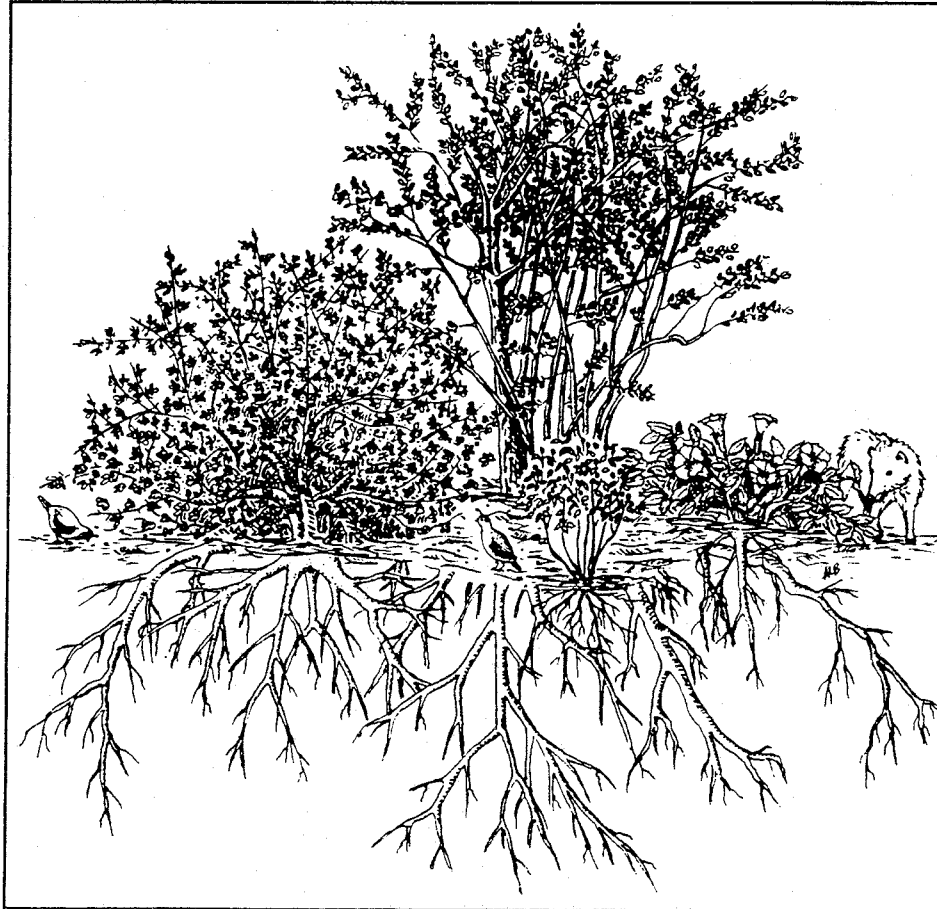


Guilds: An Essential Component of Permaculture Design



A low desert hackberry guild consisting of (l to r) quail, wolfberry, hackberry, chiltepine, datura, and javelina.

--Illustration by April Baisan

Walnut/Hackberry Guilds

By Tim Murphy

The complex harmony of guilds fascinates me. Recently I have begun developing guilds in low desert and semi-arid montane (5000') zones using information I've observed over the years. Black walnuts and hackberries both occur naturally in these zones, and form the backbone of the guilds I've been developing.

Nuts from black walnuts are a high value cash crop, and their wood is considered one of the finest hardwoods. Hackberries are tenacious pioneers, and provide valuable forage for wildlife. They both have interesting associations with other plants and animals, as well as with each other. *continued page 6*

Guild:

A Mollison definition

In the natural world, we often notice assemblies of plants or animals of different species that occur consistently over their range. Closer examination of such mixed assemblies often reveals a set of mutual benefits of help or protection that arise from such convivial togetherness.

When we design plant guilds, we try to maximize the benefits of each species to the others.

A guild, then, is a harmonious assembly of species clustered around a central element (plant or animal). This assembly assists total health, aids our work in management, or buffers adverse environmental effects.

- Bill Mollison
Permaculture:

A Designer's Manual

INSIDE

Letters.....	2
Community: Land Trusts.....	3
How To:	
Live With Solar Energy.....	4
Use Roof Run-off.....	5
Revegetate.....	8
Guilds: Walnut/Hackberry.....	6-7
Organization: SPA, Institute.....	9
Observations:	
Travels with Bill (Part II).....	10
Notices and Ads.....	11
Calendar of Events.....	12
Publishing Info.....	2

GUILDS IN DRYLANDS

Hackberry/Walnut Guilds *continued*

Many nut trees produce substances hostile to predecessor plants, thus ensuring their own succession. The creosols produced by walnut roots are especially effective at limiting competing understory and adjacent growth. Walnuts apparently have only slight effect on grasses and are planted extensively in Europe over grasses, grains, and some vegetables.¹ Other possible understory elements for a black walnut guild come from the genus *Eleagnus*. Some growers feel that Russian olives (*Eleagnus angustifolia*) are the most effective intercrop for commercial walnut groves.² They fix nitrogen and attract birds. Another species, the cherry *Eleagnus* (*E. multiflora*), is reputed to have delicious fruit and should perform the same functions.

Hackberries can endure as solitary elements, but do best in mixed stands of trees. They are capable of coexisting with walnuts; hackberry and walnut trunks have been noted within two feet of one another. Hackberries, like walnuts, produce substances which reduce competition under their crowns. Unlike walnuts, they seem to suppress shallowly-rooted elements, like grasses. Interestingly, I've observed at least two species of currants thriving under black walnut canopy, but only when a hackberry is also present. The currants may benefit from vapors of citronella (a substance produced within walnut leaves and husks and used as an insect repellent) which discourages aphids and other soft-bodied predators. It may be that currants enjoy the reduced competition from grasses under the hackberry canopy, or that they benefit from a below-ground exchange between associated micro-organisms. They definitely benefit from the varied shade provided by their hackberry and walnut nursemaids.

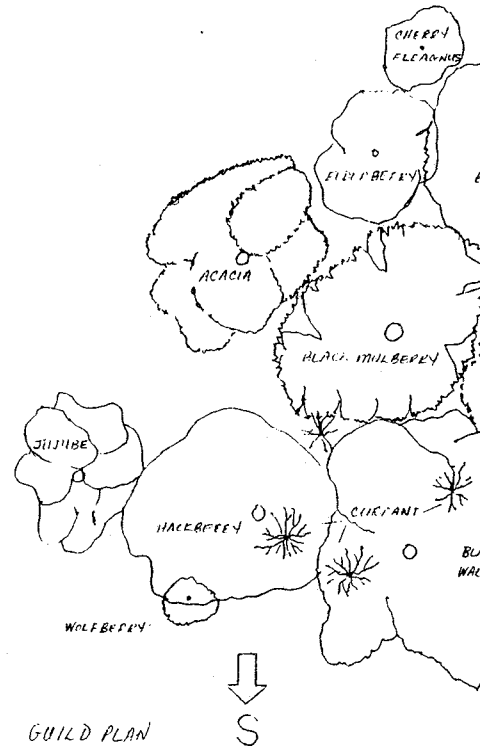
Some useful perennials are not only able to coexist with the walnut but can be placed to create a buffering perimeter 20 to 30 feet out to contain the expansion of the walnut's aggressive root zone. A buffer zone allows less tenacious fruiting perennials (apples, peaches, cherries, plums, apricots, and pears) to be added to the array.³ My personal bias leans toward using more primitive varieties of common fruit trees, or hardier species such as the jujube and pomegranate. Some buffer elements, specifically mulberries and acacias, also beneficially affect the elements on both sides of the barrier they create.

A variation on the proposed black walnut guild includes a hackberry sub-guild (illustrated in a low desert form on page 1). One frost-sensitive element, the chiltepine, is the perennial ancestor of the modern chile and has enormous value as a cash crop. While attempts have been made to raise this fiery half-inch pepper as a mono-cultural crop, the only reliable sources are the wild stands within existing guilds which are increasingly threatened by overzealous harvesting and grazing.⁴ Another possible element for this guild is the wolfberry, which is frequently found with chiltepines under hackberry canopy.⁵ Wolfberries and chiltepines belong to the Solanaceae, or nightshade, family. Members of this family (which includes such common garden vegetables as tomatoes, potatoes and tomatillos, as well as datura, or "jimson weed") appear to benefit each other in various ways. For example, datura will attract predatory insects to itself, thus sparing other Solanaceae around it. Solanaceae are narcissists and do best in a humus rich in the litter of other members of their family. We can infer that other Solanaceae are worth experimenting with in assembling a hackberry guild.

The presence of wolfberries, currants, and chiltepines under hackberries and walnuts is probably due to the useful habitat the array provides for birds. Black



ELEVATION FROM SOUTH



1 J. Russell Smith, *Tree Crops*, (Harper and Row, 1978), pp. 206-240.

2 Tom Ward, interview, 1987.

3 Bill Mollison, *Permaculture: A Designer's Manual*, (Tagari Publications, 1988), pg. 64.

4 Gary Nabhan, *Gathering the Desert*, (University of Arizona Press, 1985), pp. 130-131.

5 Gary Nabhan, *Ibid*, pg. 130.

walnuts are an ideal cover element for wildlife. Their understory is an unfavorable environment for parasites (due to citronella vapors); their airy canopy gives a mottled shade that accentuates a bird's natural shape and camouflage, while providing a fairly unobstructed view of approaching predators; and they present a convoluted line of attack for most raptors. Hackberries offer fruit over a long period, and a favorable nesting site. Birds contribute to fertility by adding their guano to the litter under the trees, turning this rich organic mixture into the soil. Semi-domesticated poultry could perform the same function in a free-range design.

Below is a species list for a proposed perennial polyculture for dryland featuring walnuts, and an idealized schematic for an array of these elements. The pattern can be applied to other guild-based polycultures--for example, other regionally adapted nut trees could be substituted for the black walnut. Overall yield per unit of area will increase through multi-story stacking, reduced predation, and mutualism; costs will diminish by eliminating traditional cultivation, and use of biocides and fertilizers. Trials are in progress on a small scale in southeastern Arizona. Your personal observations, additions, criticisms, and modifications are solicited and valued.

Black walnut - *Jugans nigra*.

UNDERSTORY ELEMENTS:

Hackberry - *Celtis*: *C. africana***; *C. australis*; *C. occidentalis***; *C. pallida* (evergreen)**; *C. reticulata*; *C. sinensis*

Currant - *Ribes*: *R. aureum***; *R. inebrians*; *R. leptanthum*; *R. menziesii*; *R. pinetrum*; *R. speciosum*; *R. thacherianum*; *R. viburnifolium*; *R. wolfii***

Eleagnus*: *E. angustifolia*; *E. commutata*; *E. multiflora***; *E. umbellata*

BUFFER ELEMENTS:

Acacia*: *A. smallii*; *A. tortilis*; *A. pyrenantha*; *A. dealbata*; *A. farnesiana*; *A. Greggii*

Mulberry - *Morus*: *M. alba*; *M. rubra*; *M. nigra***; *M. microphylla***

Locust - *Robinia*: *R. neomexicana*; *R. pseudoacacia*

Elderberry - *Sambucus*: *S. cerulea*; *S. melanocarpa*; *S. mexicana***; *S. nigra***; *S. neo-mexicana*; *S. racemosa***

HACKBERRY SUB-GUILD:

Chiltepine - *Capsicum*: *C. aviculare* or *C. glabrusculum*

Wolfberry - *Lycium*: *L. andersonii*; *L. berlandieri*; *L. californicum*; *L. cooperi*; *L. exertum***; *L. fremontii***;
L. macrodon; *L. pallidum*; *L. parishii*; *L. torreyi*

Other Nightshades: ground cherries, tomatoes, tomatillos, potatoes, datura

* nitrogen fixer
**especially desirable.

Plant Guild Restoration and Paleobotany

By Gary Nabhan

According to the U.N. Environment Programme, 8.5 million acres of desert vegetation are annually depleted of their vegetative cover, while another 2.4 million acres of semi-arid or subhumid land are degraded or desertified every year. In the Sonoran Desert alone, as much as 200,000 acres of land have been left barren within the last 15 years due to salinization, abandonment of irrigated agricultural fields, and urbanization. In addition, much of the species diversity of Sonoran Desert vegetation has been reduced through overgrazing, firewood cutting, groundwater exploitation, and introduction of exotic species, so that extant communities are depauperate.

One previously unused baseline for reconstructing these communities is the plant macrofossils found in non-indurated middens of pack rats (*Neotoma* spp.) of recent Holocene periods. These plant assemblages can be accurately dated, and represent a significant portion of the flora previously found within 100 yards of the pack rat nest. At the Desert Botanical Garden, we have set aside 16 acres below the midden-rich Papago Buttes for a Sonoran Desert restoration, using both the middens and a 50-year old floristic survey of the Buttes to suggest which species have been historically lost from the site. We are also evaluating the reintroduction of rare species in microenvironments provided by nurse plants, usually more common species with which the rare taxa have a strong association. By propagating these nurse plant guilds, we expect higher survivorship of the rare plants that are being reintroduced, as well as safe sites for the dispersal and establishment of their propagules." -- abstract of a currently unpublished paper presented at the annual meeting of the Society for Ecological Restoration and Management, 1989.