

Crop Tree Management for Forest Stand Improvement

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Natural Resources Conservation Service*

Outline

Introduction

Crop Tree Release: Basics

Logistics: When & Where

Growth and Financial Returns

Not all Trees are Created Equal

**all trees are not created equal...
in most stands, there are only a limited
number of trees that have the potential
to produce high-value products.**

Arlyn W. Perkey, PhD, USDA Forest Service (Retired)

Crop Tree Management (CTM)

An intermediate woodland treatment focused on releasing individual “crop” trees that have been pre-selected to produce future benefits consistent with the landowner’s desired goals

**CTM is not
thinning...not really!**

Crop Tree Release (CTR)

...is the selective and deliberate removal of adjacent, competing canopy trees (neighbors) whose crowns overtop, touch, or infringe upon the growth and development of your selected crop tree's crown.

A Crop Tree is...

**any tree or tree species
that the landowner wishes to
maintain [in the canopy] as part of their
woodland over a desired period of time**

**Different forest
stands often
have different
crop tree
criteria!**

Crop Trees: Timber Value

Black Walnut \$\$\$\$	Black Cherry \$\$\$	Soft Maple \$\$
White Oak spp \$\$\$\$	Red Oak spp. \$\$\$	Basswood \$\$
Hard Maple \$\$\$	Hickory \$\$\$	Ash \$\$

\$ = Illinois timber values ~ winter 2009

Timber Prices

- **Illinois**
 - Contact a local professional forester
 - Illinois Timber Prices Bulletin
 - Extension Forestry Website
- **Iowa**
 - Contact a local professional forester
- **Wisconsin**
 - Contact a local professional forester

Why Crop Tree Release?

ANSWERS

- **Landowner gets to choose desired crop trees and outcome, rather than allowing Mother Nature and stand dynamics choose for you**
- **Bigger, high-value crop trees yield greater financial returns compared to smaller, low-value trees**

Why Crop Tree Release?

ANSWERS

- “Released” stands of timber grow faster, mature sooner, produce bigger and healthier trees, and contain more desirable and valuable tree species (Mercker 2004)

Important Facts

**93% of the value of a stand
is in its relatively few crop
trees!**

(Gary Miller, USDA Forest Service)

Why Crop Tree Release?

- Here in the hardwood region of the Midwest, there is a general abundance of low value trees and a shortage of high-value trees...WHY??
 - *CTR allows us to focus sometimes limited resources and maximize growth on the best and most valuable trees to meet our objectives and the lands commercial potential.*
- Released crop trees expand their crowns, thereby increasing diameter growth
 - *Larger, well-developed crowns equals greater photosynthetic capacity and seed production*

The CTM Principle

- **Guarantee (within reason) and perpetuate your crop tree's dominant | codominant crown position**
- **Facilitates crown expansion, diameter growth, and sometimes height growth**
 - Ultimately, more volume in less time...good financial investment
- **Younger stands benefit the most...**
 - You, rather than Mother Nature, get to pick the “winners”
- **Most “bang for your buck!”**

When Does One Apply CTM?

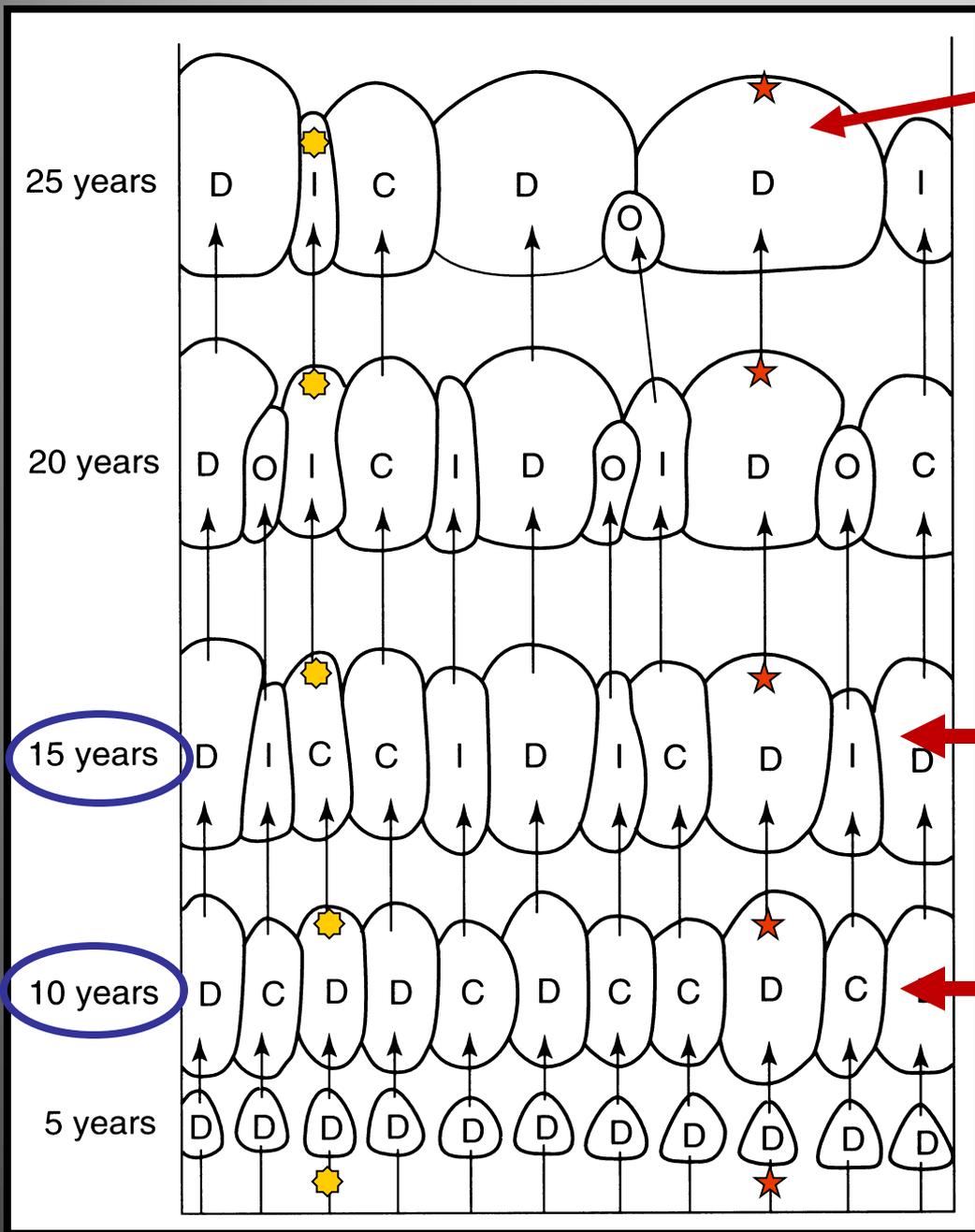
ANSWERS

- *Immediately* in young stands, before or after canopy closure (Age 10-25 yrs.)
- Trees should be around 20-25 ft tall
- Release treatments typically last 6-15 years,
 - Dependent upon stand development and site conditions
 - Some studies have indicated growth response > 15 yrs

When to Release Your Crop Trees

	Total Trees/Acre	[D/C] Trees/Acre	Desirable D/C Trees/Acre
Age 10	2600	837	<u>145</u>
Age 20	1200	307	<u>25</u>
Age 40	530	95	17

Window of opportunity...Winners and Losers!



Are these trees you wanted? Do they meet your goals?

★ Winners vs. Losers ★

CTM allows YOU, not Mother Nature, to pick the winners!

Start now...release Crop Trees early in stand development

Where Do I Apply CTR?

Apply CTR to your best quality sites first!

--High productivity sites typically have more potential crop trees and greater growth rates (Perkey and Onken).

Apply to young stands, both plantation and natural!

--Young stands typically have a lot more crop trees than mature stands.
Apply a minimum 3 | 4 side release

Middle-aged stands, both plantation and natural!

Older stands typically have fewer crop trees than younger stands and may be nearing a commercial low grade thinning. Combine CTR with commercial opportunities if they exist, contact a forester.

The attractiveness of the financial investment of CTM increases as the number of desirable crop tree candidates per acre increases!

How Do I Apply CTM?

1. **Determine your objectives and Crop Tree Criteria**
2. **Field-Select Your Crop Trees**
 - Identify the best 30-50 crop trees acre
 - Evaluate trees' release potential
 - **Flag** your crop trees or **paint** the trees that are competing with your crop trees
3. **Determine “free-to-grow” (FTG) status**
 - **FTG** rating is an *index of competition*

Crop Tree Selection Criteria

General Criteria

Dominant & Co-Dominant Trees
Don't Release Overtopped Intolerants

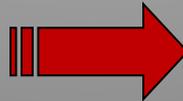
Healthy, Symmetrical Crown

Avoid High Risk Trees

Expected Longevity 20+ yrs.

Species Adapted to the Site

Release 30-50 Trees/Acre



Timber Trees

Good Form

Higher-Value Species*

Quality Butt Log ~ 8⁶

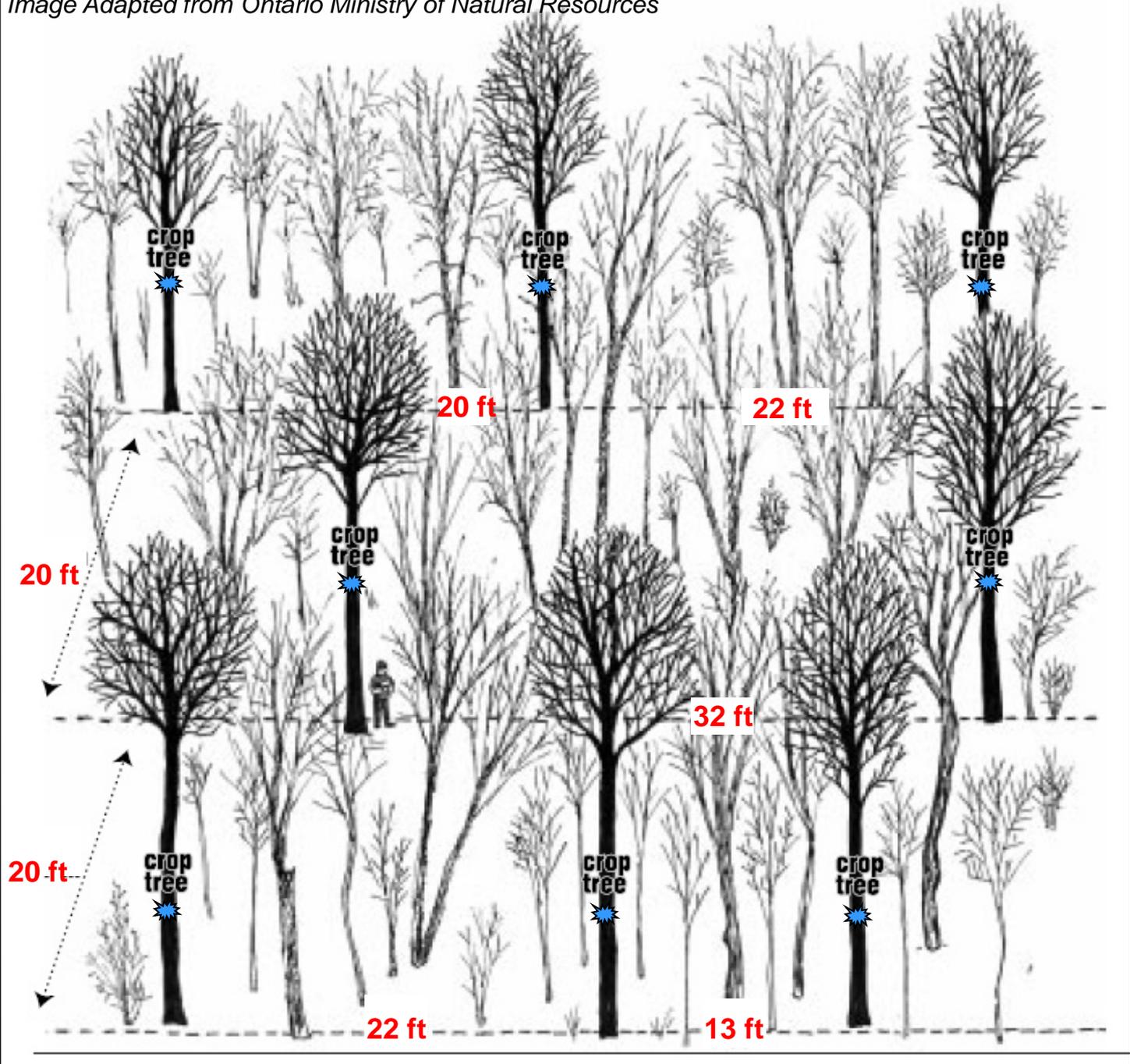
No Epicormic Branching

Avoid High Risk Trees

Minimal Defect

Bigger-Better-Faster-Greater Value

Image Adapted from Ontario Ministry of Natural Resources



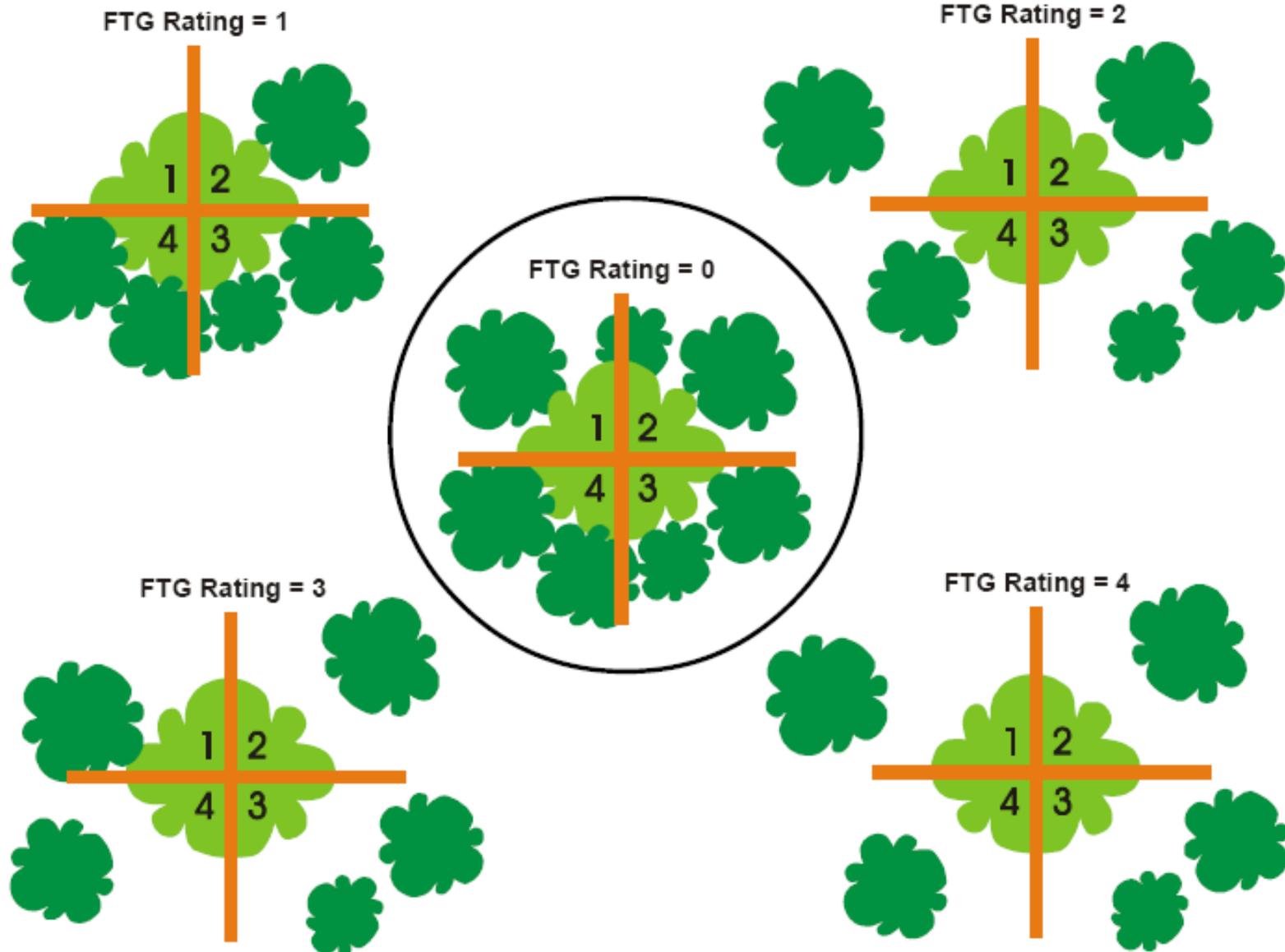
Free-to-Grow (FTG) Status

“The *free-to-grow* rating is an index of competition that rates the available growing space for the crop tree by determining on how many sides of the crown there is room for growth.”

(Apsley and Heiligmann 2002)

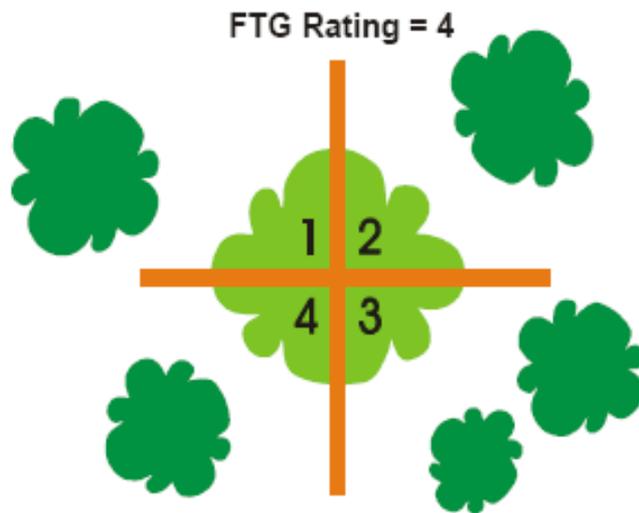
As the FTG rating increases for individual crop trees, so does the growth rate for the individual tree (Perkey and Onken).

CROP TREE MANAGEMENT — FREE TO GROW RATINGS

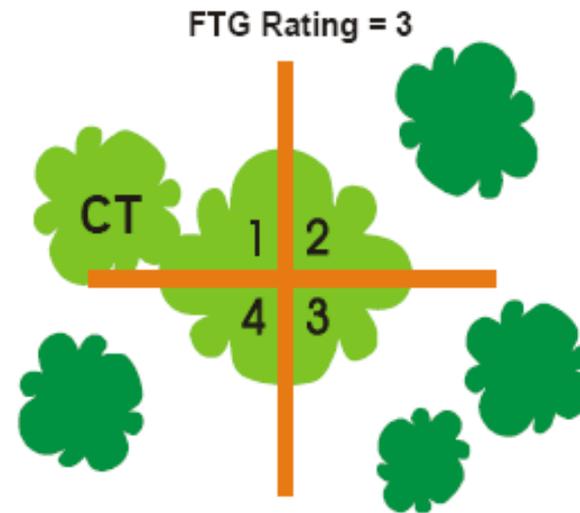


CROP TREE MANAGEMENT — CROWN-TOUCHING RELEASE

**FOR OPTIMUM GROWTH
A 4-SIDED RELEASE IS REQUIRED**



the only exception is . . .



a 3-sided release when the competing tree retained is another crop tree.

Photo: Jay C. Hayek, U of I



How Do I Apply CTM?

3. Selectively fell or girdle competing crowns (trees)

- Cut till you see/envision a ring of light around your crop tree
- **Rule of Thumb:** expect to girdle at least 3 to 4 trees for every released crop tree
- Girdle or Fell Competing Trees?
 - Personal preference...I prefer to girdle and leave standing during pre-commercial treatments.

Marking “Cut” Trees

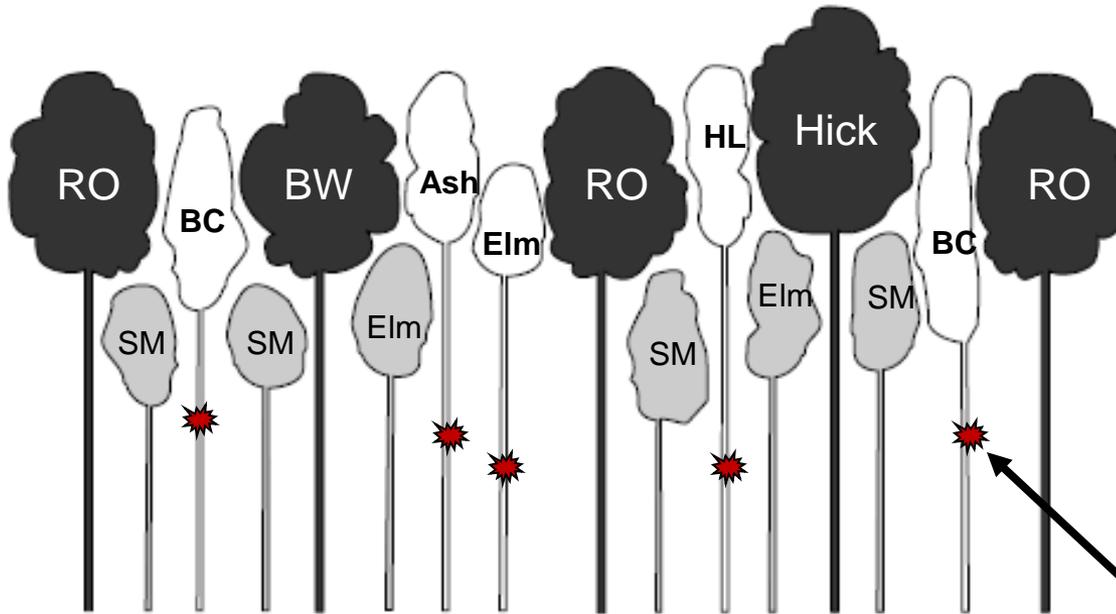


Figure 2 — Dominant trees (indicated by a dark colour in this illustration) are the tallest, most vigorous trees in the stand. The crowns of dominant trees get the most sunlight, allowing dominant trees to suppress the growth of neighbouring trees. Dominant trees make the best crop trees.



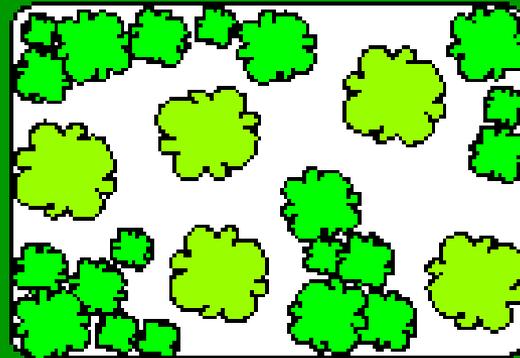
Trees marked for removal

Epicormic Branching

- Dormant buds that have broken dormancy on the lower bole of a tree
- Lead to grade defects
- Keep understory trees to shade lower bole of released crop trees



If this cutting is too heavy...

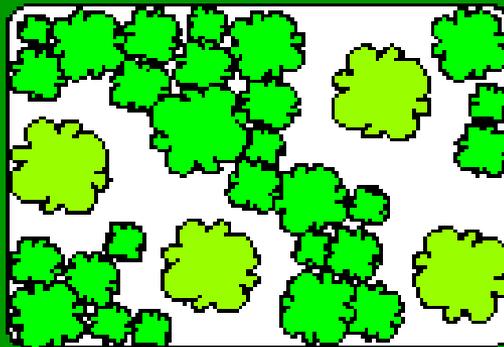


then reduce the intensity of cut by...

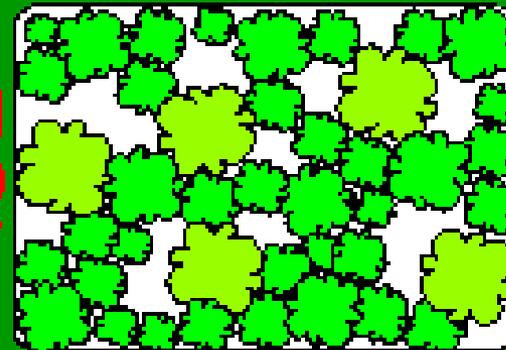
Correct

Incorrect

reducing the
number of
crop trees
selected
for release

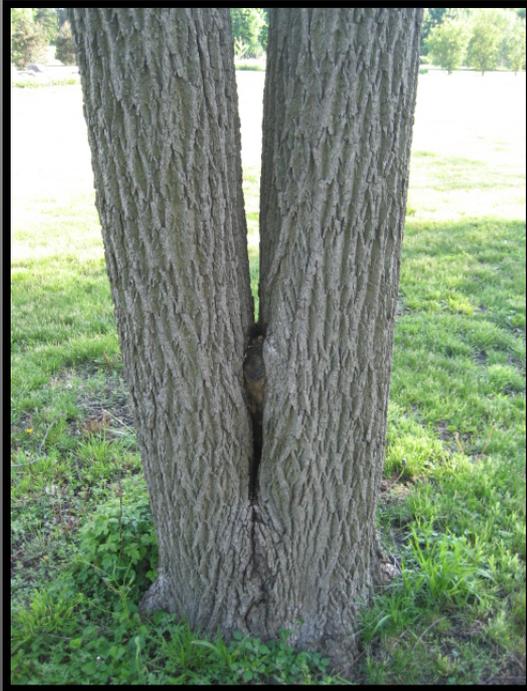


NOT

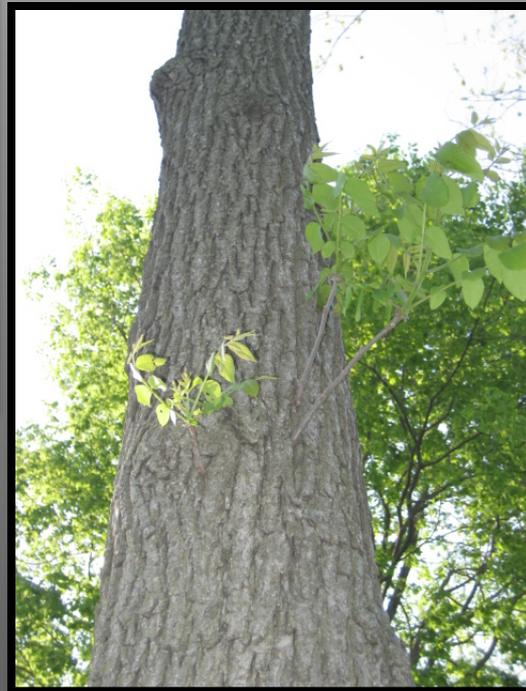


reducing the
amount of
release given
each crop tree
crown.

Crop Tree Selection



Crop Tree Selection



Photos: Jay C. Hayek, U of I





Photo: Jay C. Hayek, U of I

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Photo: Jay C. Hayek, U of I

CTR Tips and Tricks

1. **Do not** scout your woods looking for trees to remove!
2. **Rather**, become a crop tree “hunter”...train your eyes to locate and evaluate your best trees!
3. **Remember**, you’re only cutting trees that are in direct competition with your crop tree’s crown!
4. **It is acceptable** to completely release fewer crop trees per acre compared to partially releasing more crop trees per acre!



Photo: Jay C. Hayek, U of I

CTR Tips and Tricks

5. **15 feet** of growing space between crowns provides adequate release for 7-8 years.
6. **Occasionally***, two adjacent crop trees may be left next to each other, assuming these crop trees are provided a full 3-sided release!
7. **Remember**, if you have a high quality stand of timber, expect to remove some high quality trees...you can only have so many crop trees per acre before you start sacrificing growth!

* Actually, this is quite common

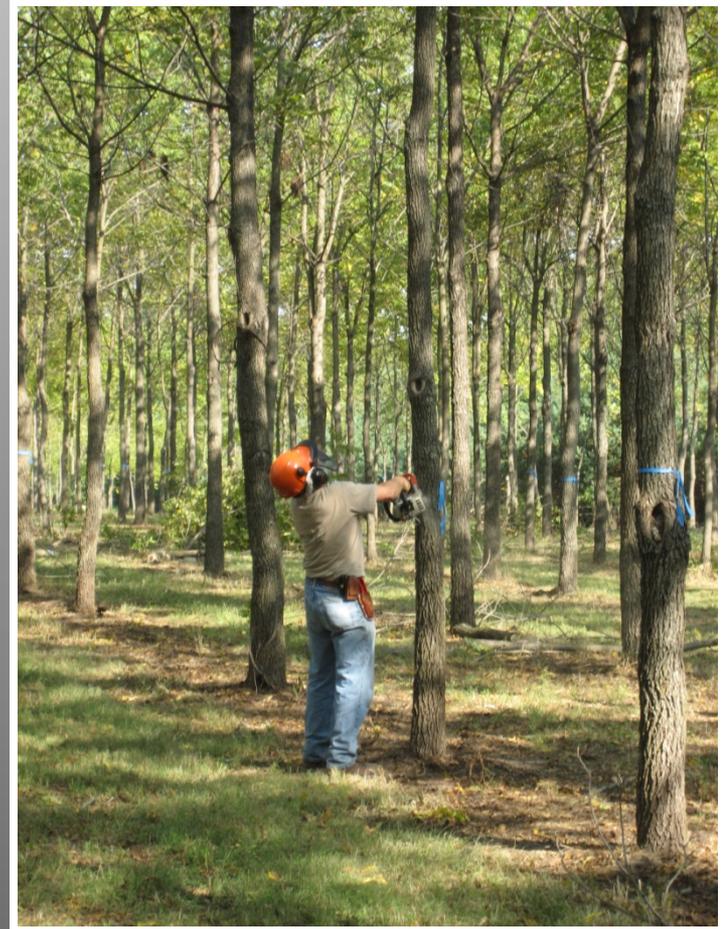
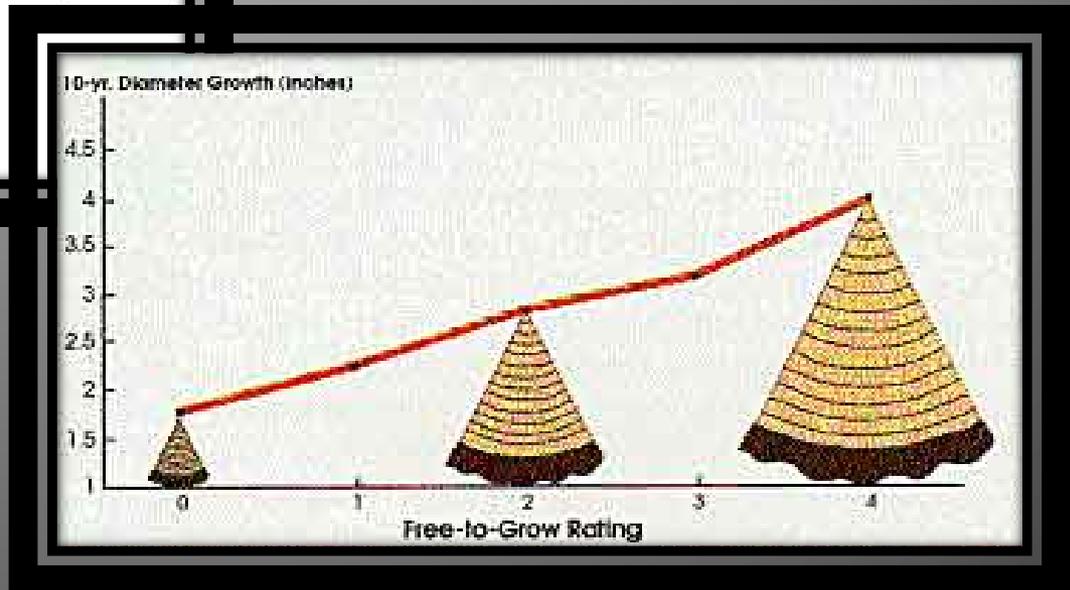
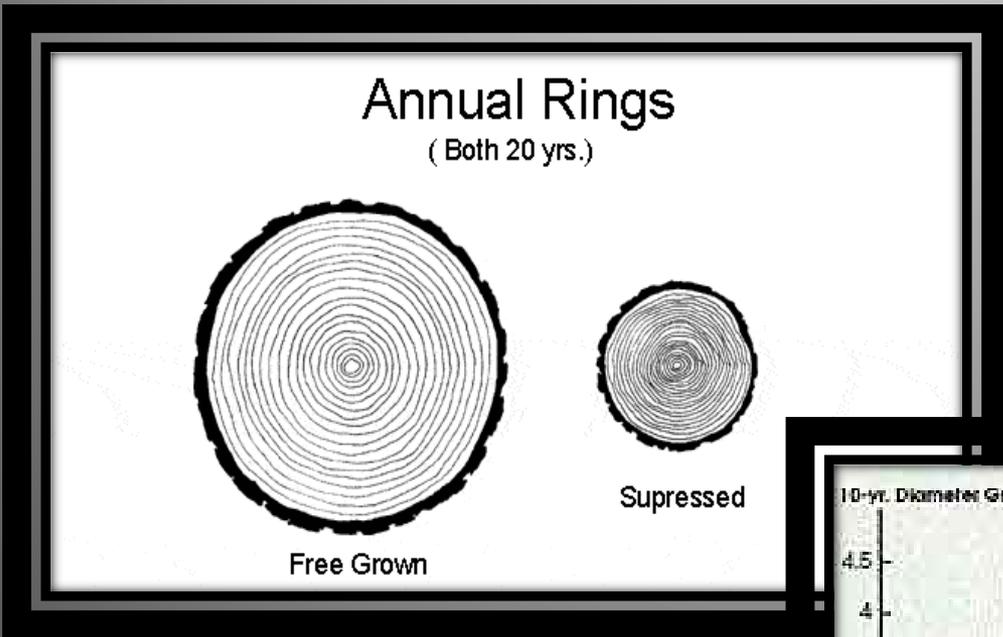


Photo: Jay C. Hayek, U of I

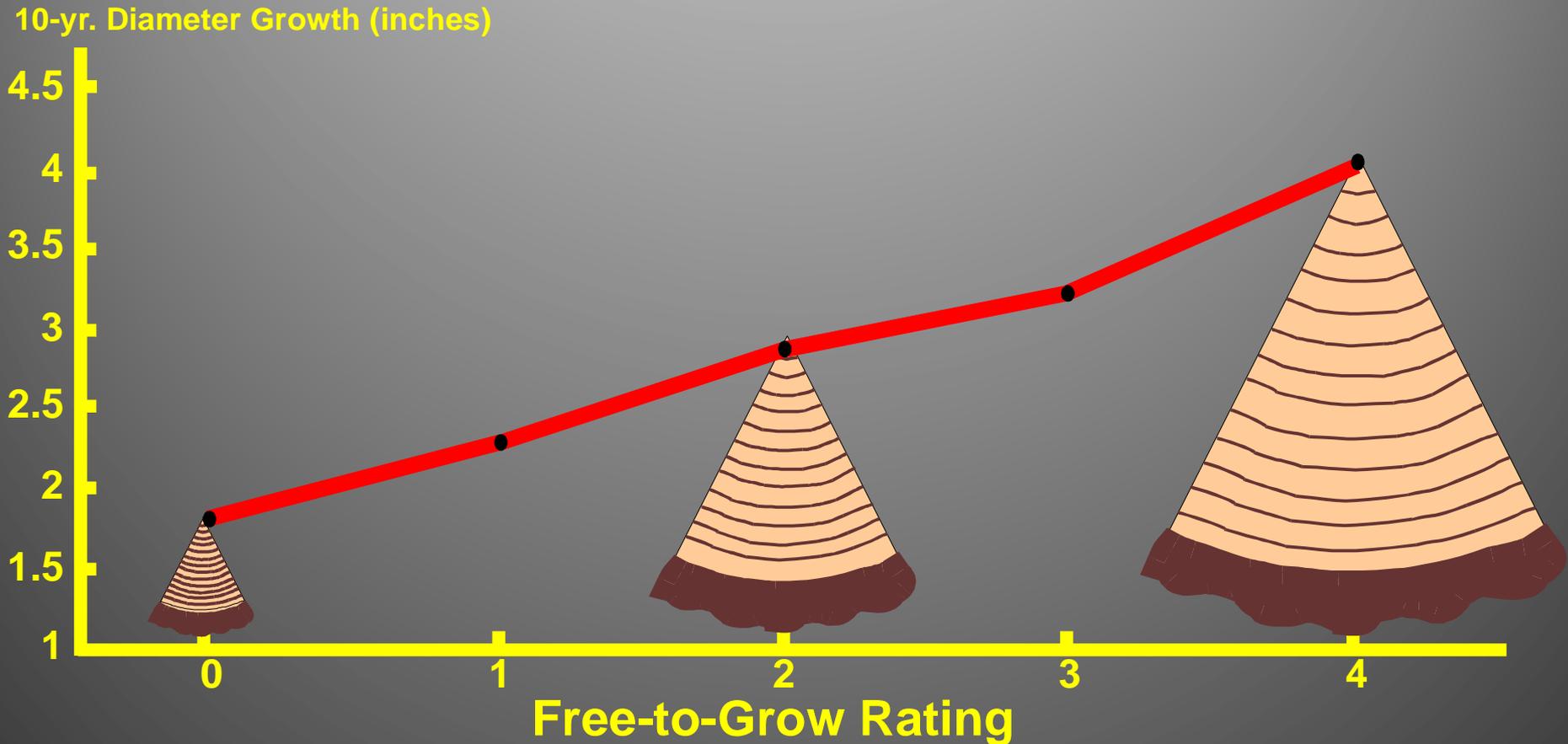
Growth and Financial Data



CTR Growth Response

- CTR results in “directed” growth! On your best Trees!
 - It’s not really about water or nutrients—it’s more about light and crown/canopy space
- Results in well-spaced crop trees for rapid response to enhanced growing conditions
- The best growth response will be on your best sites

10-Year Diameter Growth in Inches for 20 Best Crop Trees/Acre in 54-year-old Stand



CTR: Growth Response

EXAMPLE:

Assume 35 crop trees were released in a 6" diameter mixed hardwood stand

- CTR on 4 sides would yield and expected 4" of diameter growth every 10 years.
- We can expect a CTR on 2 sides would yield 2.5" of diameter growth.

What growth can we expect after 50 years by maintaining a consistent free to grow rating?

(Two additional treatments would likely be needed to maintain this which may include an additional CTR and potentially a commercial thinning)

CTR: Growth Response

4 Sided Release

26" DBH / 1.5 logs (24') = 388 board feet

35 Crop trees per acre (x) 388 bdft/tree

= **13,580 board feet/acre**

2 Sided Release

18" DBH / 1.5 logs (24') = 166 board feet

35 Crop trees per acre (x) 166 bdft/tree

= **5,180 board feet/acre**

@ 70 Crop Trees per acre = 11,620 bdft/acre

Still 1,960 bdft/acre less

Financial Perspective

35 Crop Trees @ 4 sides would yield ~2,000 bdft more per acre at the time of final harvest than 70 crop trees @ 2 sides.

In walnut stands this could mean an additional \$4,000 to \$10,000+ per acre.

In oak stands this can be an additional \$800 to \$2,000 per acre.

Crop Tree Management also can provide opportunities to develop advanced regeneration, control species composition, tree quality and overall forest health.

Financial Perspective

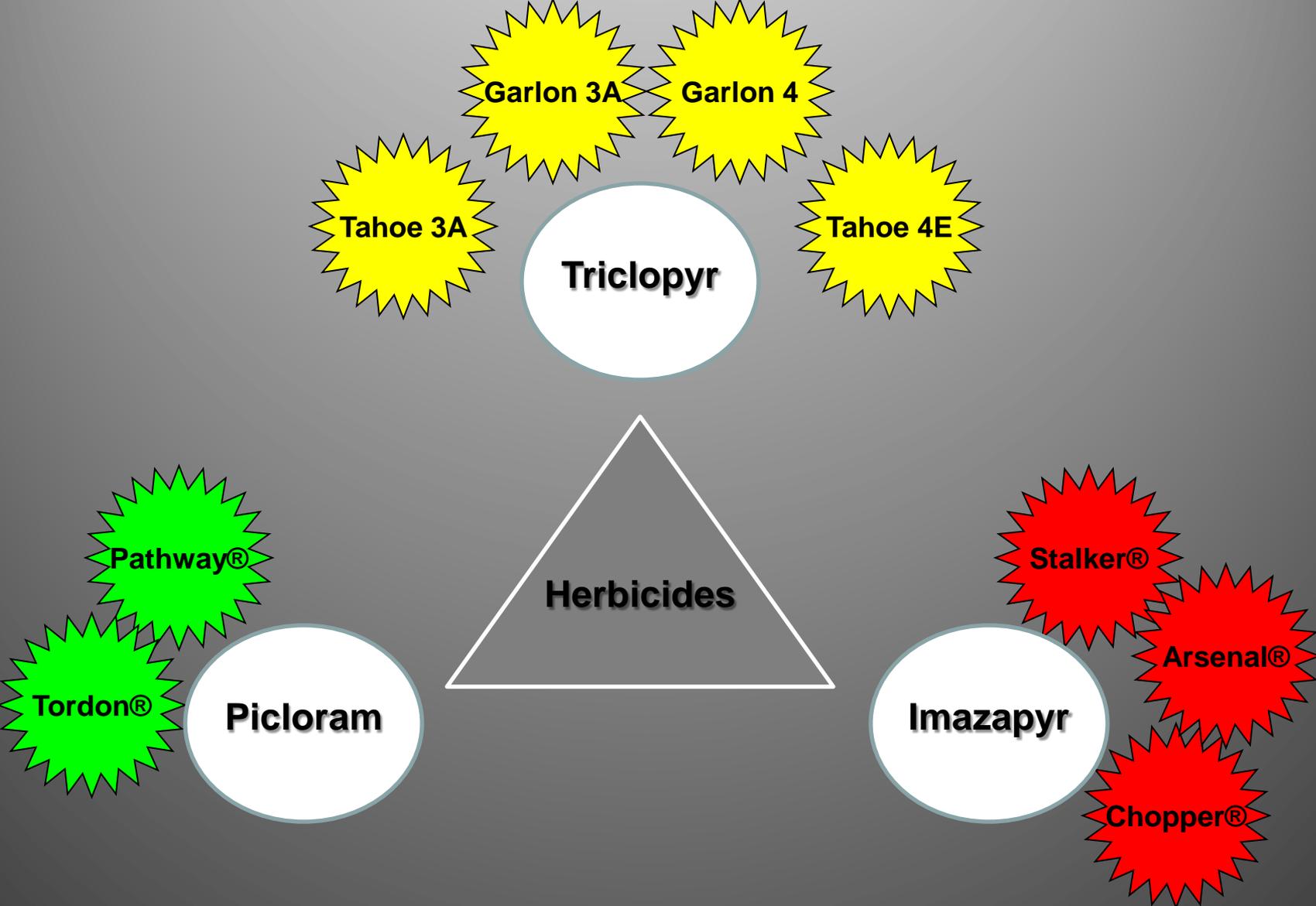
- To produce greater financial benefits, focus—or invest—your efforts on individual trees of potentially high value!
- Your Real Rate of Return (ROR) will vary depending upon:
 - Species, # crop trees, growth, quality, markets, labor costs, cost-share incentives, investment horizon, inflation, etc.

Financial Investment Tools

- Quick-Silver Forestry Investment Analysis Program
- Fast and flexible program for economic analysis of long-term, on-the-ground resource management projects for forest managers.

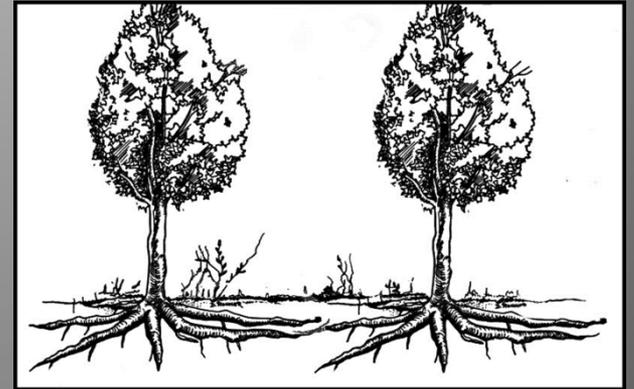
[http://www.urbanforestrysouth.org/resources/files/
Application.2004-12-21.3316/view](http://www.urbanforestrysouth.org/resources/files/Application.2004-12-21.3316/view)

Commonly Used Herbicides



Herbicide Flashback

- **Defined:** the translocation of systemic herbicides through root grafts of similar species:



- Be cautious with glyphosate, Picloram, and Imazapyr products due to flashback potential

Girdle/Frill Hack-n-Squirt Method



Jim Miller, USDA FS, forestryimage.org

Cut Stump Application





“Basal Spray”

Credit: BASF

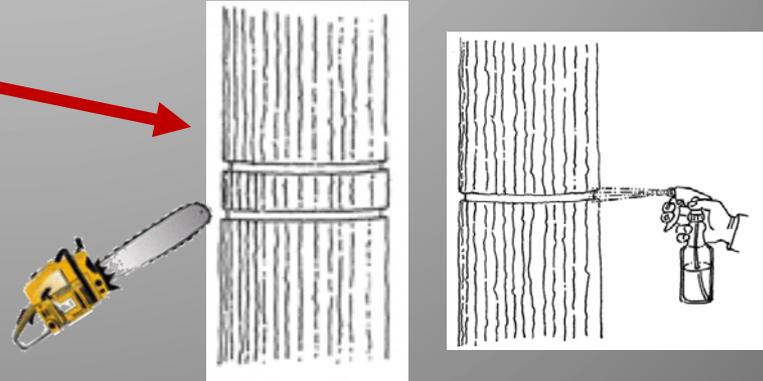


UGA0016328

Herbicide Use

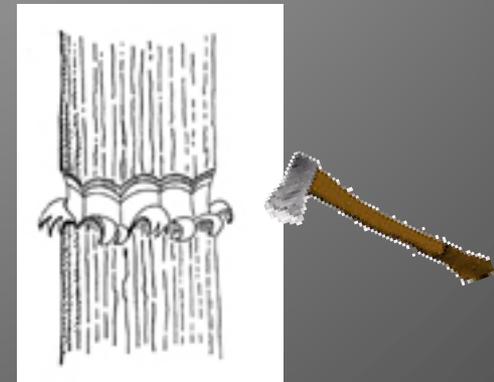
Girdle Method:

- Amine-based herbicides:
 - Garlon 3A, Pathway, Arsenal, Stalker, etc.



Frill Method:

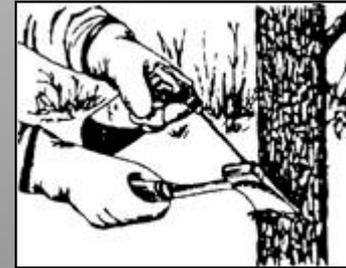
- Amine-based herbicides
 - Garlon 3A, Pathway, Arsenal, Stalker, etc.



Herbicide Use

Hack-n-Squirt

- Amine-based herbicides:
 - Garlon 3A
 - Tahoe 3A
 - Pathway
 - Arsenal



Stump Application

- Amine-based herbicides:
 - Garlon 3A, Tahoe 3A, Pathway, Stalker, Arsenal, etc.
- Ester-based herbicides:
 - Garlon 4, Tahoe 4E, Crossbow



**ALWAYS - read
and follow label
instructions for
all chemicals!**

Forest Herbicide Fact Sheets

- **The Ohio State University Extension**

<http://ohioline.osu.edu/for-fact/pdf/0045.pdf>

<http://ohioline.osu.edu/for-fact/pdf/0051.pdf>

- **The Penn State University**

<http://pubs.cas.psu.edu/freepubs/pdfs/UH174.pdf>

- **WDNR Herbicides for Forest Management**

<http://dnr.wi.gov/org/land/Forestry/FH/weeds/herbicides.htm>

Selected Publications

- **“State” NRCS eFOTG**

http://efotg.sc.egov.usda.gov//efotg_locator.aspx

- **Univ. of Tennessee & Univ. of Kentucky Ext.**

<http://www.utextension.utk.edu/publications/pbfiles/PB1774.pdf>

- **Crop Tree Mgmt in Eastern Hardwoods**

http://www.na.fs.fed.us/pubs/ctm/ctm_index.html

- **Purdue Univ. & IN-DNR Div. of Forestry**

<http://www.extension.purdue.edu/extmedia/FNR/FNR-IDNR-414.pdf>

- **WDNR: Intermediate Silvicultural Treatments**

<http://dnr.wi.gov/org/land/Forestry/publications/Guidelines/PDF/chapter16.pdf>

Most Common Errors

- Failure to utilize science when practicing the art
- Calling the thinning practice CTM when it is not - *Working with trees that are not dominant or co-dominant*
- Marking more than 50 crop trees per acre to avoid making hard choices
- Tendency to want to do only a 2-sided release to avoid making hard choices

Summary | Key Points

- **Crop Tree Release is strictly crown management and manipulation**
 - Leave the non-competing understory trees
 - Reduce # of crop trees vs. insufficient release
 - Light and space wins the race!
- **CTR reduces stand rotation age**
 - CTR accelerates growth of high-value yield (bdft)
 - Financial maturity achieved more quickly
 - End up with greater percentage of high-value canopy trees at the end of the rotation age!

Summary | Key Points

- “...all trees are not created equal... there are only a limited number of trees that have the potential to produce high-value products.” (Perkey 1993)
- CTR returns more than most other management activities
- Therefore, if you do nothing else with your woodlands, at least implement CTR!
 - The Proof is in the Numbers!

Thank you for you're attention!

Questions?