

2026 Chautauqua County Envirothon

Forestry

by:

Jeff Brockelbank & Richard Silvestro



Northern Hardwood Forest - 1700



Pioneer Subsistence Farming – 1740



Height of Intensive Farming - 1830



Intensive Farming Abandoned - 1850



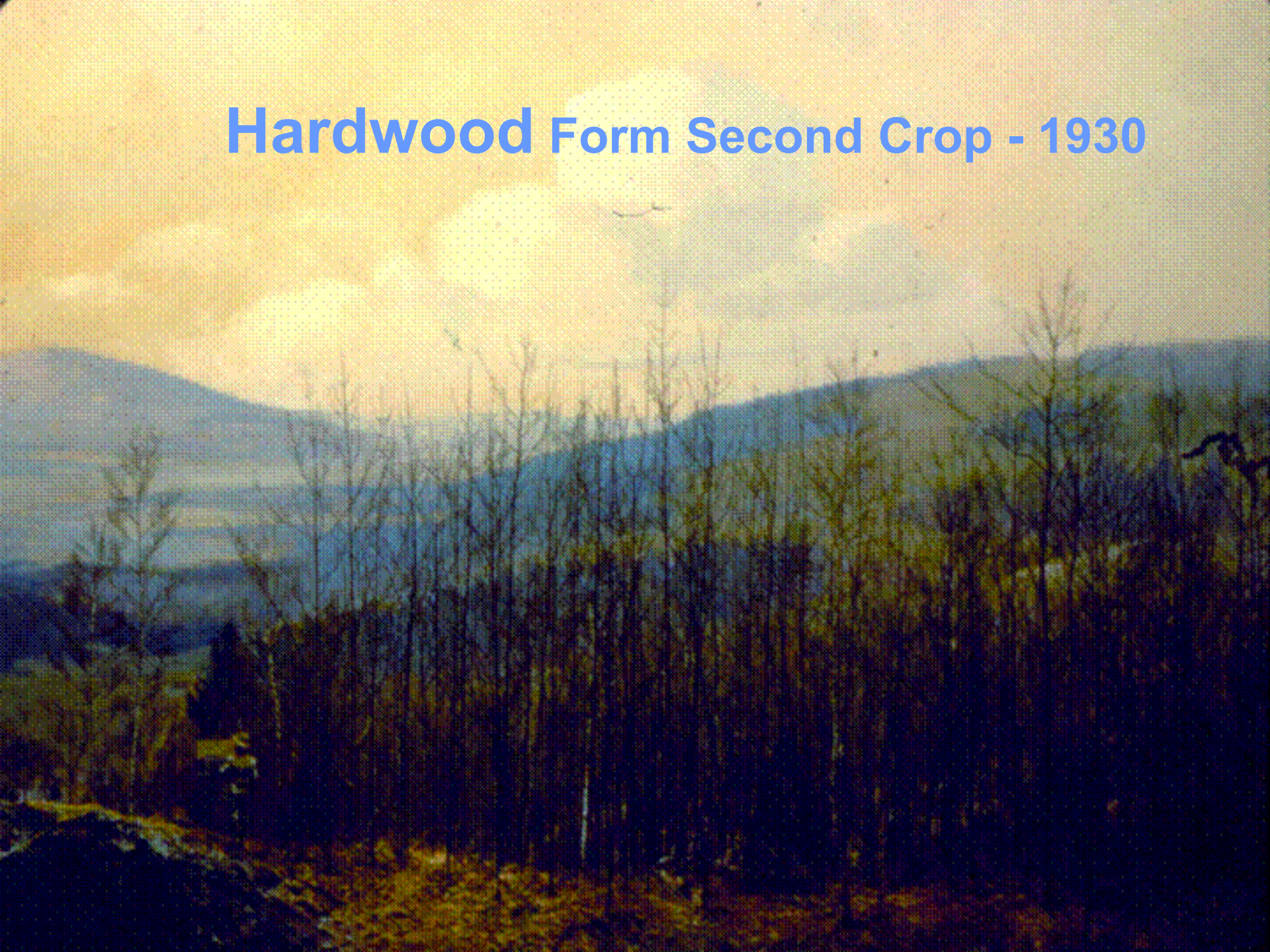
First Crop of Old-Field White Pine - 1910



Volunteer Hardwood Regeneration - 1915



Hardwood Form Second Crop - 1930



1870

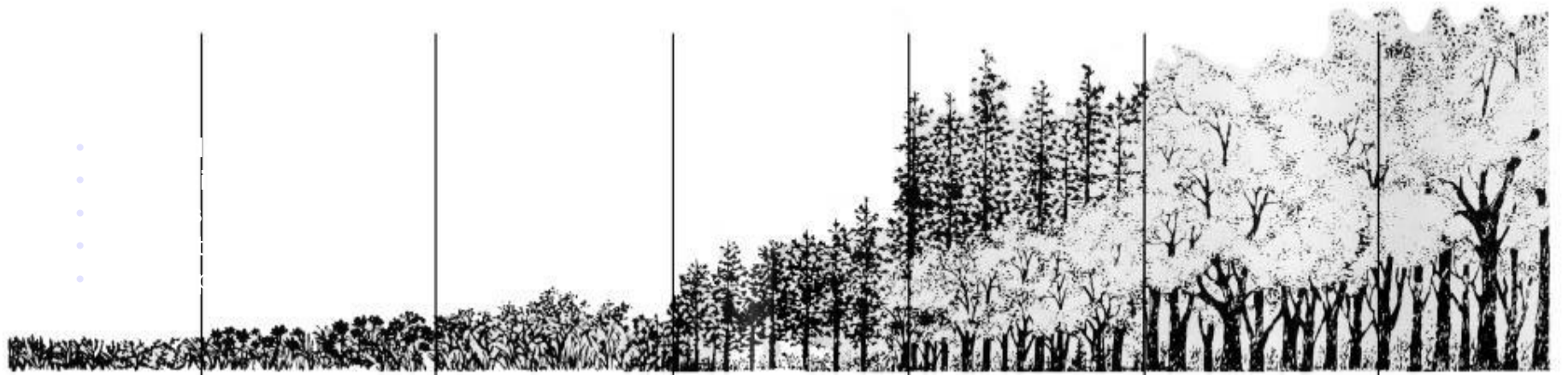
**Protts Hill,
Newfield, NY**



1970



Succession in The North East



1st year

Low-growing annual grasses and forbs (ragweed, horseweed & crabgrass, many non-native weeds).

2nd to 5th year

Perennial grasses and forbs (asters, goldenrods, Queen Anne's lace, knapweed and many others).

3rd to 10th year

Woody shrubs and shade intolerant tree seedlings invade among perennial herbs and grasses (blackberries & other Rubus species, sumacs, greenbrier)

10th to 20th year

Pioneer tree saplings form thickets (Red cedar, pines, locust, aspen or cherries depending on site).

20th to 70th year

Short-lived pioneer species gradually replaced by taller and longer lived trees (Tulip tree, ash, Red maple, Black birch, Black gum).

70th to 100+ years.

Canopy dominated by long-lived hardwoods (mixed oaks, hickories, maples). Understory of shade tolerant species

Until the next disturbance

Shade tolerant species dominate the canopy and understory (hemlock, sugar maple, beech).

Pioneer Shade-intolerant Species

Which Species of herbs, shrubs and trees dominate depends on location, site history, soil moisture, topography and circumstance.

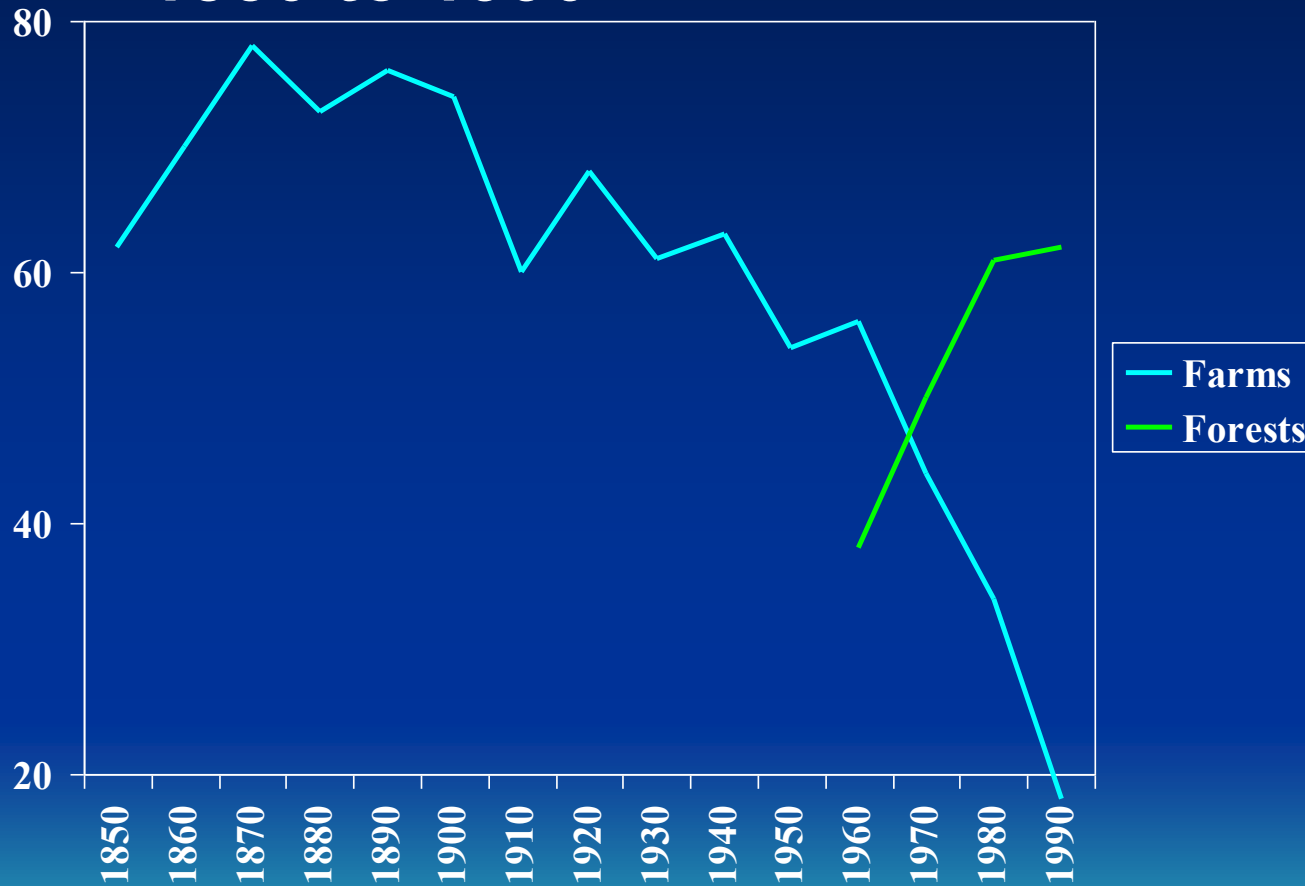
Moderately Shade Tolerant Species

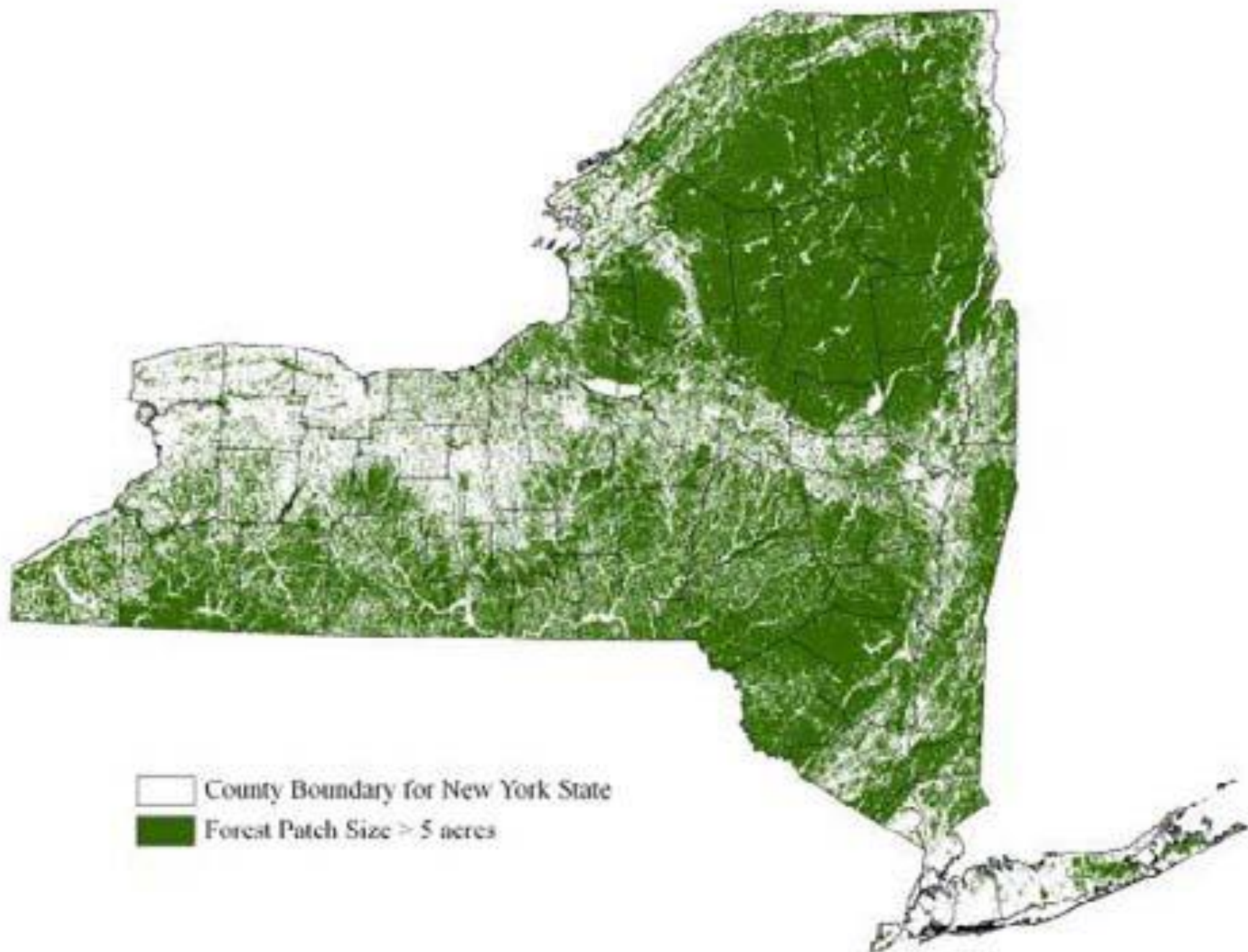
Canopy trees are all about the same age (± 20 years)

Shade Tolerant species

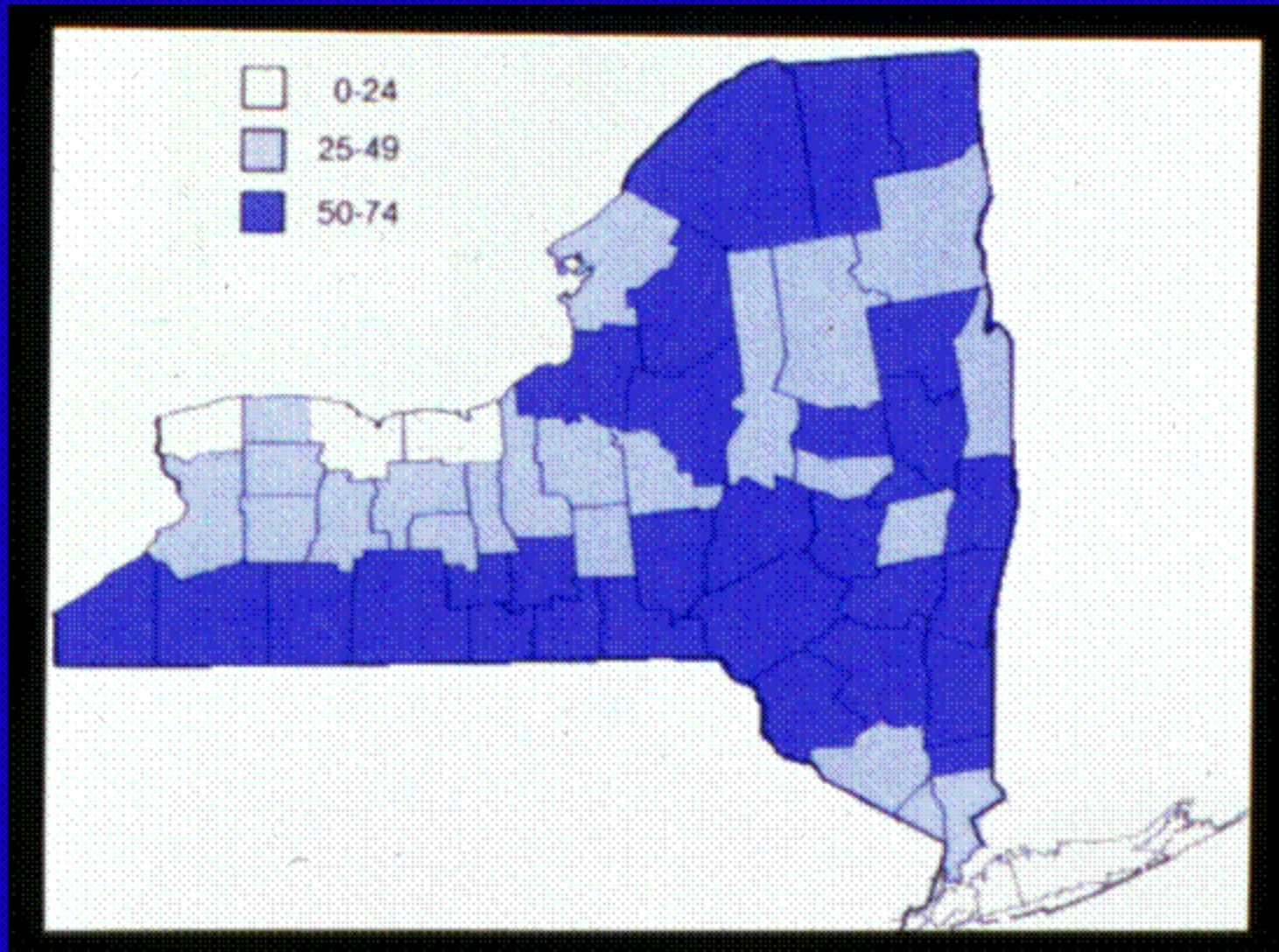
Gaps from dying trees lead to an uneven age canopy.

Percent of New York State in Farm and Forest, 1850 to 1990





Commercial Timberland in NY (%)



Tree Identification

- Sugar (Hard) Maple
 - (*Acer saccharum*)



- Red (Soft) Maple
– (*Acer rubrum*)



- Red Oak
 - (*Quercus rubra*)



- White Oak
 - (*Quercus alba*)



- Hemlock
 - (*Tsuga canadensis*)



- White Pine
 - (*Pinus strobus*)



- White Ash
 - (*Fraxinus americana*)



- Quaking Aspen
– (*Populus tremuloides*)



Aspen trees in autumn, Sierra Nevada Mountains, California
Photograph by Roy Toft

- Black Cherry
 - (*Prunus serotina*)



- Black Birch
 - (Betula Alleghaniensis)



- Amercian Beech
– (*Fagus grandifolia*)



- Yellow Birch
 - (*Betula alleghaniensis*)



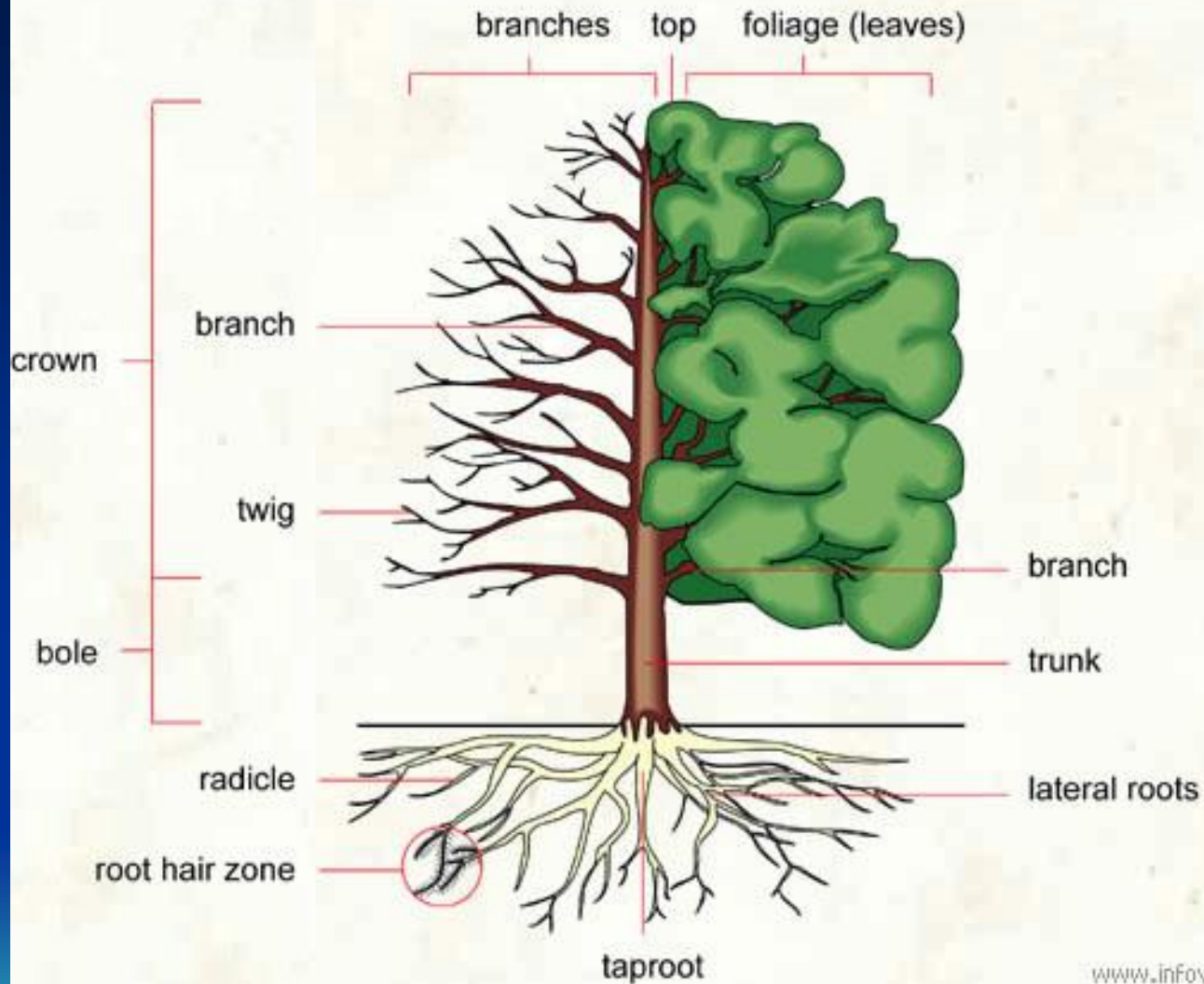
- Shagbark Hickory
– (*Carya ovata*)



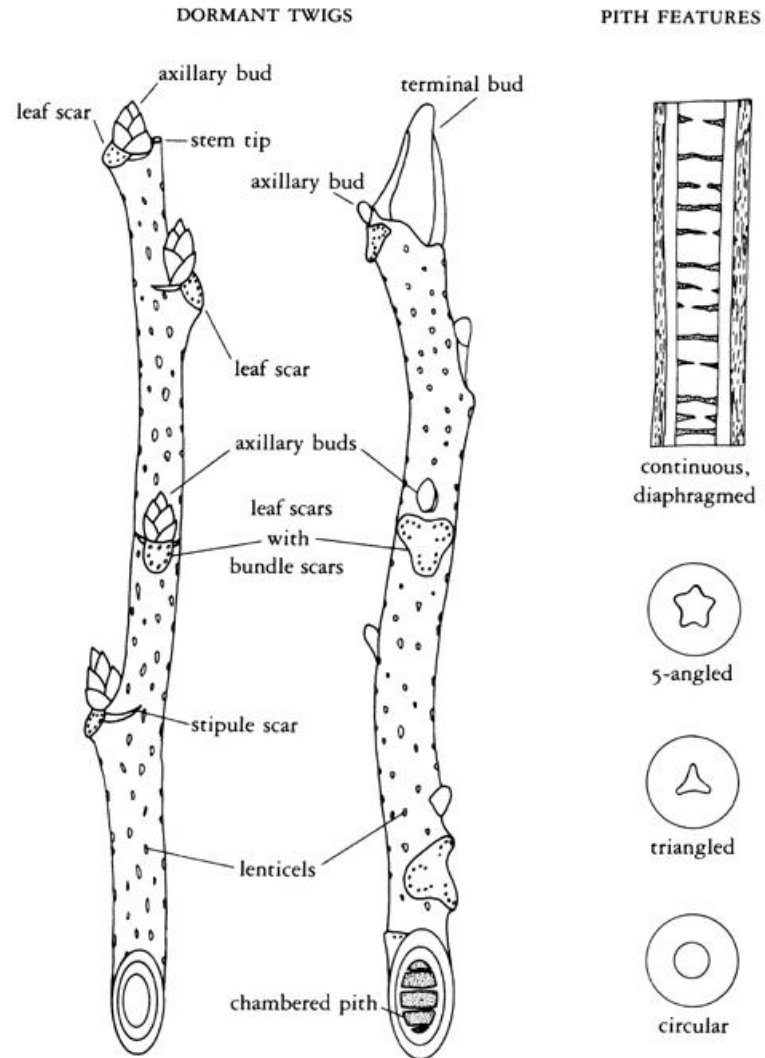
- Bitternut Hickory
– (*Carya cordiformis*)



STRUCTURE OF A TREE



Vegetative Structures



Ecosystem

includes all **abiotic** and **biotic** factors in
one particular environment

Biotic Factors

the living parts of
an ecosystem

Abiotic Factors

the nonliving parts
of an ecosystem



© 2004 Plano ISD, Plano, TX

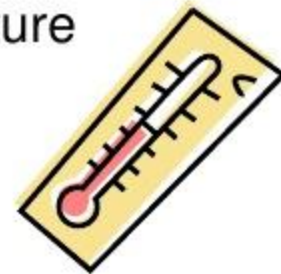


Biotic vs. Abiotic Factors

- Living
- Examples
 - ▣ Plants
 - ▣ Animals
 - ▣ Fungi
 - ▣ Bacteria



- Non-Living
- Examples
 - ▣ Water
 - ▣ Sunlight
 - ▣ Soil
 - ▣ Air
 - ▣ Temperature



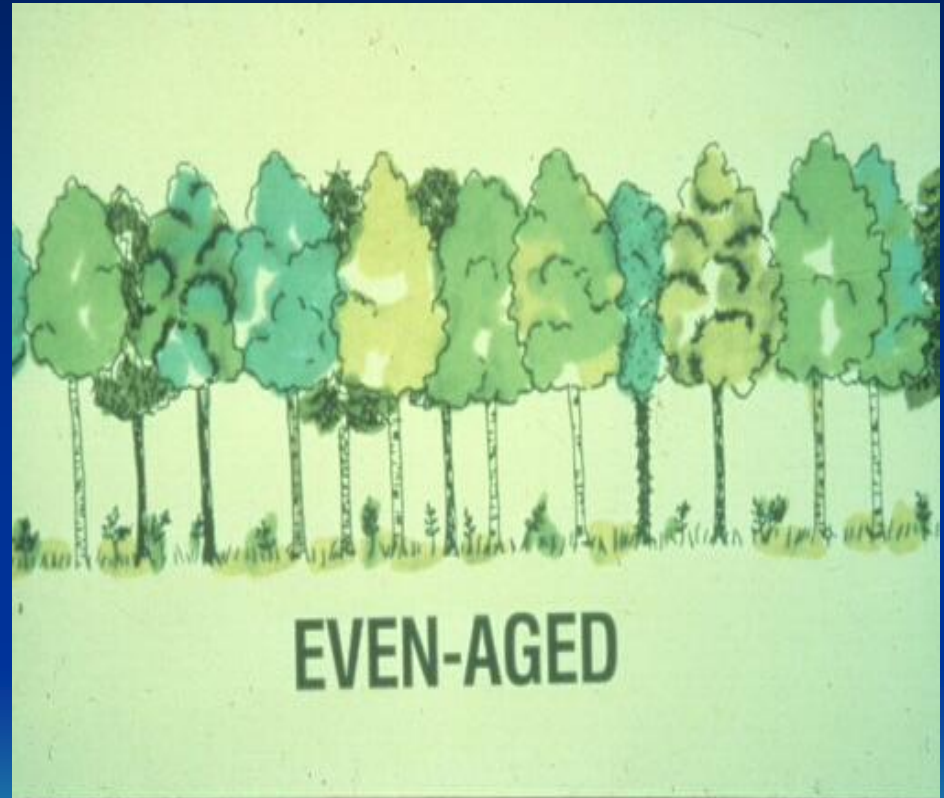
Silviculture & Forest Management

Even Aged vs. Uneven Aged



Even-aged Forests

Forests which are composed of stands in which all the trees in a stand are roughly (within about 20 years) the same age.



Even Aged Stands

Most stands in New York State are even-aged

Abandoned farmlands provided the source for many of the forests we operate in today.

The size of the tree does not determine the age:

- A larger tree is not necessarily an older tree

- A significantly smaller tree may only be a couple of years younger, not a couple of decades



Even Aged Stand



Hancock Timberlands: Cattaraugus Co., t/o Kill Buck.
Note the flagging on either side of the trail

Tree on right side of trail



94 years old – 15" stump diameter

Tree on left side of trail



97 years old – 38" stump diameter

Even Aged Methods

Shade intolerants

Oak

Ash

Cherry

- Harvest Systems

- Clear cuts

- Shelter wood

- Seed Tree



Clearcutting

Trees larger than one or two inches in diameter are generally removed from a site at one time. Some trees will be left within the area to serve wildlife, soil, water, and visual needs. Examples include snags, den trees, and streamside management zones.



Young Forest Initiative Clearcut



Shelterwood

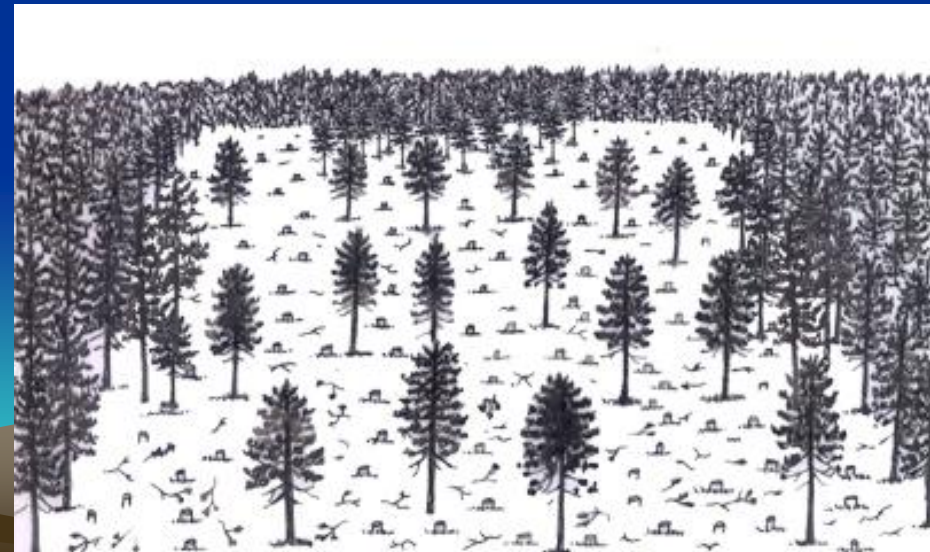
- Several cuts over a period of up to 10 years
 - Remove over-mature and high-risk trees
 - Create uniform openings in canopy
 - Create favorable conditions for desired species to regenerate
 - Hold second cut for good seed year
 - Overstory removal once seedling regeneration is established





Seed Tree

Most of the trees are removed in one cut, leaving 12 to 15 well-spaced, good seed-producing trees per acre. When needs of other resources are present, such as visual or wildlife, the trees may be left for a longer period or permanently.



Harvest Systems – Even Aged

- Advantages
 - Favors high value, fast growing species
 - Reduces damage to residual stand
 - Lower logging costs
- Disadvantages
 - Unsightly
 - Possible regeneration failure
 - 60-90 years between major harvests



Uneven-aged Forests

Forests that are comprised of stands in which each stand may have three or more well defined age classes



Uneven-aged Methods

- Single Tree Selection
- Group Selection





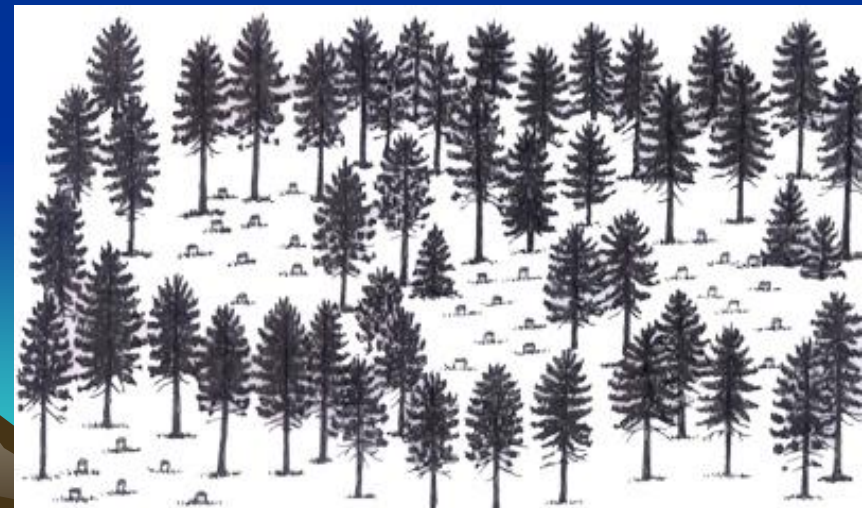
Trees Selected Based on:

- Species
- Quality
- Health
- Spacing
- Diameter



Group Selection

Small groups of trees are cut in $\frac{1}{4}$ to two acres sizes. This creates larger openings for regeneration of trees that require partial sunlight.



High-Grading

High-Grading removes all but the poorest quality trees, thereby greatly reducing the future timber value of a woodlot.



Impacts of Diameter-Limit Cutting

- Removes high value trees
- Concentrates growth on low quality trees
- Loss of control of stand density, and spacing
- Maximizes immediate \$ yield
- Decreases long-term \$ yield



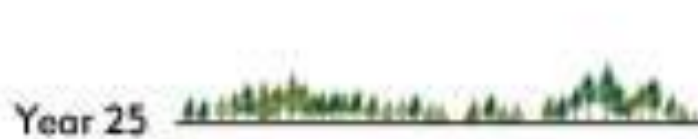
Harvest System - Uneven aged

- Advantages
 - Continuous forest cover
 - Frequent sales
 - Practical for small landowners
- Disadvantages
 - Damage to residual trees
 - Encourages slower growing trees
 - Higher mgt. Costs



Even-aged, short term (group shelterwood)

Uneven-aged, long term (group selection)



Measurements cont.

- DBH = Diameter @ breast height (4.5 feet off ground)
 - Measured with a Biltmore Stick or Diameter tape.



HOW TO USE A BILTMORE STICK FOR DETERMINING TREE DIAMETER

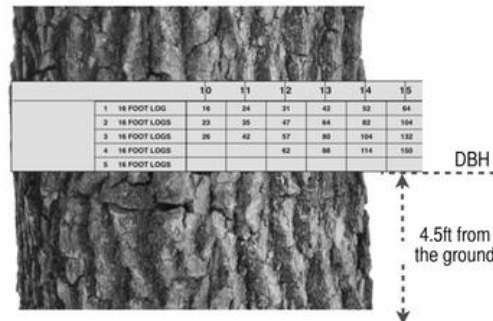
DETERMINE THE DIAMETER OF THE TREE

Diameters are taken at 4 ½ feet from the ground. (If a tree is on a slope, stand on the uphill side to measure diameter.) This is known as "DBH" (Diameter Base Height).

Step 1: Hold the side of the stick with the Tree Scale on it **perpendicular** to the tree and **25 inches from your eye**.

Step 2: Line the left edge of the stick up to the left edge of the tree. Then use only your eyes to look at the measurement on the right side. **Keep your head still.**

Step 3: Tree diameters are measured in inches. Round up or down to the **nearest whole inch** to get the recorded diameter of the tree.



DETERMINE THE BOARD FOOT VOLUME OF THE TREE

Use the Tree Scale on the Biltmore stick or a separate Log Rule Table to determine the volume of timber in board feet.

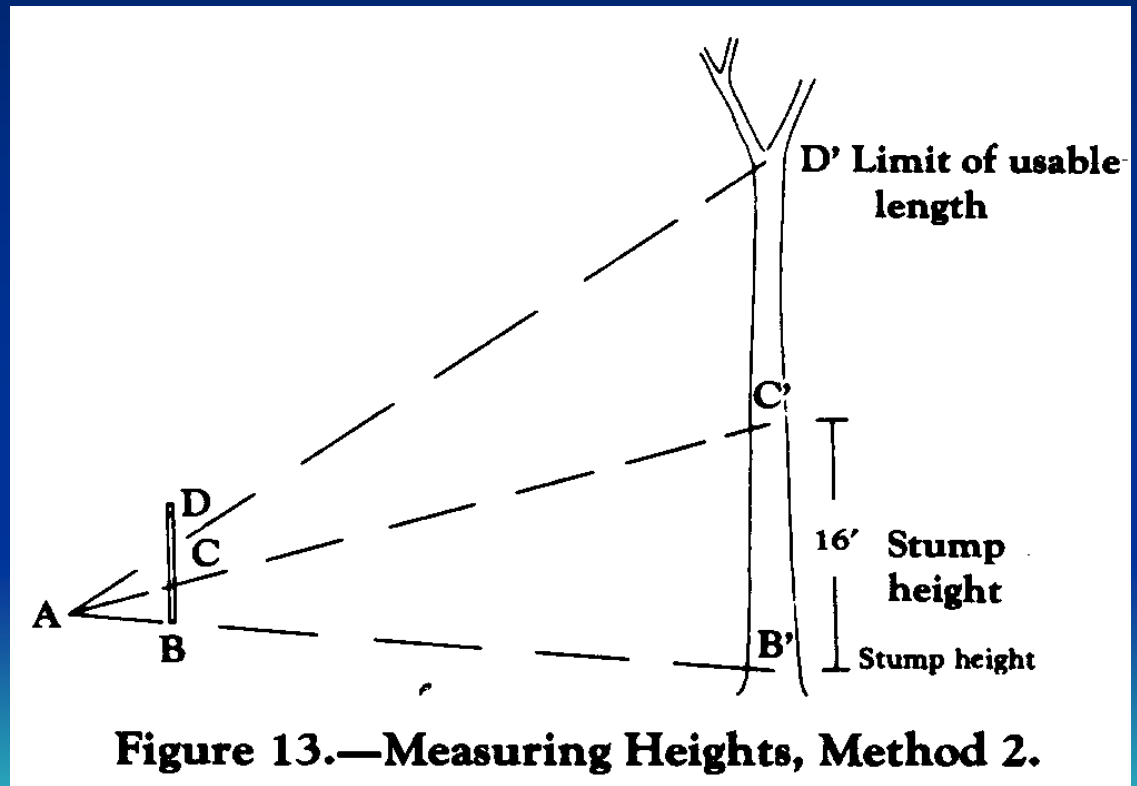
Start on the column with the tree diameter and then read down to the row with the correct number of logs.

	10	11	12	13	14	15
1 16 FOOT LOG	16	24	31	42	52	64
2 16 FOOT LOGS	23	35	47	64	80	104
3 16 FOOT LOGS	26	42	57	80	104	132
4 16 FOOT LOGS			62	88	114	150
5 16 FOOT LOGS						

DOYLE LOG RULE									
DBH	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
10	16	20	23	24	26				
11	24	30	35	38	42				
12	31	39	47	52	57	60	62		
13	42	53	64	72	80	84	88		
14	52	67	82	93	104	109	114		
15	64	84	104	118	132	141	150		
16	77	101	125	143	161	174	186		
17	92	122	152	175	198	214	230		
18	108	144	179	206	234	254	273		
19	126	168	210	244	278	301	324		
20	144	193	242	282	321	348	374	396	417
21	164	221	278	324	370	403	436	462	489
22	185	250	315	368	420	458	497	529	561
23	208	282	356	417	478	521	564	604	643
24	231	314	397	466	536	583	630	678	725
25	256	350	443	522	600	655	710	764	818
26	282	386	489	576	663	727	791	852	912
27	310	425	540	638	735	806	877	946	1015
28	339	466	592	700	807	885	963	1040	1118
29	370	509	648	766	884	970	1056	1144	1232
30	400	552	703	832	961	1055	1149	1248	1346

Measurements cont.

- Tree height – measured to a 10" top or major fork



Measurements cont.

Formula for Volume

Diameter of tree x # of 16 foot logs = Volume in board feet

Formula for Standard Cords

4'x4'x8' = 128 cubic feet



Measurements cont.

- Chain = A unit of length equal to 66' and composed of 100 links.
- Rick = Is a pile of evenly stacked cordwood, staves, bolts or other short-length wood



Increment Borer

An **increment borer** is a specialized tool used to extract a section of wood from a living tree with relatively minor injury to the tree.

It enables the user to count the rings in the core sample to determine the age of the tree or the growth rate of the tree.



- **A** = The Handle. A metal tube with square slot and clip to allow fixing of the Auger.
- **B** = The Auger. A hardened steel tube with a cutting tip at one end and a square section at the other.
- **C** = The Extractor. A thin steel half-moon blade.

Insects & Diseases

- Defoliators
- Borers
- Bark Beetle
- Foliage Disease
- Root Disease
- Fungal Diseases



Spotted Lantern Fly



Gypsy Moth



Gypsy Moth Defoliation



Gypsy Moth



Pests cont.

E. Tent Caterpillar /
Forest Tent
Caterpillar



Pests cont.

Spring / Fall
Cankerworm



Pests cont.

White Pine Weevil



Pests cont.

Asian Long horned Beetle

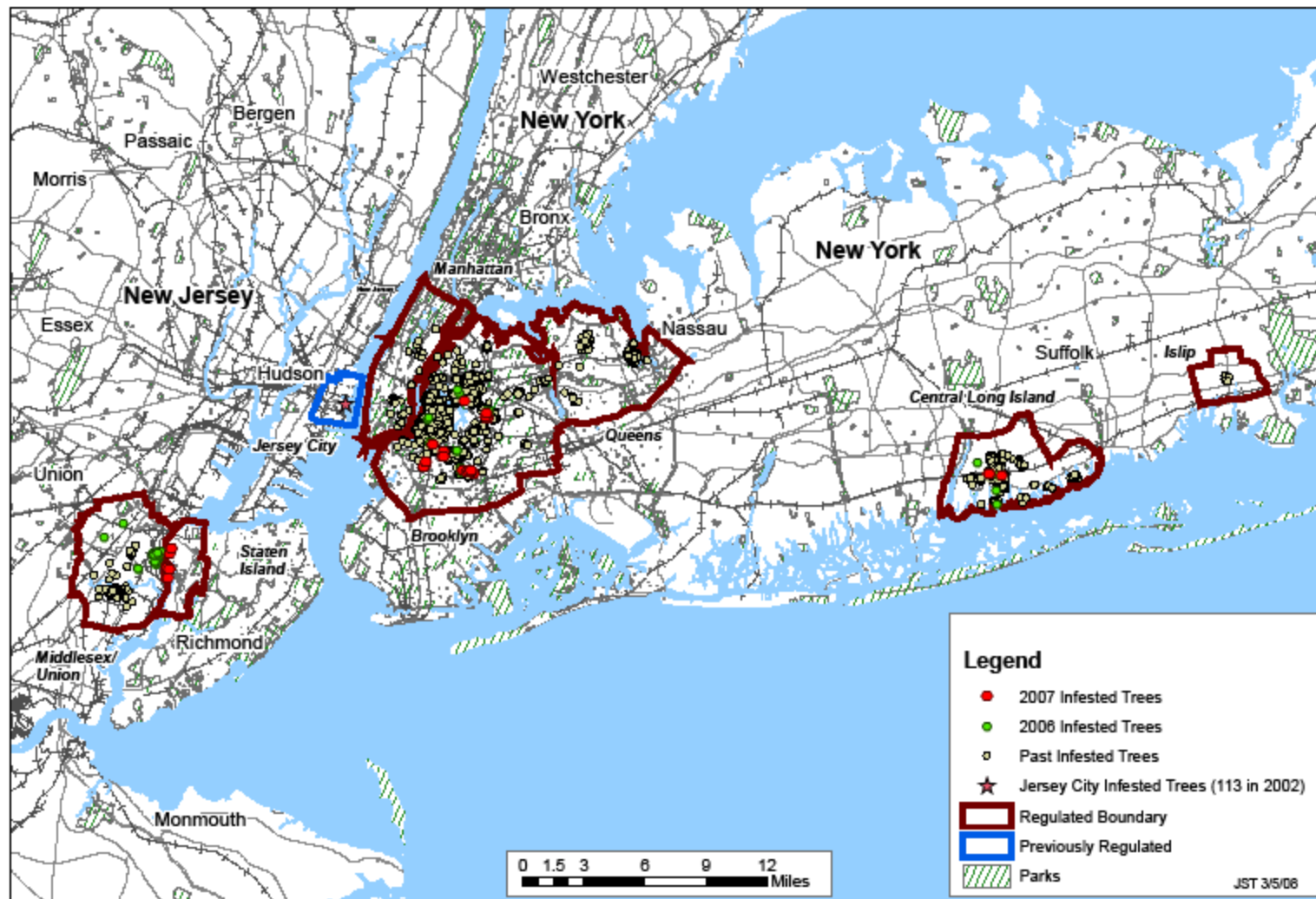


ALB Stages





New York and New Jersey Overview



Pests cont.

Hemlock Woolly Adelgid



Pests cont.

Emerald Ash Borer



Emerald Ash Borer Galleries





EAB Woodpeckering

More prevalent on the south side of the tree

Exit Holes



Figure 4. D-shaped exit holes where adult beetles emerged.

Cooperative Emerald Ash Borer Project

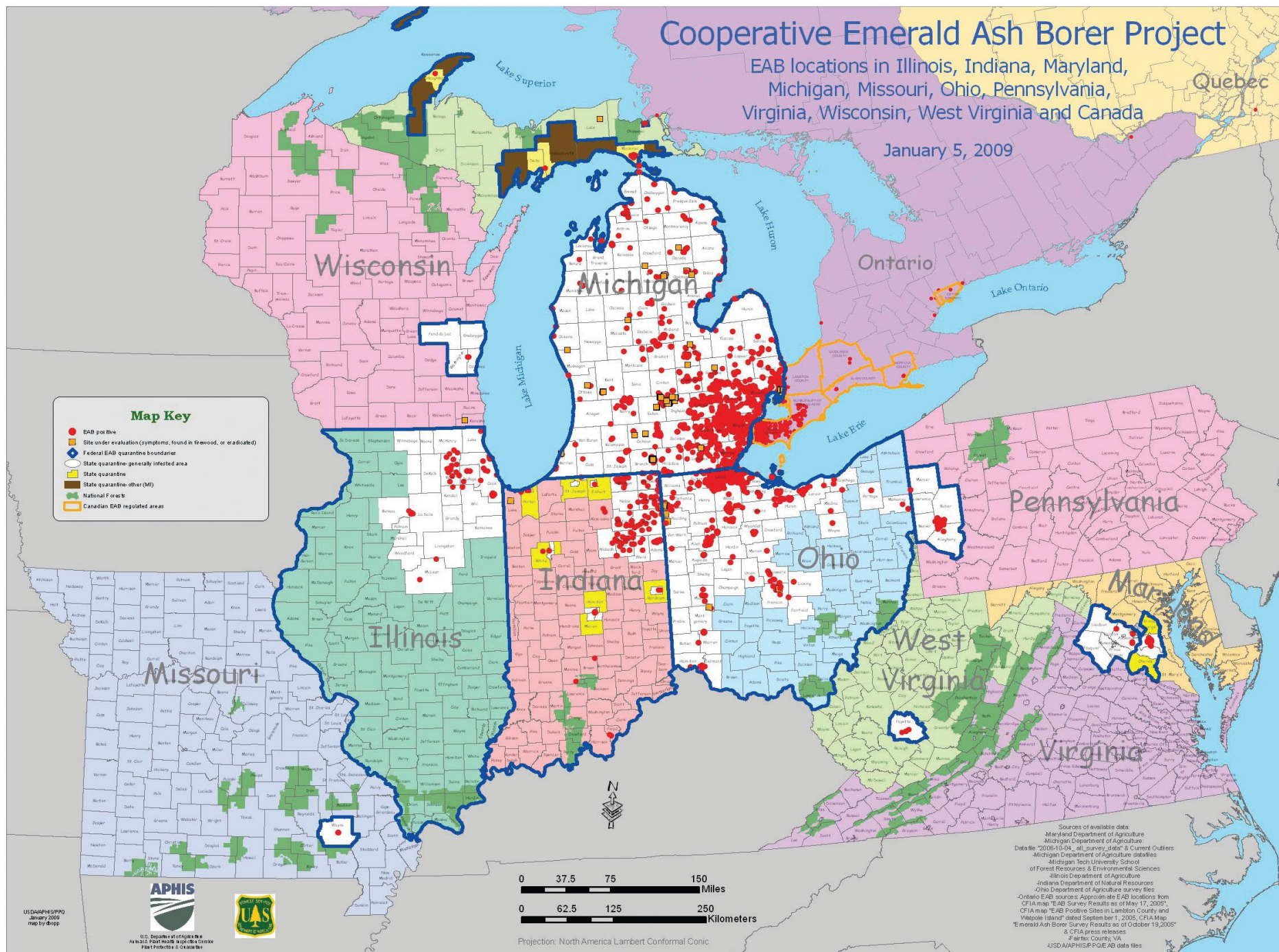
EAB locations in Illinois, Indiana, Maryland, Michigan, Missouri, Ohio, Pennsylvania, Virginia, Wisconsin, West Virginia and Canada

Quebec

January 5, 2009

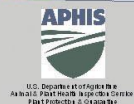
Map Key

- EAB positive
- Site under evaluation (symptoms, found in firewood, or eradicated)
- ◊ Federal EAB quarantine boundaries
- ◊ State quarantine - generally infested area
- ◊ State quarantine
- ◊ State quarantine - other (MI)
- ◊ National Forests
- ◊ Canadian EAB regulated areas



Sources of available data:
 Maryland Department of Agriculture
 Michigan Department of Agriculture
 Dettle "2006-10-04_all_survey_data" & Current Outliers
 Michigan Department of Agriculture datasets
 Michigan Tech University School
 of Forest Resources & Environmental Sciences
 Illinois Department of Agriculture
 Indiana Department of Natural Resources
 Ohio Department of Agriculture survey files
 Ontario EAB sources: Approximate EAB locations from
 CFIA map "EAB Survey Results as of May 17, 2005"
 CFIA map "EAB Positive Sites in Lambton County and
 Walpole Island" dated September 1, 2005; CFIA Map
 "Emerald Ash Borer Survey Results as of October 19, 2005"
 & CFIA press releases
 F. J. Smith, County, VA
 JSD/APHIS/P. F. G. E. AB data files

USDA/APHIS/USFS
 January 2009
 map by dnp

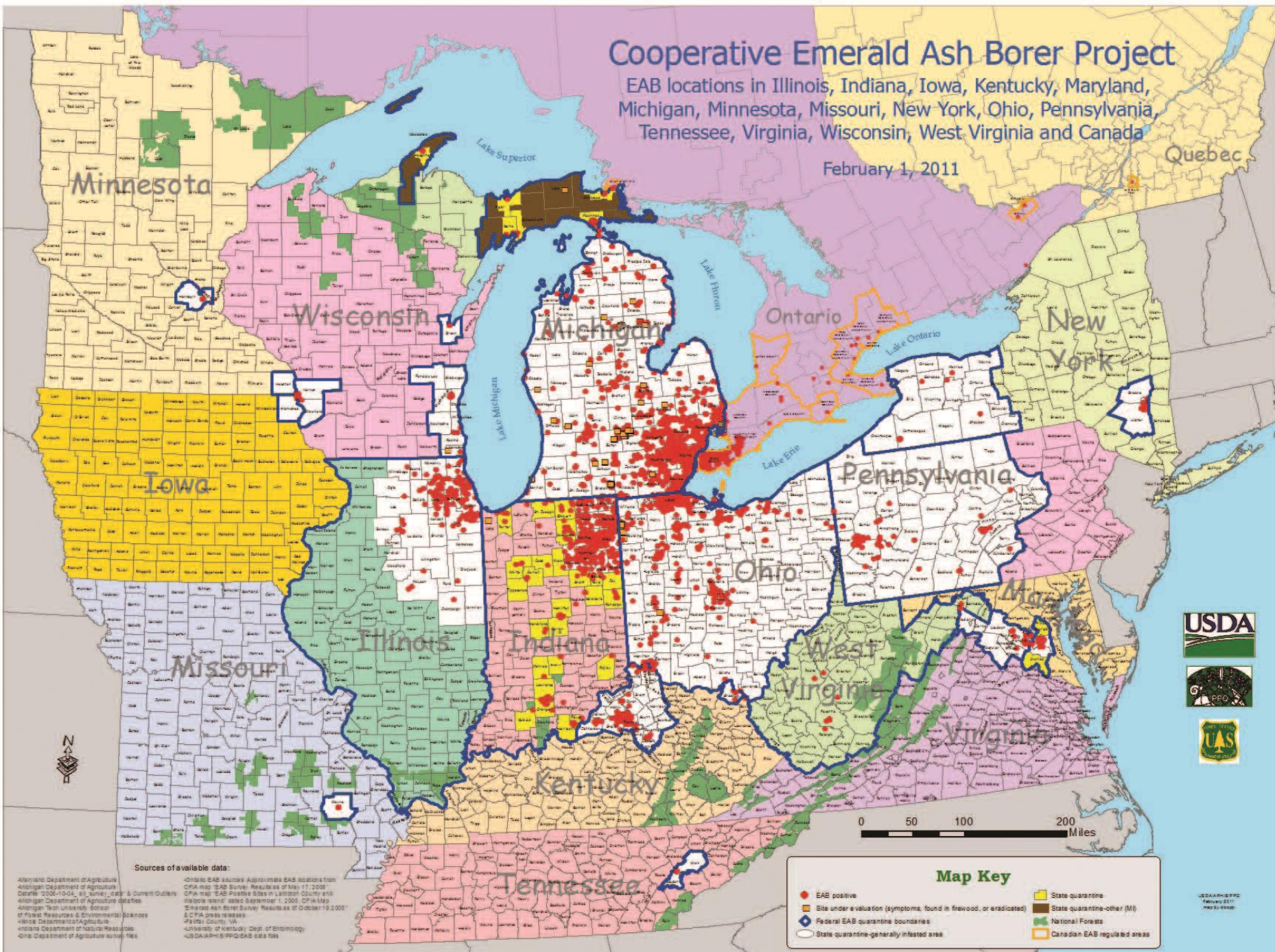


0 37.5 75 150 Miles
 0 62.5 125 250 Kilometers

Projection: North America Lambert Conformal Conic

EAB locations in Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin, West Virginia and Canada

Quebec

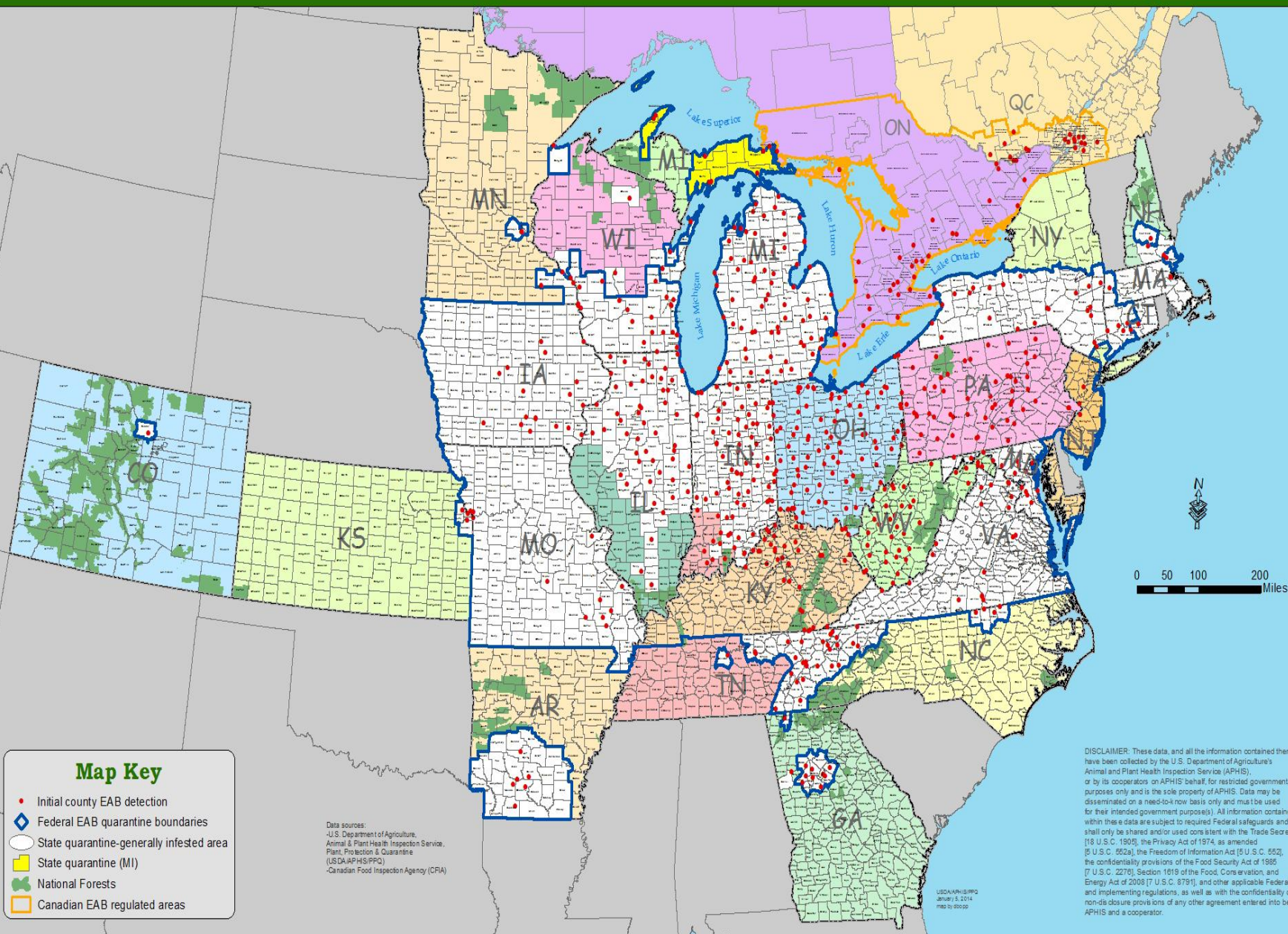




Cooperative Emerald Ash Borer Project

Initial county EAB detections in North America

January 5, 2015

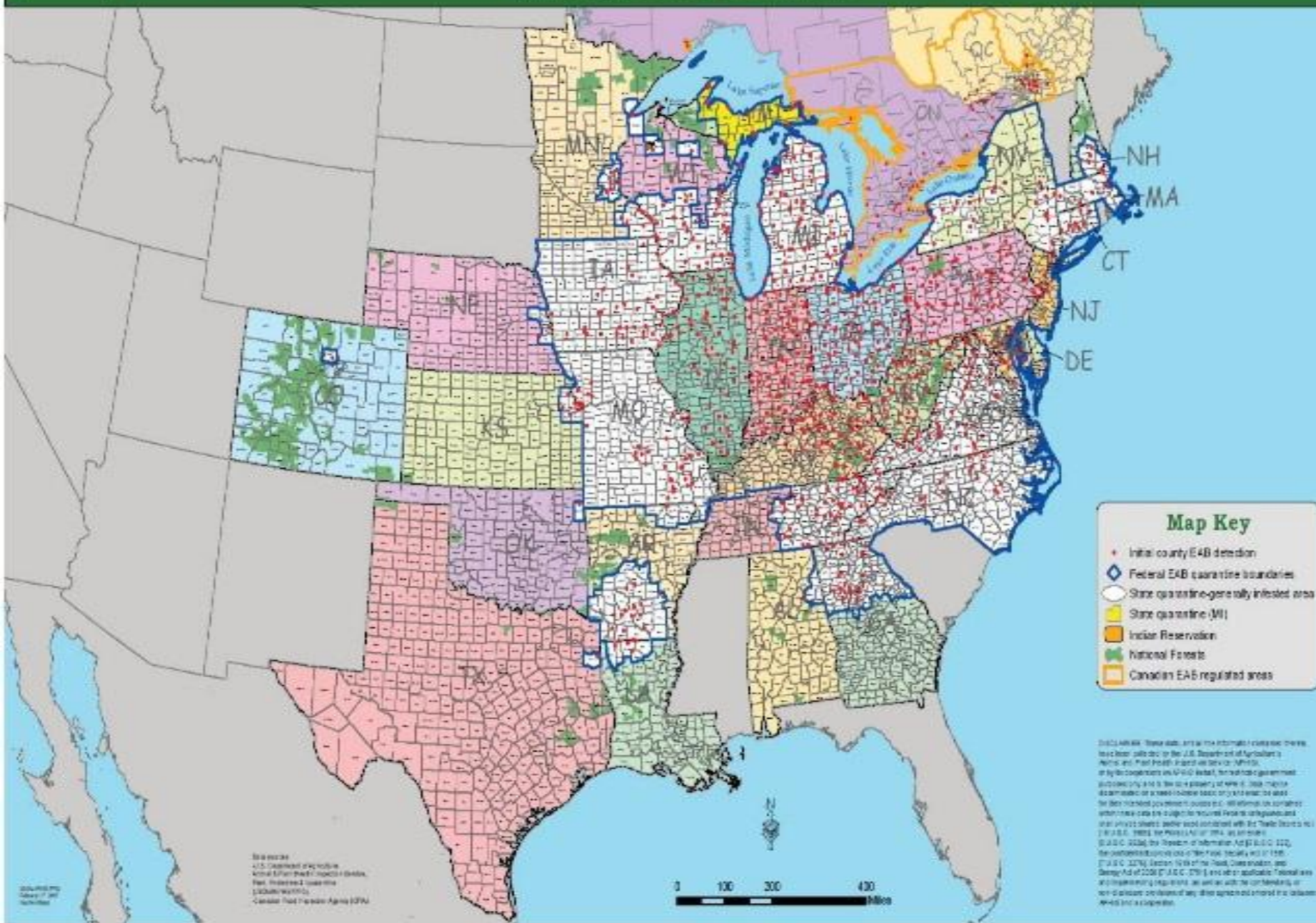




Cooperative Emerald Ash Borer Project

Initial county EAB detections in North America

February 17, 2017



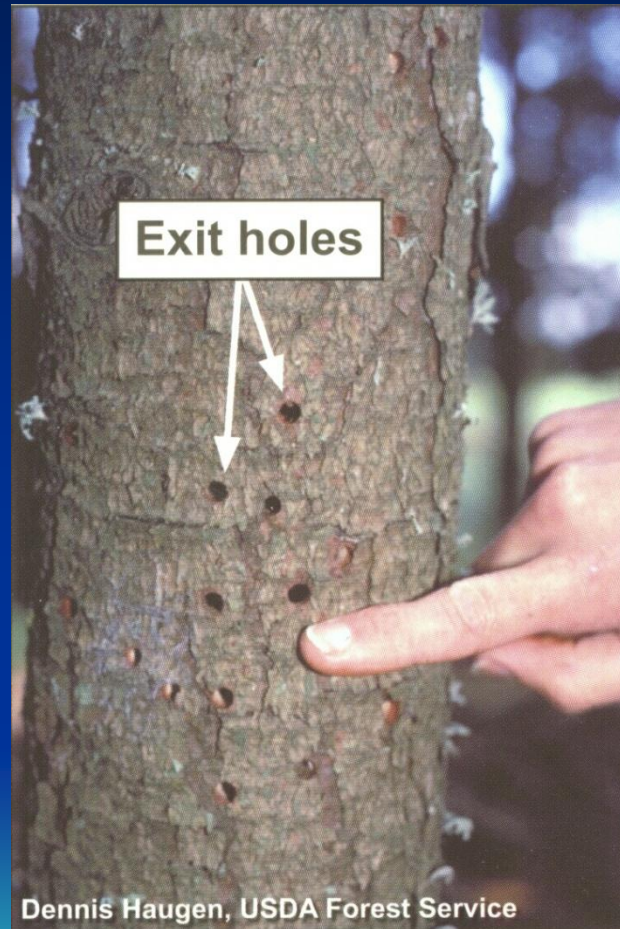
Sirex noctilio

a.k.a

European Wood Wasp



Signs of Sirex



Pests cont.

Call: 1-800-TIPP-DEC



Diseases of trees

Beech Scale



Beech Bark Disease



Dutch Elm Disease



Chestnut Blight



Ash Yellows Disease



Fomes annosus

Root Rot

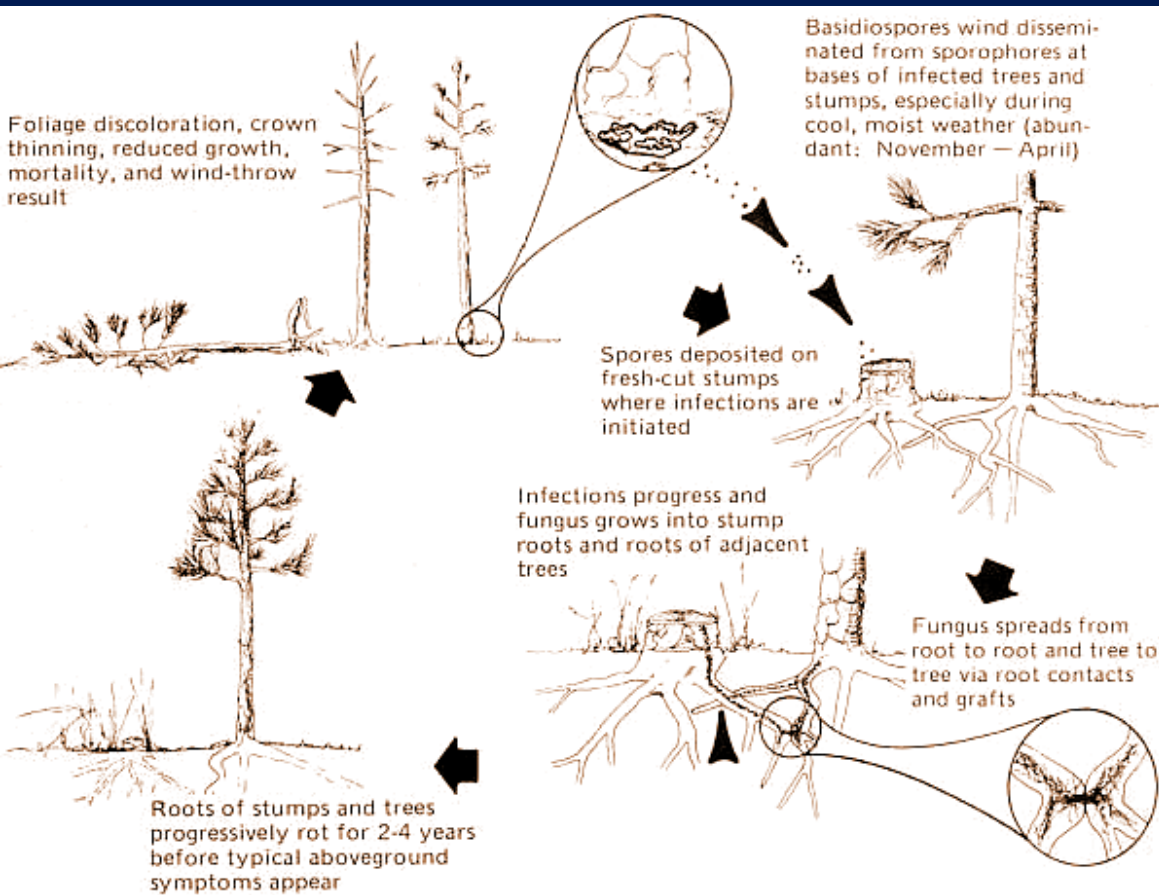


Fig. 17. Generalized life cycle of *Heterobasidion annosum*, the cause of annosum root rot (formerly, *Fomes annosus* — cause of annosus root rot).

Best Management Practices

- BMP's should always be incorporated into any timber harvest. They are design to ensure water quality.
- The following are 2 of the most important BMP's that should be utilized on every job.



Proper methods for the control and dispersal of water on truck roads, skid trails, and log landings to minimize erosion and reduce sedimentation and temperature changes in streams and water bodies.

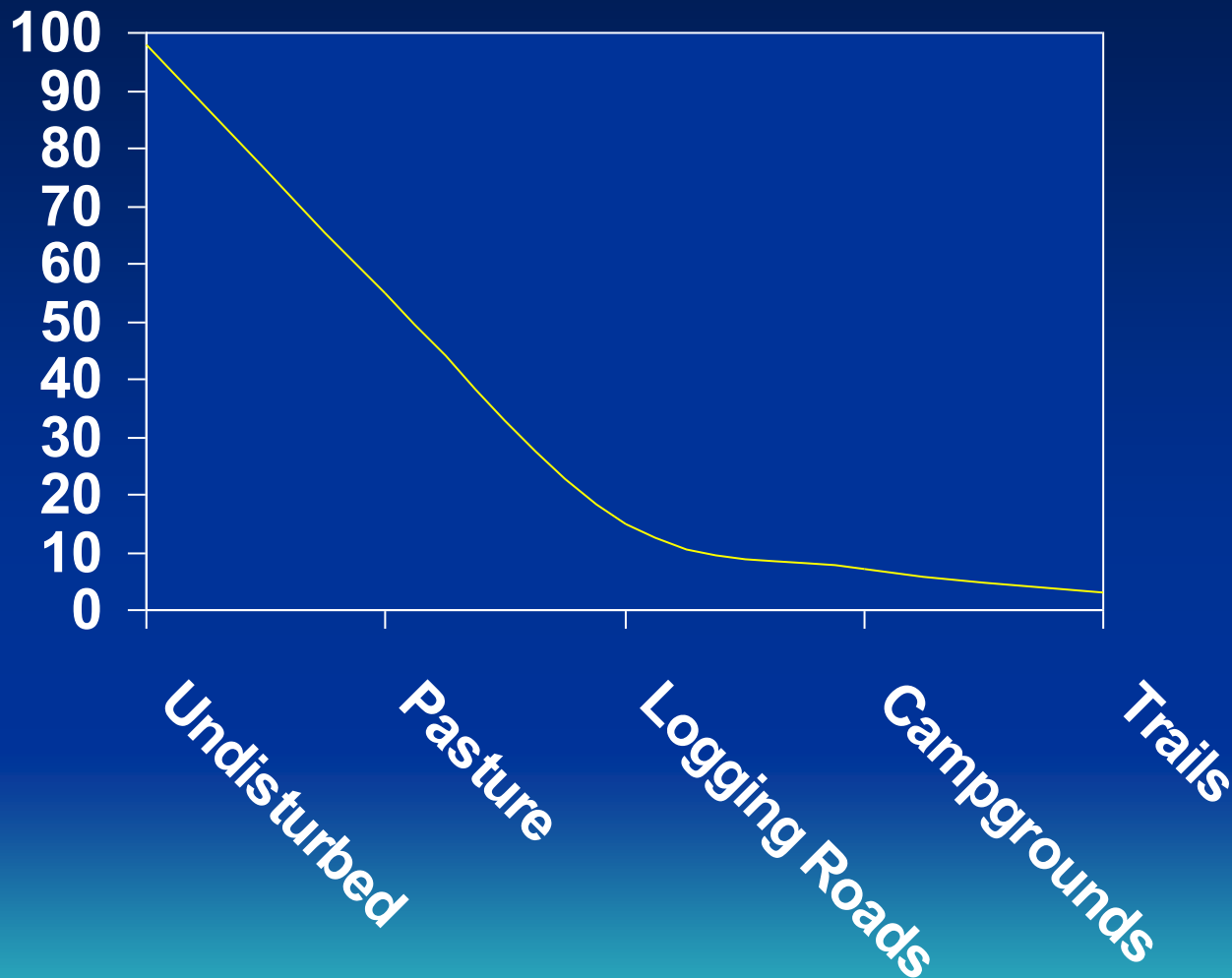


EPA Defines BMP (1975)

“...a practice...determined...to be the most effective, practicable...means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.”



Rain Infiltration Rates of Soil by Land Use



Potential Problems During Timber Harvesting

1. Sedimentation
2. Thermal pollution
3. Biogeochemical alteration (nutrient loading)



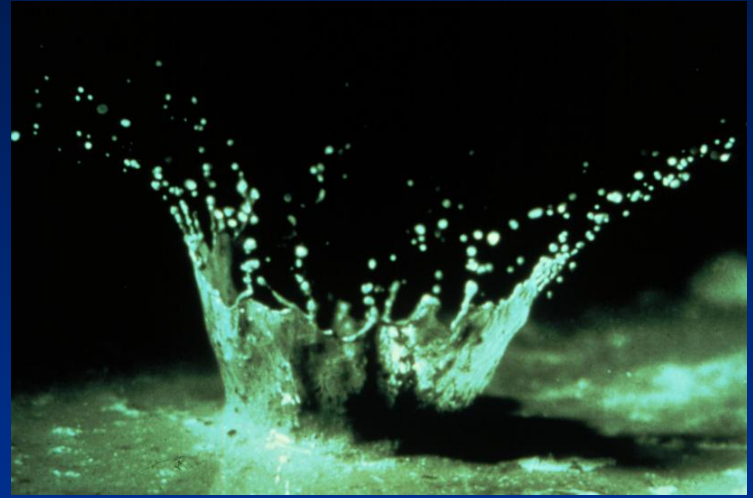
The Goal of Timber Harvesting BMPs

- Maintain or improve water quality
- Improve production efficiency
- Limit unnecessary costs
- Support Landowner goals



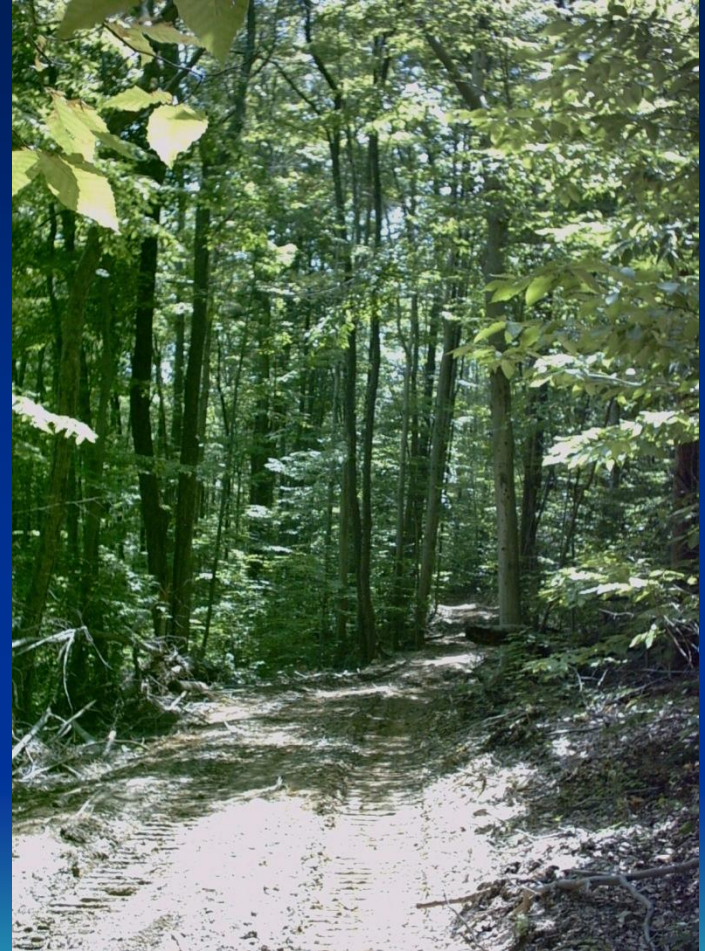
What Causes the Problem?

- Force at impact of water droplets
- Water movement diverted by roads
- Water carries exposed soil

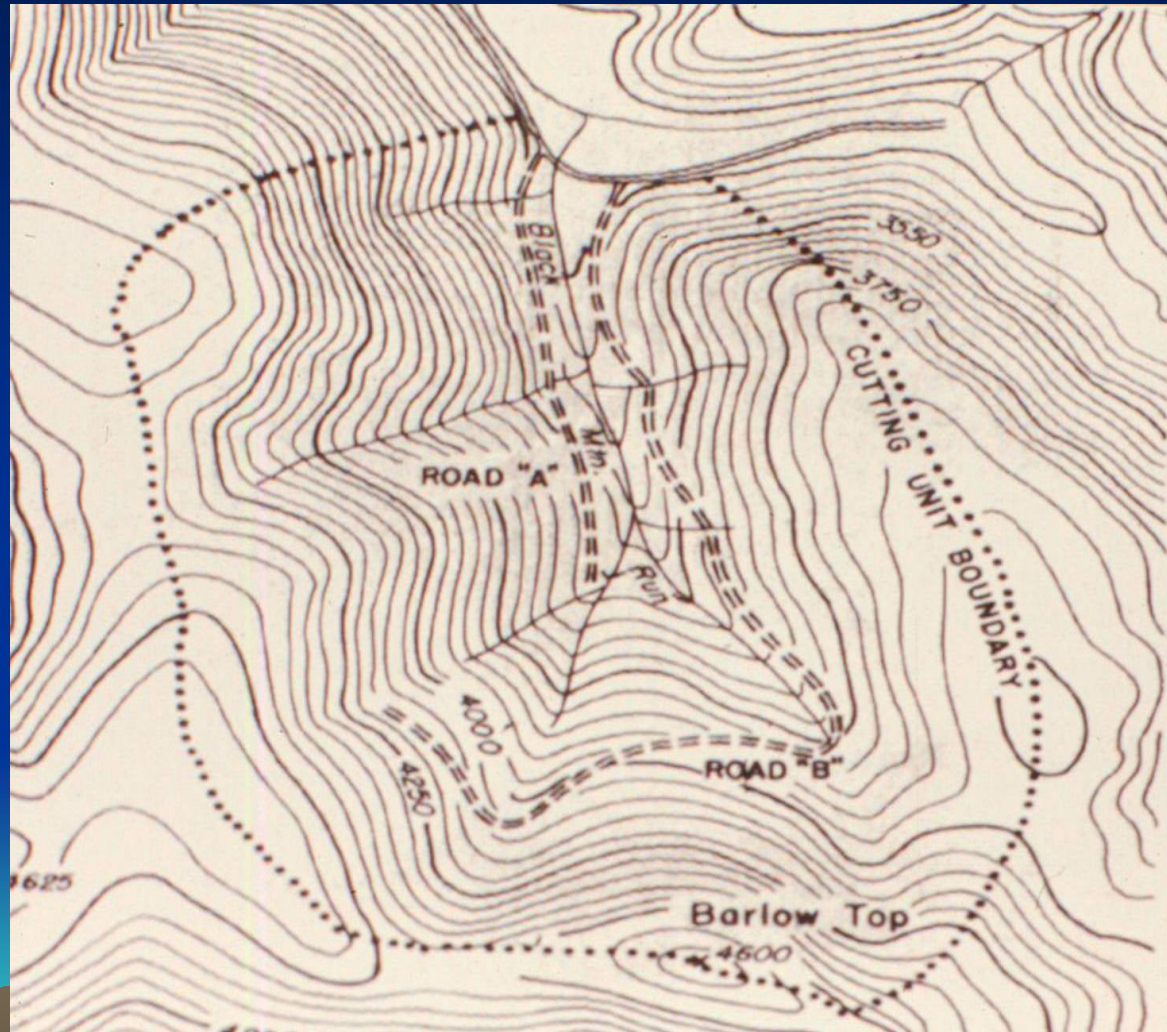


Common Sense Says.....

- Disturb as little soil as possible
- Deal with water in small amounts and when it is moving slowly:
Force = Mass x Acceleration
- Avoid streams whenever possible
- Put the job to rest



Logging Roads and Trails Should Follow Contours



Portable Skidder Bridge



Take Home Points

- Keep the water off the roads
- Plan for water quality
- Budget for water quality
- Inspect for water quality



Uses of Trees and Wood

- White Ash – Baseball Bats
- Black Cherry – High Quality Furniture
- White Pine/Hemlock – Framing lumber
- Red Oak – Furniture, trim, flooring
- Conifers – Windbreaks
- Hardwoods – Erosion control / watershed protection
- All trees- wildlife habitat



Websites

- www.nysenvirothon.net.
- <http://atlas.nyflora.org/>
- <http://www.dec.state.ny.us>
- <http://www.dnr.cornell.edu/ext/bmp/>

