’s as it has been doing. To see the complete text of Director’s Order 12 and its reference to exotic species management, please see <http://www.nps.gov/policy/DOrders/RM12.pdf>, section 3.

***Alternative 2: Preferred Alternative, Integrated Pest Management – use of mechanical, cultural, chemical, biological control, and prevention techniques to manage exotic plants.***

We envision that the preferred alternative would consider the use of the full range of IPM techniques available both now and in the future for proactive, responsible integrated weed management. This more comprehensive plan would include actions for increased education and monitoring activities to address prevention of the introduction and spread of exotic species in the monument. Using the full range of IPM techniques, including biological control agents would prevent unacceptable levels of exotic plants using the most economical means while posing the least hazard to people, property, and the environment.

### **Alternatives Excluded From Further Consideration**

#### ***Alternative 3 - Stop all exotic plant management and control activities within each park.***

This alternative was eliminated from detailed study because stopping all exotic plant management and control activities within the parks are inconsistent with federal noxious weed management policies, NPS resource management guidelines, and state noxious weed laws. Specifically, this alternative is inconsistent with E.O. 13112 on Invasive Species, the Federal Noxious Weed Control Act, NPS management policies, and Utah and Colorado noxious weed laws. This alternative would also defy the purpose and objectives of the resource management objectives at each park.

#### ***Alternative 4 - Develop an IPM Plan that considers all treatments except chemical treatments.***

Developing an IPM Plan that considers all treatments except chemical treatments was considered, but was eliminated from further analysis because of the efficiency and efficacy of chemicals for treating some exotic plants. Also, the use of chemical treatments may be restricted or avoided, as necessary, to protect resources under Alternatives 1 and 2. NPS Management Policies (2006:47) states, “Exotic species will not be allowed to displace native species if displacement can be prevented.” In some instances, chemical treatment may be the only feasible method available for reducing the threat of exotic plants to environmental and cultural resources. According to NPS Management Policies, the use of herbicides is to be considered only when “all other available options are either not acceptable or not feasible.” Because IPM applies a holistic approach to exotic plant management decision-making, it takes advantage of all

appropriate exotic plant management tools, which may include, but is not limited to, herbicides (McCrea and DiSalvo 2001:394).

***Alternative 5 - Develop an IPM Plan that considers all treatments except biological control treatments.***

Developing an IPM Plan that considers all treatments except biological control was considered, but was eliminated because of the efficiency and efficacy of some biological control agents for treating some exotic plants. NPS Management Policies (2006:47) states, "Exotic species will not be allowed to displace native species if displacement can be prevented." In some instances, biological control may be the only feasible method available for reducing the threat of exotic plants to environmental and cultural resources.

**Anticipated Timelines**

Public scoping will begin in June 2008. The Exotic Plant Management Plan and Environmental Assessment should be ready for public review by late-summer. We would like to finalize and adopt a plan in the fall of 2008.

**Public Participation**

We invite your participation and appreciate your interest in the development of this much-needed plan. An outline of suggested alternatives has been prepared. These will evolve and change as we progress with the planning process and receive input from the public and other interested parties.

**Contact Information**

Comments on this initial stage of plan development can be documented on the PEPC website or can be mailed to Superintendent, Southeast Utah Group, 2282 W. Resource Blvd, Moab, UT 84532; by fax to 435-719-2300; or by email to CANY\_superintendent@nps.gov.



IN REPLY REFER TO:

# United States Department of the Interior

NATIONAL PARK SERVICE  
Southeast Utah Group  
Arches and Canyonlands National Parks  
Hovenweep and Natural Bridges National Monuments  
2282 S. West Resource Boulevard  
Moab, Utah 84532-3298

L7617(SEUG-RM)

June 25, 2008

Ms. Shelly Smith  
Bureau of Land Management  
Moab Field Office  
82 East Dogwood  
Moab, Utah 84532

Dear Ms. Smith:

The National Park Service is in the initial stages of developing an Exotic Plant Management Plan for Southeast Utah Group. The Southeast Utah Group (SEUG) consists of Arches National Park, Canyonlands National Park, Hovenweep National Monument and Natural Bridges National Monument. Prior to preparing an environmental assessment, the National Park Service (NPS) is seeking public comment to help identify issues associated with the proposed plan. It is the intention of the National Park Service to develop this plan by fall 2008.

Non-native, exotic plants are invading our national parks, causing tremendous damage to our resources, thereby threatening the structure, organization, function, and overall integrity of the natural ecosystems the NPS aspires to protect. The NPS spends millions of dollars each year combating exotic plants in an effort to preserve park resources, and still the problem is not solved. Controlling exotic plant infestations is one of the most serious challenges facing SEUG managers, who are charged with the protection of natural and cultural resources. Exotic plants are infesting SEUG at an alarming rate. Of over 96 exotic trees, herbaceous plants and grasses occurring in the park, 19 species have been identified as a threat to SEUG natural resources. The proposed plan will assist the parks in managing this threat to ecosystem health and function and will provide a framework for cooperation with land managers, neighbors, and partners with common concerns.

This environmental assessment examines in detail two alternatives: No action and the National Park Service preferred alternative. The preferred alternative includes the judicious use of mechanical, cultural, chemical, and biological control techniques, based on a thorough analysis of the problems and a balanced approach to solutions.



# United States Department of the Interior

## NATIONAL PARK SERVICE

Southeast Utah Group

Arches and Canyonlands National Parks

Hovenweep and Natural Bridges National Monuments

2282 S. West Resource Boulevard

Moab, Utah 84532-3298

IN REPLY REFER TO:

We welcome your comments and concerns regarding the management of exotic species as we begin to develop this plan. The briefing letter for the proposed plan can be viewed on the Planning, Environment, and Public Comment (PEPC) website at <http://parkplanning.nps.gov> under Project ID #22569 for Canyonlands NP/Southeast Utah Group. **The comment period will be open until July 31, 2008** and comments on this initial stage of plan development can be documented on the PEPC website or can be mailed to Superintendent, Southeast Utah Group, 2282 W. Resource Blvd, Moab, UT 84532; by fax to 435-719-2300; or by email to [CANY\\_superintendent@nps.gov](mailto:CANY_superintendent@nps.gov).

Sincerely,

/S/

Kate Cannon  
Superintendent  
Southeast Utah Group  
L7617 (SEUG-RM)

June 25, 2008

## Appendix E

# Safety Plan

### HERBICIDE SAFETY AND SPILL PLAN

The following information will be reviewed by all workers who handle herbicides. The terms “pesticides” and “herbicides” are used interchangeably.

- All personnel who handle herbicides will obtain a Pesticide Applicators License from the Department of Agriculture through the State of Utah.
- All potential herbicides to be used in the park are described in the Exotic Plant Management Plan and Environmental Assessment. Before those herbicides are used in the park, yearly approval will be obtained from the NPS Regional IPM coordinator through the NPS Pesticide Use Proposal System (PUPS).
- All personnel will be familiar with and strictly adhere to the best management practices described in the Exotic Plant Management Plan.
- Safety equipment will be carried by all employees in the field (first aid kits, PPE). Communication equipment (cell phone and/or radio), herbicide labels, and MSDS will be carried by a minimum of one person in each field crew.

#### Herbicide Purchase

NPS 77 allows NPS personnel to purchase the amount of herbicide authorized for use during the year of approval. Larger amounts can be purchased only when the smallest amount available for purchase is larger than the amount necessary for the project. If an approved herbicide is unavailable, any substitutions with different active ingredients will require approval through the same herbicide use request and approval process.

#### Herbicide Storage

Herbicide storage facilities must be locked, fireproof, and ventilated; proper warning signs must be posted. Herbicides must be stored separately from all other substances, and the directions provided on the labeling must be followed. In addition, each type of herbicide must be stored on separate shelves. Any structure used for storage of herbicides should be posted, and copies of labels, material safety data sheets (MSDSs), and inventories should be kept in a locked container outside the storage facility.

#### Information and Equipment

A copy of the Labels and Material Safety Data sheets for herbicides being used will be available at all times during project operations. All personnel involved in the handling of herbicides will review and be familiar with relevant Material Safety Data Sheets.

Required Personal Protective Equipment (PPE) will be worn at all times when herbicides are being mixed and applied. Label requirements for specific herbicides will be followed. Applicators and handlers must wear the PPE required by the labels of each herbicide being applied.

An emergency spill kit, with directions for use, will be available when herbicides are being mixed, transported and applied. Employees will be trained in the use of the spill kit prior to initiation of operations. The spill kit will contain the following equipment:

- Shovel
- Broom
- Absorbent material
- Large plastic garbage bags
- Safety goggles
- Rubber gloves

### **Procedures for Mixing, Loading and Disposing of Chemicals**

The following procedures will apply to all herbicide applications:

1. Mixing of herbicides will occur at least 100 feet from well heads or surface water
2. Dilution water will be added to the spray container prior to addition of the spray concentrate.
3. Hoses used to add dilution water to spray containers will be equipped with a device to prevent back-siphoning, or a minimum 2-inch air gap.
4. Only those quantities of herbicides needed for one day's use will be mixed.
5. Those workers mixing chemicals will wear personal protective equipment required by the label.
6. Empty containers will be triple rinsed. Rinsate will be added to the spray mix or disposed of at the application site at rates that do not exceed those on the label.
7. Unused herbicides will be stored in a herbicide storage cabinet in accordance with herbicide storage instructions provided by the manufacturer and in accordance with Utah Department of Agriculture.
8. Empty and rinsed herbicide containers will be punctured and disposed of according to label directions.

### **Procedures for Herbicide Spill Containment**

In the event of a spill, immediately notify the project supervisor. Identify the nature of the incident and extent of the spill, including the product name(s) and chemical registration number(s).

Remove any injured or contaminated person to a safe place. Remove contaminated clothing and follow MSDS guidelines for emergency first aid procedures following exposure. Obtain medical help for any injured employee.

### **Minor Spills (Less than 1 gallon of herbicide formulation or less than 10 gallons of herbicide mixture).**

Areas where chemicals are spilled will be roped off or flagged to warn people and restrict entry. Qualified personnel will always be present on the site to confine the spill and warn of danger until it is cleaned up. The spill will be confined with earthen or sand dikes if the chemical starts to spread. The spill will be soaked up with absorbent material such as sawdust, soil, or clay. Contaminated material will be shoveled into a leak proof container for disposal and labeled. Contaminated material will be disposed of using the same method as for herbicides. The spill area will not be hosed down. Emergency phone numbers will be carried by the herbicide applicators.

**Major Spills (More than one gallon of herbicide formulation or more than 10 gallons of herbicide mixture).**

Areas where chemicals are spilled will be roped off or flagged to warn people and restrict entry. Qualified personnel will always be present on the site to confine the spill and warn of danger until it is cleaned up. The spill will be confined with earthen or sand dikes if the chemical starts to spread. The spill will be soaked up with absorbent material such as sawdust, soil, or clay.

The local fire department and State herbicide authorities will be notified. Follow their instructions for further action. Whenever possible, someone familiar with the situation will remain at the site until help arrives. Emergency phone numbers will be carried by the herbicide applicators.

Decontaminate the soil by removing it to a depth of at least 2 inches below the contaminated zone and place in clearly labeled leak proof containers for disposal.

**Reporting**

The following list is a guide for the information regarding spills that should be reported. Incidents should be reported even if there is doubt as to whether the spill is an emergency or whether someone else has reported it. Emergency phone numbers will be carried by the herbicide applicators.

Date:

Time of Release:

Time Discovered:

Time Reported:

Duration of Release:

Location: (State, county, route, milepost)

Chemical name:

Chemical identification number:

Chemical data:

Known health risks:

Precautions to be taken:

Cause and source of release:

Estimated quantity (gallons) released:

Quantity (gallons) which has reached water:

Name of affected watercourse:

Number and type of injuries:

Potential future threats to environment or health:

Your name:

Telephone numbers:

Address:

## GENERAL HEALTH AND SAFETY/ HAZARD REDUCTION PLAN

It is essential that safety be a part of every employee's job. Because of the varied terrain, elevation, variable and often severe weather, number of visitors, and a variety of work performed, employees and visitors face a myriad of potential natural and manmade hazards. Everyone needs to exercise caution on and off duty to ensure that this year will be a safe and enjoyable one. Remember: THERE IS NO JOB OR TASK WHICH IS SO IMPORTANT THAT REQUIRED TIME AND RESOURCES CANNOT BE DEDICATED SO THAT IT MAY BE PERFORMED SAFELY.

In the event of an injury, immediately notify the supervisor or crew leader and seek medical attention if needed. The required forms related to workplace injuries will be carried in the field at all times by at least one member of the field crew (typically the crew leader). In the packet with the forms will be directions to nearest medical facilities, emergency notification phone numbers, radio call numbers, and procedures to follow in case of emergency. All crew members will be provided a basic first aid kit and this will be carried at all times in the field.

Job hazard analyses have been developed for all aspects of exotic plant control work (hand-pulling, chainsaw operations, herbicide application). In addition, general environmental safety guidelines have been developed. These documents are available on the park network.

The following are some of the typical hazards employees can expect to encounter at the Southeast Utah Group parks and the actions to eliminate the hazard:

Hazard	Actions to Eliminate the Hazard
Exposure to Herbicide	<p>The only restricted- use herbicide that may be used is picloram (Tordon). Picloram is relatively non- hazardous to humans. This chemical may cause moderate eye irritation. A complete first aid kit will be on the work site and it includes eyewash. If the chemical gets in your eyes, alert your crew leader, then flush thoroughly with eyewash or drinking water and call a physician if irritation persists. Prolonged or frequent repeated skin contact with the chemical may cause allergic skin reactions in some individuals.</p> <p>Other herbicides that may be used include: Garlon 4, Arsenal, 2,4- D, Plateau, Curtail, Redeem R&amp;P, Transline, Telar, Roundup and Rodeo. All herbicide labels and MSDS sheets will be located in each spray vehicle.</p> <p>Wear all personal protective gear required by the product label: long sleeved shirt and long pants (you provide), waterproof gloves (provided by park), shoes and socks (you provide). If you dispense herbicide from the mix tank into your backpack you must also wear a face shield with goggles and respirator or full- face respirator. You may wear additional gear. The park will provide chemical- resistant coveralls (tyvek), chemical- resistant overshoes, rubber gloves, respirators, and safety glasses/goggles.</p> <p>When using a chemical, wash hands before eating, drinking, chewing</p>

Hazard	Actions to Eliminate the Hazard
	gum, using tobacco, or using the toilet. Remove clothing immediately if herbicide gets inside. Remove personal protective equipment immediately after handling. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing. Clothing that may have been exposed to herbicide should be laundered separately from other clothing using detergent and hot water.
Backpacking and Lifting	Use proper lifting techniques, such as keep back straight, lift with your legs and lift straight. Don't try to lift too much weight. Ask for assistance with heavy/cumbersome objects. Watch hands and feet when lifting and lowering objects. Be cognizant of your back when engaged in any of these type activities. Warm up to minimize chance of pulled/strained muscles.
Slipping and Falling in Holes	Wear proper hiking or work boots with slip resistant soles. Keep an eye on the terrain being traversed. Be cognizant of uneven terrain and avoid holes.
Heat Emergencies:	<p>Heat emergencies (particularly dehydration) are our biggest problem for both visitors and employees. Heat emergencies are serious and potentially fatal conditions typically brought on by exposure to heat combined with dehydration. Early symptoms include headaches, nausea, muscle spasms, and fatigue. More advanced cases (heat exhaustion to heat stroke) include symptoms of cool moist skin, dilated pupils, fever, dark urine, dry hot and red skin, confusion or irrational behavior, unconsciousness.</p> <p>Always wear sunscreen, a hat, and lightweight clothes, drink plenty of water (in summer at least one quart per hour for light to moderate activity), and eat snacks or drink an electrolyte solution to replace electrolytes lost during sweating. If you are thirsty, you are already dehydrated and need to increase your fluid consumption. Alcohol and sodas are diuretics, so avoid them when working outdoors in the heat.</p>
Blisters	<p>Be prepared. Before you head out on a long walk, take along a blister kit to be ready to cover up any hot spots or treat any blisters.</p> <p>Wear proper fitting hiking or work boots with moisture wicking socks.</p> <p>Wear proper fitting leather gloves when working with hand tools or pulling weeds.</p> <p>If a blister develops clean area with soap and water and keep area free from dirt and sweat. Place antibiotic ointment on blister and cover with sterile bandage. Change bandage every day.</p>
Biohazards	<p>Wear gloves when dealing with any kind of biohazard.</p> <p>Wash hands and other affected skin promptly with soap and water after removal of gloves and other PPE. Flush mucous membranes with water immediately or as soon as feasible following contact with blood or other potentially infectious materials.</p>

Hazard	Actions to Eliminate the Hazard
	<p>Do not bend, shear, break, or remove contaminated needles or other contaminated sharps. Recapping is authorized only when no feasible alternative (that is, approved sharps container) is available to prevent needle sticks. Accomplish recapping by using hemostats or equivalent device.</p> <p>Perform all tasks and procedures involving blood or other potentially infectious materials in such a manner as to minimize splashing, spraying, and generation of droplets, mist, or vapors of these substances.</p> <p>Do not perform mouth pipetting or suctioning of blood or other potentially infectious materials. Such practices are prohibited; no exceptions.</p> <p>When performing First Aid, CPR or other life-saving activities wear all the PPE and equipment provided by the NPS at the site of the activity. If, and when, the PPE is not available take all precautions to protect everyone to the greatest extent available.</p>
Chainsaw Operations	<p>Wear proper PPE- Chaps, hardhat, gloves, leather boots, eye protection, ear plugs. Wear long pants and long sleeved shirt.</p> <p>Never work alone under any circumstances. Have a radio with you also.</p> <p>Starting- Place saw on firm level surface with bar and chain in clear area. Never straddle guidebar or lean across saw. To start, hold saw down firmly with left hand holding down on the handlebar, place left knee snugly against engine and tip of right foot in trigger guard handle. Briskly pull starter rope with right hand. Never drop start.</p> <p>Cutting- Use caution, be alert for kickback, know exactly where the bar and tip are at all times, never cut limbs, logs, or brush simultaneously. Cut away from body and stand to the side of cut while bucking. Keep balanced. Throttle up to full speed before allowing chain to cut. Do not cut at half throttle as clutch will slip and burn. Use the proper saw for job with proper bar length and proper chain.</p> <p>Refueling-Stop saw before refueling. Refuel on bare ground or other noncombustible surface, remove spilled fuel off saw, never start saw within 10 ft. of refueling area.</p> <p>Use clearly labeled and safety approved fuel mixture and bar oil containers.</p> <p>Have first aid kit accessible.</p>
ATV Use	<p>Adhere to standard and safe operating procedures. Personal Protective Equipment required: ANSI approved crash helmet, safety goggles, gloves, lace-up/non-skid boots, long pants, and long sleeved shirt. All employees identified as ATV operators will have successfully completed an ATV Safety Institute (ASI) certification class and have in possession a certificate of qualification.</p> <p>A review of safe ATV operating procedures will be conducted prior to</p>

Hazard	Actions to Eliminate the Hazard
	<p>projects requiring the use of ATVs, including the appropriate JHA.</p> <p>A pre-ride inspection shall be performed checking tires and wheels, controls and cables, lights and electrics (ignition switch, engine stop switch), oil and fuel, drive shaft, chain, and chassis. Doing warm up exercises will help prevent muscle strain and injury. When refueling, allow machine to cool, avoid spills, refer to MSDS.</p> <p>Watch for low limbs, holes, large rocks, etc. Slow down when in rough terrain; avoid traversing side slopes that are steep, slippery or very bumpy. Going straight up or down slope is safest when possible. Use body weight to balance the ATV. If a tip-over seems likely, turn front wheels downhill if the terrain allows. If not, and shifting weight uphill does not help; quickly dismount to the uphill side avoiding the hot areas of the ATV (engine, exhaust, etc.) When approaching unknown terrain, slow to a speed that will allow for a complete stop within the limit of your visibility. In extremely rough terrain, dismount and scout travel route on foot. Always use parking brake when ATV is riderless. Follow the principles of "Light on the Land" and "Tread Lightly."</p> <p>Loads shall be securely tied down to racks properly fastened to ATV. Ensure that the load does not exceed the design capability of racks and manufacturers weight limits. The center of gravity shall be as low as possible and weight shall be evenly distributed between front and rear axles. Loads can affect handling and performance. Extra caution is essential to safe operation. Ensure that loads do not interfere with operation of ATV and the rider's ability to dismount in an emergency.</p> <p>Avoid working alone, carry a radio if possible.</p>

## Heat Emergencies

There are three types of heat emergencies you may be required to treat.

### Heat Stroke

This is the most serious type of heat emergency. It is LIFE-THREATENING and requires IMMEDIATE and AGGRESSIVE treatment!

Heat stroke occurs when the body's heat regulating mechanism fails. The body temperature rises so high that brain damage --and death-- may result unless the body is cooled quickly.

### *Signs and Symptoms*

The victim's skin is HOT, RED and usually DRY. Pupils are very small. The body temperature is VERY HIGH, sometimes as high as 105 degrees.

### *First Aid*

Remember, Heat Stroke is a life-threatening emergency and requires prompt action! Summon professional help. Get the victim into a cool place.

COOL THE VICTIM AS QUICKLY AS POSSIBLE IN ANY MANNER POSSIBLE!

Place the victim into a bathtub of cool water, wrap in wet sheets, place in an air conditioned room.

Do not give victim anything by mouth. Treat for shock.

### **Heat Exhaustion**

Heat exhaustion is less dangerous than heat stroke. It is caused by fluid loss which in turn causes blood flow to decrease in vital organs, resulting in a form of shock.

#### ***Signs and Symptoms***

COOL, PALE AND MOIST skin, heavy sweating, dilated pupils (wide), headache, nausea, dizziness and vomiting. Body temperature will be near normal.

#### ***First Aid***

Get the victim out of the heat and into a cool place. Place in the shock position, lying on the back with feet raised. Remove or loosen clothing. Cool by fanning or applying cold packs or wet towels or sheets. If conscious, give water to drink every 15 minutes.

IMPORTANT: WHILE HEAT EXHAUSTION IS NOT A LIFE- THREATENING EMERGENCY LIKE HEAT STROKE, IT CAN PROGRESS TO HEAT STROKE IF LEFT UNTREATED!

### **Heat Cramps**

Heat cramps are muscular pain and spasms due to heavy exertion. They usually involve the abdominal muscles or legs. It is generally thought this condition is caused by loss of water and salt through sweating.

#### ***First Aid***

Get the victim to a cool place. If they can tolerate it, give one-half glass of water every 15 minutes. Heat cramps can usually be avoided by increasing fluid intake when active in hot weather.

## **Other Safety Concerns When Working in the Field**

### **Lightning**

Afternoon thunderstorms are frequent in the summer monsoon season. When thunderstorms approach, avoid mountain tops, exposed areas, tall or lone trees, ponds or puddles. If lightning is nearby, refrain from transmitting on portable radios. If caught in the open when lightning is imminent, squat with hands on knees, keep your head low and wait for the storm to pass. If carrying a metal frame backpack, remove it and place it away from you. Lightning has caused several injuries and deaths in the SEUG area and should not be taken lightly.

### **West Nile Virus**

The West Nile virus (WNV) is transmitted to people by bites from infected mosquitoes. The virus is maintained in the bird-mosquito-bird cycle. Mosquitoes are infected by feeding on a bird with virus in its blood. Humans are infected when an infected mosquito bites them. Person-to-person transmission does not occur. The virus is relatively new to Arizona, but has the potential to be prevalent whenever mosquitoes are abundant. At the lower elevations this can be from March to November, or longer.

Most people who are infected with the virus do not become ill and have no symptoms. For persons who do become ill, the time between the mosquito bite and the onset of symptoms ranges from 5-15 days. Two types of disease occur in humans: (1) viral fever syndrome, and (2) encephalitis, an inflammation of the brain. Symptoms of the viral fever syndrome include fever, headache, and malaise. These symptoms persist for 2-7 days. Encephalitis is very rare. Symptoms include a sudden onset of high fever and a headache, and they may progress to stiff neck, disorientation, tremors, and coma. There is not specific treatment for this virus except supportive care. To decrease exposure to mosquitoes and the West Nile virus:

- Limit outside activity around dawn and dusk when the mosquitoes feed.
- Wear protective clothing such as lightweight long pants and long sleeve shirts when outside.
- Apply insect repellent to exposed skin when outside. Repellents with DEET are the most effective.
- Make sure that doors and windows have tight-fitting screens. Repair or replace screens that have tears or holes in them.
- Drain all standing water on property, no matter how small an amount.
- Remove items that could collect water such as old tires, buckets, empty cans, and food and beverage containers.

### **Hantavirus**

Hantavirus Pulmonary Syndrome (HPS) is a disease caused by a virus that is carried by rodents, particularly the deer mouse. Hantavirus is present in the saliva, urine and feces of infected mice. People are infected by breathing in the virus during direct contact with rodents or from disturbing dust and feces from mice nests or surfaces contaminated with mice droppings or urine.

There have been many cases of HPS reported in both Utah and Colorado and the consequences of HPS can be severe; approximately half of the people who develop HPS die.

### **Spiders (Brown Recluse and Black Widow)**

Two venomous spiders are found here, the brown recluse and the black widow. Both types of spiders have bitten employees and volunteers in past years. Please use caution when entering dark spaces in or under buildings. Little-used out buildings (like sheds) are likely hiding places.

- The brown recluse spider is typically a dark brown to almost black spider with a characteristic violin-shaped mark on the spider's back. The bite from this spider causes a stinging sensation followed by intense pain. Within 24 to 36 hours, the victim may experience fever, chills, nausea, weakness, and joint

pain. The venom kills the affected tissue, which sloughs off and exposes the underlying tissue. Healing can take 8 weeks or longer.

- Red "hourglass" markings on the lower abdomen of a shiny black body distinguish the black widow spider. These spiders spin tangled webs of coarse silk in dark places. The bite may or may not be painful. Afterward, red swelling and possible numbness may be evident in the bite area. Some people are allergic to spider venom and those victims will experience additional muscle-related symptoms (cramps, tremors, etc).

If you have been bitten by a brown recluse or a black widow spider, it is recommended that you seek medical attention.

### **Scorpions**

Scorpions are very common on the Northern Colorado Plateau desert. Scorpions are active at night; during the day they hide under stones and tree bark, in rock and wood piles, and in masonry cracks. Use caution when moving rocks, logs, etc. Don't put your hands or feet where you can't see. Shake out boots and shoes before putting them on. Scorpion stings are painful, but are rarely dangerous (except bark scorpions). People who are sensitive to insect stings may be more likely to have a reaction to scorpion stings.

### **Rattlesnakes**

The parks in the SEUG have one species of rattlesnake, the midget-faded rattlesnake. Like the name implies, the rattlesnakes have a rattle at the end of the tail. Don't count on getting a warning rattle every time you encounter a rattlesnake. Even if a snake feels threatened by your presence, it may not rattle. Snakes generally want to be left alone and prefer to stay hidden and avoid confrontation.

A rattlesnake will generally bite for one of two reasons: to inject venom into its prey, or in self defense. Most rattlesnake bites to humans are because the rattlesnake felt threatened by the human's actions. However, occasionally the victim did not intentionally provoke the snake into biting. In about 25% of all rattlesnake bite cases, the snake does not inject venom. To reduce your chances of being bitten by a snake, follow these simple guidelines. Do not harass or attempt to kill snakes. If you see a snake, stay at least 4 feet away from it. Do not put your hands or feet where you can't see. Wear boots and loose fitting pants while hiking and carry a flashlight after dark.

If you are bitten by a snake, seek emergency medical treatment immediately. Do NOT attempt to treat a snake bite yourself. Many of the treatments cause more damage than the snakebite itself (never make incisions, use ice, or electricity).