

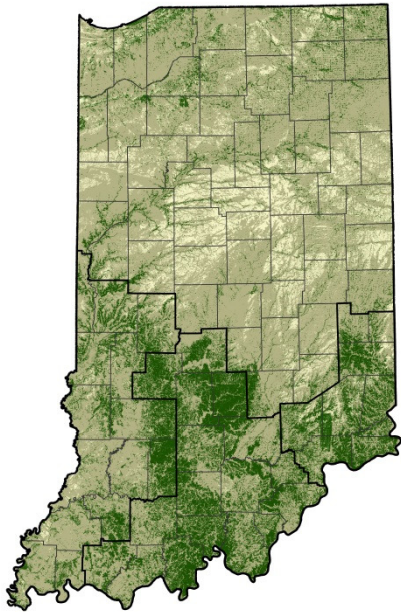
# Indiana Forests 2013 and beyond

## Presentation to the Forest Stewardship Committee

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# 3 Different Programs

- **FIA**

- Partially federally funded
- Covers entire state
- Covers all ownerships
- 1 plot/6,000 acres
- Data updated annually
- Comprehensive report every 5 years (new one will be dated 2009-2013)

- CFI programs currently on a 5 year plot remeasurement cycle
- FIA slipped to a 7-year cycle starting 2014
- Annually measure approximately 200 FIA plots, 500 Classified Forest plots, 800 Property plots
- Avenue to go DNR-wide with inventory –pilot project started with parks/reservoirs

- **CFI Properties**

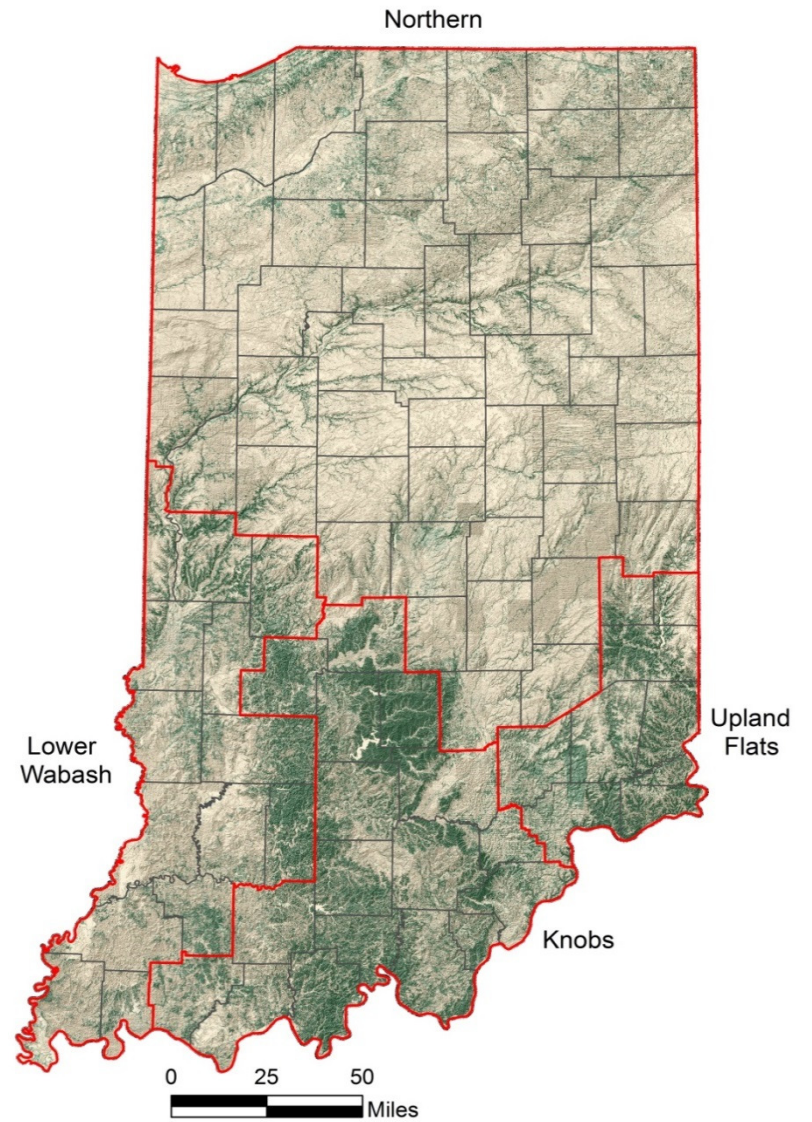
- State forest properties
- 1 plot/40 acres
- Half way complete with first re-measurements
- Comprehensive report 2008-2012 available online

- **CFI Classified Forests**

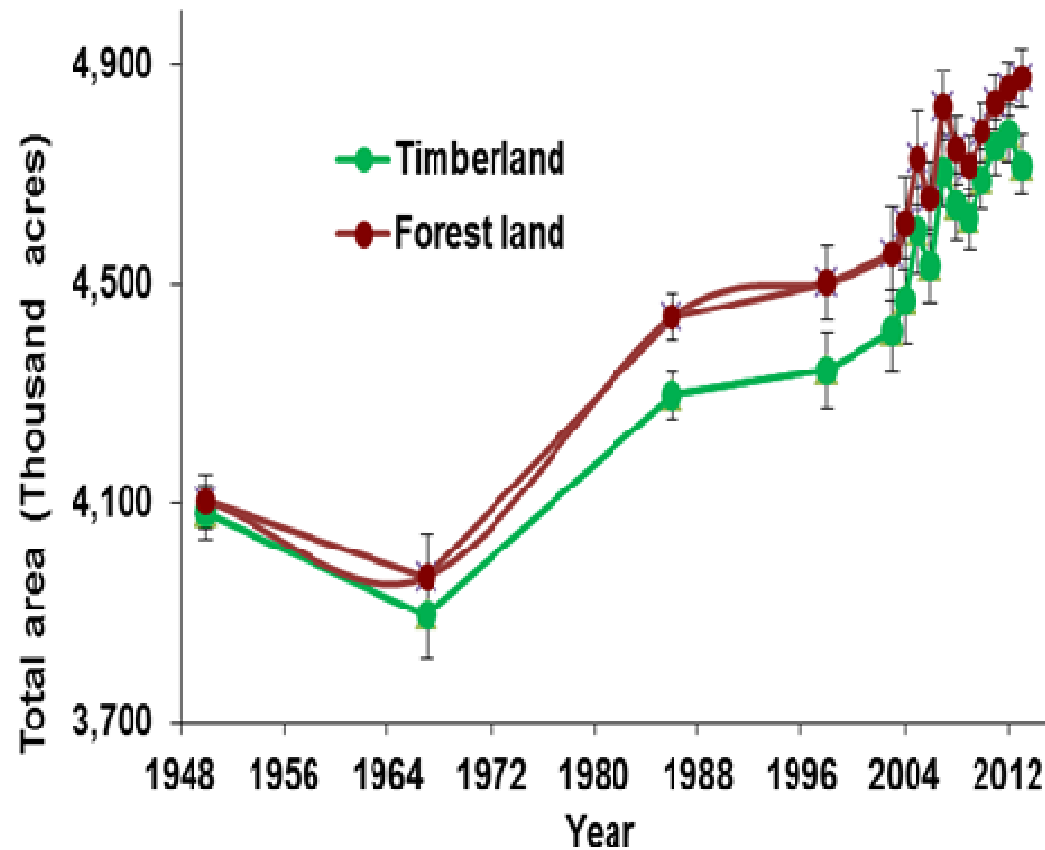
- Private lands in classified forest program
- 1 plot/200 acres
- Third year of plot establishment

# Indiana Forests—how much and where?

- 4.9 million acres of forest land
- About 20 percent of Indiana is forested
- Most forests are located in the southern half of the state



## Area of forest land and timberland by year, Indiana



Timberland and forest land show modest increases over the past several decades follow a trend since 1967

## Indiana forest statistics, change between 2008 and 2013

|  | 2008<br>Estimate | Sampling<br>error<br>(percent) | 2013<br>Estimate | Sampling<br>error<br>(percent) | Percent<br>change<br>since 2008 |
|--|------------------|--------------------------------|------------------|--------------------------------|---------------------------------|
| <b>Forest Land</b>   |                  |                                |                  |                                |                                 |
| Area (thousand acres)  | 4,744.2          | 1.3                            | 4,875.4          | 1.1                            | 2.8                             |
| Number of live trees ≥ 1 in diameter (million trees)                 | 2,194            | 2.3                            | 2,211.8          | 2.0                            | 0.8                             |
| Net volume live trees ≥ 5 in diameter (million ft <sup>3</sup> )     | 9,785.8          | 2.0                            | 10,419.5         | 1.6                            | 6.5                             |
| Live tree aboveground biomass (thousand oven-dry tons)               | 256,602.8        | 1.8                            | 270,440.0        | 1.5                            | 5.4                             |
| Net growth live trees ≥ 5 in (thousand ft <sup>3</sup> /yr)          | 348,535.9        | 5.0                            | 235,698.4        | 4.5                            | -32.4                           |
| Harvest removals of live trees ≥ 5 in (thousand ft <sup>3</sup> /yr) | 82,013.9         | 14.8                           | 71,709.7         | 14.8                           | -12.6                           |
| Annual mortality of live trees ≥ 5 in (thousand ft <sup>3</sup> /yr) | 98,585.6         | 8.3                            | 118,326.2        | 6.4                            | 20.0                            |

### Highlights

- **Number of live trees on Indiana's forest land in 2013 was estimated at 2.2 billion trees, an increase of 0.8 percent from 2008 (averages about 450 trees per acre statewide).**
- **Net volume (10.4 billion ft<sup>3</sup>) experienced an increase of about 6.5 percent, which statewide in 2013 (averages about 26 cords per acre statewide).**
- **Live tree biomass (above ground) is estimated at 270.4 million oven-dry tons or statewide, on average, about 55.5 tons per acre.**
- **Annual mortality increased by 20.0 percent between 2008 and 2013; however, when put in perspective as a percentage of net volume, mortality in 2008 was 1.0 percent of net volume and mortality in 2013 was 1.14 percent of net volume, a difference of only 0.14 percent.**
- **Similar trends were observed on Indiana's timberlands**

## Volume, Biomass, and Trends

Number, volume, biomass, growth, mortality, and removals of live trees on forest land by species of the top 10 tree species by net volume, Indiana, 2009-2013.

| Common Name       | Latin Name                     | Million Trees <sup>a</sup> | Net Volume <sup>b</sup> (million ft <sup>3</sup> ) | Aboveground Biomass <sup>a</sup> (thousand dry tons) | Average Annual Net Growth <sup>b</sup> (thousand ft <sup>3</sup> ) | Average Annual Mortality <sup>b</sup> (thousand ft <sup>3</sup> ) | Average Annual Harvest Removals <sup>b</sup> (thousand ft <sup>3</sup> ) |
|-------------------|--------------------------------|----------------------------|--|--|--|---|--|
| Yellow-poplar     | <i>Liriodendron tulipifera</i> | 79.15                      | 1,229.4  | 23,438.74  | 39,123.46  | 8,572.02  | 13,320.47  |
| Sugar maple       | <i>Acer saccharum</i>          | 356.84                     | 1,083.08   | 32,231.91  | 26,471.56  | 7,631.22  | 8,004.54   |
| White oak         | <i>Quercus alba</i>            | 37.26                      | 766.71   | 21,185.12  | 13,067.94  | 4,284.65  | 5,102.9  |
| White ash         | <i>Fraxinus americana</i>      | 102.19                     | 574.4  | 15,687.87  | 12,336.97  | 7,879.76  | 6,275.7  |
| Black oak         | <i>Quercus velutina</i>        | 33.92                      | 554.77   | 15,279.53  | 6,746.06   | 10,116.66   | 6,718.2  |
| Red maple         | <i>Acer rubrum</i>             | 110.16                     | 465.74   | 11,411.58  | 13,233.55  | 3,008.57  | 1,035.61   |
| Northern red oak  | <i>Quercus rubra</i>           | 25.02                      | 456.52   | 12,800.2   | 10,879.95  | 4,433.74  | 3,836.44   |
| American sycamore | <i>Platanus occidentalis</i>   | 16.96                      | 442.23   | 9,060.78   | 13,186.48  | 1,226.39  | 2,543.42   |
| Shagbark hickory  | <i>Carya ovata</i>             | 44.86                      | 365.26   | 1,1591.81  | 6,582.19   | 1,075.14  | 1,619.3  |
| Black cherry      | <i>Prunus serotina</i>         | 105.62                     | 349.52   | 8,634.17   | 10,622.88  | 4,255.22  | 3,045.37   |

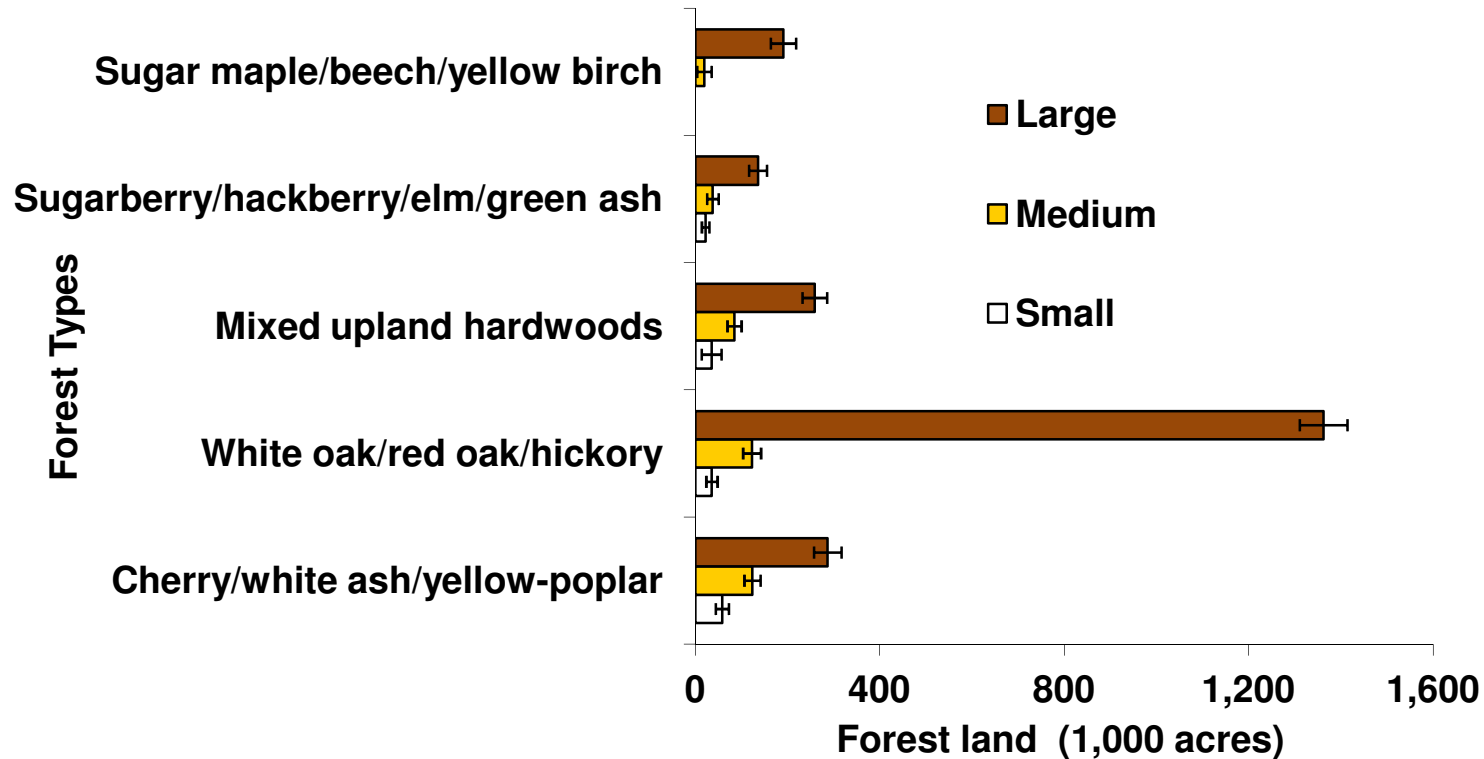
<sup>a</sup> Trees  $\geq 1$  in diameter

<sup>b</sup> Trees  $\geq 5$  in diameter

### Highlights

- **Yellow-poplar and sugar maple are growing the most vigorously with each accumulating over 39 and 26 million cubic feet per year respectively.**
- **The most numerous species, sugar maple, is not the most voluminous species in the state. That distinction belongs to the State tree, yellow-poplar, a.k.a. the tulip tree (*Liriodendron tulipifera*) with a net volume of nearly 1.23 billion cubic feet.**
- **Black oak followed by yellow-poplar, white ash, and sugar maple show the highest mortality. Oaks stressed from drought, gypsy moth defoliation, old age, fire, poor site conditions, or other factors often succumb to secondary agents such as twolined chestnut borer (*Agilus bilineatus*), Hypoxylon canker (*Hypoxylon mammatum*), and shoestring root rot (*Armillaria mellea*). This scenario, in which a primary agent stresses the tree and a secondary agent kills it, is known as "oak decline"**
- **Yellow-poplar removals are nearly double or more, by volume, than most species except sugar maple**

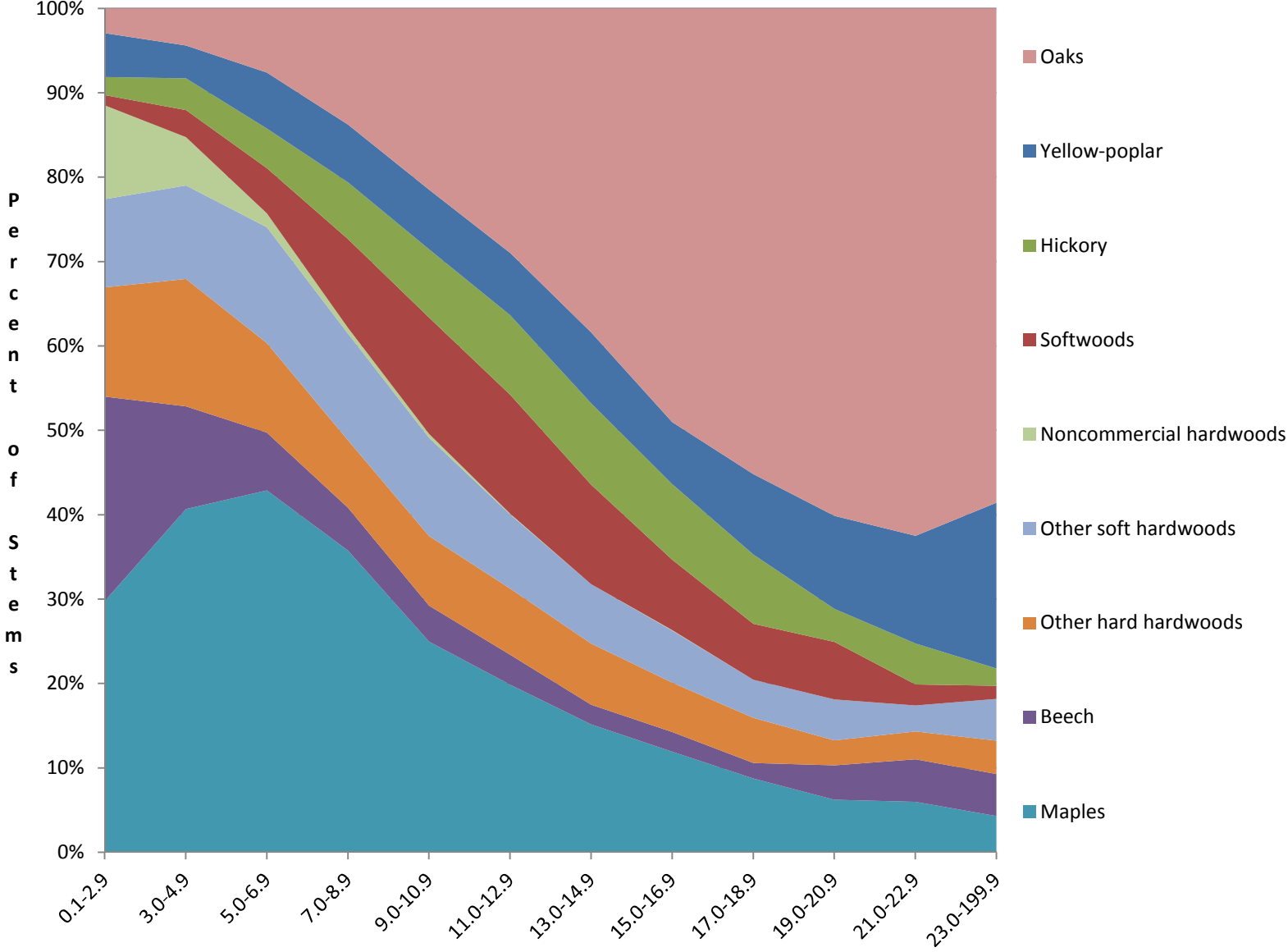
## Nearly half (48 percent) of the stands are over 61 years of age.



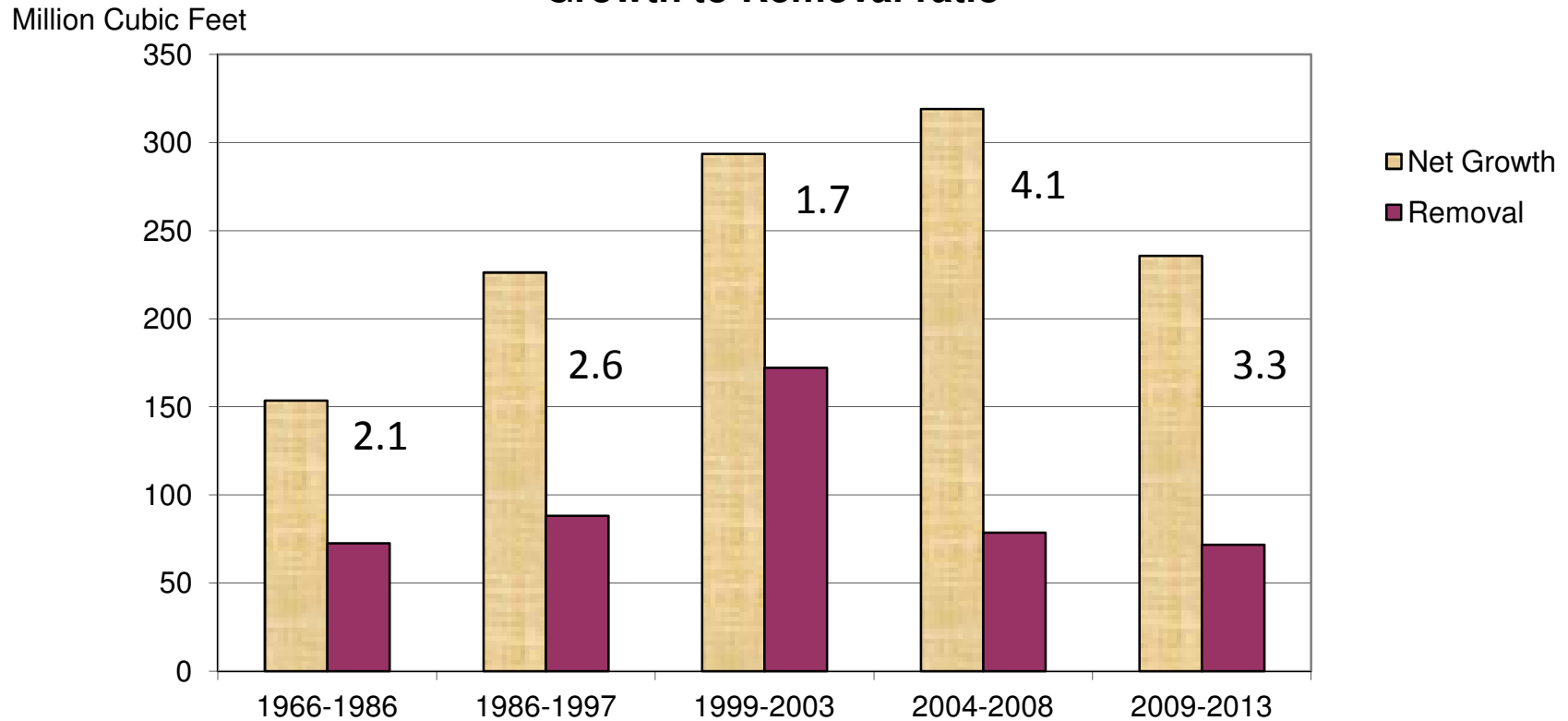
- Indicative of a maturing (aging) forest, white and red oak/hickory is found primarily in the large stand-size class
- The cherry/white ash/yellow-poplar group is less common (470 thousand acres) as are the mixed upland hardwoods (375 thousand acres).
- The sugar maple/beech/yellow birch forest-type group is relatively abundant (218 thousand acres) and occurs mostly in large stand-size classes



# Number of Trees by Species and Diameter Class



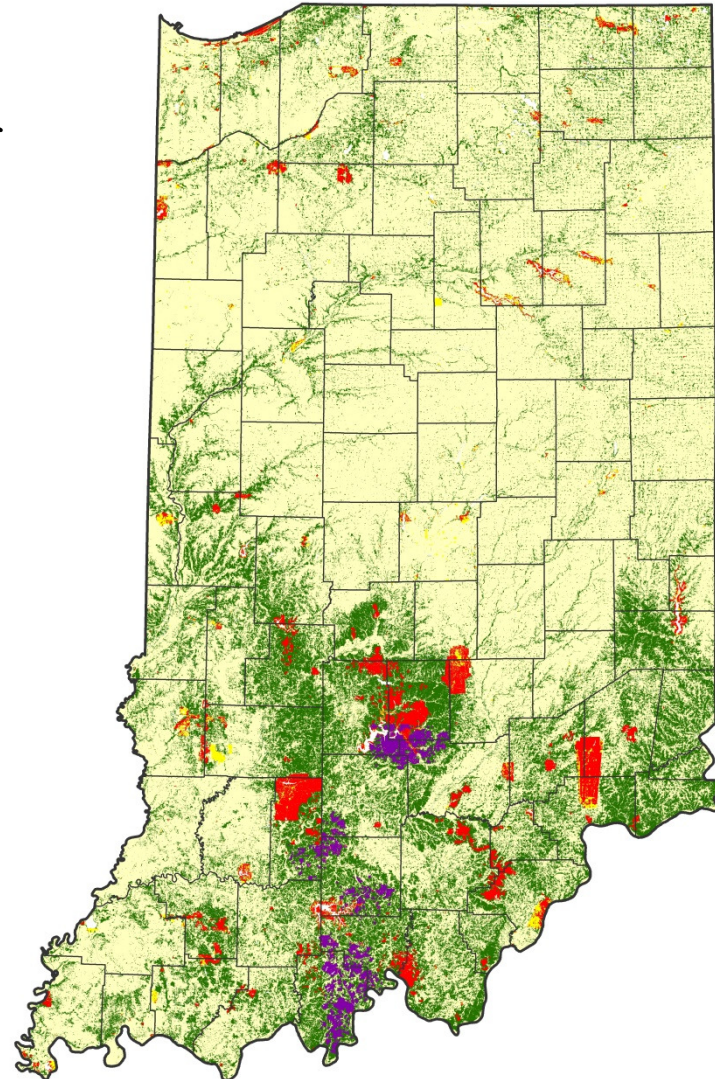
## A Comparison of Net Growth and Removal of Growing Stock in Indiana 1966-2013 Growth to Removal ratio









A net growth-to-removal ratio of 1.00 indicates that the volume of growth equals that being removed. A ratio of 2.00 means that twice as much volume is growing than is being removed. On average, Indiana trees are growing in volume more than 3 times the amount being removed.

# Who Owns Indiana's Forests

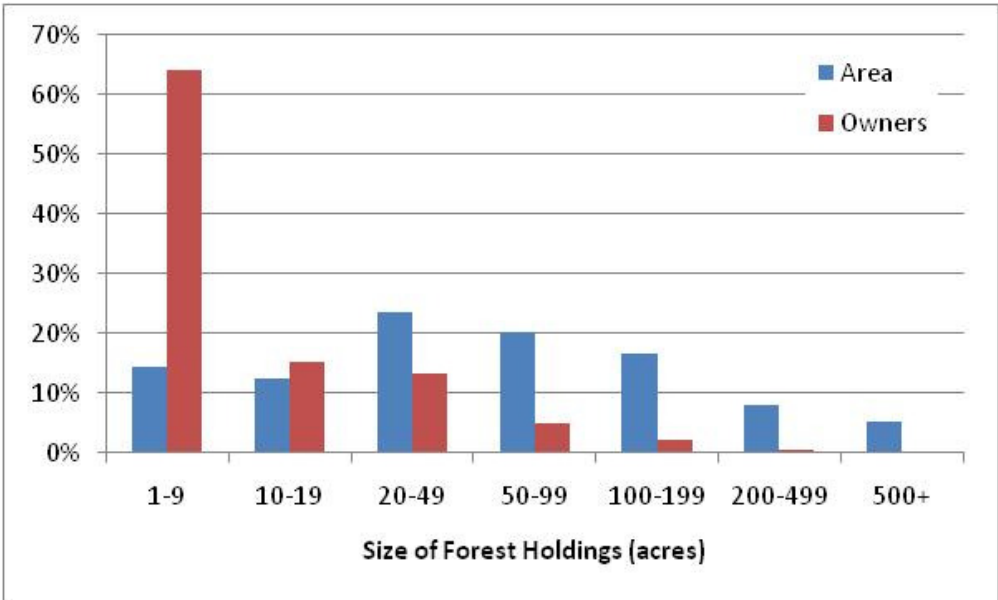
- Seventy three percent or 3.5 million acres of forest land is privately owned by individuals...an additional 10% privately owned by corporations, NGOs, etc.
- The state owns 7.5 percent or 365 thousand acres of forest land.
- The federal government owns roughly eight percent or 380 thousand acres.
- A little over 3 percent or 159 thousand acres of forest land is considered reserved.



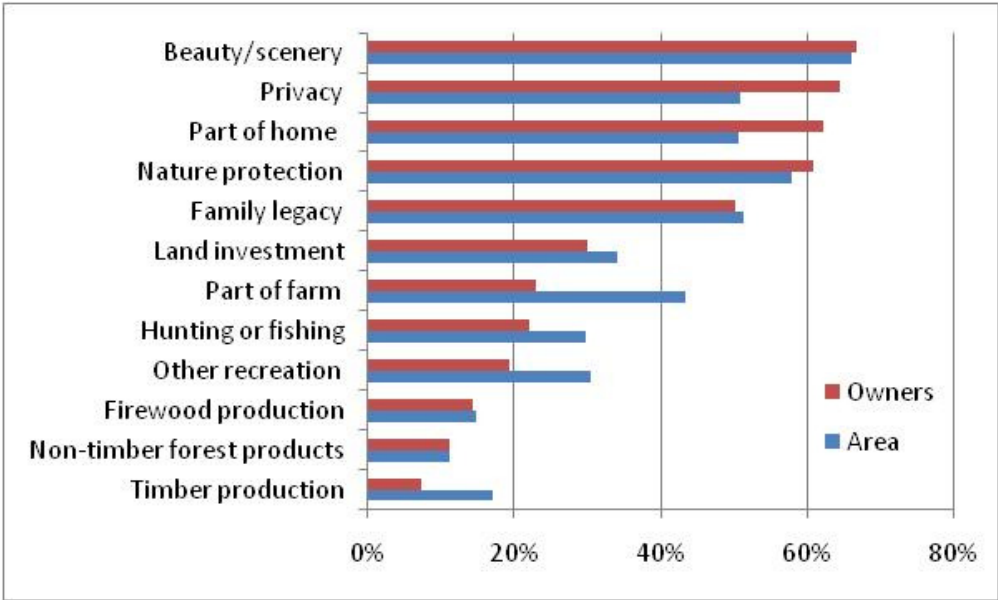
## Ownership

|  |   |  |
|--|---|--|
|  Hoosier NF forest    |  Private forest    |  Other public forest    |
|  Hoosier NF nonforest |  Private nonforest |  Other public nonforest |

# Forest Ownership in Indiana



- Over 200,00 family forest owners who control 75 percent of the forest land
- Average size of forested holdings is 16 acres
- Primary reasons for owning forestland are related to aesthetics, privacy, and the land being part of their home



- 1 in 3 acres is owned by someone who plans to harvest firewood, 1 in 6 by someone who plans to harvest timber, and 1 in 8 by someone who plans to pass their land on their heirs or sell it.
- Less than 10 percent of the land is owned by people who have a written management plan and less than a third have received forest management advice.

## Concerns

- Average parcel size is decreasing and there is a lot of land that will soon be changing hands.
- Family legacy is a major ownership objective, passing land on is a major planned activity, but family legacy is also a major concern.
- Landowner turnover is something that is perpetually happening, but it is also a critical juncture for the owners and the land.
- Lack of public understanding about the importance of forests and forestry.
- What can be done to help the landowners and the land?



# Anticipated changes to the forests of Indiana between 2010 and 2060

Analysis is derived entirely from the Northern Forest Futures study (Shifley et al. In press)

<http://www.nrs.fs.fed.us/futures/>



## Three storylines (scenarios)

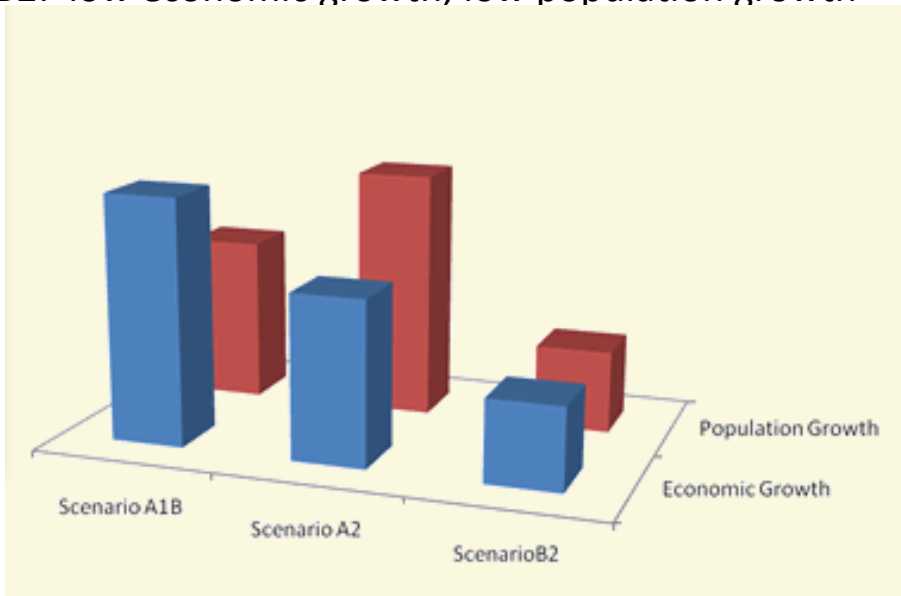
Scenarios represent a range of assumptions about climate change, economic activity, and population growth, which produce differing future forest conditions.

Specifically, the scenarios assume the following future trends:

A1B: high economic growth, moderate population growth

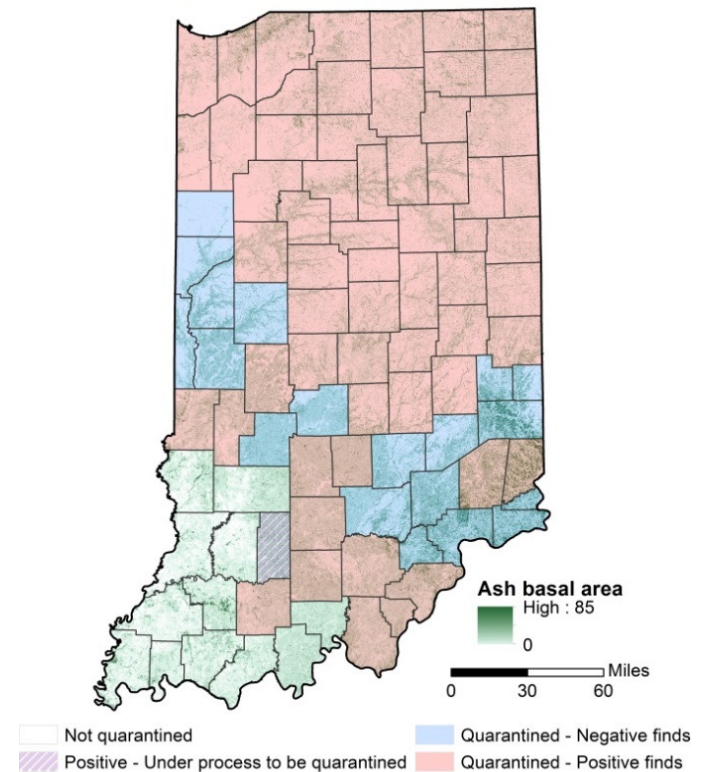
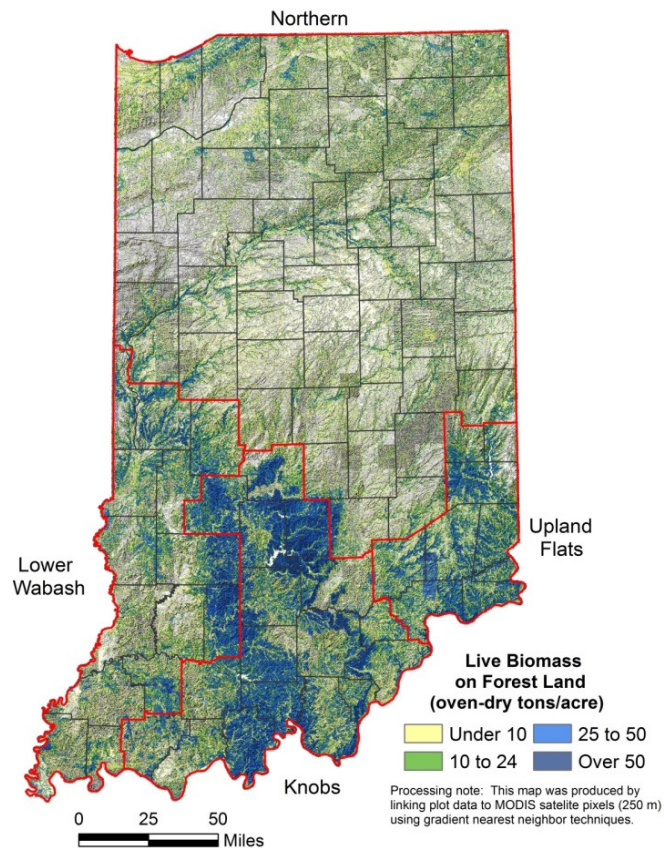
A2: moderate economic growth, high population growth

B2: low economic growth, low population growth



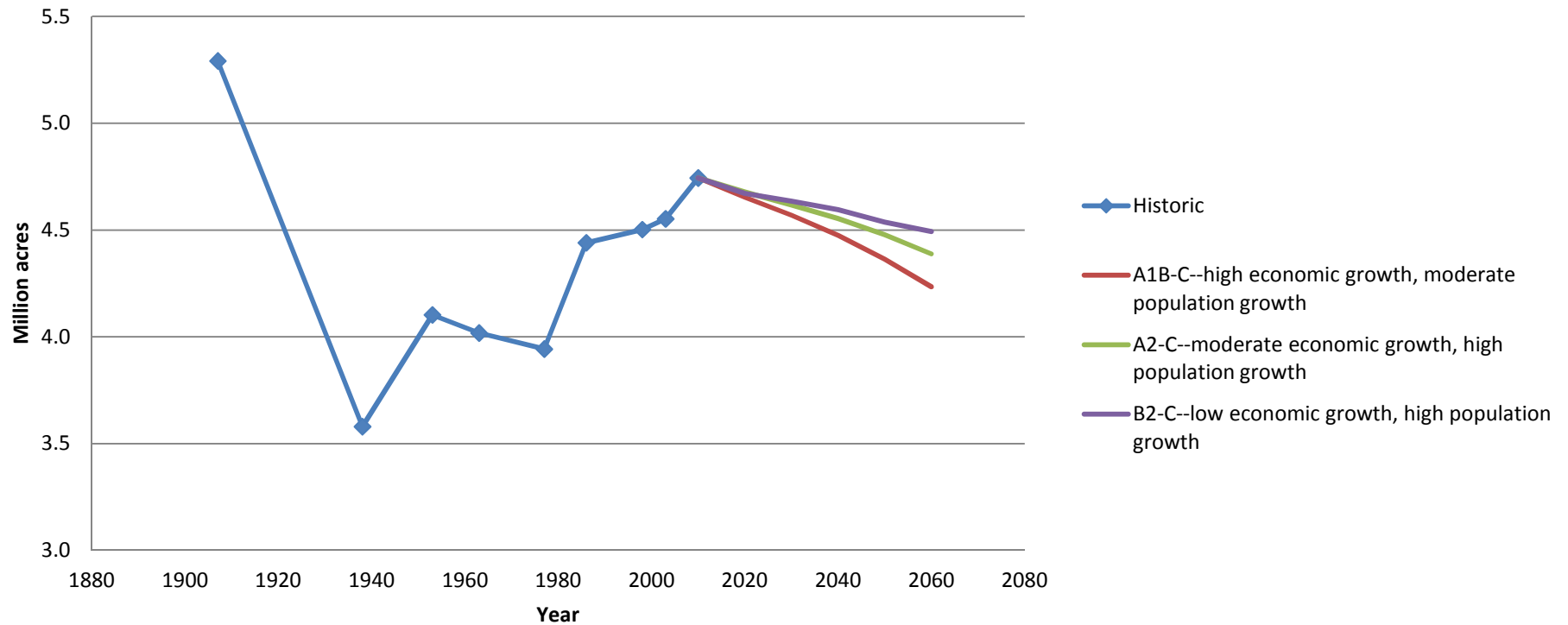
### Three storyline variations:

- C – Standard
- BIO - Variations of the A1B, A2, and B2 storylines look at impact of increased harvest and utilization of woody biomass for energy. They are referred to as scenarios A1B-BIO, A2-BIO, and B2-BIO.
- EAB - Variation of the A2 storyline examines the potential impact of continued spread of the emerald ash borer with associated mortality of all ash trees in the affected areas. This is referred to as scenario A2-EAB.



Source: <http://extension.entm.purdue.edu/EAB/index.php?page=locations/indiana>

## Future Forests of Indiana



Anticipated declines in forest land, total in the hundreds of thousands of acres, reverses the long-term trend of increasing forest area in Indiana since the late 1930's .

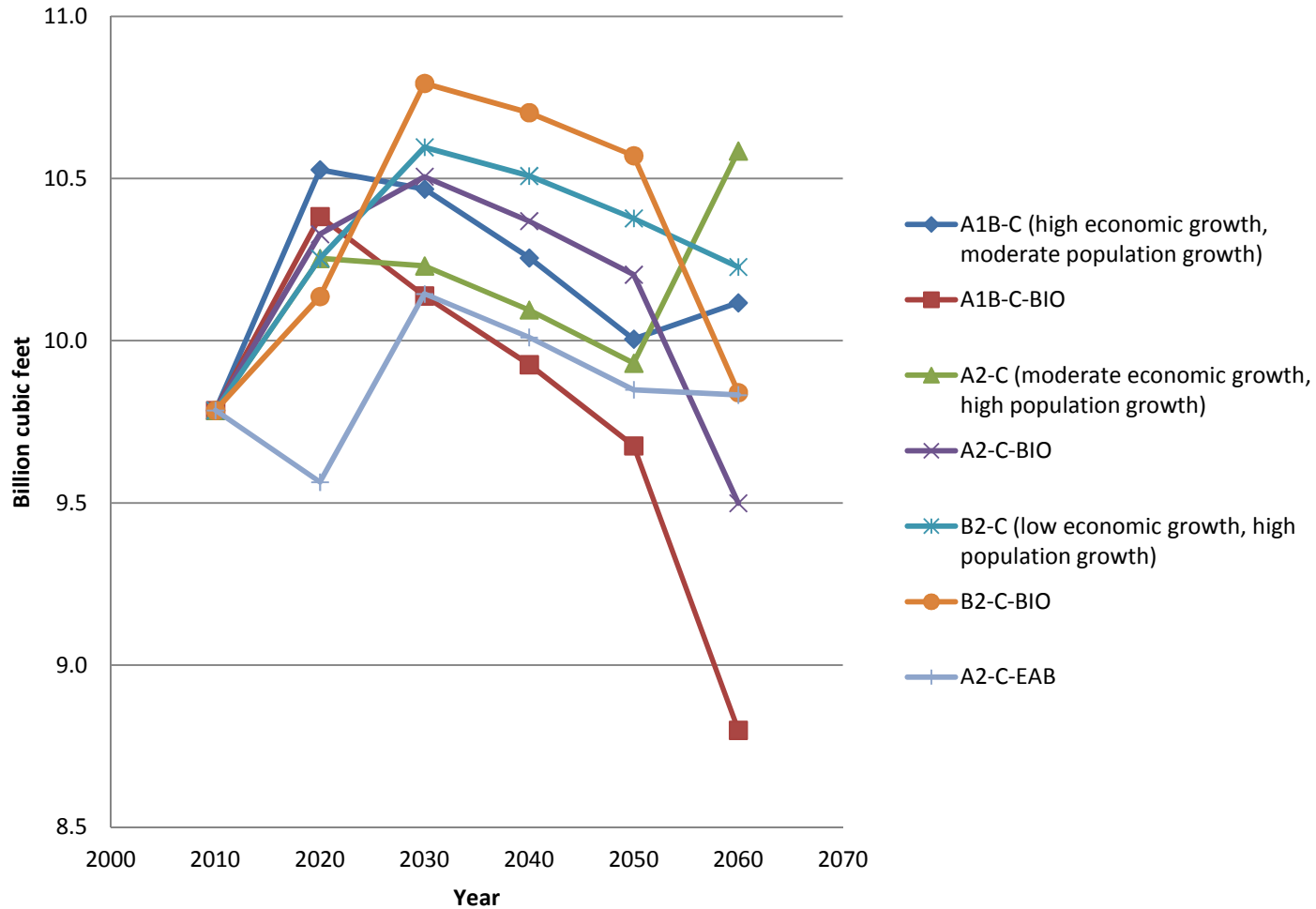
Specifically, over the next 50 years forest land area is projected to decline from an estimated 4.7 million acres in 2010 to 4.2 million acres (- 12 percent) in 2060 under scenario A1B-C; to 4.4 million acres (-8 percent) under scenario A2-C; and to 4.5 million acres (-6 percent) under scenario B2-C.

Anticipated losses of forest land are still relatively small compared to the cumulative increase in forest area since 1938.



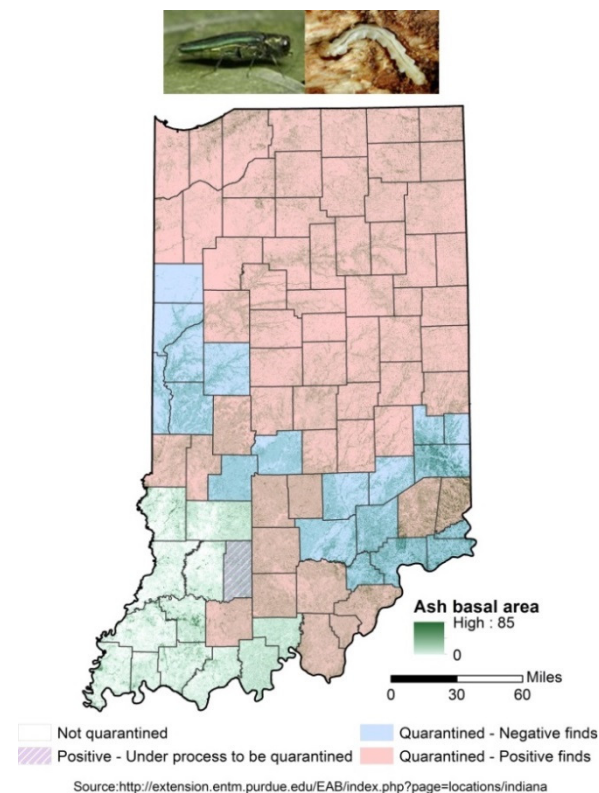
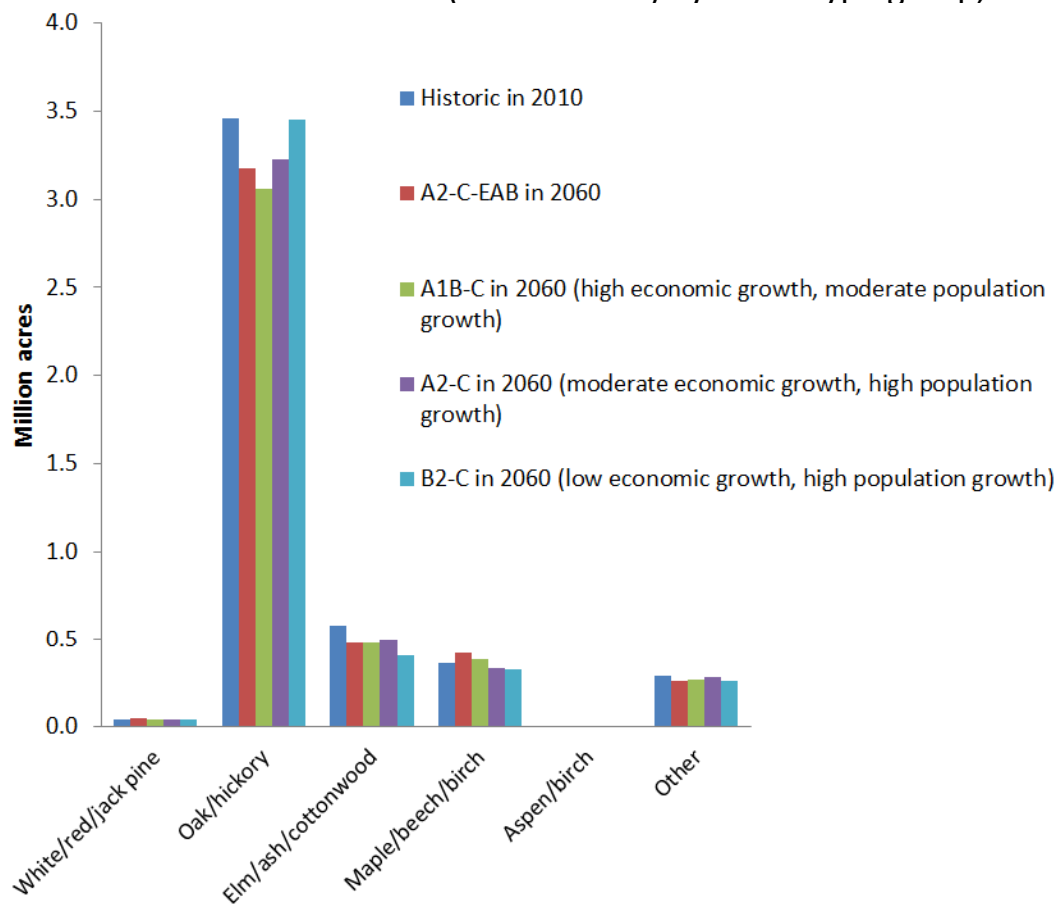
## Future Forests of Indiana

Live tree volume (billion cubic feet) on forest land in Indiana by scenario, 2010-2060.



Negative impacts of EAB are more apparent in this figure where the volume under scenario A2-C-EAB is projected to be 7 percent less than the volume under scenario A2-C in 2060

Forest land area (million acres) by forest type group, 2010 and by scenario in 2060

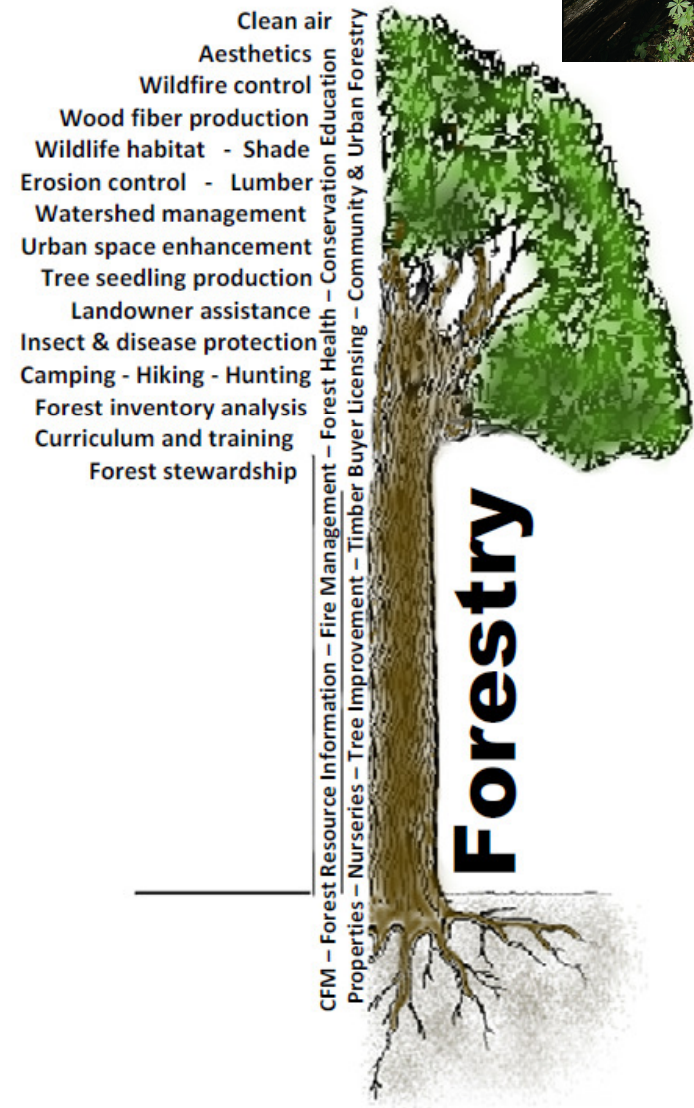


Emerald ash borer (EAB) was initially detected in Indiana on April 21, 2004. Ash species comprise 8 percent of the total live tree volume on forest land in Indiana and 12 percent of the volume in the Elm/ash/cottonwood type. Under scenario A2-C-EAB ash species volume is projected to decline from 767 million cubic feet in 2010 to zero cubic feet by 2030. Under scenario A2-C ash volume is expected to decline from 767 million cubic feet in 2010 to 668 million cubic feet by 2060. In the figure there is a decline in the area of Elm/ash/cottonwood type from 2010 to 2060 under both scenario A2-C (-13 percent) and A2-C-EAB (-16 percent).

The loss of the ash component in the Elm/ash/cottonwood type in scenario A2-C-EAB is partially offset by increases in other associated species in the Elm/ash/cottonwood type group.

## Key Current and Future Issues

- Continued loss of forestland base to non-forest uses.
- Lack of public understanding about the importance of forests and forestry.
- The continuing threat from exotic and invasive species requires adaptive forest management.
- Data and knowledge gaps regarding rural and urban forest resources.

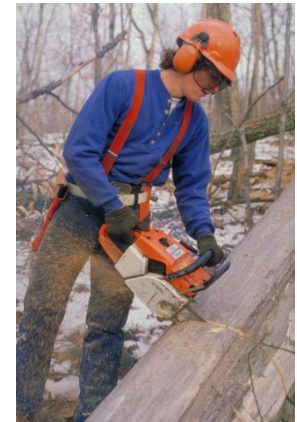




## Summary



- Forests of Indiana are expanding and maturing.
- The inventory and monitoring of Indiana's forests indicates that forest land area and volume have been steadily increasing for decades. Hardwood forests continue to dominate the majority of Indiana's forests both in terms of acreage and volume.
- Average annual growth far exceeds removals continuing a long-term trend for Indiana's forests.
- The greatest risks to Indiana's forest resources are not the rather stable levels of removals across Indiana, but rather the conversion of forests to non-forest conditions (e.g., urban sprawl), advanced stages of stand development, and invasive species/pests (e.g., emerald ash borer).
- Given these constant forest health threats both to Indiana's forests and those across the Nation, the objective monitoring of Indiana's hardwood forests will ensure their economic viability, productivity and sustainable management into the future.



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