

# Weed Control in Hay & Pasture Fields

February 12, 2015

Mark Landefeld  
OSU Extension Educator  
Monroe County, Buckeye Hills EERA



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES



# Why Control Weeds in Hay & Pastures?

- May limit new stand establishment
- Forage quality can be reduced
- Weeds can reduce yield
- Shade out beneficial plants
- Can be poisonous
- Aesthetics



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# Weed Life Cycles

- **Summer annuals**
- Plants that germinate from seed in the spring, flower and produce seed in mid to late summer, and die in the fall. Control April – mid July
  - Examples include large crabgrass, barnyardgrass, common cocklebur, spiny amaranth, spurge, and ragweed.



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# Weed Life Cycles

- **Winter annuals**
- Plants that germinate from seed mostly in late summer through winter, flower and produce seed in late winter to spring, and die in late spring to early summer. Control November - March
  - Examples include annual ryegrass, hairy buttercup, chickweed, henbit, purple deadnettle and cressleaf groundsel.



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# Weed Life Cycles

- **Biennials**
- Plants that complete their life cycle over two growing seasons. They germinate and produce a vegetative rosette the first year. The second year, the plants bolt, flower, produce seed and die. Best controlled in rosette stage
  - Examples include musk thistle, bull thistle, wild carrot, common burdock and yellow rocket.



# Weed Life Cycles

- **Perennials**

- Plants that produce a vegetative structure (taproot, tuber, bulb, rhizome, etc.), which allows them to live for more than two years. Most perennials also reproduce from seed. Control is growth stage dependent

-Examples include johnsongrass, buckhorn plantain, horsenettle, tall ironweed, goldenrod and brambles.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# Weed Control in Pastures

- Difficult challenge
- Weeds often grow on rough terrain/hillsides
- Livestock tracking opens the soil allowing weeds to germinate
- Herbicides kill the weeds, but may kill your legumes too



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# Options Available

- Fertility/Fertilization
- Multispecies grazing
- Mowing/clipping
- Herbicides
  - Always check the label, there may be grazing/hay cutting restrictions etc.

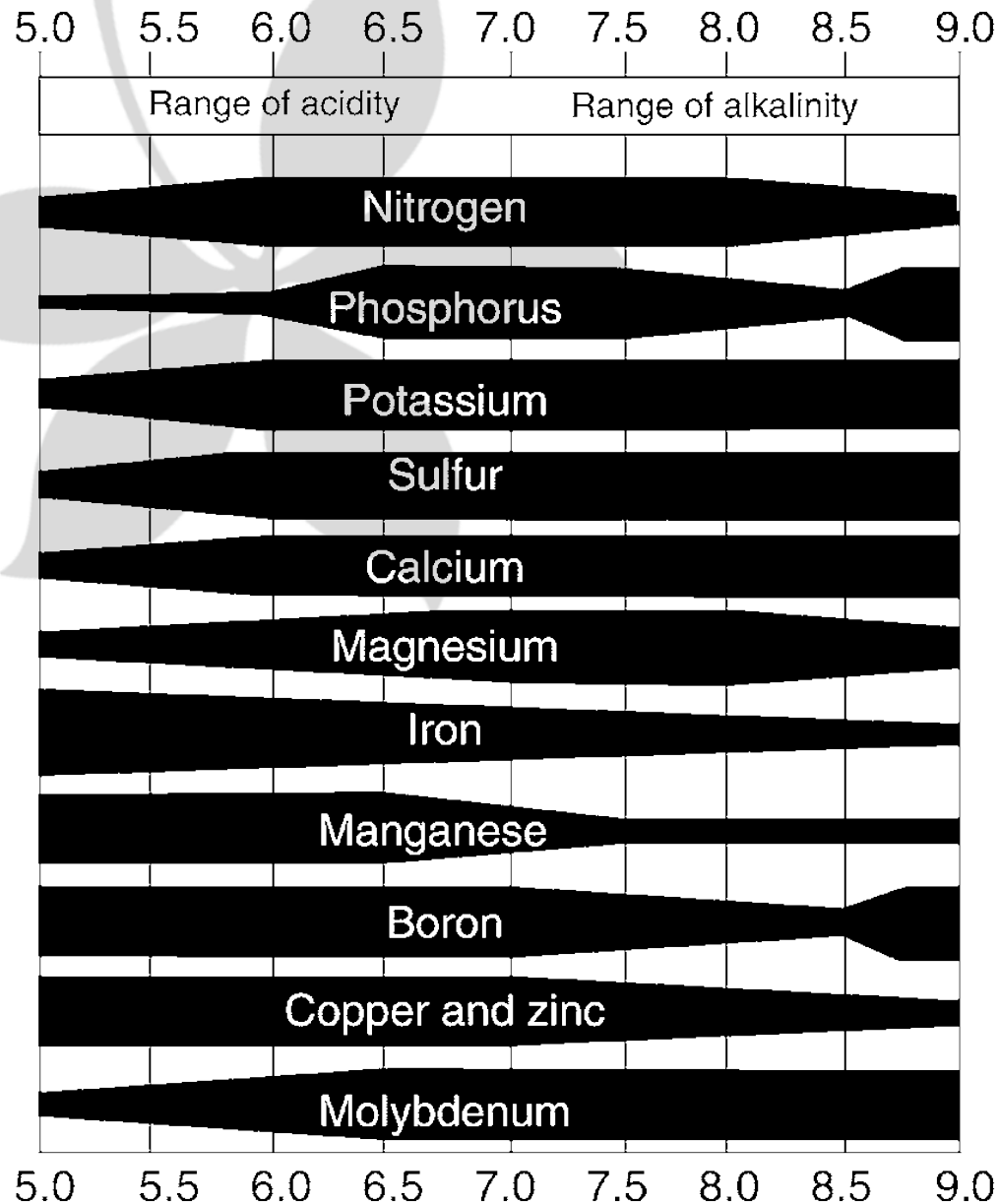
Combine all the above for an integrated approach to weed management



# Weed Management Starts With Fertility

- Pastures need managed so forage plants can compete with weeds!
- Soil Test
- Adjust pH
- Adjust Phosphorus (P) & Potassium (K)
- Provide nitrogen
  - Legumes or commercial fertilizer applications
- Proper grazing management





## Effects of pH on nutrient availability to plants



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Purple Deadnettle**
- A winter annual.
- Mature plants have square stems and gently lobed triangular shape leaves.
- Flowers are crowded at the end of the branches and form under the leaves.



- **Henbit**
- A winter annual.
- Mature plants have square stems with whorled leaves and showy pink to purple flowers.
- Flowers are above the upper leaf whorls.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Purple Deadnettle Control**
- Alfalfa Hay
  - Eptam
  - Metribuzin
  - Sinbar
  - Glyphosate (spot treat)
  - Paraquat



- **Henbit Control**
- Alfalfa Hay
  - Eptam
  - Metribuzin
  - Sinbar
  - Glyphosate (spot treat)
  - Paraquat



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Ground Ivy**
- A low growing, creeping perennial.
- Can reproduce by seeds, but most often reproduction is by stems that root at the nodes.
- Square stem plant with opposite leaves that are rounded or heart shaped.



- **Common Mallow**
- Often confused with Ground Ivy.
- Can grow as a winter annual, summer annual or biennial plant.
- Will grow erect, but is more often prostrate in its growth habit.
- Round stem with alternate leaf pattern.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Ground Ivy Control**
- Usually not a problem in pastures
- 2,4-D
- dicamba products



- **Common Mallow Control**
- Usually not a problem in pastures
- 2,4-D
- dicamba products



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Chickweed**

- A low growing winter annual that can form dense thick patches.
- Reproduction is by seed.
- More than one generation can be produced a year in cool, moist areas.
- Small white flower with 5 petals.



- **Yellow Rocket**

- Generally a biennial with deep-green glossy foliage. First year rosette shown at bottom right.
- Reproduces by seed.
- The flowering stem produces bright yellow flowers in early spring the second year.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Chickweed control**
- dicamba products
- Metsulfuron
- Cimarron Max
- Glyphosate (spot treat)



- **Yellow Rocket Control**
- Cimarron Max
- Crossbow
- Metsulfuron
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Curly Dock**
- A herbaceous perennial with tall, erect stems.
- Reproduces by seeds and a thick fleshy taproot.
- It is a variable species that hybridizes with other dock species.



- **Wild Mustard**
- Winter/Summer annual plant
- 2-7 inch leaves with irregularly lobed lower leaves
- Seeds can live in the soil for many years.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Curly Dock Control**
- dicamba products
- Cimarron Max
- Forefront
- Milestone
- Grazon
- Glyphosate (spot treat)



- **Wild Mustard Control**
- In Alfalfa
  - Butyrac
  - Chateau
  - Metribuzin
  - Sinbar
  - Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Oxeye Daisy**
- A herbaceous perennial plant in the aster family
- The plant produces over 500 seeds that spread by wind or animals
- Seeds remain viable for 2-3 years
- It can quickly replace up to 50% of the grass species in pastures



- **Cressleaf Groundsel**
- Winter Annual plant
- Can be toxic to livestock
- Yellow individual flowers in a cluster
- Leaf alternate, deeply divided with wide round toothed lobes



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Oxeye Daisy Control**

- Forefront
- Milestone
- Grazon P&D
- Glyphosate (spot treat)



- **Cressleaf Groundsel Control**

- 2,4-D
- 2,4-D + dicamba
- Sencor 75DF
- Pursuit
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Broadleaf Plantain**
- A rosette forming perennial with broad oval leaves.
- Reproduce by seed.
- Has a slender, fibrous taproot and can grow in compacted soils.



- **Buckhorn Plantain**
- A narrow leaved perennial that forms a basal rosette.
- Reproductions is by seed and new shoots from the base of the plant.
- Seedhead is a dense cone-like spike on the end of a leafless stem.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Broadleaf Plantain Control**

- 2,4-D
- Cimarron Max
- Crossbow
- Forefront
- PastureGard
- Glyphosate (spot treat)



- **Buckhorn Plantain Control**

- 2,4-D
- Cimarron Max
- Crossbow
- Forefront
- PastureGard
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Horse Nettle**

- An erect perennial that spreads by spreading rhizomes and seeds.
- Leaves are alternate with older leaves wavy, lobed and prickly on both sides.
- Mature fruit seed are yellow berries (green when immature).



- **Eastern Black Nightshade**

- An erect branching summer annual or short lived perennial.
- Mature foliage is slightly hairy with smooth stems.
- Mature fruit seed are glossy black, spherical berries.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Horse Nettle Control**

- Cimarron Max
- Metsulfuron
- Milestone
- Glyphosate (7) (spot treat)



- **Eastern Black Nightshade Control**

- Forefront
- Milestone
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Smooth Groundcherry**

- A perennial with deeply rooted thick fleshy rhizomes.
- Reproduces by seeds & rhizomes.
- Fruit is covered by a papery bladder-like case and flowers are greenish-yellow with purple center.



- **Yellow Nutsedge**

- A perennial with triangular stems and long-grass like leaves that are yellowish-green.
- Can reproduce by seed, but mainly by tubers on the end of the rhizome roots.
- Dormant tubers remain viable >10 yrs.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Smooth Groundcherry Control**
- Crossbow (7)
- Glyphosate (7) (spot treat)



- **Yellow Nutsedge Control**
- Usually not a problem in pastures
- halosulfuron products



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Hemp Dogbane**
- Native perennial weed.
- Grows 1-4 feet tall and reproduces by root and seeds.
- Resembles milkweed, shoots emerge late May-June with reddish color stem.
- Can be toxic to livestock (esp. Horses)



- **Milkweed**
- A perennial with a thick un-branched stem.
- Reproduces from seeds or rhizomes..
- Stem produces milky sap when broken.
- Opposite leaves (sometimes whorled) are oblong to elliptic with a prominent white midvein.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Hemp Dogbane Control**
- Remedy Ultra
- 2,4-D
- Cimarron Max
- Curtail
- Glyphosate (spot treat)



- **Milkweed Control**
- Frequent mowing
- Milestone (F)
- Crossbow (F)
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Canada Thistle**

- A persistent perennial plant that spreads by wind-blown seeds or rhizomes.
- Leaves are deeply lobed with spiny margins.
- Flowers are pink to purple in color.



- **Bull Thistle**

- A biennial with prominent spines.
- A basal rosette is formed the first year while erect branching stems develop the second year.
- Spine-tipped bracts support reddish purple flowers.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Canada Thistle Control**
- Forefront
- Milestone
- Curtail
- Stinger
- Glyphosate (spot treat)



- **Bull Thistle Control**
- 2,4-D
- Forefront
- Milestone
- Crossbow
- Curtail
- Stinger
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Cocklebur**

- An erect growing branched summer annual with distinctive prickly burs.
- Burs are elliptical to egg shaped.
- Leaves are spirally arranged with deeply toothed margins.



- **Burdock**

- A biennial producing a large coarse leaved rosette the first year and a much more erect, branched stem shape the second year.
- The plant produces spiny persistent burs that terminate in Velcro-like hooks.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Cocklebur Control**

- Cimarron Max
- Crossbow
- Dicamba
- Forerfront
- Milestone
- Stinger
- Glyphosate (spot treat)



- **Burdock Control**

- Cimarron Max
- Crossbow
- 2,4-D
- Forerfront
- Milestone
- PastureGard
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Yellow Foxtail**
- A clump-forming summer annual that reproduces by seed and has a characteristic bottle-brush or “fox tail” seedhead.
- Green Foxtail & Giant Foxtail are very similar species.



- **Jimsonweed**
- An annual that grows to five feet tall.
- The leaves are coarsely serrated along the edge and 3-8 inches long.
- A hard spiny seed capsule forms before bursting open when ripe.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Yellow Foxtail Control**
- In Alfalfa
  - Balan
  - Eptam
  - Clethodim
  - Post/Post Plus
- Pastures
  - No good herbicides



- **Jimsonweed Control**
- Cimarron Max
- dicamba products
- Forefront
- Crossbow
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Bur Cucumber**

- This herbaceous plant is an annual vine growing up to 25' long that develops multiple lanky stems
- Can grow in moist meadows in the floodplain, banks of ditches and rivers



- **Fall Panicum**

- Is a fibrous-rooted annual grass that reproduces by seeds
- Fall panicum flowers from June to October and produces seed in late summer and fall
- It has a distinctive pyramid shape and long, wispy flower stalks



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Bur Cucumber Control**

- Multiple mowings
- dicamba products
- Pastures
  - Usually not a problem



- **Fall Panicum Control**

- In Alfalfa
  - Balan
  - Eptam
  - Clethodim
  - Poast/Poast Plus
  - Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Common Ragweed**
- An erect, branching summer annual.
- Pollen from this plant is most common cause of hay fever.
- Reproduces from seed.
- Leaves are deeply cleft on margins forming rounded to pointed lobes.



- **Giant Ragweed**
- An erect summer annual that can reach six feet tall.
- Reproduces by seed.
- Mature plant leaves generally have 3-lobes, but sometimes 5-lobes.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Common Ragweed Control**

- 2,4-D
- Crossbow
- Curtail
- dicamba products
- Forrefront
- PastureGard
- & More
- Glyphosate (spot treat)



- **Giant Ragweed Control**

- 2,4-D
- Crossbow
- Curtail
- dicamba products
- Forrefront
- PastureGard
- & More
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Redroot Pigweed**
- An erect branching summer annual.
- Reproduction is from seed.
- Small greenish flowers are produced in dense, stiff spike-like terminal shoots.
- Fibrous taproot is usually red.



- **Spiny Amaranth**
- A summer annual that grows erect and freely branches.
- Roots are fibrous from a well developed taproot.
- Has a pair of sharp spines at base of most leaves.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Redroot Pigweed Control**

- Cimarron Max
- dicamba products
- Metsulfuron
- PastureGard
- Glyphosate (spot treat)



- **Spiny Amaranth Control**

- 2,4-D
- Cimarron Max
- dicamba products
- Crossbow
- Milestone
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Smartweed**

- An erect or ascending, often branched summer annual.
- Reproduction is by seed.
- Stems are green or reddish with bright pink to white flowers that form on a spike-like cluster.



- **Smooth Bedstraw**

- An erect to prostrate mat forming perennial.
- Reproduces by rhizomes and stolons.
- Stems are smooth and have a whorled leaf pattern.
- Mature plants have numerous small white flowers



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Smartweed Control**

- Forefront
- Milestone
- Grazon P & D
- Metsulfuron
- Glyphosate (spot treat)



- **Smooth Bedstraw Control**

- Crossbow
- Forefront
- Milestone
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Spotted Knapweed**

- A perennial, invasive plant that can produce large amounts of seed from numerous terminal & axillary heads.
- Grazing capacity can be reduced 65-90% if left untreated.



- **Queen Anne's Lace**

- Also known as wild carrot this plant is an erect growing biennial reaching 3-4 feet in height from a tough, fibrous taproot.
- Reproduces by seed.
- Flat-topped umbel flower with white petals.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Spotted Knapweed Control**

- Forefront
- Milestone
- Curtail
- dicamba products
- Stinger
- Glyphosate (spot treat)



- **Queen Anne's Lace Control**

- Cimarron Max
- Crossbow
- Metsulfuron
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Ironweed**
- A warm season perennial.
- Fibrous taproot and rhizomes, but reproduces primarily by seeds.
- Spreading flat-topped flower with 13-30 purple colored florets.



- **Goldenrod**
- A tall erect perennial.
- Reproduces by seed or rhizome growth and can form large patches.
- Flowers are yellow, open in August and remain until frost.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Ironweed Control**

- Crossbow
- Forefront
- Milestone
- Pasture Gard
- Redeem
- Glyphosate (spot treat)



- **Goldenrod Control**

- dicamba products
- 2,4-D
- Forefront
- Curtail
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Johnsongrass**

- A coarse textured perennial grass.
- Reproduces by seeds and aggressive, thick rhizomes.
- Seedhead is a large, open, coarse purplish panicle.



- **Broomsedge**

- A clump forming perennial grass.
- Most commonly recognized in the dormant stage as copper-tan clumps of dried leaves & stems.
- Reproduces by seeds and short rhizomes.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Johnsongrass Control**
- Multiple mowings/grazing
- Glyphosate (spot treat)



- **Broomsedge Control**
- Add nutrients
  - Lime
  - Phosphorus



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Ailanthus** (Tree-of-Heaven)
- Aggressive competitor, produces allelopathic compound suppresses growth of native trees/shrubs
- Prolific seeder (300,000/tree/yr.)
- Often mistaken for Black Walnut, Sumac or Butternuts
- Sap can cause heart problems if in contact with skin



- **Bush Honeysuckles**
- Multiple species cause problems: Tartarian, Amur, and Morrow
- Upright deciduous shrubs with long arching branches 6 to 20 feet tall
- Honeysuckle out competes and shades out desirable native woodland species



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Ailanthus Control**

- Foliar

- Crossbow
- triclopyr products (Garlon 3A, Garlon 4, Remedy, etc.)
- Glyphosate

- Cut stump

- triclopyr products (as above)
- imazapyr products (Stalker, Chopper, Arsenal etc.)



- **Bush Honeysuckle Control**

- Foliar

- Crossbow
- triclopyr products (Garlon 3A, Tahoe 3A etc.)
- Glyphosate

- Cut stump

- Tordon RTU
- Pathway



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Multiflora rose**
- A perennial, prickly-stemmed shrub.
- Reproduces by seed and runner stems which form adventitious roots.
- White flowers bloom in June and form clusters of red berries.



- **Autumn Olive**
- A medium to large invasive, deciduous shrub.
- Reproduces by seeds dispersed by birds & other animals.
- Can grow in poor soil & in low pH soil.



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

- **Multiflora rose Control**

- Cimarron Max
- Metsulfuron
- Remedy Ultra
- Crossbow
- Spike 20P
- Glyphosate (spot treat)



- **Autumn Olive Control**

- Remedy Ultra
- Crossbow
- Garlon
- Arsenal
- Glyphosate (spot treat)



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# In Summary

- Weeds can reduce quantity and quality of hay and pasture forages
- Properly Identify the weed(s)
  - Determine the life cycle and best approach to control weeds
- Use herbicides as the last option
  - When using herbicides, be sure to read and follow the label, use appropriate amounts and wear PPE



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# Questions?



**THE OHIO STATE UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES