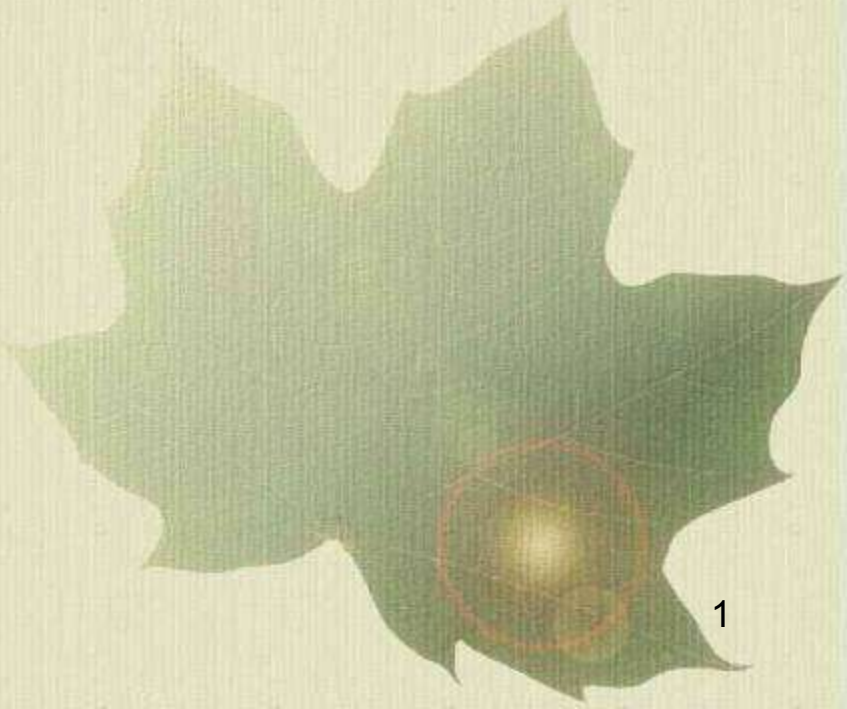
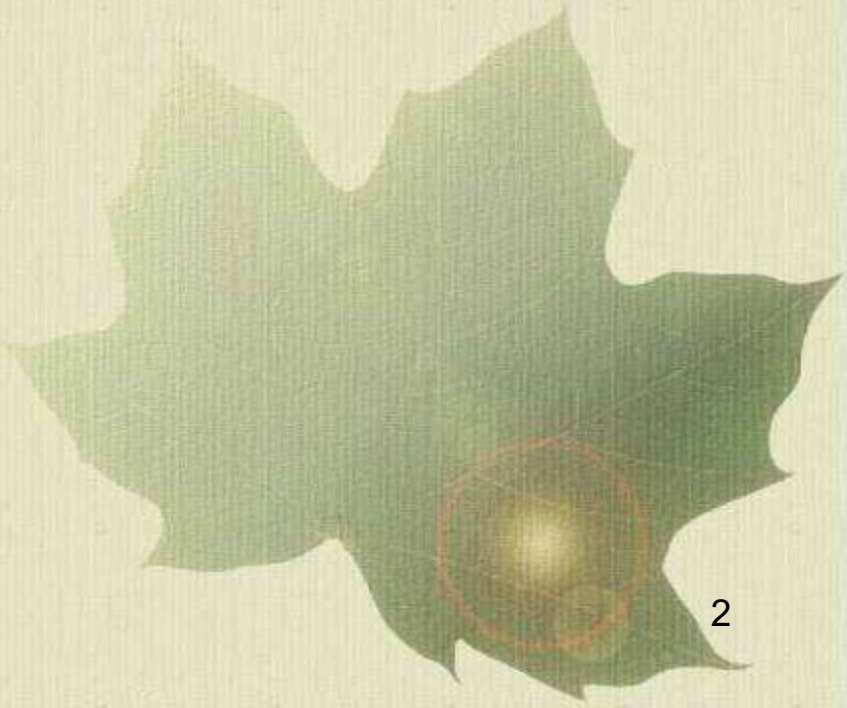
Principles and Practices of Sugar Bush Management



This workshop is another title in the

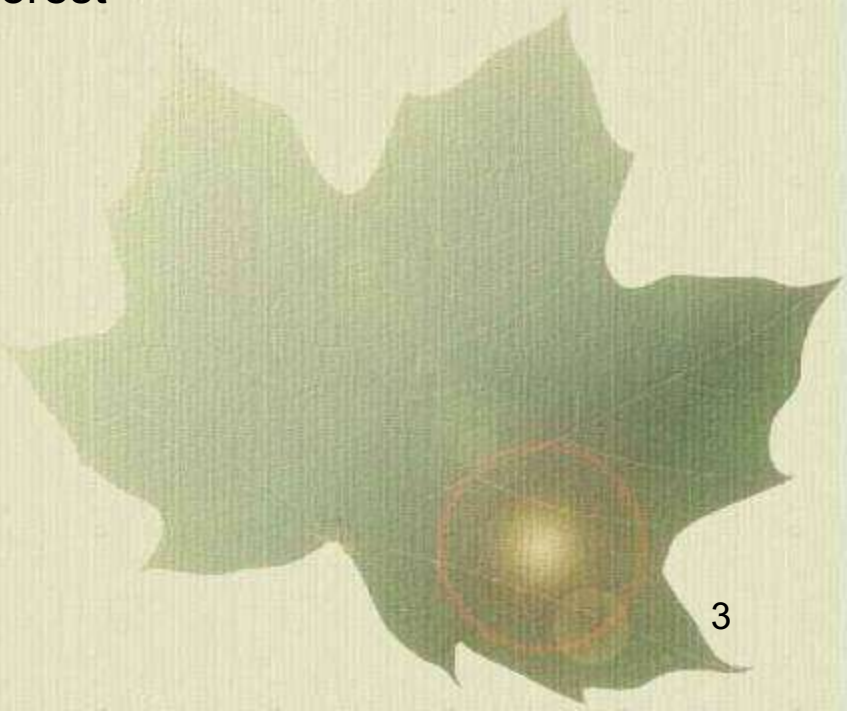
Caring For Your Land Workshop Series



Supporting partners in the

Caring For Your Land Workshop Series

- Ontario Stewardship Program
- Conservation Ontario
- Eastern Ontario Model Forest



The Principles and Practices of Sugar Bush Management

Workshop Outline:

Module 1: Introduction

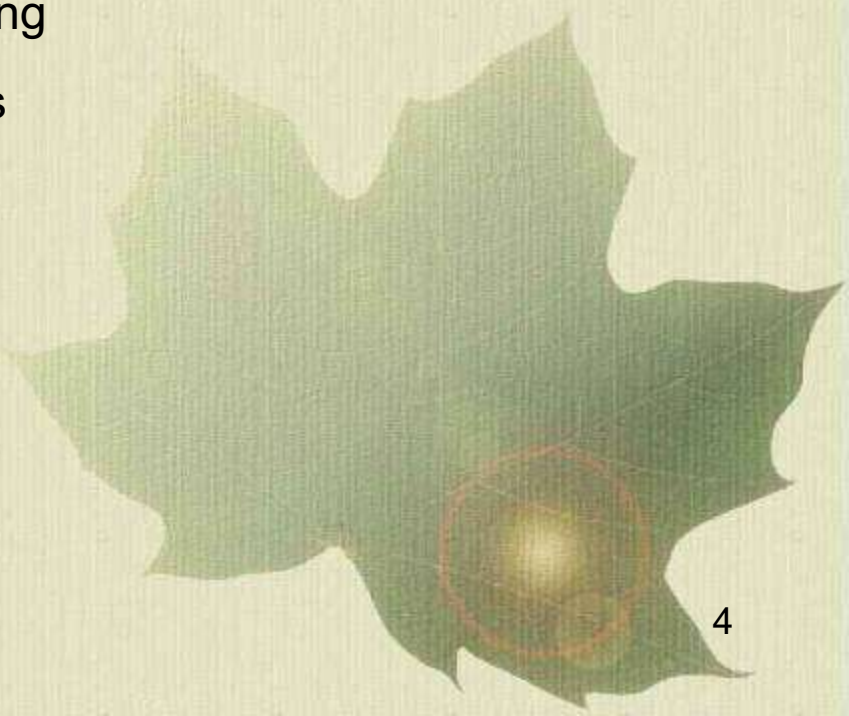
Module 2: Management Planning

Module 3: Marking and Harvesting

Module 4: Sugar Bush Problems

Module 5: Maple Orchards

Module 6: Maple Facts



The Principles and Practices of Sugar Bush Management

Selected References:

1) *A Silvicultural Guide to Managing Southern Ontario Forests* available through the Ontario Woodlot Association (613-258-0110)
2) *A Landowners Guide to Selling Standing Timber* also available through the OWA
3) *Sugarbush Management: A guide to maintaining tree health* (available ???)
4) *North American Maple Syrup Producers Manual* available through the Ontario Maple Syrup Producers Association (OMSPA)
5) *Protection of Ice-Damaged Sugar Bushes*. Five extension notes available through the EOMF
6) *Sugar Bush Management for Maple Syrup Producers* (available ????)

The Principles and Practices of Sugar Bush Management

Module 1 - Introduction:

1) What is sugar bush management?
2) Why manage your sugar bush?
3) What are some of the general terms and concepts?

What is Sugar Bush Management?

Is it …. Cutting trees?

Is it …. Stringing tubing?

Is it …. Making syrup?

Sugar bush management can be looked at as those activities associated with caring for your forest

What is Sugar Bush Management?

Scale is also important…

10 taps or 10000 !!

Proper

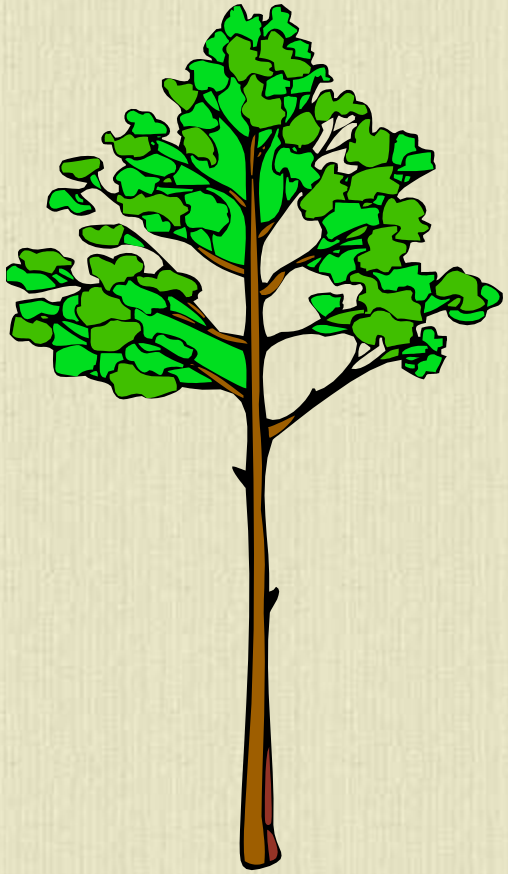
What is Sugar Bush Management?

- It's doing what is right
- It's being an informed landowner
- It's being able to adapt

- It means doing more then just tapping trees

- It is the area that most syrup producers don't put enough resources into

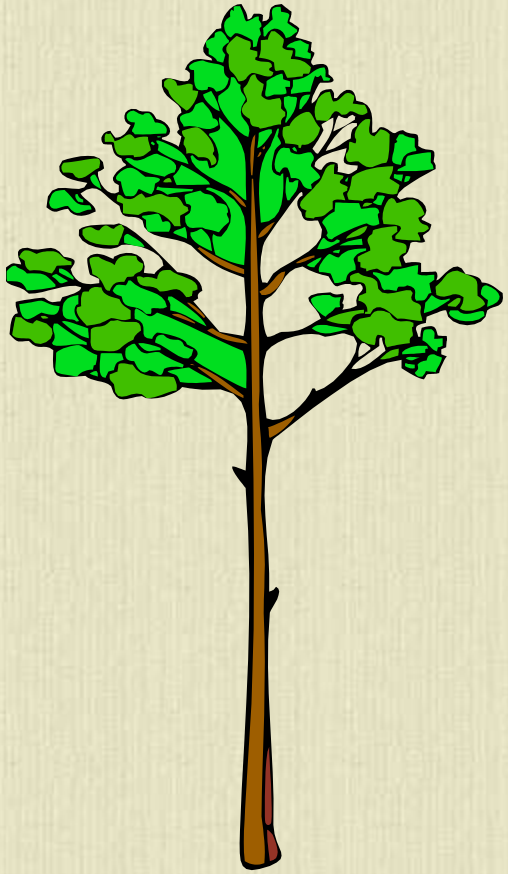
Why ‘manage’ your sugar bush …



After all…

- Sap flows from maple in both managed and unmanaged sugar bushes
- Management takes time, knowledge, careful planning and COSTS MONEY
- Benefits aren’t immediate
- Mistakes can be costly

Why ‘manage’ your sugar bush …

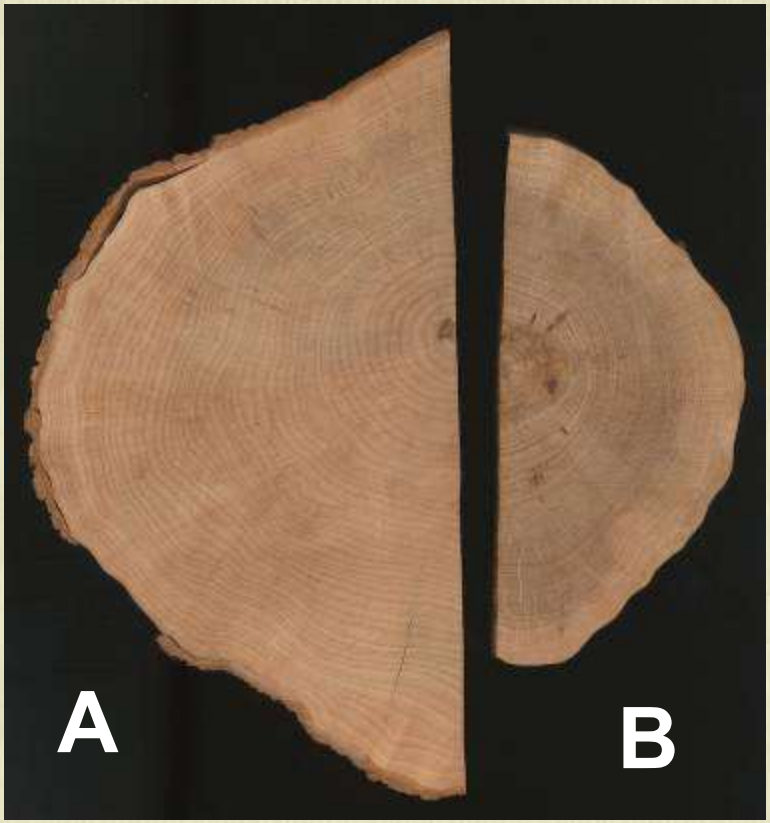


Benefits include…

- faster growth
- more sap per tap
- sweeter sap
- a healthier forest
- a periodic timber harvest
- a sustainable sugar bush

Why ‘manage’ your sugar bush …

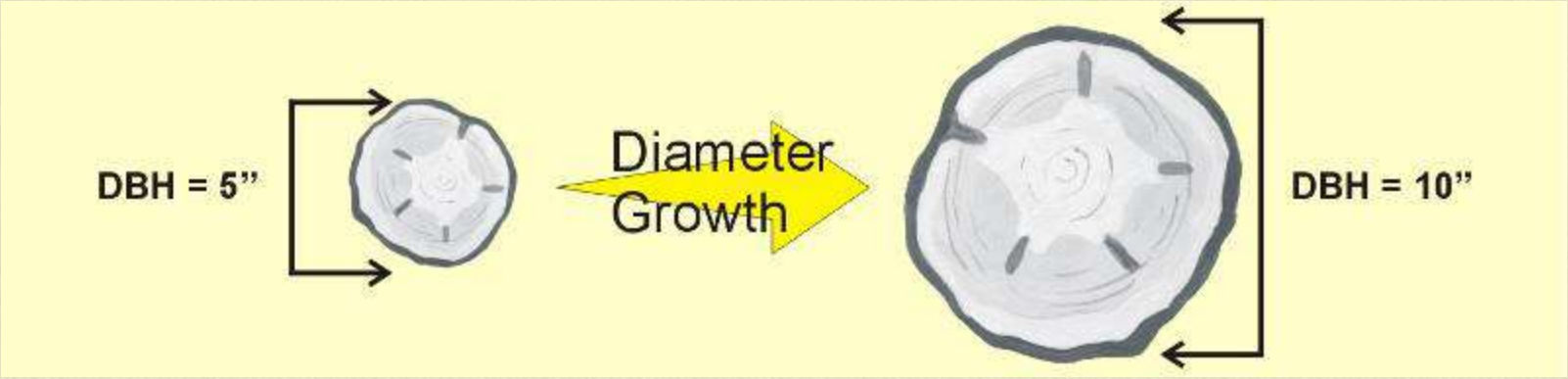
Faster growth…



Which tree would you rather have in your sugar bush?

Why ‘manage’ your sugar bush …

Faster growth…



A 5” tree growing in a …

Unmanaged Forest

- would take 65 years to grow into the 1 tap diameter class
- Would produce $345 worth of syrup over the next 100 years

Managed Forest

- would take 29 years to grow into the 1 tap diameter class
- Would produce $1260 worth of syrup over the next 100 years

Why ‘manage’ your sugar bush …

More sap per tap…

- A managed sugar bush is producing about 2 liters per tap more then an unmanaged one
- This means more sap from the existing infrastructure… more money

Why ‘manage’ your sugar bush …

Sweeter sap…

Keep in mind, sap sweetness varies …

- Between trees (genetics)
- Hour by hour, day by day and year by year

- Proper management favours trees that produce sweeter sap
- The decision to harvest one tree over another should be based in part on sap sweetness

Why ‘manage’ your sugar bush …

A healthier forest …

Management tends to improve the health of a sugar bush

Sugar bushes are always vulnerable to weather

Why ‘manage’ your sugar bush …

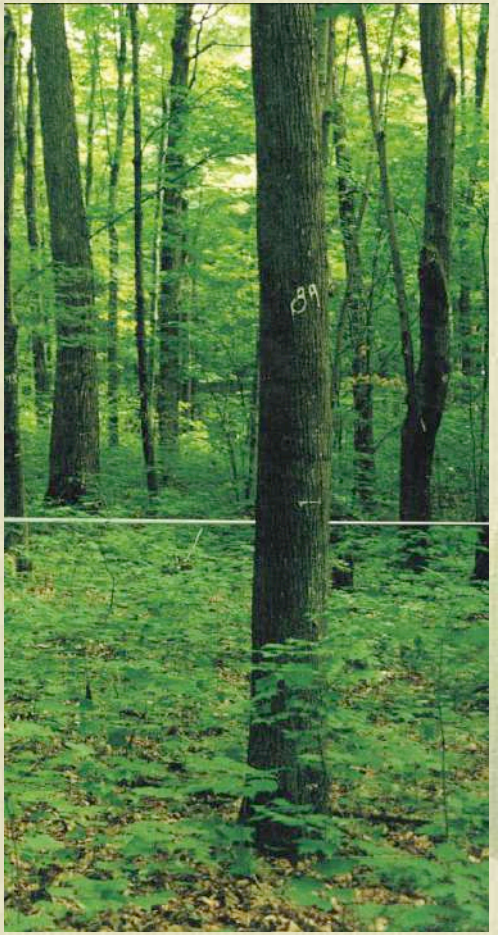
A periodic timber harvest …

- **Trees grow each year**
- **Proper management means that the number of trees is controlled**
- **This produces a periodic supply of sawlogs and fuelwood**
- **Trees are thinned out of the forest to enable the remaining ones to grow at a maximum rate**

Careful harvesting is important!

Why ‘manage’ your sugar bush …

A sustainable forest …



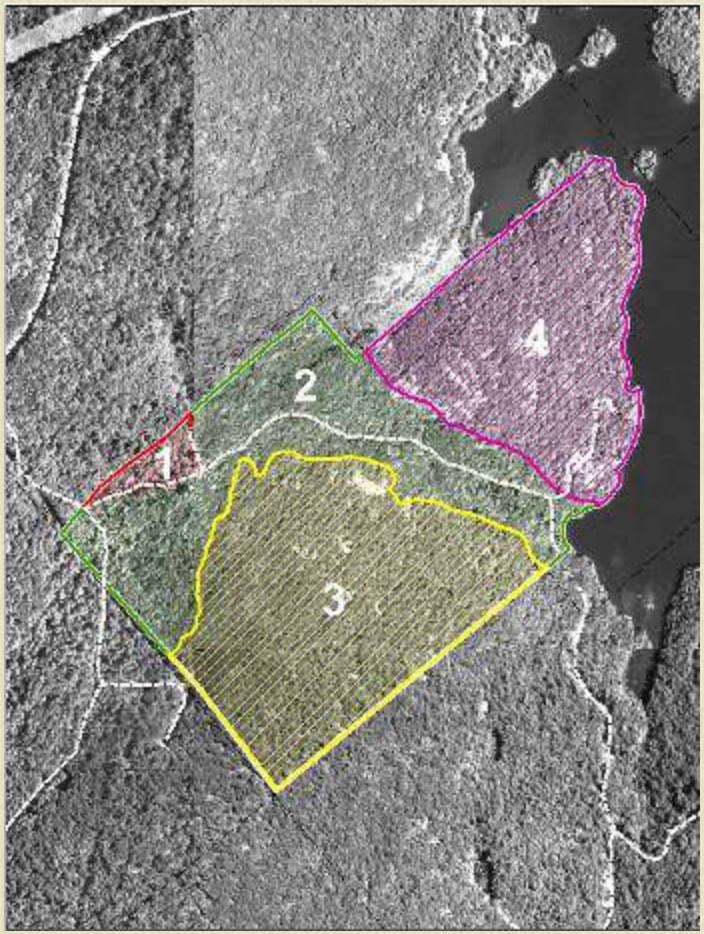
General Terms and Concepts

Sugar Bush Classification

- **Forests are classified into different categories**
- **Allows for comparison with**
  - **Other forests**
  - **What is recommended**

General Terms and Concepts

Forest Stands



- **Forests are also classified into different STANDS**
- **Stands contain trees that are similar in size, species and age**

General Terms and Concepts

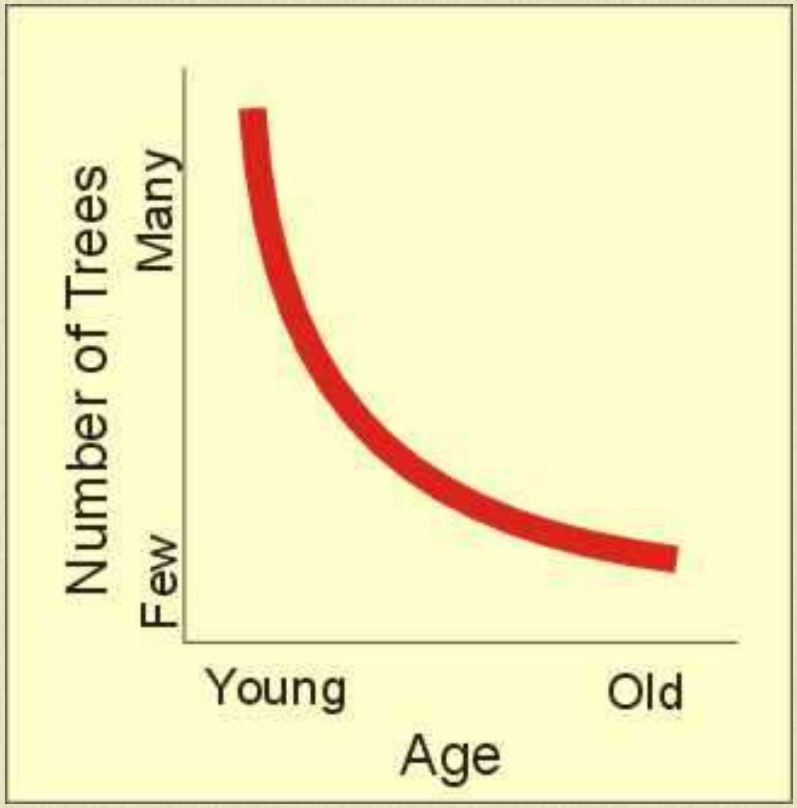
All-aged vs. Even-aged Management

All-aged Sugar Bush

Even-aged Sugar Bush

General Terms and Concepts

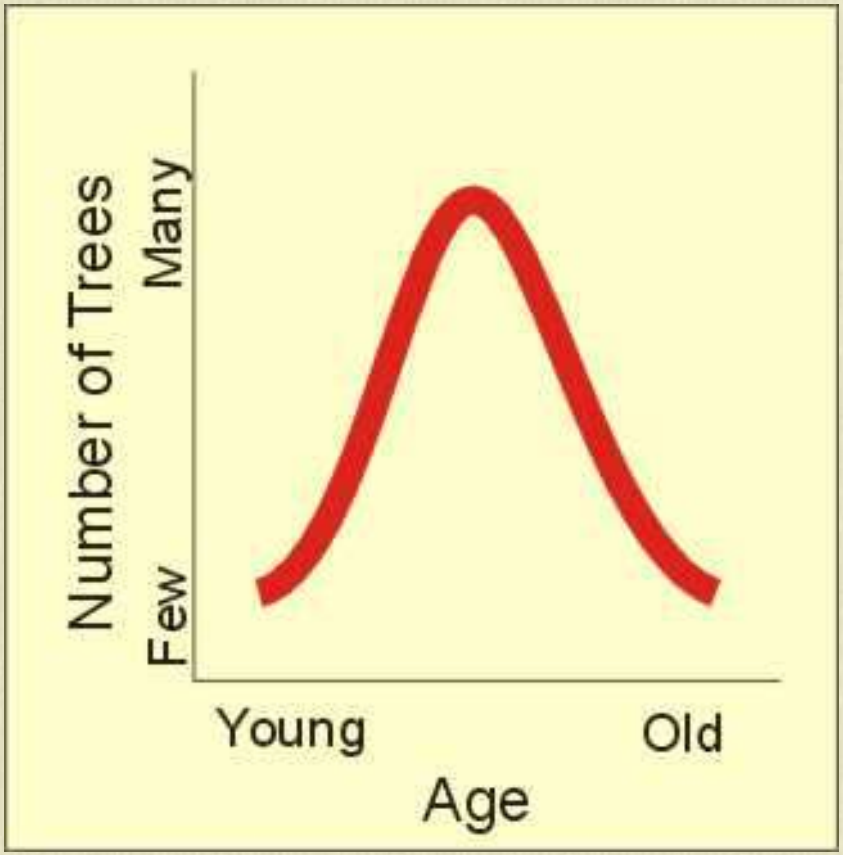
The All-aged Sugar Bush



- **There are many more young trees then there are old trees**
- **The young ones will eventually replace the old ones**
- **Less taps/hectare**

General Terms and Concepts

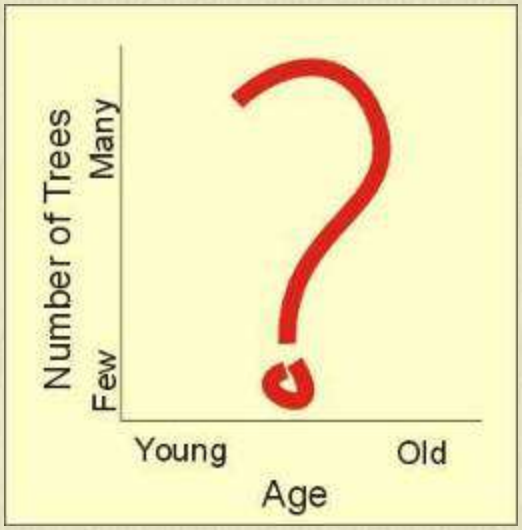
The Even-aged Sugar Bush



- **Most of the trees are the roughly the same age**
- **Similar in age does not mean similar in diameter**
- **Usually have more taps/hectare**

General Terms and Concepts

What's better? – all-aged or even-aged

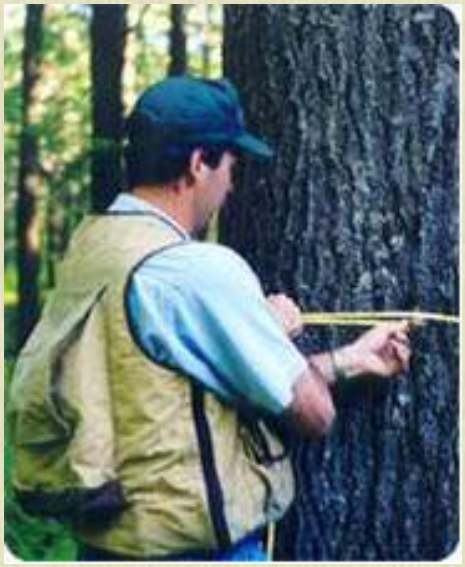


It depends on:

- **What you have now**
- **How much you have**
- **What kind of condition it is in**

General Terms and Concepts

Tree Diameter



- **Usually taken at 1.3 m (breast height)**
- **Called diameter at breast height (DBH)**
- **If the stem is deformed move the measurement up or down**

General Terms and Concepts

Tree Diameter

Tree A
DBH: 36 cm
Height: 22 m

Tree B
DBH: 28 cm
Height: 18 m

Which tree is older?

General Terms and Concepts

Crown Position

Crown position diagram
Does any one have a drawing of crow position??

Trees occupy space!

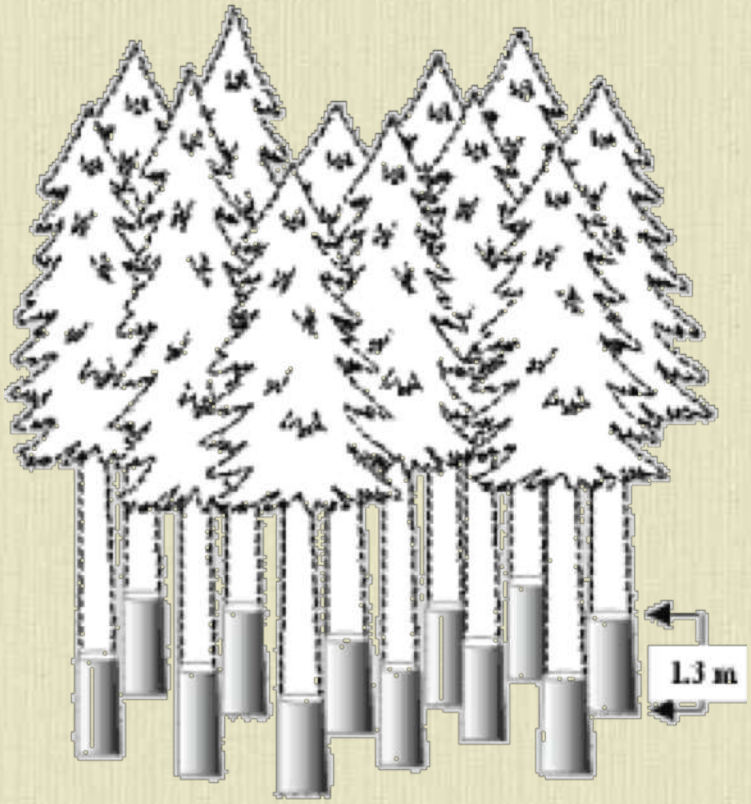
General Terms and Concepts

Crown Position

- **Open grown trees don't compete for light**
- **Open grown trees have large crowns, thick stems and branches that start close to the ground**

General Terms and Concepts

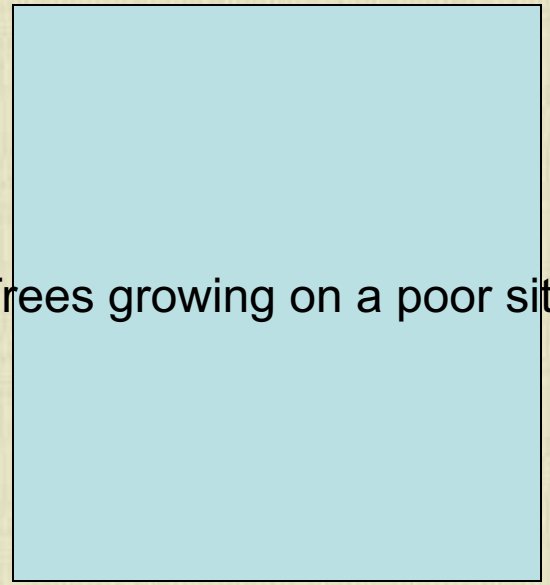
Basal Area



- **Cross-sectional area of the tree**
- **Usually expressed in terms the total basal area for an area of land … basal area per hectare**

General Terms and Concepts

Site Conditions

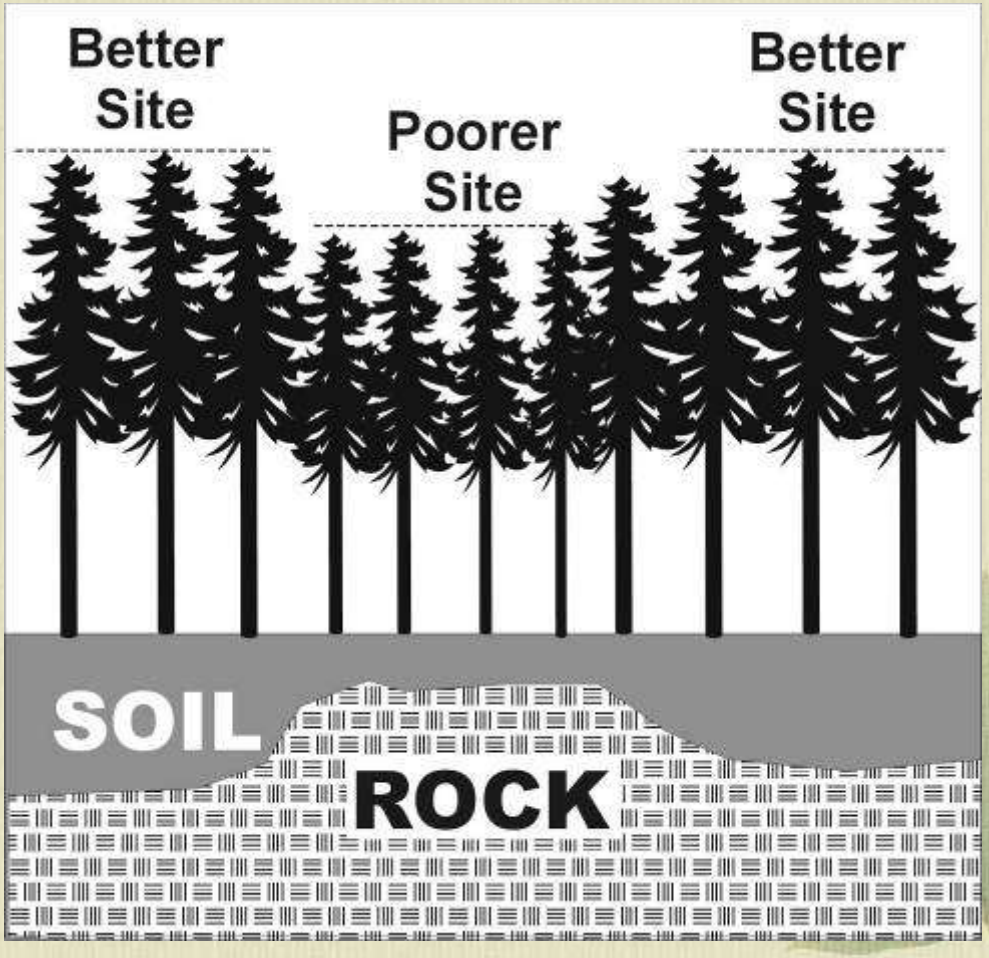


Trees growing on a poor site

- Site is important
- Impacts on management

General Terms and Concepts

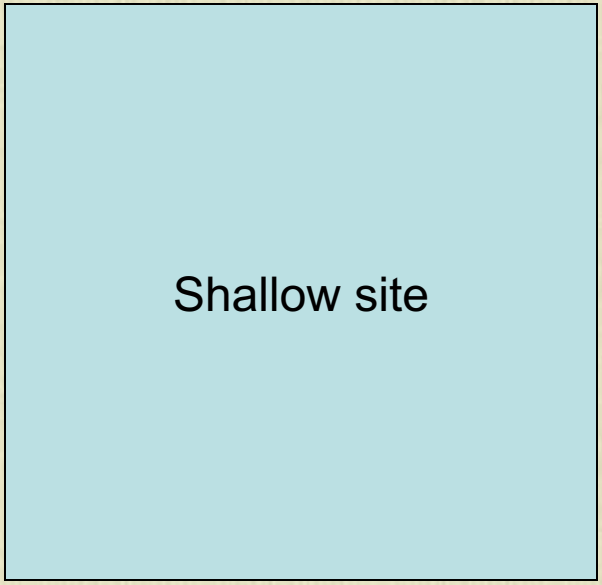
Site Conditions



General Terms and Concepts

Site Conditions

Soil Depth and Drainage

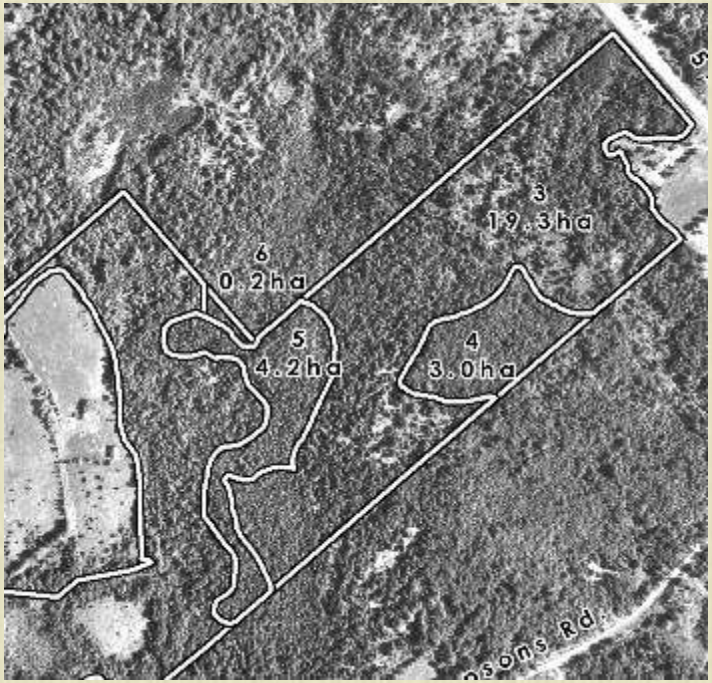


- **Shallower soils usually indicate a poorer sites**
- **Sugar maple does not grow as well on dry shallow soils, or on wet swampy areas**

General Terms and Concepts

Site Conditions

Take into consideration site quality

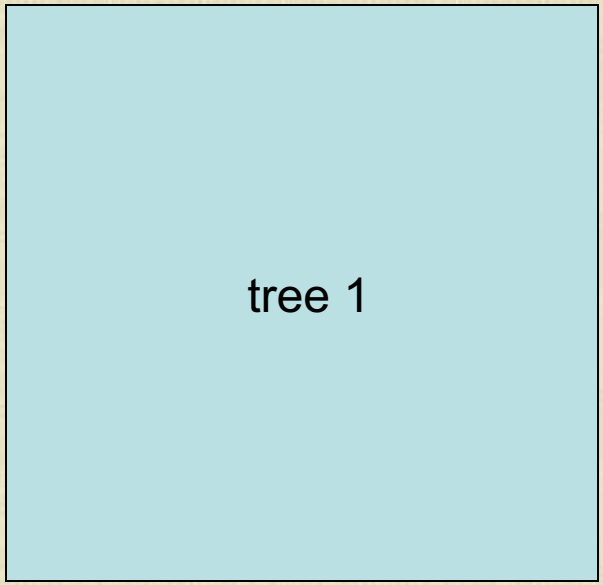


- Thinning is a way of capturing the potential of a site
- Poor sites don't respond well to thinning
- Good sites respond well to thinning

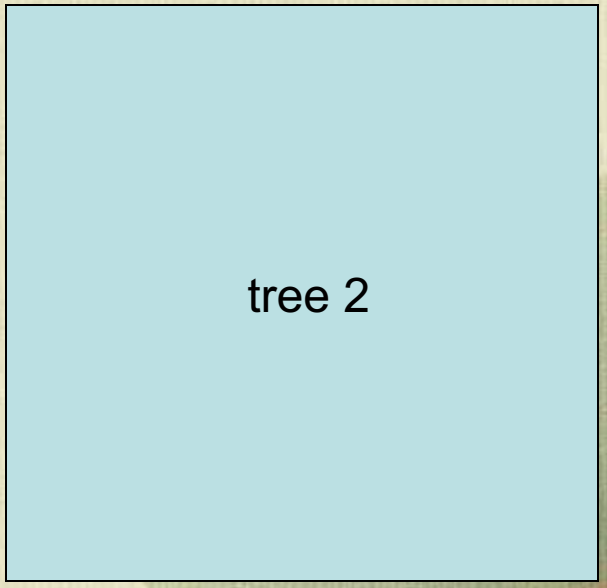
General Terms and Concepts

Tree Vigour

Not Vigorous



Vigorous



General Terms and Concepts

Stocking

A measure of whether a forest has too many, too few or just enough trees

- **a site can only grow so much biomass**
- **diameter and site dependent**
- **main indicator of whether a stand needs thinning**

Over Stocked – too much biomass

Adequately Stocked – just enough biomass

Under Stocked – not enough biomass

General Terms and Concepts

Shade Tolerance

- Trees require differing amounts of light to survive

Shade Tolerant Species

Maple, Ironwood, Beech, hemlock

Mid-tolerant Species

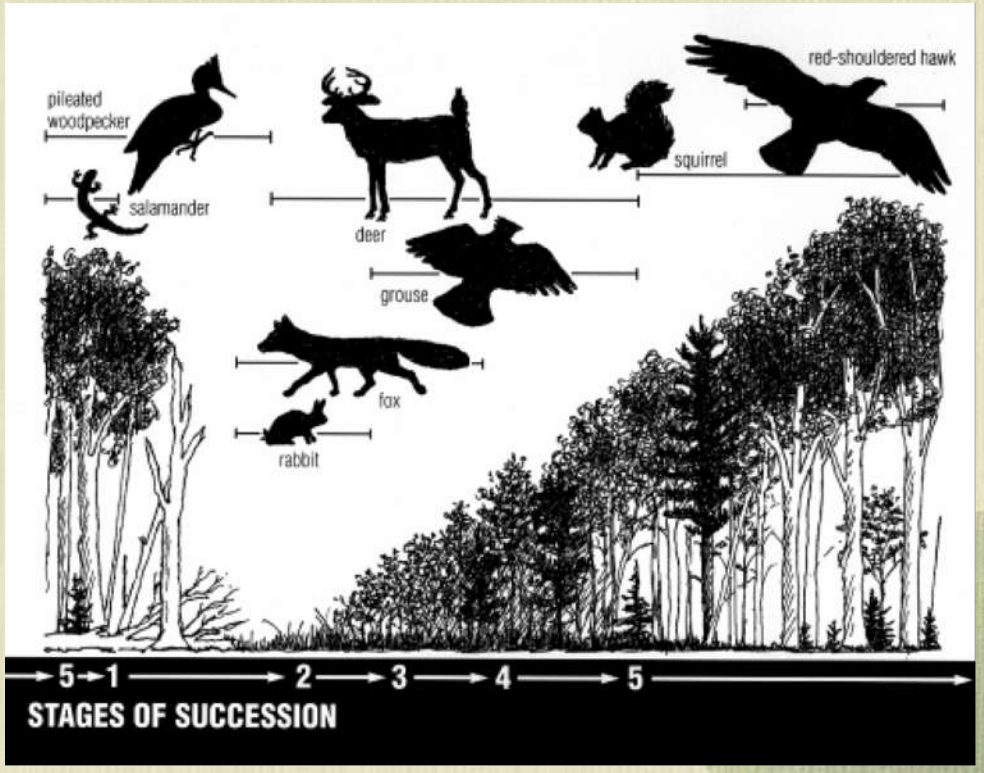
Oak, Ash, Basswood, White Pine

In-tolerant Species

Aspen, cherry, birch, red pine

General Terms and Concepts

Succession



Module 1 - Summary

- **Management means manipulation**
- **There is good management and there is bad management**
- **Management provides increased benefits**
- **Basic forestry terms**
    - Even/all-aged management
    - Site conditions
    - Basal area and tree diameters
    - Stocking
    - Vigour
    - Shade tolerance
    - Succession

Principles and Practices of Sugar Bush Management

Module 2 – Management Planning

The Principles and Practices of Sugar Bush Management

Workshop Outline:

Module 1: Introduction

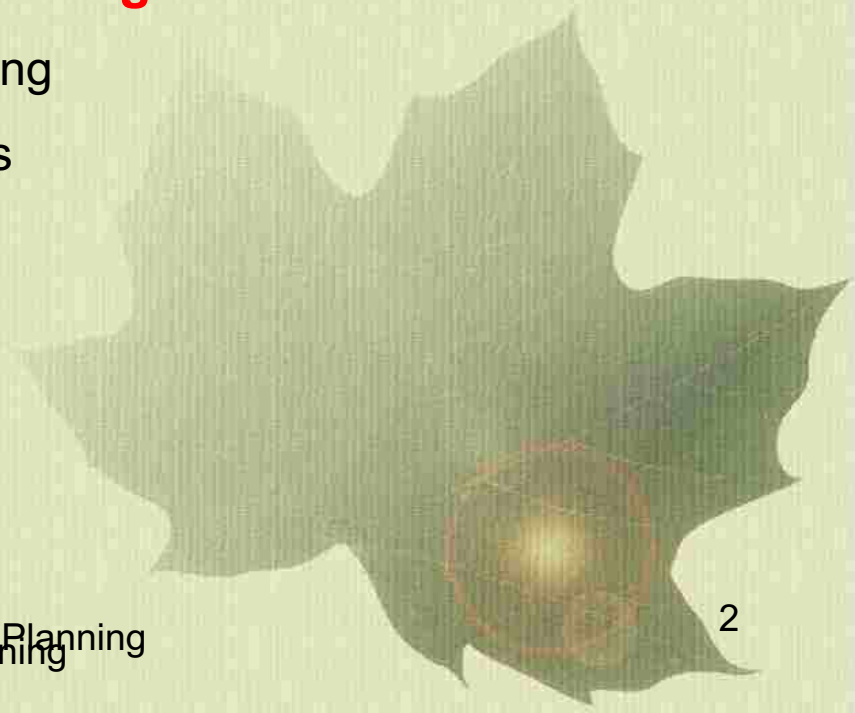
Module 2: Management Planning

Module 3: Marking and Harvesting

Module 4: Sugar Bush Problems

Module 5: Maple Orchards

Module 6: Maple Facts



In this module ….

What is the Management Cycle?

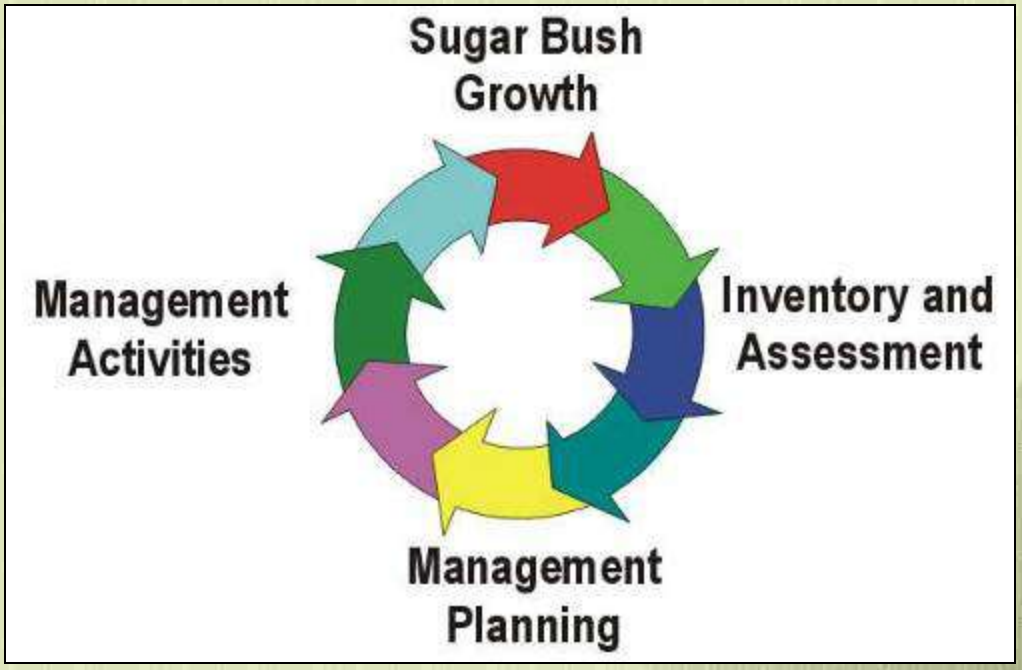
What is Management Planning?

Where do you begin?

How complex does it really need to be?

Where do I get help?

Proper management follows a cycle

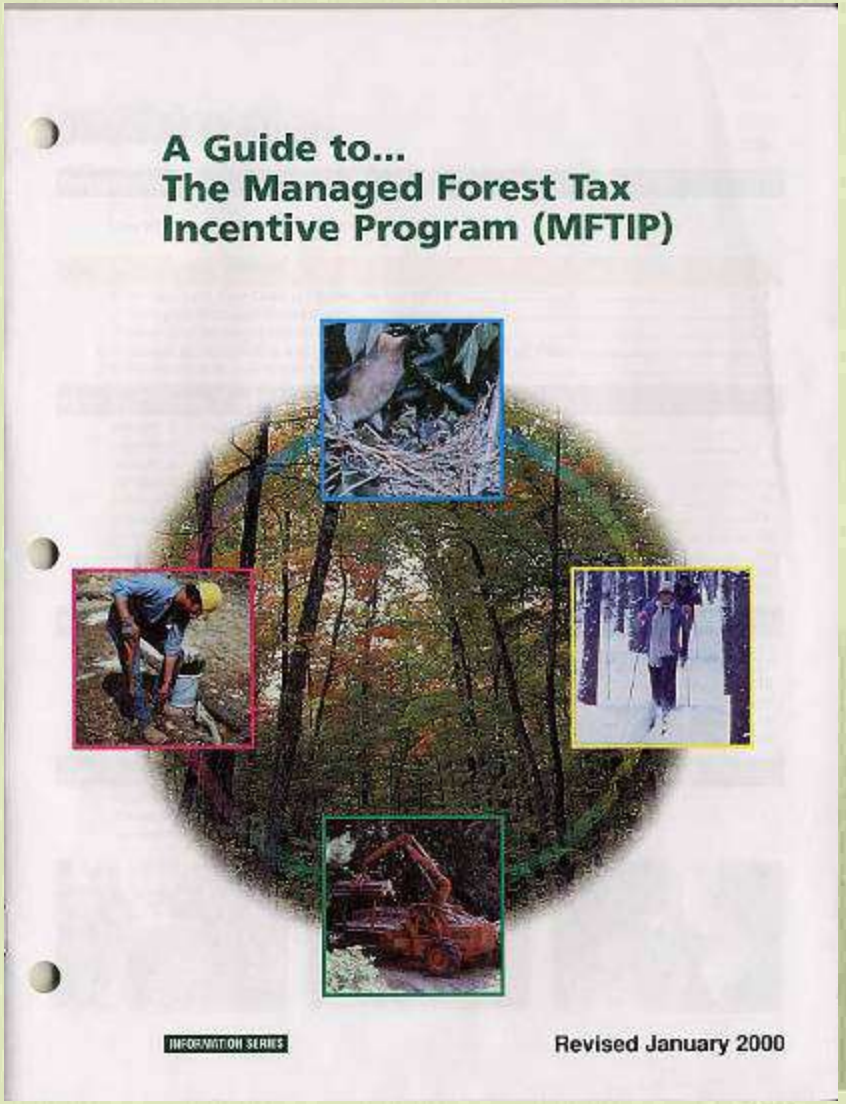


Proper management is really a series of steps

Step 1: The Management Plan

- It is a document
- It will vary in complexity depending on sugar bush size
- It is a guide for what you are going to do
- There is a sample plan included at the back of your workbook

Step 1: The Management Plan



Step 1: The Management Plan

- There are a number of sections contained within the management plan
- Some of the more important ones are:
  - Goals and objectives
  - Forest compartments and inventory
  - Forest operations (activities) schedule

Step 1: The Management Plan

Goals and objectives

- **Describe what you want to do over the plan length (5 & 20 yrs)**
- **Objectives deal with longer term**
- **Goals are usually geared at shorter period**

- **There can be goals and objectives for all the forest as well as for a smaller portion (stand) within it**

Step 1: The Management Plan

Forest Compartments

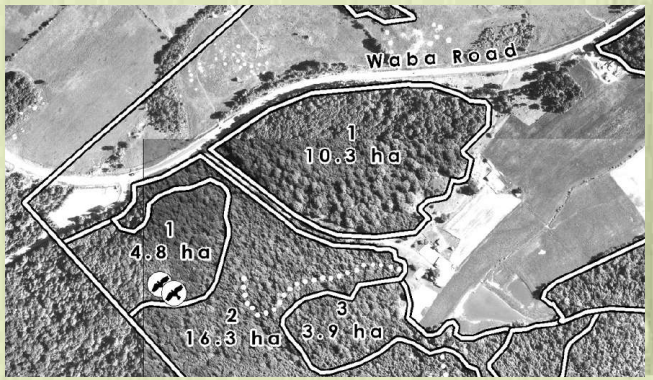
- Smaller sections of the overall forest
- Usually denote areas of similar species composition, sizes, age and/or usage
- Make it easier to decide what to do
- Can be variation within it

Step 1: The Management Plan

Forest Compartments

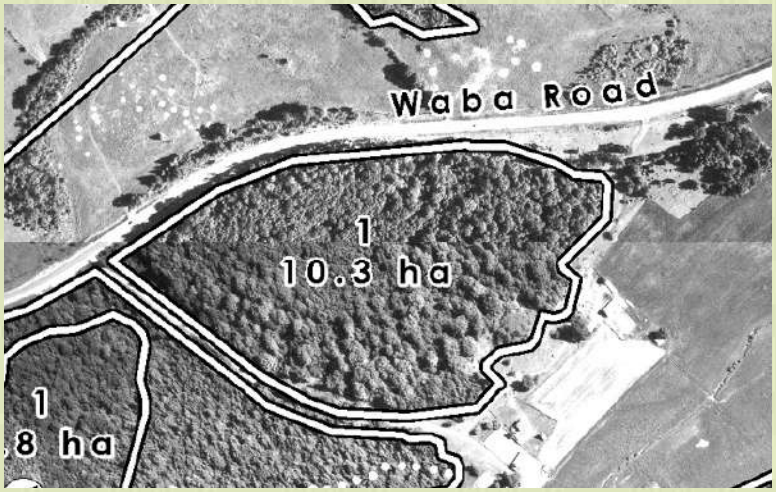
Compartment sections could address…

- **Species composition and other inventory data**
- **Landform** – slope, soil, drainage (general info)
- **Compartment Area in hectares**
- **History** – what has been done in the compartment
- **Wildlife features** – are there mast trees, stick nests etc.
- **Goals and objectives**



Step 1: The Management Plan

Forest Compartments



- **Need to know area (in hectares)**
- **Should be distinct**
- **Species composition**

$Mh_6\ Be_3\ He_1\ Or_1$

Species — **% Composition**

Step 1: The Management Plan

Forest Compartments

What would the species composition be for this compartment?

Species	Trees	BA
Iw	21	7
Mh	12	10
He	12	8
Or	2	1
Po	5	1
Pw	3	2

Iw = Ironwood
Mh = sugar maple
He = hemlock
Or = red oak
Po = poplar
Pw = white pine

Step 1: The Management Plan

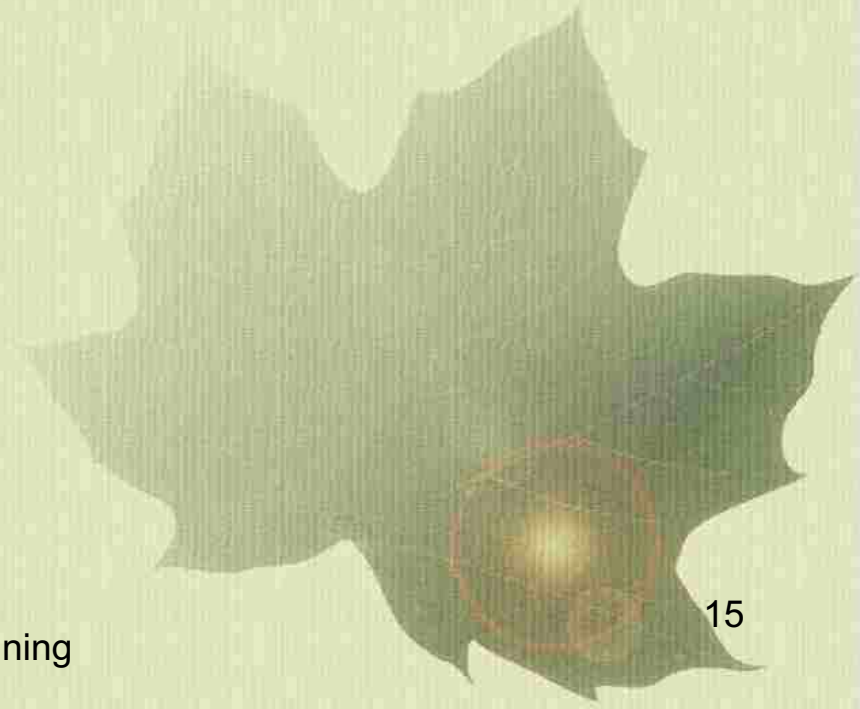
Forest Compartments

Species	Trees	%	BA	%
Iw	21	38	7	24
Mh	12	22	10	35
He	12	22	8	28
Or	2	4	1	3
Po	5	8	1	3
Pw	3	6	2	7
	45	100	29	100

$Mh_4\ He_3\ Iw_2\ Other_1$

Step 1: The Management Plan

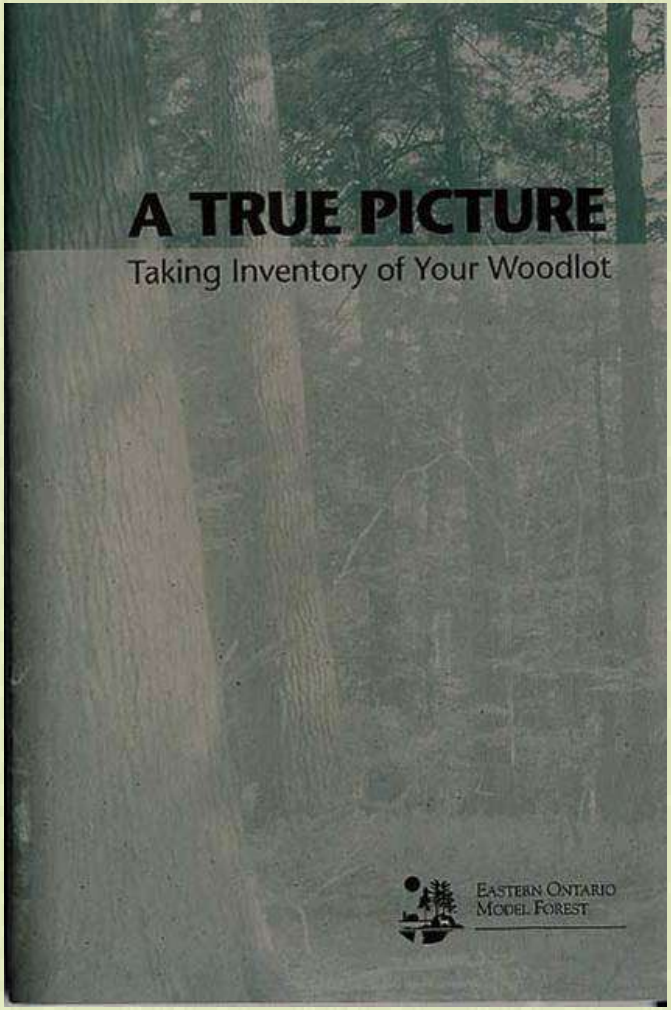
Have a management plan!!!



Step 2: The Forest Inventory

Step 2: The Forest Inventory

Step 2: The Forest Inventory



How should I inventory my sugar bush?

- Decide what information you need
- Be realistic – can you do it
- Collect reference material

Step 2: The Forest Inventory

What information do I need to collect?

- Based on two main needs
  - What you are trying to do now
  - What you are planning to do in the future

Need to collect information on tree numbers, sizes, species and conditions.

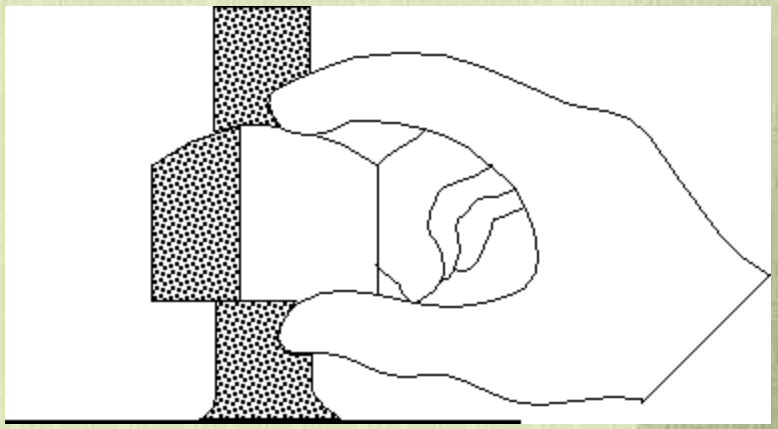
Step 2: The Forest Inventory

How should I inventory my sugar bush?

- There are two main methods
  - Prism cruise
  - Plot Sample

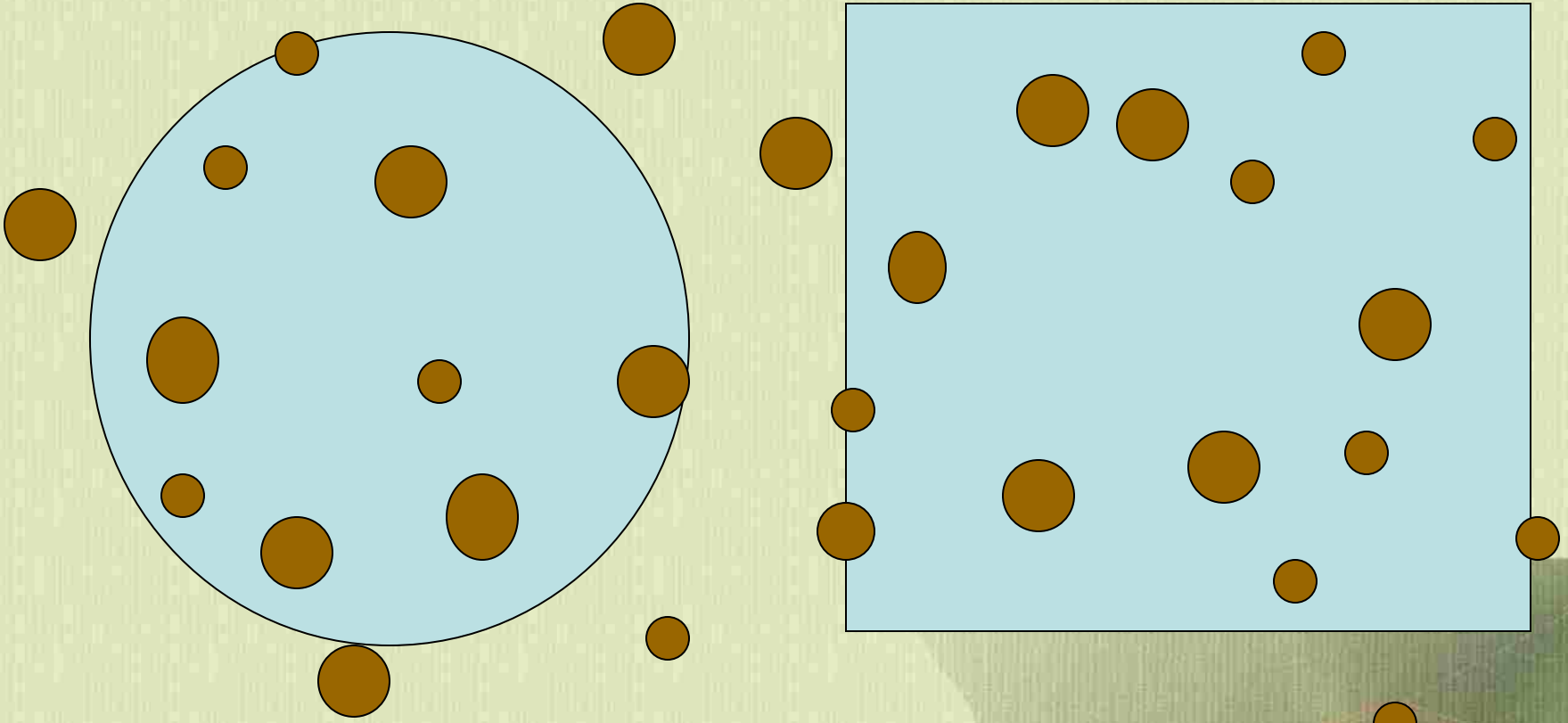
Using a prism

- A prism is a tool used to measure:
  - Basal Area (B.A.)
  - stand composition
  - diameter distribution



Step 2: The Forest Inventory

Fixed plots



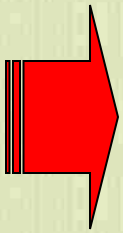
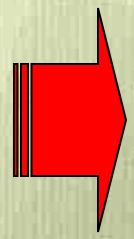
Tallying information

For each plot you will collect:

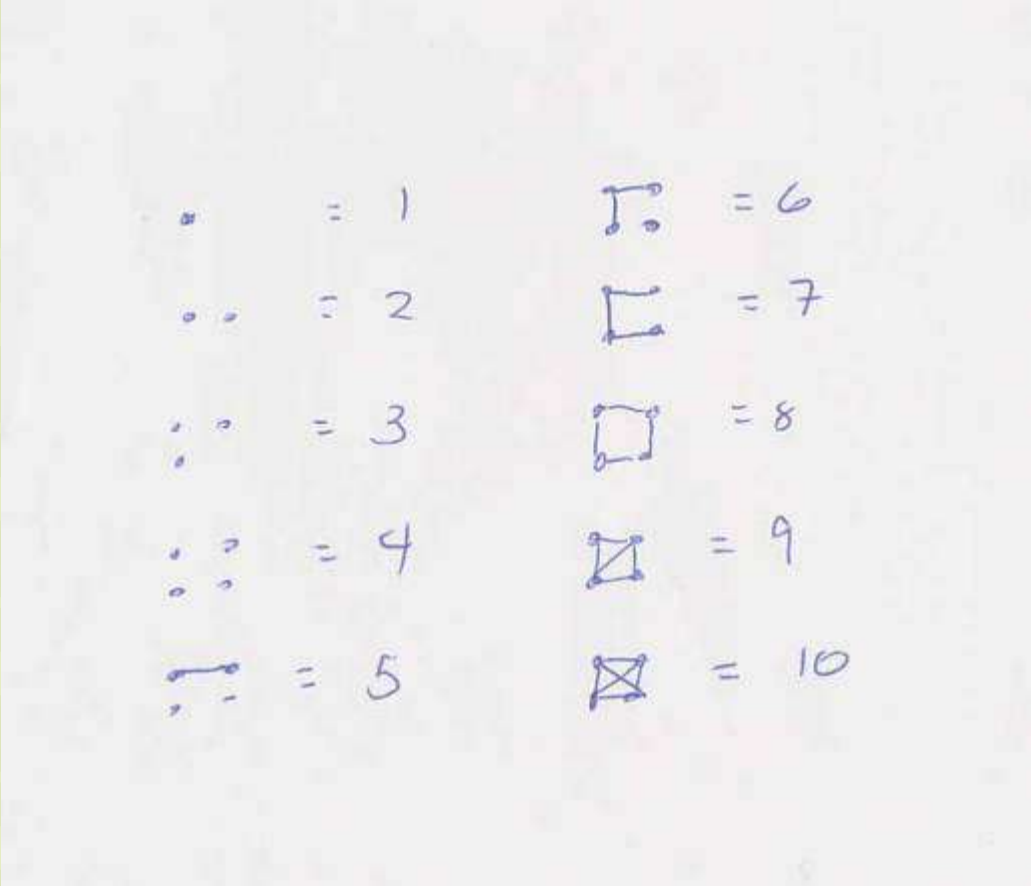
- Species
- DBH (tree diameter)
- AGS/UGS (quality)

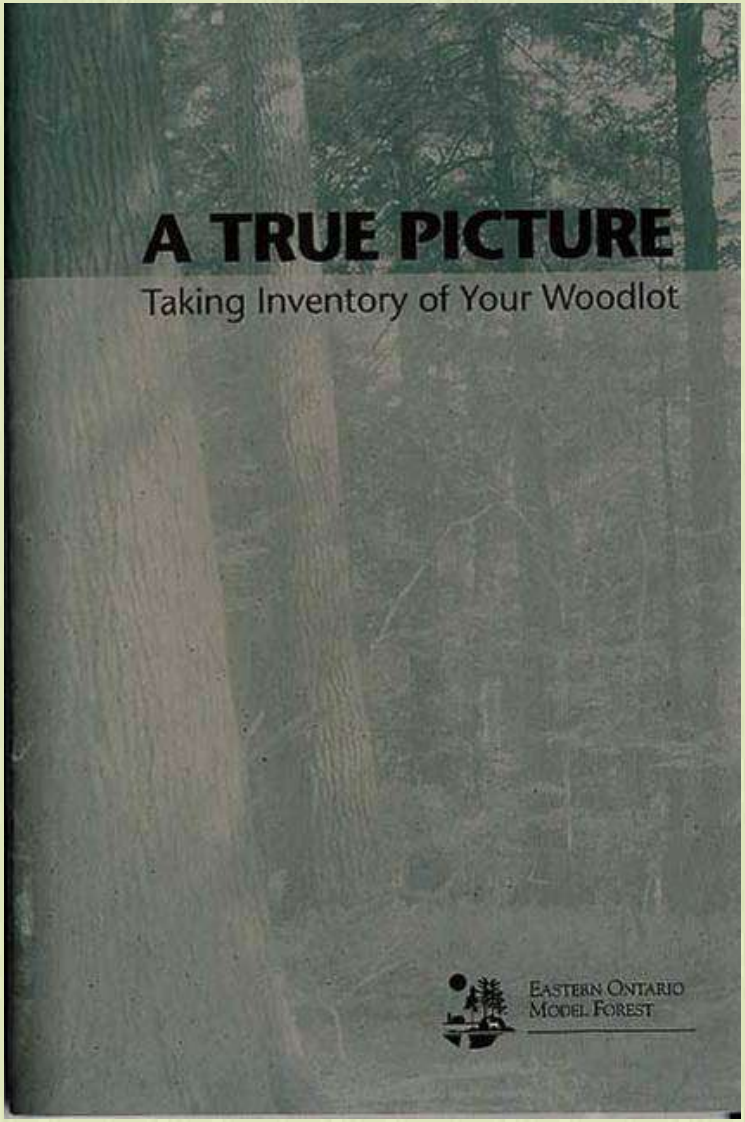
Tallying information

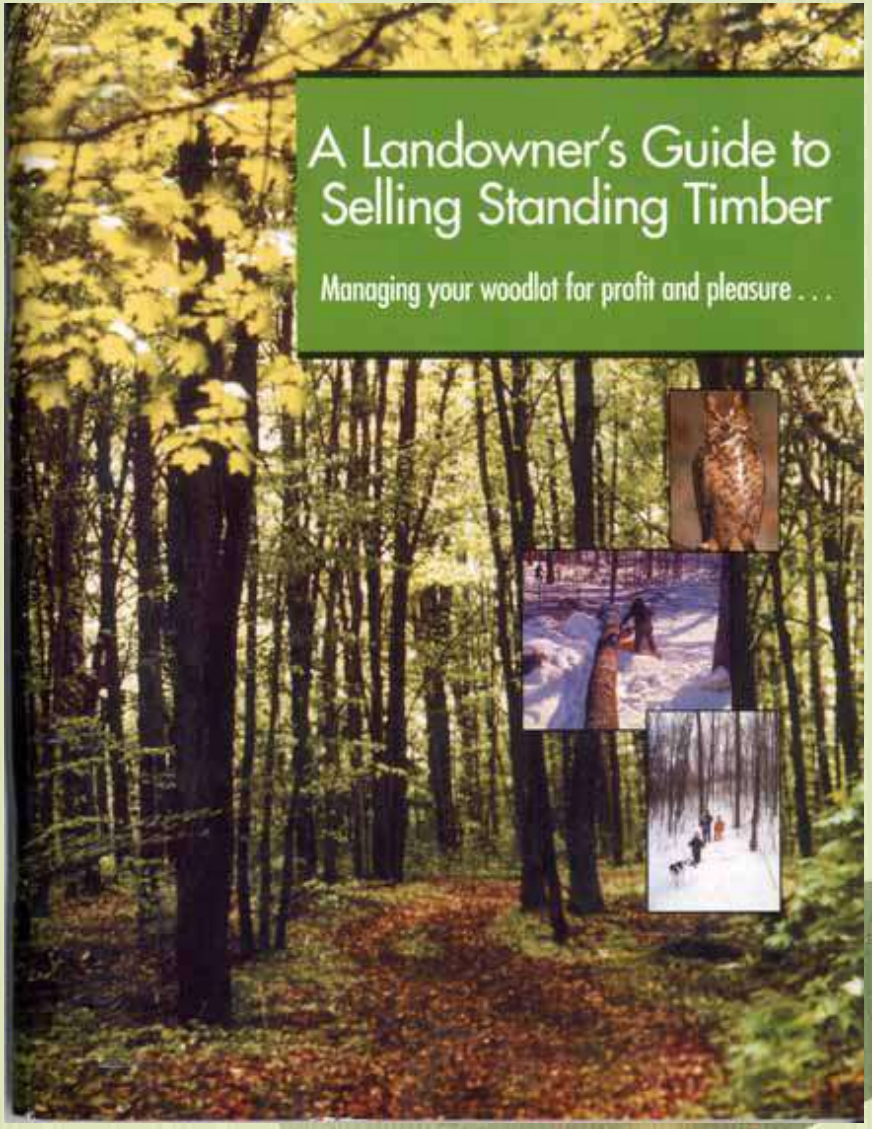
- 1 plot per 2 ha minimum, more preferred
- Plots are averaged for the stand

Inventory  **Summarize**  **Analysis**

Tallying information with a prism




A TRUE PICTURE
Taking Inventory of Your Woodlot
Eastern Ontario
Model Forest


A Landowner's Guide to
Selling Standing Timber
Managing your woodlot for profit and pleasure . . .

Step 3: Determining what to do

Inventory

The sugar bush inventory determines whether there are too many, or too few trees.

Understocked
Too few trees per hectare or acre

Overstocked
Too many trees per hectare or acre

Step 3: Determining what to do

- there is no perfect number of trees
- the sugar bush is constantly changing
- stocking guidelines are suggested recommendations
- stocking guidelines work better on larger properties
- current stocking recommendations are based on even-aged forests
- all-aged sugar bushes are more difficult to manage and tap

Step 3: Determining what to do

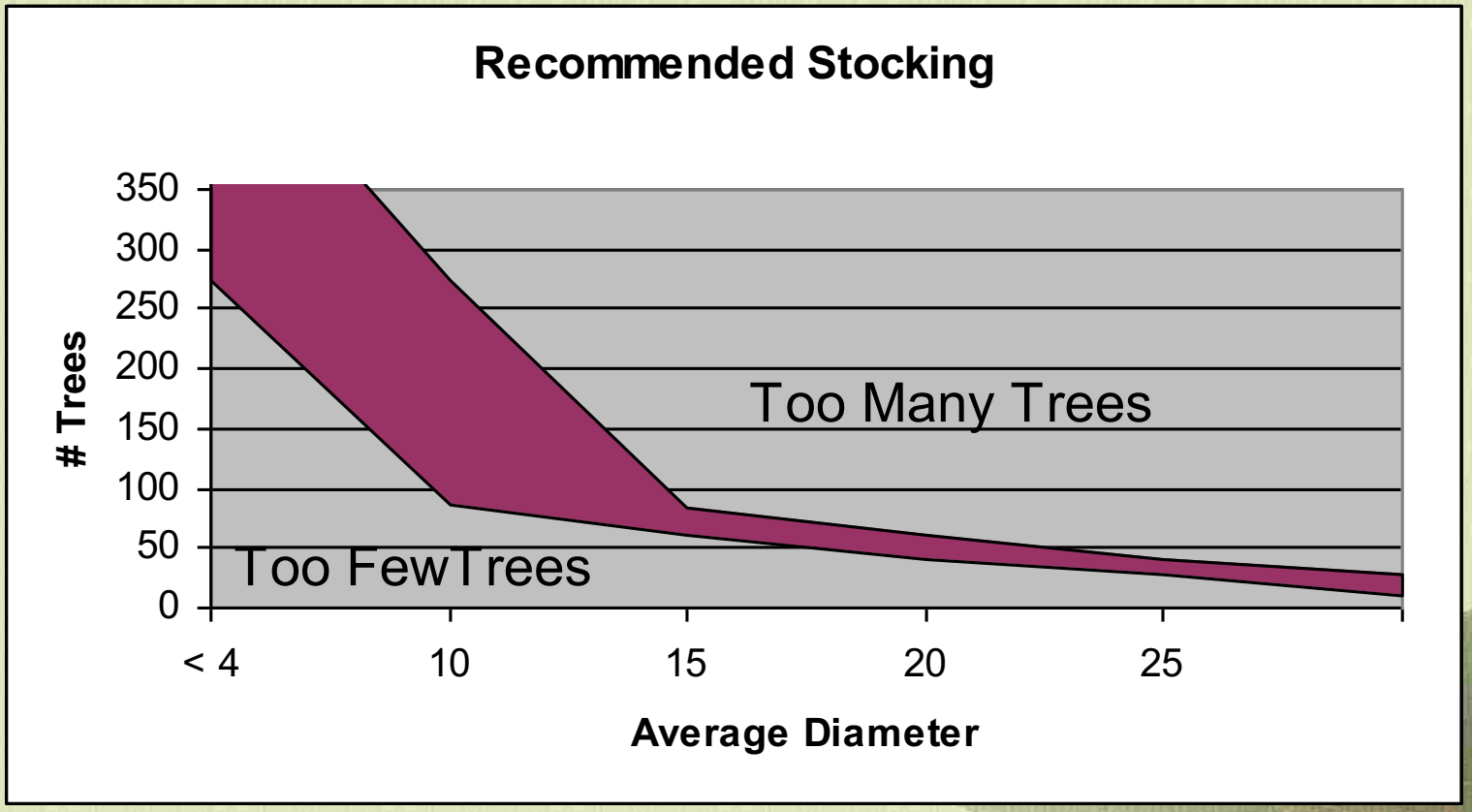
How many trees do I need?

Average Diameter (in)	Number of Taps	Recommended Trees/acre	Num of Taps per Acre
less than 4	0	more than 275	0
4 to 10	0	85 to 275	0
10 to 15	1	60 to 85	60 to 85
15 to 20	2	40 to 60	80 to 120
20 to 25	3	27 to 40	80 to 120
greater than 25	4	less than 27	less than 108

Imperial System (inches and acres)

Step 3: Determining what to do

How many trees do I need?



Imperial System (inches and acres)

Step 3: Determining what to do

How to use the table…

How many trees should we have if our average diameter is 16 inches?

Average Diameter (in)	Number of Taps	Recommended Trees/acre	Num of Taps per Acre
less than 4	0	more than 275	0
4 to 10	0	85 to 275	0
10 to 15	1	60 to 85	60 to 85
15 to 20	2	40 to 60	80 to 120
20 to 25	3	27 to 40	80 to 120
greater than 25	4	less than 27	less than 108

Imperial System (inches and acres)

Step 3: Determining what to do

How to use the table…

Average Diameter (in)	Number of Taps	Recommended Trees/acre	Num of Taps per Acre
less than 4	0	more than 275	0
4 to 10	0	85 to 275	0
10 to 15	1	60 to 85	60 to 85
15 to 20	2	40 to 60	80 to 120
20 to 25	3	27 to 40	80 to 120
greater than 25	4	less than 27	less than 108

Ave. DBH = 16

Crop trees: 40 to 60 times 10 = 400 to 600
Taps: 80 to 120 times 10 = 800 to 1200

Imperial System (inches and acres)

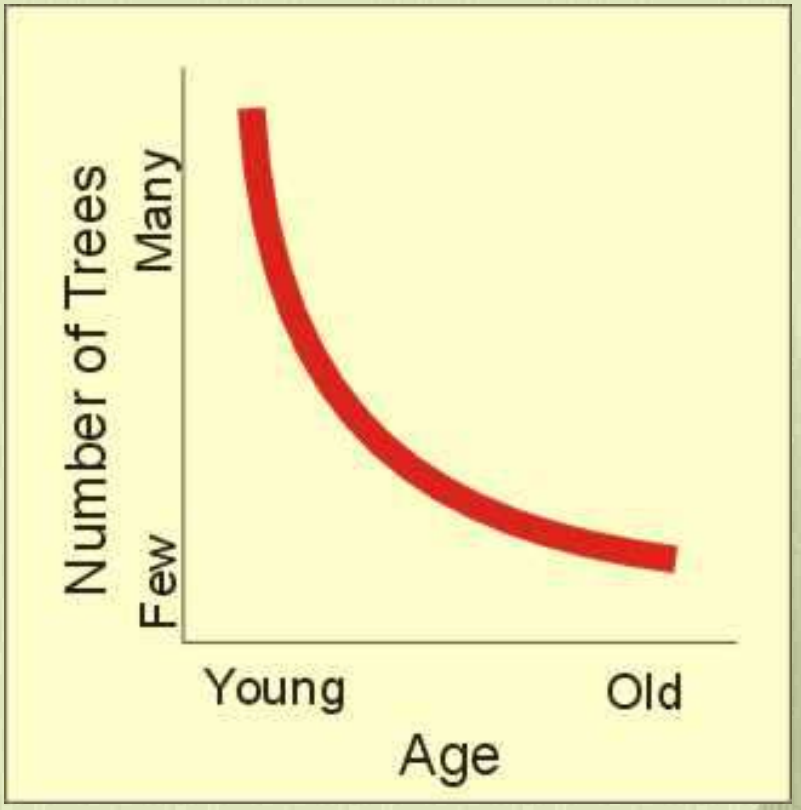
Step 3: Determining what to do

Average Diameter (cm)	Number of Taps	Recommended Trees/Ha	Num of Taps per Ha
less than 10	0	more than 680	0
10 to 25	0	210 to 680	0
25 to 37	1	150 to 210	150 to 210
37 to 50	2	100 to 150	200 to 300
50 to 63	3	67 to 100	200 to 300
greater than 63	4	less than 67	less than 268

Metric (cm and ha)

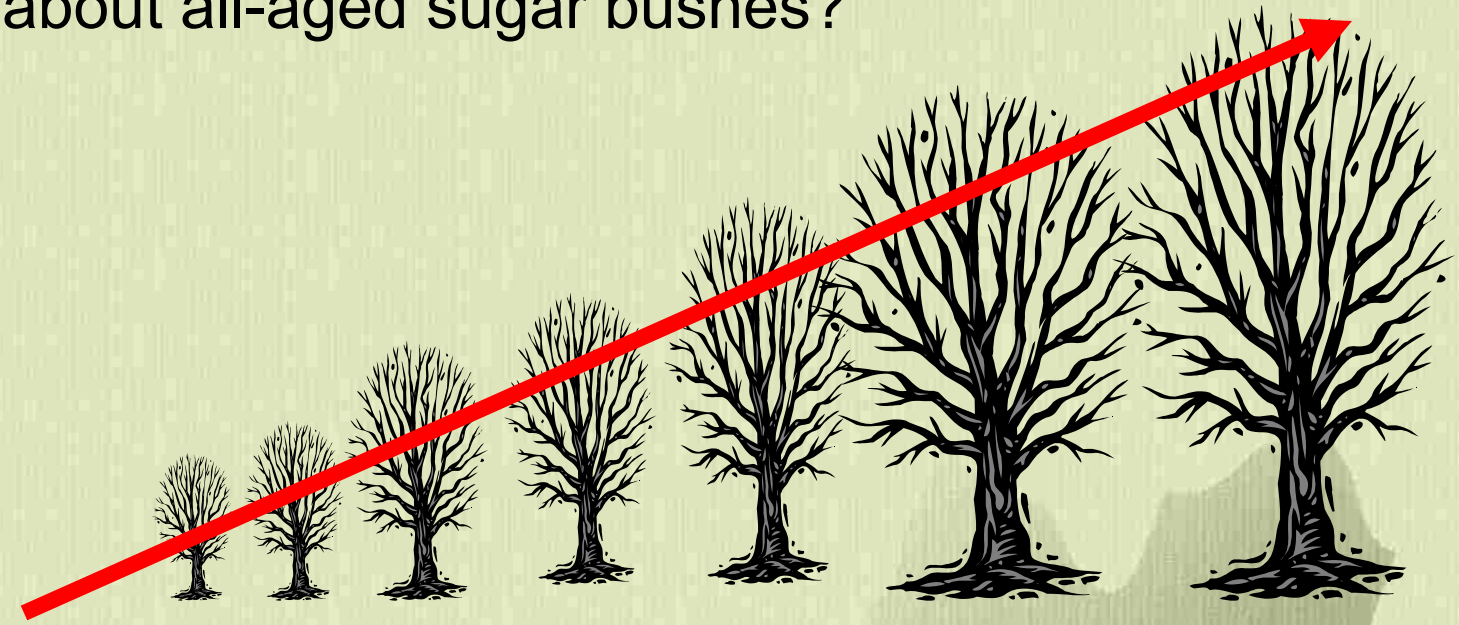
Step 3: Determining what to do

What about all-aged sugar bushes?



Step 3: Determining what to do

What about all-aged sugar bushes?



- All size classes present
- Many more small trees/ha

Step 3: Determining what to do

What about all-aged sugar bushes?

- All-aged sugar bushes will have less taps/ha
- Emphasis on stand structure; the right number of trees of different size classes

Dia. Range	Taps	# Trees per Ha
0 to 10	0	58 to 117
10 to 25	0	41 to 86
25 to 37	1	21 to 33
37 to 50	2	15 to 23
50 to 63	3	11 to 15
> 63	4	5 to 6

Step 3: Determining what to do

Developing a prescription

Step 3: Determining what to do

Lets look at an example…

Inventory

Average Diameter (cm)	Number Trees
less than 10	40
10 to 25	60
25 to 37	190
37 to 50	0
50 to 63	4
greater than 63	0

Average Diameter: 30.4 cm

Step 3: Determining what to do

Lets look at an example…

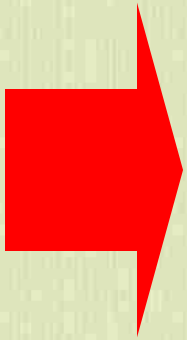
Our goals…

1. **Improve forest health**
2. **Promote tree growth**
3. **Encourage new and smaller trees**

Step 3: Determining what to do

Lets look at an example…

What is recommended …



Average Diameter (cm)	# of taps	Recommended Trees/Ha	Num of Taps per Ha
25 to 37	1	150 to 210	150 to 210

Step 3: Determining what to do

Lets look at an example…

Inventory compared to Recommended

Average Diameter (cm)	Number Trees
less than 10	40
10 to 25	60
25 to 37	190
37 to 50	0
50 to 63	4
greater than 63	0

Total Trees: 294

Recommended: 180

Step 3: Determining what to do

Lets look at an example…

The Prescription

- Identify and mark 180 crop trees per ha which are greater then 10 cm DBH
- Thin out the remaining trees according to crown spacing requirements (NEXT MODULE)
- Protect small trees (<10 cm)

- Create a several small openings in the sugar bush to promote regeneration
- Mark for removal poorer quality trees

Summary of Module 2

1. Management planning is important

2. Sugar bush inventory provides critical information

3. The prescription is based on the inventory

Principles and Practices of Sugar Bush Management

Module 3 – Marking & Harvesting

The Principles and Practices of Sugar Bush Management

Workshop Outline:

Module 1: Introduction

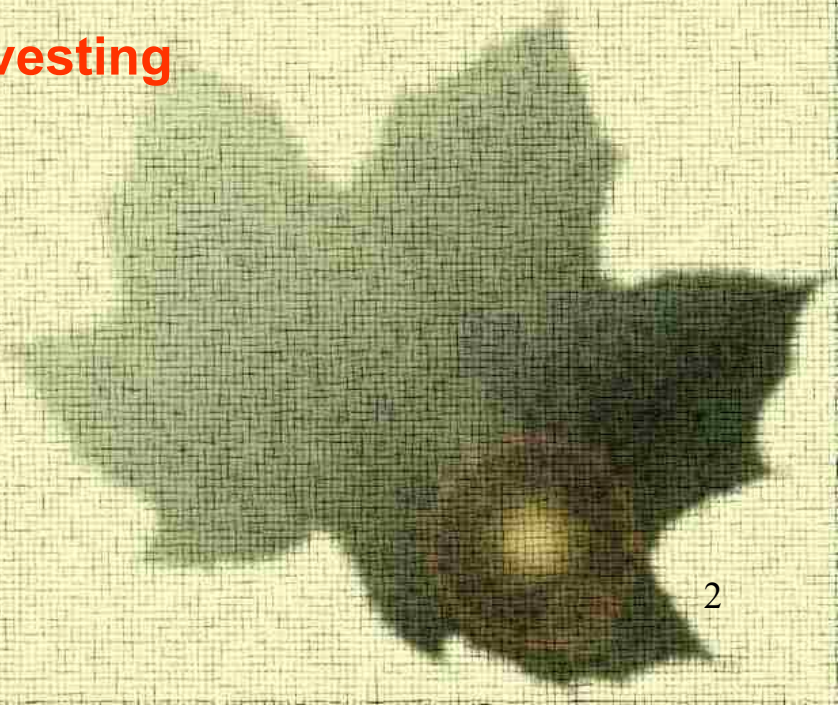
Module 2: Management Planning

Module 3: Marking and Harvesting

Module 4: Sugar Bush Problems

Module 5: Maple Orchards

Module 6: Maple Facts



Marking and Harvesting

1. What to take
2. What to leave
3. Cutting
4. Selling

Marking and Harvesting

The long list of “do’s & don'ts”

1. **Don’t ‘just thin out your sugar bush’**
2. **Do have your sugar bush Marked according to a prescription**

Tree Marking

Choosing trees to remove

- poor quality stems
- undesirable species
- What size the tree is

UGS trees

- High risk of decline
- diseased trees
- decline during next cutting cycle
- poor form
- will not improve in quality

Diseased trees

- Trees with:
  - fungal diseases e.g. false tinder fungus
  - cankers e.g. Eutypella (contagious)
  - Black Bark
  - stem wounds

Dead trees

- OHSA
- tree length reserve

Trees to leave

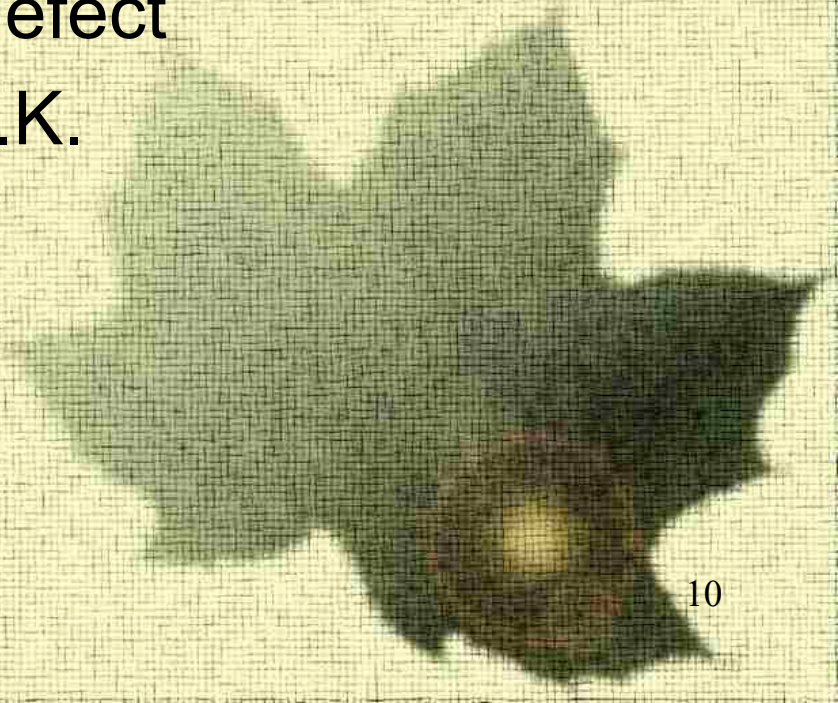
- AGS trees
- cavity trees
- mast trees
- isolated conifers
- isolated individuals
- Maple crop trees

Trees to leave

AGS trees

AGS- Acceptable Growing Stock

- maintain/improve quality over 20 years
- free from serious defect
  - minor defects O.K.

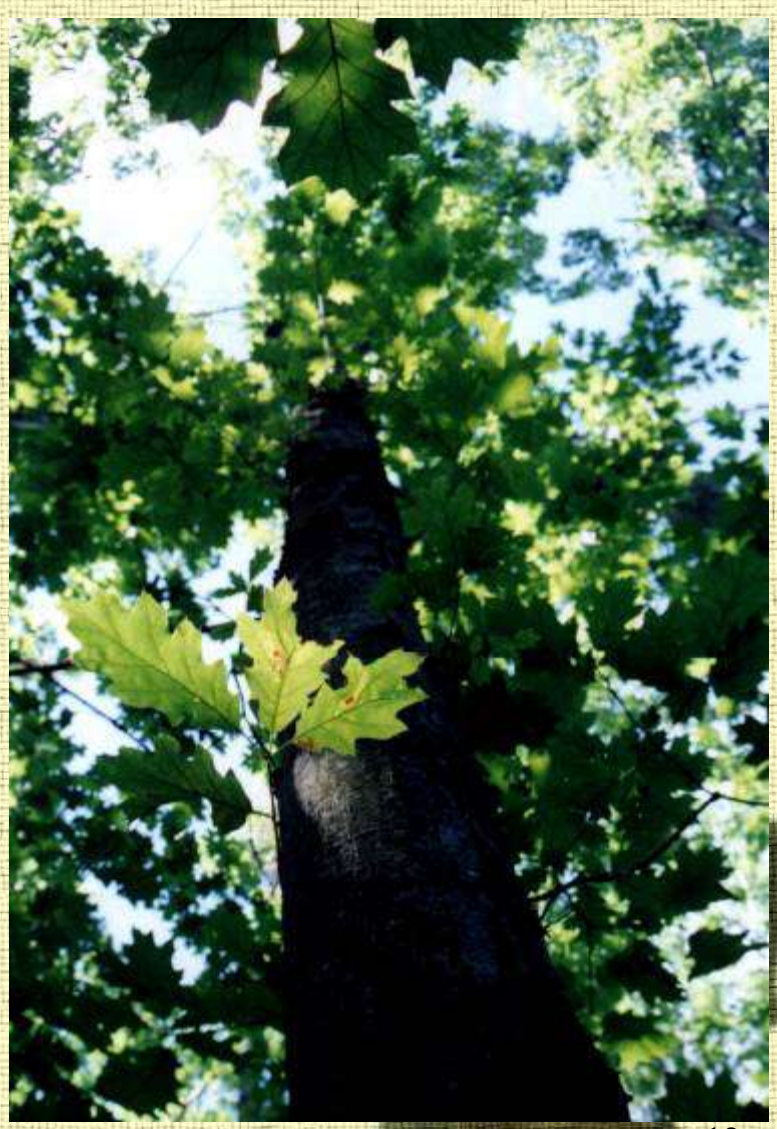


Trees to leave

- Cavity trees
  - leave 6 trees per ha
  - 25% of wildlife use

Trees to leave

- Mast trees
  - Oak, Cherry, Basswood, Beech preferred
  - Ironwood, Hickory, Butternut O.K.
- retain 7-8 per ha
- retain trees with healthy vigourous crowns
- 25% of wildlife use



Trees to leave

- Isolated conifers
  - 10% of wildlife use
  - critical habitat component
- Retain 10/ha where possible
  - >40 cm dbh
  - long lived species
  - clumps

Trees to leave

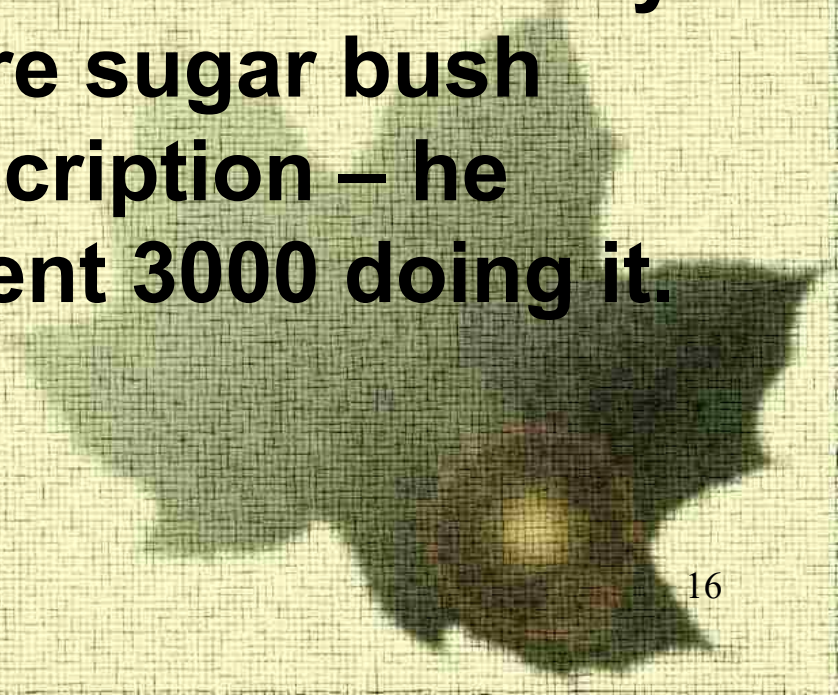
- Isolated individuals
  - retain scattered individuals such as Cb, By
  - tree diversity = wildlife diversity

Getting started

- Stand inventory and prescription
- Doing the marking yourself
  - tree marking course
  - following the prescription
- Hiring a professional
  - experience
  - Certification
  - **Know how to manage a Sugar Bush**

Consider the following example:

- Landowner A had a logger thin out his 50 acre sugar bush – he made $10000 on the sale of the wood
- Landowner B had a forester inventory and mark his 50 acre sugar bush according to a prescription – he made 10000 but spent 3000 doing it.



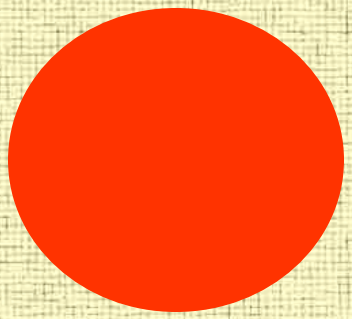
Doing it yourself

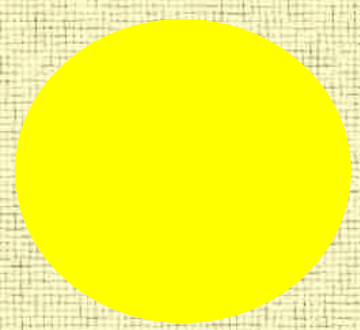
- You might consider taking the MNR's Tree Marking course
- Get some good publications on 'How to manage your sugar bush'
- Hire a tree marker to help you (train you)
- equipment
  - prism, paint, calipers or dbh tape

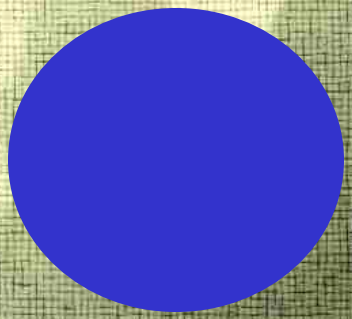
Doing it yourself

Key Points:

- Interpret each area of the sugar bush separately
- Identify and mark ‘crop trees’
- Don’t over harvest
- Look for the poorest quality trees to remove first







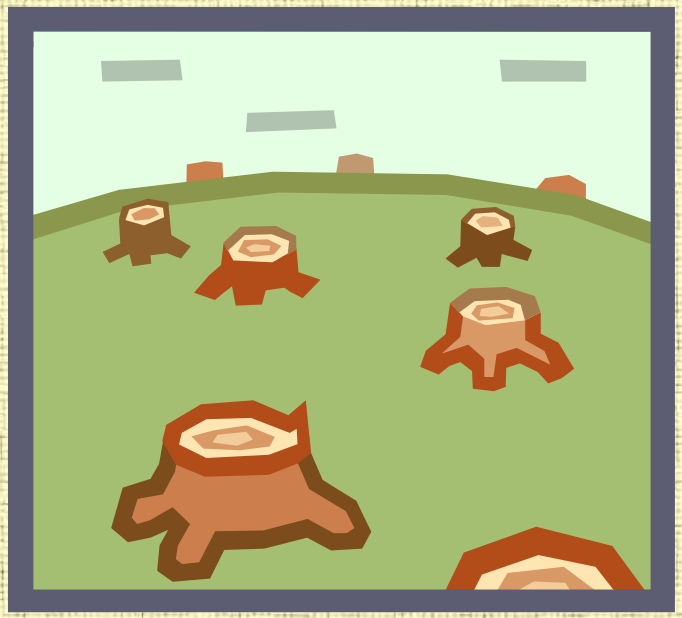
Doing it yourself

Key Points:

- Red paint for boundary identification
- Yellow or orange for trees to harvest
- Blue paint for crop trees or trees that won't be harvested

Doing it yourself

How to Mark



Your sugar bush should not look like this when you are done!

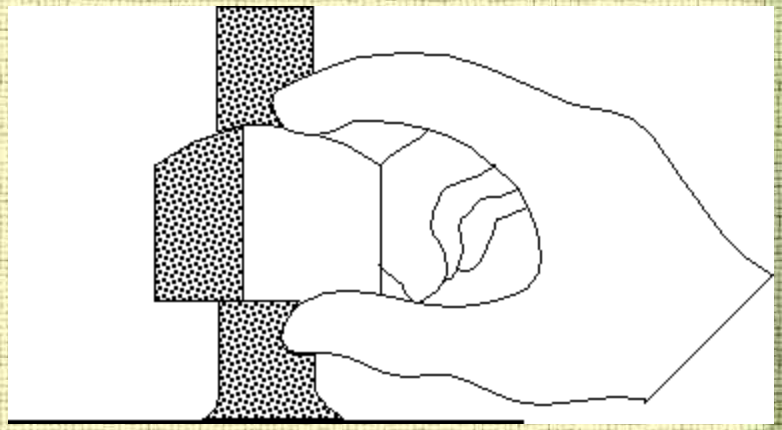
- Best to mark systematically
- Record your trees (mark and tally)

- There are two main systems:
  1. Basal area reduction
  2. Crop tree release

Doing it yourself

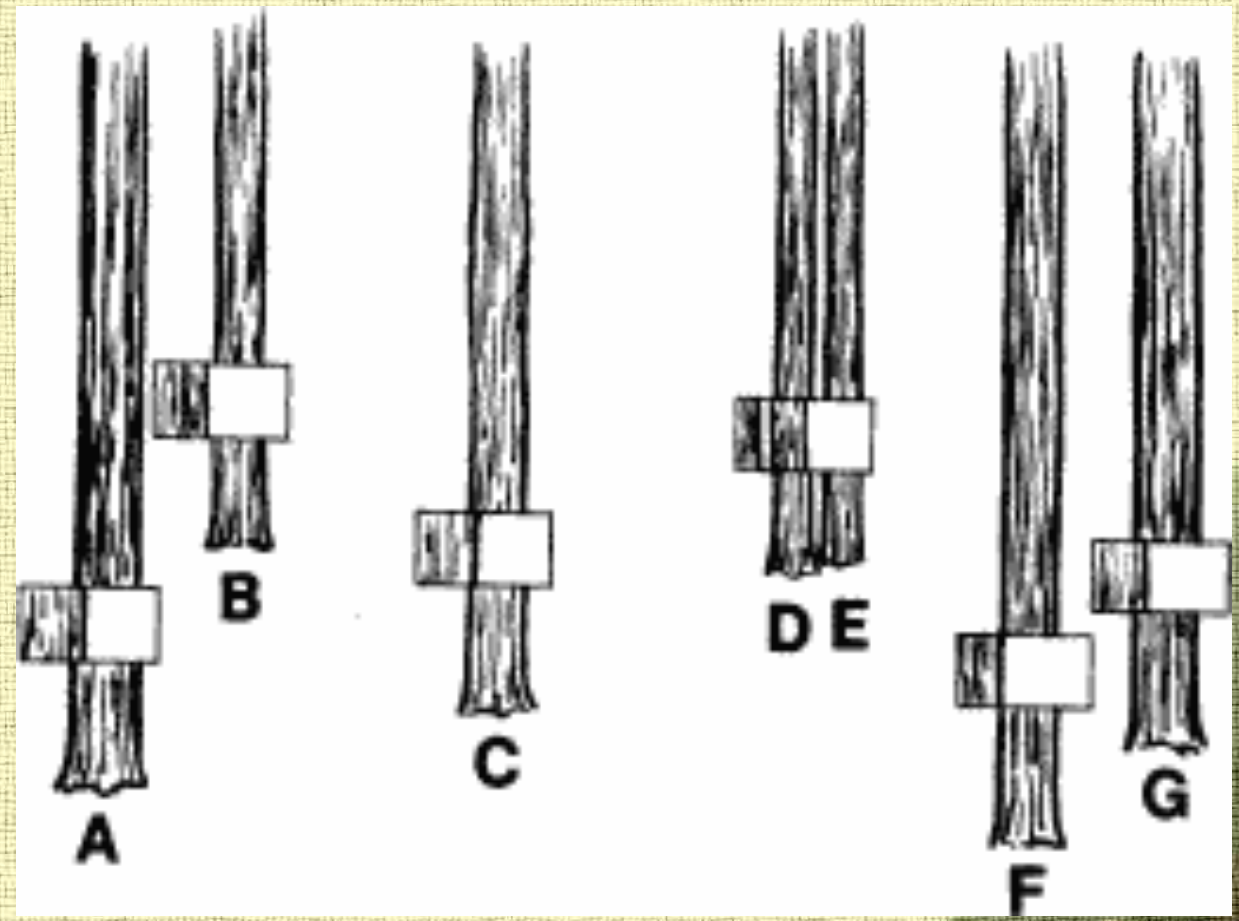
How to Mark – BA Reduction Method

- Usually used on larger areas
- More complicated but usually provides better results
- Requires a good understanding of Basal Area
- Best to use a Prism



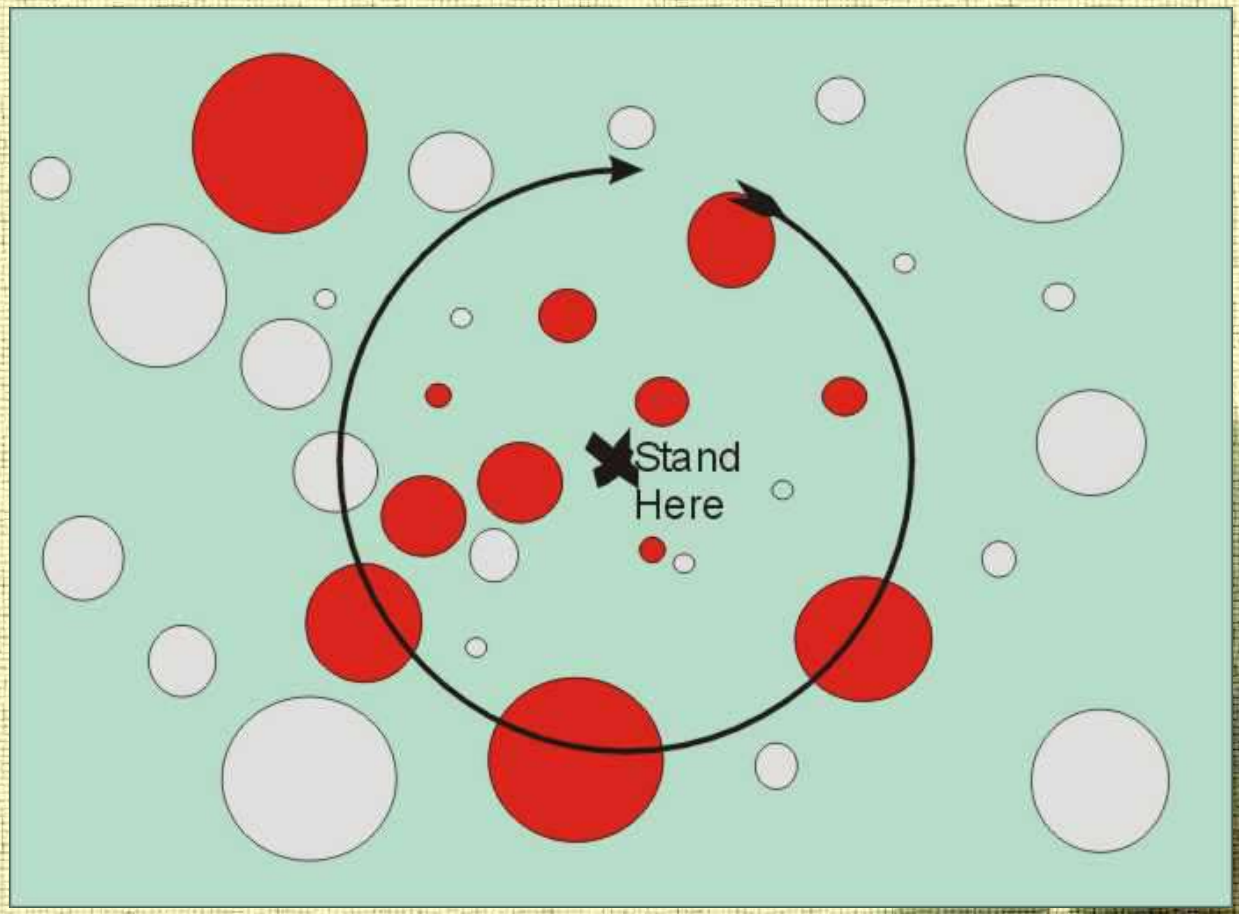
Doing it yourself

How to Mark – BA Reduction Method



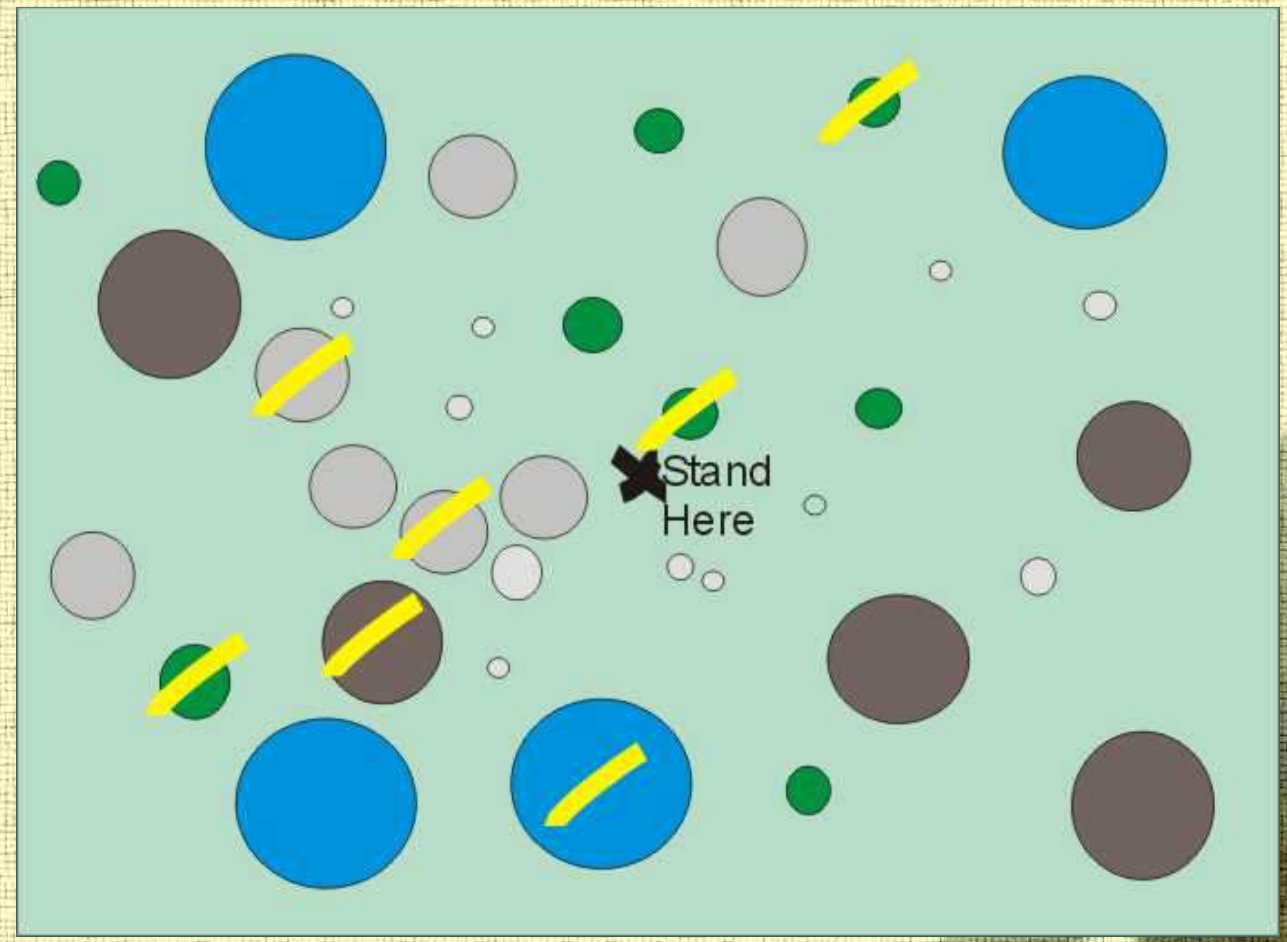
Doing it yourself

How to Mark – BA Reduction Method



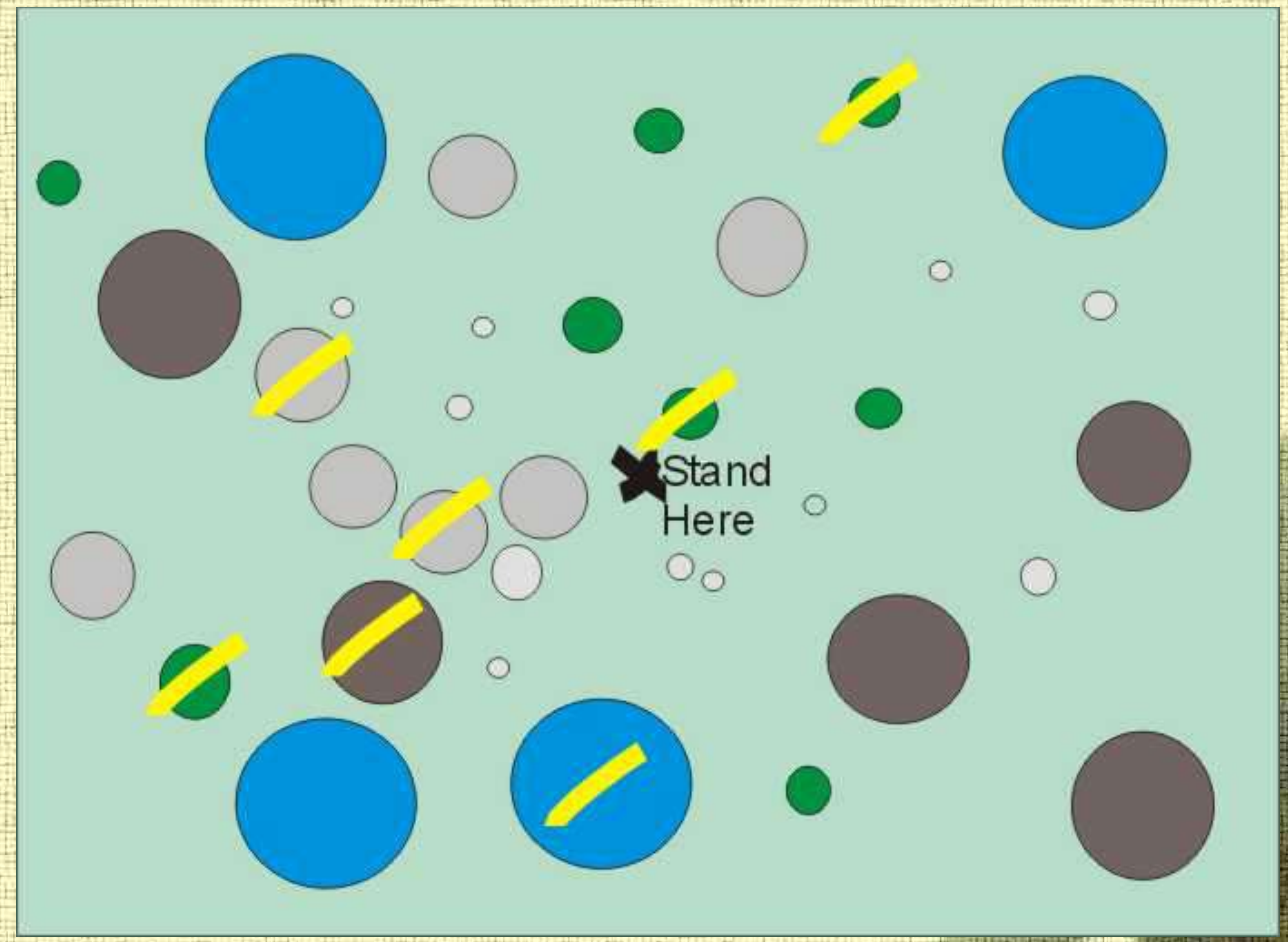
Doing it yourself

How to Mark – BA Reduction Method



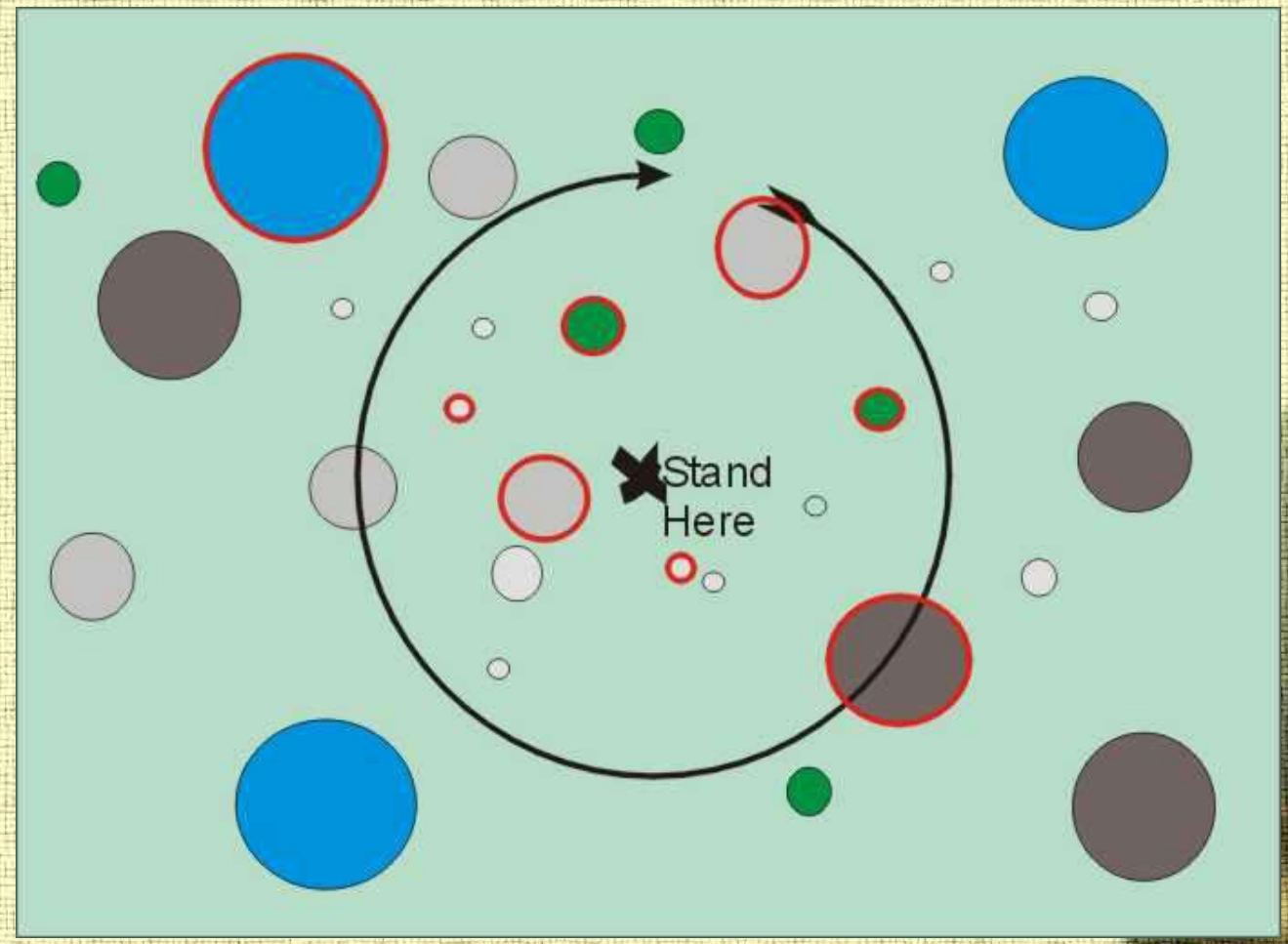
Doing it yourself

How to Mark – BA Reduction Method



Doing it yourself

How to Mark – BA Reduction Method



Doing it yourself

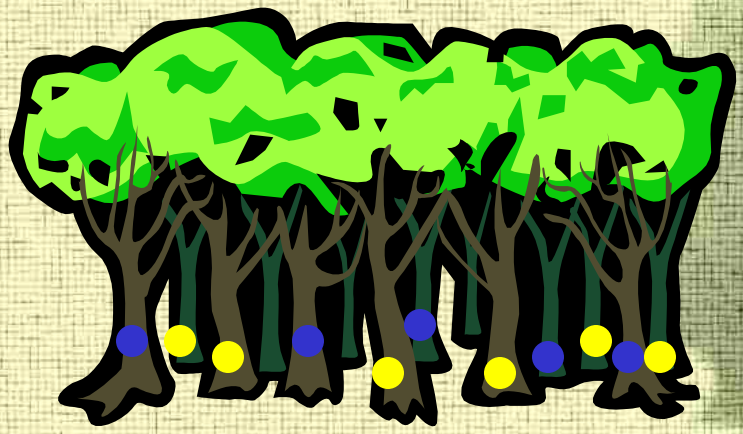
How to Mark – Crop Tree Selection

- This is the best method for the do-it-yourselfer
- You still need (or should!) use a prism to check your starting and residual BA
- Never thin out more than 1/3 of the BA at any one time
- Select the best trees and thin out around them

Doing it yourself

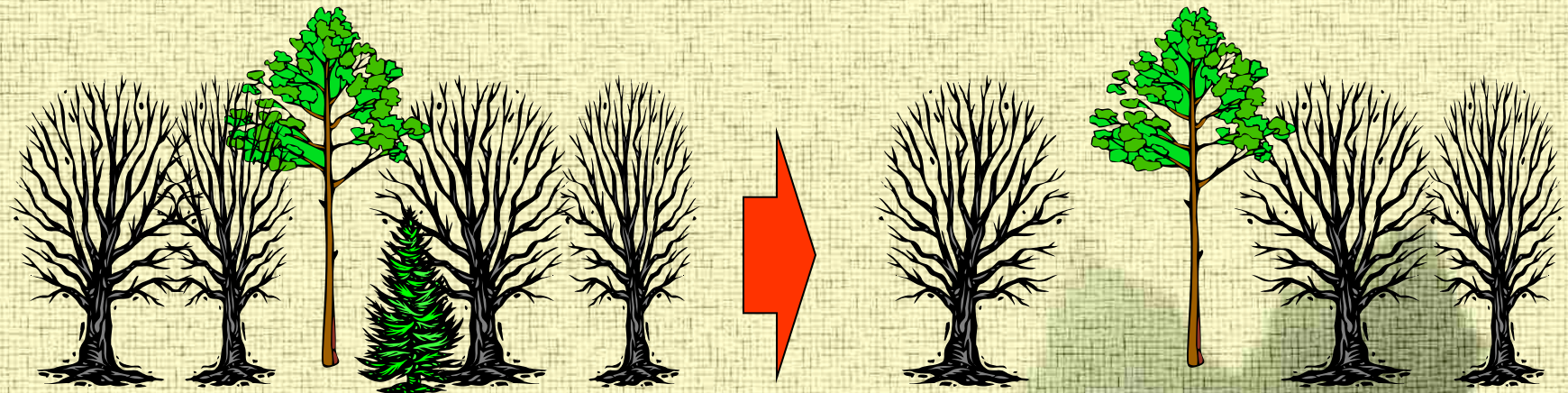
How to Mark – Crop Tree Selection

- Identify crop trees and mark them with blue paint
- Identify the trees which interfere with the selected crop tree and mark them for removal with yellow or orange paint



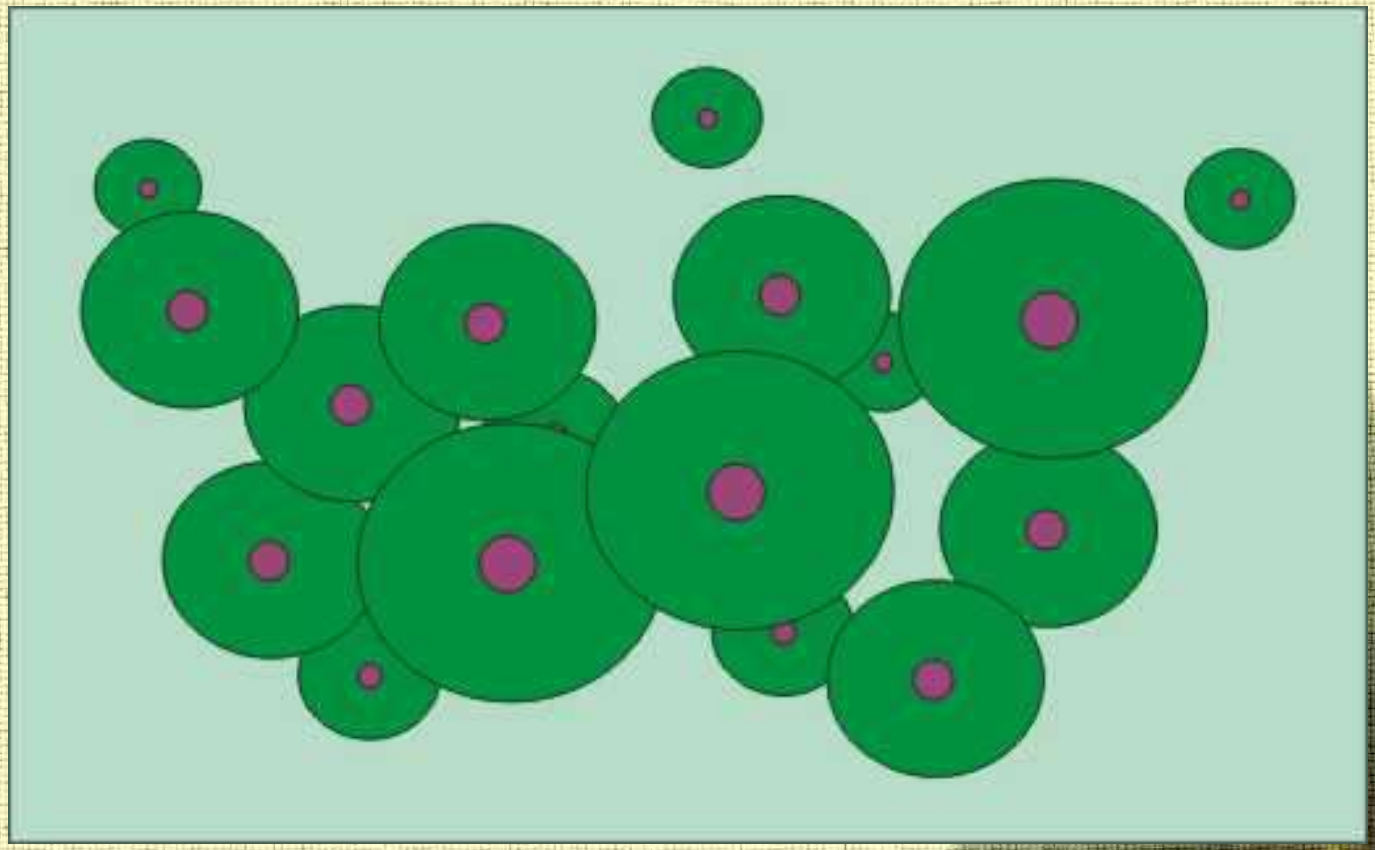
Doing it yourself

How to Mark – Crop Tree Selection



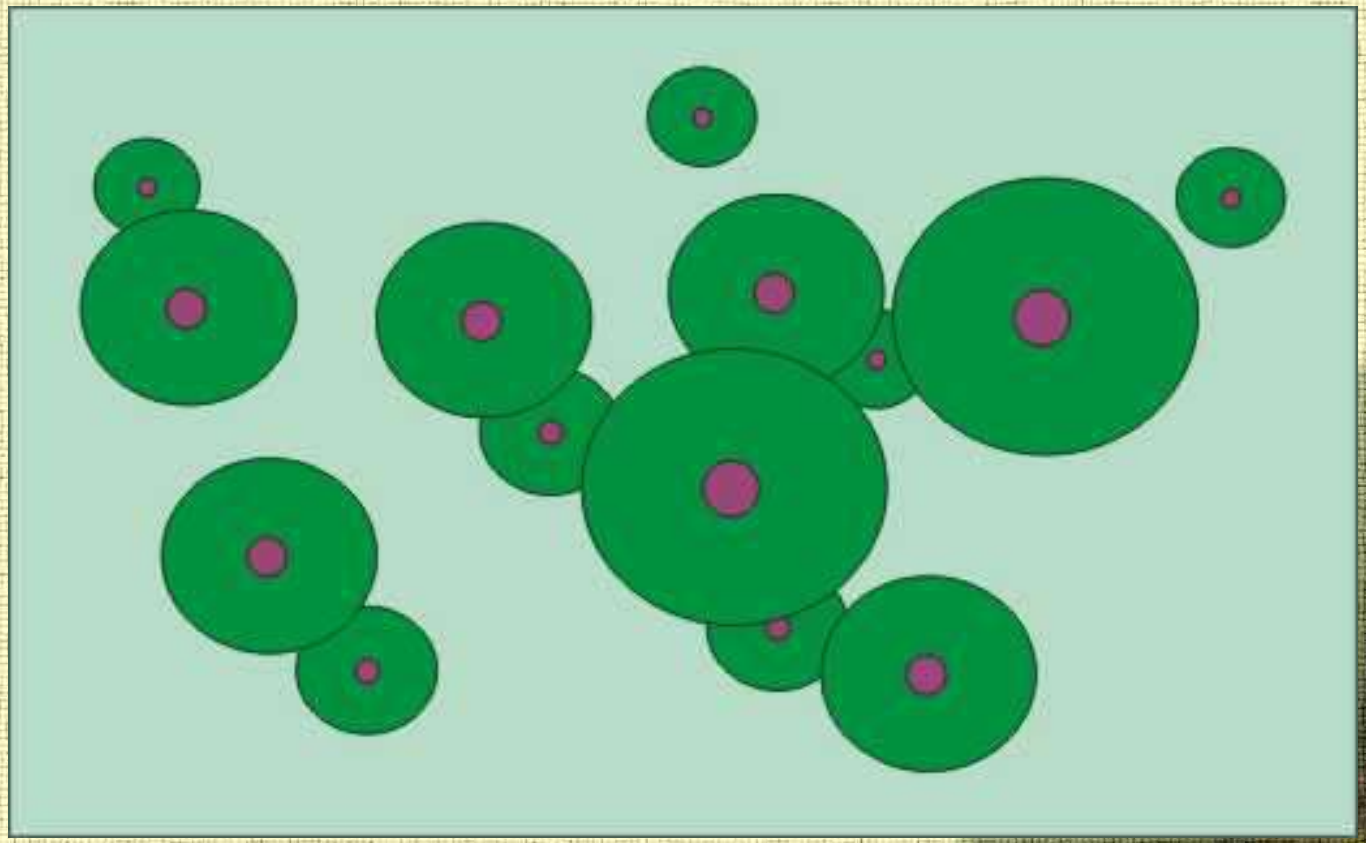
Doing it yourself

How to Mark – Crop Tree Selection



Doing it yourself

How to Mark – Crop Tree Selection



Doing it yourself

How to Mark – Crop Tree Selection

What makes a good crop tree:

- Preferred species
- Healthy
- Good form
- Higher sugar content (be careful)

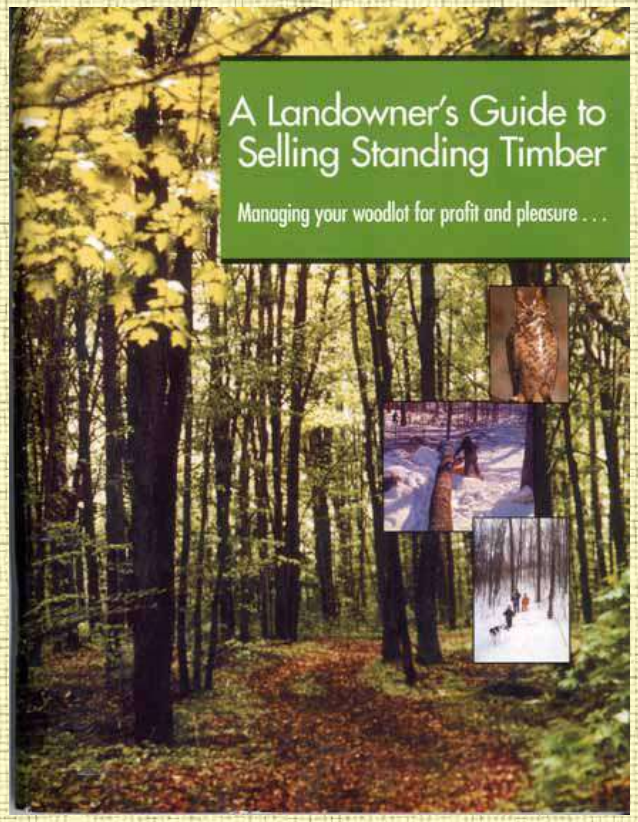
Doing it yourself

How to Mark – Crop Tree Selection

Balancing Act

- AGS/UGS
- releasing your best (crop) trees
- unevenaged distribution
- maintaining prescribed basal area
- Sugar bush size

Estimating volume and value



- mark and tally
- volume tables
- markets

Hiring a professional

- the logger is not an appropriate tree marker
  - need an independent
- experience
  - marked sugarbushes before?
- certification
  - not mandatory but recommended
  - not a substitute for experience

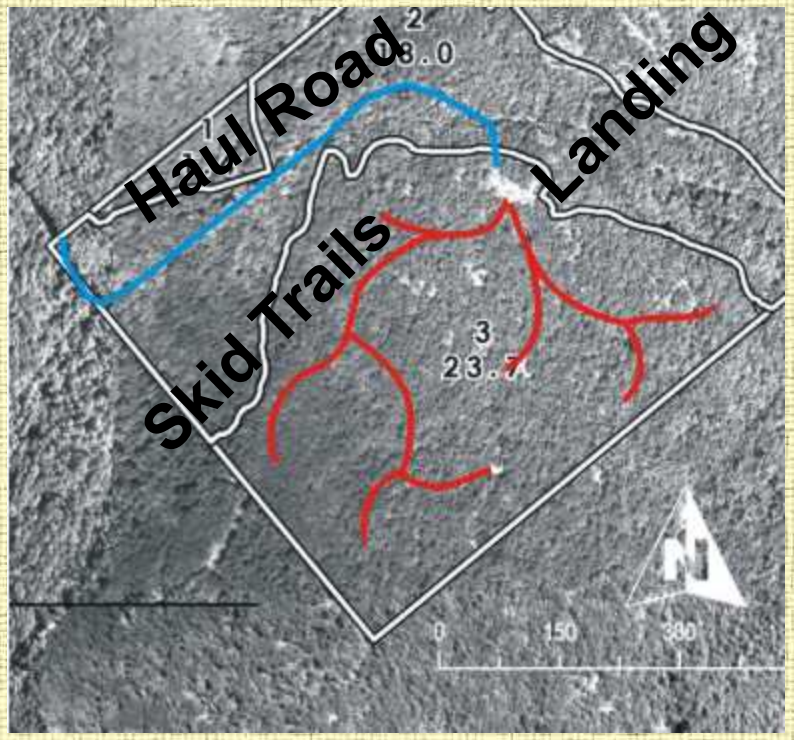
Harvesting

Harvesting

Considerations…

- Access
  - road network
  - landings
- Cutting and Skidding
  - safety
  - careful logging practices
  - maximizing dollar value

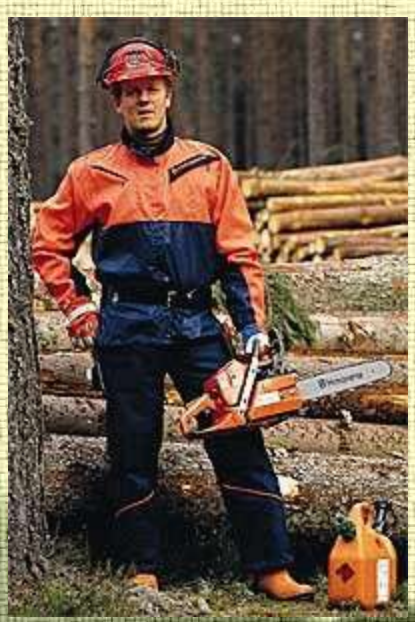
Access



- Road network
  - main road(s)
  - skid trails
    - 50m reach with cable
- Landings

Cutting and Skidding

- Safety
  - OHSA
    - cutter/skidder operators license
  - equipment
    - cutter
      - hardhat with faceshield and earmuffs, gloves, pants, boots
    - skidder or farm tractor
      - ROPS, fire extinguisher



Cutting and Skidding

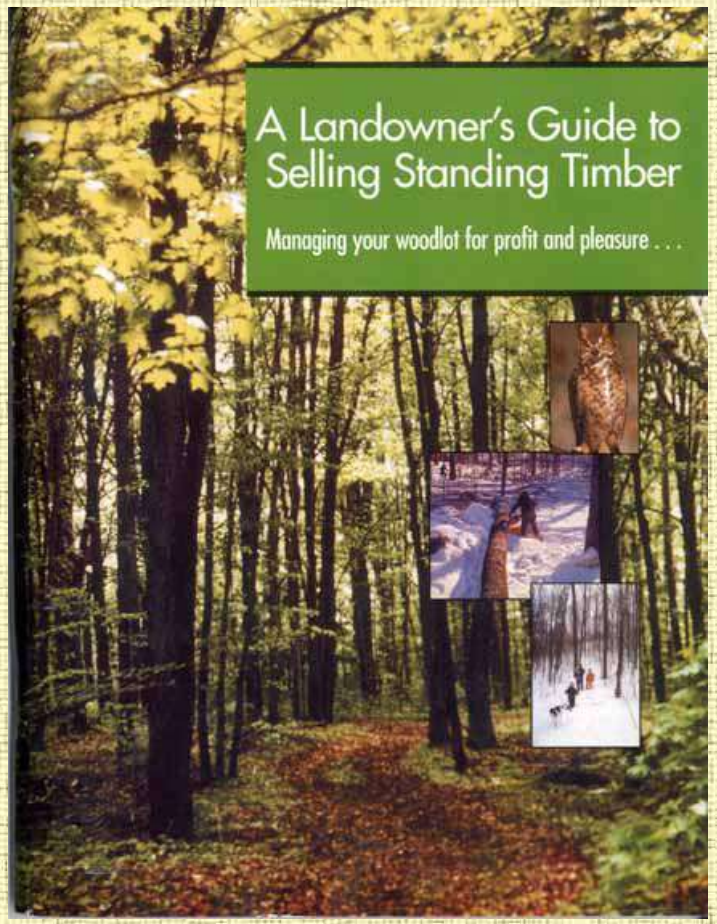
- Careful logging practices
  - directional felling
  - bucking

- Skidding
  - use the cable
  - buck logs into manageable lengths

Cutting and Skidding

- Maximizing dollar value
  - what does the market want?
    - e.g. 9’4” Red Maple for railway ties
  - maximize diameter/length relationship
  - specialty markets
    - e.g. Basswood
      - duck decoys
      - mouldings

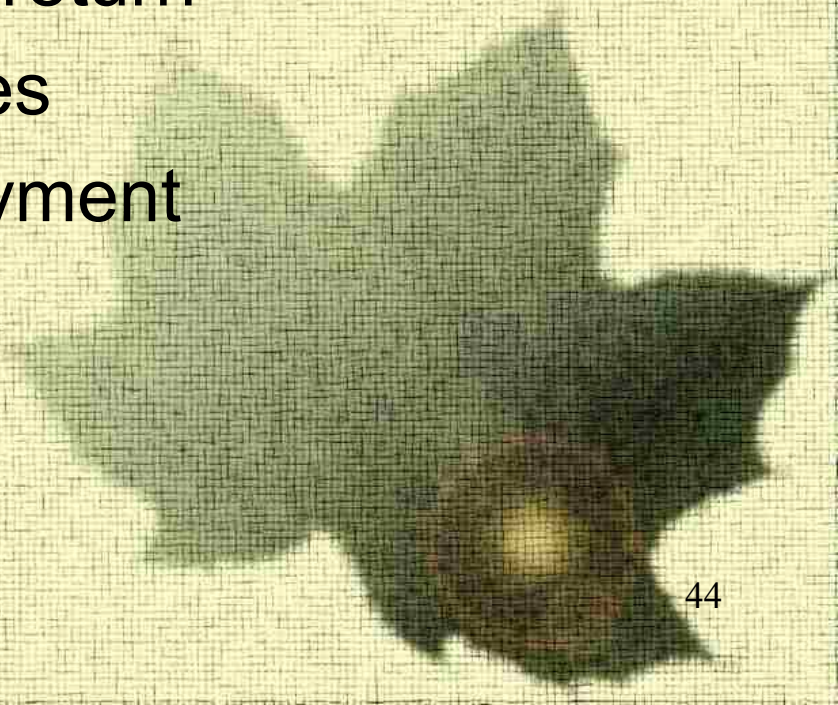
Selling your wood



- Selling it yourself
  - to loggers
    - tender sale
  - to others
    - specialty markets
    - Domtar
    - milling it yourself

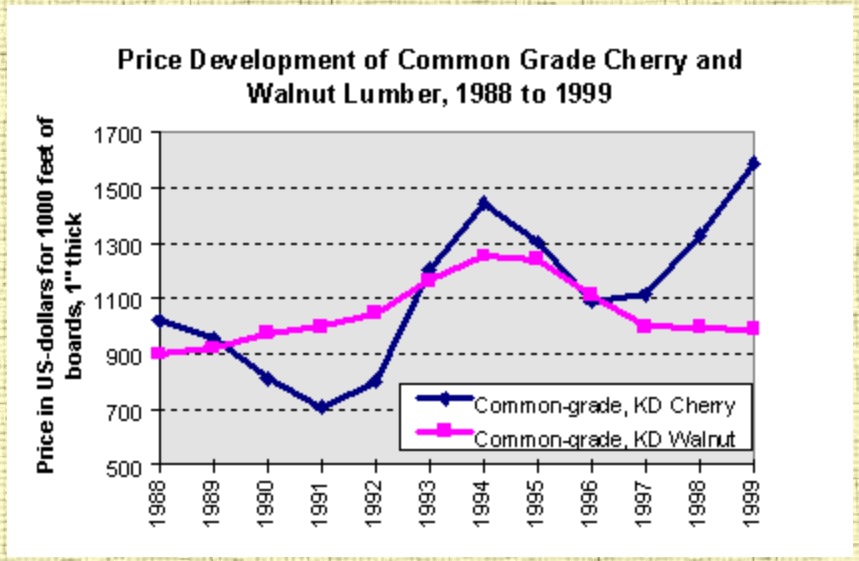
Timber Sale Checklist

- Use the following points to:
  - Maximize financial return
  - Minimize headaches
  - Ensure future enjoyment



1. Markets and prices

- market conditions and prices
- timing of sale



EASTERN ONTARIO
Peterborough East Area

Species	Sawlogs $/M fbm L	Sawlogs $/M fbm H	Veneer $/M fbm L	Veneer $/M fbm H	Pulpwood $/tonne Hard	Pulpwood $/tonne Soft	Poles $
Basswood	80	165	-	-	3	-	-
Beech	80	180	-	-	6	-	-
Hard Maple	100	375	400	900	6	-	-
Poplar	75	100	-	-	3	-	-
Red Oak	90	400	400	850	6	-	-
Red Pine	55	120	-	-	-	-	-
White Ash	85	120	-	-	6	-	-
White Birch	100	275	260	400	6	-	-
White Cedar	80	120	-	-	-	-	-
White Pine	100	200	-	-	-	-	-
White Spruce	55	150	-	-	-	9	-

2. Consider hiring a consultant

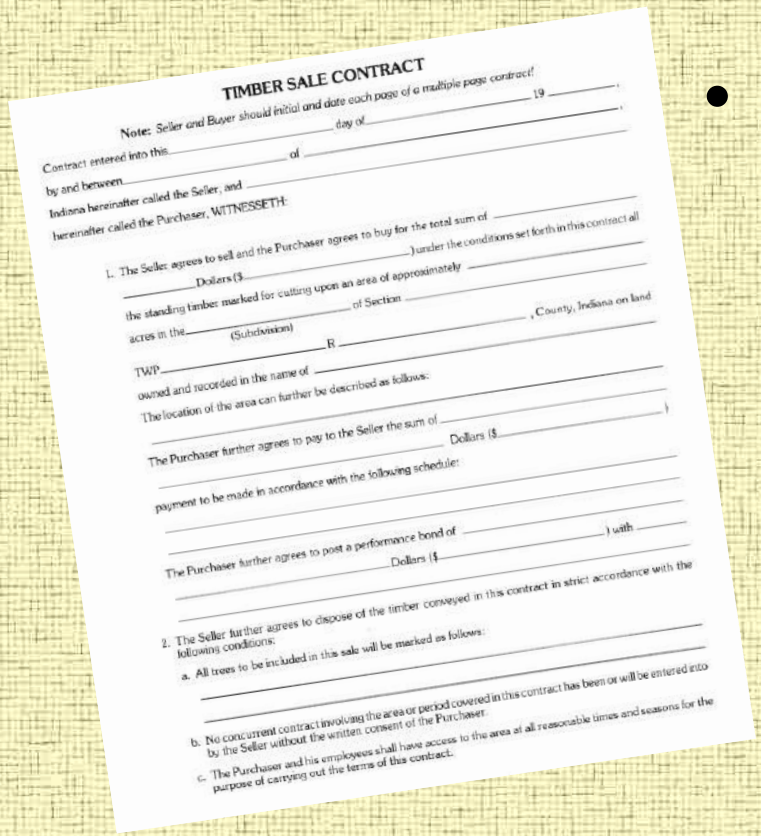
- your agent
  - tree marking
  - tender sale
  - cut and post harvest inspection
- check references
- visit woodlots they have previously managed

3. Visit bushes currently being cut

Check for:

- aesthetics
- wood utilization
- safety
- road layout and maintenance
  - affects future recreational use

4. Written contract



TIMBER SALE CONTRACT

Note: Seller and Buyer should initial and date each page of a multiple page contract!

Contract entered into this _____ day of _____, 19 _____,

by and between _____,

Indiana hereinafter called the Seller, and _____

hereinafter called the Purchaser, WITNESSETH:

1. The Seller agrees to sell and the Purchaser agrees to buy for the total sum of _____ Dollars ($_____) under the conditions set forth in this contract all the standing timber marked for cutting upon an area of approximately _____ acres in the _____ (Subdivision) of Section _____, County, Indiana on land TWP. _____ R _____ owned and recorded in the name of _____

The location of the area can further be described as follows:

The Purchaser further agrees to pay to the Seller the sum of _____ Dollars ($_____) payment to be made in accordance with the following schedule:

The Purchaser further agrees to post a performance bond of _____) with _____ Dollars ($_____

2. The Seller further agrees to dispose of the timber conveyed in this contract in strict accordance with the following conditions:

a. All trees to be included in this sale will be marked as follows:

b. No concurrent contract involving the area or period covered in this contract has been or will be entered into by the Seller without the written consent of the Purchaser.

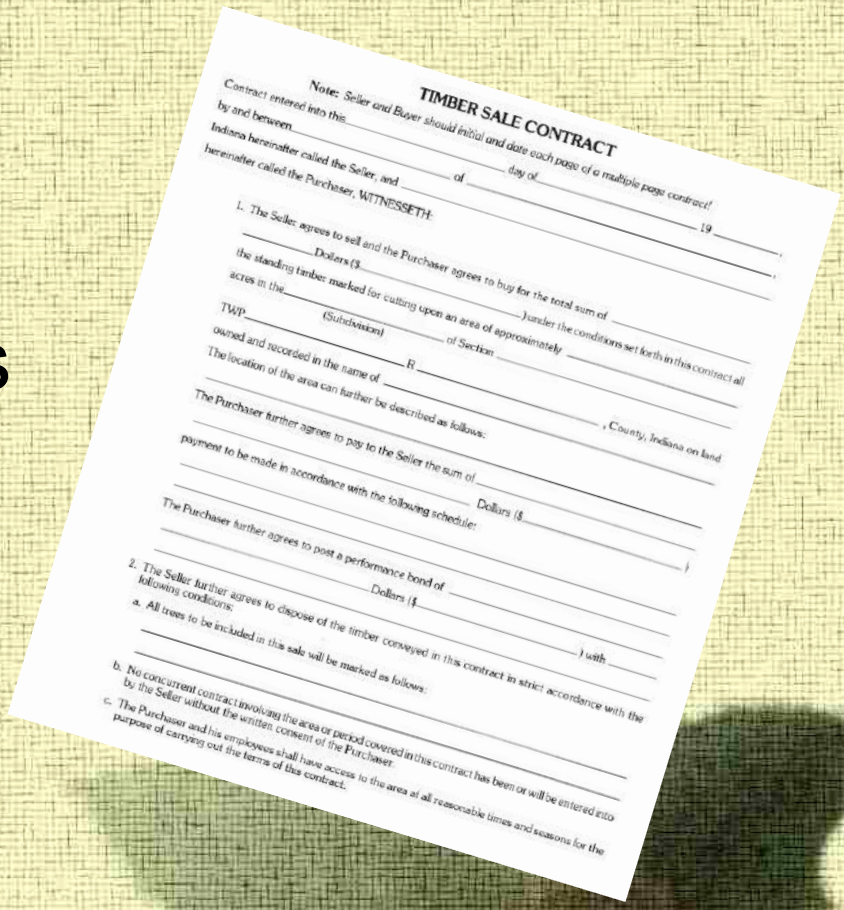
c. The Purchaser and his employees shall have access to the area at all reasonable times and seasons for the purpose of carrying out the terms of this contract.

- Contract should cover:
  - payment method
  - area and trees to be harvested
  - penalties
  - precautions
  - subcontracting

4. Written contract

And…

- Expiry date
- products and prices agreed upon
- arbitration
- liability insurance



TIMBER SALE CONTRACT

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by and between _____ of _____,
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1. The Seller agrees to sell and the Purchaser agrees to buy for the total sum of _____
_____ Dollars ($_____) under the conditions set forth in this contract all
the standing timber marked for cutting upon an area of approximately _____
acres in the _____ of Section _____,
TWP. _____ R _____, _____ County, Indiana on land
(Subdivision)
owned and recorded in the name of _____.
The location of the area can further be described as follows:

The Purchaser further agrees to pay to the Seller the sum of _____
_____ Dollars ($_____)
payment to be made in accordance with the following schedule:

The Purchaser further agrees to post a performance bond of _____
_____ Dollars ($_____) with _____

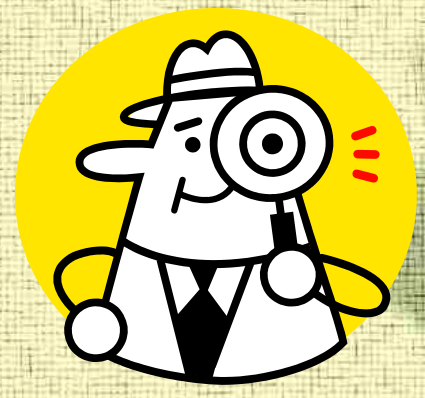
2. The Seller further agrees to dispose of the timber conveyed in this contract in strict accordance with the following conditions:
   a. All trees to be included in this sale will be marked as follows:
   b. No concurrent contract involving the area or period covered in this contract has been or will be entered into by the Seller without the written consent of the Purchaser.
   c. The Purchaser and his employees shall have access to the area at all reasonable times and seasons for the purpose of carrying out the terms of this contract.

5. Tree Marking Bylaws

- does your county have one?
- implications for your harvest

6. Inspection

- Inspect the woodlot regularly during harvesting
- discuss concerns with logger sooner rather than later



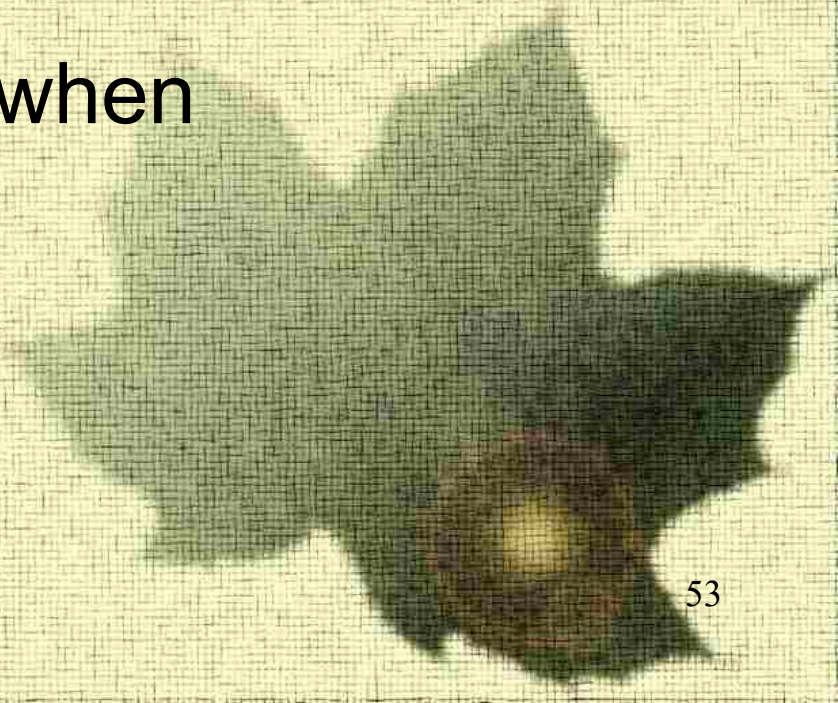
7. Cleanup

Consider adding to the contract:

- that all tops be slashed within 1m of the ground
- roads will be cleared of slash and tops
- forbidding tree length skidding

Module 3 - Summary

- Mark your sugar bush
- Be careful!
- Work safely
- Hire a consultant when necessary
- Harvest carefully



Principles and Practices of Sugar Bush Management

Module 4 – Sugar Bush Problems

The Principles and Practices of Sugar Bush Management

Workshop Outline:

Module 1: Introduction

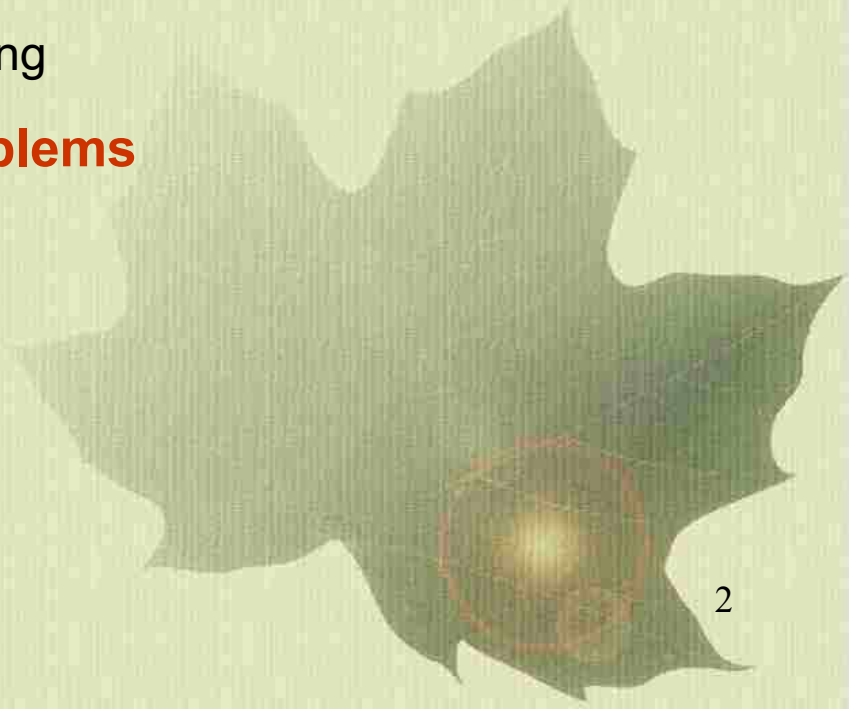
Module 2: Management Planning

Module 3: Marking and Harvesting

Module 4: Sugar Bush Problems

Module 5: Maple Orchards

Module 6: Maple Facts



Tree health and vigour

What can go wrong with your maples?

Insects, disease, physical damage….. It's all stress

Site quality

Site quality influences:

- **health and vigour**
- **growth and yield**
- **susceptibility to stressors such as insects or disease**
- **proportion of good quality (AGS) trees to poor quality (UGS) trees**

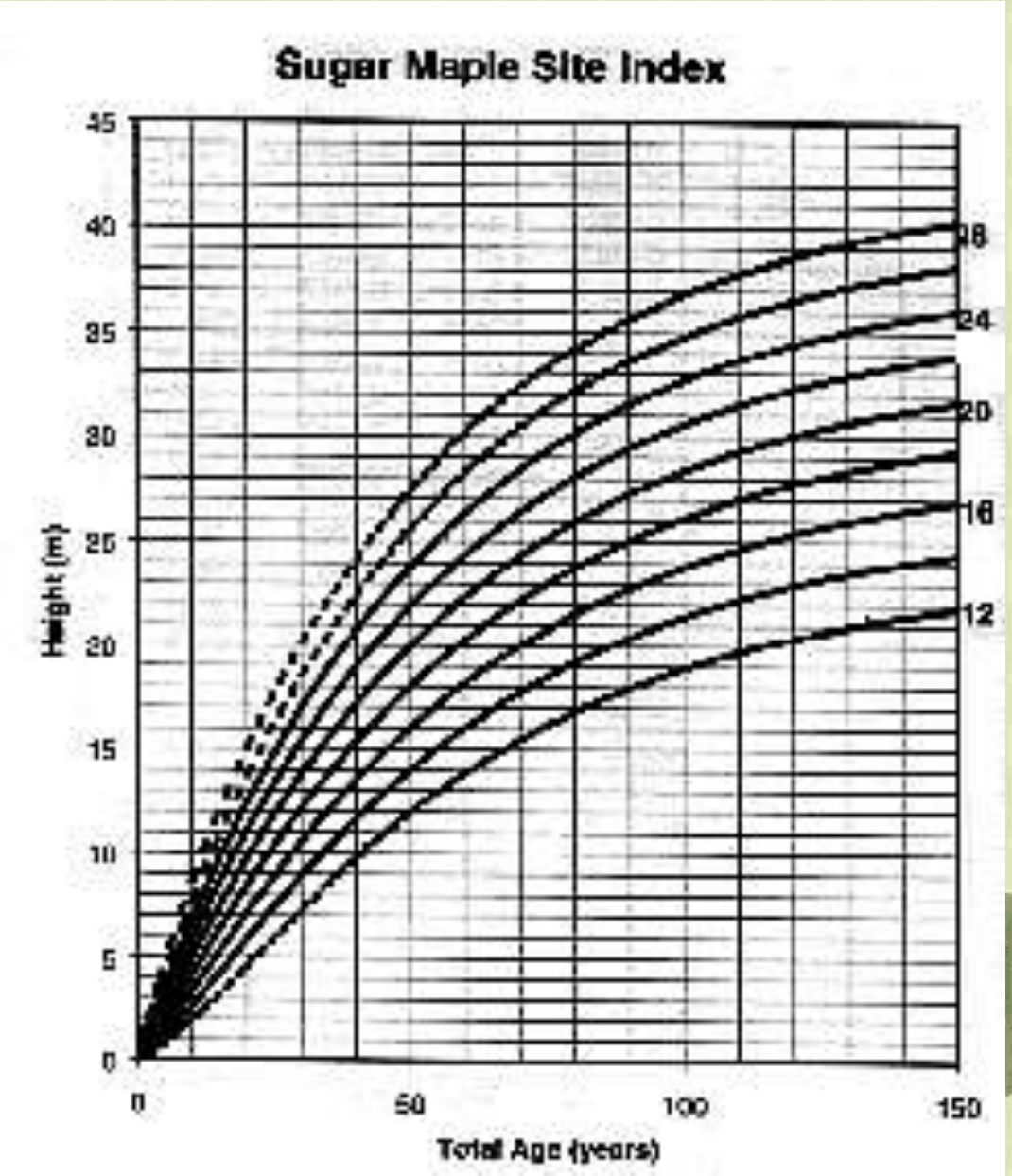
Site type

Sugar Maple grows on a wide range of site types

- shallow to deep soil
- pure sands to silt loams
- dry to moist moisture regimes
- grows best on deep well drained loams

Site index

- Height ranges from 12 to 24m at age 50



Site quality and growth and yield

Site type	Age	Average dbh cm	Basal area m2/ha	total volume m3/ha	volume sawlogs m3/ha	number of taps
Good	120	38	31.5	265.3	150.5	2
Medium	120	31	29.4	202.3	100.8	1
Poor	120	25	25.9	127.4	53.2	1

Shallow soil

- Shallow sites can lead to restricted root growth
  - may result in Maple Decline
  - leaves trees more susceptible to drought
  - may leave trees more vulnerable to windthrow

Drought

Severe droughts, as we had in 2001 are harmful to your trees

- **leaf wilt and early drop**
- **young regeneration may be killed**
- **may increase Maple Decline**

Maple decline

A condition caused by a variety of factors:

- overmature trees
- drought and restricted rooting depth
- insect defoliation
- stem and branch wounds and subsequent infection
- overstocking
- grazing and other factors

Maple decline symptoms

- Premature leaf coloration and drop as early as August
- twigs and branches of increasing size die as the condition progresses

Problem Insects

Insects of concern:

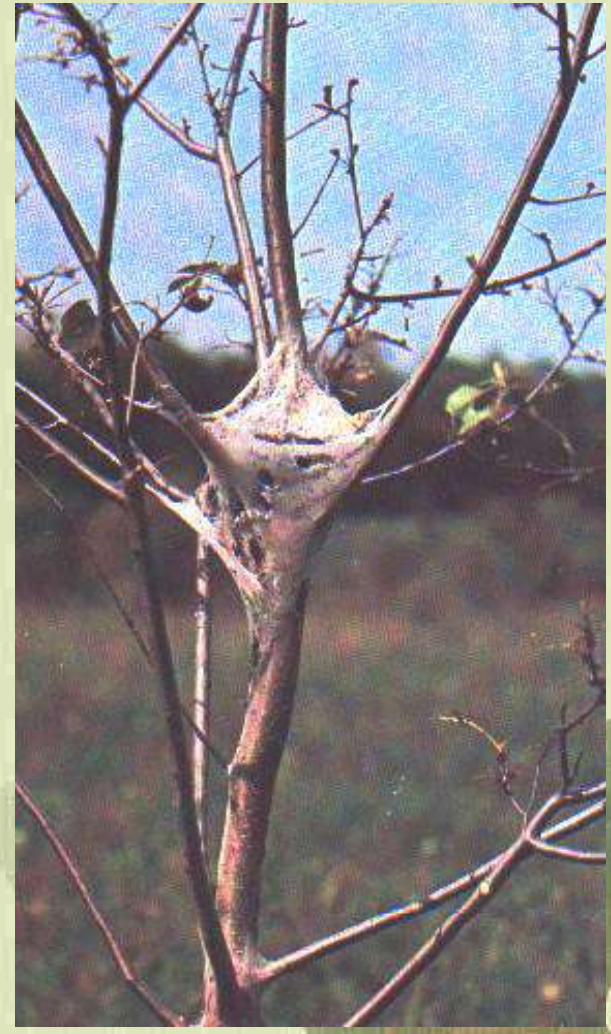
- defoliators
- boring insects
- sucking insects

Defoliators

- Defoliation- affects sap flow and sweetness
- May have cyclical peaks and lows
- Usually exist at low levels

Forest Tent Caterpillar

- hatch in spring and feed until the end of June
- does not make a tent, but does spin a mat for resting, and a cocoon for pupating
- eats majority of foliage,
- Maples may be killed if defoliated in successive years



Forest Tent Caterpillar

Forest Tent Caterpillar

Eastern Tent Caterpillar

Saddled Prominent

- hairless larvae hatch in late June
- larvae feed throughout July, eating the entire leaf except for the main veins
- often causes up to 3 years of successive defoliation, which may cause top dieback or tree mortality

Saddled Prominent

Maple Leafcutter

- damage first noticed when foliage turns light brown in late summer.
- damage is caused by the leaf being mined out and small holes are also cut out
- repeated attacks reduce tree vigour and sugar content of sap

Bruce Spanworm

- Orange eggs are laid on the lower trunk in the fall
- larvae spin down from the tree on silken threads when disturbed
- larvae feed for 5-7 weeks, cutting numerous holes in the leaves

Sugar Maple Borer

- adults oviposit eggs into maple bark, and the larvae hatch and feed on the outer sapwood
- this feeding kills the bark in that area, and the bark eventually falls off leaving the telltale scar
- The feeding area (gallery) appears as a shallow groove or channel

Sugar Maple Borer

Control Measures

- Maintain a healthy sugar bush
- Remove overmature, low-vigor, and heavily infested sugar maples
- Pre-June harvest of infested trees will prevent reinfestation of the residual sugar maple.
- Because grazing reduces stand vigor, exclude livestock.
- Promote stand vigor through sound sugar maple management. Maintain well-stocked stands.

Sugar Maple Borer

- galleries do not usually extend around the entire tree, so the tree is not killed
- the scar is a weak point, and the tree may snap at this point in a windstorm
- extensive attacks often follow heavy thinnings, particularly on shallow, dry soils

Other borers

- Occasional problems
  - Carpenterworm
  - Maple callus borer
  - Horntails

Serious Threat!

Asian Longhorn Beetle

- 1 to 1 1/2 inches in length
- black and shiny with white spots
- long distinguishable antennae that are banded with black and white.

Sucking Insects

- Aphid species
- injure leaves
- reduce growth

Problem Diseases

Diseases

Two main types:

- fungal diseases
  - heart rot, butt rot
  - Armallaria
- canker diseases (also fungal)
  - Eutypella
  - Nectria

Fungal diseases

- Enter through stem and branch wounds
- Some cause interior (heart) rot
  - spongy rot
  - yellow cap fungus
  - spine tooth fungus
  - false tinder fungus
  - mossy top fungus

Fungal diseases

- Overtapping may also cause heart rot
- heart rot
  - weakens trees
  - volume losses
  - fewer taps
- automatic UGS

Fungal diseases

- Armillaria or shoestring root rot

- **attacks low vigour trees**
- **damages roots and the lower stem**
- **often kills**

Fungal diseases

- Armillaria or shoestring root rot

Cankers

- Perennial
- contagious
- automatic UGS

Eutypella canker

- a.k.a. cobra canker
- kills smaller trees >8 cm
- weakens larger trees
- remove infected trees when thinning

Eutypella canker

Eutypella canker

Nectria canker

- a.k.a. target canker
- weakens stem
- remove infected trees when thinning

Wildlife Damage

Porcupine

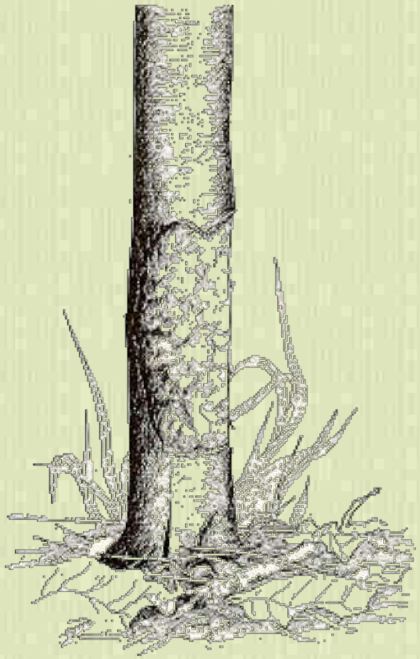
- feed on younger bark in crown
- girdle and kill branches
- trees may resprout and recover

Wildlife Damage

Porcupine

Wildlife Damage

Mice and Voles



- feed on seedling and sapling bark
- travel under the snow
- trees may die or become deformed
- control through
  - poisons
  - use tree guards in plantations

Wildlife Damage

Beaver

- Around wetlands
- may travel further in dry years
- provide valuable habitat
- control through: trapping, shooting

Wildlife Damage

Woodpeckers and Sapsuckers

- Woodpeckers
  - attack declining trees
  - shorten lifespan
  - provide valuable habitat
- Sapsuckers
  - make small holes in stem
  - do minor damage

Forest Operations

- Forest management can damage trees
  - logging damage
  - root breakage and compaction
  - poor mainline setup
  - overtapping

Logging Damage

- New growth easily bruised and removed
- entry points for fungal spores
- root damage vs. stem and branch
- size of wound

Root Breakage & Compaction

- Road design
- damaged roots
  - less nutrient and water uptake
  - less starch storage
  - point of infection for Armallaria

Improper Mainline Setup

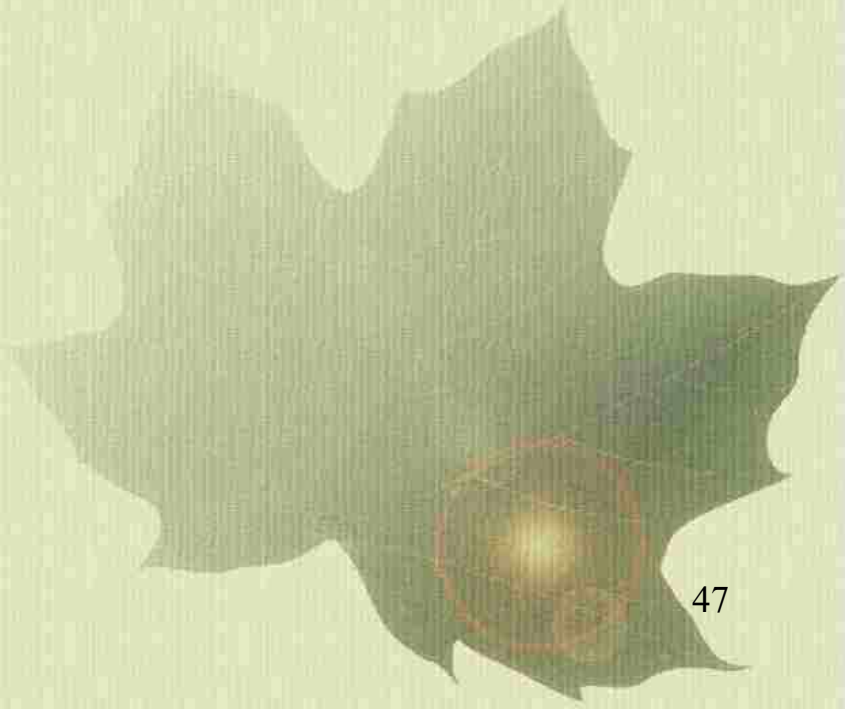
- abrasions
- girdling
- protection
- other options
  - fenceposts
  - ironwood

Overtapping

- too many taps
- tapping trees under 10”
- commonly done
- health spiles
- stain and decay columns

Conclusion

- Maintaining tree health and vigour is no accident
  - monitor
  - correct
  - preventative actions
    - careful logging
    - appropriate tapping



Principles and Practices of Sugar Bush Management

Module 5: Maple Orchards

The Principles and Practices of Sugar Bush Management

Workshop Outline:

Module 1: Introduction

Module 2: Management Planning

Module 3: Marking and Harvesting

Module 4: Sugar Bush Problems

Module 5: Maple Orchards

Module 6: Maple Facts

What is a maple orchard?

- defined as an intensively managed plantation of sugar maple (*Acer saccharum*) and/or black maple (*Acer nigrum*)
- means of expanding production

Site

- Site quality
  - texture
  - depth/moisture
  - fertility
- Location
  - proximity to sugarbush
  - slope

How long does it take?

- Average case:
  - 25-30 years from transplanting to tapping
- Ideal case:
  - 20 years

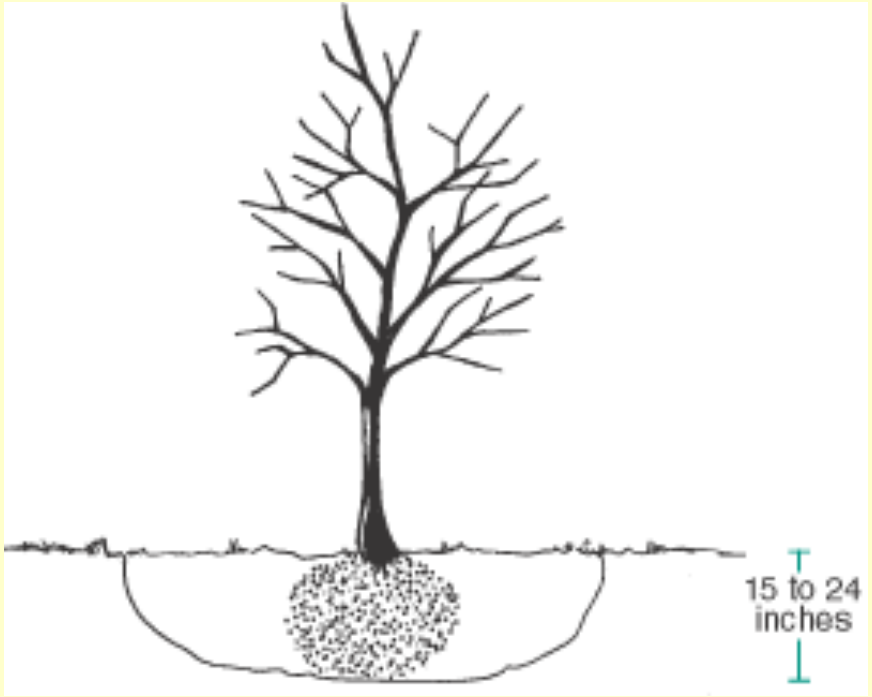
Choosing stock to transplant

- vigourous, fast growing
- 1/2-1” in diameter
- 4-10’ high
- consider Black Maple vs. Sugar Maple
- avoid
  - flat topped (suppressed) trees
  - stunted trees

How to transplant

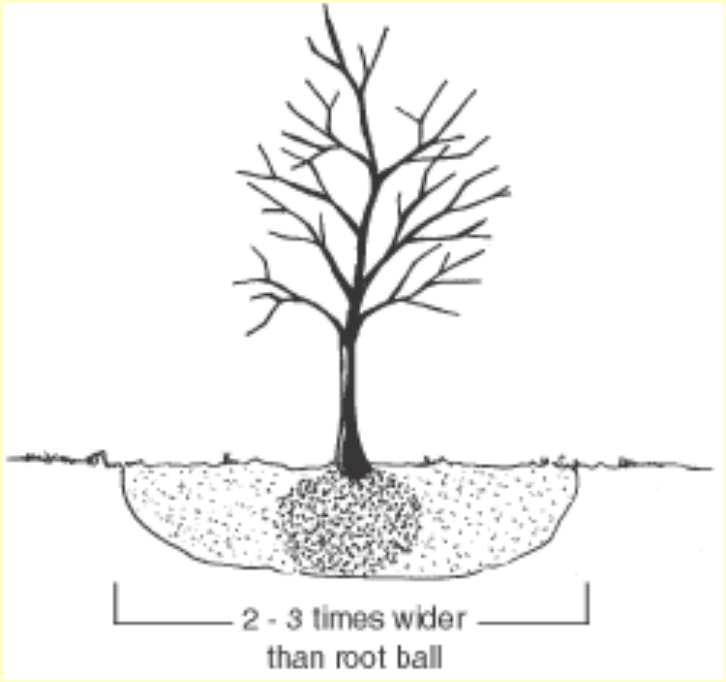
- Transplant:
  - in early spring
  - in fall
- Select:
  - open or forest grown trees
  - leader growth > 1’
  - stems free of defect

How to transplant



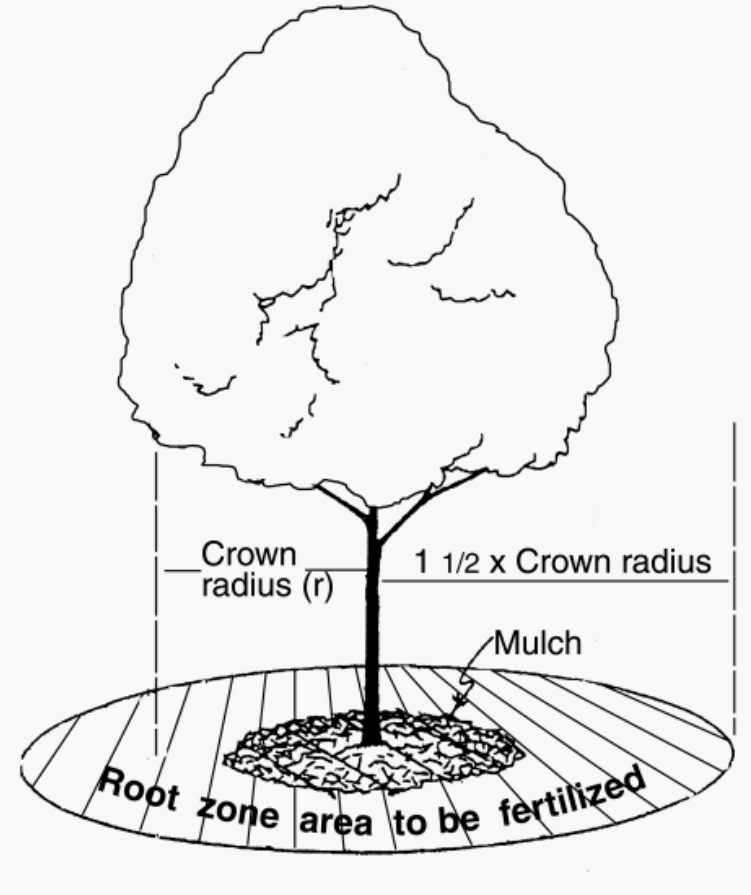
- Remove a ball of soil around the tree:
  - 8-10 inches deep
  - 2 feet in diameter
- work the shovel down and in to loosen the tree
- lift the tree with the shovel
  - retain soil
  - wrap root ball in burlap

How to transplant



- Dig a hole
  - large enough to fit the root ball
  - tree should be planted at the same level it was previously
- Backfill the hole and pack firmly

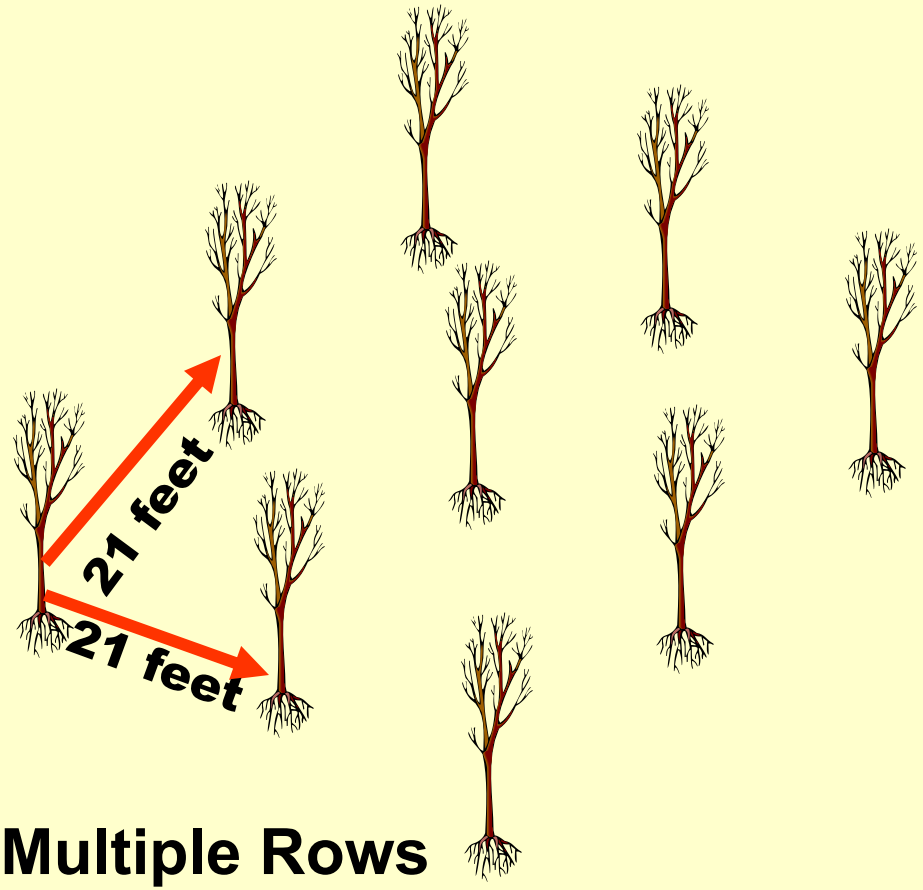
Fertilizing



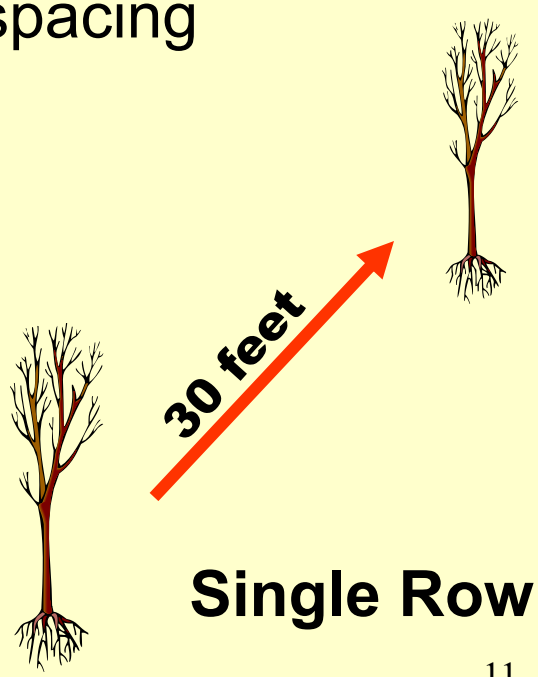
- Slow release tablets
- commercial dry fertilizer
  - apply 1 year later
- well rotted manure

Spacing

- **1 row of trees**
  - 30’ apart
- **multiple rows**
  - aim for 100 trees/acre
  - approx. 21’ X 21’ spacing



Multiple Rows



Single Row

Problems

- In a dry year
  - water trees once a week
- Trees which are tall and spindly should be supported
  - use a strong stake 6-8’ in length
  - use a wire covered with garden hose to tie tree to stake

Pruning

- may be necessary
- trying to balance roots and crown
- prune after leaves start to form or in early fall
- cut back side branches by 1/3
- take out multiple leaders

Control competition

EXTENSION NOTES

Ministry of Natural Resources

Ontario

MULCHES HELP TREES BEAT WEED COMPETITION

Mulches are an effective alternative to herbicides for protecting tree seedlings from competition with other plants for light, nutrients and moisture. Placed on the soil around the base of a tree seedling, they improve growth and survival by preventing other plants from germinating or growing.

Depending on their structure and the material they are made of, some mulches also help seedlings grow by increasing the temperature of the soil and holding that heat during cool evenings. These mulches can also protect plants from extreme hot and cold temperatures.

All mulches protect plants from dry conditions by trapping moisture beneath them. The most effective also allow air to reach the soil so that excess water can evaporate.

This fact sheet provides information about the kinds of mulches that are available and how to use them effectively.

UNCONSOLIDATED AND CONSOLIDATED MULCHES

There are two basic kinds of mulches — unconsolidated and consolidated. Unconsolidated mulches are loose materials such as wood chips, bark and straw. Although these traditional mulches have been used for centuries to control weed competition, weeds often grow through or on them. The soil temperature is also cooler under loose materials, and they do not protect plants from extreme hot or cold temperatures.

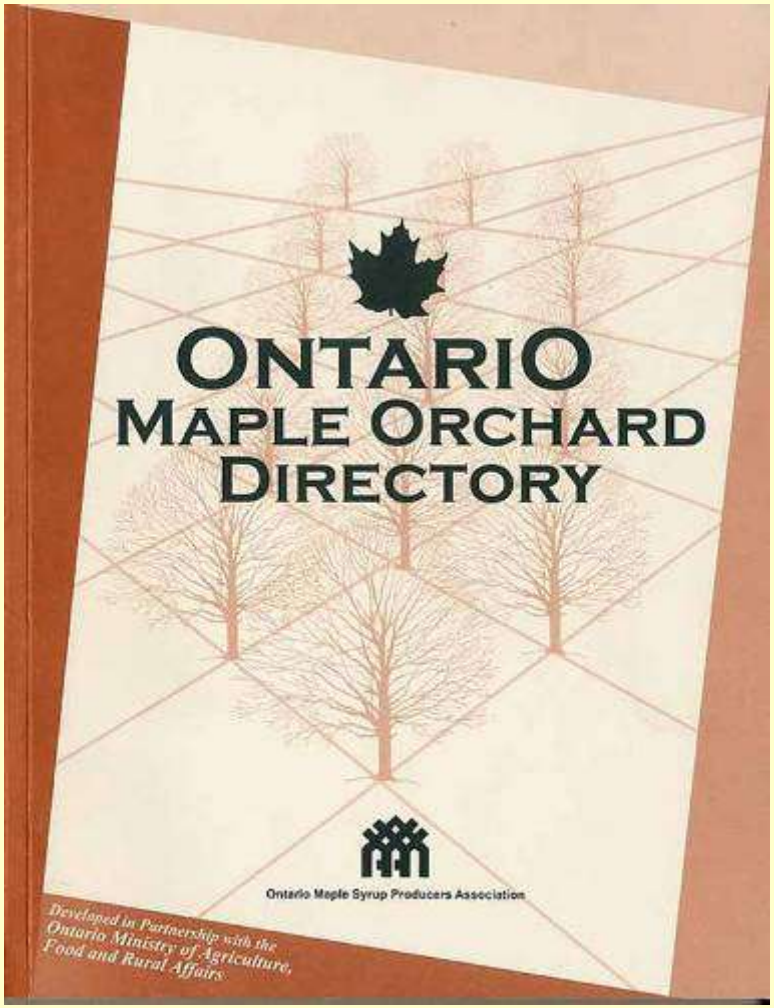
Consolidated mulches are sheets of plastic or natural fibres that are laid on the ground and anchored with staples. They are more effective than traditional mulches in preventing the germination of plants that would compete with seedlings, and many are lighter and easier to apply. Plastic mulches have the added advantage of preventing soil moisture and soil temperature. Many consolidated sheets are also designed to hold rain water and allow excess water to evaporate.

- Cultivate
  - before and after
- Herbicides
  - 3-4’ circle around the tree
  - Roundup or Simazine

Protection

- Young bark a favorite food of mice and rabbits
  - use tree guards
    - plastic wraps
    - chicken wire
  - mouse bait in fall

References



Call your local OMAF office

Principles and Practices of Sugar Bush Management

Module 6 – Maple Facts

The Principles and Practices of Sugar Bush Management

Workshop Outline:

Module 1: Introduction

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Module 5: Maple Orchards

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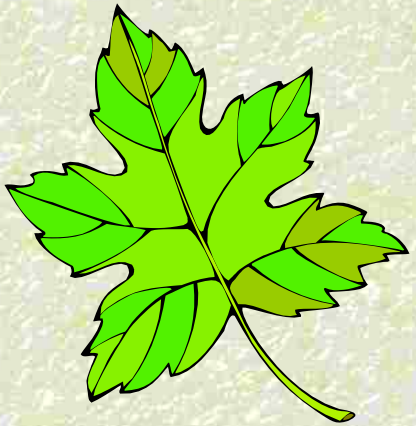
Species



- There are about 35 species in North America
- all maples produce sap
- Black, Sugar, Red and Silver(?) produced commercially
- backyard producer can tap Manitoba, and some varieties of Norway maple

Sap

- lifeblood of the maple tree
- sugar content
  - average 2.2 %
  - typical range 1 to 4 %

Syrup

- evaporated maple sap
  - water is removed
- defined as:
  - 66 % by weight of soluble solids (mostly sugar)
    - use a hydrometer or refractometer to measure
  - boiling point of water
    - use a thermometer (special ones available)

Sugar Bush Productivity

Class	Taps needed per gallon of syrup
Excellent	<3
Good	3-4
Average	5-6
Poor	7-10
Bad	>10

Number of Taps Per Tree

- Depends on
  - tree health/vigour (e.g. ice storm damage)
  - landowner objectives (e.g. aesthetic trees versus commercial sugarbush)

Ontario Tapping Rule

Tree diameter	# of taps
25 to 37 cm (10-14”)	1
37 to 50 cm (15-19”)	2
50 to 63 cm (20-24”)	3
> 63 cm (25”+)	4

Tapping Guidelines for Ice Damaged Sugarbushes

Ice Damage	Tapping Guidelines
0-25 %	tap as usual
26-50 %	use conservation guidelines
51-75 %	use conservation guidelines if tree showing high vigour
>75 %	only tap trees identified for removal

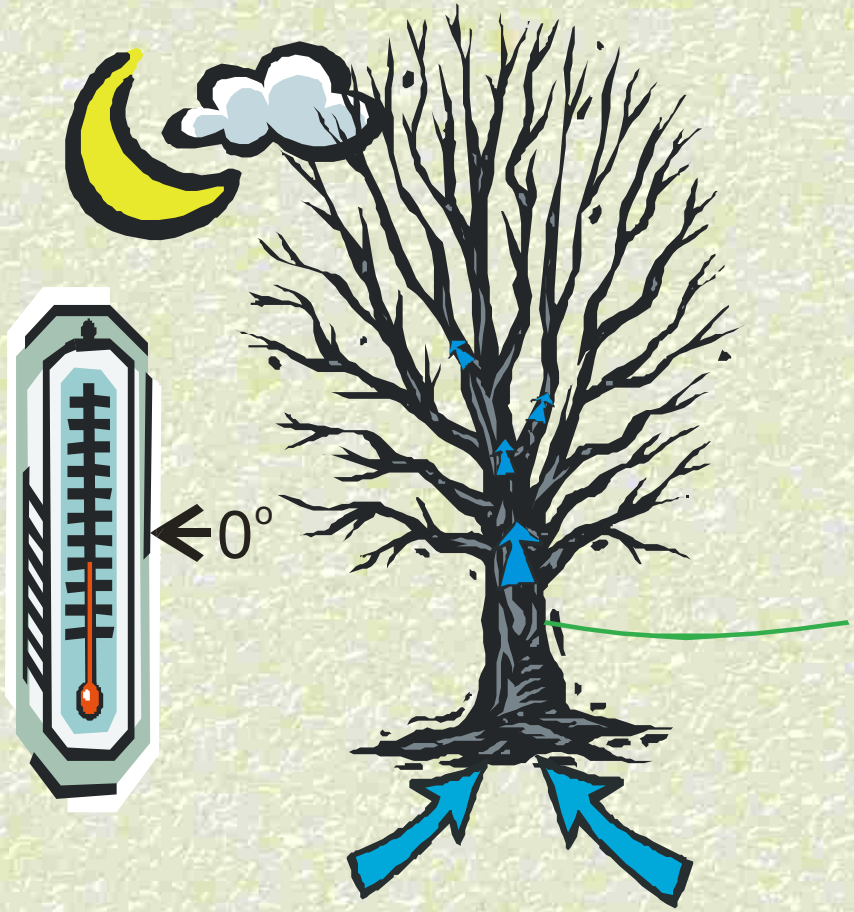
Conservation Tapping for Ice Damaged, Stressed, or Aesthetically Valuable Trees

Diameter	# of taps
12-18”	1
18”+	2

Why Sap Flows

- production of sap by maple trees is a natural phenomenon
- Flow and collection of sap is not natural
- occurs anytime during the winter when air temperature fluctuates above and below zero
- largest flows occur during February, March and April

Why Sap Flows

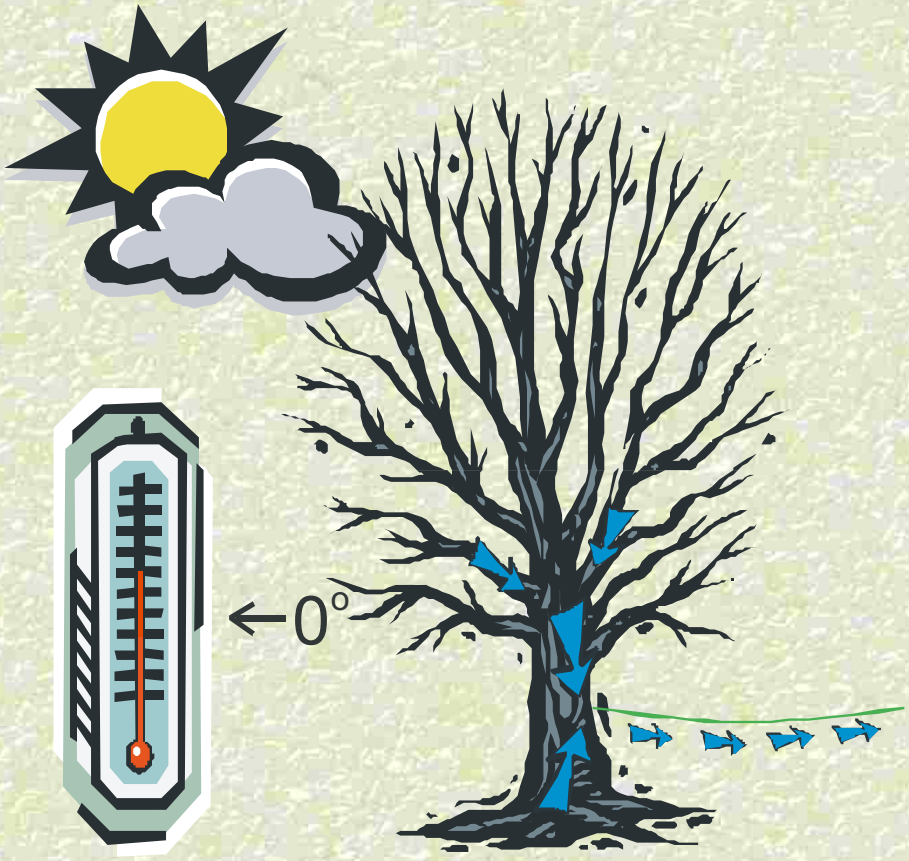


Sap flow is a function of temperature

Sap flows from a hole when the internal pressure is greater than the external (atmospheric) pressure

Cold nights induce a -ve pressure within the tree causing water to be absorbed by the roots

Why Sap Flows



Warm days induce a +ve pressure causing sap to flow out of a wound or taphole

It is believed that CO_2 expansion and contraction is responsible for the pressure change within the tree

Why Sap Flows

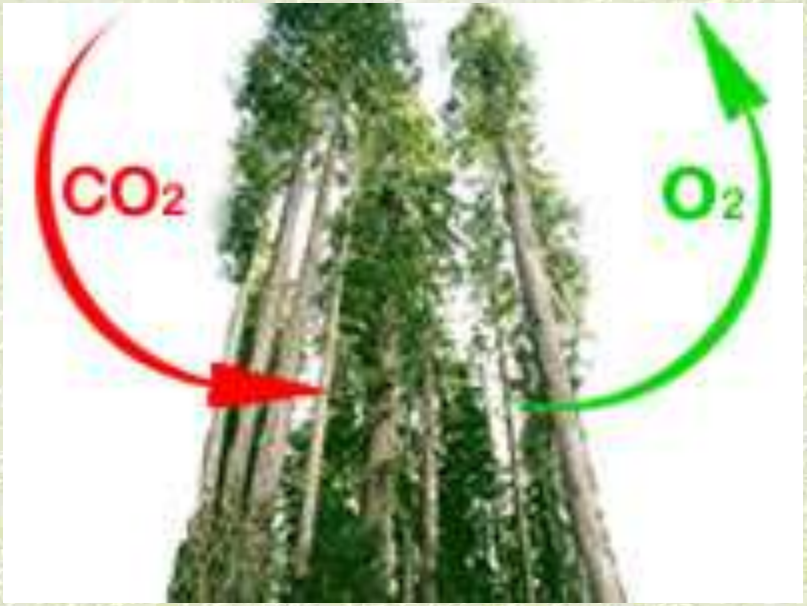
This type of sap flow is unique to the genus *Acer*

The exact mechanism is still not completely understood

It doesn't really make sense when you consider that water expands as it freezes

Sap sweetness is also related to the freeze/thaw that occurs in early spring

Sugar in the Maple Sap

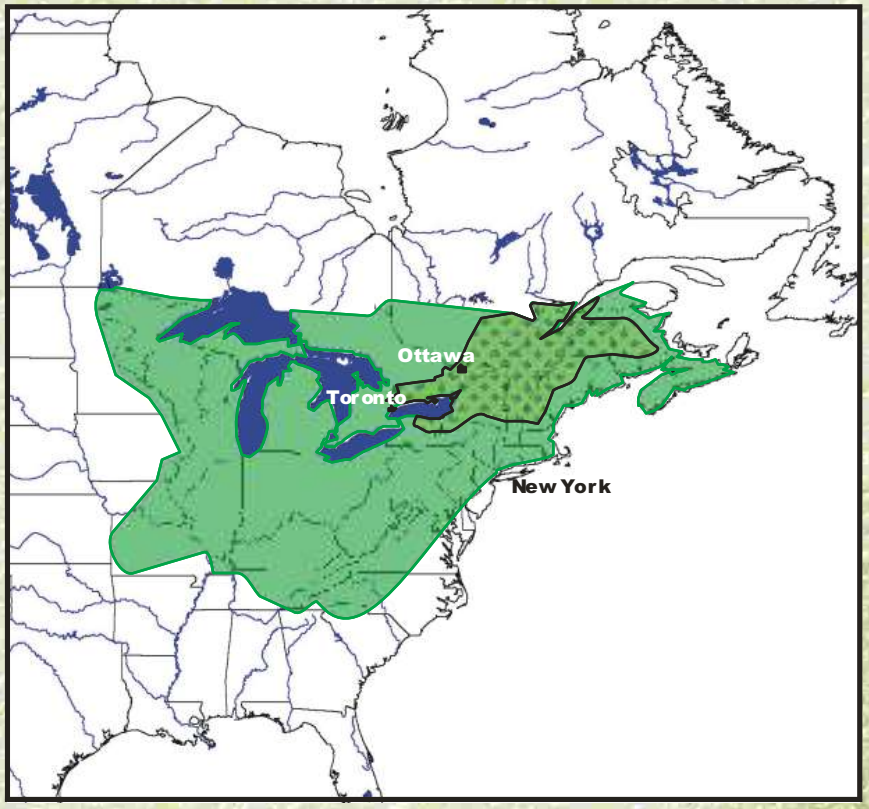


- Made by photosynthesis during the previous growing season
- produces carbohydrates which are stored as starch
- during the winter, some starch is converted to sugar and is dissolved in the sap

Amount of sugar varies

- tree genetics
- soil and site quality
- tree health and vigour
- environmental conditions (e.g. drought)

Range of Sugar Maple



North American Range of Sugar Maple

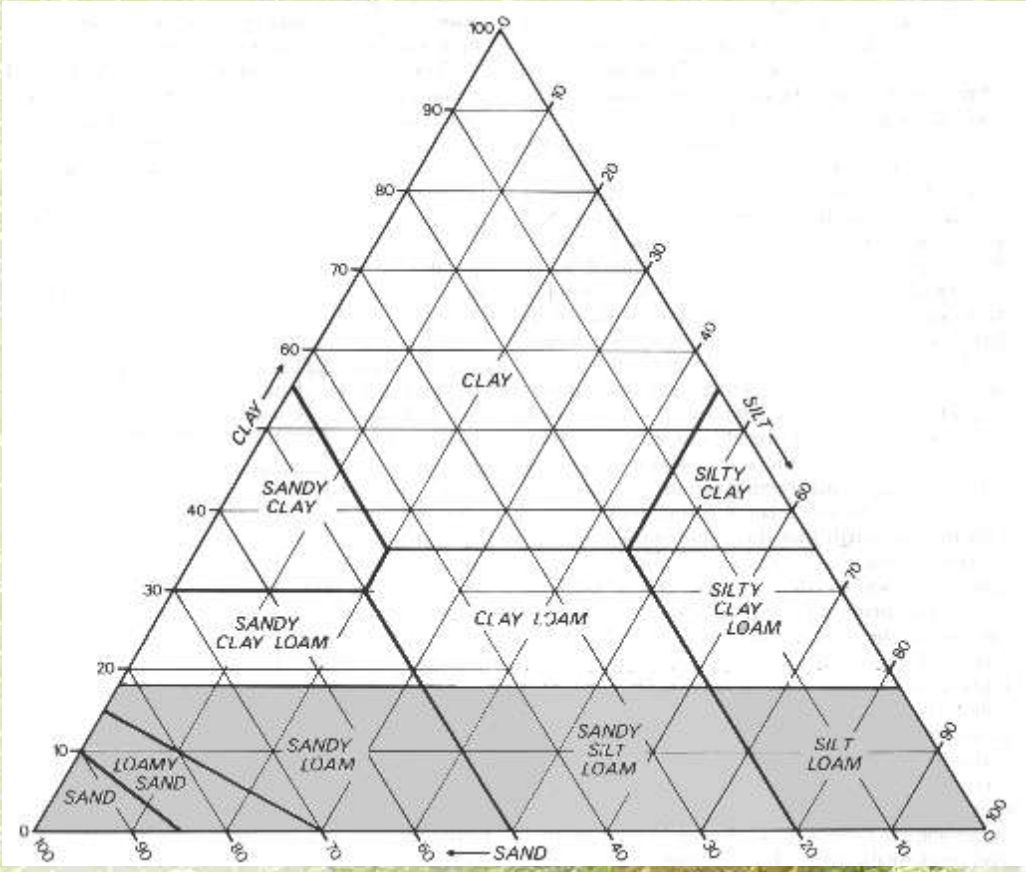
Main Syrup Producing Region

Climate

- sugar maple is restricted to regions with cool, moist climates in North America
- within this region winter temperatures range from -18 to 10^{o}C
- July temperatures range from 16 to 27^{o}C

Soils

- sugar maple grows on sands, loamy sands, loams, sandy loams, silt loams
- grows best on well drained loams
- excessive site moisture can lead to shallow rooting and windthrow



Soils

- sugar maple does not grow well in
  - dry, shallow soils (exception fractured limestone bedrock)
  - swamps

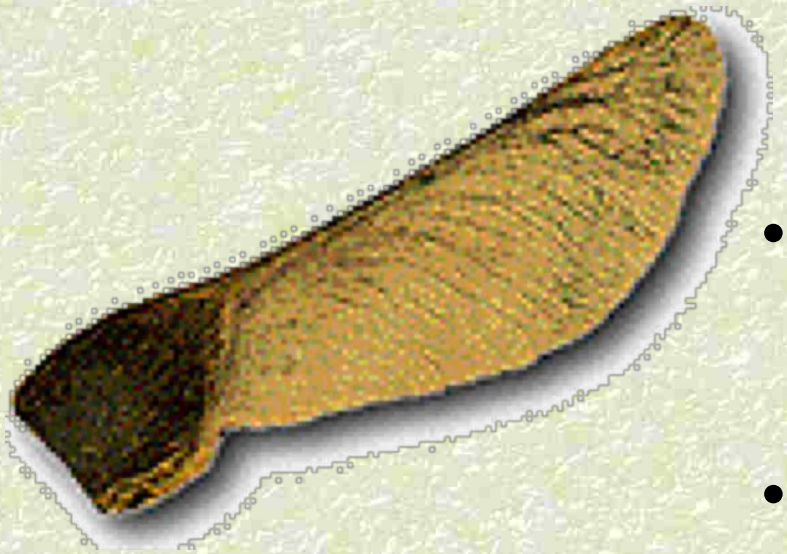
Associated Forest Cover

- Sugar Maple is commonly found with:
  - Basswood
  - White Ash
  - American Beech
  - Hemlock
  - Red Maple
  - Yellow Birch
- Found as seedlings/saplings under almost all upland forest types

Reproduction

- reproduces primarily through seeds
- can reproduce through stump sprouts (coppice)

Seeds



- light crops produced by 40-60 year old trees (20 cm dbh)
- moderate crops from 70-100 year old trees (25-36 cm dbh)
- heavy crops from older trees
- up to 22 million seeds/ha

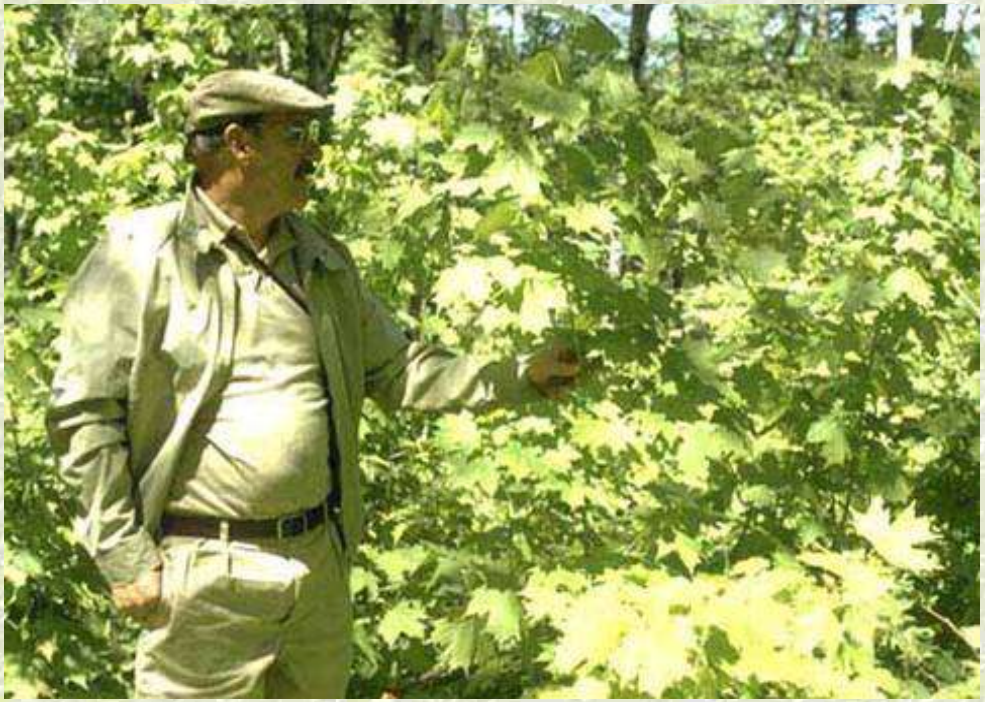
Seed Periodicity

- period between good-better seed crop ranges from 3 to 7 years

Germination

- high germination (95 % of seeds viable)
- optimum temperature for germination is 1^{o}C
  - lowest of any forest species
- often germinated with first leaves out before the snow is gone
- develops strong primary root, able to penetrate heavy leaf litter and reach mineral soil

Seedling Development



- very shade tolerant
- can survive long periods of suppression
- grow best under partial shade
- maximum photosynthesis is reached at 25 % full sunlight