

# **Understanding Allelopathy Science**

**2016 NETWC Conference  
Lake Placid, NY  
Timothy Chick  
Paul Smith's College**

# *Plant Competition*

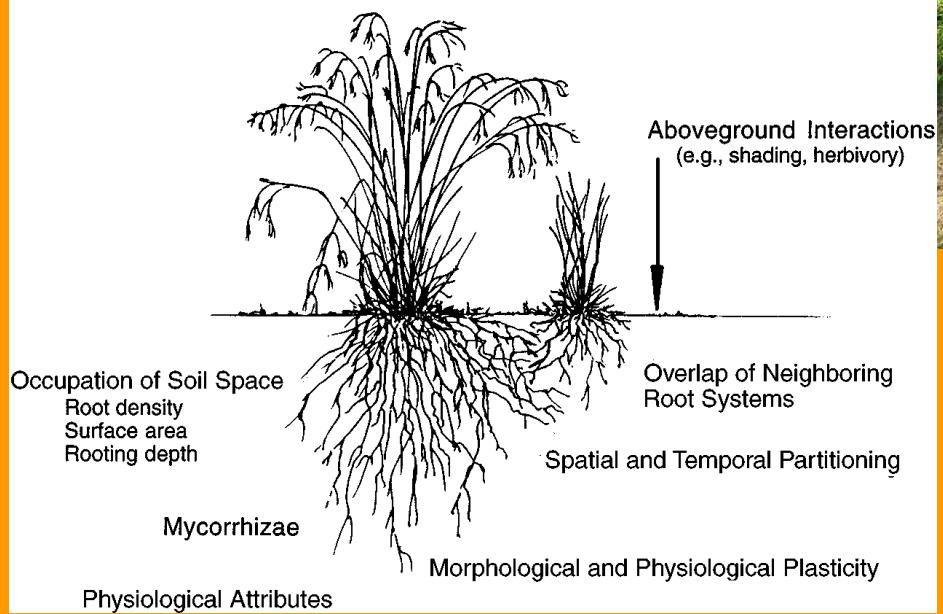


***SUNLIGHT  
WATER  
NUTRIENTS***

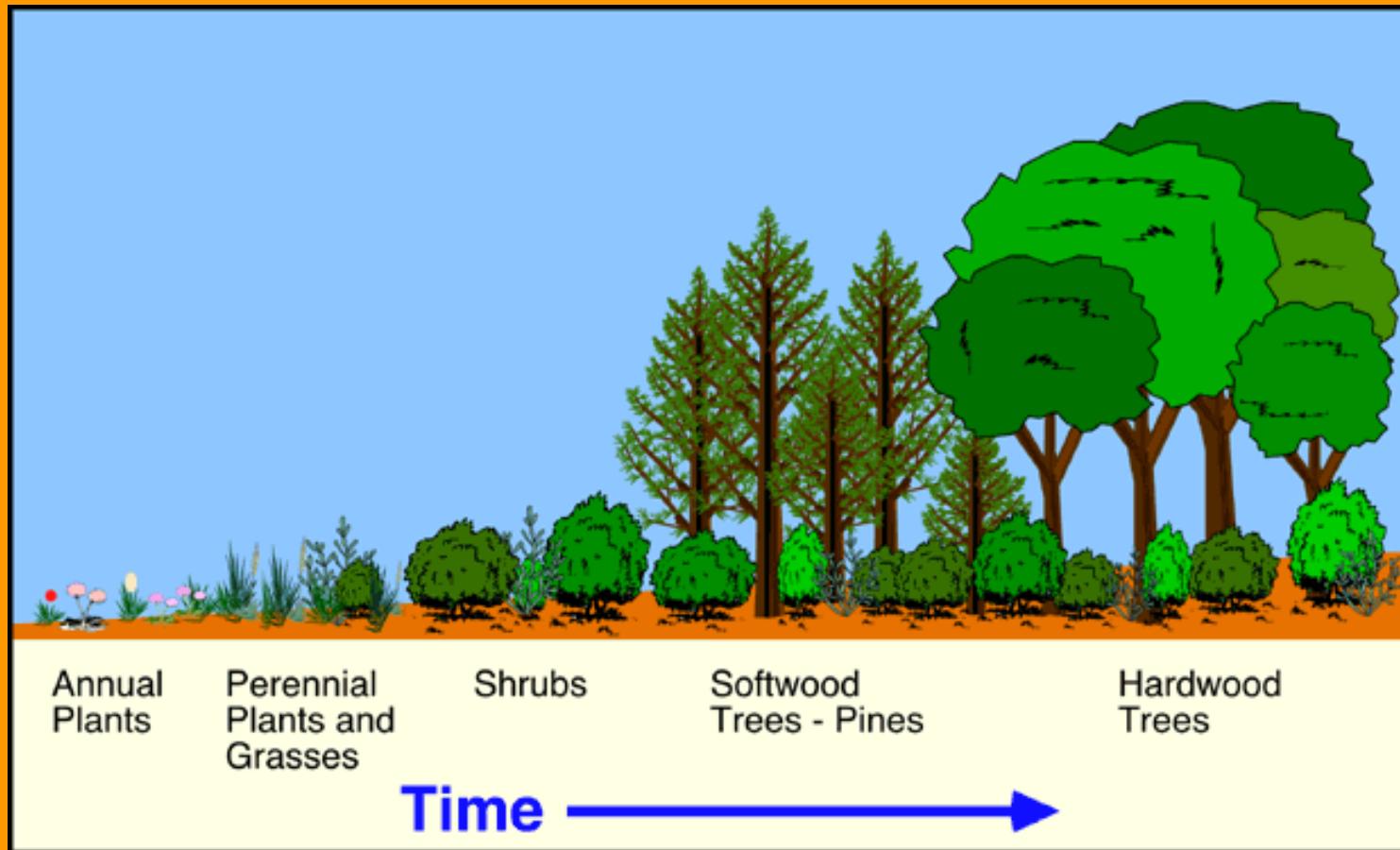


# *Root competition*

## Belowground Competition In Plants



# *Secondary Succession*



# *Where's the Plant Succession??*



## *What is Allelopathy?*

*“The chemical influence of  
one plant by another”*

# *Allelopathy affects:*

- *Germination*
- *Growth*
- *Health*
- *Survival*



# *Black Walnut – the “Spokesperson” for Allelopathy*



# *Classic walnut-tomato conflict*



# *Interference*

## *Definition-*

*The combination of competition and allelopathy*

*Important to use this term when it's unclear if competition or allelopathy is operable.*

# *Why is allelopathy important?*

- *More accurate understanding of plant physiology and interactions*
- *A powerful tool for IVM biological control*
- *Better knowledge of tree resistant species*
- *Biological control is a wonderful PR tool*

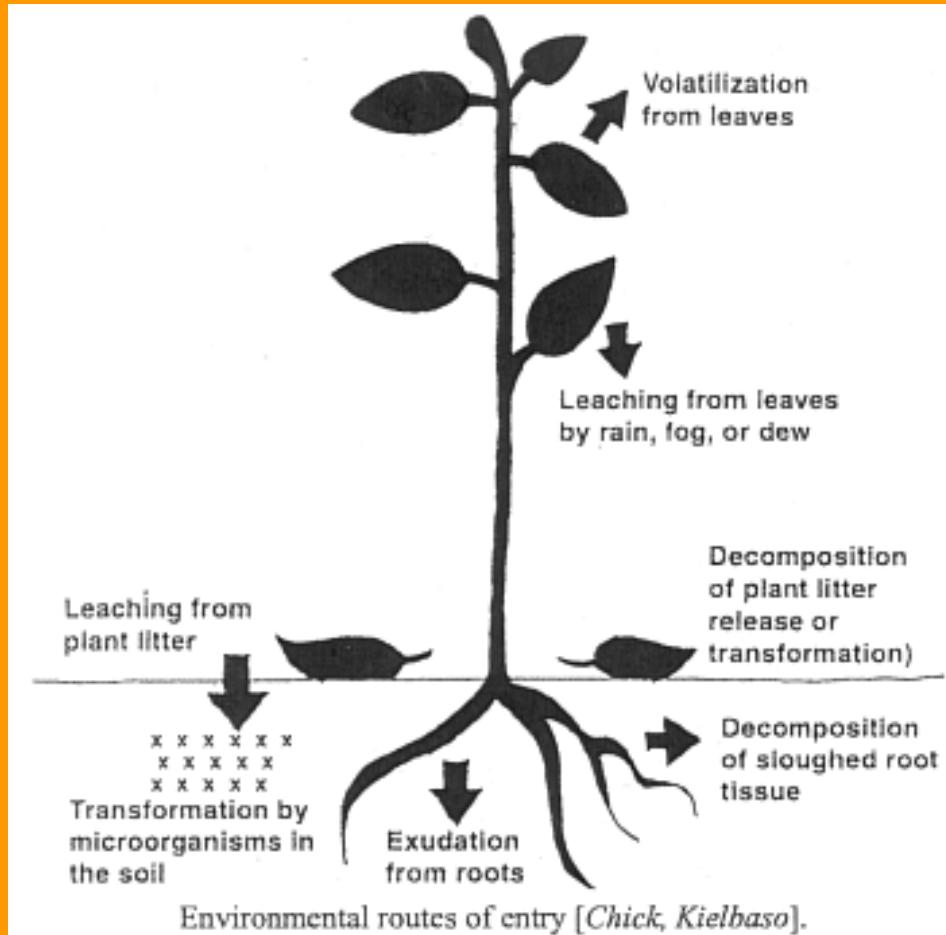
# *Allelochemicals*

- *Secondary metabolites*
- *14 classes of chemicals – tannins, phenols, polyacetylenes, flavonoids*
- *Species specific*
- *Additive or synergistic*
  - *Multiple toxins*
  - *Stresses*

# *Physiological Sites of Action*

- *Germination*
- *Cell division*
- *Cell extension*
- *Membrane permeability*
- *Protein synthesis*
- *Enzyme activity*
- *Respiration*
- *Water relations*
- *Photosynthesis*
- *Nutrient uptake*

# *Environmental Routes of Entry*



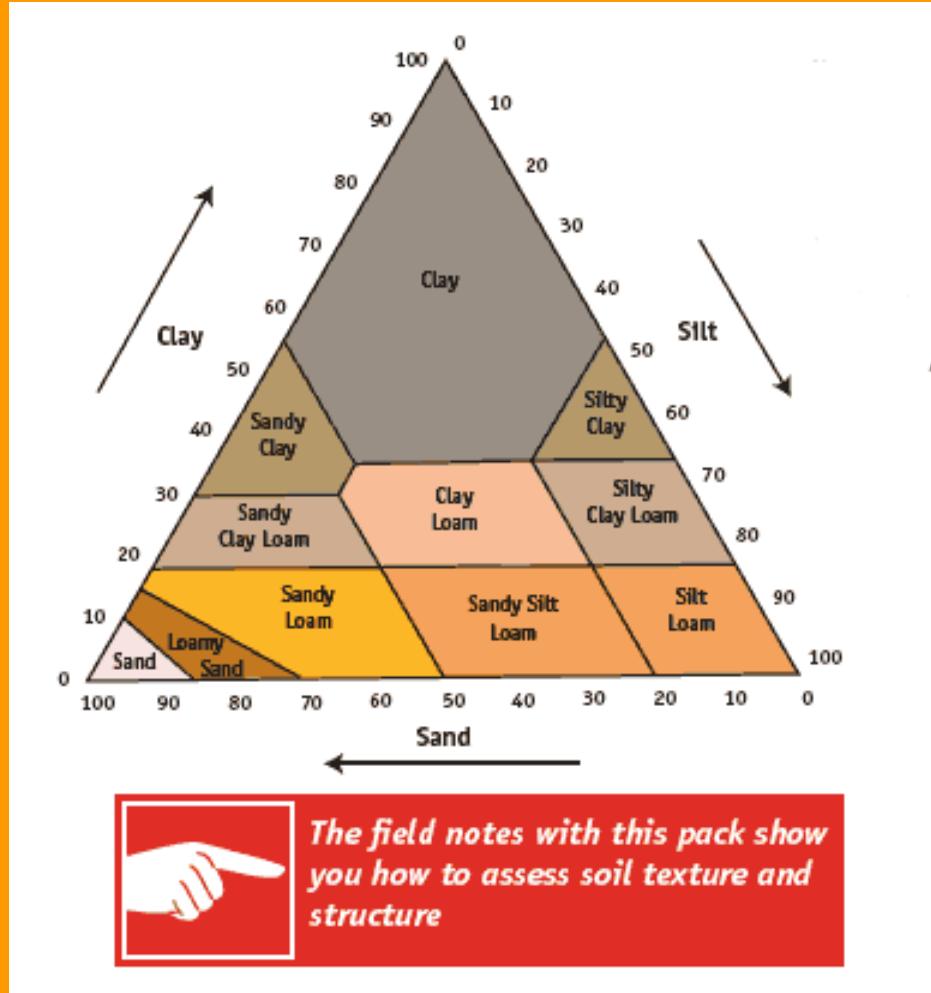
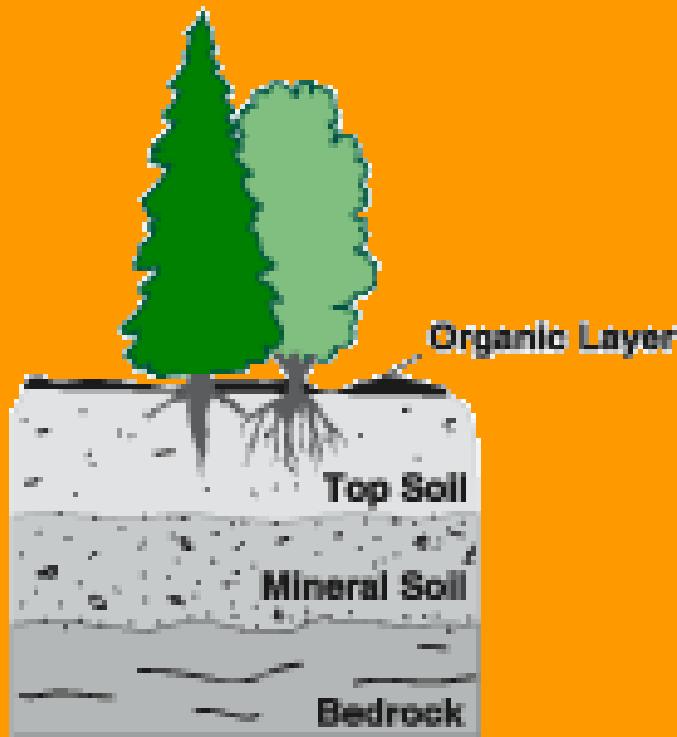
**VOLATILIZATION  
LEACHING  
EXUDATION  
DECOMPOSITION**

**\*TRANSFORMATION  
PRODUCTS**

# *Persistence Varies (without replenishment)*

- *Sugar maple*                    *5 days*
- *Some grasses*                  *2 weeks*
- *Goldenrod*                      *2+ years*
- *Black walnut*                   *5+ years*

# *Soil Type Effects*



# *Allelochems Adsorb to Clay Particles – Poor Drainage*



# *Sandy Soils –Poor Adsorption Drains Easily*



© J. Kelley, <http://SoilScience.info>

# *Pool Size Elements*

- *Concentration inputs (amt. + no. species)*
  - *Persistence*
  - *Stresses – temp., water and nutrients*
  - *Soil texture – clay and sand*
  - *Drainage*
- \*\* *Addition and depletion varies over time*



*Little  
bluestem  
*Schizachyrium  
scoparium**

# *Tall fescue*

## *Shedonorus phoenix*



© Ted Bodner

# *Bracken fern – Pteridium aquilinum*



# *Goldenrod – Solidago spp.*



# *Aster spp.*



# *Meadow sweet - Spiraea latifolia*



# *Quackgrass - Elymus repens*

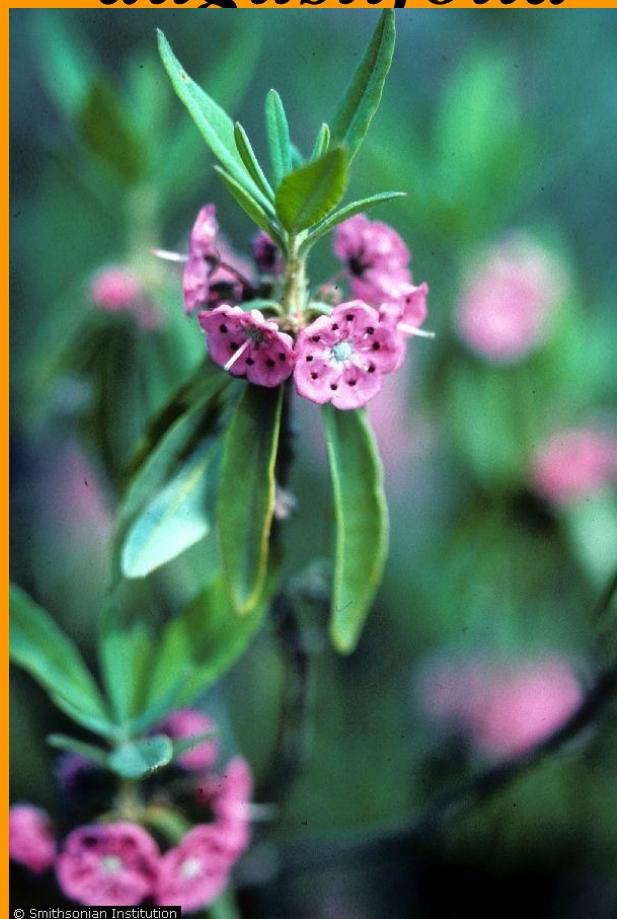


# *Blueberry – Vaccinium augustifolia*





*Sheep laurel*  
*Kalmia*  
*augustifolia*



# *Additive and Synergistic Effects*



*Take away message...*

*Allelopathy is an important  
interference factor in IVM  
biological control which can  
delay the need for chemical  
interventions by resisting tree  
invasion*

# *Reference*

*Allelopathy as a Biological Control for IVM,  
Arborist News, Dec., 2010*

# *Contact*

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