Brush and Weeds Management

Improving plant community composition

By

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NMSU Brush and Weed Specialist

Why do people hate weeds?

Why do people hate weeds?

- Weeds are
  - Fast growing
  - Hard to kill
  - Expensive
  - Time consuming
- Weeds reduce
  - Forage for animals
  - Wildlife habitat
  - Degrade the land (erosion)

Potential Extent of Invasion

- Many weeds have not reached full extent possible
- Prevention
  - Most effective
  - Cheapest

How do we prevent weed invasion?

Exotic Invasive Plant Dispersal

- Before exotic plants can invade
  - They have to travel to a new area
    - Seeds or meristematic tissue (resprout)
- Methods of weed dispersal
  - Animals
  - Equipment
  - Erosion
  - Hay
  - Manure
  - People
  - Water
  - Wind

General Prevention Tactics

- Don’t transport weed seeds
  - From infested areas to uninfested areas
  - Clean all equipment and clothing after working in infested areas
- Early detection and treatment
  - Treating weeds early in the invasion process is
    - Easier and more effective
    - Cheaper and faster

Weeds Already Here?
Methods of weed control

- Important considerations
  - Cost, labor, time required, equipment available, weather, plant community response
  - How much area do you need to treat?
  - Vegetation and soil disturbance can
    - Increase water and soil nutrient availability
    - If weeds dominate and desirable plants are lacking
      - Weed control may increase resource availability for another invasive weed

Control Methods

- Hand
  - Small areas
  - Slow process

    or
  - Pay several workers

Control Methods

Cut

Control Methods

- Biological

jornada.nmsu.edu

Control Methods

Mechanical

yubanet.com

Control Methods

Fire

Control Methods

- Cultural Practices
  - Class of livestock
  - Season of use
  - Rest-rotation grazing patterns
  - Crop selection&rotation

Control Methods

- Herbicides
  - Granules
  - Liquid

Herbicide Application – Shrubs & Trees

- Hard to kill perennials with resprouting roots
  - Foliar – spray when full and vigorously growing foliage
  - Basal, hack-and-sqiurt, or cut stump – time varies by herbicide (see label)
  - Soil applied
  - Often require: broad spectrum herbicides that injure or kill many plant species

www.thesanguineroot.com

greenshootsnews.wordpress.com

Forestry - About.com

Important

- Spot versus broadcast application
  - Selective vs broad spectrum
  - Soil active vs inactive
- Adjuvants/surfactants/wetting agents
  - Necessary for hard to kill plants with thick cuticles are lots of hairs
- Time is required for the plants to
  - Uptake the herbicide
  - Translocate the herbicide through the extensive root system
- Heavy clay soils can reduce effectiveness of soil applied herbicides

Key Points to Weed Control with Herbicides

- Always read and follow herbicide label

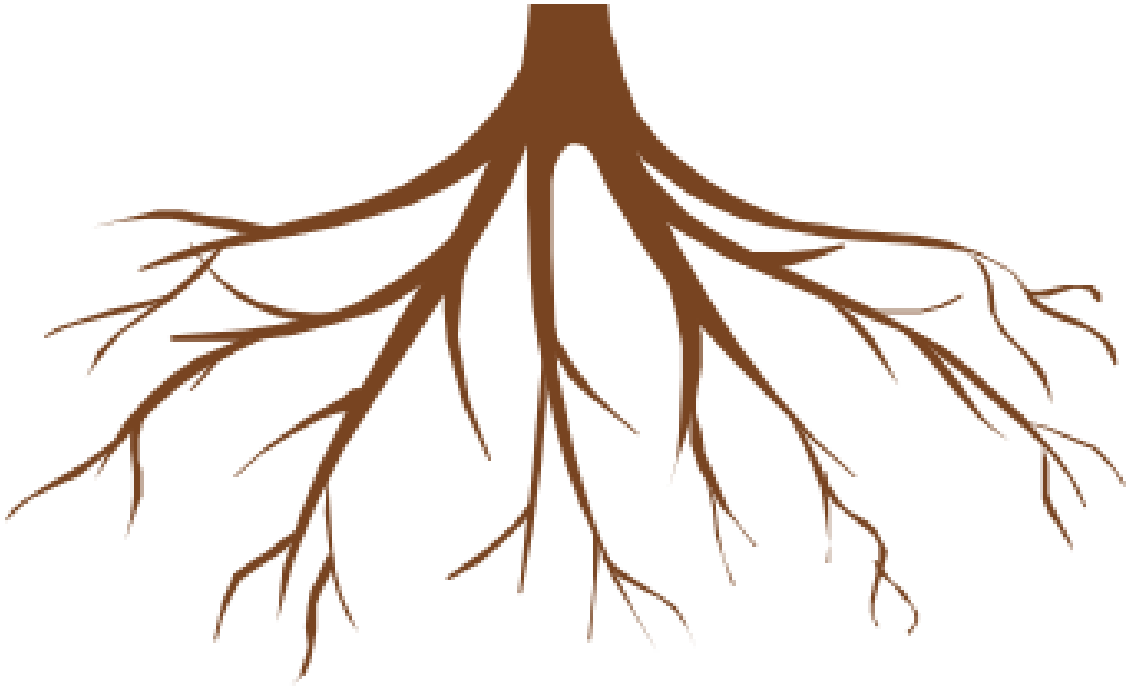
- What is the first step to controlling a bad weed with herbicide?

Key Points to Weed Control with Herbicides How do you tackle a bad weed?

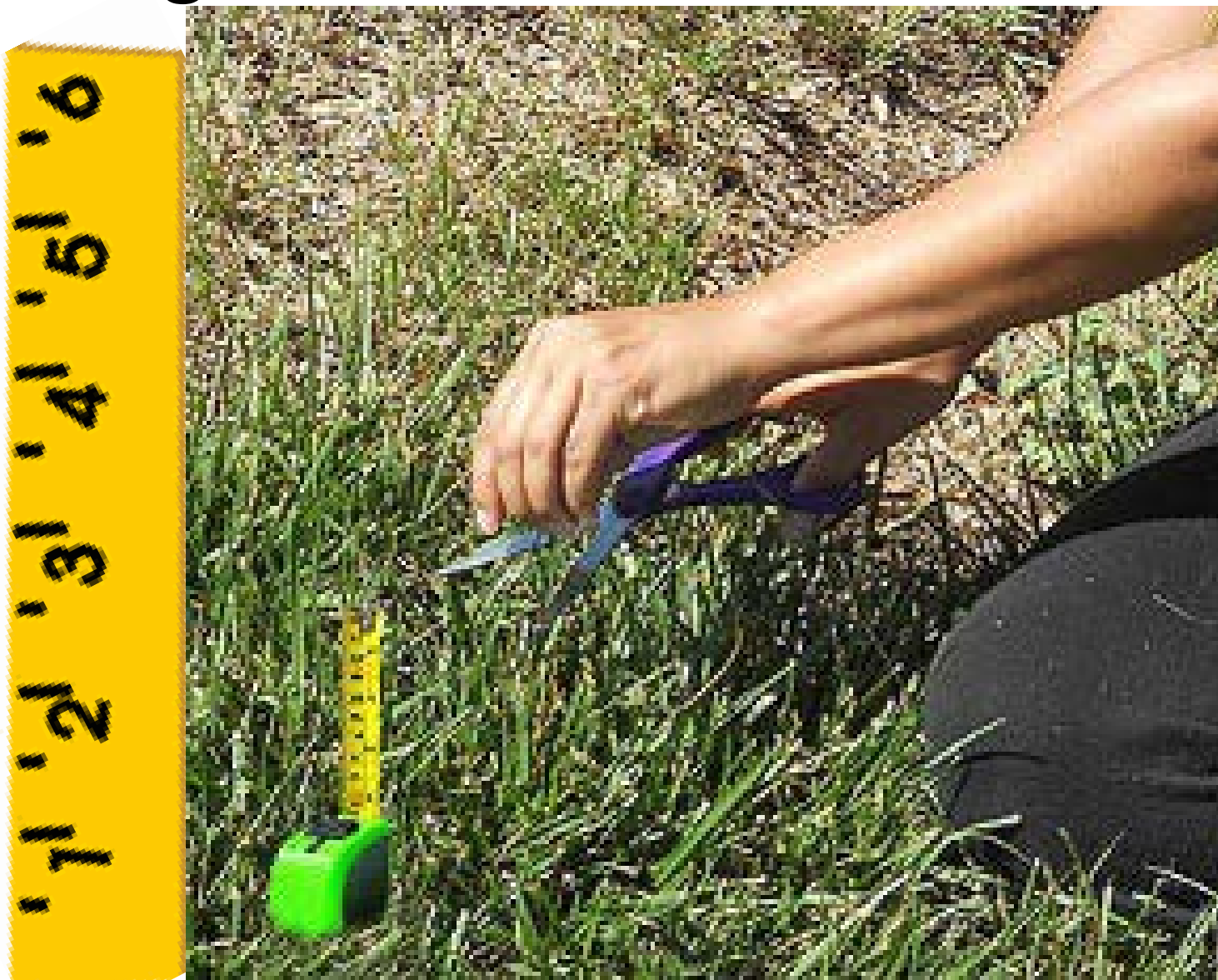
- Identify the weed
- Select herbicide labeled for the
  - Weed
  - Setting
- Apply herbicide at the correct rate and time
  - Stage of plant development
  - Plant condition
    - Not stressed by drought, disease, insects, extreme cold or hot temperatures
  - Weather
    - Long term – average to wet year (not drought)
    - Immediate – little wind, moderate temperatures, no rain

Key Points to Weed Control with Herbicides

- Timing with foliar herbicides
  - Annuals
    - Between emergence and flowering
  - Biennials
    - Rosette stage
  - Perennials
    - When nutrients moving from leaves to roots
- Timing with soil applied herbicides
  - Less critical
  - Optimal, just before warm, rainy season

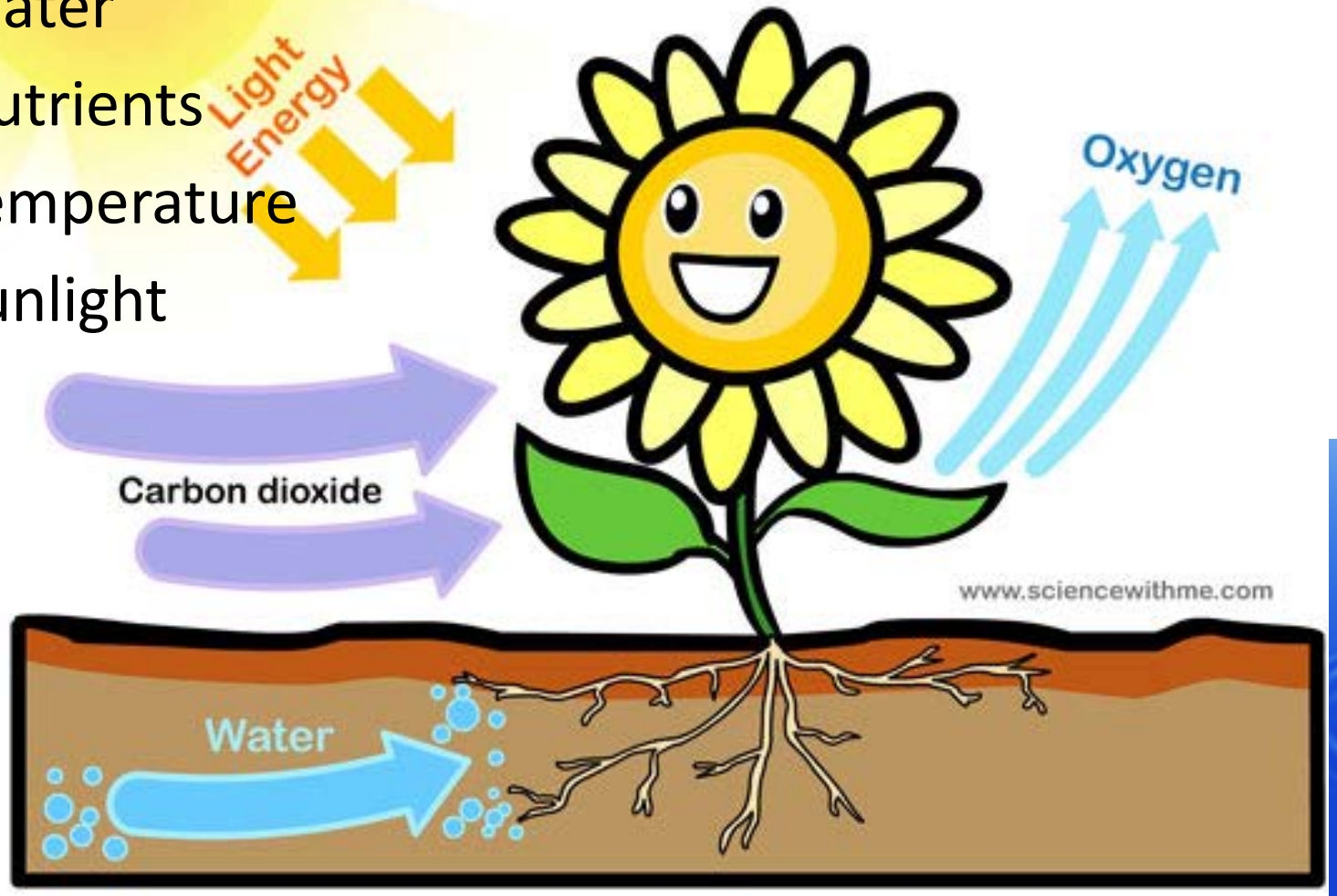


What most limits plant growth?



What most limits plant growth?

- Water
- Nutrients
- Temperature
- Sunlight



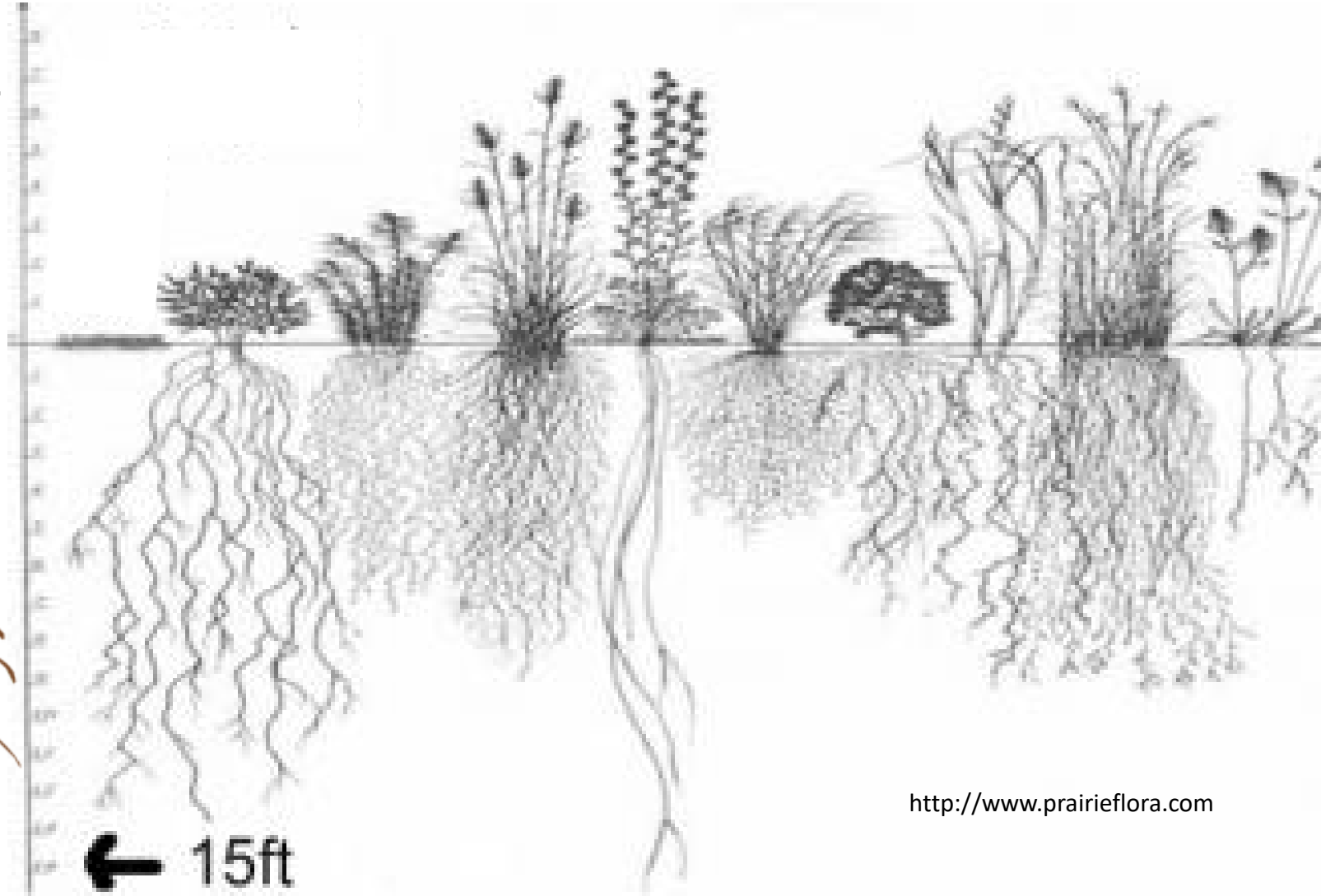
Why are weeds (invasive plants) so successful

Why are weeds (invasive plants) so successful Resource Paradigm

- <u>Weeds use resources in time or space not used by desirable plants</u>
  - Earlier in the spring
    - During cooler temperatures

Why are weeds (invasive plants) so successful Resource Paradigm

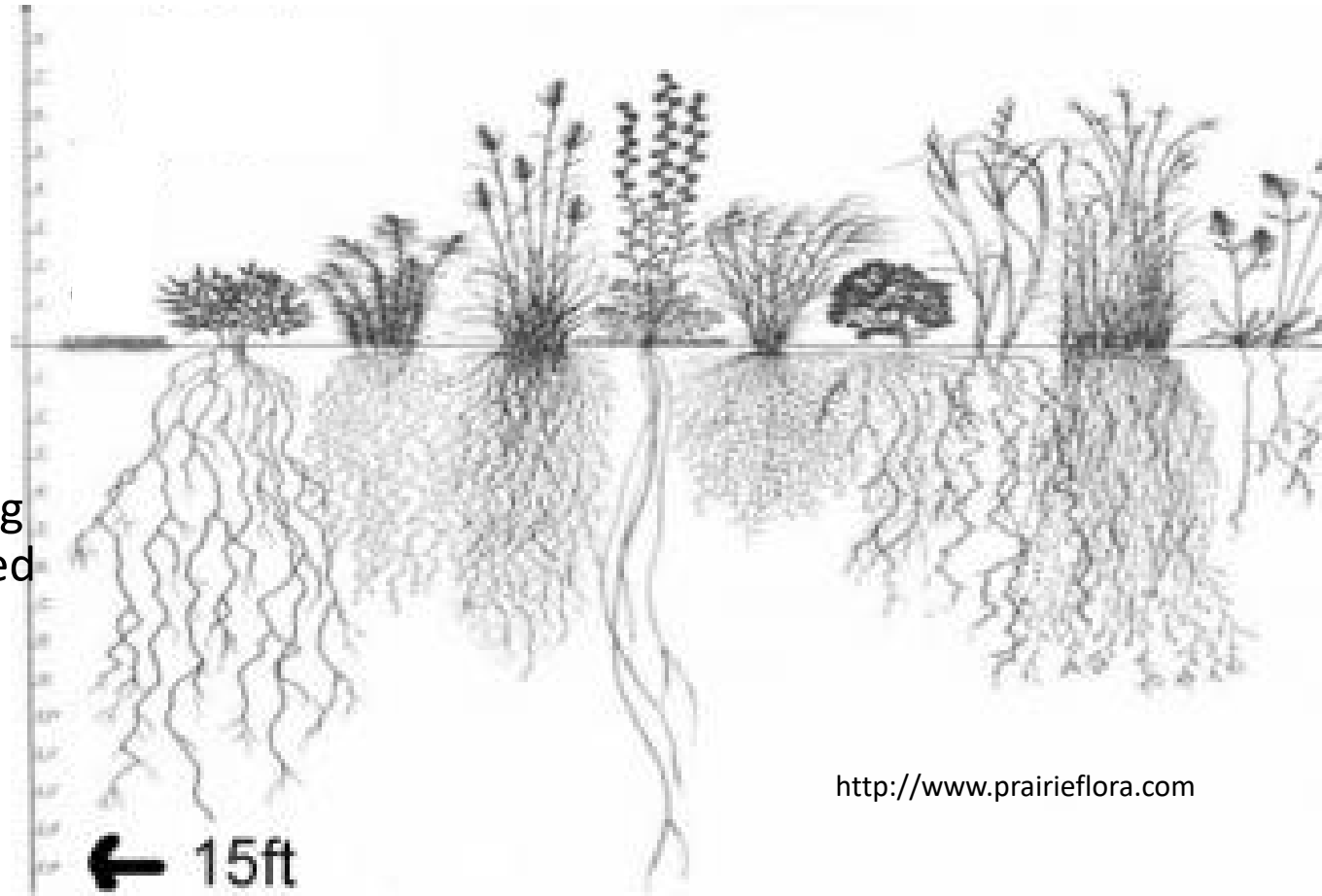
- <u>Weeds use resources in time or space not used by desirable plants</u>
  - Deeper roots
    - Where soil moisture remains



http://www.prairieflora.com

So, how do we put this information to use?

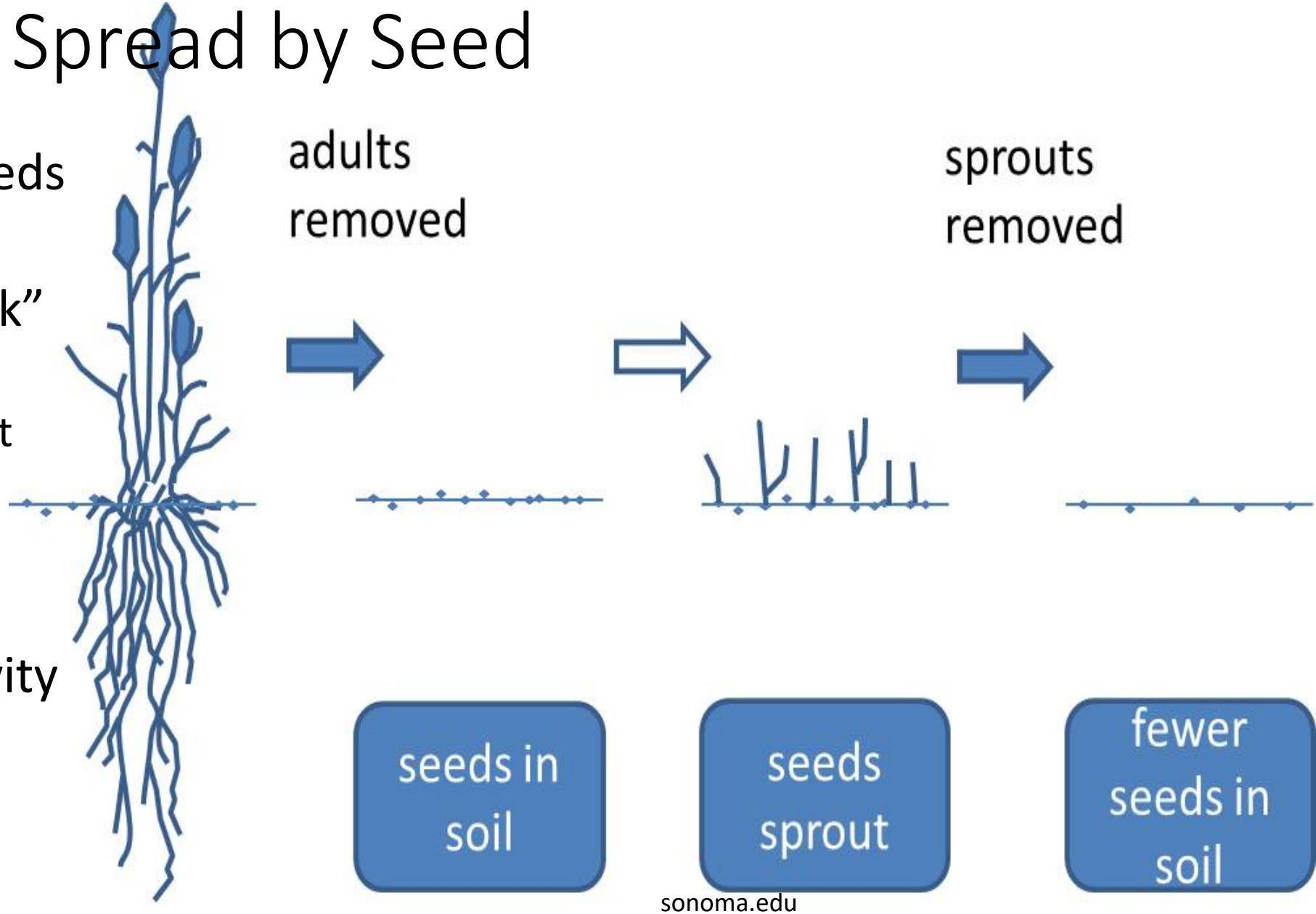
- To manage weeds
  - Manage resource availability (water, N, etc…)
  - Minimize soil disturbance
  - Vigor of desired plants
    - Leave sufficient photosynthetic tissue (energy production)
  - Plant diversity
    - Desired plants using resource during more time and space than weakened



http://www.prairieflora.com

Weeds that Spread by Seed

- Control before weeds produce seed
- Deplete “seed bank” through
  - Years of consistent treatment
  - Monitoring
  - Re-treatment
- Viable seed longevity



What are some of the costs of not controlling invasive brush and weeds?

What are some of the costs of not controlling invasive brush and weeds?

- Reduced
  - Wildlife habitat
  - Forage production
  - Aesthetics
- Increased
  - Control costs
  - Erosion
  - Fire danger
  - Repair time

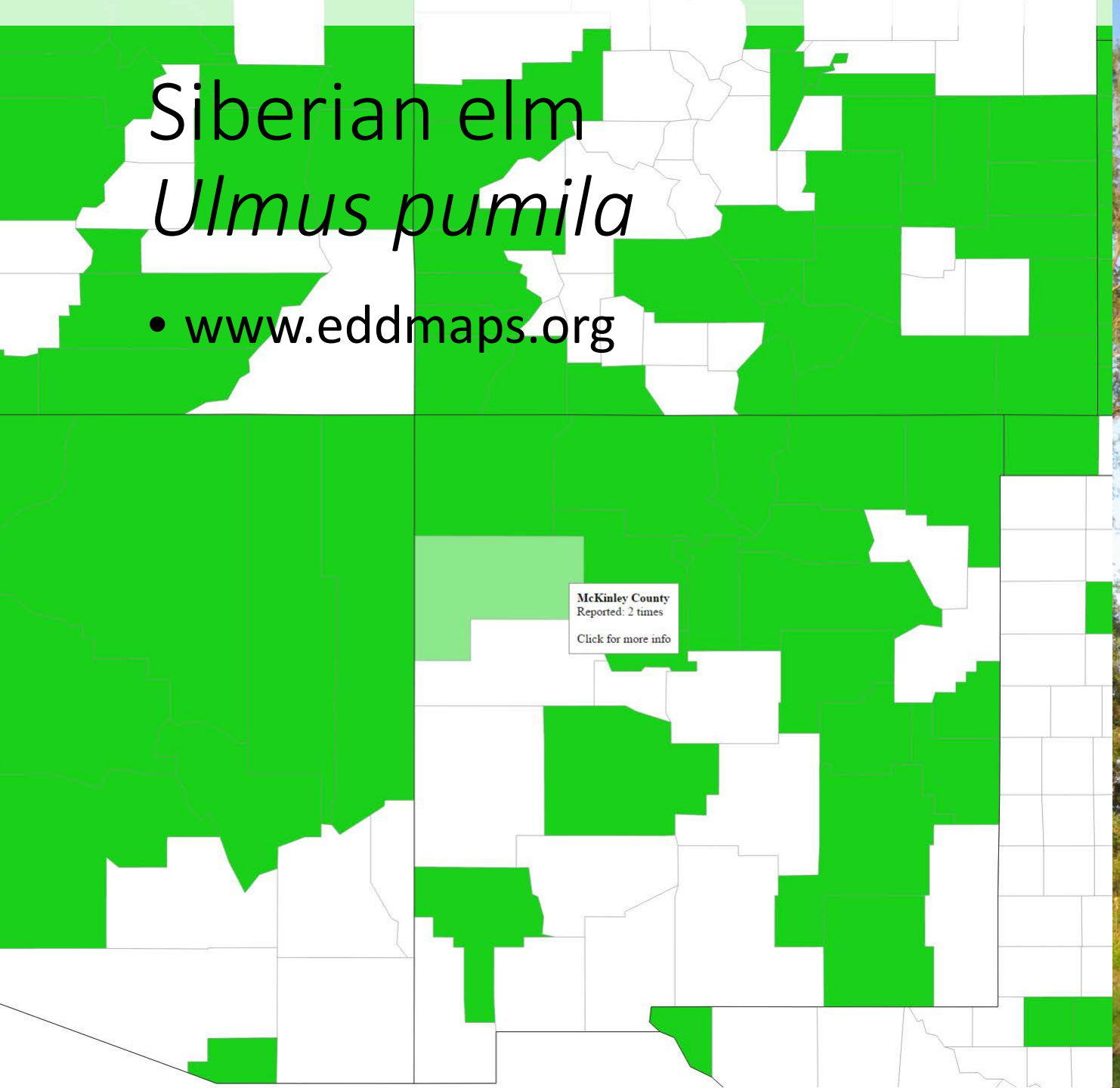
Costs of doing nothing
Dangers of Not Controlling Juniper Trees

- Mature woodlands
  - Fire resistant
  - Depleted understory vegetation
- Burn
  - >35% juniper canopy cover
  - Dry, hot weather
  - Extreme crown fire

Controlling Weeds Once They have Arrived

Siberian elm
Ulmus pumila

- www.eddmaps.org



Siberian Elm (*Ulmus pumila*)

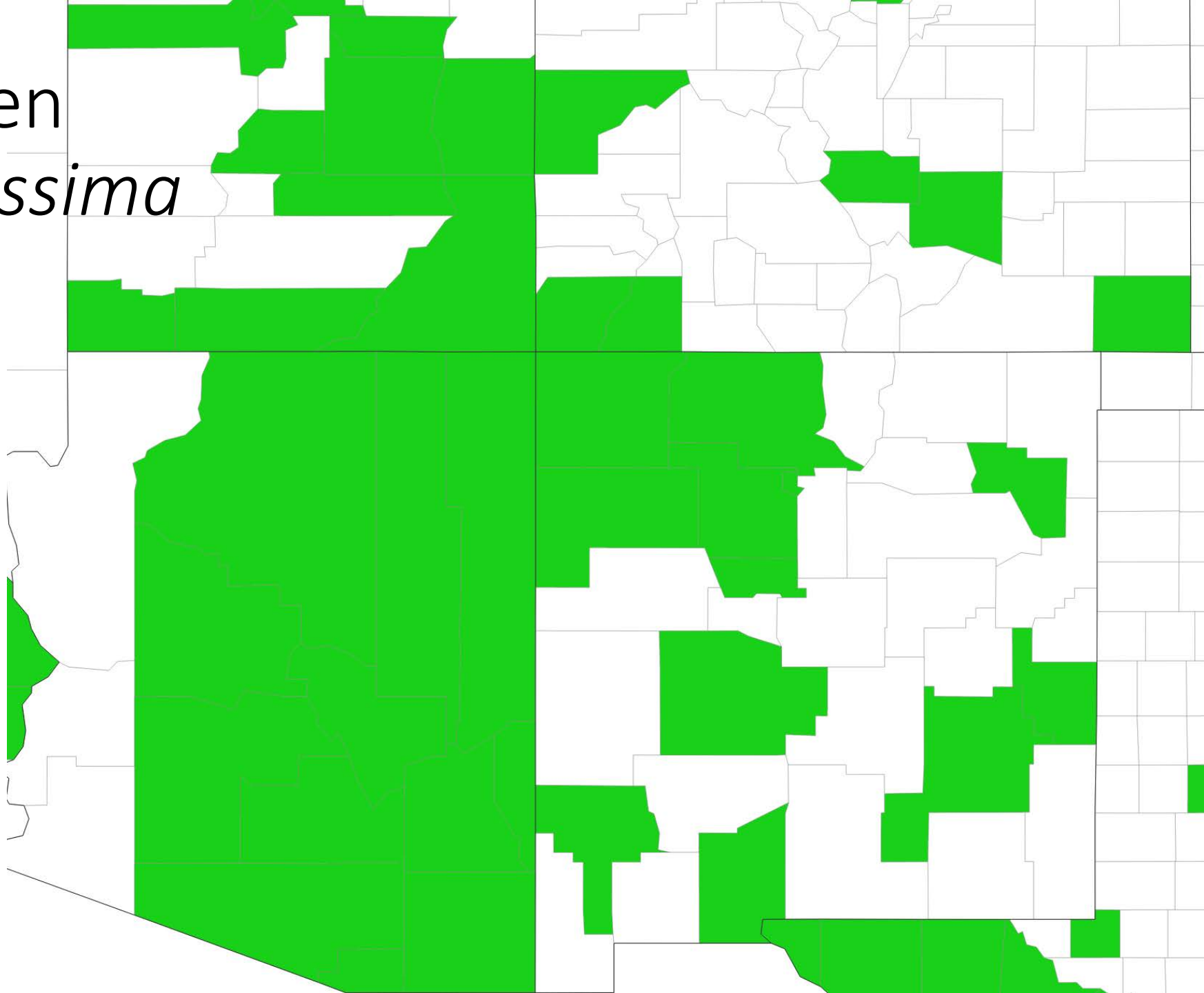
- Non-native, perennial tree
- Trunk: rough, grey to brown
- Leaves: deciduous, alternate; serrate to entire margins
- Reproduction: seed
- Root: resprouter
- Flowers: green without petals

Siberian Elm Herbicide Control

- Triclopyr
- Glyphosate
- Imazapyr
- Aminocyclopyrachlor + imazapyr + metsulfuron methyl
- Timing
  - Summer – early fall
  - Active growth
  - Fully leafed before fall color change

Tree-of-heaven
Ailanthus altissima

- www.eddmaps.org



L.R. Landrum www.swbiodiversity.org

Tree of Heaven (*Ailanthus altissima*)

- Deciduous tree, <65 ft tall
- Bark
  - From smooth gray/brown to diamond shaped fissures
- Leaves
  - Pinnately arranged
  - 10-22 pairs of opposite leaflets (3-5 in long)
  - Mostly smooth margins
    - 2-4 rounded teeth at base
    - Small, circular glands on leaf backs
    - Skunky odor

Ashigh, Wanstall, Sholedice. 2010. Troublesome Weeds of NM

Forest Service. 2014. Field guide for managing tree-of-heaven in the SW

Friends of Belfast Botanic Gardens httpwww.fobbg.co.uk

L.R. Landrum www.swbiodiversity.org

Tree of Heaven (*Ailanthus altissima*)

- **Flowers**
  - Small, green/yellow – to – white
  - 5 petals
- **Seed pods**
  - 1-2 in long, 0.5 in wide
  - Flat
  - Constricted around seed
  - Yellow to red/brown
  - Develop in bunches
- **Roots**
  - Deep and shallow
- **Reproduction**
  - Root crown
  - Lateral roots
  - Seed
- **Roots have to be killed or removed**

Ashigh, Wanstall, Sholedice. 2010. Troublesome Weeds of NM

projects.ncsu.edu S.J. Baskauf

L.R. Landrum www.swbiodiversity.org

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Tree of Heaven (*Ailanthus altissima*)

- **Exotic**
- **Dioecious**
  - **Separate female and male**
- **Rapid growth of young sprouts**
  - **As much as 10-15 feet / year**

Ashigh, Wanstall, Sholedice. 2010. Troublesome Weeds of NM

projects.ncsu.edu S.J. Baskauf

L.R. Landrum www.swbiodiversity.org

Tree of Heaven Herbicide Control

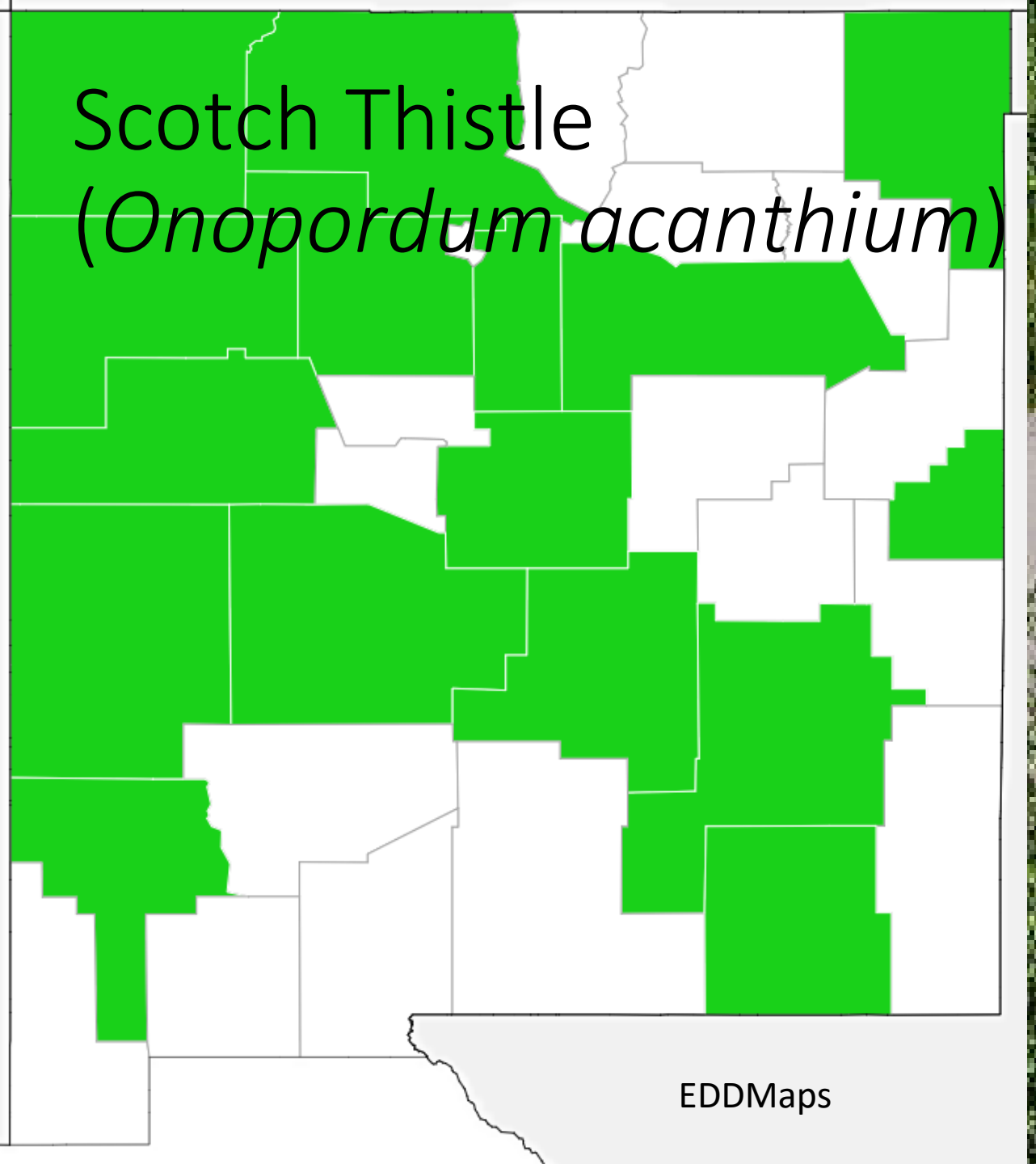
- Foliage
  - Saplings
  - Glyphosate
  - Triclopyr
- Basal
  - Less than 8 in trunk diameter
  - Triclopyr
  - Picloram
  - Imazapyr
- Cut stump
  - Apply within 5 minutes of cutting
  - Triclopyr
  - Imazapyr
- Injection or hack-and-squirt
  - Triclopyr

Thistle Seed Heads

bull Canada musk plumeless Scotch wavy leaf

Stevens County Noxious Weed Control Board

Scotch Thistle (*Onopordum acanthium*)



Scotch Thistle (*Onopordum acanthium*)

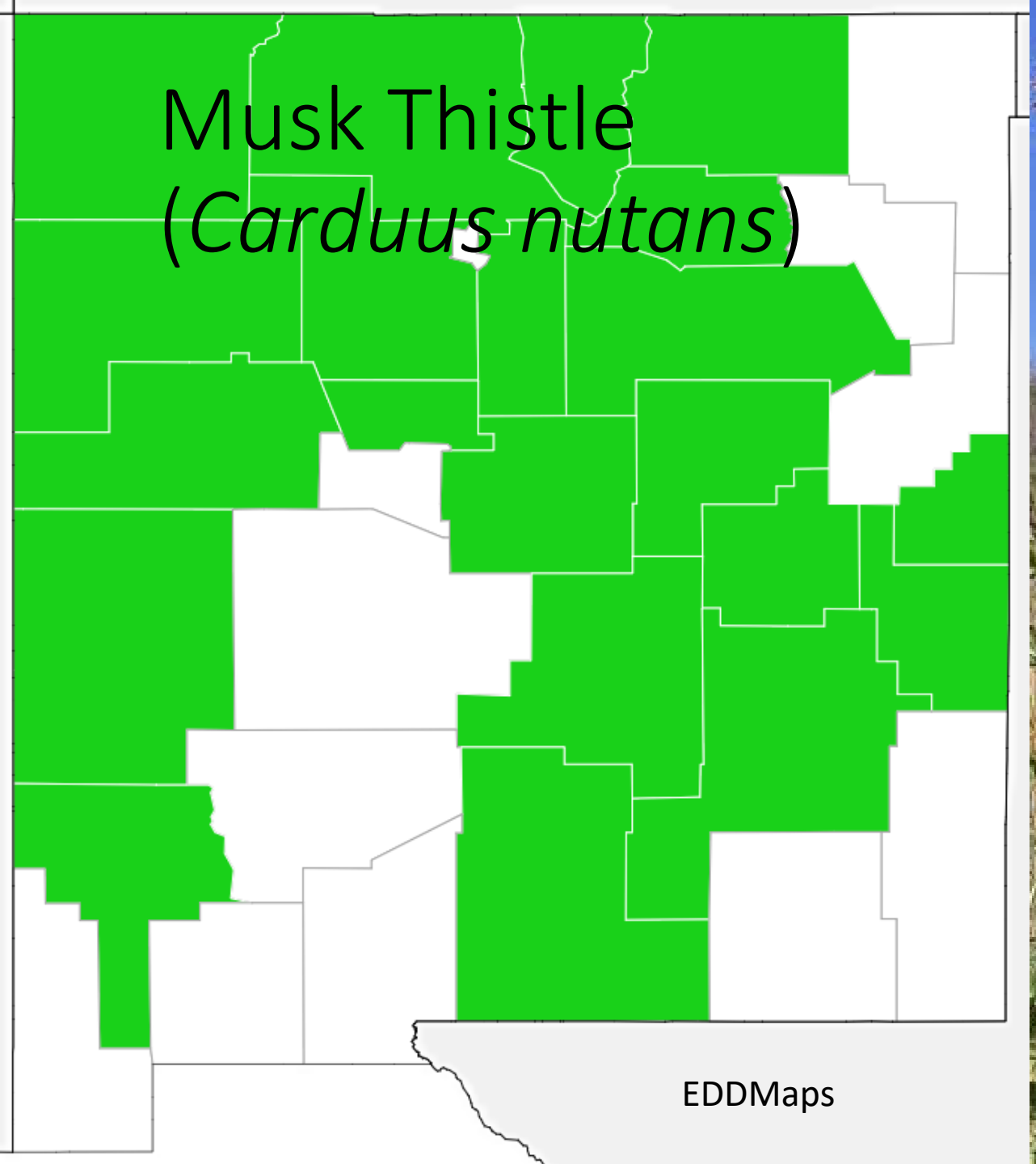
nwcb.wa.gov

swbiodiversity.org

- Non-native, biennial forb
- Form: rosette and bolt, very tall when sufficient soil moisture
- Stems: spiny wings
- Flowers: pink-lavendar
- Leaves: large with yellow spines, wooly hairs, gray-green appearance
- Reproduction: Seed, mottle brown to blackish with pink-red pappas
- Seeds: smooth, slender, plumed

en.wikipedia.org

Musk Thistle (*Carduus nutans*)

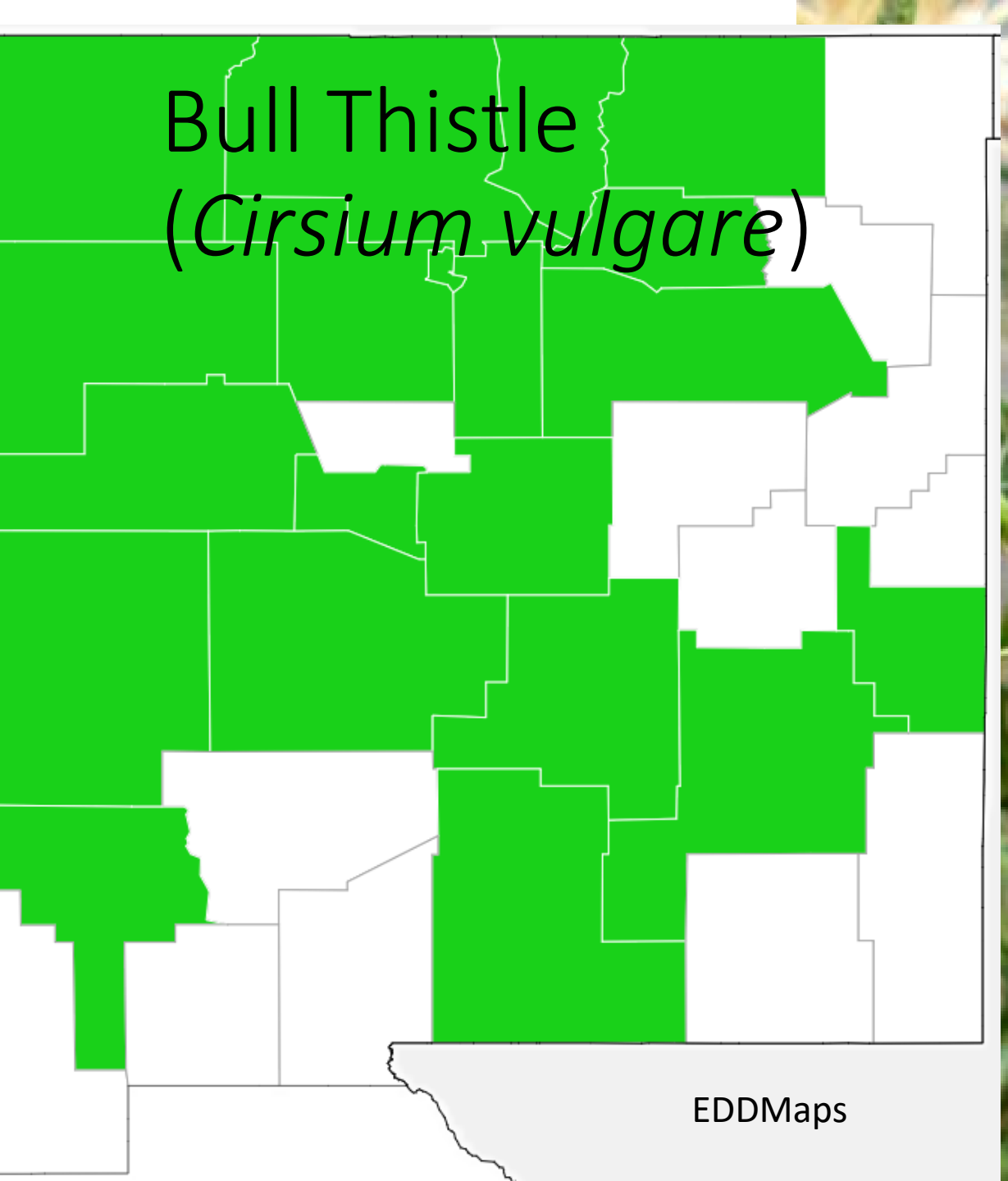


Musk thistle (*Carduus nutans*)

- Non-native, biennial forb
- 2-6 feet tall
- Stems: hairy, narrow wings formed by leaf bases
- Leaves: 4-15 in long, dark green with light green center
  - Deeply lobed, spiny margins
- Flower heads: 1.5-3 in diameter
  - Bracts are usually lanceolate
- Flowers: usually pink-purple
- Roots: taproot
- Reproduction: seed

www.idahoweedawareness.net

Bull Thistle (*Cirsium vulgare*)

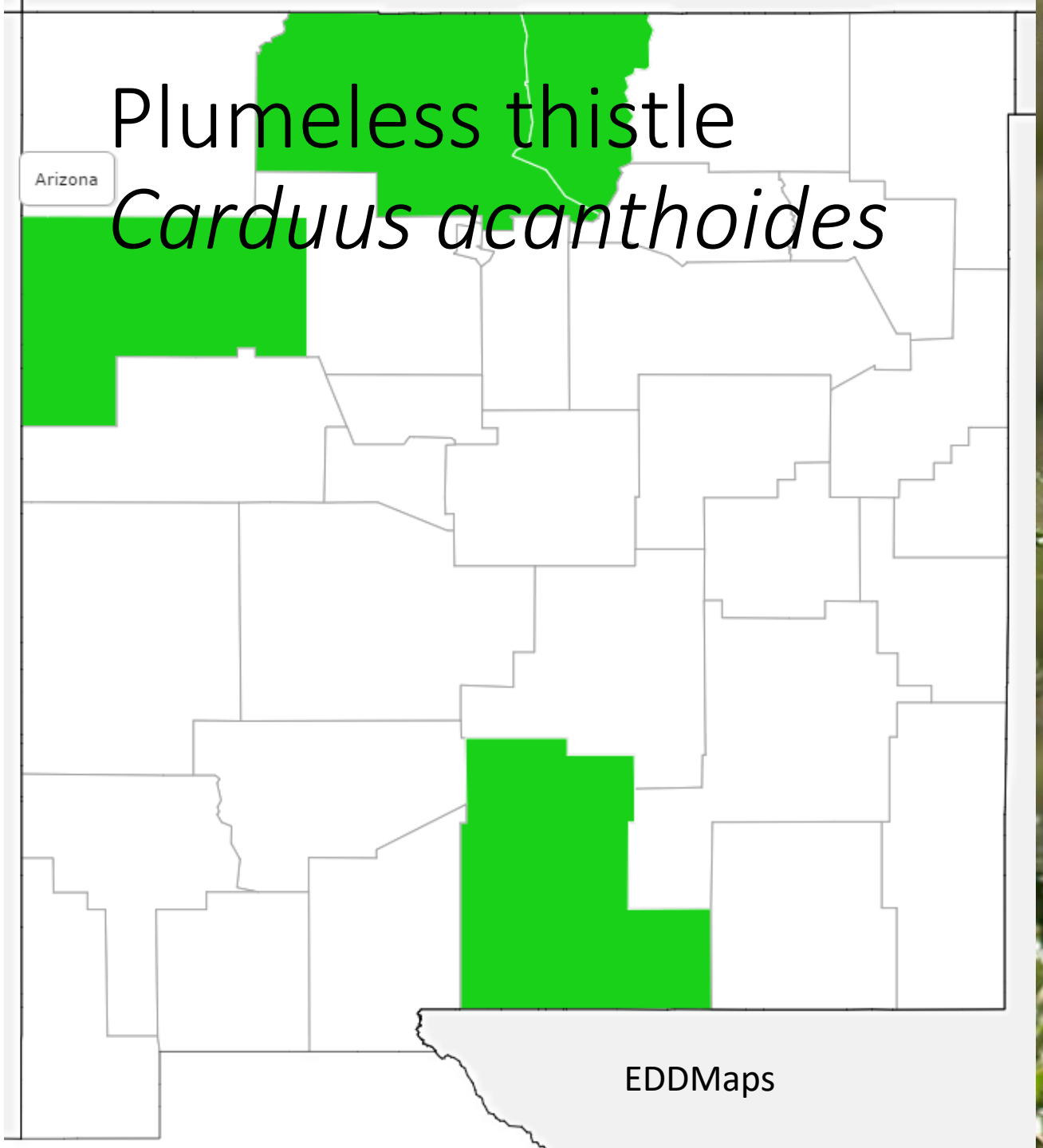


en.wikipedia.org

Bull Thistle (*Cirsium vulgare*)

- Non-native, biennial forb
- Stems: hairy with purple veins, prickly wings
- Leaves: leathery, deeply lobed,
  - Topside has prickly hairs
  - Underside is wooly with yellowish spines
- Flowers: purple
- Reproduction: seed
- Roots: tap

Plumeless thistle
Carduus acanthoides



Plumeless thistle
Carduus acanthoides

- Biennial
- Height:
  - Potentially >6 feet
- Fruit:
  - Achene
- Disturbed areas
- Poor competitor in vigorous desired vegetation

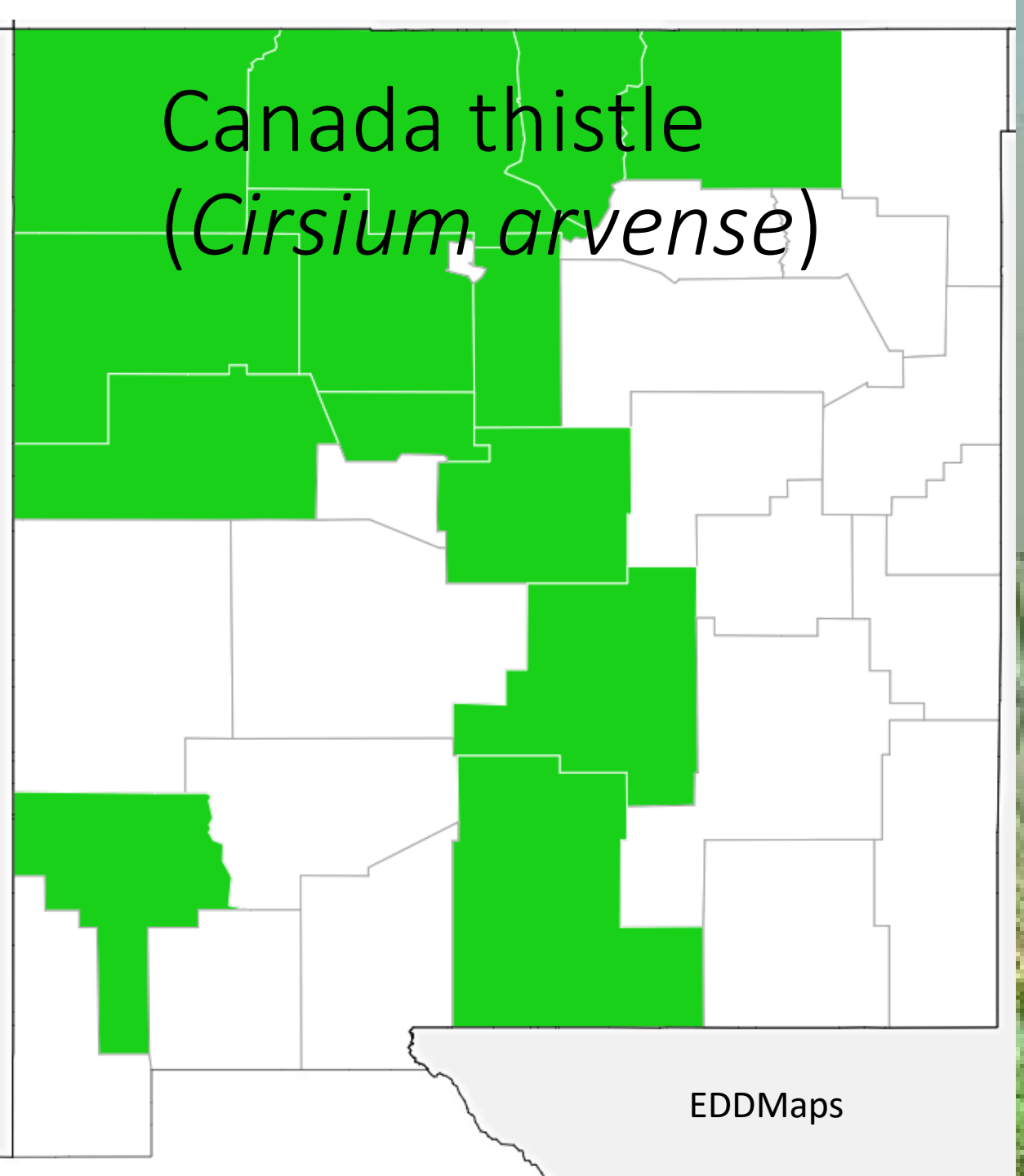
Bull Thistle and Musk Thistle Control

- **Digging if cut below root crown**
- **Fire creates conditions for musk growth**
- **Aminopyralid**
  - **Fall or spring**
  - **Rosette or bolting**
- **Clopyralid**
  - **Fall or spring in rosette stage**
- **Imazapic**
  - **Fall or spring in rosette stage**
- **Picloram**
  - **Fall or spring**
  - **Rosette or bolting**

www.ediblewildfood.com

ndweeds.homestead.com

Canada thistle (*Cirsium arvense*)



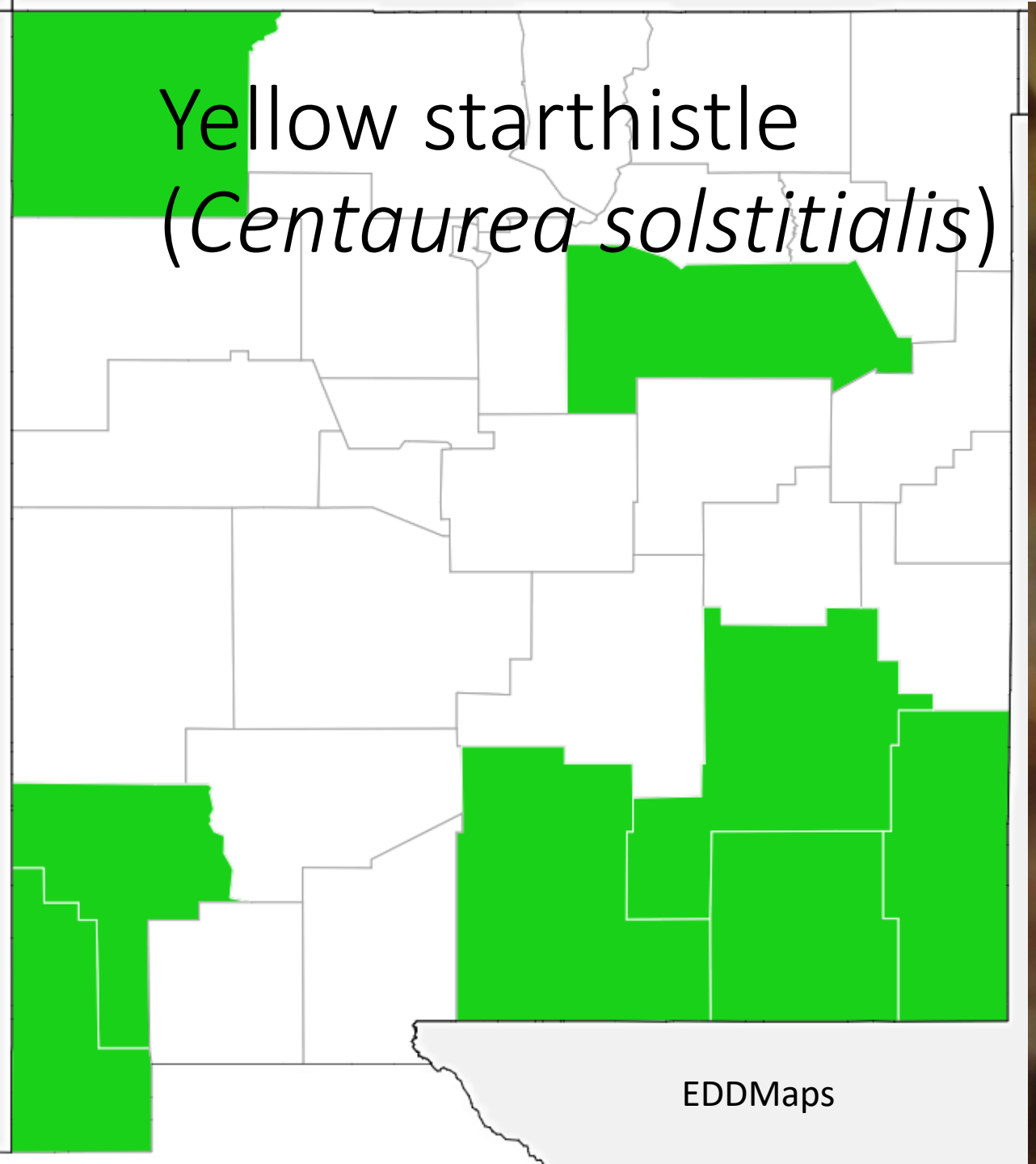
Canada thistle (*Cirsium arvense*)

- Non-native, perennial, 18-48 in tall
- Stems: have ridges, not wings
- Flowers: pink-purple
- Reproduction: seed and spreading roots
  - Resprout
- Leaves: green, lance shaped, deeply lobed
  - Alternative, spiny toothed margins
  - Upper surface: waxy
  - Lower surface: sparsely wooly
- Dioecious Plants
  - Female and male plants separate
- Roots: deep and extensive (15 feet distant)
- New shoots emerge whenever conditions are good

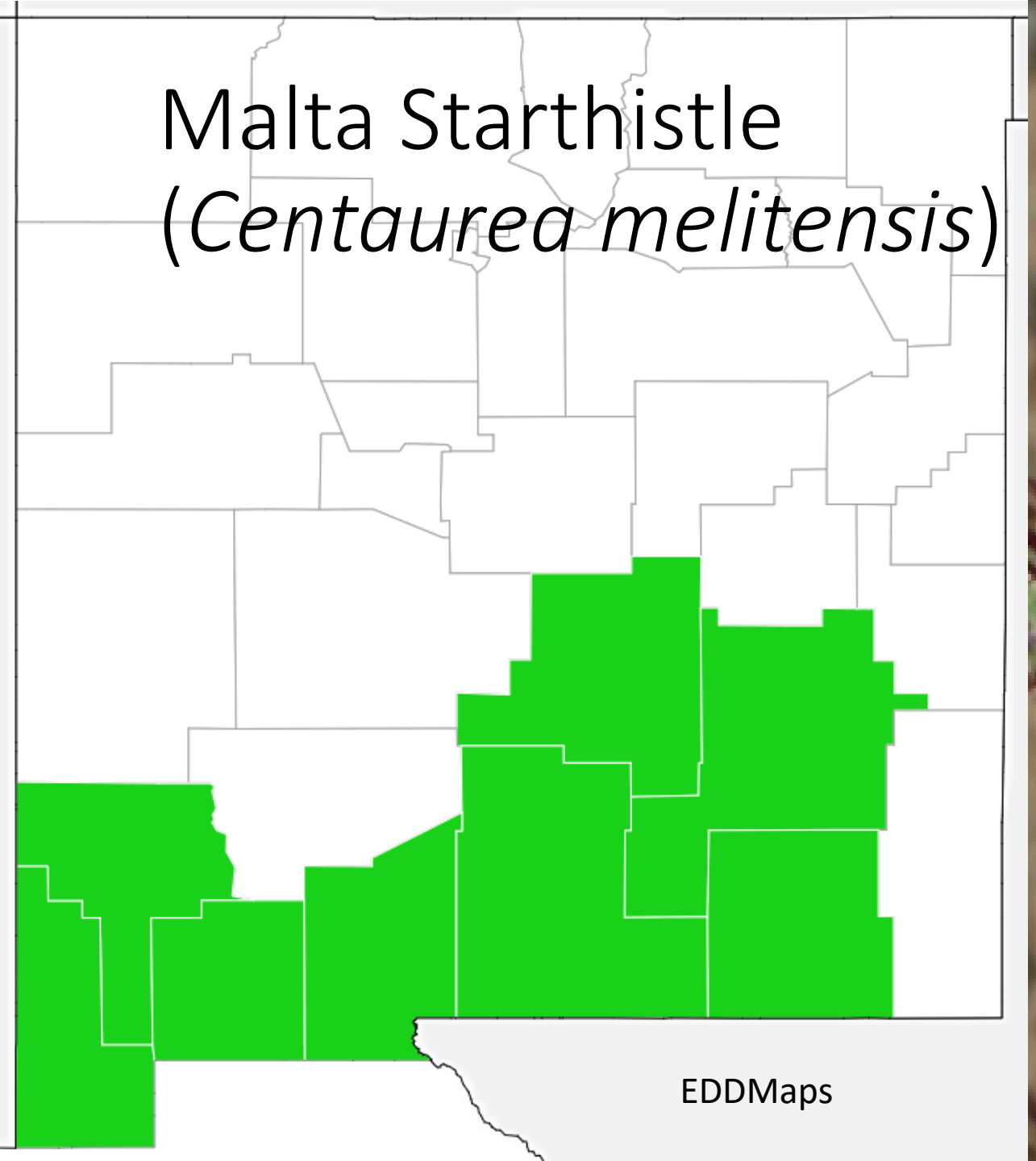
Canada thistle (*Cirsium arvense*)

- Aminopyralid
  - Fall: after flowering but before dormancy
  - Spring: vegetative to early-bud stage
- Clopyralid
  - Rosette to bud stage
- Picloram
  - Best in fall just after bloom, other times also work
- Dicamba
  - Fall: after bloom but before dormancy

Yellow starthistle (*Centaurea solstitialis*)



Malta Starthistle (*Centaurea melitensis*)



Malta Starthistle (*Centaurea melitensis*)

Plants.usda.gov

Invasive.org

- Non-native, annual or biennial forb
- Stems: have wings
- Flowers: yellow with purple or brown bracts
- Leaves: initially green but may age to bluish-green, cobwebby hairs
- Reproduction: seed
- Spines:
  - Unpalatable but may cause neurological disorder in horses

Neal Kramer

Starthistle Control

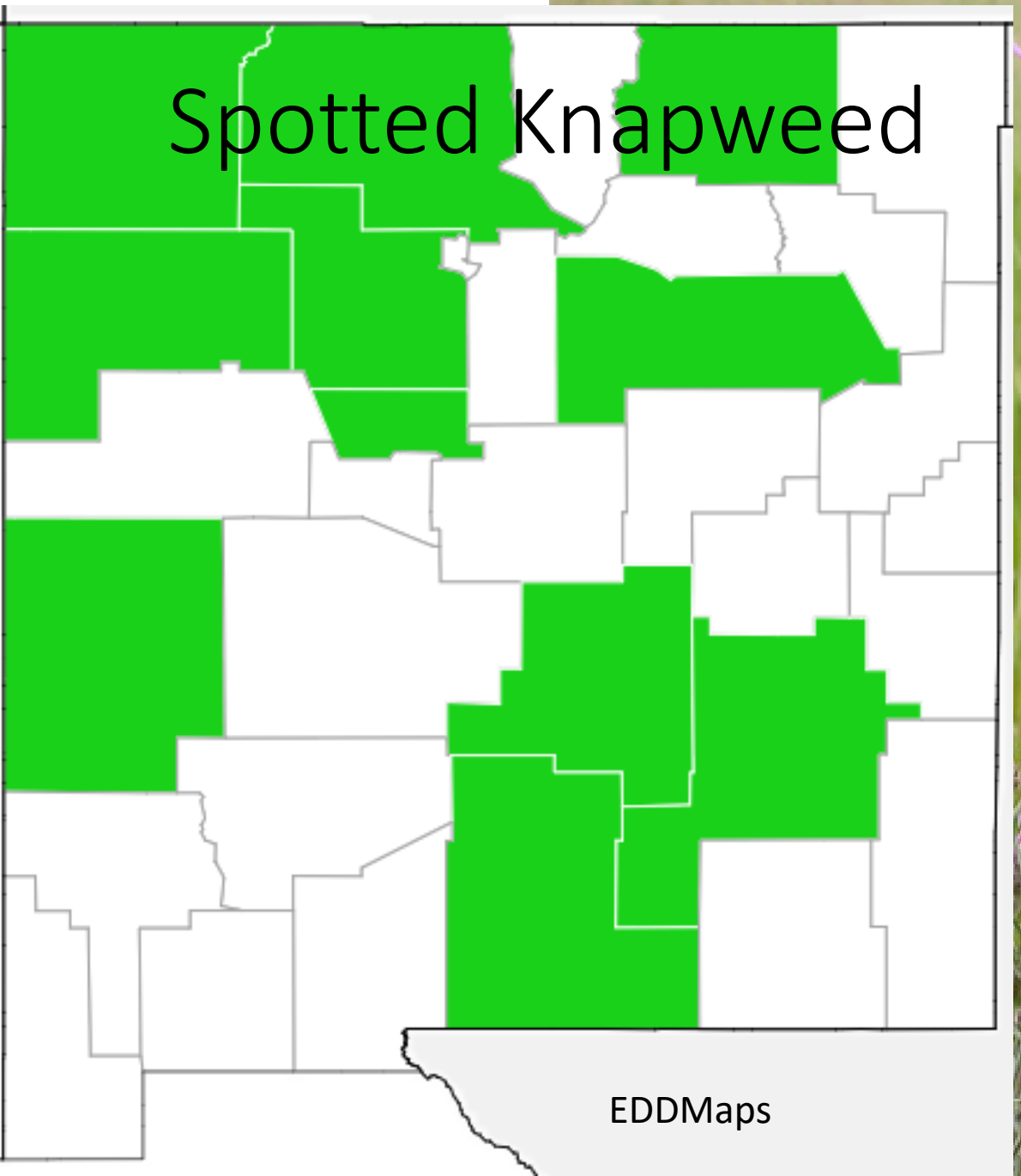
- **Metsulfuron**
  - **Seedling to early bud**
- **Triclopyr**
  - **Spring to early bud**
- **Imazapyr**
  - **Spring to early bud**
- **Dicamba**
  - **Spring to early bud**

Barry Rice swbiodiversity.org

Jillian Cowles swbiodiversity.org

SPOTTED KNAPWEED	DIFFUSE KNAPWEED	RUSSIAN KNAPWEED
Short-lived perennial or biennial; tap-root	Short-lived perennial or biennial; tap-root	Perennial with black, spreading roots that form new shoots
Black-tipped bracts	Spiny or "crab-like" bracts tips	Rounded bracts with transparent tips
Pink flowers, rarely cream colored	White to rose, or sometimes purple	Pink to lavender flowers

Spotted Knapweed

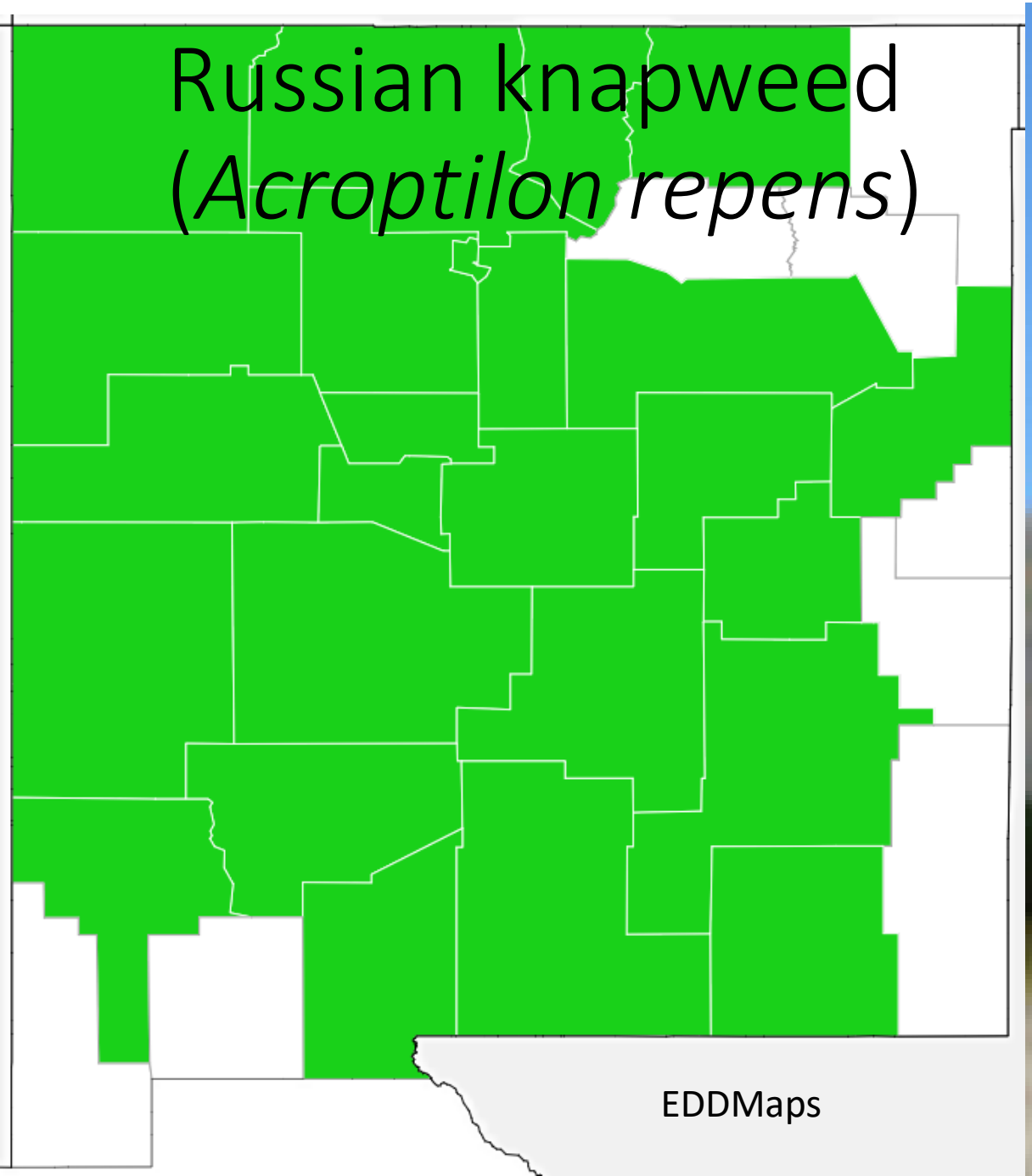


Spotted knapweed (*Centaurea biebersteinii*)

- Non-native, biennial to short-lived perennial
  - 4 feet tall
- Seed heads:
  - Bracts are black tipped
  - Bract fringes are shorter than the bracts are wide
- Stems: numerous, branching
- Leaves: 4-8 in long, alternating, gray hairs
- Lower leaves: deeply lobed
- Upper leaves: deeply divided, narrow, entire leaflets, do not form wings on stems
- Flowers: pink-purple - white
- Reproduction: seed production

mtweed.org

Russian knapweed (*Acroptilon repens*)



blackrockdesert.org

Russian knapweed (*Acroptilon repens*)

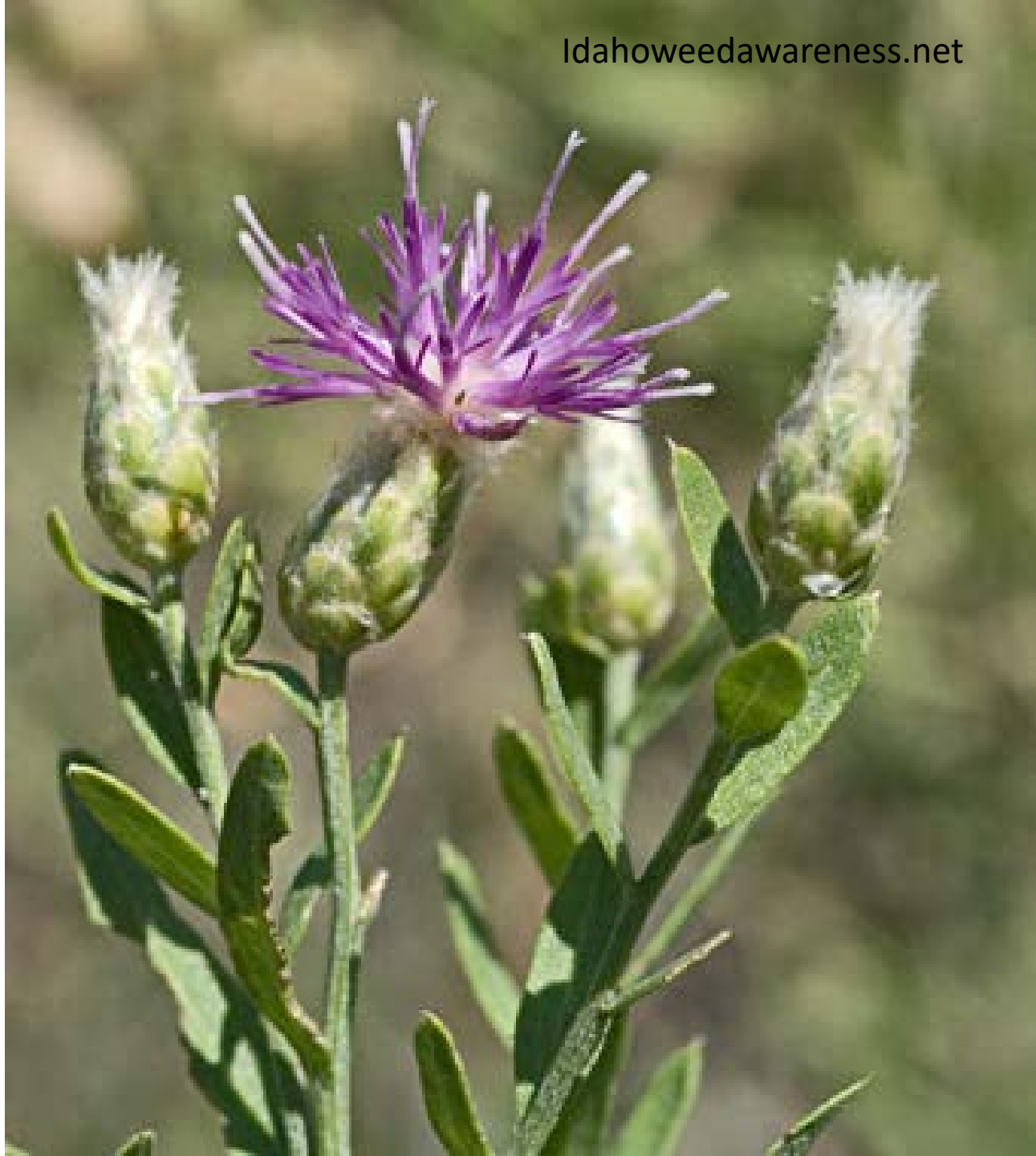
- Non-native perennial, 1-3 feet tall
- Seed heads: bracts rounded, transparent tips
- Stems: numerous, branching
- Lower leaves
  - 1.5-4 in long
  - Alternating
  - Lobed – wavy margins
  - Do not form wings on stems
  - Dense gray hairs
- Flowers: lavender, pink - white
- Reproduction: seed and creeping, resprouting roots

blackrockdesert.org

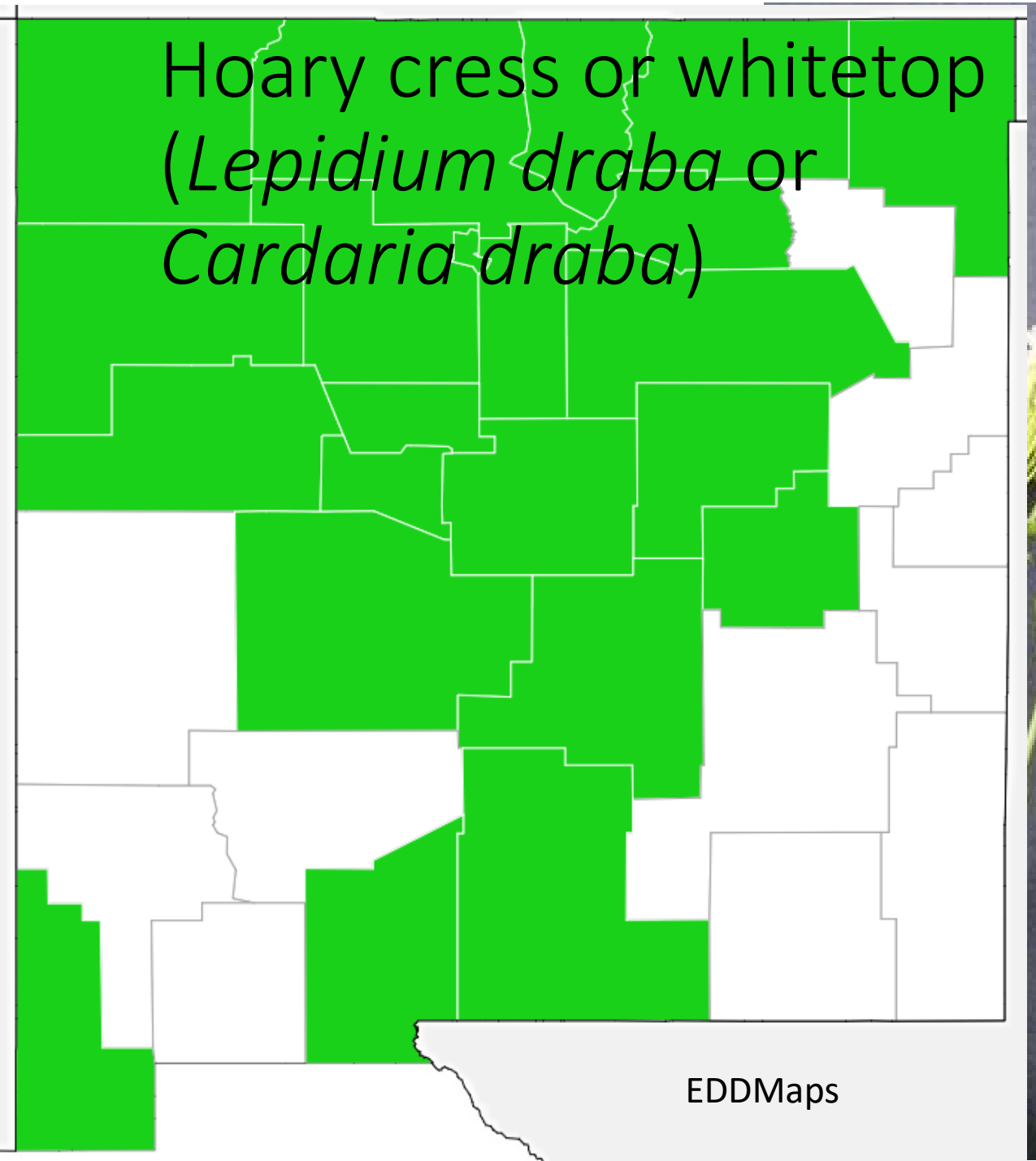
extension.colostate.edu

Knapweed Control

- Picloram
  - Timing
    - Spotted & Diffuse – Rosette to mid-bolting
    - Russian – Early Flower to frost
- Clopyralid + 2,4-D
  - Timing
    - Spotted & Diffuse – Rosette before bolting
    - Russian – Full bloom to frost
- Aminopyralid + metsulfuron
  - Timing
    - Spotted & Diffuse – Spring or fall
    - Russian – Spring or fall
- Imazapic
  - Timing
    - Russian - Fall and Winter
- Other herbicides



Hoary cress or whitetop (*Lepidium draba* or *Cardaria draba*)



Hoary cress
Lepidium draba or *Cardaria draba*

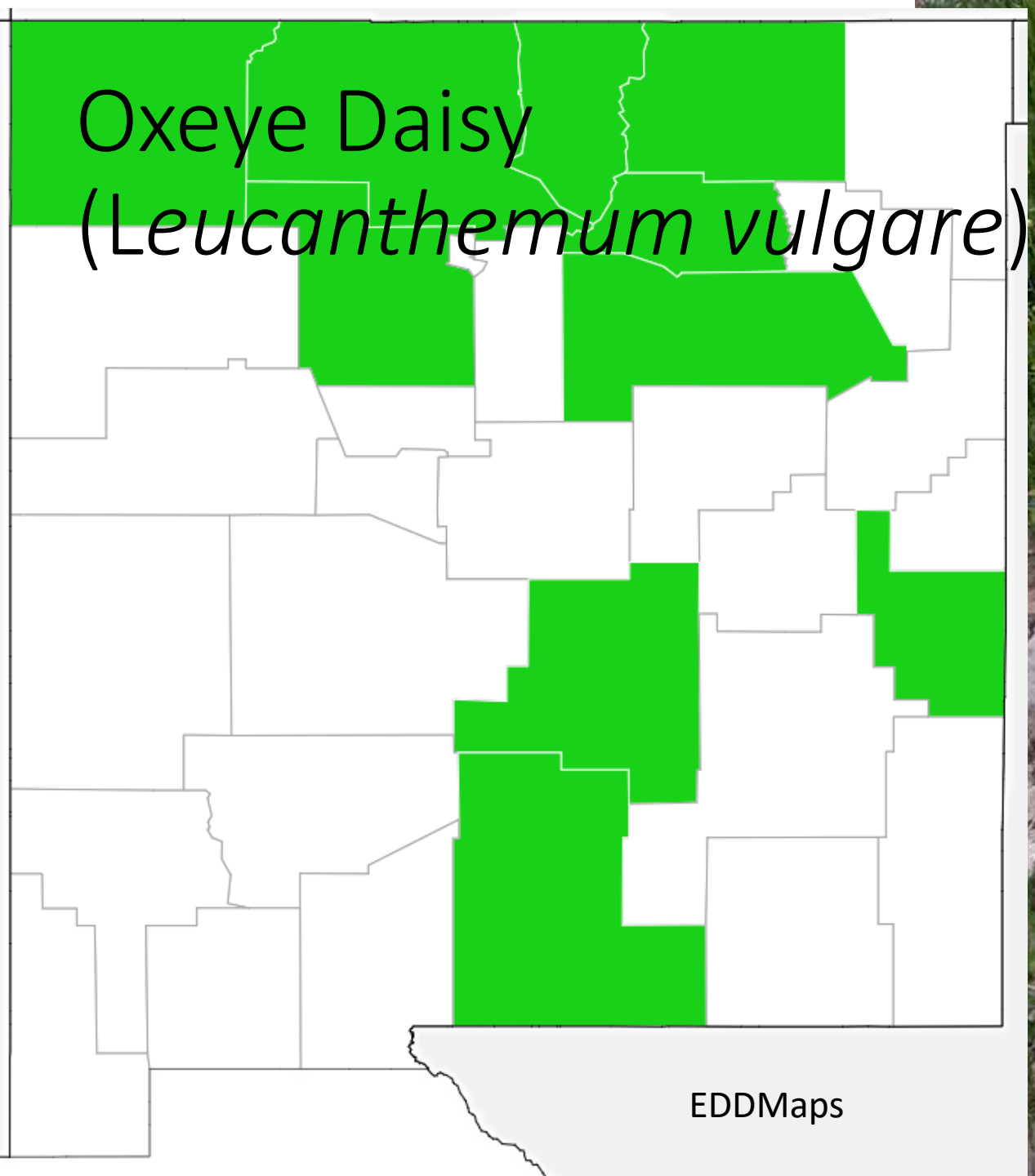
- Rhizomatous
  - Root spreader
- Fruit
  - Heart shaped pods - Silicle
- Height
  - 16-20 inches
- Leaves
  - Alternate
  - More leaves on lower portions
- Toxic – cattle
- Allelopathic

Hoary cress
Lepidium draba or *Cardaria draba*

- Chlorsulfuron
- Metsulfuron
- Imazapic
- Timing
  - Bud to early bloom

www.kansasnativeplants.com

Oxeye Daisy (*Leucanthemum vulgare*)




Seinet, Max Licher

Oxeye Daisy (*Leucanthemum vulgare*)

- Short-lived exotic species
- Reproduce via seed and creeping rhizomes
  - One plant produces thousands of seeds
  - Seeds remain viable > 6 years
  - Top growth can die back to rhizomes during high stress
    - Then regrow
  - Wide ecological amplitude
  - Highly competitive


Seinet, Max Licher

Oxeye Daisy

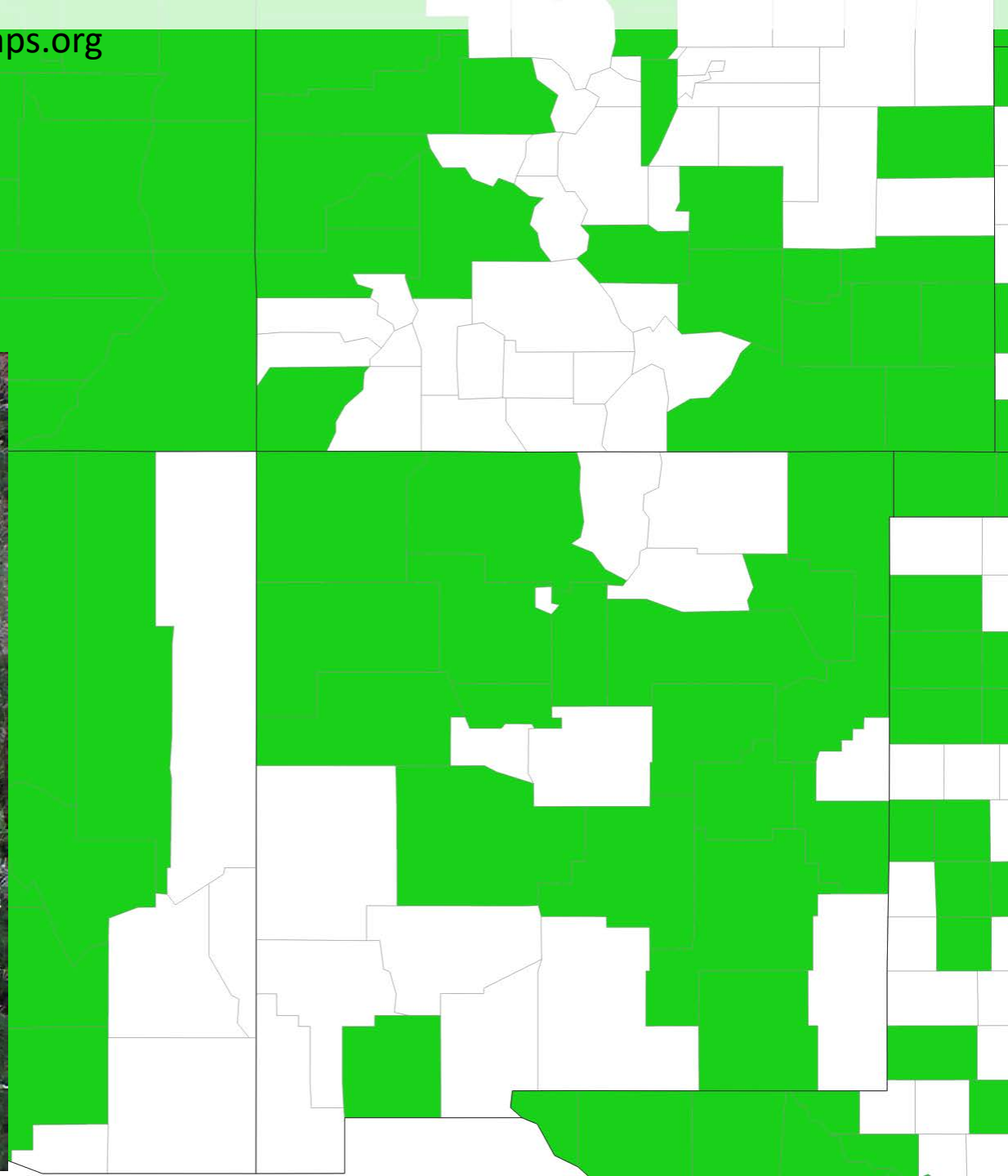
- Herbicide control
  - Several herbicides
    - 2,4-D, Aminopyralid, metsulfuron methyl, dicamba+metsulfuron, picloram, etc…
    - Timing depends on herbicide
    - Early spring in rosette stage before flower stalks
    - Late fall
      - If using picloram alone

Seinet, Max Licher

Saltcedar
Tamarix ramosissima

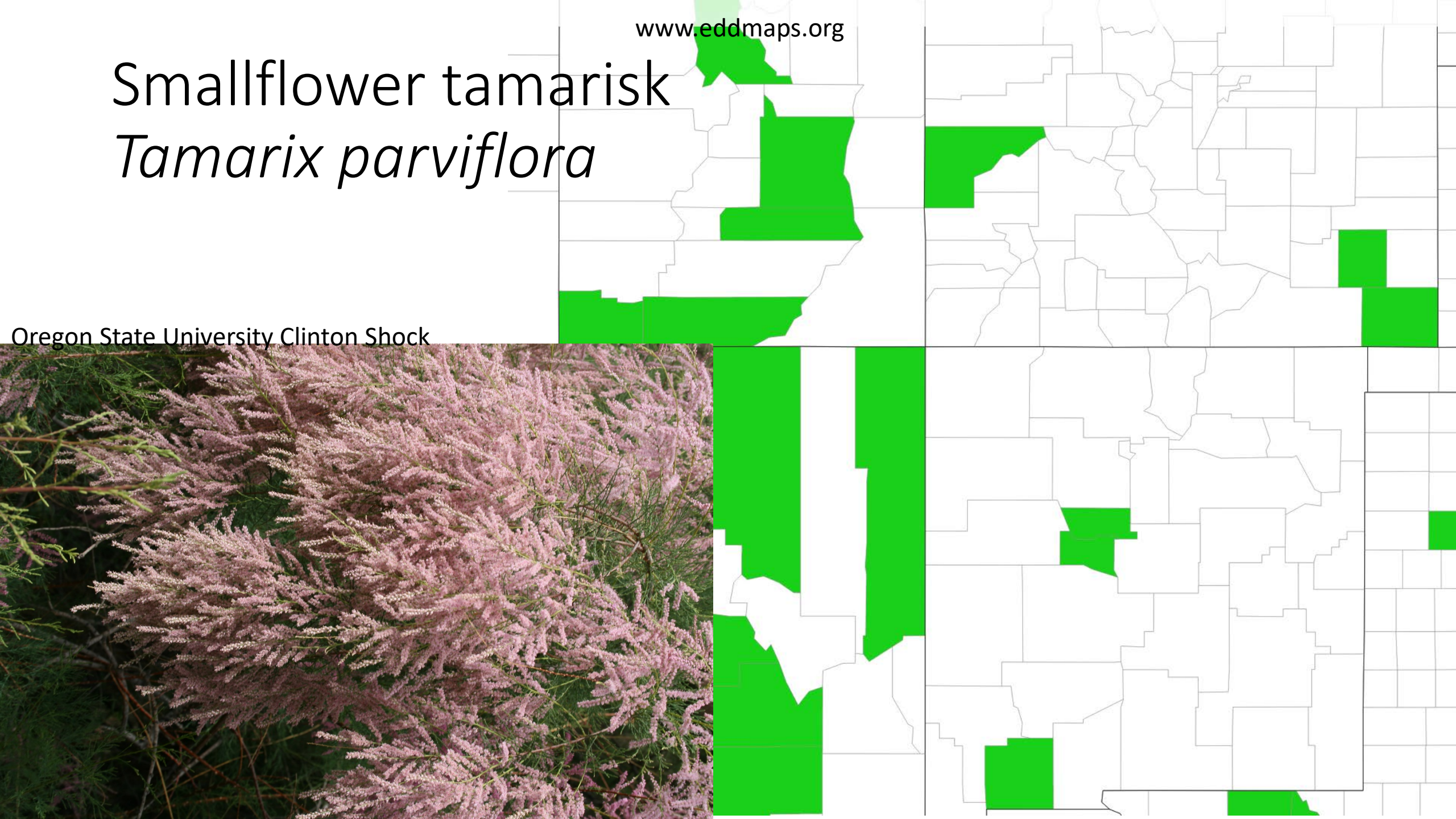
Wikipedia Jerzy Opioła

www.eddmaps.org



Smallflower tamarisk
Tamarix parviflora

www.eddmaps.org



Oregon State University Clinton Shock

Salt Cedar (*Tamarisk* spp.)

- Non-native, perennial shrubs
- Leaves
  - Deciduous, scalelike, salt-secreting glands
- Flowers
  - 4 petals, 4 sepals
- Capsule fruit
- Reproduction
  - Seeds
    - Rapid germination
  - Spreading roots
    - resprouting

Saltcedar

- Reduce native vegetation
- Degrade wildlife habitat
- Reduce wildlife population numbers
  - Although used by a few species like southwestern willow flycather
- Increased flooding potential
- Increased wildfire potential

www.malag.aes.oregonstate.edu

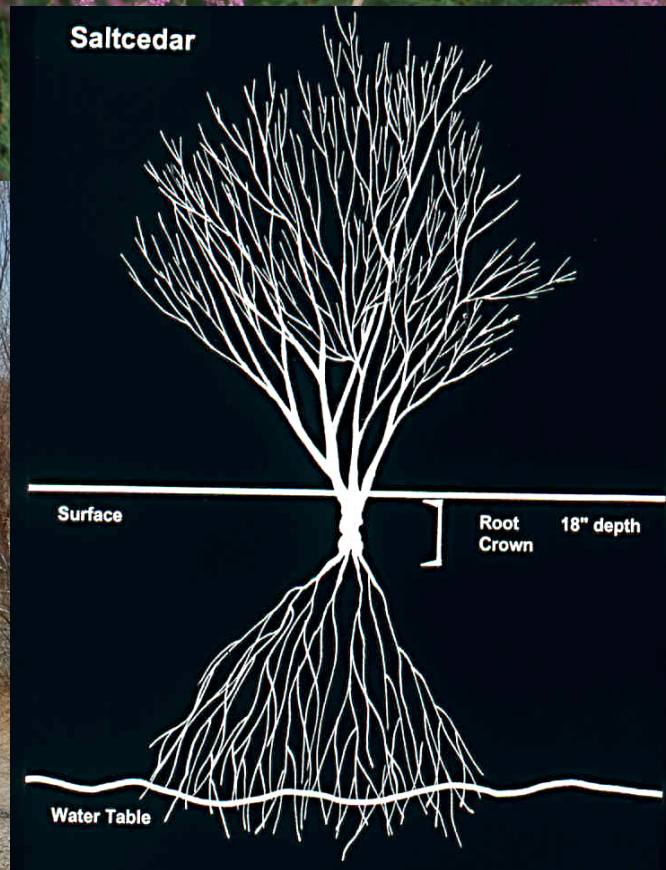
Saltcedar

- Rapid germination
- Exudes salt from leaves
- Increases salt concentration on top of soil
- A large tamarisk tree can transpire 11-16 gal of water per day
- Dense stands have high transpiration rates
  - Dense stands estimated to use about 1 meter of water per year

www.malag.aes.oregonstate.edu

Saltcedar control

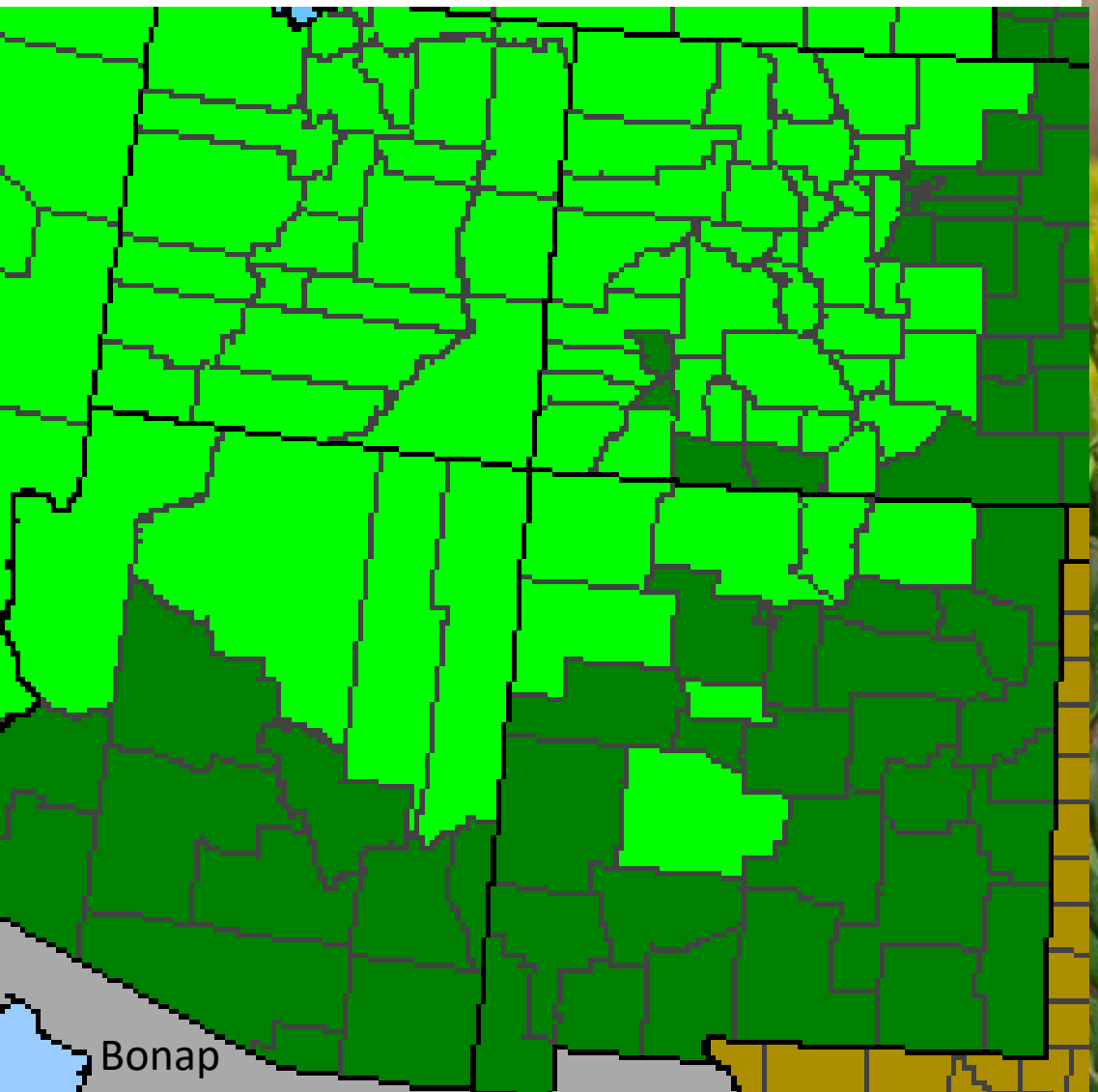
- Foliar herbicide
  - Imazapyr w/ or w/out glyphosate
  - Aug - Sept
  - High volume of spray solution required
  - Thorough coverage of foliage required
- Stump or stem
  - Triclopyr (e.g., Garlon 3A)
- Root kill required
- Biological control
  - 4 species of saltcedar beetles in NM



www.abqjournal.com by Dean Hanson

Green Rabbitbrush

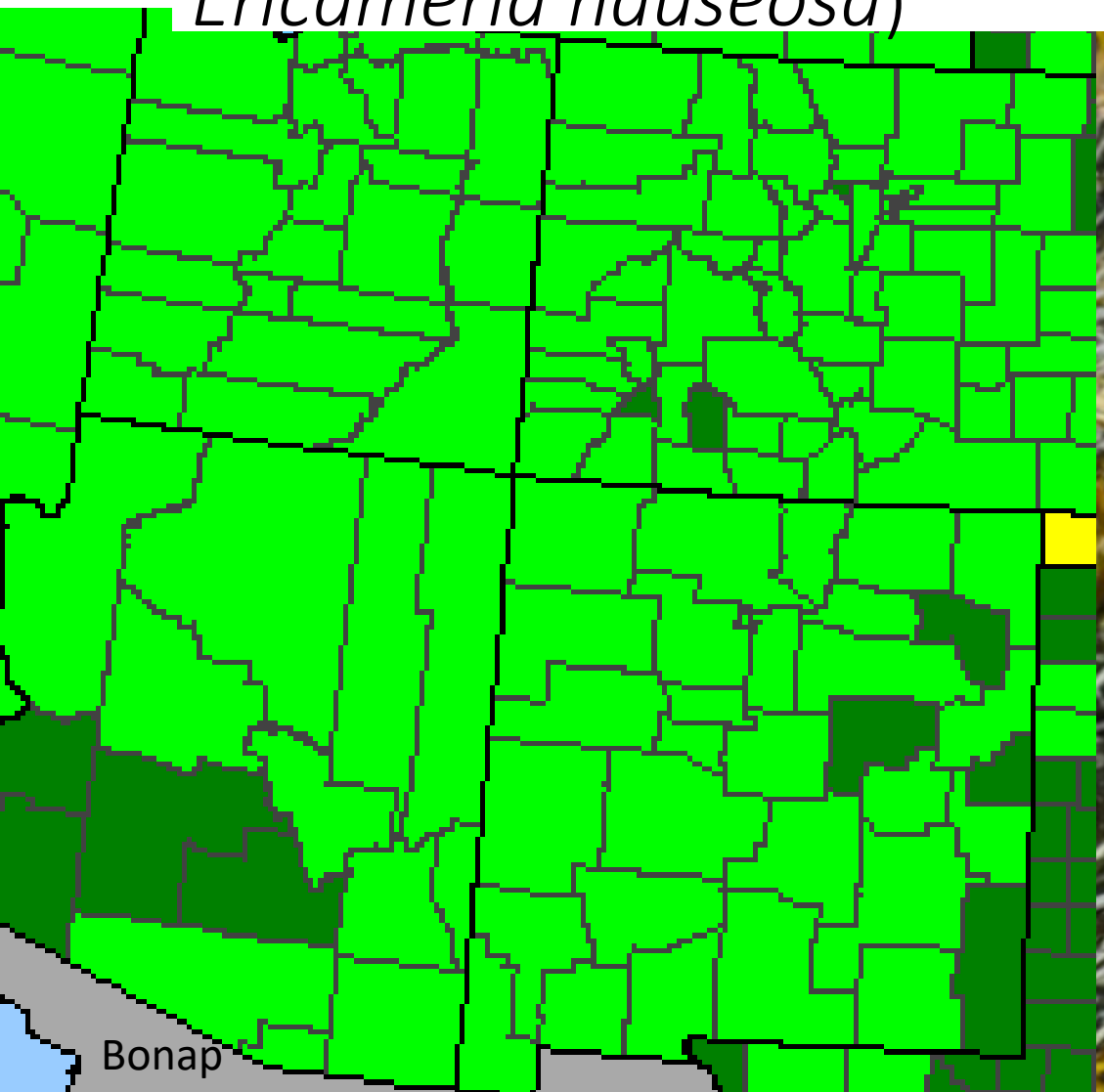
(*Chrysothamnus viscidiflorus)*



Seinet, Max Licher

Grey Rubber Rabbitbrush

(*Chrysothamnus nauseosus* or *Ericameria nauseosa*)



Seinet, Max Licher

Green Rabbitbrush (*Chrysothamnus viscidiflorus)*
Grey Rubber Rabbitbrush (*Chrysothamnus nauseosus* or *Ericameria nauseosa*)

- Several species and subspecies
- Green rabbitbrush
  - Usually taller
  - Leaves not covered by felt-like layer of hairs
  - Some of the upper leaves twist
  - Base of flower clusters appear sticky
- Grey rubber rabbitbrush
  - Usually shorter
  - Leaves covered with short felt-like layer of hairs

Green Seinet, Max Licher

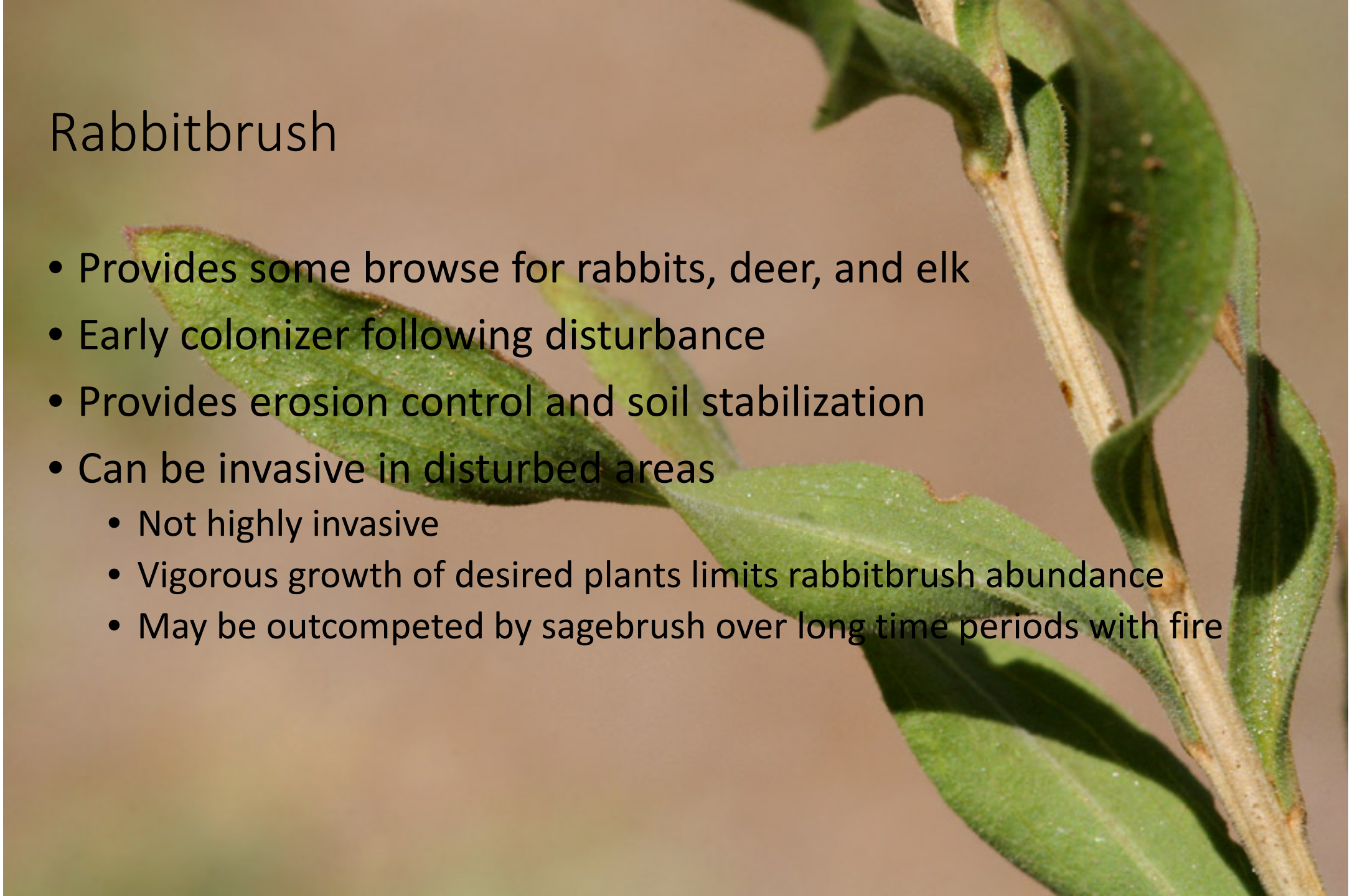
Grey Rubber

Green Rabbitbrush (*Chrysothamnus viscidiflorus)*
Grey Rubber Rabbitbrush (*Chrysothamnus nauseosus* or *Ericameria nauseosa*)

- Deep taproot with some lateral roots
- Reproduce by seed and vegetatively at base of stems or root crown
- Germinate in open areas when moisture and temperature are good (spring or fall)
- Seed viability in the soil <3 years

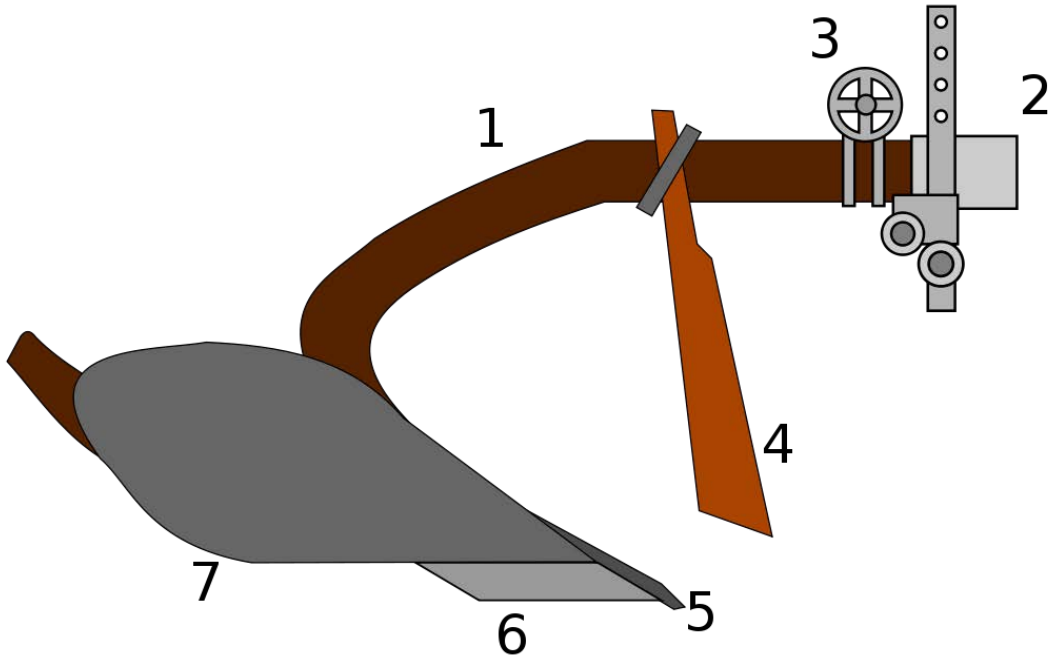
Rabbitbrush

- Provides some browse for rabbits, deer, and elk
- Early colonizer following disturbance
- Provides erosion control and soil stabilization
- Can be invasive in disturbed areas
  - Not highly invasive
  - Vigorous growth of desired plants limits rabbitbrush abundance
  - May be outcompeted by sagebrush over long time periods with fire



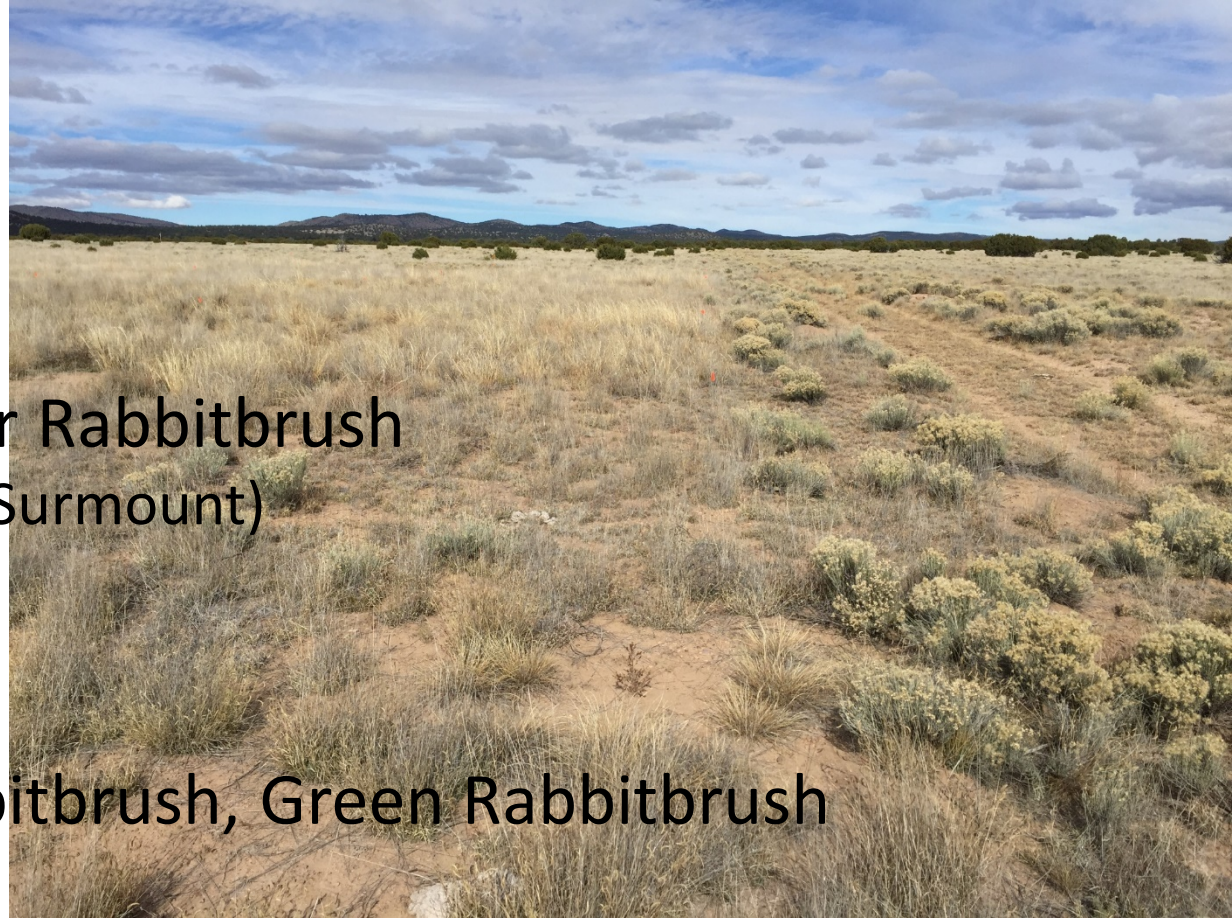
Green
Seinet, Max Licher

Rabbitbrush Control



- Mechanical or Fire
  - Discing or fire – not effective
    - Plants can survive
    - Resprout from root crowns
  - Deep plowing where deep soils allow can be effective

Rabbitbrush Chemical Control



- Broadcast application – Grey Rubber Rabbitbrush
  - Picloram (for example, Tordon 22K or Surmount)
  - Application timing
    - Late fall (1 Oct – 15 Nov)
    - Late-bloom or post-bloom
- Individual plant – Grey Rubber Rabbitbrush, Green Rabbitbrush
  - Picloram
  - Aminocyclopyrachlor (for example, Method 240SL) - can kill grass
    - Industrial, rights-of-way,
    - Non-crop, Non-agricultural, Non-grazing
  - Hexazinone (for example, Velpar) – can kill grass
- Broadcast application – <u>green rabbitbrush</u>
  - <u>More work is needed</u> to determine appropriate herbicides, rates, timing, etc…

Grey Rubber Rabbitbrush

(*Chrysothamnus nauseosus* or *Ericameria nauseosa*)

Implications

- In General
  - Control weed invasion before desirable species are weakened or lost
  - Vegetation community composition before treatment
    - Strongly influences plant composition after treatment
      - Largely due to plant propagules on site
  - Maintaining healthy, perennial vegetation may be the most effective way to limit invasive-annual species dominance (Turner et al. 1963; Chambers et al. 2007; Roundy et al. 2007)
  - Each year, monitor plant community composition
    - Adjust future treatment approach and expectations
    - Wait a few years before final determination of treatment success or failure
- Weed control requires
  - Years of consistent, repeated treatment

Thank You

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Key Resources for Brush and Weed Management

- NMSU, Chemical Weed and Brush Control for New Mexico Rangelands
- http://aces.nmsu.edu/pubs/_circulars/CR597/

- Weed Field Guides - Forest Service, Southwestern Region website
- https://www.fs.usda.gov/detail/r3/forest-grasslandhealth/invasivespecies/?cid=stelprd3813522

- Troublesome Weeds of New Mexico
- http://aces.nmsu.edu/pubs/weeds/welcome.html