Designing Polycultures

(Guild Building)

Polycultures (or "**guilds**" as we sometimes call them) are an essential element of agroforestry and permaculture design. Here I'll define them this way:

- Plantings containing at least two plant species;
- Designed to minimise competition between the plants;
- Designed to maximise cooperation between the plants;
- Designed to optimise management and ease of harvest;
- May also include livestock, cultivated fungi, and other elements.

(from '**GUIDELINES FOR PERENNIAL POLYCULTURE DESIGN',** January 15, 2016 by Eric Toensmeier, permaculturenews.org)

Some examples …

Figure 1. Black locust and pawpaw in a wild-occurring model for polyculture systems. The black locust forms the canopy, and fixes nitrogen. Pawpaw is a fruit tree that likes some shade and appreciates the nitrogen. Both sucker, so the whole polyculture can spread to new areas. Note this is the American pawpaw Asimina triloba, not the Caribbean and Australian pawpaw which is papaya, Carica papaya.

from
http://permaculturenews.org/2016/01/15/guidelines-for-perennial-polyculture-design/

Figure 2. Woodbine Ecology Center, Colorado USA. Native whitestem gooseberry planted under an existing Rocky Mountain maple with a wild raspberry understory, as a result of the design process described in this article.

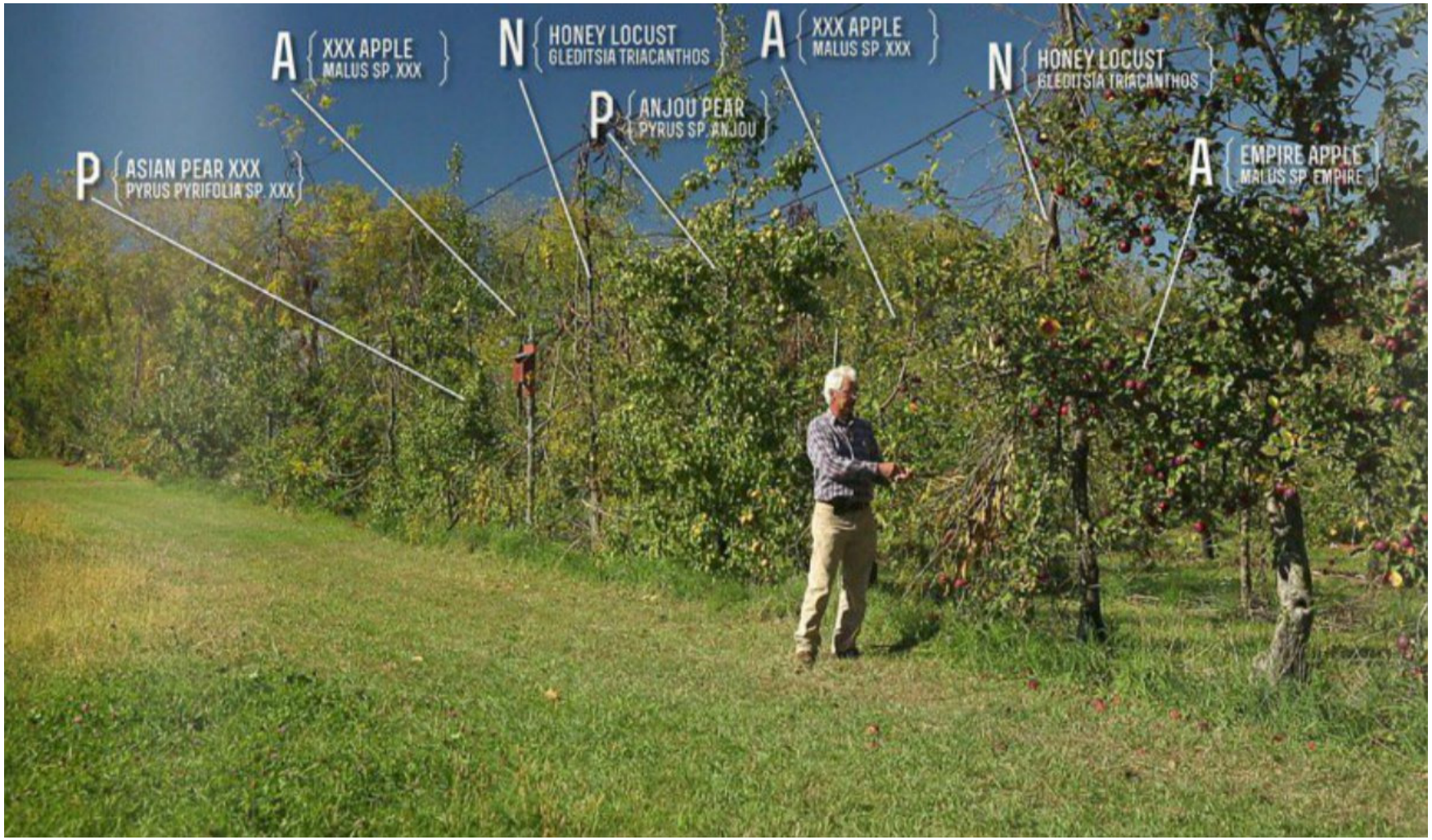
from
http://permaculturenews.org/2016/01/15/guidelines-for-perennial-polyculture-design/

Figure 3. Deer Creek Canyon, Colorado USA. A few days after planting we hiked in a nearby natural area, where we found Rocky Mountain maple, native raspberry, and whitestem gooseberry growing together.

Polyculture design can allow us to begin, in a very rough way, to understand and anticipate the way plant communities work in nature.

from
http://permaculturenews.org/2016/01/15/guidelines-for-perennial-polyculture-design/

Here’s how a polyculture design might look in a permaculture orchard …



(Stefan Sobkowiak – Miracle Farms: A 4 -acre Commercial Permaculture Orchard)

This is how a fruit tree guild might look in a home garden …

(picture from http://www.meetup.com/Suburban-Chicago-Permaculture-Guild/events/133223502/)

Here's a polyculture design by Geoff Lawton that was planted along a swale. (His 'Food Forest' DVD explains all the details.)

(picture from http://permaculturenews.org/2012/01/20/swale-fail/)

When you start looking on the internet, there are so many resources …

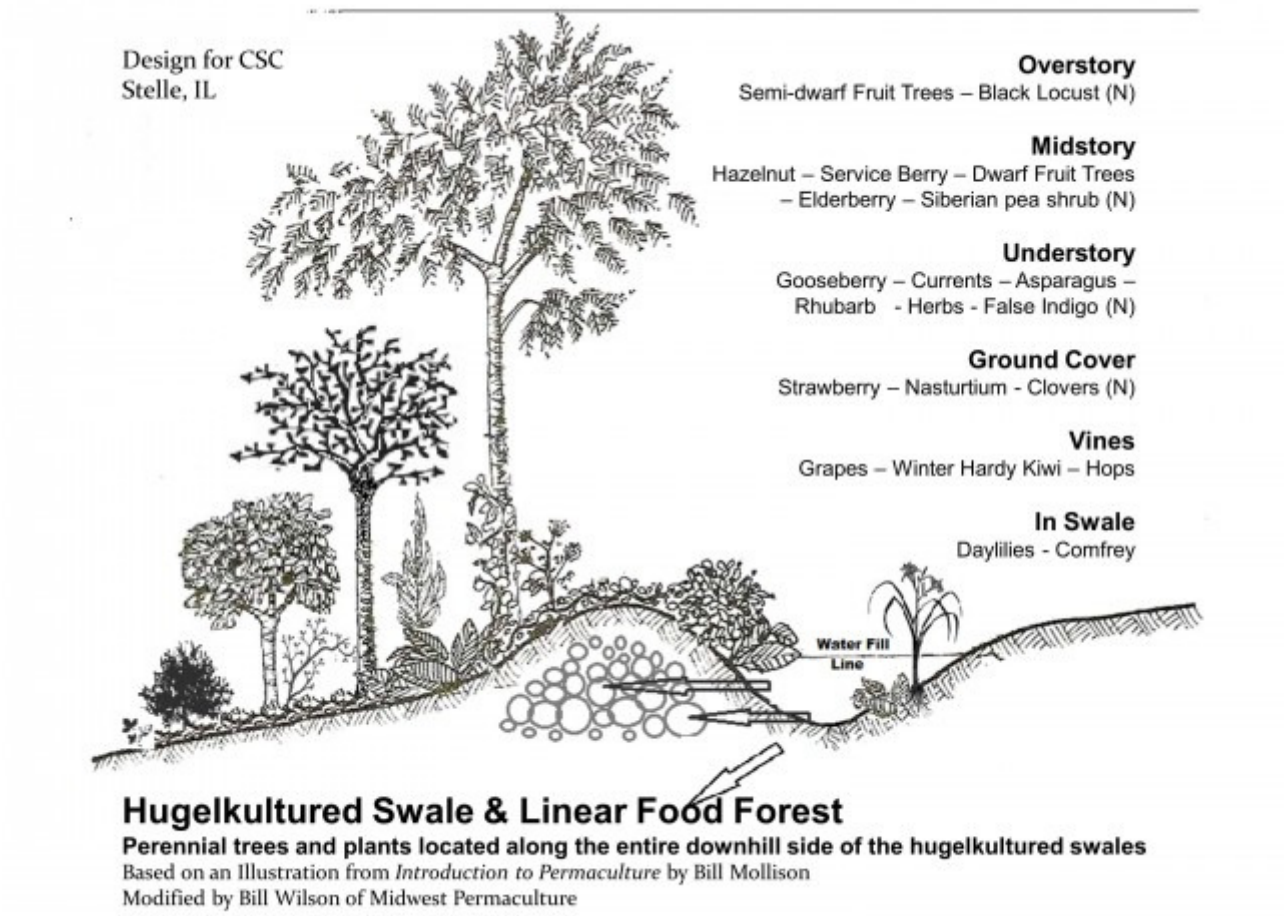


Image from midwestpermaculture.com

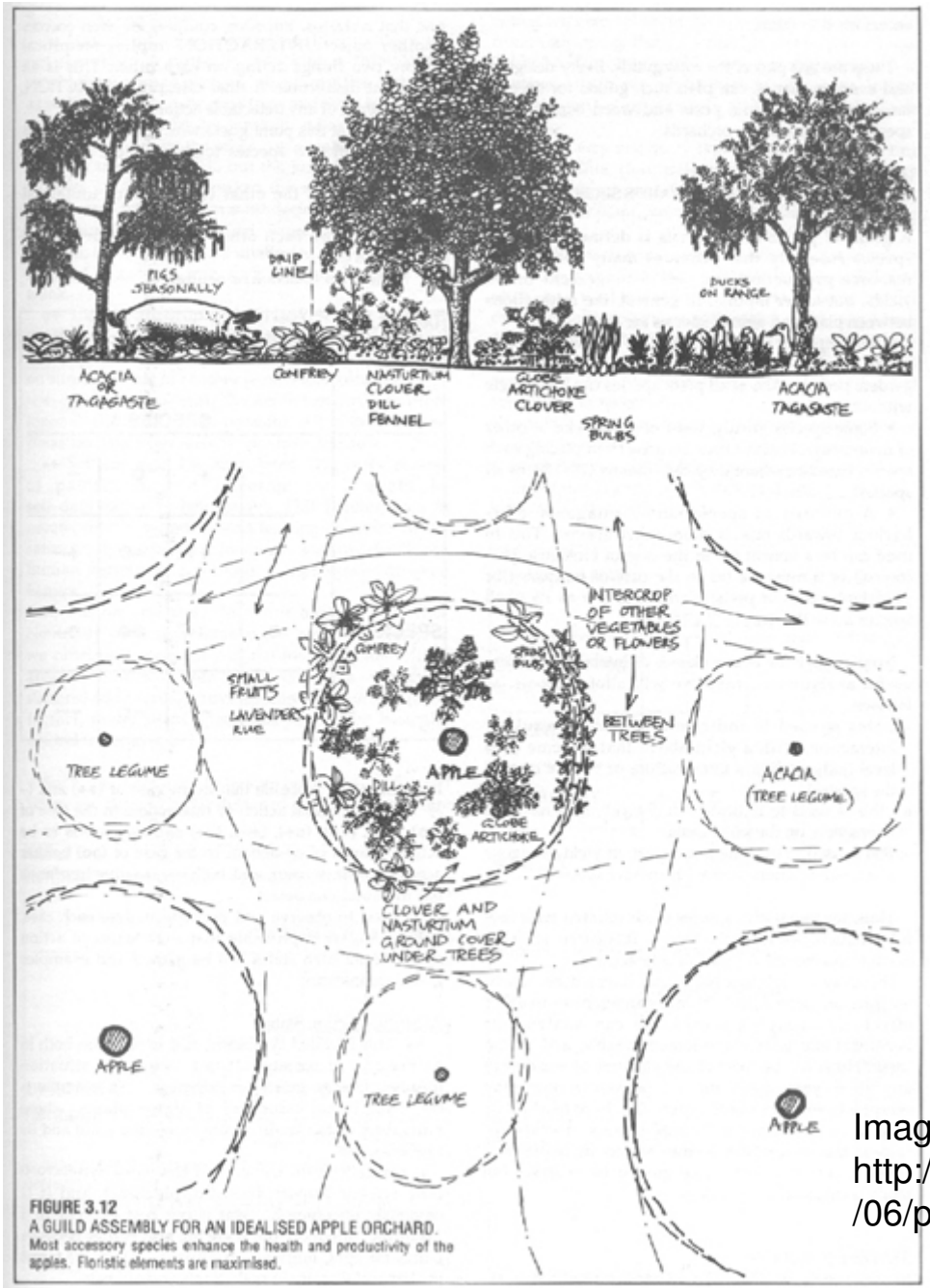


FIGURE 3.12
A GUILD ASSEMBLY FOR AN IDEALISED APPLE ORCHARD.
Most accessory species enhance the health and productivity of the apples. Floristic elements are maximised.

Image from
http://tcpermaculture.blogspot.co.nz/2011/06/permaculture-guilds.html

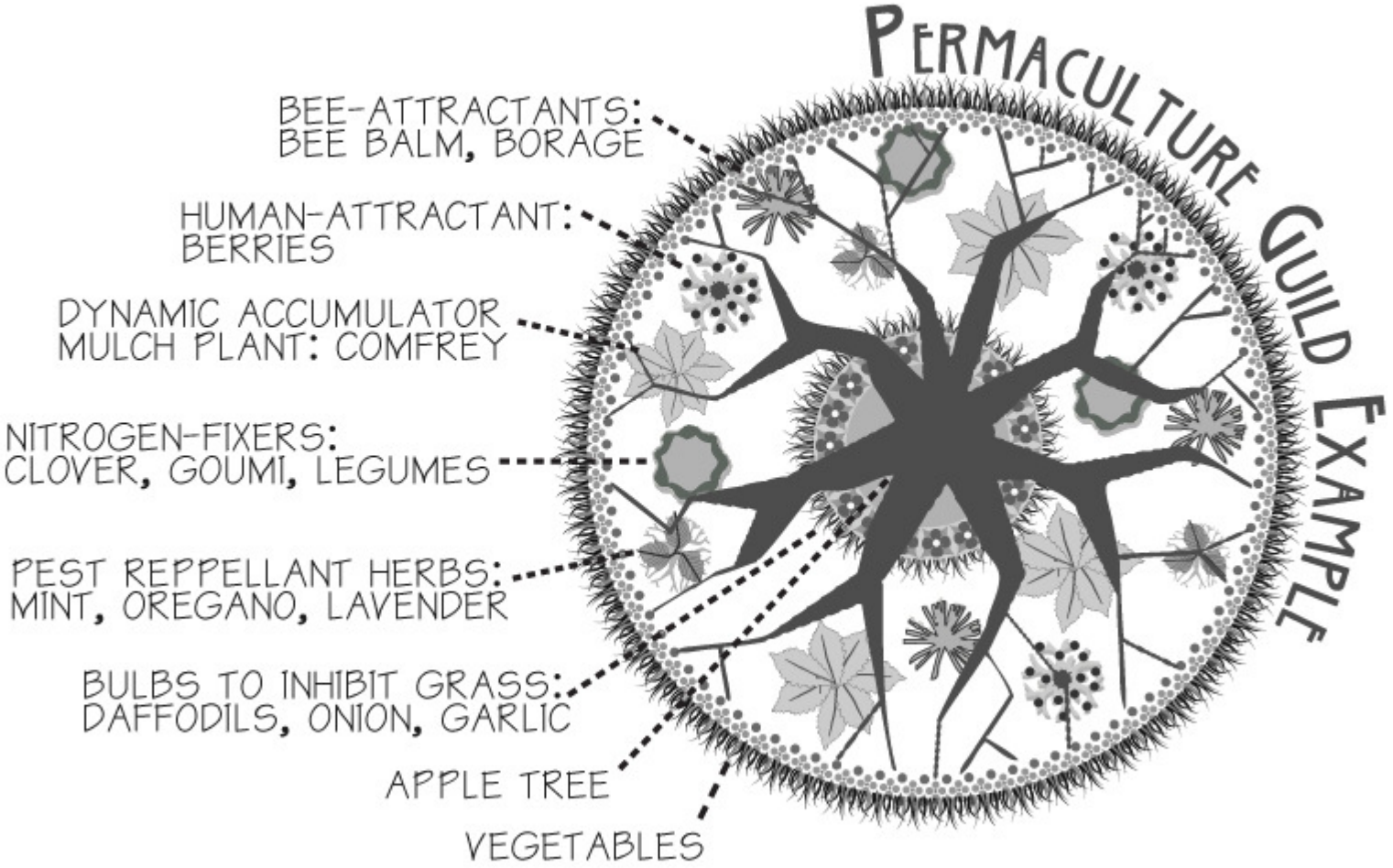


Image from http://www.theresiliencyinstitute.net/wp-content/uploads/2013/03/fruit-tree-guild-handout.jpg

But ...

it is good to be able to design
your own polycultures
to suit you and your place.

POLYCULTURE DESIGN PROCESS

Polyculture design is a phase that comes rather late in the permaculture design process. The following steps should already have taken place to some degree:

- 1. Goal setting
- 2. Site analysis and assessment
- 3. Design concept
- 4. Schematic design (and perhaps some detailed design)

As a result, you should have a particular area (a “patch”) in mind for your polyculture. Characterize your patch as follows:

- Name or title
- Key products or functions that you want it to fill (e.g., fruit production, beneficial insect area, livestock fodder, etc.)
- Review the conditions in the patch (e.g., sun, soil, moisture, slope, etc.)
- Determine the desired “architecture”
  - Layers (which are present – will there be tall trees, only shrubs and lower, etc.)
  - Habitat type and feel (e.g., orchard vs. wild and woolly; thicket, forest edge, meadow, etc.)
  - Size and form of plants (e.g., not taller than 2 meters, etc.)
- Intensity and forms of management (e.g., how intensive; how diverse; how much care; will it be irrigated; will poultry be rotated through; will you use special techniques like coppicing, chop and drop, or fire management, etc.)
- Soil fertility plan (nutrient budget: will you provide compost, etc.?)
- Infrastructure to be installed (e.g., pathways, irrigation, fencing, etc.)

At this point, you should develop a species palette for this polyculture.

From the longer list of species you are considering for the whole site, select those that are

a) suited your site conditions and

b) meet your goals as far as size, uses, and functions.

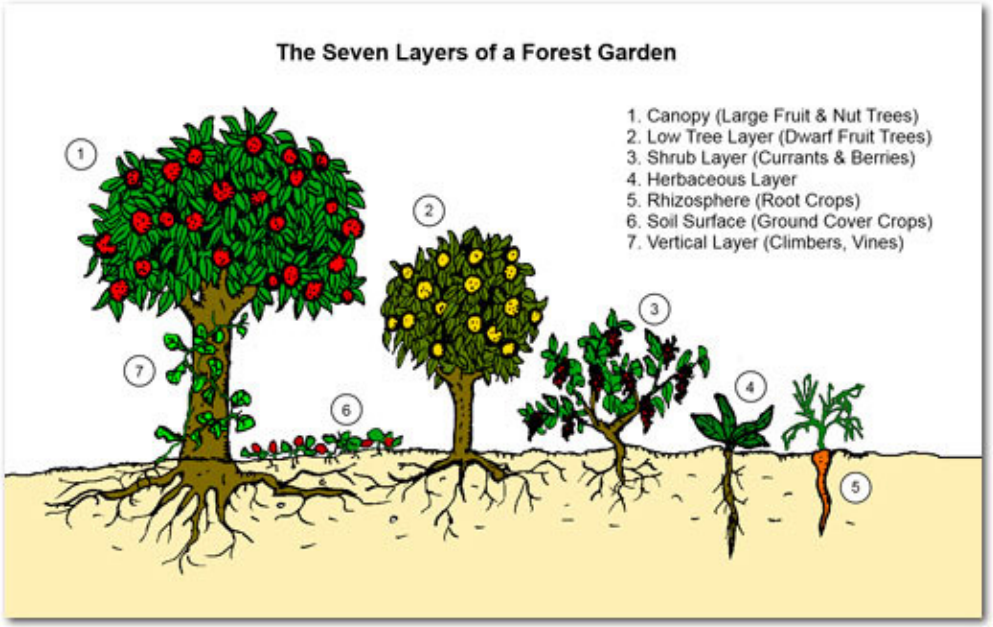
Here's an example …

Plants 15 meters+ tall									
Latin Name	Common Name	Clump vs. Run	Light	Edible Uses	Nitrogen Fixer	Bene-ficial Insects	Ground Cover	Native	Notes

Then add more categories, like: plants 4-15, 2-4, 1-2. 0.5-1, and 0-0.5 metres tall, as well as one for vines.

This then covers all the main layers in a 'forest garden'.

Image source: Permaculture a Beginner's Guide, by Graham Burnett



SPECIES SELECTION

- Select species that:
    - Meet your goals for the patch
    - Are tolerant of the conditions there
- Use 2-7 species per polyculture (keep it simple)
- Fill key uses and functions first (start with your most important goals, like fruit production or livestock fodder)
- Select species with similar management needs (like the same level of irrigation or number of visits per week; this is in line with the permaculture zone system)
- Start with the tallest species and work down

SPACING AND PATTERNING GUIDELINES

• Determine the mature height and width of each species (how big will they get when they grow up under your planned pruning and/or coppicing regime, if any)

• Set spacing between clumping species (those that will not spread vegetatively), usually such that the edges of their crowns are just touching, or ideally quite a bit wider

• Plant runners (aggressively spreading species) that are shorter than adjacent clumpers (to make sure runners will not smother clumpers)

• Plant shade lovers under taller plants

• Keep pollination needs in mind

• Plant the tallest plants to the south in the southern hemisphere

FUNCTIONAL SPECIES PATTERNING

- Plant soil builders like nitrogen fixers and mulch plants in every polyculture or patch where they will be needed (so as not to have to cut and carry the material to another area)
- If all nitrogen is to come from nitrogen-fixing plants, remember they need 25-40% of the overstory or 50-80% of the understory
- Nitrogen fixers and beneficial insect plants don't need to be in harvest reach of pathways
- Provide complete ground cover
- Running groundcovers help fill in empty spaces
- Try to include some beneficial insect species in each polyculture (though the insects can fly 15-30 meters, so they don't need to be right next to the crops they are planting, and could be clustered in islands or strips)

SEQUENCING ISSUES

• Is there a niche for sun-loving, short-term crops in the early years? (annual vegetables, strawberries, papayas, pigeon peas, nitrogen-fixing cover crops, etc.)

• Wait to plant shade lovers until there is enough shade

• For living trellises, wait to plant climbers until the trellis tree is well established

MANAGEMENT ISSUES

• Consider livestock integration requirements if necessary

• Choose species of similar vigour (so they don't smother each other)

• Match species to patch management style

• Choose species with similar irrigation and fertility requirements

• Will any aggressive species require control (e.g., rhizome barrier?)

HARVEST ISSUES

• Make sure to have access for harvest

• Will there be a need to pick up fruits and nuts from the understory? (If so, stinging or spiny understory species are undesirable; understory could be harvest-season mow or chop compatible; understory could be tarp-compatible)

• Don’t mix toxic species with similar-looking edibles, especially in the same layer (e.g. daffodils and garlic chives!)

• Consider adding more shade-loving edibles (mushrooms, shade fruits and vegetables, etc.)

• Make sure root crop harvest does not damage roots of any sensitive species

FINAL TESTING

• Does the polyculture meet your goals? (products, functions, management style, etc.)

• Are conditions ideal for the “keystone” (most critical) species from your goals?

• Is each species adapted to its niche?

• How will conditions change when the polyculture is mature? What changes will this produce?

Note:

This design process comes from ‘**GUIDELINES FOR PERENNIAL POLYCULTURE DESIGN’,** published by Eric Toensmeier on permaculturenews.org on 15 January 2016.