Brush Control: an Integrated Pest Management (IPM) Approach

Chase T. Brooke
County Extension Agent – Agriculture & Natural Resources, Collin County
Texas A&M AgriLife Extension Service
Is this your pasture?
Or does it look more like this?
Learning Objectives:

• Discuss the need for brush control on properties
• Compare methods of managing brush species using Integrated Pest Management principles.
• Identify specific species of concern and how to manage them.
Why is Brush Control important?

More brush, more problems
Definitions – What is brush exactly?

**Brush**

• General term for unwanted woody vegetation on rangelands and pastures

• Typically found in xeric upland areas, but could be anywhere on the landscape

• For example: Juniper spp., Mesquite, Honey Locust
Historical Rangelands & Prairies

- Pre European settlement, much of Texas was predominantly grassland with interspersed brush.

- Frequent fires (1-3 year fire return interval) pushed most ecosystems towards grass/forb dominance on uplands.

- This kept most fire sensitive brush species such as junipers relegated to drainages, ridgetops, and other areas which were less likely to burn.

- Some species of trees (such as oaks & pines) adapted to the frequent fire conditions.
Mean FRI for United States. from Guyette et al (2010)
Post-settlement ecosystem changes and disturbance

• During the settlement of Texas, our prairies and plains were valuable land for agriculture.

• As time progressed, other types of disturbance were brought to the landscape.
  • Grazing of cattle, sheep, & goats
  • Plowing of fields
  • Purposeful burning for agriculture/range management.

http://www.cas.vanderbilt.edu/bioimages/ecoregions/w50814-77028.jpg
The removal of fire

• During the late 1800s, massive wildfires across the US caused a dramatic shift in policy towards maximum suppression of fires.

• This continued for over 100 years.

• 1935 was the apex, when federal policy dictated all fires to be extinguished by 10am.
Modern Day Impacts

- Today, many parts of the state feel the impacts from these decisions.
- 100 years of fire exclusion has dramatically changed our landscapes.
- As land has slowly fragmented into smaller parcels, the historical knowledge and idea native areas being grass dominated has been declining.
Disturbance & Successional Ecology

Secondary Succession

Fire

Annual plants

Grasses and perennials

Grasses, shrubs, pines, young oak and hickory

Mature oak and hickory forest

Pioneer Species

Intermediate Species

Climax Community

0 years

1-2 years

3-4 years

5-150 years

150+ years

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Afforestation

• In Texas afforestation – or woody plant encroachment – is the greatest threat to our grasslands.

• This can be largely attributed to the removal of fire as a means of culling young pioneer saplings in open areas.

• Also through changes in utilizations of pastures/rangelands.
Why is brush a problem?

- Invades pastures and rangelands
- Reduces grass/forage area
- May cause physical harm (thorns, noxious phytochemicals)
- Wildfire risk
- The more brush encroaches, the more difficult and expensive it is to remediate.

Photo courtesy of AgriLife Today
Principles of Integrated Pest Management

Not trying to paint this topic with a broad brush... or tree.
What is Integrated Pest Management (IPM)?

- IPM is a flexible, comprehensive approach to managing and eradicating pests.
- As a set of management principles, it applies to
  - Weeds
  - Brush
  - Insects
  - Any unwanted living pests.
- IPM is not a rigid set of rules – rather it’s a way to approach managing an issue caused by unwanted plants/critters/bugs.
Principles of IPM

- Scouting and monitoring for pests
  - Scout frequently and at many times of year
- Damage recognition
  - Physical damage, disease, presence of pests
- Pest identification
  - What is the species, is it a pest, is it seasonal?
- Action thresholds
  - How many are present/how much damage before it needs treatment?
- Appropriate Treatment
  - What will achieve the desired result with the least impact?
Identifying noxious plants

• Accurate identification is the first step in a successful brush management program.
• Trying to treat a problem without knowing what you have will cost you more money and more problems over the long run.
• There are many resources for plant and weed ID
  • https://rangeplants.tamu.edu/
  • https://plants.sc.egov.usda.gov/java/
  • iNaturalist – free app for your phone
Control methods for brush

- **Cultural Practices**
  - Prescribed Grazing, rotating pastures, Changing management practices

- **Mechanical Removal**
  - Shredding, bulldozing, diskimg, pulling

- **Prescribed Fire**
  - Patch-burn, pasture-burn, cut & stuff, brush piles

- **Chemical Treatment**
  - Herbicide, fertilizer, et cetera...

- The right choice depends on your management goals, operation, and the species of plant.
Cultural practices

• Cultural practices are the schedule and methods of managing a property.

• Improving competition in our pastures
  • Tall healthy grass shades out and competes with weeds.
  • When we limit our desirable forages, we make openings for weeds to establish.

• Prescribed Grazing
  • Determining a plan for managing stocking rates and pasture rotation
    • Resting pastures to ensure good grass health & regrowth
  • Selecting livestock that will utilize brush as forage
    • Putting goats on to eat cedar or poison ivy
Mechanical removal

- Using tractors or other machinery to cut, shred, dig, or otherwise remove brush.
- Is often expensive and time-intensive
- May require capital investment in machinery, tools, and implements
- Will leave debris that needs to be taken care of or removed
Maximizing effectiveness of mechanical removal

- Seedlings and small saplings may be shredded with a brushhog
- Tree shears, forestry mulchers, grubbers for larger trees
- Know whether brush will resprout if cut above soil
  - May require follow-up herbicide treatments
- Plan your brush piles ahead of time
  - Many small piles is better than fewer, larger ones
Chemical/Herbicide Treatments

• Herbicides are very effective when matched with the species of brush, applied in the correct manner, and at the appropriate time.
• Different products have activity on different species
• Timing is critical – waiting too long can mean reduced or non-effectiveness vs. brush.
  • Smaller/younger is more effective.
Chemical/Herbicide Treatments

• Applications methods vary greatly based on the product and life stage of the brush.

• Broadcast leaf spraying – most effective on young/short individuals with many stems per acre, on many acres

• Spot leaf spraying – most effective on a single individual basis, or where targeted areas can be treated efficiently.

• Soil Application - effective when plants are actively taking in soil moisture & nutrients, or where individuals are too tall to spray.
Chemical/Herbicide Treatments

• Basal (bark) application – often requires product to be mixed with an oil for best penetration of product into cambium
  • Very effective, though leaves standing dead trees
  • Can be difficult on shrubby brush
• Girdling application (hack & squirt) – cut through the cambium in a ring around the trunk
  • Will kill the tree on its own – must spray herbicide to prevent resprouting.
• Cut stump treatment – exactly as it sounds; apply to stump immediately after cutting.
  • Best done while surface is moist to transfer herbicide to roots.
Chemical/Herbicide Treatments

• **ALWAYS READ THE LABEL BEFORE USE**
  - The herbicide label dictates what the application rates, safety concerns, and livestock re-entry times are for each product.
  - Failure to follow the label is against the law.
  - Each product has different application and mixing rates, so it’s critical to make sure you are getting the right amount of treatment on the ground.

• It’s like taking medicine; if you doctor tells you to take 1 pill a day, you wouldn’t go home and take 6 ‘for a little more oomph’ right?
Prescribed fire treatments

• Prescribed fire can be a powerful tool to manage brush
• Can be inexpensive
• Effective at clearing debris/thatch on soil surface
Prescribed fire treatments

• Can stimulate growth and development of forage grasses and desirable forbs.

• Adds organic matter to soil via black carbon
Prescribed fire treatments

- Takes a lot of preparation and planning
  - Limited by weather conditions and burn bans
- May take repeated applications to completely remove standing brush
- Requires adequate fuel loads
- Not all weeds respond equally to fire
  - Some are encouraged by the growth (smutgrass, etc...)
Comparing treatment costs

• Prescribed fire may cost $2.50/ac
• Herbicide spraying varies, but may cost $11-$23.08/ac
• Mechanical Clearing may cost between $50.20 and $89.88 per acre
• Concluded that costs of herbicide treatment would need to be halved to be competitive with fire, but that is lessened on smaller properties.
Comparing brush control treatments

• The most successful operations are ones that use a variety of methods to manage brush populations
• Everyone’s situation is different – the tools you use will reflect that.
  • Clearing mature juniper thickets will be conducted differently than a patch of mesquite
  • Access to PBAs, contractors, and other resources will effect implementation.
Common Species of Brush and How to Kill Them

Knowledge is power!
Juniper (aka Cedars)

• A juniper is a dioecious evergreen tree/shrub that occurs across pretty much every part of Texas.
• Very common in a ‘climax’ community.
• Often is a main culprit of encroachment into grasslands and prairies.
Why are they called cedars?

• Early in settlement by the Spanish and other Europeans, the native junipers of Texas were termed cedars due to their resemblance to the cedar trees of Europe.

• This has stuck around Texas and other regions despite the best efforts of botanists and other picky plant people.
Resprouting vs Non-Resprouting junipers

• From a management perspective, the juniper species of Texas can be broadly split into either resprouting or non-resprouting species.

• A critical part of managing juniper is correctly identifying the species present, as effective management of juniper depends on the biology of the plant.

• A juniper is considered to be resprouting if, once the main stem is cut, killed, or removed, new shoots will sprout from the belowground bud zone on the root collar of the plant (Fig. 1).

• This requires very different management techniques compared to non-resprouting junipers, which will die off after the main stem is burned or removed.

• Generally, non-resprouting junipers are more susceptible and sensitive to fire. Additionally, older and larger trees are able to withstand fire effects better than younger ones.

Bud zone on a redberry juniper (J. pinchotti). Photo courtesy of Dr. Darrell Uekert.
Eastern Redcedar (*J. virginiana*)

- **Common names:**
  - Eastern red cedar
  - Red cedar

- Common juniper species found across the eastern portion of the state and the eastern United States.

- **Physical Characteristics**
  - Tall, single trunked tree
  - Non-resprouting
  - 40-70ft tall at maturity
  - Shallow rooted

Distribution of *J. virginiana* across Texas. (Brooke & Treadwell, 2019)
Eastern Redcedar

- *Juniperus virginiana*
- Evergreen tree commonly found East of I-35 through to the Atlantic Ocean.
- Native, but invasive plant.
- Treatment Options:
  - Herbicide: triclopyr or picloram (leaf)
  - Does not resprout, so mechanical removal is effective.
  - Prescribed fire is effective if >70% of the canopy is burned.
Ashe Juniper (J. ashei)

- **Common names:**
  - Ashe cedar
  - Ash juniper
  - Blueberry cedar

- A common sight across the Texas Hill Country, Ashe juniper also occurs in eastern Oklahoma and Arkansas.

- **Physical Characteristics**
  - Multi-stemmed tree
  - Non-resprouting
  - Short; seldom grows over 30ft tall
  - Fast growing; mature at 10-20 years old
  - May have white stripes on branches

Distribution of J. ashei across Texas. (Brooke & Treadwell, 2019)
Ashe Juniper (J. ashei)

• Ecological Characteristics
  • Suppresses growth of understory plants.
  • Fire intolerant
  • Critical habitat for some endangered species.

• Treatment Options:
  • Herbicide: triclopyr or picloram (leaf)
  • Does not resprout, so mechanical removal is effective.
  • Prescribed fire is effective if >70% of the canopy is burned.

Photo credit: connlindajo on iNaturalist
Pinchot’s Juniper (J. pinchotti)

• **Common names:**
  • Redberry cedar
  • Pinchot’s juniper

• Redberry juniper is a multi-stemmed shrubby tree commonly found in the shallow and rocky soils in the northern and western parts of the state

• **Physical Characteristics**
  • Relatively fast grower.
  • Resprouting
  • Short tree/shrub; Individuals grow 3–15 ft tall, and reach maturity at 12 years.
  • Most common resprouting species of juniper in Texas.
  • Notable red or reddish-brown fruit.

Distribution of *J. pinchotti* across Texas. (Brooke & Treadwell, 2019)
Pinchot’s Juniper (J. pinchotti)

• Ecological Notes
  • Grasses such as buffalograss, sideoats grama, and tobosa may stunt the growth of J pinchotti.
  • Berries make good wildlife forage.
  • Low value, unpalatable browse

• Treatment Options:
  • Herbicide: triclopyr or picloram (leaf)
  • Vigorous resprouter, so mechanical removal alone is not effective.
  • High intensity fire may kill individuals.
    • Younger are more susceptible

Photo credit: sotexnaturalist on iNaturalist
Honey Mesquite (*Prosopsis glandulosa*)

- **Common names:**
  - Mesquite
  - Many 4-letter words

- **Common in central, south, and west Texas, honey mesquite is a common invasive brush species in the past 100 years.**

- **Physical Characteristics**
  - 1-4” thorns
  - Leguminous
  - Very drought tolerant; makes deep tap roots, and lateral roots can spread > 60ft from trunk.
Honey Mesquite (Prosopsis glandulosa)

- Management Options
  - Leaf spray
    - Sendero (Aminopyralid & Chloropyralid)
    - Triclopyr mixed with Chloropyralid
  - Basal Spray
    - Triclopyr + diesel
  - Fire may be ineffective on all but the youngest/smallest trees. Requires frequent burning (1-2yr FRI)
  - Mechanical removal requires grubbing to remove belowground bud zones.

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Honey Locust (*Gleditsia triacanthos*)

- Common noxious hardwood tree often found in northeast and east Texas

- **Physical Characteristics**
  - Thorns may injure livestock and damage tires.
  - The thorns have thorns on them.
  - Leguminous
Honey Locust (*Gleditsia triacanthos*)

**Management Options:**
- **Herbicide** – numerous options for treatment, can be about 70% effective.
  - Foliar applications require wetting as much leaf surface area as possible.
  - Hack & Squirt applications using triclopyr can be very effective for larger trees.
- Resprouting species, so mechanical removal needs to be either repeated or combined with herbicide.
- Prescribed fire mainly effective on seedlings.
  - Burning will also clear up fallen thorns

<table>
<thead>
<tr>
<th>Herbicide Options</th>
<th>Concentration in Spray Solution</th>
<th>Tank Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 gal</td>
<td>3 gal</td>
</tr>
<tr>
<td>Sendero</td>
<td>1.0%</td>
<td>1.28 oz</td>
</tr>
<tr>
<td>GrazonNext HL</td>
<td>1.0%</td>
<td></td>
</tr>
<tr>
<td>MezaVue</td>
<td>1.0%</td>
<td>1.28 oz</td>
</tr>
<tr>
<td>Grazon P+D</td>
<td>1.0%</td>
<td>1.28 oz</td>
</tr>
<tr>
<td>Non-ionic surfactant</td>
<td>0.25%</td>
<td>0.32 oz</td>
</tr>
<tr>
<td>Hi-Light Blue Dye</td>
<td>0.25–0.5%</td>
<td>0.32–0.64 oz</td>
</tr>
</tbody>
</table>
Oaks (*Quercus spp.*)

- **Common names:**
  - Many – varies by species/location

- Ubiquitous around Texas. Oaks are found in every ecoregion of the state, and are an important species in many ecosystems.

- **Physical Characteristics**
  - Generally fire tolerant
  - Generally grow slowly
  - Growth habit varies by species.
Oaks (*Quercus spp.*)

- Worth treating when overabundant on landscape.
- Oaks are vigorous Resprouters

**Management Options**

- Fire is generally effective on seedlings.
- Herbicide – aminopyralid, picloram (restricted use), imazapyr or triclopyr are effective
- Mechanical removal may be effective with follow-up fire or herbicide treatment.
Yaupon Holly (*Illex vomitoria*)

- **Common names:**
  - Yaupon
  - Native understory species in East and Central Texas that can grow thick under oak and other tree canopies.

- **Physical Characteristics**
  - Grows vigorously
  - Naturally caffeinated
Yaupon Holly (*Illex vomitoria*)

**Management Options:**
- Prescribed fire followed by herbicide application is most effective
  - Fire alone is unlikely to achieve adequate control
- Resprouts vigorously - mechanical removal needs to be either repeated or combined with herbicide
- Good candidate for prescribed grazing w/ goats

<table>
<thead>
<tr>
<th>Garlon 4 concentration (%)</th>
<th>6 Months post-burn</th>
<th>18 Months post-burn</th>
<th>Cost/plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel only - 0</td>
<td>84</td>
<td>60</td>
<td>0.17 (0.20-0.28)</td>
</tr>
<tr>
<td>5</td>
<td>96</td>
<td>92</td>
<td>0.28 (0.29-0.30)</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
<td>92</td>
<td>0.40 (0.40-0.43)</td>
</tr>
<tr>
<td>20</td>
<td>100</td>
<td>96</td>
<td>0.62 (0.62-0.65)</td>
</tr>
<tr>
<td>25</td>
<td>100</td>
<td>100</td>
<td>0.73 (0.73)</td>
</tr>
</tbody>
</table>
Chinese Privet (Ligustrum sinense)

• **Common names:**
  • Privet

• **Physical Characteristics**
  • Visually similar to Yaupon Holly
    • Leaves are oppositely pinnate in privet.
  • Very vigorous resprouter.
Chinese Privet (*Ligustrum sinense*)

**Management Options**

- **Herbicide** – foliar, cut stump, basal applications.
  - 3-5% Glyphosate (foliar) – any time, particularly in fall.
  - 8% triclopyr, or 20% glyphosate solution (cut stump)
  - 20% triclopyr + diesel (basal)

- **Mechanical removal**
  - Removal may be effective if combined with fire or herbicide.
    - Hand cutting + cut stump spray
    - Shredding + foliar spray 1 year later.
Poison Ivy (*Toxicodendron radicans*)

- Common woody understory plant, generally across east Texas, and in wet areas elsewhere.

- Physical Characteristics
  - Leaves of three, leave them be
  - Leaf morphology varies
  - Grows as groundcover and vine.
  - Urishiol is the irritant that causes inflammation and allergic reactions in humans. Animals are generally unaffected.
Poison Ivy

• **Management Options**
  - Prescribed Grazing - Goats love poison ivy. Given a chance, they’ll do a great job of browsing it down. Just be careful handling them afterwards.
  - Herbicide – foliar applications are best, must be applied late spring or early summer to be effective.
    • Glyphosate (any time)
    • 2,4-D + Dicamba (early summer & Spring)
    • Triclopyr (Spring or Fall)
  - Mechanical Removal
    • If cutting or shredding, treat cut stumps with herbicide to prevent resprouting.
    • Wash all equipment after use.
  - Prescribed fire
    • Not recommended due to risk of inhaling urishiol and causing life-threatening allergic reactions.
Resources/Information:

• [http://Collin.agrilife.org/publications/agriculture](http://Collin.agrilife.org/publications/agriculture)
• AgriLife Forage Fax Blog
• B-1466 - [Chemical Weed and Brush Control: Suggestions for Rangeland](http://Collin.agrilife.org/publications/agriculture)
• [https://rangeplants.tamu.edu/](https://rangeplants.tamu.edu/)
• [https://plants.sc.egov.usda.gov/java/](https://plants.sc.egov.usda.gov/java/)
• iNaturalist – free app for your phone
Questions?

Chase T. Brooke
County Extension Agent, Agriculture & Natural Resources, Collin County
Texas A&M AgriLife Extension Service

825 N McDonald St, Suite 150
McKinney, TX 75069

Email: Chase.brooke@ag.tamu.edu
Phone: 972.548.4232