

Category C—Low

Bald brome (*Bromus racemosus*)

Identification and Impacts



Photo credit: P. Rothrock



Photo credit: P. Rothrock



Photo Credit: M. Licher

Key ID Tips

- Relatively short inflorescence with 6-10 seeds.
- Single awn on each seed, 0.5 inch in length.
- Hair grows down on the leaf sheath.
- 3-5 veins on each seed.

Origin
Native to Eurasia

Description
Bald brome is a winter annual that grows in pastures and disturbed sites. It grows upright and can be 3 feet tall.

Its identified by the pubescence on its leaves and how the hair on its leaf sheath grows backwards (VT 2023). The seedhead forms a panicle 4—8 inches long that begins upright but droops as it matures. They have a single awn on each lemma, or floret, about a half inch in length. The seedheads can appear slightly compressed and can have 3-5 visible veins running vertically (SEINet 2023). The ligule is a thin membrane, usually 1-2mm in length, and auricles are not present.

Biology
Bald brome prefers rangelands and disturbed sites and is one of many annual brome species that impacts rangelands on the Navajo Nation. It can be grazed by livestock but dries up and loses much of its nutritional value in the summer and winter.

Locations
It has been detected in Canyon de Chelly.

Ecological Threat and Management Concerns
Bald brome is one of many annual brome grass species that have altered rangelands on the Navajo Nation, by replacing preferred perennial grasses and forage. While it can be grazed by livestock, over time, it can accumulate dry thatch which can increase fuels and fire risks. It also replaces preferred perennial grass species, which can increase soil erosion and top soil loss, especially in pastures and rangelands (Redsteer et al. 2011). Bald brome is included as part of several non-native annual brome species that have spread in rangelands in the region.



Photo credit: S. Holiday

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Small infestations can be hand pulled or hoed in the early spring before seed maturation. Mowing is not recommended as it can initiate flowering if done before seeds mature. If necessary, repeated mowing should be done every 3 weeks to reduce seed production and followed with herbicide. Shallow tilling in the fall or early spring can also suppress bromes and facilitate perennial grass establishment.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing is not recommended as disturbance can increase germination. However, bald brome is not harmful to livestock. Burning can be effective if done before seeds mature, but should be monitored closely.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Glyphosate
- Indaziflam
- Metribuzin

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

Redsteer, M.H., R.C. Bogle, and J.M. Vogel. 2011 Monitoring and analysis of sand dune movement and growth on the Navajo nation, Southwestern United States. U.S. Geological Survey Fact Sheet 2011-3085. 2 pp.

Virginia Tech University (VTU). 2023. Weed Identification: Bald Brome. Available online at: <https://weedid.cals.vt.edu/profile/504>.

SEINet Portal, Arizona—New Mexico Chapter. 2023. *Bromus commatatus*. Available online at: <https://swbiodiversity.org/seinet/taxa/index.php?taxon=1821&clid=2947>



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Category C—Low

California burclover (*Medicago polymorpha*)

Identification and Impacts



Photo credit: G. McDonald



Photo credit: K. A. Rawlins



Photo Credit: J. Viola

Navajo Name
Tł'oh azee

Origin
Native to the Mediterranean region.

Description
California burclover, despite its name, is a non-native annual legume. It grows from numerous prostrate stems that spread outward 6 to 20 inches. The leaves are clover-like in appearance, are wedge-shaped and toothed at the top. They have smooth surfaces. Plants have only a few small yellow pea-like flowers. The fruit is a flattened, coiled pod about 1/4 inch wide with a double row of hooked spines that spiral around the outside of the pod. Individual plants can develop more than 1,000 pods (NRCS 2006)



Photo credit: Forest and Kim Starr

Biology
Burclover germinates in the fall and matures in early summer. It is adapted to mild winters and hot summers. It is well adapted to a wide range of soil conditions, but prefers loamy soils. It can grow in full sun to heavy shade and it is tolerant of alkaline soils (NRCS 2006). It prefers disturbed sites, pastures, roadsides and vacant lots.

Locations
It has been detected in Canyon de Chelly in Canyon del Muerto.

Ecological Threat and Management Concerns
California burclover was initially used as a cover crop and was sometimes added to livestock feed. However, it can grow fast and displace more preferred native vegetation. It can also affect agricultural sites and can be a contaminant in hay or feed. As a prolific seed producer, burclover should be managed for a few years to ensure populations are controlled.

Key ID Tips

- Small pea-like flowers
- Small, flattened seed pods with double rows of hooked spikes spiraled on the outside.
- Wedge-shaped leaves with toothed edges at the top.

Category C—Low

California burclover (*Medicago polymorpha*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Mowing and cutting can be effective when paired with other control methods. Hand pulling is recommended for small populations and shallow tilling is an effective control method, especially in agricultural fields.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing is not recommended as disturbance can stimulate germination and resprouting. However, burclover is not harmful to livestock and is used as feed in some instances. Burning is only partially effective and can stimulate resprouting. Monitoring of post-fire conditions is essential.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- 2,4-D
- Glyphosate
- Indaziflam

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

USDA Natural Resources Conservation Service (NRCS). 2006. Plant Fact Sheet: Burclover. 2 pp. Available online at <http://plants.usda.gov>.



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Category C—Low

Cheatgrass (*Bromus tectorum*)

Identification and Impacts



Photo credit: L.J. Mehrhoff



Photo credit: L.J. Mehrhoff



Photo Credit: B. Ackley

Navajo Name
Shíyínáldzidí

Origin
Native to Eurasia

Description
Cheatgrass is an erect annual grass that grow to 8—25 inches tall. The leaf sheaths and blades are covered in soft hairs and have thin, short, paper-like ligules. The panicle droops to one side, with open, branching spikelets. The panicle can appear green to reddish-purple becoming tan when mature. The florets taper to a sharp pointed awn, about an inch long that can spiral and curl. Lemmas are covered in soft hairs and barbs that allow them to attach to clothing and fur. They have shallow roots and can grow with multiple stems in a clump.



Photo credit: Bureau of Indian Affairs

Biology
Cheatgrass is widespread across the United States and is well adapted to a wide range of conditions. It prefers well drained soils and does not do well in saline or wet soils. It grows in disturbed sites, rangeland, forests, and crop land. As a cool-season grass it germinates in the fall, and flowers in early spring. As the inflorescence matures, it becomes reddish-purple before dying in the late spring and summer. Seeds can survive in the soil for 2 to 3 years, with some instances of them surviving up to 5 years. As they grow, they accumulate thatch and dry material. It reproduces only by seed. They also spread easily by attaching to shoes, clothing, and animal fur.

Locations
Found throughout the Navajo Nation and problematic in rangelands and along trails.

Ecological Threat and Management Concerns
Cheatgrass increases the fire frequency of the areas it invades, especially in open rangelands and development areas. Its life cycle allows it to outcompete native grass species, crowding out perennial grass species. It is also responsive to disturbance, becoming one of the first plants to resprout. In agricultural settings, cheatgrass can reduce production of cultivated grass species. The seeds can also harm animals with their sharp tips.

- Key ID Tips**
- Open inflorescence that droops to one side.
 - Hairy leaves and leaf sheaths.
 - Awns 1-2 cm long, that spread and curl and may be barbed

Management Recommendations

Category C—Low

Cheatgrass (*Bromus tectorum*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Small infestations can be hand pulled or hoed in the early spring before seed maturation. Mowing is not recommended as it can initiate flowering if done before seeds matures. If necessary, repeated mowing should be done every 3 weeks to reduce seed production and followed with herbicide. Shallow tilling in the fall or early spring can also suppress bromes and facilitate perennial grass establishment.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing can be used to control cheatgrass when young and before seed development. However, treatments should be followed with herbicide and should only apply moderate pressure. Burning can be used when done in the spring before seed set and as part of a 2 to 3 year program.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Glyphosate
- Imazapic
- Indaziflam
- Paraquat*

*Restricted Use by U.S. EPA

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

USDA, NRCS. 2023. PLANTS Database. Available at <https://plants.sc.egov.usda.gov/>. National Plant Data Team, Greensboro, NC 27401-4901 USA.



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Category C—Low

Field bindweed (*Convolvulus arvensis*)

Identification and Impacts



Photo credit: B. Ackley



Photo credit: USFS



Photo Credit: D. Cappaert

Key ID Tips

- Creeping prostrate vines that use other plants for support.
- Single flowers with five fused petals.
- Heart-shaped to ovate petals with a rounded tip.

Navajo Name
Ch'il natł oi łigaí

Origin
Native to Eurasia

Description

Field bindweed is a perennial creeping vine. Its leaves are green and ovate to heart-shaped to arrowhead shaped but rounded on top with the shape becoming more distinct further along the vine. Flowers are bell or trumpet-shaped with five fused petals and are white to pink. Flowers also open during the day and close at night. They occur along the stem as mostly solitary flowers but can be in cymes of 2 to 4. Plants have vine like stems that are glabrous and curl around other plants for support. Bindweed has deep thin tap roots that can grow to 10 feet deep with lateral creeping roots. As a result, a single plant can have multiple stems attached to the same tap root.

Biology

Bindweed can reproduce by seed or vegetatively. A single plant can produce up to 500 seeds. The seeds can survive buried for 15 to 20 years, with some studies finding seeds surviving for up to 60 years. They grow in disturbed sites, gardens, pastures, and along trails and roadsides. They prefer well drained soils.

Locations

Widespread on the Navajo Nation on rangeland, agricultural fields and roadsides.

Ecological Threat and Management Concerns

Field bindweed can spread and grow aggressively. Its ability to resprout from small root fragments makes it difficult to control, especially as its roots are thin and break easily. They are also prolific seeders with seeds that can survive most conditions for long periods of time. Roots can penetrate fabrics, plastic, and other barriers. They typically grow in large patches, making spot treatments difficult unless done frequently. Because they use other plants for support, their stems can reduce the growth of other plants and removal can sometimes affect more desirable plants in the vicinity.



Photo credit: Bureau of Indian Affairs

Management Recommendations

Category C—Low

Field bindweed (*Convolvulus arvensis*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Hand pulling is only effective on seedlings and young adults but becomes ineffective once the tap root develops. Mowing is not effective due to bindweed's low profile, its use of other plants for support, and its vigorous resprouting. Tilling, grubbing, and cutting are not recommended as it can cause vigorous resprouting from cut stems and root fragments, which can increase the size of the infestation. Deep tillage down to 3 feet can be effective, but must be repeated over the next several years.

Biological

Two biological control organisms are available for use on the Navajo Nation. These include a gall mite and a moth whose larvae eat the leaves and flowers.

Cultural Control

Grazing and burning are not recommended to control bindweed as both can lead to resprouting.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- 2,4-D
- Dichlobenil
- Glyphosate
- Picloram*

*Restricted Use by U.S. EPA

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

USDA, NRCS. 2023. PLANTS Database. Available at <https://plants.sc.egov.usda.gov/>. National Plant Data Team, Greensboro, NC 27401-4901 USA.



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Category C—Low

Field brome (*Bromus arvensis*)



Photo credit: P. Rothrock



Photo credit: J.M. Randall, TNC



Photo Credit: J.M. DiTomaso

Origin
Native to Eurasia

Description
Field brome is an annual grass that grows between 14 –40 inches tall. Leaf blades are flat and covered with soft, thin hairs while hairs on the leaf sheath are denser. Ligules are small while auricles are absent. The inflorescence is an open panicle 2-7 inches long with drooping branches and 6-10 smooth spikelets. The first glumes have 3-5 veins while the second have 5-9 veins. Awns on the seeds are between 1/4 to 3/4 inches long. They have shallow roots and can grow with multiple stems in a clump.



Photo credit: Daderot

Biology
Field brome, sometimes called Japanese brome, grows in grasslands and disturbed sites, including shrublands, pinyon-juniper woodlands, low elevation forests, and agricultural sites. They can grow in a wide variety of soils. Plants germinate in the fall. Seeds can remain viable for several years, with most viable between 2 to 5 years.

Locations
Small populations have been detected on the Navajo Nation.

Ecological Threat and Management Concerns
Field brome can outcompete native perennial grass species and can reduce the amount of available forage for livestock and wildlife. While it can be used for grazing or as a cover crop, its ability to crowd out more desirable vegetation can alter native plant biodiversity and increase erosion. As an annual grass species, dead plants can accumulate thatch and alter fuels and fire risk. Field brome is included as one of several non-native annual brome species that have impacted rangelands in the region.

Key ID Tips

- Different venation seen on the first set of glumes versus the second.
- Spikelets are smooth while leaves and sheath are hairy.
- Branch to spikelet is long.

Category C—Low

Field brome (*Bromus arvensis*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Small infestations can be hand pulled or hoed in the early spring before seed maturation. Mowing is not recommended as it can initiate flowering if done before seeds mature. If necessary, repeated mowing should be done every 3 weeks to reduce seed production and followed with herbicide. Shallow tilling in the fall or early spring can also suppress bromes and facilitate perennial grass establishment.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing can be used to control field brome when young and before seed development. However, treatments should be followed with herbicide and should only apply moderate pressure. Burning can be used when done in the spring before seed set and as part of a 2 to 3-year program.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Glyphosate
- Indaziflam
- Metribuzin

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

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Category C—Low

Horehound (*Marrubium vulgare*)

Identification and Impacts



Photo credit: R. Kleinman, WNMU



Photo credit: P. Alexander



Photo Credit: B. Million, BLM

Key ID Tips

- Woolly, square stems
- Hooked spines at the top of seed pods.
- Small, bilateral white flowers.
- Woolly leaves with depressed veins.

Origin
Native to Eurasia

Description
Horehound is a perennial shrub that grows to about two feet tall. It has erect, densely hairy stems that appear grey or silvery. The cross-section of the stems are square and branched at the base. It has round to ovate leaves with round-toothed margins that are also covered in dense hairs. Leaves are opposite and have depressed veins, making the surface wrinkly. They also have a pungent smell. Flowers occur at the leaf axils and are in clusters with small, bilateral white flowers with spiny calyces. The seed pods are small oval pods that have hooked spines at the top, which can cling to animals, shoes, or clothing.



Photo credit: A. Smith-Muse, NMSU

Biology
Horehound grows in disturbed sites, including rangelands and roadside, preferring dry sites. It can expand under drought conditions and under heavy grazing pressure. Their seed pods can cling to animals and clothing, allowing them to travel great distances. Some evidence suggests seeds can survive in the soil for 7 to 10 years.

Locations
Horehound has been documented near Ganado, east of Lukachukai along BIA-13, and east of South Sheba Crater.

Ecological Threat and Management Concerns
Horehound colonizes disturbed sites and overgrazed rangelands and can be an initial colonizer at eroded sites. Livestock tend to avoid it as it is bitter tasting, giving it an advantage over more preferable native forage. This creates a feedback loop that allows horehound to displace native vegetation. Since it can also expand under drought conditions, horehound populations can further outcompete native plants, especially when combined with other land management practices.

Category C—Low

Horehound (*Marrubium vulgare*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Hand pulling is effective for small populations and should remove the top of the taproot to limit resprouting. It should be repeated as new seedlings emerge. Mowing can restrict the growth of some populations. Tilling can be effective when soils are dry and is recommended only for agricultural areas.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing is not recommended because horehound is not a preferred forage and it can spread under intense grazing pressure. Burning is also not recommended as it can stimulate germination and should only be used in combination with other control methods.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- 2,4-D
- Metsulfuron methyl
- Picloram*
- Triclopyr

* Restricted use by U.S. EPA

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

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Category C—Low

Jointed goatgrass (*Aegilops cylindrica*)

Identification and Impacts



Photo credit: S. Dewey, USU



Photo credit: P. Alexander



Photo Credit: J.M. DiTomaso

Navajo Name
Cl'oh a'he ni'li

Origin
Native to Mediterranean region and western Asia.

Description
Jointed goat grass is a winter annual grass that can resemble winter wheat. It grows up to 20 inches tall. Its stems are hollow. Its leaves, auricles, and leaf sheaths are spaced evenly apart on the stems and it has fine hairs along the margins. Its seeds grow in distinct cylindrical spikelets with the seeds appearing to zig-zag vertically. Each spikelet is hard, cylindrical to cone shaped, and while each has an awn, the terminal spikes have significantly longer awns (USFS 2014). The seeds start green and turn red as they mature. Plants do produce tillers, but these are less productive once seed set begins.



Photo credit: P. Alexander

Biology
Jointed goatgrass reproduces solely by seed. However, the hard coating around the seeds makes them tolerant of fire, high temperatures, and drought. Individual plants can produce around 3,000 seeds and seeds remain viable for 3-5 years (USFS 2014). It can hybridize with wheat, and other similar species. It prefers pastures and agricultural fields, as well as disturbed sites and roadsides. It germinates in the winter and fall, sometimes while still attached to the parent plant. It has high silica content, which reduces its decomposition at sites.

Locations
Unknown if present on the Navajo Nation.

Ecological Threat and Management Concerns
Jointed goatgrass is a concern in rangelands and agricultural settings. Its ability to hybridize with wheat, reduces yields and degrades land values. Its high silica content allows it to accumulate in natural areas, where it can suppress other native species and increase fuels. The tough seedheads allow seeds to survive at infested sites after treatments. Additionally the tough seedheads have been known to injury humans and animals.

Key ID Tips

- Cylindrical shaped spike inflorescence with hard seedcoat.
- Hollow stems.
- Has a longer awn (4-8 cm) at the terminal end of the seed spikelet.

Category C—Low

Jointed goatgrass (*Aegilops cylindrica*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Hand pulling is effective for small populations and should remove and air-dry the roots before disposal. Mowing can reduce seed production if done after flowering but before seeds reach the boot stage. Tilling can be effective if seeds are buried deep enough. However, subsequent tilling within 5 years, could bring up seeds and result in germination.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing is not recommended as it can increase plant density. Burning can be effective if done before seeds/joints disarticulate to ensure seed kill. It will not affect seeds on the surface and can increase germination due to increased soil fertility. Burning treatments should be followed with additional control methods the following year.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Glyphosate
- Imazapic
- Indaziflam

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information center, University of California. 544 pp.

USDA, NRCS. 2023. PLANTS Database. Available at <https://plants.sc.egov.usda.gov/>. National Plant Data Team, Greensboro, NC 27401-4901 USA.

U.S. Forest Service. 2014. Field guide for managing jointed goatgrass in the Southwest. U.S. Forest Service Southwest Region Forest Health. TP-R3-16-29. 10 pp.



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Category C—Low

Kochia (*Bassia scoparia*)

Identification and Impacts



Photo credit: L.J. Mehrhoff



Photo credit: P.J. Alexander



Photo Credit: M. Licher

Navajo Name
Ch'il nilt'ol'i

Origin
Native to Eurasia

Description
Kochia is an annual forb/shrub that can grow to 7 feet tall. It

appears grey green to bluish and is covered in soft hairs. Leaves are alternate, flat, and lanceolate to linearly shaped. Stems can turn reddish in the fall as plants mature. Flowers grow in spikes near the end of each branch and are small, green to yellow, inconspicuous, and may lack petals. They develop a deep tap root over time with lateral, branched roots.

Biology

Kochia grows in disturbed sites, waste areas, rangelands, and crop lands. They are often associated with alkaline sites and can tolerate saline, drought, frost, and sandy soils. Seeds begin to germinate in the spring. It is also allelopathic and releases chemicals into the soil that prevent or reduce growth of other plants. A single plant can produce thousands of seeds, which can remain viable for 1 to 2 years.

Locations

Found throughout the Navajo Nation.

Ecological Threat and Management Concerns

Kochia grows well in disturbed areas, such as waste sites, rangelands, and agricultural fields. Once established, it can reduce the growth of native plants and forage. A single plant can produce thousands of seeds. While seeds do not remain viable for long, they can germinate easily and plants can tolerate a wide range of conditions. Their allelopathic traits also help reduce competition with other native plants. When plants die, the stem remains and creating a tumbleweed. These tumbleweeds can break off and distribute seeds when plants are blown by the wind. They can also increase fire risks if tumbleweeds accumulate in areas. Older plants also have higher levels of oxalates which can be toxic to livestock in large amounts.



Photo credit: J.M. DiTomaso

Key ID Tips

- Small, numerous lanceolate to linear flat leaves.
- Erect, shrub-like growth pattern.
- Inconspicuous leaves.
- Stems turn reddish-brown as it matures.

Category C—Low

Kochia (*Bassia scoparia*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Manual removal can be effective if the root is severed below the soil surface. Mowing can reduce seed production if done before flowering. However, cutting and mowing plants can make them harder to remove as plants can resprout from remaining taproots. Shallow tillage is not recommended as it can stimulate recruitment and germination. Deep tillage is effective if seeds are buried deep enough.

Biological

No biological control organisms are available.

Cultural Control

Grazing and burning are not recommended or effective. However, intensive grazing can reduce populations. However, grazing should only be done when plants are young as older plants have higher levels of oxalates. Establishment of perennial grass and forb species does reduce and inhibit kochia establishment.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Atrazine*
- Dichlobenil
- Fluroxpyr
- Glyphosate
- Indaziflam
- Isoxaben
- Metribuzin
- Paraquat*
- Pendimethalin
- Prodiamine

*Restricted Use by U.S. EPA

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

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Category C—Low

Puncturevine (*Tribulus terrestris*)

Identification and Impacts



Photo credit: S. Hurst, NRCS



Photo credit: H.F. Schwartz, CSU



Photo Credit: S. Dewey, USU

Key ID Tips

- Seed pods have two hard large spines.
- Prostrate branches with opposite, pinnate compound leaves
- Small, solitary, simple yellow flowers

Navajo Name
Ch'il ilhoshiq
Naakaibihosh

Origin
Native to southern Europe and Mediterranean region.

Description
Puncturevine, sometimes called goathead, is prostrate annual forb that grows radially from a central stem and taproot. It has evenly pinnate compound leaves with 3 to 7 pairs of leaflets. The leaflets are ovate with round tips. They produce small, solitary yellow flowers with five petals. These become the seed burs with two distinct hard spines that point away from each other at about a 45° angle.

Biology
Puncturevine grows in cultivated areas, along roadsides and at disturbed sites. They prefer dry, sandy sites and tolerate most soil types. They can be killed by freezing temperatures. Seeds can remain viable for 3 to 6 years, with germination occurring in the early spring through the summer. Plants begin flowering within 3 weeks of germination and begin developing the burred seed pods within 6 weeks.

Locations
Found throughout the Navajo Nation along roadsides, in fields, disturbed sites, and near watering holes and windmills.

Ecological Threat and Management Concerns
The hard seed pods can stick to tires, shoes, and passing animals, allowing them to spread to areas far from the parent plants. They are prolific seeders with some accounts of seeds persisting for up to 20 years. Their taproots can make them hard to control as they can resprout from cut plants. Puncturevine produces saponin compounds that are toxic to livestock, especially sheep.



Photo credit: J.M. DiTomaso

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Hand pulling is effective when populations are small and soils are moist. Plants should be pulled before seeds develop. Mowing is not effective due to their prostrate form and ability to resprout. Hoeing and shallow cultivation is effective and is recommended before flower and seed production. Tilling should be to at least 1 inch below the surface and deep tillage can be effective but can increase seed longevity when buried.

Biological

One biological control organism is available on the Navajo Nation. A seed feeding weevil is approved through USDA APHIS.

Cultural Control

Grazing and burning are not recommended or effective. Since plants can be toxic to livestock, grazing is not recommended. The low-growing habit of the plant makes burning infeasible. Planting does prevent infestations and can reduce germination.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- 2,4-D
- Indaziflam
- Pendimethalin

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

USDA, NRCS. 2023. PLANTS Database. Available at <https://plants.sc.egov.usda.gov/>. National Plant Data Team, Greensboro, NC 27401-4901 USA.



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Category C—Low

Red brome (*Bromus rubens*)

Identification and Impacts



Photo credit: J.M. Randall, TNC



Photo credit: M. Licher



Photo Credit: J.M. Randall, TNC

Key ID Tips

- Dense, erect panicle with flaring spikelets.
- Inflorescence starts with red tips and becomes entirely red as they mature.
- Smaller stature than other annual bromes.

Navajo Name
Bi'zé yilwo' lichíí

Origin
Native to the Mediterranean region.

Description
Red brome is a erect annual grass that grows to 10-40 cm tall, being smaller in stature than the other listed brome species. Leaves are thin with hair on both surfaces and only a few per stem. The inflorescence is its most distinct feature as they are 2-10 cm long, erect, and dense with panicle branches that don't droop. The spikelets flare out, are longer than the panicle branches, and are densely crowded. The seeds are linear to lanceolate and covered in small, short hairs.

Biology
Red brome grows in disturbed sites, wastes, fields and rocky slopes. It is more sensitive to cold than the other bromes. It expands with disturbance, which increases germination.

Locations
Found throughout the Navajo Nation and problematic in rangelands and along trails.

Ecological Threat and Management Concerns
Red brome increases the fire frequency of the areas its invades, especially in open rangelands and development areas. Its growth pattern allows it to outcompete native grass species, crowding out perennial grass species. It is also responsive to disturbance, becoming one of the first plants to resprout. In agricultural settings, red brome can reduce production of cultivated grass species. The seeds can also damage grazing animals with their sharp tips. Red brome is included as one of several non-native annual brome species that have impacted rangelands in the region.



Photo credit: K. Gishi, NRCS

Category C—Low

Red brome (*Bromus rubens*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Small infestations can be hand pulled or hoed in the early spring before seed maturation. Mowing is not recommended as it can initiate flowering if done before seeds mature. If necessary, repeated mowing should be done every 3 weeks to reduce seed production and followed with herbicide. Shallow tilling in the fall or early spring can also be suppress bromes and facilitate perennial grass establishment.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing can be used to control red brome when young and before seed development. However, treatments should be followed with herbicide and should only apply moderate pressure. Burning can be done in the spring before seed set and as part of a 2 to 3-year program.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Atrazine*
- Fluazifop-P-butyl
- Glyphosate
- Imazapic
- Indaziflam

*Restricted use by U.S. EPA

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

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Management Recommendations



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Category C—Low

Rescuegrass (*Bromus catharticus*)

Identification and Impacts



Photo credit: P. Alexander



Photo credit: J.M. DiTomaso



Photo Credit: M. Licher

Key ID Tips

- Spikelets are flattened and appear braided together.
- Seeds or lemmas are awnless.
- Longer ligules with irregularly toothed at the end.
- Broad hairless leaves.

Origin

Native to South America.

Description

Rescuegrass is an annual brome species that grows in clusters with erect or leaning stems. The leaf blades are mostly hairless, but the sheaths have small fine hairs that point downward. They have a long ligule that is irregularly toothed at the top. Their inflorescences are distinct from other annual bromes as the spikelets are flattened with the seeds arranged in a braided pattern and are awnless. Seed spikelets appear green, turning red as they mature. The inflorescence is in an open panicle with several branches of spikelets that can be erect or nodding.



Photo credit: P. Alexander

Biology

Rescuegrass can be found in rangelands, agricultural fields, riparian areas, and roadsides. It is well adapted to warm climates and resistant to extreme cold. Similarly to other non-native invasive bromes, it can outcompete native vegetation and replace high value perennial forage. It can be used as forage when needed.

Locations

Found throughout the Navajo Nation and problematic in rangelands and along trails.

Ecological Threat and Management Concerns

Rescuegrass can outcompete native grass species, crowding out perennial grass species especially in rangelands and riparian habitats. It can grow in dense clusters, preventing native plant growth and regeneration. It is also responsive to disturbance, becoming one of the first plants to resprout. It is tolerant of a wide range of environmental conditions, giving it an advantage over slower growing native species. In agricultural settings, rescuegrass can reduce production of cultivated grass species. The seeds can also be carried by animals, humans, and equipment, allowing it to spread to new areas. Rescuegrass is included as one of several non-native annual brome species that have impacted rangelands in the region.

Category C—Low

Rescuegrass (*Bromus catharticus*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Small infestations can be hand pulled or hoed in the early spring before seed maturation. Mowing is not recommended as it can initiate flowering if done before seeds mature. If necessary, repeated mowing should be done every 3 weeks to reduce seed production and followed with herbicide. Shallow tilling in the fall or early spring can also suppress bromes and facilitate perennial grass establishment. Equipment should be cleaned after treatment to prevent seed distribution to new areas.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing can be used to control rescuegrass when young and before seed development. However, treatments should be followed with herbicide and should only apply moderate pressure. Burning can be used when done in the spring before seed set and as part of a 2 to 3-year program.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Glyphosate
- Indaziflam
- Metribuzin
- Prodiamine

References

Southwestern Environmental Information Network (SEINET) Arizona-New Mexico Chapter Portal. Available at: <https://swbiodiversity.org/seinet/index.php>.

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Category C—Low

Ripgut brome (*Bromus diandrus*)

Identification and Impacts



Photo credit: J.M. DiTomaso



Photo credit: J.M. DiTomaso

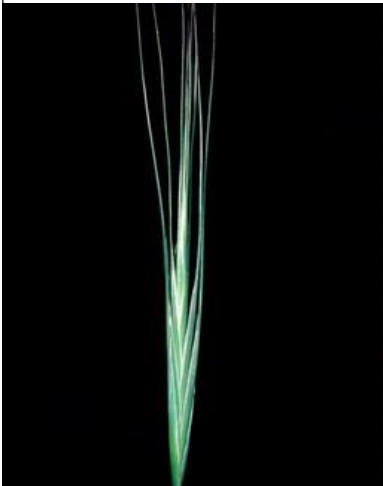


Photo Credit: B. Rice

Navajo Name
T'oh da a gighi

Origin
Native to South America.

Description
Ripgut brome can look very similar to cheatgrass but tends to be taller (2.5 feet tall) with wider leaves (2 to 7 mm wide). Their inflorescence are in an open panicle that is very similar in size to cheatgrass. However, the awns on the seeds are longer (1.5 to 2 inches). The spikelets do become reddish brown to tan as the seeds mature. Leaves and sheath are covered in hairs and it has a distinct ligule that is not fringed and does not have hairs around the margins.



Photo credit: M. Licher

Biology
Ripgut brome is a cool season annual grass that grows in open disturbed sites, rangelands, agricultural fields, roadsides, and many natural communities. They are often in dry sandy soils where there is limited competition with other vegetation. They germinate in the winter and flower in the spring. The seeds generally disperse a short distance from the parent plant but can travel longer distances by wind or by animals and humans. Seed typically survive for 2-3 years, with some evidence of viability after 5 years.

Locations
Currently found east of Chinle near Canyon de Chelly.

Ecological Threat and Management Concerns
Ripgut brome can outcompete native grass species, crowding out perennial grass species especially in rangelands. Accumulated thatch can increase fuels and alter fire regimes. It is also responsive to disturbance, becoming one of the first plants to resprout. It is tolerant of a wide range of environmental conditions, giving it an advantage over slower growing native species. In agricultural settings, ripgut brome can reduce production of cultivated grass species. The seeds can also be carried by animals, humans, and equipment, allowing it to spread to new areas. Ripgut brome is included as one of several non-native annual brome species that have impacted rangelands in the region.

Key ID Tips

- Similar growth habit to cheatgrass, but taller in stature.
- Seeds have long awns than other brome species.
- Ligule is not fringed and does not have hairs around the margins.

Ripgut brome (*Bromus diandrus*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Small infestations can be hand pulled or hoed in the early spring before seed maturation. Mowing is not recommended as it can initiate flowering if done before seeds matures. If necessary, repeated mowing should be done every 3 weeks to reduce seed production and followed with herbicide. Shallow tilling in the fall or early spring can also suppress bromes and facilitate perennial grass establishment. Equipment should be cleaned after treatment to prevent seed distribution to new areas.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing can be used to control ripgut brome when young and before seed development. However, treatments should be followed with herbicide and should only apply moderate pressure. Burning is feasible and should be done before seeds mature in the late spring. Burning after seed dispersal can increase germination and density.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Glyphosate
- Indaziflam
- Metribuzin

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

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Category C—Low

Russian thistle (*Salsola tragus*)

Identification and Impacts



Photo credit: J.M. DiTomaso



Photo credit: NPS



Photo Credit: Bureau of Indian Affairs

Navajo Name

Chi'ildeeníni

Origin

Native to Eurasia

Description

Russian thistle is a bushy summer annual that grows 3 feet tall or more in a spherical shape. It has rigid, curved

branches that grow upward and are covered in stiff, prickly upper stem leaves. The plant can appear bluish green to yellow-green. Leaves and stems are succulent and become more rigid as they mature. Leaves are alternate and thread like, developing a sharp tip at the end. Flowers are small and grow at the leaf axils. They have showy sepals that can be white to pink and no petals.



Photo credit: E. Coombs

Biology

Russian thistle grows in disturbed sites, such as waste areas, roadsides, and some over used native plant communities. It grows best in loose sandy soils and can tolerate alkaline and arid conditions, where it can outcompete native plants during drought conditions. Plants usually flower in the summer and early fall. In the fall, plants senesce, turning gray or brown. At this stage, the shrub can break off at the root, forming a tumbleweed. As the tumbleweeds move, seeds are distributed. The plant skeletons can persist for more than a year, and can accumulate along fences and structures, increasing fire risks. Seeds can survive for up to 3 years and require little moisture to germinate.

Locations

Currently found throughout the Navajo Nation on rangelands and agricultural sites.

Ecological Threat and Management Concerns

Russian thistle invades arid lands and increases fire risk. The tumbleweeds can create fire hazards along structures and allow the plants to spread and establish at new sites. They are also high in oxalates, making them toxic to livestock. The stiff spines on the leaves can also cause injury. Russian thistle has also shown resistance to a number of herbicides.

Key ID Tips

- Succulent leaves with a sharp tip at the end.
- Small, solitary flowers at the leaf axils, with no petals and sepals that can be white to magenta.
- Stems are red

Russian thistle (*Salsola tragus*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Small infestations can be hand pulled or hoed before seed set. Mowing should be repeated to provide control and done before flowers mature. If done after seed set, it can disperse seeds and increase the population size. Tilling can control plants but should be repeated for at least two years to deplete the seed bank. Monitoring is necessary as tilling can increase disturbance, which can cause germination.

Biological

No biological control organisms are available.

Cultural Control

Targeted grazing is not recommended as plants contain toxic compounds. However, it can suppress young plants and should only be done in areas where other forage is readily available. Prescribed burning is not recommended as it can create conditions that increase germination and tumbleweed movement.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- 2,4-D
- Clopyralid
- Glyphosate
- Indaziflam
- Isoxaben
- Metribuzin
- Picloram*

*Restricted use by U.S. EPA

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

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Category C—Low

Smooth brome (*Bromus inermis*)

Identification and Impacts



Photo credit: University of Massachusetts



Photo credit: J.M. DiTomaso



Photo Credit: J.M. Randall, TNC

Navajo Name
Bijh ṭ óh

Origin
Native to Eurasia

Description
Smooth brome is a cool-seasonal perennial grass that can vary in height from 2 to 4 feet tall. The plants has deep-rooted rhizomes with erect stems. Leaves and stems are usually smooth with no hairs. The blades are thin and flat, and some may have an “m” or “w” shaped imprint midway down the blade. They have a small ligule, no auricle, and sheaths are closed. The inflorescence is an open panicle 2 to 8 inches long. The spikelets are nearly cylindrical and smooth and begin green and turn purple to brown as the seeds mature. When in bloom, they have yellow flowers that hang from the spikelets.



Photo credit: P. Rothrock

Biology
Smooth brome can reproduce vegetatively and by seed, creating dense populations that eventually take over sites. They prefer sunny areas and disturbed sites, such as roadsides and pastures, but can grow in open spaces in forests. They are not shade tolerant. It was originally used to control erosion and as forage. They form thick sods that crowd out native plants and deplete soils of nitrogen, limiting the growth of native plants. Its deep rhizomes make them tolerant of prolonged drought and cold environments.

Locations
Populations have been detected in the Chuska Mountains north of Long Lake and along Highway 34.

Ecological Threat and Management Concerns
Smooth brome’s rhizomatous roots and ability to alter soil conditions gives it a competitive advantage over native plants, quickly dominating sites where it establishes. It can also act as a vector for several agricultural viruses and pests. There is research that suggests its presence alters the life cycles of native arthropods as well.

Key ID Tips

- Rhizomatous perennial grass.
- Seeds are awnless.
- Some leaves may have an “M” or “W” constriction midway and have no hair.
- Inflorescence can be green, purple, to brown.

Category C—Low

Smooth brome (*Bromus inermis*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Mowing during the boot stage can be effective when repeated. The ideal time is during dry periods that follow hot and moist conditions. Hand pulling and digging can be limited as the rhizomes can resprout. If done, the entire root ball should be removed to limit resprouting.

Biological

No biological control organisms are available.

Cultural Control

Burning can be effective if done in the early spring between the boot and early bloom stage. Burning will control the spread, but will not eliminate the species. Grazing can also control smooth brome spread and is most effective when done at the beginning of the growing season when plants are young.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- Glyphosate
- Indaziflam
- Metribuzin

References

DiTomaso, J.M., G.B. Keyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.

Southwestern Environmental Information Network (SEINET) Arizona-New Mexico Chapter Portal. Available at: <https://swbiodiversity.org/seinet/index.php>.

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Category C—Low

Spreading wallflower (*Erysimum repandum*)

Identification and Impacts



Photo credit: S. Smith, U of A



Photo credit: P. Alexander



Photo Credit: P. Alexander

Navajo Name
Bist'á azéé tsoh

Origin
Native to Eurasia

Description
Spreading wallflower is an annual winter forb with erect stems that can sometimes form a low shrub, usually between 1 to 2 feet tall as they have multiple branches. Their leaves are linear to lanceolate with wavy or widely spaced toothed margins. Flowers grow in clusters at the end of the stems and have small yellow to light green flowers. They develop long thin siliques, or seed pods. Individual plants have a thick, deep taproot.



Photo credit: M. Licher

Biology
Spreading wallflower prefers disturbed sites, such as rangelands, roadsides, and waste species. They flower from March to July. Wallflower thrives in fertile, moist soils and full sun, but can tolerate some shade. Plants reproduce by seed only, but can resprout from the taproots. Like most mustard species, seeds can remain viable for years.

Locations
Populations have been detected in Canyon de Chelly.

Ecological Threat and Management Concerns
Spreading wallflower can affect rangelands and disturbed sites, making it difficult for native plants to establish or maintain adequate cover. They can also be problematic in agricultural settings, such as in wheat crops where they can contaminate harvests and reduce yields. Some varieties are also resistant to various herbicides. They can be prolific seeders and can spread quickly in disturbed sites.

Key ID Tips

- Linear to lanceolate leaves with wavy to widely toothed margins.
- Yellow small flowers in clusters at the end of the stems.
- Thin silique or seed pods.
- Many stems and branching.

Category C—Low

Spreading wallflower (*Erysimum repandum*)

Additional safety measures and limitations may apply for each method. Refer to the [Navajo Nation Integrated Weed Management Plan](#) for more information.

Mechanical/Manual Removal

Hand pulling and digging can be effective on small populations, but should remove as much of the taproot as possible to reduce resprouting. Cutting and mowing can be used to reduce growth and spread if done when plants are young and before flowering. Tilling can be effective but only on seedlings and when conditions are dry and warm. Otherwise, tilling can increase germination. Deep tillage is recommended to bury the seeds, though repeat treatments could stimulate germination of previously buried seeds.

Biological

No biological control organisms are available.

Cultural Control

Burning and targeted grazing are not recommended or effective as it can cause resprouting and promote germination. Maintaining healthy native plant cover or using cover crops can reduce or prevent establishment.

Chemical

Use of herbicides can be effective. Refer to the product labels for information application rates, timing, and approved application methods.

Recommended herbicides include:

- 2,4-D
- Thifensulfuron methyl

References

Lyon, D.J., I.C. Burke, and J.M. Campbell. 2018. Integrated management of mustard species in wheat production systems. Pacific Northwest Extension Publication PNW703. 9 pp.

Southwestern Environmental Information Network (SEINET) Arizona-New Mexico Chapter Portal. Available at: <https://swbiodiversity.org/seinet/index.php>.

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