AGROFORESTRY



Michael Downey

Forest Stewardship Program Coordinator

Service Forester North Central District

MA Bureau of Forest Fire Control & Forestry

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Acknowledgements

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Angus Glenn Farm, Watkins Glen, NY
Twisted Tree Farm, Spencer, NY
Wellspring Forest Farm, Trumansburg, NY

USDA National Agroforestry Center

FOREST SERVICE US DEPARTMENT OF AGRICULTURE

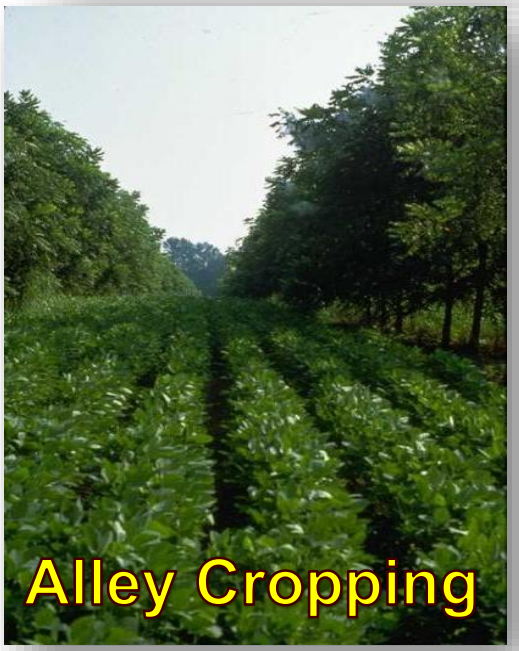
CORNELL small FARMS PROGRAM

NRCS Natural Resources Conservation Service

Photos not credited in this presentation are from
USDA National Agroforestry Center (NAC), Lincoln NE

What is Agroforestry?

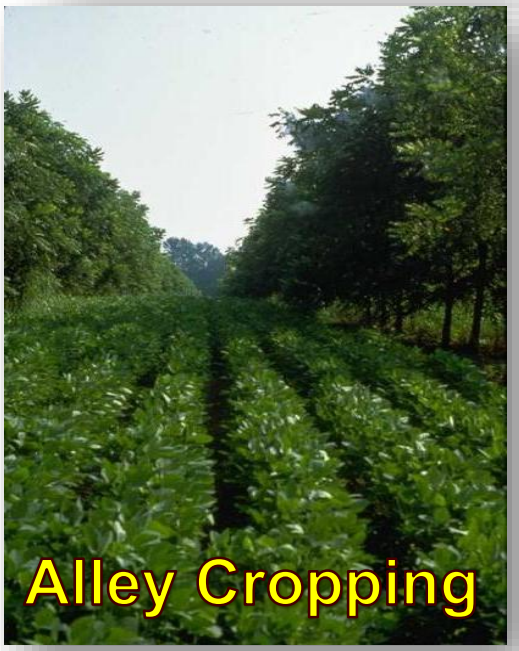
The *intentional* integration *o*f agriculture and forestry to create productive and sustainable farms, ranches, and woodlands.



Agroforestry Criteria

the 4 I's

- ✓ **Intentional**
- ✓ **Intensive**
- ✓ **Integrated and**
- ✓ **Interactive**



The 4 I's

Intentional

Designed, established and managed to work together and yield multiple products and benefits.

Intensive

Managed to maintain their productive and protective functions.

Integrated

Components are functionally and structurally combined into a management unit to meet objectives of the landowner.

Horizontal or Vertical, Above- or Below-Ground, Simultaneous or Sequential.

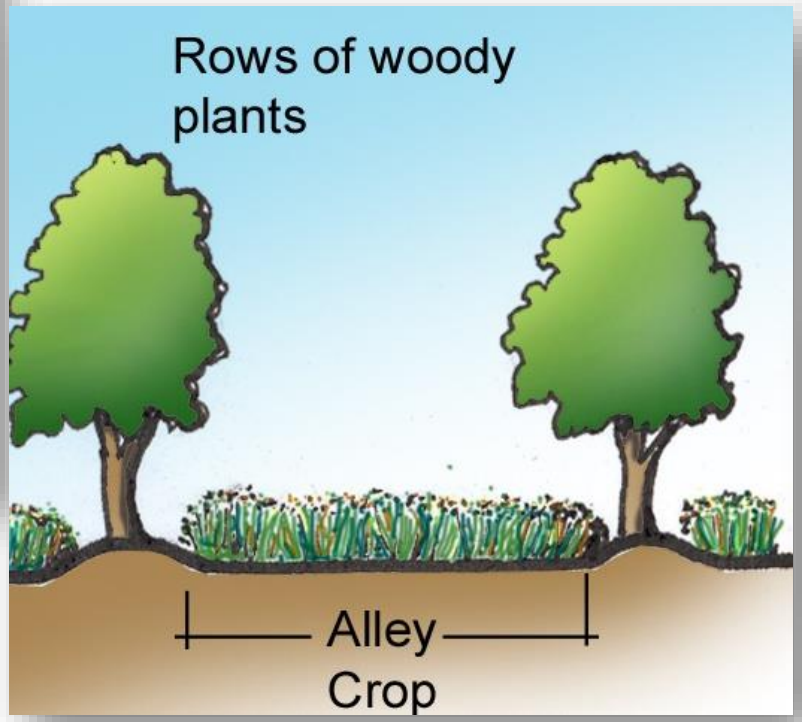
Interactive

Providing numerous conservation and ecological benefits while yielding multiple products.

Agroforestry Practices

Alley Cropping

Black Walnut with Hay

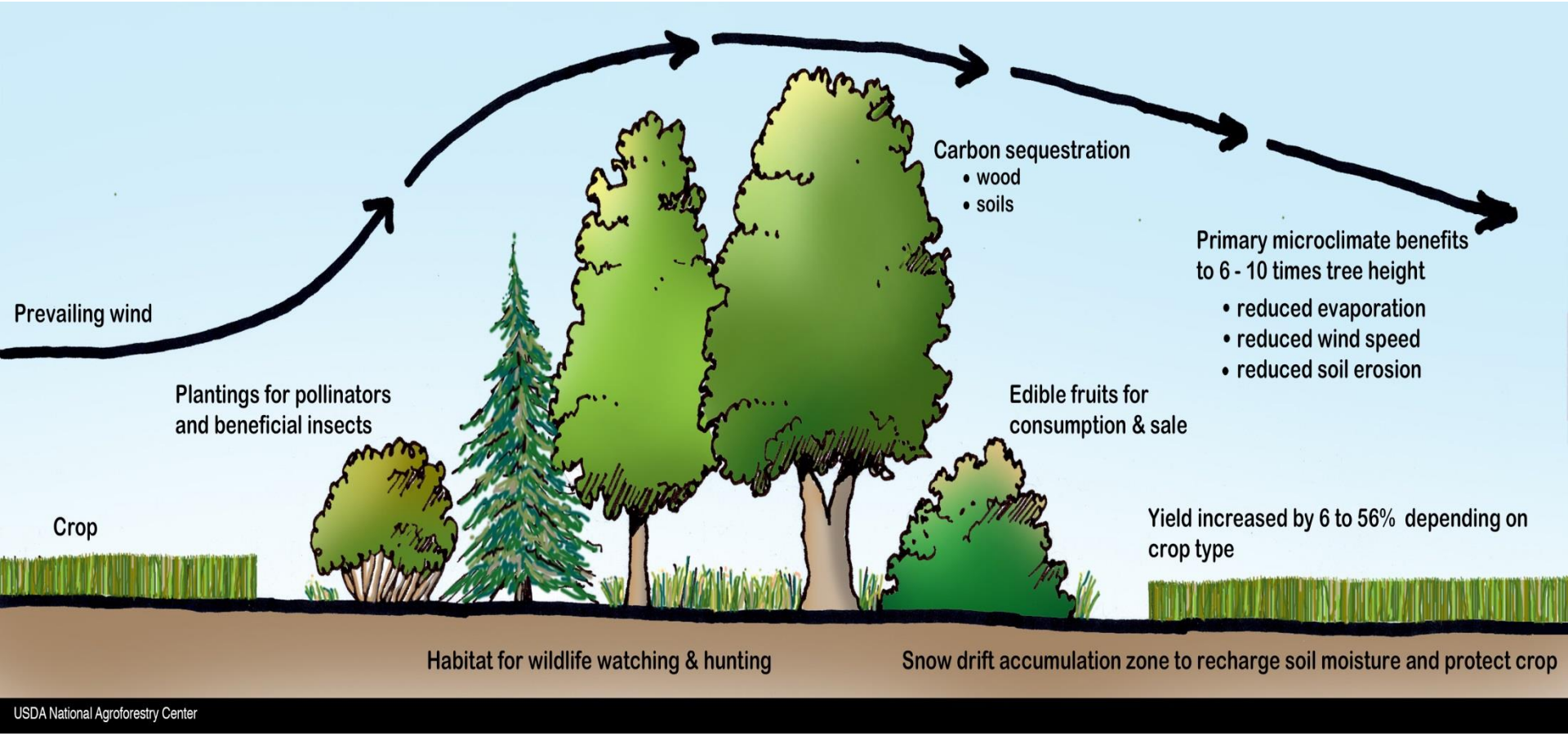


Alley Cropping Benefits

- Improves crop or forage quality and quantity by enhancing microclimate
- Improves crop diversity, and economic returns
- Increases net carbon storage in the soil and vegetation
- Improves utilization and recycling of soil nutrients
- Decreases off site movement of nutrients or chemicals
- Provides or enhances wildlife habitat

Agroforestry Practices

Windbreaks



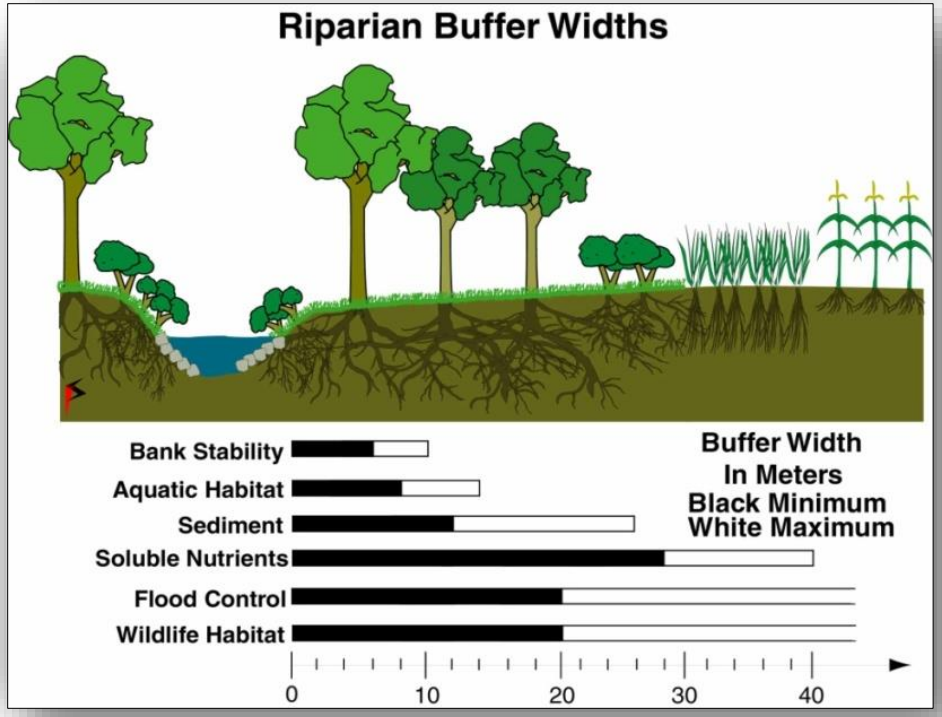
Windbreak Benefits

- Reduce Soil Erosion
- Protect Plants
- Enhance Plant Growth
- Manage Snow
- Improve Wildlife Habitat
- Reduce Energy Needs
- Enhance Aesthetics

- Moderate Noise
- Reduce Airborne contaminants
- Improve irrigation efficiency
- Increase carbon storage
- Mitigate Odors

Agroforestry Practices

Riparian Forest Buffers



Riparian Forest Buffer Benefits

- *Flood protection*
- *Protect aquatic habitat*
- *Protect stream banks*
- *Income source (timber and specialty products)*
- *Improve water quality*
- *Enhance wildlife habitat*

Agroforestry Practices

Forest Farming

Maple Sap

Ginseng

Shitake

Goldenseal

Firewood

*The **intentional** manipulation, **integration**, and **intensive** management of woodlands that capitalize on specific plant **interactions** to produce non-timber products.*

Forest Farming Benefits

- Enhance Forest Health
- Improve Forest Composition
- Diversify Income Opportunities
- Range of Operation Sizes (<1/2/ acre to >50 acres)

Forest Farming
Types of NTFPs

- Medicinal

Aromatic oils, bark, buds, leaves, roots, fruit & flowers and pollen

- Edible

Fiddleheads, Ramps, Mushrooms, Nuts, Roots, Honey, Maple Syrup, Fruit and Leaves

- Floral, Decorative & Craft

Leaves, Berries, Cones, Seeds, Capsules

- Specialty Wood

Raw materials for hand crafted products and art

Forest Farming Methods

- Woods Cultivated/Grown aka Forest Gardening (Most Intensive)

- Wild-Simulated (Plant a seed)

- Managed Wild Population (Work with existing populations)

✓ Woods Cultivated
  - higher costs
  - farming in the forest

✓ Wild simulated
  - mimics nature
  - lower cost
  - less inputs

Agroforestry Practices

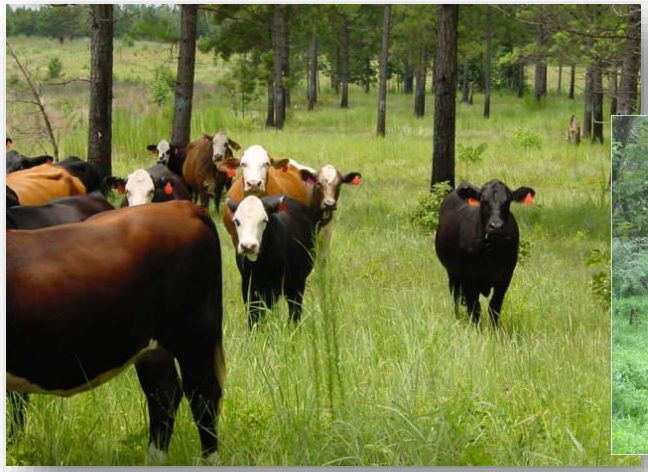
Silvopasture

Combining timber, livestock and forage production on the same acreage.

- ✓ ***Intentional***
- ✓ ***Designed***

Managing:
Tree Layer
Forage Layer
Animal Layer

Trees provide long-term returns, while livestock and forages generate an annual income.

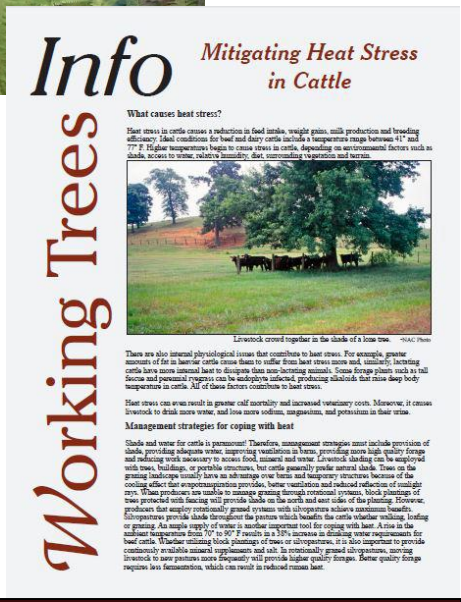


Silvopasture Benefits

- *Lower Animal Stress*
- ✓ *Heat Stress*
- ✓ *Cold Stress*


Photo credit: J. Jourdain

- *Diversified Income*
- ✓ *annual (grazing, hay, hunting)*
- ✓ *Long-Term Income (timber)*


Info
Mitigating Heat Stress in Cattle
Working Trees
What causes heat stress?
Heat stress in cattle causes a reduction in feed intake, weight gains, milk production and breeding efficiency. Ideal conditions for beef and dairy cattle include a temperature range between 41° and 77° F. Higher temperatures begin to cause stress in cattle, depending on environmental factors such as shade, access to water, relative humidity, diet, surrounding vegetation and terrain.
Livestock crowd together in the shade of a lone tree. -NAC Photo
There are also internal physiological issues that contribute to heat stress. For example, greater amounts of fat in heavier cattle cause them to suffer from heat stress more and, similarly, lactating cattle have more internal heat to dissipate than non-lactating animals. Some forage plants such as tall fescue and perennial ryegrass can be endophyte infected, producing alkaloids that raise deep body temperature in cattle. All of these factors contribute to heat stress.
Heat stress can even result in greater calf mortality and increased veterinary costs. Moreover, it causes livestock to drink more water, and lose more sodium, magnesium, and potassium in their urine.
Management strategies for coping with heat
Shade and water for cattle is paramount! Therefore, management strategies must include provision of shade, providing adequate water, improving ventilation in barns, providing more high quality forage and reducing work necessary to access food, mineral and water. Livestock shading can be employed with trees, buildings, or portable structures, but cattle generally prefer natural shade. Trees on the grazing landscape usually have an advantage over barns and temporary structures because of the cooling effect their evapotranspiration provides, better ventilation and reduced reflection of sunlight rays. When producers are unable to manage grazing through rotational systems, block plantings of trees protected with fencing will provide shade on the north and east sides of the planting. However, producers that employ rotationally grazed systems with silvopasture achieve maximum benefits. Silvopasture provide shade throughout the pasture which benefits the cattle whether walking, loafing or grazing. An ample supply of water is another important tool for coping with heat. A rise in the ambient temperature from 70° to 90° F results in a 38% increase in drinking water requirements for beef cattle. Whether utilizing block plantings of trees or silvopastures, it is also important to provide continously available mineral supplements and salt. In rotationally grazed silvopastures, moving livestock to new pastures more frequently will provide higher quality forages. Better quality forage requires less fermentation, which can result in reduced rumen heat.

Two Approaches to Creating Silvopasture

- Woodlot Conversion (utilizing silviculture)

Photo credits: M. Downey

- Establish Trees in Existing Pasture

Not Silvopasture

"Woodland Grazing"

"Turning Livestock into the Woods"

Photo credit: J. Orefice, *"Pigs 'N Trees"*

Photo credit: J. Jourdain

Woodland Grazing

"Turning Livestock into the Woods"

Contrary to the Benefits of Silvopasture

When Woodland Grazing
is Not Properly Applied

Decreases in overall Tree Health,
Soil Health & Forest Regeneration

Silvopasturing is not:

"A few shade trees in a pasture, nor dense timber with sparse understories of edible plants. No resource is managed to the detriment of others."

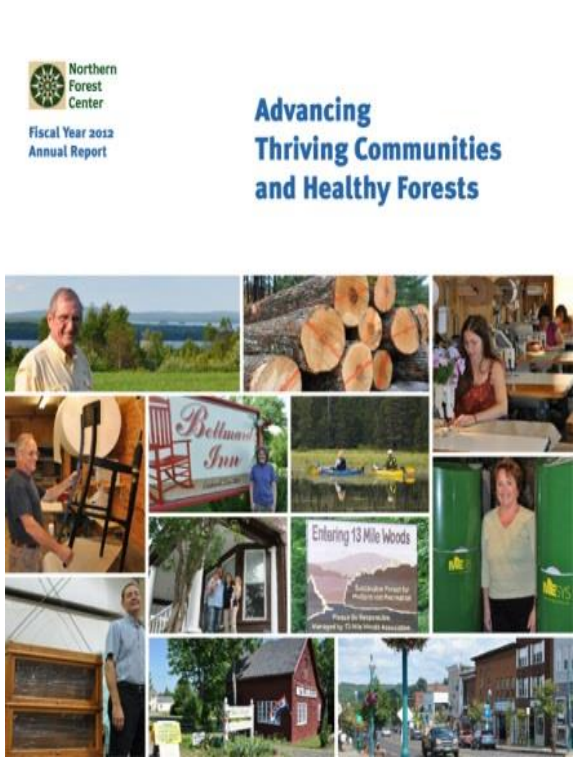
B. Chedzoy, Cornell Cooperative Ext.

"Livestock kept without care for tree, soil or forage health is not Silvopasture."

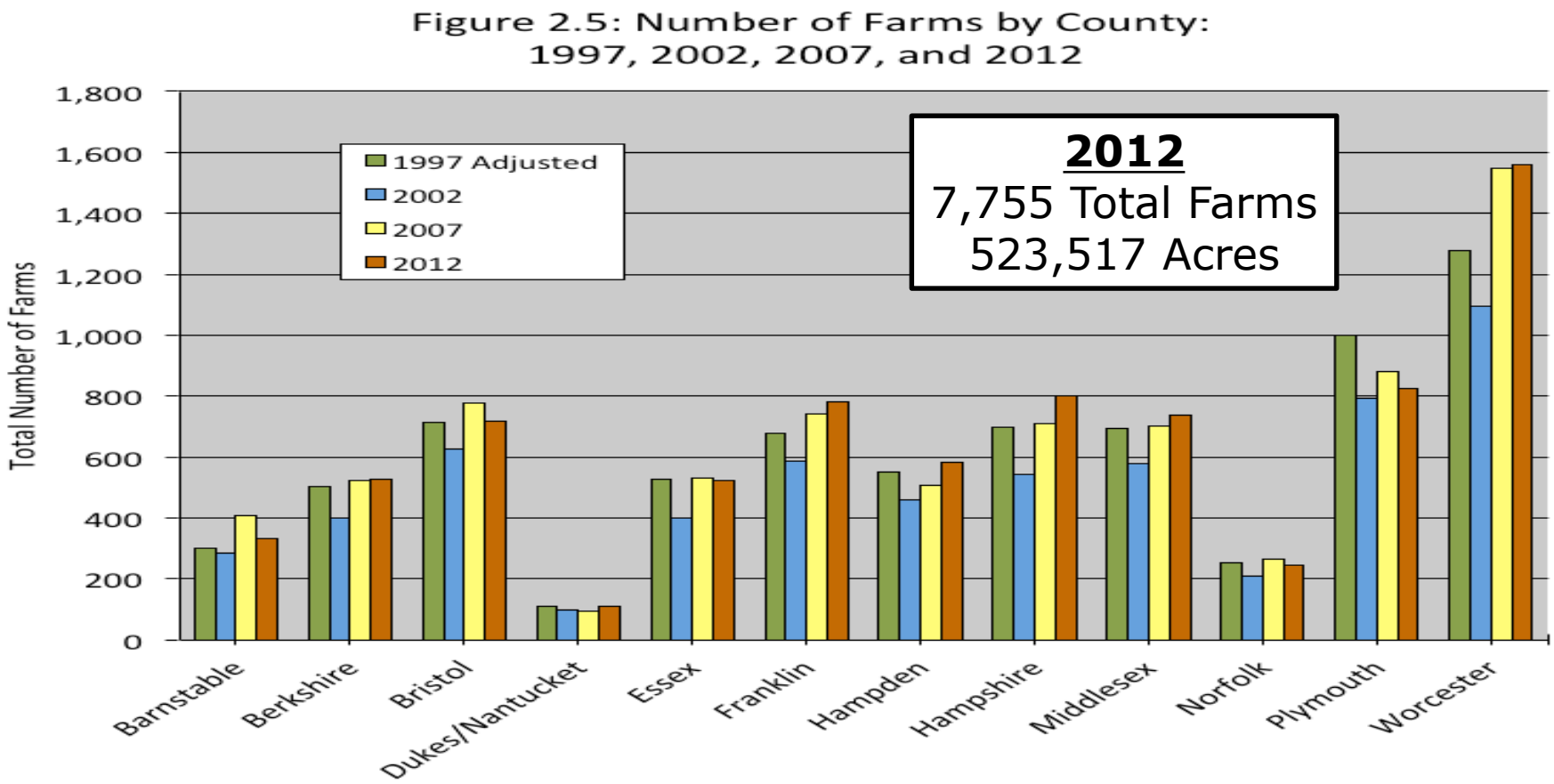
S.Gabriel, Cornell Cooperative Extension

Agroforestry

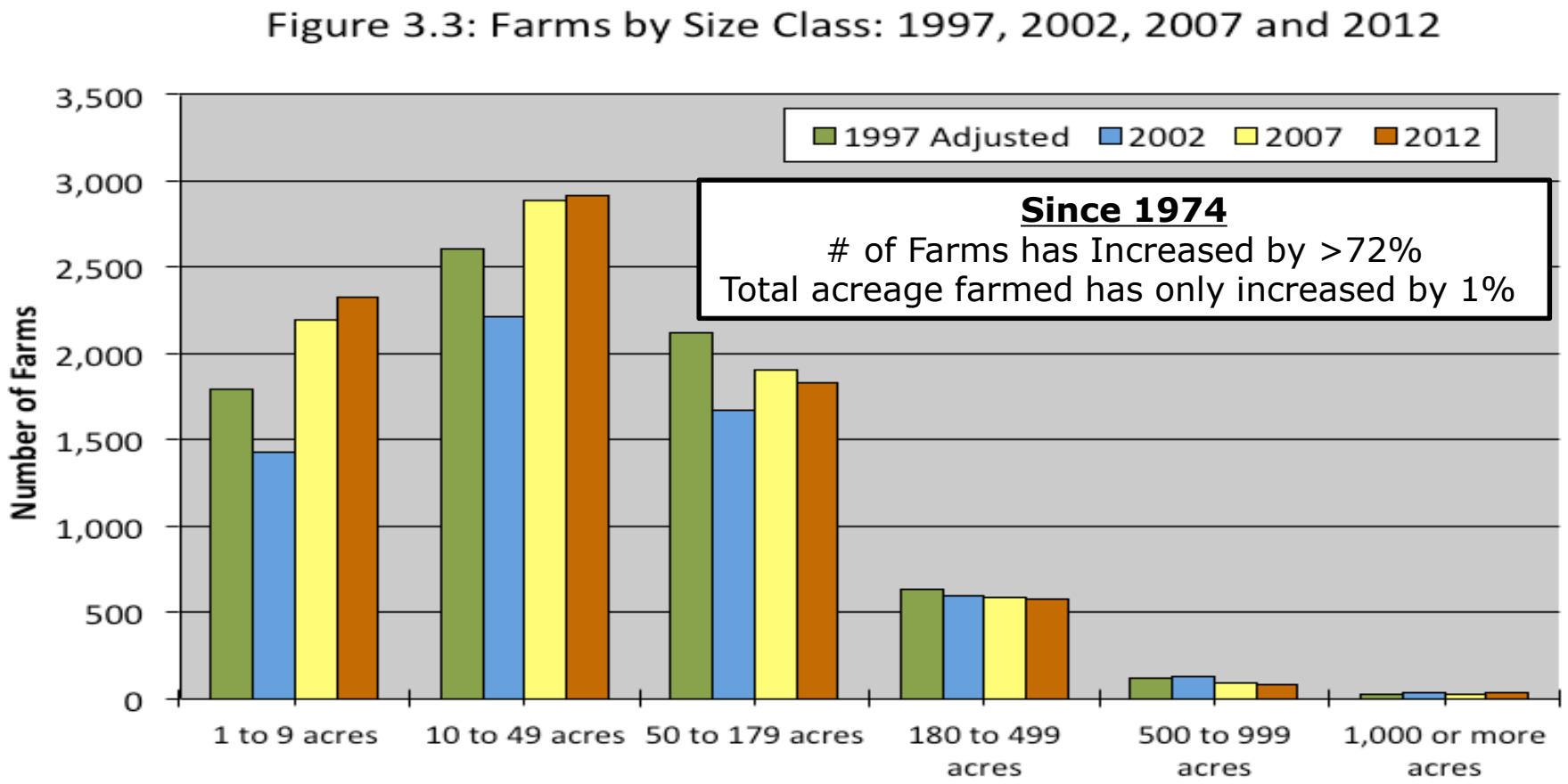
A Massachusetts Perspective



MA Agricultural Census Data 2012

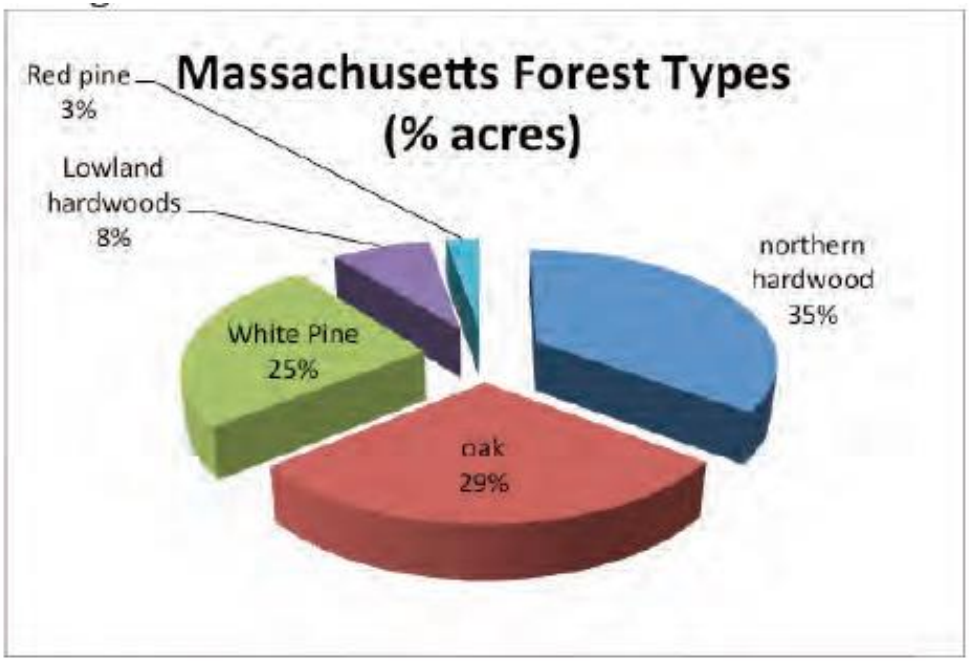


Most Farms are Small

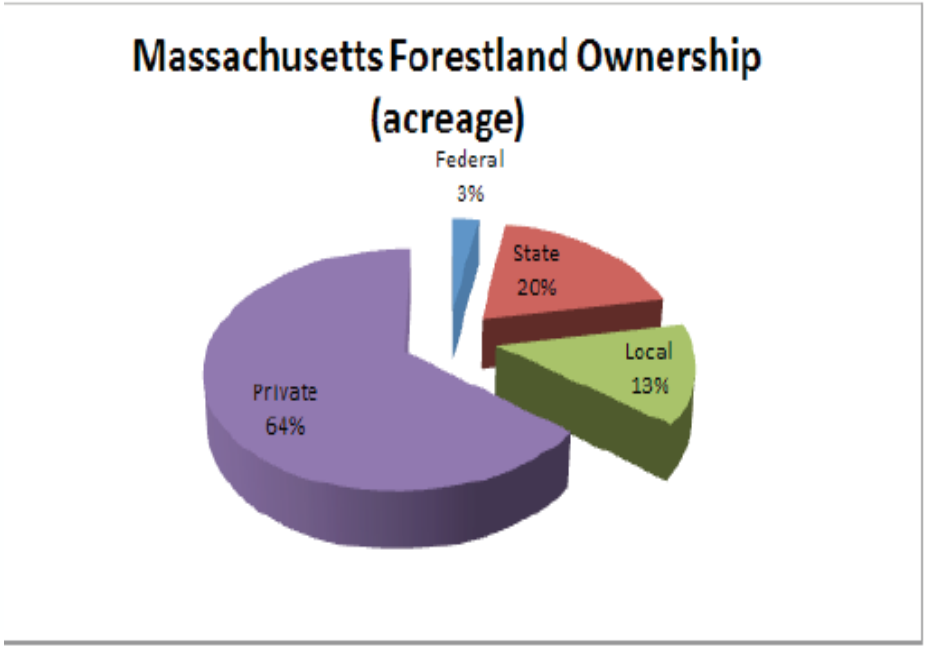


MA Agricultural Census Data, 2012

Massachusetts Forests



Source: USDA Forest Service, Forest Inventory and Analysis



Source: USDA Forest Service, Forest Inventory and Analysis & private data

3.03 million acres of forest land
2.179 million NIPF acres
293,000 landowners

As reported to USFS
FEB. 2017

Distribution of Woodland Pasture in Massachusetts

Land in Pasture	85,760 acres
Woodland Pasture	17,837 acres (21% of total pasture)

Number of Farms using Woodland Pasture
1,093

Number of Farms self-identifying as practicing alley cropping or silvopasture
59

OPPORTUNITY?

Data taken from 2012 USDA Farm Census

Is Massachusetts Ready for Agroforestry Expansion?

- *Peer-to Peer Learning*

Identify landowners practicing

- *Professionals*

Increase technical, educational, marketing assistance

- *Partnerships*

Increase awareness and understanding

- *Programs*

Support planning and establishment of agroforestry practices

Photo credits: M. Downey

Time to Move Past Old Biases

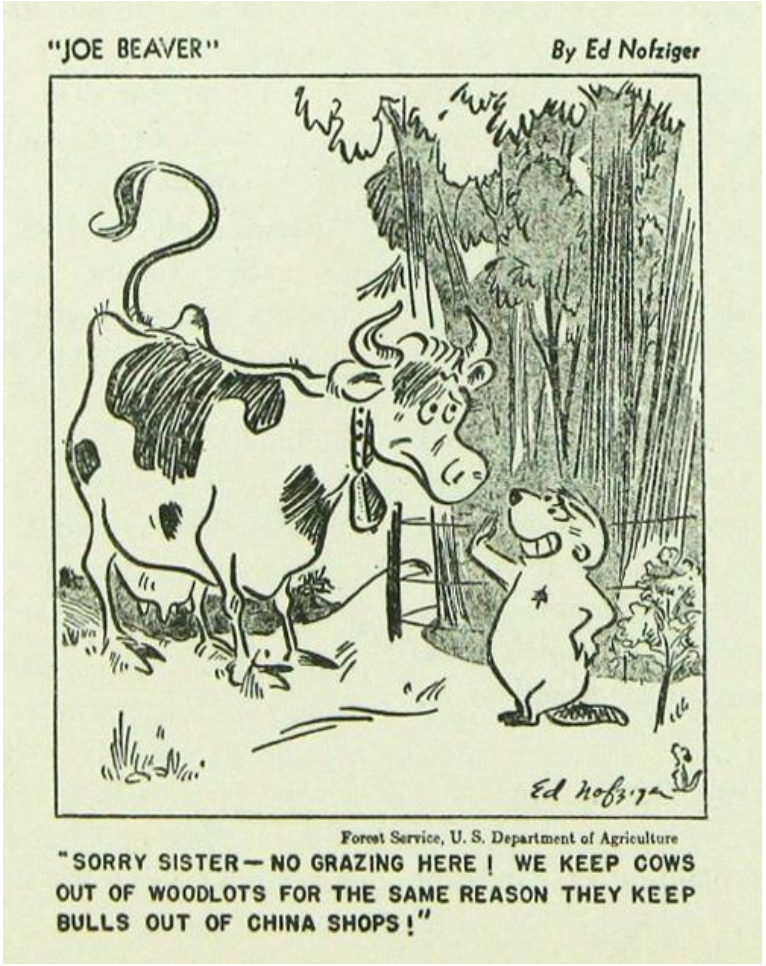
Long been taught that livestock and trees don't mix

Challenge Your Tree-Centered Self

Increase "our" capacity to deliver technical assistance

Recognize when Agroforestry Practices are being thoughtfully applied—and when they are not!

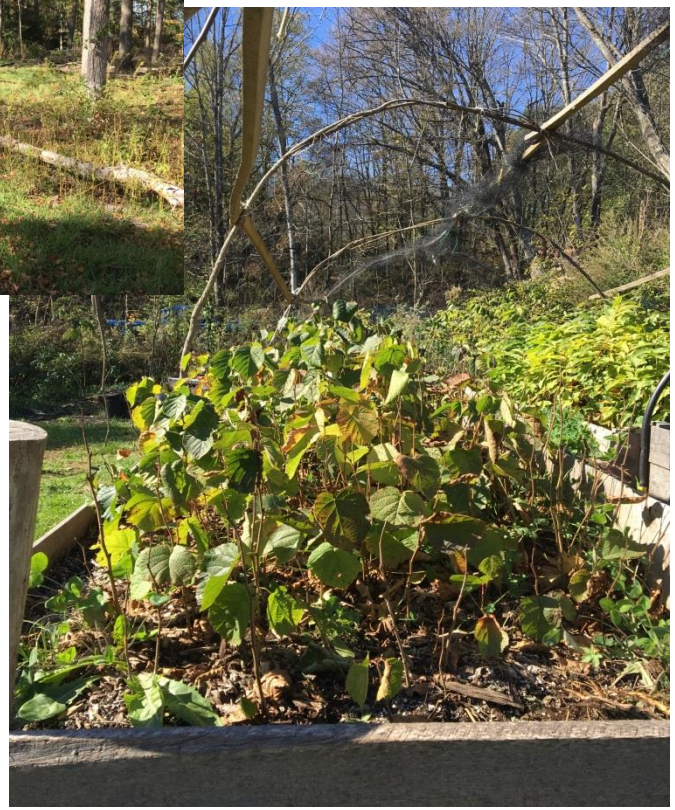
- Clean Water and Air
- Safe and Healthy Food
- Abundant Wildlife
- Beautiful Places
- Clean Renewable Energy
- Sustainable Family Farms



Landowner Adoption

Photo credit: Hemlock Hill Farm

Photo credits: M. Downey



For Additional Information

- ***USDA National Agroforestry Center***

https://www.fs.usda.gov/nac/

- ***The Center for Agroforestry***

http://www.centerforagroforestry.org/

- ***Association for Temperate Agroforestry***

http://www.aftaweb.org/

- ***Cornell Small Farms Program***

http://smallfarms.cornell.edu/projects/agroforestry/

- ***Agroforestry Net***

http://www.agroforestry.org/

- ***Silvopasture (online course)***

https://www.silvopasture.org/

- ***World Agroforestry Centre***

http://www.worldagroforestry.org/

- ***Silvopasture (Peter Smallidge, Cornell Senior Extension Associate)***

http://silvopasture.ning.com/

Thank You!

Photo credit: M. Downey