NON-NATIVE, INVASIVE PLANTS OF ARIZONA

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THIS GUIDE IS DEDICATED TO THE MEMORY OF CAROL BAILEY

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TABLE OF CONTENTS

Woody Plants

Aquatic, Riparian, or Wetland Plants

Glossary of Common Plant Terminology

Introduction

The noxious weed problem in the western United States has been described as "a biological forest fire racing beyond control because no one wants to be fire boss." Indeed, when small weed infestations are left unchecked, they can grow exponentially and spread across the land much like a slow-moving wildfire. Land consumed by noxious weeds may be irreversibly changed and never again reach its full biological potential.

There are currently many small noxious weed infestations in Arizona that most people probably do not even recognize as a problem. However, the risk of ignoring these small infestations is great. Many weed scientists compare small infestations to biological time bombs, primed to explode when the right combination of environmental conditions come along. Indeed, over the past decade, many smaller infestations in Arizona have increased dramatically, expanding their range into previously non-infested areas. If we continue to allow this to happen, noxious weeds will cause widespread, irreparable economic and ecological damage in Arizona.

This updated edition provides management suggestions for most listed species based on a synthesis of peer-reviewed (as available) field trials and greenhouse experiments mostly conducted in the arid southwest. Also included are non peer reviewed guidelines as recommended by managers. These suggestions do not constitute formal recommendations. In many cases, IPM strategies are suggested. IPM, or integrated pest management, is an approach that uses mutually supporting control methods (e.g. herbicide and seeding) to manage weeds.

In all cases, care should be taken when considering suggestions as they might be based on studies conducted on dissimilar habitat types, which can affect management outcomes. *When using herbicide always read the label, and when in doubt, consult your county agent.*

GRASSES

GRASS #1

Buffelgrass

Cenchrus ciliaris L.

Origin: Africa, Asia, the Middle East

Description – : A perennial warm-season bunch grass with rhizomes and sometimes stolons. It is a very robust grass that may grow over 3' tall and wide. Bristly flower heads range from 1½-5" long and can be purple, gray, or yellowish, turning a distinctive golden-brown color when dry. Spikes are crowded with dense bristly fruit which are actually burs without hardened spines. It is an extremely prolific seed producer; inflorescences may emerge whenever soil moisture is available. New plants produce seed in as little as six weeks. Older plants branch profusely and densely at nodes, giving mature plants a "messy" appearance.

Distribution – Extremely drought tolerant and reestablishes and expands its range quickly after fire. Seeds are dispersed by wind, water, animals and vehicles and is often found on roadsides. It is spreading in southern Arizona and is increasing its range up elevation.

Management – Treatments that cause disturbance (like hand pulling, grazing and fire) in the absence of seeding result in long term increases in coverage. Most herbicides, such as glyphosate (0.32 gal/ac), Fusilade 212 (0.21 gal/ac) and Pastora reduce cover. 2, 4-D does not appear effective. IPM best strategy for management.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563017.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_P/Pennisetum_ciliare.pdf

Image: Zachary Berry

GRASS #2

Cheatgrass (downy brome) *Bromus tectorum* L.

Origin: Eurasia

Description – A cool-season annual that can grow between 2"-2' tall. It germinates during cooler temperatures and rapidly grows and sets seed before most other species. It is a prolific seed producer. Seedlings are bright green with conspicuously hairy leaves, sheaths, glumes and lemmas. Seed heads are open, drooping, multiple-branched panicles with moderately awned spikelets. Auricles are absent. At maturity the foliage and seed heads often turn purplish before drying to brown.

Distribution – Can be found from desert valley bottoms to the tops of the highest mountain peaks. Especially rampant during wet winters. It quickly invades heavily grazed rangeland, roadsides, waste places, burned areas, and disturbed sites. It can still flower and produce viable seed even when environmental conditions are poor and/or when grazing animals crop the plants. Spikelets readily attach to fur, clothing, and vehicles.

Management – Using glyphosate (above 0.07 gal/ac and indaziflam (above 0.006 gal/ac) in the late fall/early spring provide good control. Imazapic provides inconsistent control and demonstrates the most negative non-target effects. Seeding perennial grasses is effective for control, as is spring intensive grazing with or without burning.

1. http://www.wyoextension.org/agpubs/pubs/B1246.pdf
2. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410110.pdf

Image: Jennifervb

GRASS #3

Fountaingrass

Pennisetum setaceus (Forssk.) Chiov.

Origin: Africa, southwest Asia, the Middle East

Description — A coarse, perennial, warm-season bunchgrass that grows 2-3½' tall. Tufted culms grow in dense, usually large, clumps. Red, rosy to purple, bristly, spike inflorescences are 2-4" long, and ¾-1" wide. The ¼" long spikelets are solitary or in clusters of 3 on white, hairy branches attached below the bristles. Flower heads are prominent, nodding, feathery, and attractive.

Distribution — Used as landscape plant, the cultivars 'Cupreum', 'Eaton Canyon' and 'Rubrum' are marketed as sterile cultivars which reportedly do not produce fertile seeds. Found along roadways and invading rangelands. Palatability is low which facilitates competition with native plants. It rapidly reestablishes after burning and is prevalent in southern Arizona

Management — Fire is effective, as is glyphosate at 0.30 gal/ac. Hand pulling in three successive years appears to have short term success in small populations.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563027.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_P/Pennisetum_setaceum.pdf

Image: Max Licher

GRASS #4

Jointed goatgrass

Aegilops cylindrica Host

Origin: Eurasia

Description — A winter annual reaching heights of 15-30". It is closely related to, and can interbreed with, wheat. Its flowering portion is slender and segmented (jointed) and closely resembles wheat until spikes appear. Spikelets contain 1-3 viable seeds and disarticulate at maturity. Uppermost joints have distinctive awns. Plants produce 1 to many erect stems. Leaves have evenly spaced, fine hairs along the leaf edge and the sheath opening. Auricles are short and hairy. Ligules are short and membranous.

Distribution — Found primarily in the north central part of Arizona in both cultivated and uncultivated areas. It can impede wheat production.

Management — Spring application of glyphosate at 0.04 gal/ac is effective but imazamox has shown variable effects. IPM strategies are effective where spring grazing is paired with summer burning and seeding of species with similar traits to goatgrass.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563031.pdf
2. https://wric.ucdavis.edu/information/crop/natural%20areas/wr_A/Aegilopscylindrica-triuncialis.pdf

Image: Max Licher

GRASS #5

Quackgrass

Elymus repens (L.) Gould

Origin: Eurasia

Description — Quackgrass is a rhizomatous, cool-season perennial that can grow up to 3½' tall. Seed heads are long, narrow spikes consisting of many individual spikelets arranged in 2 rows along the stem. Flowers consist of spikelets with 3-7 lemmas. Stems are erect and hollow. Leaves are less than ½" wide and up to 12" long. Auricles clasp the stem. Its root system is a dense mass of fibrous roots and stout rhizomes. Reproduction is by seeds and rhizomes.

Distribution — Established Arizona populations are typically above 4000' in elevation, occurring along roadsides, urban areas, streambanks and forest meadows.

Management — Glyphosate (0.1 gal/ac) applied spring - fall and fluazifop (0.03 gal/ac) applied in the spring are effective control methods. Grazing and mowing have also been shown to be effective control strategies. Mechanical treatment is not advised because it stimulates underground rhizomes which can produce new plants.

1. https://wric.ucdavis.edu/information/natural%20areas/wr_E/Elytrigia.pdf
2. http://www.tsusinvasives.org/home/database/elymus-repens

Image: Luigi Rignanese

GRASS #6

Red brome

Bromus rubens L.

Origin: Eurasia, Mediterranean region

Description — A cool-season annual that grows 8-20" tall with several to numerous stems from an erect to spreading base. Seed heads are reddish-purple as they ripen and form a dense, compact panicle that is 2-3" long. As seed heads dry they turn tawny to brown. Leaf blades are short, narrow, flat and hairy, with prominent veins. Leaf sheaths are papery.

Distribution — Occurs on disturbed sites in various soil types. During wet winters, cool-season annuals like red brome and cheatgrass increase fine fuel loads which intensify wildfire danger in warm and cold deserts.

Management — Herbicides such as MON 37500 (below 0.002 gal/ac) and Fusilade II (at 0.04 gal/ac) can be effective. Treatments that include seeding of natives are particularly effective.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563040.pdf

Image: Max Licher

GRASS #7

Yellow bluestem

Bothriochloa ischaemum (L.) Keng

Origin: Europe, Asia and Africa

Description — Warm-season perennial tuft-forming grass that can grow to 5' in height. Leaves are thicker near the collar, which is covered in long hairs. Stems can be light green to pale yellow. The inflorescence, which is composed of purplish flowers, is a panicle of branches that bear spikelets.

Distribution — An emerging invasive in Arizona, this species grows in dry, disturbed areas. This species has been found in many areas southeast of Tucson and in the National Forests northwest of Phoenix.

Management — Mowing is not recommended. Prescribed fire in dry conditions can be effective. Glyphosate and imazapyr (0.03 gal/ac) can provide effective control.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd597000.pdf

Image: Max Licher

FORBS

FORB #1

African (Sahara) mustard

Brassica tournefortii Gouan

Origin: Mediterranean region, Middle East, North Africa

Description – Is a cool- season annual with a strong herbaceous taproot. Growth begins as a rosette that may have a diameter of up to 3' during wet years. Height of mature plants rarely exceeds 4'. Plants develop a wide multi-branched inflorescence that can be 3-4' wide at maturity. Pale yellow flowers are small. Adult plants produce thousands of seeds that become sticky when wet. Stems and leaves are hairy and bristly.

Distribution – Infests roadsides, deserts, severely disturbed soil (rural and urban), abandoned cropland and hayfields primarily below 3500'. It flourishes during wet winters and behaves as a tumbleweed when June and July winds blow plant skeletons across the landscape. This activity can greatly spread the seeds of this plant. Sticky, hairy seeds facilitates spread by animals and vehicles.

Management – Spring treatment via hand pulling or early season glyphosate application (0.28 gal/ac) are effective control strategies.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3828962.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_B/Brassica_tournefortii.pdf

Image: Max Licher

FORB #2

African rue

Peganum harmala L.

Origin: North Africa

Description – A low-growing, aggressive, poisonous perennial that has a substantial woody root system. Its fruiting structure typically consists of 2-4 capsules with each cell containing many seeds. Flowers consist of 5 white petals. Each flower is borne singly in leaf axils along stems. Has a "bushy" growth habit with multiple branches. Stems and leaves are fleshy and, when crushed, have a disagreeable odor. Leaves are alternate, smooth, and divided into linear segments. Height rarely exceeds 1-1½'.

Distribution – First reported in the United States near Deming, New Mexico in the 1920's. Found mostly in the eastern side of Arizona.

Management – Herbicides Indaziflam and Imazapyr (0.03 gal/ac) effective (especially in drier systems) on mature stands but can have negative non-target effects.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563015.pdf

Image: Patrick Alexander

FORB #3

Bull thistle

Cirsium vulgare (Savi) Ten.

Origin: Eurasia

Description – A biennial that forms a rosette in its first year and then bolts and produces seed in its second year. Second-year leaf lobes are double-toothed and end in a spine. Leaves have wavy margins with prickles on the surface and pubescence on the underside. Stems are very pubescent and have dark purple veins. Flower heads produce red or purple flowers that can grow up to 2" wide. Bracts are narrow and spine-tipped. Seeds are topped with a pappus. The root system is short and fleshy.

Distribution – Although widely distributed throughout Arizona (although more common at high elevations), is less aggressive than the other non-native thistles that occur in the state. It typically grows as a few scattered individual plants or populations, primarily at higher, moister sites above 5000'.

Management – Seeding of species that germinate earlier than bull thistle can competitively dominate the weed for adequate control.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410130.pdf
2. https://www.ag.ndsu.edu/publications/crops/perennial-and-biennial-thistle-control-w799

Image: Liz Makings

FORB #4

Canada thistle

Cirsium arvense (L.) Scop.

Origin: Eurasia

Description – An erect perennial forb, it grows to 1½-4′ tall, with ridged stems becoming hairy and branching at maturity. Leaves are alternate, lance-shaped, and irregularly lobed with spiny toothed margins. Flowers are usually purple (occasionally white) and typically bloom from June to September. Does not have spines on its flowers or stems. Fruits are small flattened brown achenes with bristly plumes. Horizontal roots may extend 15′ or more and vertical roots may grow 6-15′ deep. Plants develop either male or female flowers and grow in circular patches that often are one clone and sex.

Distribution – Found in the high country. Generally, vegetative reproduction from its root system contributes to local spread but seeds contribute to long distance dispersal in a variety of ways (i.e., wind, water, attaching to animals, clothing, vehicles and farm equipment, via contaminated crop seed).

Management – Application of aminopyralid (0.009 gal/ac) in late spring is effective. As is mowing and seeding of competitive (early germinating and fast growing) species.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563022.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_C/Cirsium_arvense.pdf

Image: BK Mertz

FORB #5

Dalmatian toadflax

Linaria dalmatica (L.) Mill.

Origin: Europe

Description – A creeping perennial with an extensive root system that grows up to 3' tall. Even though it is a prolific seed producer that can reproduce both by seed and vegetative reproduction, its deep-penetrating and horizontally spreading root system accounts for much of its spread once seedlings mature. Leaves are alternate, waxy, broad-based, and clasp the stem. Yellow flowers, similar to snapdragons, are borne in the axils of upper leaves. Flowers are striking with an orange bearded throat and a characteristic spur.

Distribution – It was probably introduced as an ornamental. It prefers dry sites at mid-to-high elevations. It is very problematic in communities north of the Mogollon Rim (Flagstaff, Payson, Prescott).

Management – Herbicides that demonstrate effectiveness for reducing cover include aminocyclopyrachlor (0.03 gal/ac in the fall), chlorsulfuron (0.008 gal/ac in the fall or spring) and picloram (0.06 gal/ac in the spring). Prescribed fire enhances cover.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410111.pdf
2. https://weeds.nmsu.edu/pdfs/dalmatian_toadflax_factsheet_11-06-05.pdf

Image: Max Licher

FORB #6

Diffuse knapweed

Centaurea diffusa Lam.

Origin: Eurasia, Mediterranean region, the Middle East

Description – Can grow as an annual, biennial, or short-lived perennial with multiple branches. It ranges in height from 1-3' at maturity and can have white, rose, or purple flowers. Yellowish-green bracts are tipped with slender terminal spines that curve outward, are typically light brown with a margin like a comb. Bracts can also be "tipped" like spotted knapweed. Basal leaves are finely divided while the stem leaves are entire and smaller than basal leaves.

Distribution – A serious problem in Young and Flagstaff, Arizona. It is important to keep this plant in check because it can grow at low and high altitudes in a variety of ecological sites.

Management – Grazing is ineffective. Fire has been shown to be useful and particularly successful when paired with herbicide use.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410116.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_C/Centaurea_diffusa.pdf

Image: Liz Makings

FORB #7

Field bindweed

Convolvulus arvensis L.

Origin: Europe

Description – A drought tolerant, perennial creeping vine with climbing stems of 1-4'. Mature plants form dense tangled mats. Leaves are generally 1-2" long, are smooth, and are shaped like a spade or an arrowhead. Roots reach 20' below ground, and extensive lateral roots have buds that initiate new plants. Fruits are small, round capsules, each containing 4 seeds. Flowers are 1-1½" wide, trumpet-shaped, white or pink in color, typically with 2 small bracts located on the petiole. Flowers close each afternoon and reopen the following day.

Distribution – Widespread throughout Arizona. It is difficult to eradicate because of its extensive and deep root system and because seeds can remain viable in the soil for at least 60 years.

Management – Many herbicides have proven effective for short-term control, including picloram (0.01 gal/ac), 2, 4-D (0.06 gal/ac), glyphosate (0.1 gal/ac), imazapyr (0.01 gal/ac), and dicamba (0.24 gal/ac). Most herbicides are most effective when used at the flowering stage and multiple treatments provide better control. Seeding natives reduces biomass and flower production.

1. https://wric.ucdavis.edu/information/crop/natural%20areas/wr_C/Convolvulus.pdf

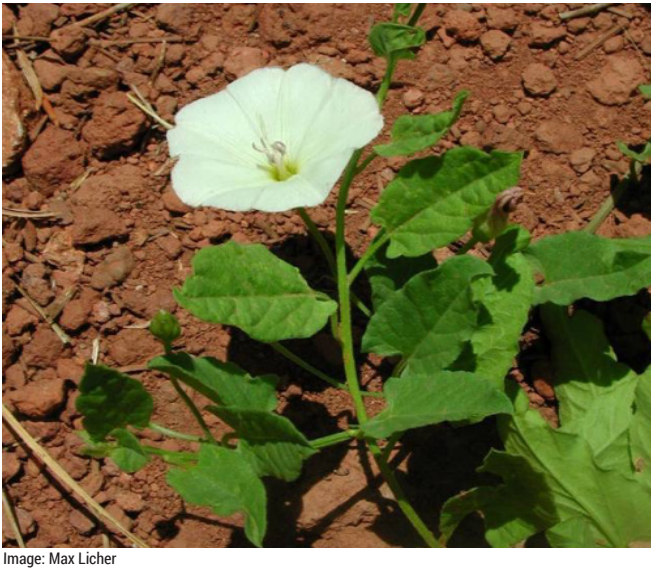


Image: Max Licher

FORB #8

Hoary cress

Lepidium draba L.

Origin: Europe

Description – A creeping perennial that grows up to 3' tall. It reproduces by seed and an extensive, deeply penetrating root system. Leaves are elliptical, grayish-green, clasping, and lightly pubescent. Stems are erect and greatly branching near the flower. Flowers have four white petals, ¼" across, borne on the top of the plant. Heart-shaped seed pods have a slender, persistent beak in the upper cleft of seed pods. Two small, flat, reddish-brown seeds are contained in each of the heart-shaped seed pods.

Distribution – Distribution is limited to the north-central part of Arizona. It easily establishes in moist sites and is difficult to control once established. It has been introduced into urban settings as filler for dry flower arrangements.

Management – Glyphosate application has demonstrated variable effects, depending on what it is mixed with (e.g. surfactants, defoamers or drift retardants). Other tests have shown no effects of herbicide on cover or density.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410132.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_C/Cardaria_chalepensis-draba-pubescens.pdf

Image: Gordon Scott

FORB #9

Leafy spurge

Euphorbia esula L.

Origin: Eurasia

Description — An aggressive, creeping, perennial with a root system that can extend 30′ into the soil. Leaves are 1-4″ long, are linear, alternate, and entire (several times long as wide). Stems are thickly clustered and smooth and exude a milky latex juice when broken. Small, yellowish-green flowers are enclosed by paired, heart-shaped yellow-green bracts. The fruiting structure is a 3-celled capsule, with each capsule containing a single seed. Capsules rupture at maturity and disperse seeds as far as 15′.

Distribution — This plant has caused severe eye and skin irritations in livestock and in some people. It is a serious problem near Flagstaff and Springerville, Arizona.

Management — Seeding with early germinating species can be extremely effective. Herbicides picloram (0.24 gal/ac) and dicamba (1 gal/ac) are also effective.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410117.pdf
2. https://wric.ucdavis.edu/information/crop/natural%20areas/wr_E/Euphorbia_esula-oblongata-terracina.pdf

Image: Toby Frates

FORB #10

London rocket

Sisymbrium irio L.

Origin: Eurasia

Description — An aggressive winter annual that can exceed 3' in height. Alternate stem leaves that are nearly hairless. Small clusters of pale yellow and rarely white flowers with four petals each grow at the stem tip. Pinnately lobed basal leaves are up to 8" long and are longer than leaves higher up on the plant. Slender seed pods are up to 2" long.

Distribution — Found in most counties in Arizona. This species rapidly colonizes disturbed (especially from fire) sites.

Management — Hand pulling is effective on small populations. Other traditional methods of control, such as early burning and grazing and herbicide application (2, 4-D, glyphosate, chlorosulfuron, imazapic, and amazapyr) has shown to be effective.

1. https://wric.ucdavis.edu/information/natural%20areas/wr_S/Sisymbrium_altissimum-irio.pdf

Image: Leslie Landrum

FORB #11

Malta starthistle

Centaurea melitensis L.

Origin: Mediterranean region

Description – A cool-season annual that grows 1-3' tall. Short-stalked, lobed basal leaves form a rosette. Upper leaves are narrow and pointed. An extension of the leaf blade forms a "wing" down the stem. Stems are erect, branched, rough, and hairy. Yellow flowers develop with floral bracts that are tipped with many slender, but short spines (less than ¾") that may appear yellow, brown, or purple in color.

Distribution – Readily infests disturbed sites. It is especially problematic along roadsides in and around Tucson, on roadsides and landscapes in north Scottsdale areas, in the upper Sonoran Desert, semi-desert grasslands, and interior chaparral.

Management – Pulling and mowing can be effective in early stages. Winter application of clopyralid and picloram also effective. Most strategies that work for yellow starthistle work for this species.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410119.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_C/Centaurea_melitensis.pdf

Image: Max Licher

FORB #12

Musk thistle

Carduus nutans L.

Origin: Europe

Description – Has been classified as a biennial, but it can also grow as an annual. It has a thick tap root from which a rosette of basal leaves emerges. Rosettes grow 3-4' in diameter. Leaves are hairless and have deep lobes, are dark green with a light green midrib, and a spiny margin. Leaves extend beyond the stem, giving the appearance of a "winged" stem. Large, "powder puff" flower heads (1½-3" in diameter) can be deep rose, purple violet, or white. Flower head weight bends stems downward which gives the appearance of "nodding" flower heads when the wind blows. One plant can produce up to 20,000 seeds with about a third of those being viable. It grows up to 8' tall with adequate soil moisture.

Distribution – Has broad ecological amplitude, growing in dry open rangeland and in wetlands. The key to controlling biennial invasive thistles is to destroy them before they set seed. Spotty infestations occur in northern Arizona.

Management – Chlorsulfuron (0.02 gal/ac) applied early in the growth period is effective. Mowing late in the season is also an effective method of control.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410130.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_C/Carduus_acanthoides-nutans-pycnocephalus-tenuiflorus.pdf

Image: Max Licher

FORB #13

Onionweed

Asphodelus fistulosus L.

Origin: Eurasia and Mediterranean region

Description — An erect, herbaceous perennial with leaves like onions. However, it does not produce bulbs or have an onion odor. Its root system is a dense mass of fibrous roots. Fruiting structure is a spherical, 3-segmented capsule that is approximately ¼" in diameter. Flowers typically consist of 6 white or pink petals with a red-brown or dark brown mid-vein. Petals are about ½" long and flower diameter is approximately 1'. Flower stems and leaves are fleshy and hollow structures like tubes. Leaves are all basal, narrow, flat on one side, and up to 15" long. Height of vegetative growth is less than 18" and maximum flower stalk height is 2½-3'.

Distribution — Arizona populations are known to occur in Sedona, Tombstone, Bisbee and Sierra Vista, along roadsides, and in urban areas.

Management — Herbicides, including atrazine (0.1 gal/ac), diuron (0.1 gal/ac), and pendimethalin (0.1 gal/ac), can be effective. Mechanical control can also be effective when used several times within a single growing season.

1. https://wric.ucdavis.edu/information/natural%20areas/wr_A/Asphodelus.pdf

Image: Luigi Rignanse

FORB #14

Russian knapweed

Rhaponticum repens (L.) Hidalgo

Origin: Eurasia

Description — A creeping perennial that forms dense colonies from a deep (up to 20-30') spreading root system. Roots are typically dark brown or black. Above-ground portions of the plant grow up to 4'. Lower leaves range from entire to lobed. Upper leaves are smaller, entire, and directly attached to the stem. Cone-shaped, pink to lavender flower heads are up to ½" in diameter and are borne at the end of leafy branches. Floral bracts are papery thin and smooth, greenish with a rounded or pointed margin.

Distribution — It is a serious problem in northeastern and southeastern Arizona. Can cause "chewing disease" in horses. Its deep, perennial root system makes control efforts difficult once established.

Management — Most herbicides tested effectively reduced cover, including picloram, 2,4-D mixed with other products, and glyphosate. Mechanical control and fire are not recommended.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563042.pdf
2. https://accs.uaa.alaska.edu/wp-content/uploads/Acroptilon_repens_BIO_ACRE3.pdf

Image: Patrick Alexander

FORB #15

Scotch thistle

Onopordum acanthium L.

Origin: Europe

Description – An aggressive biennial that ranges in height from 2-12'. Stems have broad, spiny wings formed by leaf bases. Rosette leaves are very large (up to 2' long and 1' wide), spiny, and covered with a dense mat of hairs that give the plant a grayish color. Stem leaves are also hairy, alternate, and coarsely lobed. Flowers are violet to reddish, grow up to 2" in diameter, and look like a "shaving brush." Spiny bracts surround each flower head.

Distribution – It is present in every northern county in Arizona. It is an imposing thistle due to its size and formidable spines which negatively impacts livestock forage production, wildlife habitat, and recreational values.

Management – Manual control effective prior to seed set. Most effective herbicides include aminocyclopyrachlor + chlorsulfuron, clopyralid, and chlorosulfuron.

1. https://www.unce.unr.edu/publications/files/nr/2002/FS0257.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_O/Onopordum.pdf

Image: Max Licher

FORB #16

Spotted knapweed

Centaurea stoebe L.

Origin: Eurasia

Description – A perennial that grows 1-3 feet tall. It reproduces from seed (primary means of spread) and forms a new shoot each year from a taproot. Basal rosette leaves can be up to 6 inches long and are deeply lobed (similar to diffuse knapweed). Pinkish-purple, lavender, sometimes cream-colored, flower heads are solitary at the end of branches, and are about the same size as diffuse knapweed flowers (#12). Floral bracts are fringed and "comb-like" with stiff dark tips that give the appearance of "spots." Bracts have obvious vertical veins below the tips and a reduced central spine.

Distribution – Spotted knapweed is sometimes confused with diffuse knapweed but control practices are similar for both species. Both species have been confirmed around Flagstaff and are aggressive competitors that displace native vegetation in rangelands, meadows, pastures, wildlife habitat, and recreational areas. One Montana study documented severe soil erosion losses on watersheds infested by this spotted knapweed.

Management – Repeated, severe prescribed fire as well as repeated hand pulling can be effective for control. Herbicides such as clopyralid, dicamba, and picloram appear to be effective. An IPM strategy as defined in the introduction is best for control.

1. http://culter.colorado.edu/~tims/Knochel_Seastedt_2009.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_C/Centaurea_stoebe.pdf

Image: Patrick Alexander

FORB #17

Yellow starthistle

Centaurea solstitialis L.

Origin: Mediterranean region

Description — An aggressive, cool-season annual. It germinates during cooler temperatures and grows 2-3' tall as temperatures warm. Deeply lobed basal leaves form a rosette, while stem leaves are linear or tapered at both ends and attach directly to the stem. An extension of the leaf runs down the stem, giving it a "winged" appearance. Flowers are yellow and are held by bracts that produce stiff, sharp spines that can grow up to 1" long. Seed produced from ray-shaped flowers are dark-colored and lack bristles, while seed from disk flowers are lighter-colored and have a tuft of white bristles.

Distribution — Can cause "chewing disease" in horses. The Tonto Weed Management Area in Gila County was formed primarily to address the spread of this weed.

Management — Planting of functionally similar species resists invasion. Consecutive annual prescribed fire can also be very effective for control. Clopyralid (0.43 gal/ac) can be effective. Grazing both early and late in the growing season can be effective. An IPM strategy as defined in the introduction is most effective for control.

1. https://plants.usda.gov/plantguide/pdf/pg_ceso3.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_C/Centaurea_solstitialis.pdf

Image: Max Licher

WOODY

WOODY #1

African sumac

Searsia lancea (L.f.) F.A.Barkley.

Origin: South Africa

Description — This is an evergreen tree with a single or multi-stemmed trunk. Can grow to a height of 30′ with a crown of equal size. Leaves are a shiny dark green, 2-3″ long and ½″ wide in groups of 3 resembling that of a willow. Fruit is yellow to red and like a berry containing black seeds. Female plants have minute, light-green flowers borne in dense clusters. Bark is brownish-gray with an orange-mahogany underlayer appearing through fissures.

Distribution — Unfortunately, it is widely used in landscaping due to drought tolerance and low maintenance requirements. We strongly recommend using drought tolerant native trees rather than this invasive non-native plant. Establishes easily from seed.

Management — Mechanical treatments on young trees are effective.

1. https://pleasantvalleyconservancy.org/sumac.html

Image: Bri Weldon

WOODY #2

Camelthorn

Alhagi maurorum Medik.

Origin: Asia, India, Russia

Description – An aggressive creeping perennial shrub with an extensive root system. It is a "nitrogen fixer" that reproduces by seeds and by extensive, deep-penetrating and horizontally spreading roots. Seeds are housed in jointed seedpods that appear maroon to red in color. Greenish stems are typically tipped with slender greenish-yellow spines that grow ¼-1¾" long. Leaves are alternate, hairless on the upper surface, but pubescent on the underside.

Distribution – Currently has a scattered distribution throughout the northern counties of Arizona. It is especially problematic near the towns of Winslow and Holbrook where it has caused extensive damage to highways, walkways, and housing foundations. Its creeping root system helps form dense monocultures creating problems for farmers, ranchers, and recreationists.

Management – Herbicide application twice (once at budding and once after regrowth) appears effective and can include 2, 3, 6-TBA, 2, 4-D, glyphosate (0.43 gal/ac), and clopyralid. Mechanical control not effective.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410108.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_A/Alhagi.pdf

Image: Max Licher

WOODY #3

African sheepbush

Pentzia incana (Thunb.) Kuntze.

Origin: South Africa

Description — A 1-1½' tall, multiple branched, perennial shrub with grayish leaves covered with matted hairs. Leaves are alternate, once pinnatified, marked with pits, and have revolute margins. The small yellow discoid flowers are in terminal heads enclosed by graduated phyllaries. Inter-phyllaries have scarious margins. Fruits are 5-angled achenes with cup-shaped, scarious crowns of scales. Leaves and stems have a strong pineapple scent when crushed.

Distribution — Found in isolated areas of central and southern Arizona, particularly in chaparral vegetation types. Infestations are associated with Civilian Conservation Corps work areas who planted these plants to stabilize the soil during the "dust bowl" days in the 1930's. Detected populations have typically been less than 10 acres in size.

Management — None found. However, at a minimum, monitoring, and hand pulling or tilling should be done at invaded sites.

Image: Max Licher

WOODY #4

Russian olive

Elaeagnus angustifolia L.

Origin: Eurasia

Description – Can grow as a small, thorny shrub or as a deciduous tree that can grow up to 40' tall. All parts of the stems, buds, and leaves have a dense covering of silvery to rusty scales. The bark is smooth and gray when young but develops ridges and furrows with age. The leaves are 1-3" long and about ½" wide, are simple, alternate, and are usually egg or lance-shaped with smooth margins. Flowers are aromatic, creamy-yellow, and bell-shaped. Fruits are like silver berry achenes about ½" long that appear in clusters usually during late summer and early fall.

Distribution – Can be found near streams, fields and open areas in Arizona. Its fruit is readily eaten and disseminated by many species of birds. It can "fix" nitrogen and is easily established on bare soils and in riparian areas. Establishment and reproduction is primarily by seed although some vegetative propagation also occurs.

Management – Mechanical control with a weed wrench is effective. Aminocyclopyrachlor might show promise. Fire is ineffective.

1. https://www.unce.unr.edu/publications/files/nr/2007/fs0739.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_E/Elaeagnus.pdf

Image: Max Licher

WOODY #5

Sweet resinbush

Euryops multifidus (Thunb.) DC.

Origin: South Africa

Description – A low-growing, medium-sized shrub (usually <3′ tall). Its small leaves are about 1″ long. Each leaf is divided into 3 to 5 narrow lobes that look like tiny turkey tracks. The shrub usually sheds its leaves during dry seasons and blooms in late winter to early spring. Hundreds of small inflorescences similar to daisies may hide the green leaves. The name comes from the sweet, but disagreeable, odor of the flowers and the drops of resin exuded by the woody stems.

Distribution – Was introduced to central and southern Arizona in the 1930's to provide livestock forage and to control soil erosion. Because this shrub has proven to be highly invasive in semi-arid grassland areas, several projects have been initiated to eradicate or manage it in the southern half of Arizona. It occurs primarily below the Mogollon Rim in Arizona.

Management – Mechanical removal and herbicide application tend to be effective. Fire is generally ineffective.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd563047.pdf
2. https://wric.ucdavis.edu/information/crop/natural%20areas/wr_E/Euryops.pdf

Image: E. Makings

WOODY #6

Tree of Heaven

Ailanthus altissima (Mill.) Swingle

Origin: China

Description – This fast-growing, deciduous, dioecious tree, grows 50-80' tall. Its large compound leaves, 1-4' in length, are composed of 11-25 smaller lance-shaped, pointed leaflets that alternate along the stems. Each leaflet has 1 to several glandular teeth near the base. Staminate flowers appear in small terminal clusters and have a very strong, offensive odor. The yellowish-green, ¼" long, pistillate flowers are in dense terminal clusters. The 1-1½" reddish-brown fruits are twisted, winged, and appear in dense clusters. It reproduces by seed and root suckers.

Distribution – Found in towns and along streams throughout much of Arizona. It is a common ornamental in many mining communities (i.e., Bisbee, Jerome).

Management – Cutting and girdling without herbicide (glyphosate, triclopyr, imazapyr or picloram in the spring) use on the cut stump is ineffective.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410131.pdf
2. https://wric.ucdavis.edu/information/crop/natural%20areas/wr_A/Ailanthus.pdf

Image: LR Landrum

AQUATIC, RIPARIAN, OR WETLAND PLANTS

OTHER #1

Feathered mosquitofern

Azolla pinnata R. Br.

Origin: Africa, Australia, China, India, Japan, Malaysia, the New Guinea mainland, Philippines, and southeastern Asia

Description – An annual aquatic, free-floating fern that consists of small (less than 1"), triangular-shaped fronds. Individual plants clump together and blanket open water in a velvety reddish and green color. Fine lateral rootlets appear feathery in the water. When fertile, very small (less than ⅛") round sporocarps can be seen on the undersides of the frond branches. Can double its biomass in 5-10 days.

Distribution – Reduces oxygen levels and degrades water quality in slow moving riparian areas. It is an occasional contaminate in holding tanks where backyard pond plants are sold in Phoenix and Tucson but is not known to have established populations in natural or constructed water resources in Arizona.

Management – Butachlor (0.1 gal/ac), oxadiazon (0.05 gal/ac) and fentin acetate (0.02 gal/ac) effective for control.

1. https://wric.ucdavis.edu/information/crop/natural%20areas/wr_A/Azolla.pdf

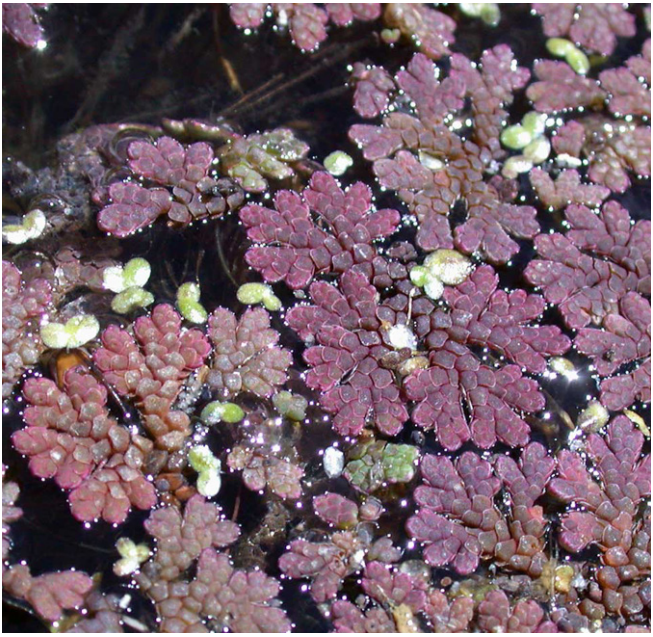


Image: Lorraine Phelan

OTHER #2

Giant cane, giant reed grass

Arundo donax L.

Origin: Europe

Description — A multi-branched, perennial "cane" with numerous culms that grow from root clumps that can expand to 10-20' in diameter. Creeping rootstocks grow from clumps and bear fibrous roots which may extend 15-20' from the clump. Above ground plant parts may grow 6-20' tall. Broad, linear, fibrous leaves are glabrous or scabrous. Woody culms are ½-1½" in diameter, hollow between internodes, and support leafy branches at nodes and panicles shaped like plumes. Reproduction is primarily vegetative via "spears" from rhizomes or vegetative stem fragments that form new stems and roots. Growth can occur throughout the year depending on location.

Distribution — Grows in scattered populations in moist sites across southern and central Arizona. It is a concern along the Gila, Salt, San Pedro and Verde River systems as well as Aravaipa Creek and Sabino Canyon. It has also been planted as an ornamental in yards and as windbreaks along irrigation ditch banks.

Management — Glyphosate (late fall at 0.21 gal/ac), and paraquat (0.08 gal/ac) can be effective for control. Prescribed fire is not recommended. Pulling is effective for small infestations. An IPM approach is most effective for control.

1. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5410114.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_A/Arundo.pdf

Image: Anthony Mendoza

OTHER #3

Giant salvinia

Salvinia molesta Mitchell

Origin: Southeastern Brazil

Description – A free-floating aquatic fern, consisting of a horizontal stem lying just below the water surface. Nodes along stems produce a pair of ovate to oblong floating leaves, or highly dissected submerged leaves that resembles roots. Stems fragment as colonies enlarge and new plants develop from apical and lateral buds. Dormant buds can withstand periods of stress from low temperatures and drying. It can completely dominate slow-moving or quiet freshwaters during warmer periods of the year.

Distribution – Discovered in the Colorado River in 1999, it has negative impacts on wildlife and fishery habitats, on agriculture, and on recreational activities. Boaters must make certain not to transport this invasive aquatic weed on gear or watercraft. It has been reported as being sold by some nurseries in Phoenix.

Management – Paraquat (0.01 gal/ac), diaquat (0.24 gal/ac), fluridone (0.15 gal/ac) and imazamox can all be effective for control.

1. https://www.unce.unr.edu/publications/files/nr/2002/FS0269.pdf
2. https://wric.ucdavis.edu/information/natural%20areas/wr_S/Salvinia.pdf

Image: Barry Rice

OTHER #4

Parrot feather watermilfoil

Myriophyllum aquaticum (Vell.) Verdc.

Origin: South America

Description – This freshwater species gets its name from feathery leaves arranged around the stem in whorls of 4-6. Emerged leaves look like small fir trees growing above the water surface. Rhizomes function as adventitious roots and provide buoyancy for emergent growth in the summer. Male plants are unknown outside its native range, so no seeds are produced in North American populations. Plants spread exclusively from vegetative fragments. In fall, plants die back to the rhizomes.

Distribution – This species was introduced worldwide for use in indoor and outdoor aquaria but has escaped cultivation and has been confirmed in backwater lagoons and canals along the lower Colorado River near Yuma as far north as the Imperial Reservoir. Mat formations provide habitat for mosquitoes. Other adverse impacts include altering native aquatic ecosystems and impeding navigation.

Management – Imazapyr (0.06 gal/ac) and 2, 4-D application are effective.

1. https://aquaplant.tamu.edu/management-options/parrotfeather/
2. https://wric.ucdavis.edu/information/natural%20areas/wr_M/Myriophyllum_aquaticum.pdf

Image: LS

OTHER #5

Floating water primrose

Ludwigia peploides (Kunth.) P.H. Raven ssp. *glabrescens* (Knutze) P.H. Raven

Origin: South America

Description – This robust, aquatic, freshwater perennial grows upright as a dense sprawling, tangled mat of vegetation. Its bright yellow, 1" flowers usually have 5 petals that bloom throughout the summer. Leaves are "willow-like", alternate, simple, slightly hairy, and elliptic to obovate with entire margins. Fruits are capsules that contain many tiny yellow ellipsoid seeds. Reproduction is by seed and by vegetative fragments.

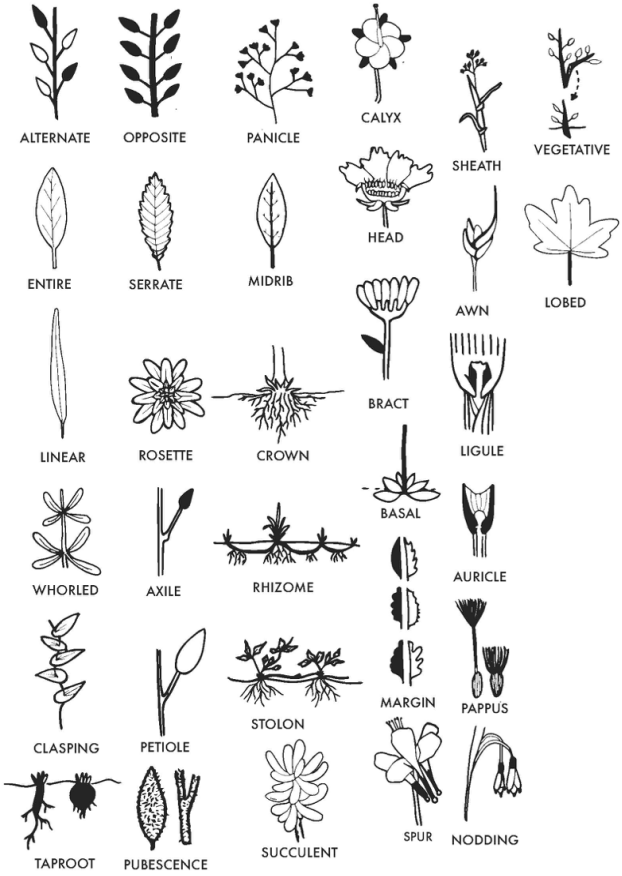
Distribution – Dense mats alter native aquatic ecosystems, provide mosquito habitat, and impede navigation. It is in the Verde River from Clarksdale downstream to the Salt River and occurs along some stretches of the Gila River. It can be common in areas where urban, agricultural, and industrial waste water create wetland habitats.

Management – Many herbicides have demonstrated utility for control, including 2, 4-D, glyphosate, imazamox, and imazapyr. IPM strategies are very effective.

1. https://wric.ucdavis.edu/information/natural%20areas/wr_L/Ludwigia.pdf

Image: Frankie Coburn

GLOSSARY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