

Cornell University  
Cooperative Extension and  
Department of Horticulture

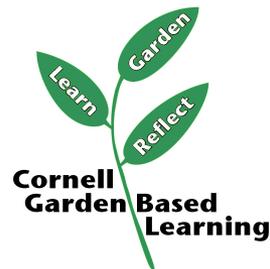
# Designing Polycultures for the Garden

Author: Steve Gabriel

This presentation was originally created for use in the fall of 2013 for the Cornell Garden-Based Learning Regional Training for Cornell Cooperative Extension educators and Master Gardener Volunteers. This training kicked off our CCE 2014 Growing Season Educational Campaign: Designing for Garden Ecosystems.

Garden design is critical for setting the stage for garden success and environmental stewardship. In this training we consider a **polycultures** approach to garden design. The concept embraces growing multiple crops in the same space, in imitation of the diversity of natural ecosystems.

[gardening.cornell.edu](http://gardening.cornell.edu)

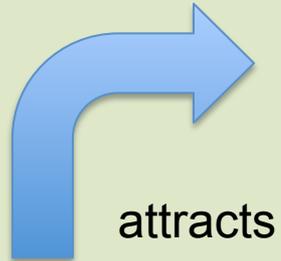


**Polyculture:** a community of *multifunctional* plants, animals, and fungi that is designed for *functional interconnection*

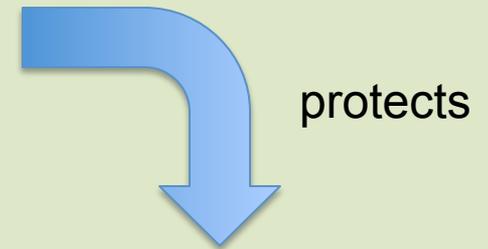
# The many parts of multi-functionality

Human Needs	Ecosystem Services
Food	Nitrogen Fixation
Fuel	Nutrient Accumulators/ Fertility
Fodder (for animals)	Living Mulch/Ground Cover
Medicine	Insectary
Aesthetics	Nectary/Pollen

# Functional Interconnection



LACEWING



YARROW



BRASSICAS

# Patterns of the Aster or Sunflower Family

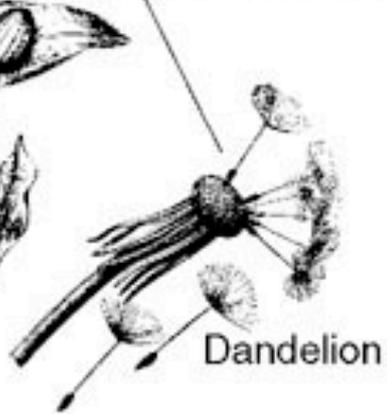
Plants of the Aster family are "composites" of many small flowers in a disk-like flowerhead.

Asters are often easy to recognize from a distance.



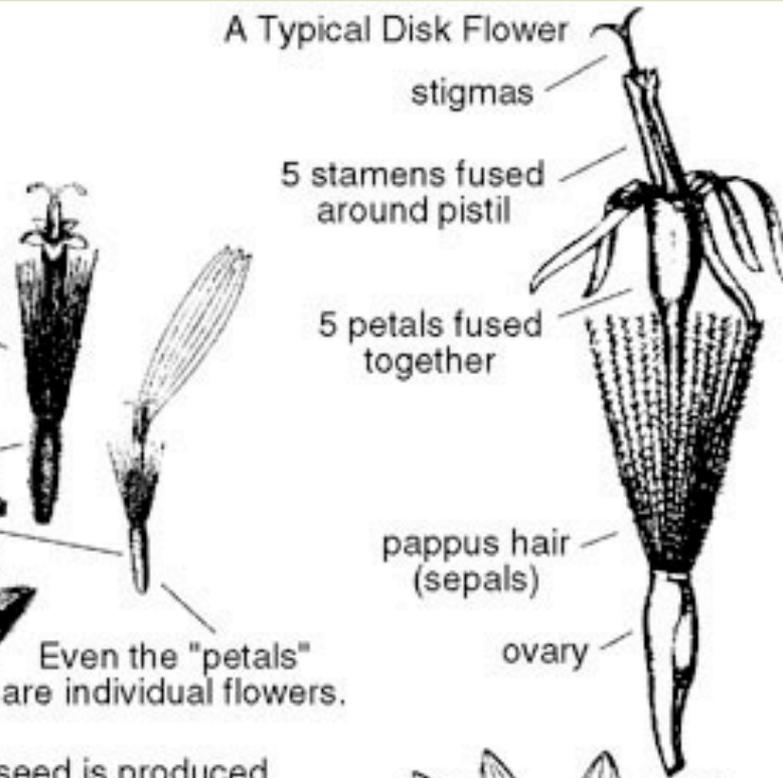
Arnica

Each seed is produced by a single tiny flower.



Dandelion

A Typical Disk Flower



stigmas

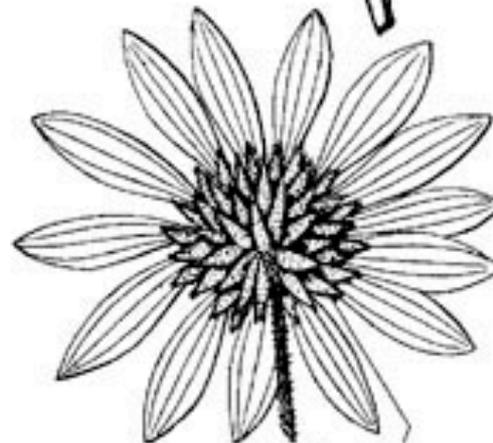
5 stamens fused around pistil

5 petals fused together

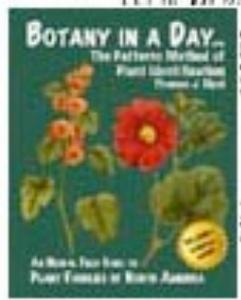
pappus hair (sepals)

ovary

Even the "petals" are individual flowers.

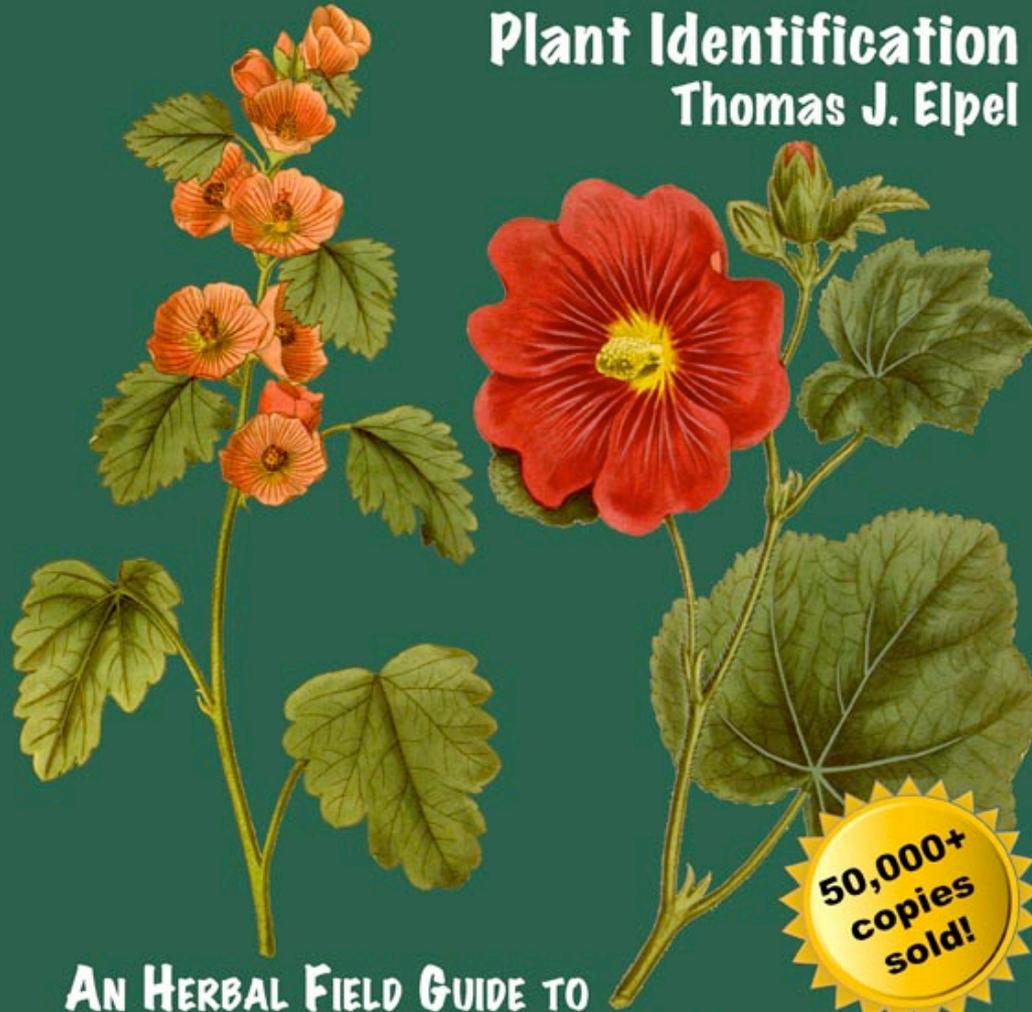


multiple layers of bracts are common



# BOTANY IN A DAY<sup>APG</sup>

The Patterns Method of  
Plant Identification  
Thomas J. Elpel



AN HERBAL FIELD GUIDE TO  
PLANT FAMILIES OF NORTH AMERICA



## Umbelliferae family

*Wild Carrot, Dill, Cow Parsnip, Sweet Cicily, Water Celery...*

# Mint (Lamiaceae) family

(Anise hyssop, horehound, self heal, all mints)



# What about companion planting?

*Unfortunately, much of the popular literature that discusses companion planting is based upon some very bad science, in particular, the "sensitive crystallization method" which was originated by Dr. Ehrenfried E. Pfeiffer in the 1930's. ....Thus, the notion that "carrots love tomatoes" but "beans dislike fennel" is based upon an analytical laboratory procedure and not on direct observation of the plants in nature...*

**[www.gardening.cornell.edu/companionplants](http://www.gardening.cornell.edu/companionplants)**

# Polyculture from Nature



Douglas Fir



Mycorrhizal Fungi



N Flying Squirrel



Spotted Owl

“Pill of Symbiosis”



# Polyculture from Human History



Figure 4

*The Three Sisters*, drawing by John Kahionhes Fadden (1988).  
Courtesy of the New York State Museum, Albany, NY, 12230.

# The 4<sup>th</sup> sister?



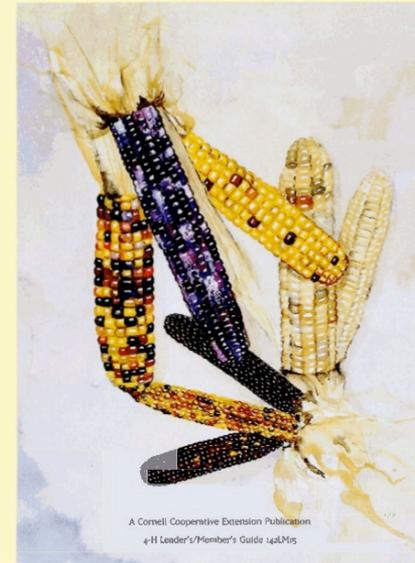
- young leaves, flowers, and seed pods of bee plant are edible, and native people boiled and ate them, or made a paste from the plant for later use.
- accumulates iron, and thus is the source of a deep-hued paint used to create the characteristic black designs on Anasazi pottery.
- songs and blessings of New Mexico's Tewa people mention corn, beans, squash, and bee plant,



# The Three Sisters

Exploring an Iroquois Garden

Marcia Eames-Sheavly



A Cornell Cooperative Extension Publication  
#H Leader's/Member's Guide 148M15



# Turning Problems into Opportunities



**Walnut**  
*Juglans spp.*



**Paw Paw**  
*Asimina tribola*



Elderberry  
*Sambucus canadensis*



# Sunchoke

*Helianthus  
tuberosus*





*Allium spp.*



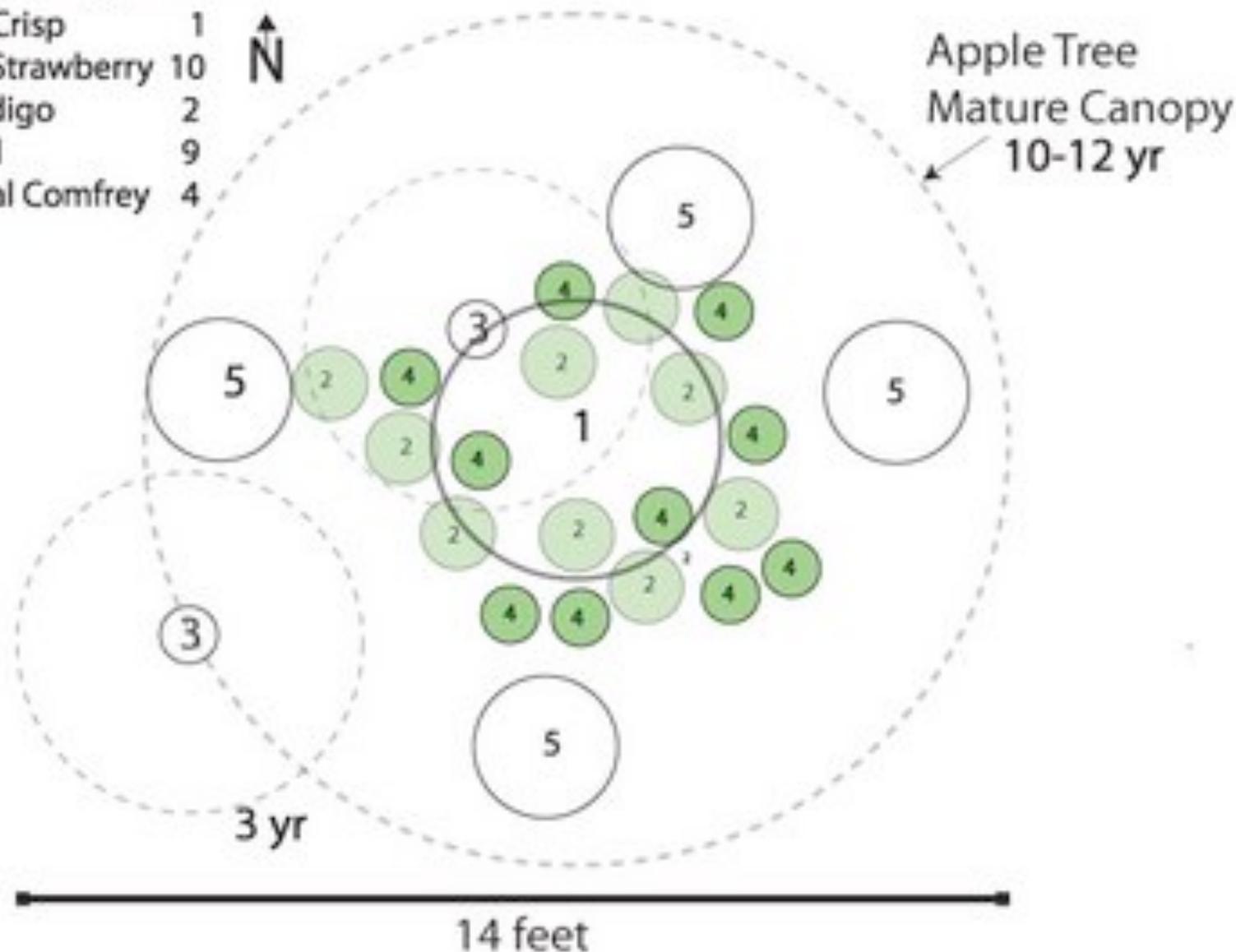
**White Clover**  
*Trifolium repens*



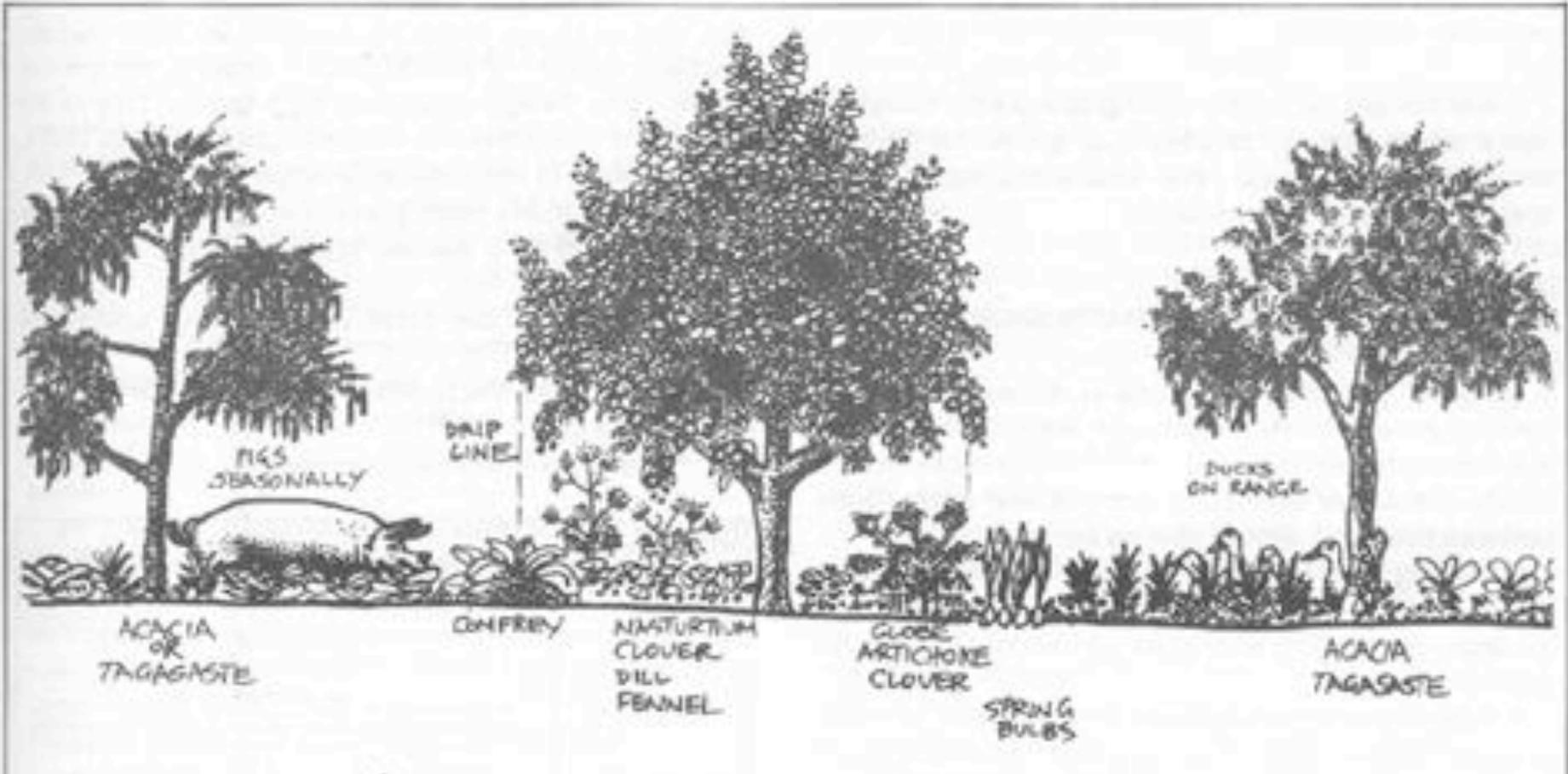
**Wine Cap**  
*Stropharia rugosa annulata*

# Orchard Polyculture

1 Honey Crisp	1
2 Alpine Strawberry	10
3 Wild Indigo	2
4 Daffodil	9
5 Optional Comfrey	4



# More complex...

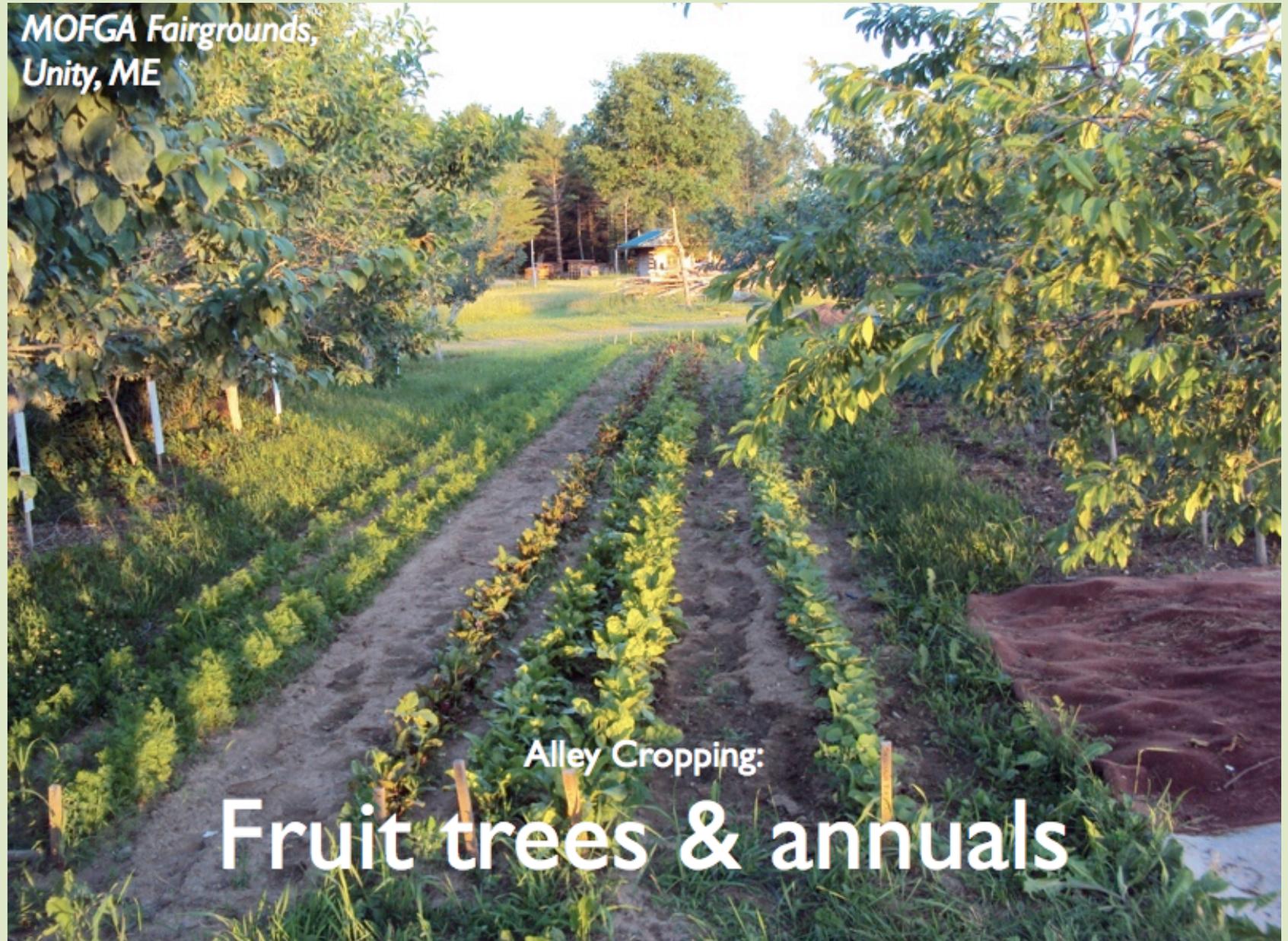


# Apple/Peach, Asparagus, Clover, and Turkeys at Good Life Farm



# Or simpler...

MOFGA Fairgrounds,  
Unity, ME



Alley Cropping:

## Fruit trees & annuals



# Some polycultures from Cornell Students:

- **Smoothie Polyculture**  
*(Hazelnuts, Paw Paw, Berries, Mint, Spinach)*
- **Tye-Dye Polyculture**  
*(Walnut, Sumac, Elderberry, Calendula)*
- **Viticulture Polyculture**  
*(Grapes, Oak, Ducks, Elderberry)*
- **Compost Toilet Polyculture**  
*(Bamboo, Lavender, Mullein, Mints)*

POLY CULTURE NAME

GROUP MEMBER NAMES

TO SCALE SKETCH

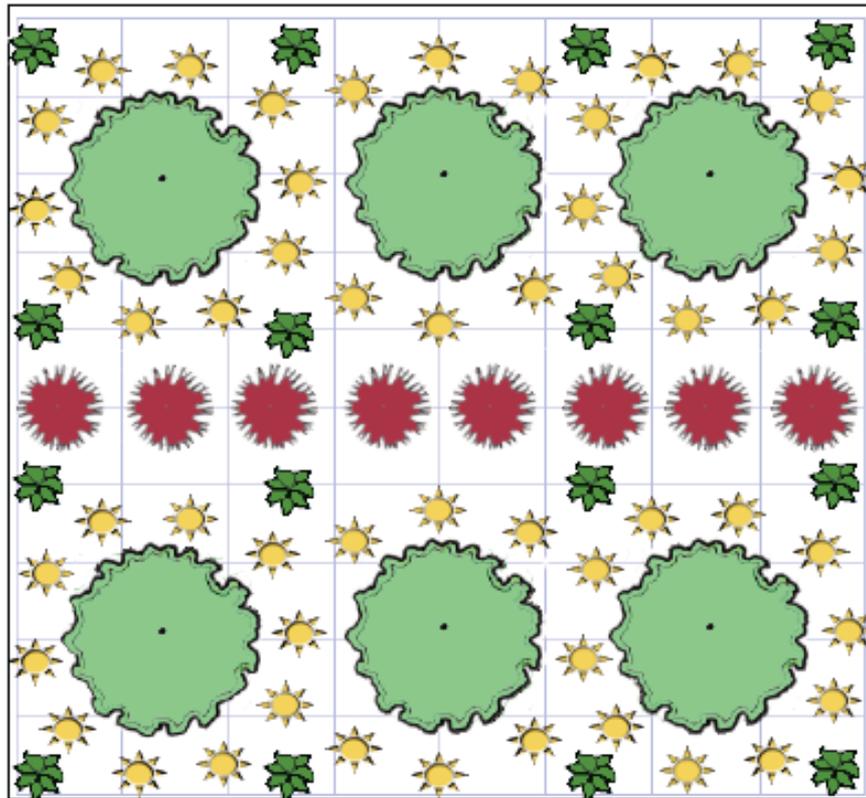
1 BLOCK =  
1ft or 5ft or 10ft

3 – 5 GOALS

*Arrange cards and describe connections between plants  
(start with 3 to 5 plants!)*

# Paw Paw Paradise

Steve Gabriel



1 block = 10 feet

1. Support Paw Paw crop
2. Get food yields in first year
3. Foraging habitat for ducks

Shade

Sunchoke

*Helianthus tuberosus*

Tall growing woody herbaceous plant. High yields of high protein edible tubers. Easy to grow, will be permanent where you plant!

Paw Paw

*Asimina triloba*

Understory, shade tolerant tree. Need at least two for pollination. Largest tree-fruit that can be grown in NY. Nutritious and delicious.

Comfrey

*Symphytum uplandicum*

Herbaceous. Accumulates K, P, Ca, Cu, Fe, Mg. "chop n drop", spider plant, Hybrid varieties have sterile seed (x uplandicum)

N<sub>2</sub>

Alder

*Alnus spp.*

Overstory or understory tree that tolerates range of soils, likes moisture. Nitrogen fixing and good wood & wildlife value. Naturalized.

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