College of Agricultural, Consumer and Environmental Sciences

Dr. Leslie Beck

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New Mexico State University
aces.nmsu.edu

Noxious Weeds of The Four Corners

Photo by: Leslie Beck

About the College The College of Agricultural, Consumer and Environmental Sciences is an engine for economic and community development in New Mexico improving the lives of New Mexicans through academic research and extension programs

Weed definitions

- Native plant – part of the balance of nature that has developed over hundreds/thousands of years in a particular region or ecosystem
  - Only plants found in US prior to European settlement
- Non-native – plant introduced with help (human, animal, weather) to a new place or habitat where it was not previously found
  - All non-native plants are invasive
  - Introduced intentionally or accidentally
    - Salt cedar, kudzu, etc.

Weed definitions

- Exotic – plant not native to the continent on which it is now found
  - European plants are exotic to North America

Saltcedar

Common bermudagrass

Weed definitions

- Invasive weed – A plant that is both non-native and able to establish, grow quickly, and spread to the point of disrupting plant communities or ecosystems
  - Generally detrimental to native pop.
- Noxious weed – Any plant designated by Federal, State, or county government as injurious to public health, AG, recreation, wildlife, or property
  - Not all invasive plants are considered noxious

Cheatgrass/ Downy Brome

Photo by: Leslie Beck

Cheatgrass (*Bromus tectorum*)

- Class C: Winter annual

Photos by: Leslie Beck

Aka: downy brome

All leaves and stems covered in soft, dense hair

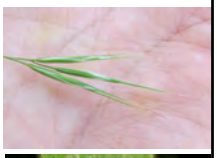
Papery thin, ragged edged ligule

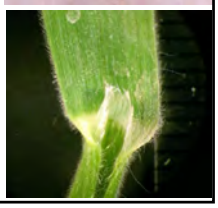
Inflorescence is dense, slender, and usually drooping

Can produce 300 seed per plant or more

Seed has awns that can be 3/8 to 5/8" long

Awns can turn purplish at maturity





Cheatgrass
Reproduction and spread

- Plant reproduces by seed
- Can increase growth area by tillers
  - Up to 20 per plant
- Each plant can produce up to 5,000 seeds
  - Middle to late June
  - Remain dormant 3 yrs
  - Long sharp awns attach to clothing and fur
- Seeds germinate early, roots grow rapidly, quick maturation

Bruce Ackley, The Ohio State University, Bugwood.org

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Cheatgrass: Impacts

- Displaces native stands by:
  - Short lifecycle, quick germination, prolific seed production, and roots growing through the winter
  - Fostering grass fires (stands dry out by mid-June)
    - Becomes more dominant with every fire
- Dried awns can impale mouthparts, esophagus, and stomachs of grazing animals

weedid.cals.vt.edu

John M. Randall, TNC, bugwood.org

Cheatgrass

George Beck and James Sebastian, Colorado State University, bugwood.org 5391958

Frequent grass fueled fires reduce sagebrush populations. Many native species cannot regenerate after fire.

George Beck and James Sebastian, Colorado State University, bugwood.org

Cheatgrass
Mgmt. Dos and Don'ts

- Maintenance of a healthy native community and prevention are best
- Burning before seed dispersal will destroy immature seed, but may leave site susceptible to re-invasion
- Mowing within a week after flowering will reduce seed production
- Grazing possible on young plants prior to producing seed
- Herbicides are effective (fall or spring)
  - Timing is narrow so natives aren't injured

Biennial Thistles

Photo by: Leslie Beck

Musk thistle (*Carduus nutans*)

- Class C: Biennial

Grows from a basal rosette

Both leaves and stems have sharp spines

Leaf margins are deeply lobed with white tinge

Leaves dark green with light green midrib

Leaf bases extend down to stem, creating spiny wings

Long hairs only along main leaf veins

Bright pink/purple flowers atop long erect stalks that 'nod' at 90 angle

Phyllaries form spines on flowers

Invasive to native and Ag plants

Spines can be harmful to grazing livestock and wildlife

Photos by: Leslie Beck

Bull thistle (*Cirsium vulgare*)

- Class B: Biennial to weak perennial

Grows from a basal rosette

Both leaves and stems have sharp spines

Spines much more pronounced than musk thistle

Leaf margins deeply lobed

Base of leaves can extend as a prickly wing along the stem

Leaves prickly and scratchy hairy on upper surface, cottony underneath

Flowers clustered at the ends of branches on erect stalks

Bright pink/purple flowers with spiny bracts

Photos by: Leslie Beck

Scotch thistle (*Onopordum acanthium*)

- Class A: Biennial to weak perennial

Max Licher, swbiodiversity.org/seinet

Grows from a large basal rosette (up to 2 feet across)

Both leaves and stems have sharp spines

Leaf margins shallow-lobed, wavy appearance

Plants appear bluish-gray due to thick hairs covering leaves

Leaves attach to stems to form prominent 'wings' with additional spines

Flowers appear mid-summer (June – July)

Purple or white, shaving-brush flowers

Multiple needle-like bracts at base of flower

Flower spines are slender and purple-brownish tinged

Photo by: Gary Stone

https://courses.missouristate.edu/

Biennial thistles
Reproduction and spread

- Requires 2 years to complete reproductive cycle
  - May flower in 1 yr with warm temps
- Plants can grow up to 6 ft tall
  - Scotch stems can grow up to 12 ft tall
- Flowers from May September.
  - Viable seed in 1 month
- Reproduces from seed
  - Musk = 120,000
  - Scotch = 40,000
  - Bull = 4,000
- Seed spread through wind and disturbance events
  - Flooding, soil erosion
- Seed viable for 10-20 yrs

https://courses.missouristate.edu/

Photo by: Thayne Tuason

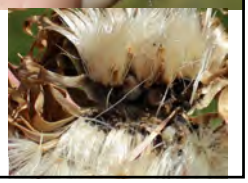
Biennia thistles: Impacts

- Unpalatable to wildlife and livestock
  - Focus on other plants in the surrounding areas
  - Give thistles competitive edge over foraged natives
- Primary taproot leads to increased soil erosion
  - Actually helps seed to spread

Photos by: Leslie Beck

Biennial thistles
Mgmt. dos and don'ts

- Biological control
  - Thistlehead-feeding weevil (*Rhinocyllus conicus*)
  - Rosette weevil (*Trichosirocalus horridus*)
- Have been released in some western states
- Larvae does damage
  - flower heads/reduce seed production
  - Burrow down petiole into growth point of rosette to cause stunted growth
- Unintentional impacts
  - Also feed on native thistles, including some rare endangered species
- Biological control is a useful tool…will not control weed on their own



Photos by: Leslie Beck

Biennial thistles
Mgmt. dos and don'ts

- Proper identification is important
  - Can be confused with native thistles
- Mechanical removal should cut roots below soil surface
  - Remove stems before flowering
- Herbicides are effective
- DO NOT mow after flowering to prevent seed spread
- DO NOT use fire – it creates favorable conditions for growth

Photo by: Leslie Beck

Canada Thistle

Photo by: Leslie Beck

Canada thistle (*Cirsium arvense*)

- Class A: Perennial

forms from a basal rosette, but grows more erect than other thistles

Creeping perennial that forms dense patches connected by rhizomes

Leaf margins are wavy, lobed, or toothed with prickly spines

Leaves can appear dark to bright green with upper surface waxy and lower surface sparsely wooly

Erect, branched, slightly hairy stem with ridges and spines, can be up to 4 ft tall, not winged

Pink or purple umbrella shaped flower clusters; male and female flowers on separate plants (dioecious)

Urn-shaped flower head with smooth bracts (phyllaries)

Extensive root system includes taproot and rhizomes

Allopathic chemicals may inhibit growth of other plants.

Photos by: Ben Legler and Leslie Beck

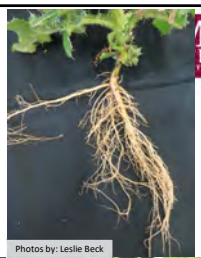
Canada thistle
Reproduction and spread

- Reproduces through root buds, rhizomes, and seed.
- Flowers from June to Oct.
  - White wooly hairs help seed spread
- Produces 1,500 seed
  - Seed viability within 10 days
  - Can remain viable >20 years
- Plants are dioecious
  - Male and female on two separate plants
  - Insects attracted to sweet smelling female flowers can pollinate stands >200 ft apart

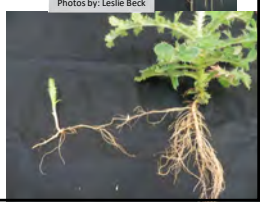
Photos by: Richard R. Old

Canada thistles
Reproduction and spread

- Emerges from root system April – May
  - Spreads through vertical and lateral roots (rhizomes)
  - 15 ft. wide and deep
  - Aggressive rhizomes spout new plants as they spread
- Greatest flush of root-derived plants occurs in the spring, second flush in the fall
  - Growth flushes can occur anytime during growing season with soil moisture



Photos by: Leslie Beck



Canada thistle: Impacts

- Unpalatable to wildlife and livestock
  - Focus on other plants in the surrounding areas
  - Give thistles competitive edge over foraged natives
- Plants can be stimulated by fire events, mowing or tillage so management must be appropriately timed

Photos by: Leslie Beck

Canada thistles
Mgmt. dos and don'ts

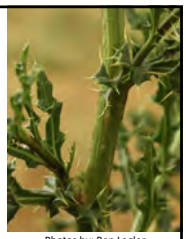
- Biological control
  - Shoot, stem, or leaf larvae
  - More suitable for remote stands inaccessible to other management options
- Unintentional impacts
  - Also feed on native thistles, including some rare endangered species
- Young plants can be grazed by goats, sheep, and possibly cattle
- Biological control is a useful tool…will not control weed on their own
  - IPM!

Canada thistle stem weevil (*Ceutorhynchus litura*)

seed head weevil (*Larinus planus*)

Canada thistle
Mgmt. dos and don't

- Proper identification is important
  - Can be confused with native thistles
- Early detection and eradication are the most effective control methods
- Repeated cultivation, mowing (before seed production) or hand removal can be effective if consistent and no rhizomes have matured
- Herbicides are effective
- Slow seed germination makes plant susceptible to competition from desirables
- DO NOT mow during flowering to prevent seed spread (bag clippings)
- DO NOT use fire – it creates favorable conditions for growth


Photos by: Ben Legler

Russian Knapweed

Russian knapweed (*Acroptilon repens*)

- Class C: Perennial

Grows from a basal rosette

Newly emerged/lower leaves are toothed and covered in fine hairs

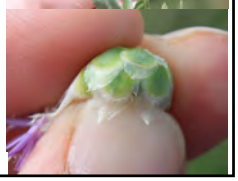
Upper stem leaves smaller with toothed or entire margins

Leaves are bluish-green in color

Spreads via aggressive rhizomes

Pink/purple flowers

Outer bracts under flower heads have broad, papery tips



Russian Knapweed
Reproduction and Spread

- Low seed production
  - 50 to 500 per flower
  - Viable 2 – 3 yrs in soil
- Primarily spreads vegetatively
  - Roots grow rapidly
    - 6-8 ft deep 1 season
    - 16 to 24 ft deep 2 seasons
    - 40 x 40 ft in +2 season
  - Additional plants grow from spreading rhizomes

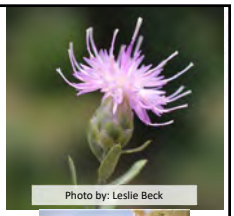
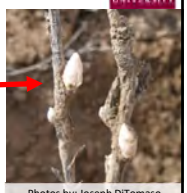



Photo by: L.L. Berry

Russian Knapweed
Phenology

- Shoots emerge in early spring
  - March to early April
- Bolt mid to late spring
  - Usually in May
- Flowers appear in early summer through fall
  - June - September


Photos by: Joseph DiTomaso

Russian knapweed: Impacts

- Allelopathic – Quickly forms monocultures
  - Exudes polyacetylenes from roots
  - Accumulates copious quantities of zinc in foliage
- Toxic to horses – chewing disease

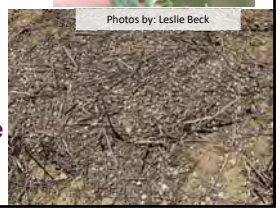
Colorado State University Weed Science

https://www.nwcb.wa.gov/weeds

Russian Knapweed
Mgmt. Dos and Don'ts

- Prevention and early detection essential
  - Difficult to control large infestations and once rhizomes have developed
- Prevention & healthy plant community best control methods
- Herbicides are effective
  - Nov. is best application timing

Photos by: Leslie Beck



Spotted Knapweed

John M. Randall, TNC, Bugwood.org

Diffuse Knapweed

Eric Coombs, Oregon Dept. of Ag, Bugwood.org

Spotted Knapweed (Centaurea biebersteinii)

- Class A: Perennial

Photo by: Leslie Beck

Grows from a basal rosette

Soon grow as several branched upright stems

Can grow up to 5 ft tall

Leaves are deeply lobed

Leaves smaller as they advance up the stem

Leaves are silver-green in color

Purple (rarely white) flowers grow at ends of branches

Bracts under flower head have distinctive vertical veins below black triangular spot on bract tip

Flowers continuously from early summer into fall

Steve Dewey, Utah State Univ., Bugwood.org

Spotted Knapweed
Reproduction and Spread

- Simple perennial
  - Lives up to 9 years
- Can produce 5,000 to 40,000 seeds/year
  - Produces more during wet periods
- Seeds germinate in spring or fall
- Plants produce 1 to 6 shoots
  - Rosettes form early spring, bolt early May, flower June thru Sept.

John M. Randall, TNC, Bugwood.org

Spotted Knapweed
Reproduction and Spread

- Spread occurs via seed only
  - Bracts open when dehydrated
    - 2-3 weeks after maturity
  - Wind or passing animals flick seed from head and carry off
    - Also undercarriages of vehicles
    - Seeds float well
      - Rivers and other water sources vectors of spread
    - Crop seed & hay contaminant

Michael Rasy, University of Alaska, Bugwood.org

Diffuse knapweed (*Centaurea diffusa*)

- Class A: Biennial/ perennial

Photo by: Richard Old

Grows from a basal rosette

Newly emerged/lower leaves are lobed and covered in fine hairs

Upper stem leaves smaller with entire margins

Leaves are bluish-green in color due to cottony hairs

Do not form wings on the stem

White to light purple shaving brush flower

Bracts are straw colored with comb-like edges and spiny tip

Bract spines bend outward at flower maturity

Photo by: Leslie J. Jehrhoff, University of Connecticut, Invasive.org

Photo by: George Beck and James Sebastian, Colorado State University, bugwood.org

Diffuse Knapweed
Reproduction and Spread

- *Centaurea diffusa*
  - Asteraceae
- Weak perennial
  - Can complete life cycle in 1 year
  - Plants need to reach 13 leaves to reproduce
  - Spreads only from seed
    - 11,200 to 48,100/1000ft^2
  - Shoots break off and tumble in the wind
    - Ideally suited to spread by vehicles

Cindy Roche, Bugwood.org

Diffuse Knapweed
Reproduction and Spread

- *Centaurea diffusa*
  - Asteraceae
- Seeds germinate near the soil surface
  - Germination occurs with adequate moisture
    - Spring or fall
      - Multiple germination events over a season can occur
  - Soil disturbance also facilitates germination
  - Problem weed of rangeland, pastures, roadsides, non-crop

George Beck and James Sebastian, Colorado State University, Bugwood.org

Photo by: George Beck and James Sebastian, Colorado State University, bugwood.org

Spotted and Diffuse Knapweed
Impacts

- Decreases forage livestock and wildlife
  - Ex: spotted knapweed
    - Decreased bluebunch wheatgrass yield
    - Elk use decreased drastically
  - Ex: diffuse knapweed decreased forage production
    - 1290 lbs/A with no diffuse knapweed
    - 185 lbs/A with 590 lbs/A diffuse knapweed
- Detrimental to water and soil resources
  - Ex: spotted knapweed
    - Surface water runoff increased 56%
    - Erosion increased 192%

Spotted and Diffuse Knapweed
Mgmt. Do's and Don'ts

- Preventing seed dispersal and healthy plant community are essential
- Mechanical removal must remove at least 3-4 in. of root crown
- Thirteen biological control agents have been introduced
  - Useful tool to injure weeds, DO NOT control population on their own
- Herbicides are effective during active growth
- Fire is NOT effective

Hoary Cress; aka: whitetop

John M. Randall, TNC, Bugwood.org

Perennial Pepperweed

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Hoary cress (*Cardaria* spp.)

- Class A: Perennial

Photo by: George Beck and James Sabastian

Creeping perennial

Stems can grow up to 3 ft or along the ground (can't root)

Deep, long-lived taproot with extensive creeping root system

Plants and leaves have gray-green, soft hairy appearance

Lower portion of plant tends to be hairier and have more leaves

Leaves alternate, gray-green oblong and entire or toothed

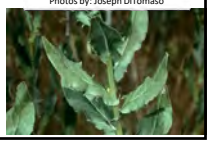
Base of upper leaves clasp the stem

Flowers are small, white, 4 petals, and bunched into inflorescence at top of plant

Seed pods are round to heart-shaped with long beak

Seed have short projection (1 in)

Photo by: Mark Schwarzlander



Photos by: Joseph DiTomaso

Hoary cress

Reproduction and Spread

- Spreads as creeping perennial and seed
- Flowers from May-July
- Can produce 5,000 seed
  - Viable for 3 years
  - In warmer climates may seed multiple times/year
- Seedlings develop 10 in. taproot with lateral roots and buds in 1 month
- Taproots can reach 5 ft deep
  - Lateral roots can extend up to 30 ft in two growing seasons
  - Shoots can grow from 1 in. root fragments

Steve Dewey, Utah State University, Bugwood.org

Perennial pepperweed (*Lepidium latifolium*)

- Class B: Perennial

Photos by: Mary Ellen (Mel) Harte

Semi-woody stems grow up to 5 ft

Rhizome-like creeping roots are white to cream in color with horseradish smell

Plants and leaves have gray-green, waxy appearance

Lower portion of plant tends to be hairier and have more leaves

Leaves alternate, oblong with smooth or jagged edges and small petioles

More mature leaves lack petiole and get smaller towards the top of the plant

Leaves DO NOT clasp stem

Flowers are small, white, 4 petals, and bunched into inflorescence at top of plant

Seed pods are round to oval-shaped, small beak

Photo by: Leslie J. Mehrhoff

Perennial pepperweed

Reproduction and Spread

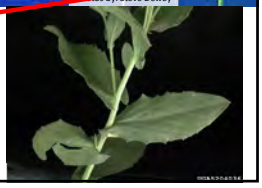
- Spreads as creeping perennial and some seed
- Flowers from May-July
- Can produce 6 billion seed/A
  - Short-lived and don't germinate well
- Taproots can reach 10 ft deep
  - Lateral roots can extend up to 10 ft per year
  - Shoots can grow from 1 in. root fragments

Steve Dewey, Utah State University, Bugwood.org

How can you tell the difference?

- Perennial pepperweed plants are taller
  - Hoary cress only roughly 3 ft tall
- Hoary cress lacks primary stalk
  - Pepperweed has primary stalk and branches at the top
- Hoary cress leaves clasp the stem

Photos by: Steve Dewey



www.cals.uidaho.edu

Hoary cress and p. pepperweed
Impacts

- Both are highly invasive due to creeping roots
  - Dense infestations can crowd out desirable plants
  - reduce animal diversity and wildlife habitats
- Foliage of hoary cress contains glucosinolates
  - Toxic to cattle
  - Decompose into allelopathic compounds
- P. pepperweed acts as a salt pump
  - Draws salt ions from deep within the soil and saturates top soil profile
  - Pushes out other native/desirable species

Hoary cress and p. pepperweed
Mgmt. Do's and Don'ts

- Prevention and healthy plant community are essential
- Mechanical removal must be consistent and remove as much root system as possible
- Herbicides are effective during periods of low carbohydrate root reserves
  - Early flowering or bud stage
- Targeted grazing with sheep and goats in the spring
- Tillage may be effective if persistent
  - 1-2 times per month for up to 4 years (remove root)
- Mowing can help prevent seed, but won't kill plant
- Fire is NOT effective

Common Teasel

Teasel (*Dipsacus fullonum*)

- Class B: Biennial to short-lived perennial

Photo by: Steve Dewey

Biennial/short-lived perennial

low growing rosette (1st year)

Base of leaves cupped to hold rainwater

Leaves appear wrinkled with light mid-vein

Bolting flower stems 1.5 – 6 ft tall

Leaves are increasingly prickly moving upward on stem

Cone-like flowers (purple or white) occur singly atop stems

Long prickly bracts form 'cage' around flower

800 seeds per flower/ 34,000 seeds per plant

Teasel
Reproduction and Spread

- Not known to have allelopathic properties
  - aggressively competitive
  - Open disturbed sites is an invitation for invasion
- Flowers from early summer to early fall
  - Flowers only live 1 day
- Prolific seed producer
  - 40,000 seeds per plant
  - Viable for 2 years

Steve Dewey, Utah State University, Bugwood.org

Steve Dewey, Utah State University, Bugwood.org

Common Teasel: Impacts

- Very aggressive
  - Will quickly invade areas of open soil with even slight disturbance
- Biennial life cycle allows for claiming space while it stores resources for reproduction.
  - Greater seed production = greater success

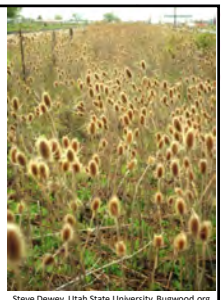
Steve Dewey, Utah State University, Bugwood.org

Ohio State Weed Lab, The Ohio State University, Bugwood.org

Common Teasel

Mgmt. dos and don'ts

- Early detection/rapid response
- Competitive stands of desirable plants can help prevent establishment
  - Reseeding areas with desirable natives
  - Cover crops
- Mow flowering stems prior to seed production
- Utilize improved grazing strategies to prevent excessive grazing
  - Give teasel competitive edge
- Herbicides are effective
- Implement monitoring and follow-up management for missed plants/seedlings



Steve Dewey, Utah State University, Bugwood.org

"We never should have waited this long ... Now the weeds have *completely* taken over."

Dr. Leslie Beck
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