Companion Plantings & Polycultures

Guide 16 · The Design Layer

Biological Mechanisms · Master Matrix · Worked Guild Designs

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Contents

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- **Guide 16 — Companion Plantings & Polycultures** (this guide) · the design layer for the library — how crops fit together, what to plant beside what, the Dragoons guild designs that put it into practice
- **Guide 17 — Recipes & Kitchen Integration** · what to cook with what came out of the garden this morning · by-crop recipes + seasonal menus

This guide is the design layer. The other fifteen guides cover crops one at a

time, with companion notes scattered through them — basil next to peppers, dill flowering for parasitic wasps, three sisters in Guide 7, garlic interplanted with brassicas. This guide consolidates that scattered material into one place, expands it to cover every crop in the library, fills the gaps the other guides leave (orchard understory, cover crops, native perennial polycultures), and presents ten Dragoons-specific worked guild designs that show what the practice actually looks like on the ground.

About this guide

Who it is for · how it relates to the other fifteen guides · how to read it

The original kitchen garden was a polyculture. So was the original cornfield, and the original orchard, and the original village. Single-crop monoculture — one species per bed, neat rows, no understory — is a recent invention that solved problems of mechanized harvest and chemical input that small-scale Cochise County gardens do not have. Almost every garden in this library is small enough that polyculture is the natural design choice.

This guide is for a reader who has the other fifteen guides on the shelf and now wants to assemble the crops into a layout that does more than the sum of its parts. The library so far has been organized by crop family: this is how you grow peppers, this is how you grow brassicas, this is how you grow figs. The polyculture question is the *next* one: how do those crops fit together in the same bed, the same orchard understory, the same monsoon-fed garden? That is what this guide answers.

> **What polyculture buys you in the Dragoons, specifically.** Three things, in order of how much they matter: (1) pest pressure drops because flowering herbs feed the parasitic wasps and hoverflies that handle aphids, hornworms, and brassica caterpillars at a level no spray program reaches; (2) water use drops because mixed plantings shade soil more completely, reducing evaporation by 20–30% in the May–June pre-monsoon window when water is most expensive; (3) the garden tolerates failure better — when the harlequin bug arrives or the tomato hornworm flight hits, a monoculture bed gets devastated and a polyculture bed loses one component. The same three benefits apply at the orchard scale and the perennial-bed scale.

The guide is organized in two halves:

- **§1 through §4: the framework and the master matrix.** The biological mechanisms (repellence, attraction, allelopathy, nitrogen fixation, structural support, shade), the consolidated companion-plant matrix covering every crop in the library, the anti-companions and allelopathy reference, and the cover-crop chapter.
- **§5 through §13: nine worked guild designs.** Each is a complete planting plan for a specific Dragoons context — three-sisters in the Cochise climate, a pepper-basil-marigold bed, the harlequin-defense brassica-allium bed, a stone-fruit orchard guild, a fig + Mediterranean-herbs hilltop, a mesquite-anchored native guild, a vineyard cover-crop interrow, a kitchen-garden insectary strip, and a monsoon-fed three-bean polyculture. Each chapter has a sketch diagram, a planting calendar, and the rationale for why the combination works.

The guide assumes you already know how to grow the individual crops. It does not repeat *Guide 2*'s pepper-staking instructions or *Guide 6*'s broccoli timing. It points back to those guides where the cultivation details live and focuses on what's not in them — the interactions between crops.

LOCAL TIP

A note on the literature. Companion-planting is a topic where the published material runs the spectrum from rigorous agronomy (UC Davis, Rodale, the Land Institute) to folkloric tradition (some of which is genuinely useful, some of which is wishful). This guide leans on what's been demonstrated in working Cochise County gardens and what's documented in the peer-reviewed IPM literature. Where the evidence is solid, the recommendation is direct. Where the evidence is mixed — sage with cucumbers, fennel as a general repellent — the entry says so. The reader's own observations, kept across two or three seasons, are worth more than any chart in this guide.

1 · The five mechanisms

How companion planting actually works · what to expect from each mechanism · what does not work

Companion-planting effects come from five biological mechanisms. Understanding which mechanism is doing the work in any given pairing — repellence, attraction, allelopathy, nitrogen exchange, or structural — is the difference between a polyculture that works and one that just looks photogenic.

1.1 Repellence

The aromatic-herb-keeps-pests-away mechanism. Volatile organic compounds released by plant leaves interfere with pest insects' host-finding behavior. The insect is looking for a tomato by scent; the basil interplanted between the tomatoes masks or scrambles the scent signal; fewer pest insects land on the tomato.

What works in the Dragoons:

- **Basil with peppers and tomatoes.** Genuinely reduces aphid pressure. Plant 1–2 basil plants per 4 ft of bed.
- **Mint, thyme, sage, oregano along brassica beds.** Reduces cabbage white moth oviposition (egg-laying) by 30–60% in observed local trials. Mediterranean herbs do this without much help.
- **Nasturtium as a sacrificial aphid trap.** The aphids prefer nasturtium foliage to almost anything else — let nasturtium run along bed edges and pull infested plants weekly.

What does not reliably work: marigold as a general repellent for everything (it works for some root nematodes but not for the airborne pests most home gardeners worry about); rue, wormwood, and tansy as broad-spectrum repellents (too aggressive to plant near most vegetables, marginal effect anyway).

1.2 Attraction

The flowering-herb-feeds-beneficial-insects mechanism. Parasitic wasps, hoverflies, lacewings, and ladybugs need nectar and pollen between hunting bouts. A garden with continuous bloom from spring through fall holds populations of these beneficial insects at much higher density than a garden without flowers — and those populations handle aphid, caterpillar, and mite control without intervention.

The mechanism is well-documented and the practical implications are large. *Guide 10 §18.2* lays out the insectary-strip practice in detail; *Guide 8 §8.1* gives the herb-by-herb beneficial-insect table. The single highest-return habitat intervention in a Dragoons garden is letting some herbs flower, every month, somewhere in the garden.

The flowering rotation that holds beneficial insects from March through Oc-

tober:

Period	Flower in bloom
March – April	Cilantro (overwintered, bolting now); flowering arugula and mustard; sweet alyssum
May – June	Dill (spring-sown), parsley (year-2 plants), borage, calendula
July – August	Borage, bachelor's button, fennel (long-season), basil flowers (if allowed)
September – October	Fall-sown cilantro flowering, dill round two, alyssum re-flush, native sunflower

A single 4×8 ft "insectary bed" managed for continuous bloom holds the population for an entire garden. The placement matters less than the existence — anywhere within 100 ft of the vegetables works.

1.3 Allelopathy

The one-plant-suppresses-another-by-chemistry mechanism. Some plants release compounds through roots or leaves that inhibit germination or growth of other species. Most allelopathic effects are minor and species-specific; a few matter enough to plan around.

Allelopathic pairings to avoid in the Dragoons:

- **Fennel near tomatoes, peppers, beans, brassicas.** Fennel root exudates suppress most vegetable seedlings. Plant fennel in its own corner, not in or beside vegetable beds.
- **Walnut (*Juglans*) within 50 ft of vegetables.** Juglone from walnut roots suppresses tomato, pepper, eggplant, asparagus. Not a common Dragoons tree, but worth knowing.
- **Brassica residue freshly worked into beds.** Glucosinolates from decomposing brassica leaves briefly suppress germination — wait 4–6 weeks after turning brassica residue under before sowing small seed.

The literature lists many more "allelopathic" pairings (sage near cucumber, etc.) where the evidence is mixed at best. The three above are the ones with consistent documentation.

1.4 Nitrogen exchange

The legume-feeds-the-non-legume mechanism. Beans, peas, and other legumes host symbiotic *Rhizobium* bacteria on their roots; these bacteria fix atmospheric nitrogen

into plant-available form. The bean plant uses some; some stays in the soil; some becomes available to neighbors and successors.

Practical implications:

- **Beans next to corn** in the same bed do feed the corn — modestly during the same season, more substantially the season after. *Guide 7 §9.6* details the three-sisters timing.
- **Cover-crop legumes** (winter peas, hairy vetch, crimson clover) precede heavy-feeding crops (corn, brassicas, peppers) in the rotation. See §4 below.
- **Inoculating legume seed** with the right *Rhizobium* strain at sowing time increases nitrogen fixation 20–50%. *Guide 11 §6.4* covers inoculation.

The mechanism is real but modest. A bean crop adds 30–80 lb/acre of nitrogen in a good year — useful, but it is not a replacement for compost.

1.5 Structural and shade

The tall-plant-supports-or-shades-the-short-plant mechanism. Corn supports pole beans. Sunflowers shade lettuce in summer. Tall warm-season cover crops shade soil and reduce moisture loss.

Dragoons-specific structural pairings:

- **Corn + pole beans** (three sisters, classic).
- **Sunflower or amaranth + summer lettuce.** A row of tall sunflowers on the south side of a lettuce bed extends the lettuce season by 2–3 weeks in early summer by providing afternoon shade.
- **Trellised tomato or cucumber + shade-tolerant herbs.** Cilantro and parsley underneath bolt slower with afternoon shade from a tomato trellis.

1.6 What the mechanisms mean for design

The five mechanisms suggest a design rule of thumb: every working bed in the Dragoons should include at least one component drawn from at least three of these five mechanisms. A bed with only “main crop” components — only peppers, only brassicas — is fragile. A bed with main crop + one flowering herb (attraction) + one aromatic herb (repellence) + one bean (nitrogen) is resilient enough that no single failure mode wipes out the season.

The matrix in the next chapter and the guild designs in §5 through §13 are applications of this rule.

2 · The master matrix

Every crop in the library × its companions · plant-with, plant-near, never-near · the consolidated reference

This is the central reference of the guide. Every cultivated crop in Guides 2–15 appears here. The columns are:

- **Plant with** — within the same bed or row, immediately adjacent. The pairing actively benefits one or both crops.
- **Plant near** — within 20 ft, same garden zone. The benefit is real but indirect (beneficial-insect support, microclimate, pest dilution).
- **Never near** — within 20 ft. Allelopathic or pest-shared. Active negative interaction.

Where a cell is blank, no significant interaction is documented for that crop in the Cochise context. Cross-references to other guides cite the canonical home for the cultivation detail.

2.1 Warm-season fruiting crops (Guide 2, 7, 9)

Crop	Plant with	Plant near	Never near
Peppers (G2, all *Capsicum*)	Basil, marigold (*T. patula*), sweet alyssum	Dill or cilantro bolting nearby; lettuce as ground cover under	Fennel; brassicas (light shading conflict in May–June)
Chiltepin (G15) wild bush	Mesquite or oak shade (its native companion); native bunchgrass	Other *Capsicum* (no cross-pollination concerns in *annuum* family)	Disturbance-tolerant weeds that crowd young plants
Tomatoes (G7)	Basil (genuinely measurable effect), parsley, borage	Dill flowering, sweet alyssum, bachelor’s button	Fennel; black walnut; brassicas (slight allelopathic interference)
Cucumbers (G7)	Dill (for the pickle pairing and beneficial-insect attraction), nasturtium (trap for cucumber beetles)	Borage, calendula	Sage (mixed evidence — some yield reduction reported); strong-scented Mediterranean herbs in same row

Crop	Plant with	Plant near	Never near
Summer squash, winter squash (G7)	Nasturtium (trap crop for squash bugs), marigold	Borage (bee forage), corn (three-sisters partner)	Potatoes (some pest overlap, mostly Colorado potato beetle which is not endemic)
Melons (G7)	Marigold, nasturtium	Corn as windbreak	Cucumbers in same bed (cross-pollination is benign but vine competition is real)
Beans, snap and pole (G7)	Corn (structural support for pole types), summer savory, marigold	Carrots, beets, parsley	Alliums (onions, garlic, leeks) — moderate suppression of bean growth; fennel
Beans, dry — including tepary (G7, G15)	Corn (in the three-sisters pattern), squash (in three sisters)	Tomatoes (modest nitrogen sharing), brassicas at distance	Alliums; fennel
Sweet corn (G7)	Pole beans, winter squash (three sisters), amaranth (similar timing and pollinator overlap)	Cucumbers (with caution — heavy water competition), borage	Tomatoes in same bed (very heavy combined feeding load)
Heritage flour and dent corn (G7, G15) — Hopi Blue, Painted Mountain, O’odham 60-day	Pole beans (especially Hopi Yellow Lima), winter squash	Amaranth — both monsoon-keyed	Other corn varieties within 250 ft (cross-pollination)
Sweet potatoes (G7)	Marjoram, oregano (vines tolerate the perennial herb edge); pole beans on the same trellis	Corn at a distance (no direct interaction)	Squash in same bed (vine competition for ground)

2.2 Cool-season crops (Guide 6)

Crop	Plant with	Plant near	Never near
Broccoli, cauliflower, cabbage	Garlic or onion (genuine reduction in cabbage white pressure), dill flowering, mint or thyme along bed edge	Calendula, sweet alyssum, lettuce as living mulch	Strawberries; tomatoes (allelopathic interference)
Brussels sprouts, kale, kohlrabi	Same as above; particularly garlic or onion	Same	Strawberries
Garlic, onions, shallots, leeks	Carrots (modest pairing benefit), beets, lettuce, brassicas (when defending against cabbage moth)	Roses, fruit trees (deer deterrent)	Beans, peas — alliums suppress legume growth modestly
Lettuce, spinach, arugula	Carrots, radishes, taller plants for afternoon shade (corn, sunflower, tomato)	Most herbs	None significant
Mâche, claytonia, winter greens	Spinach, lettuce	Garlic, leeks (overwintering near greens)	None significant
Carrots	Onions, leeks (mutual carrot rust fly + onion fly suppression — measurable), rosemary, sage, chives	Tomato (shallow-deep root pairing), lettuce	Dill if both are allowed to flower (cross-pollination)
Beets, turnips, parsnips	Onions, lettuce, brassicas	Garlic	Pole beans (same family stress on the legume side)

2.3 Perennials and orchard (Guide 5, 9, 15)

Crop	Plant with	Plant near	Never near
Grapes (G5)	Native bunchgrass between rows, rose at row ends (powdery mildew early-warning); thyme or oregano in the row	Sunflowers as windbreaks at vineyard edges	Cabbage family (no clear allelopathic effect but the spray programs don’t mix)
Figs, pomegranates, jujubes (G9)	Mediterranean herbs at the dripline (rosemary, sage, thyme, oregano); spring-flowering bulbs	Garlic and chives as gopher deterrent; comfrey as a nutrient miner	Black walnut (allelopathy across most fruit)
Stone fruits — peach, apricot, plum, almond (G9)	Comfrey (nutrient mining, mulch), chives, garlic, daffodils (gopher deterrent)	Dill, fennel at distance (parasitic wasps for codling moth)	Other Prunus species in dense plantings (shared pest pressure, brown rot)
Mesquite (G15)	Native bunchgrass; *Atriplex* (saltbush); under-canopy Chiltepin	Agave understory; prickly pear	Mediterranean herbs require less water than mesquite can deliver in its own root zone
Agave (G15)	Prickly pear, yucca, native bunchgrass	Mesquite (overstory)	Heavily irrigated crops
Prickly pear (G15)	Native bunchgrass; tepary planting at edge in monsoon season	Mesquite	Same as above

2.4 Herbs (Guide 8)

Crop	Plant with	Plant near	Never near
Basil	Peppers, tomatoes	Most vegetables	Rue, sage in same row
Cilantro	Lettuce, spinach, brassicas	Tomatoes, peppers (bolt-feeding benefit)	Fennel (will cross when both flower)

Crop	Plant with	Plant near	Never near
Dill	Cucumbers (for pickling and beneficials), brassicas	Tomatoes, peppers	Carrots (will cross when both flower); fennel
Parsley	Tomatoes, carrots	Asparagus, roses	None significant
Rosemary, thyme, sage, oregano	Most vegetables (perennial bed edges); fruit-tree driplines	Brassicas (light pest repellence)	Wet-loving herbs (basil, mint) in the same shared-water row
Mint (containers only)	Brassicas (deterrent effect for cabbage moth) — but contain the mint	Fruit trees	Direct in-ground vegetable beds (will dominate)
Fennel	A bed of its own	Stone fruits at distance (beneficial insects)	Tomatoes, peppers, beans, brassicas (allelopathic)

2.5 Native cultivated crops (Guide 15)

Crop	Plant with	Plant near	Never near
Tepary beans	Corn (three sisters), squash; native sunflower at field edges	Amaranth, other monsoon-keyed crops	Garlic, onions
Anasazi, Hopi Yellow Lima beans	Corn, squash	Tomatoes (modest nitrogen sharing)	Alliums
Devil’s claw	Tepary, amaranth (same monsoon timing)	Native sunflower	None significant
Grain amaranth	Corn (similar timing, pollinator overlap), beans	Brassicas, tomatoes (insectary support)	Other amaranth species (volunteer aggressiveness)

How to use this matrix. Pick the crop you’re planning. Look at “Plant with” first — these go in the same bed or immediately adjacent. “Plant near” components live within walking distance, not in the same bed. “Never near” tells you what to keep at least 20 ft away. For a polyculture bed of 4×8 ft, you can

typically include 2–4 “plant with” components for your main crop without the bed becoming crowded. The §5–§13 worked guild designs show what this looks like in practice.

3 · Anti-companions and allelopathy reference

The “never near” combinations · what mechanism is at work · the practical separation distance

The companion matrix in §2 lists what to plant beside what. This short chapter consolidates the reverse — the pairings to keep apart — into a single reference table. The biological mechanism behind each entry is covered in §1.3; this chapter is the at-a-glance lookup, intended to be consulted at the time the bed layout is being drawn.

Two notes before the table. First, almost every anti-companion in this list is a *moderate* effect, not a catastrophic one. A row of garlic six feet from a row of beans does not kill the beans — it produces a bean crop perhaps 10–20% smaller than the same beans grown 20 ft away. The combinations here are the ones worth designing around when there is room to do so. Second, the strongest single anti-companion in the whole guide — fennel near almost every vegetable — is also the one most often violated in well-meaning herb-bed plans. If only one entry in this chapter gets remembered, make it that one.

3.1 The reference table

Pairing or scenario	Mechanism (§1.3)	Practical mitigation
Fennel near tomato, pepper, bean, brassica	Root allelopathy — fennel exudes compounds that suppress most vegetable seedlings	Plant fennel in its own corner of the garden, at least 20 ft from vegetable beds. Fennel is best in the insectary strip (see §12) where its flowers feed parasitic wasps and its allelopathy doesn’t matter
Walnut (*Juglans*) within 50 ft of *Solanum* crops	Juglone allelopathy from walnut roots — suppresses tomato, pepper, eggplant, asparagus	Site selection. Not a common Dragoons tree but worth knowing if a neighbor has one
Brassica residue freshly turned under, small seed sown immediately	Glucosinolate suppression of germination from decomposing brassica leaves	Wait 4–6 weeks between turning brassica residue under and sowing small-seeded crops (carrots, lettuce, herbs). Transplants are unaffected
Alliums (onion, garlic, leek) near beans and peas	Modest allium suppression of legume *Rhizobium* nodulation	20 ft separation — different beds, same garden zone is fine

Pairing or scenario	Mechanism (§1.3)	Practical mitigation
Tomato in the same bed as brassicas	Light allelopathic interference both directions; shared pest pressure	6 ft separation is enough; don't share a 4×8 bed
Cucumber and sage in the same row	Mixed evidence; some reported yield reduction on cucumber	Avoid same row. Sage in a perennial herb edge 6 ft away is fine
Strawberries and brassicas in the same bed	Shared pest pressure (cabbage looper, slugs); minor allelopathic notes	Different beds. Strawberries pair well with borage and thyme instead
Multiple corn varieties within 250 ft	Wind-pollination cross — not allelopathy but lineage loss	Isolation distance (250 ft for home seed-saving, 660 ft for seed returned to keepers) *or* stagger tasseling dates by 3+ weeks. See *Guide 15 §4.2*
Dill and carrot both allowed to flower	Same family (Apiaceae); will cross-pollinate; affects seed only	Eat one; let the other flower. Not an issue if neither is being saved for seed
Dill and fennel allowed to flower together	Same family cross	Same fix as above
Sweet corn and field/flour corn in the same garden	Cross-pollination ruins both — the sweet corn loses sugar, the flour corn picks up sugary genes that reduce its grinding quality	Time isolation (different tasseling weeks) or skip one. See *Guide 7 §9.4*
Two squash varieties of the same *Cucurbita* species within bee flight	Cross-pollination — does not affect this year's fruit but ruins saved seed	Grow varieties from different *Cucurbita* species (one *pepo*, one *moschata*, one *maxima*) to share a garden without crossing
Heavily irrigated crops near mature mesquite	Mesquite root competition will out-pull drip lines; deep mesquite roots dewater the upper soil	Site irrigated beds outside the mesquite canopy plus one canopy-radius of buffer
Mediterranean herbs (rosemary, sage, thyme, lavender) in heavy-water vegetable beds	These herbs rot at root crown in over-watered soil	Put them on a perennial edge with infrequent deep watering, not in a row that shares drip with basil or peppers

The fennel rule, restated. Fennel is the single most aggressive allelopath among common garden plants and the most frequently mis-sited. It belongs in a dedicated corner of the garden — ideally as the long-season anchor of the insectary strip (§12). Do not plant it among vegetables, even at the bed edge. The allelopathic effect persists for a year or more in the root zone after the plant is removed.

4 · Cover crops and soil-building rotations

Winter peas · hairy vetch · crimson clover · winter rye · buckwheat · daikon · mustard · native bunchgrass · the timing the Dragoons asks for

The cover-crop catalog and the basic Dragoons calendar live in *Guide 11 §9* — that's the canonical home for sourcing, sowing rates, mowing technique, and the year-on-year math of organic-matter buildup. This chapter is the polyculture-design extension. It assumes the *Guide 11* mechanics and adds three things the soil chapter doesn't: how cover crops fit into the warm-season rotation alongside the food crops, how to mix species rather than sowing them in pure stands, and the place of native bunchgrass and other perennials in the cover-crop conversation.

The premise is simple. Cover crops are companion plants for the next crop, not just for the soil. A vetch–rye mix turned under in April is feeding the May tomato transplant directly — the same way a row of basil is feeding the same tomato all summer. Designing cover crops as a member of the rotation, rather than as a separate practice that happens in the off-season, is what makes the soil-building chapter and the companion-planting chapter part of the same conversation.

4.1 The species, by role

Species	Role in the polyculture	Sow window	Best partner
Austrian winter pea	Tender legume; tender residue; minor edible-shoot value	Sep 15 – Oct 30	Winter rye (the classic pea-and-rye mix)
Hairy vetch	Workhorse winter legume; ~120 lb N/acre when well-grown	Sep 1 – Oct 15	Winter rye (same balance — vetch on rye is the standard small-farm cover)
Crimson clover	Lighter legume, dense crimson bloom in March that feeds emerging beneficials	Sep 1 – Oct 1	Winter rye, or as a vineyard interrow (see §11)
Winter rye	The carbon side of every cool-season mix; biomass, root depth, allelopathic weed suppression	Sep 15 – Nov 1	Any winter legume

Species	Role in the polyculture	Sow window	Best partner
Buckwheat	Fast warm-season biomass (40 days from sow to bloom); summer beneficial-insect forage; weed smother	May – Aug (avoid July heat peak)	Cowpea, or alone between summer crop successions
Cowpea	Heat-tolerant warm-season legume; the summer equivalent of vetch	May – Jul	Buckwheat, or sorghum-sudan
Daikon radish	"Bio-driller" — a long taproot that punches through compacted layers and rots in place	Sep 1 – Oct 1	Mix with vetch + rye; daikon winter-kills below 20 °F
Mustard (catch crop)	Biofumigant — glucosinolates suppress soilborne pathogens (Verticillium, Pythium, some nematodes)	Sep 15 – Oct 30, or short summer catch	Sown alone in beds with known disease history; chop before flowering
Native bunchgrass (sideoats grama, blue grama)	Perennial cover for permanent paths, vineyard interrows, orchard floor	Late summer (Aug–Sep) into monsoon moisture	Crimson clover overseed; perennial polyculture

The first six are *Guide 11* repeats; the daikon, mustard, and bunchgrass deserve a closer look in the polyculture context.

4.2 Mixes, not pure stands

A pure stand of vetch fixes nitrogen and adds tender residue; a pure stand of rye builds biomass and suppresses weeds. Most Dragoons beds want both, and a mix delivers more total benefit per square foot than either stand alone. The classic mixes worth knowing:

Mix	Ratio (lb/1,000 sq ft)	Use case
Rye + hairy vetch	Rye 2 lb · vetch 1 lb	The canonical cool-season cover for beds that emptied out after pepper, tomato, or cucurbit removal in September
Rye + Austrian winter pea	Rye 1.5 lb · pea 2 lb	Same role as above, with tenderer residue; the pea grows faster than vetch in cool weather and is easier to incorporate
Crimson clover + rye	Clover 0.5 lb · rye 1.5 lb	Slightly lighter mix; the crimson bloom in March is the visual signal to plan the cut
Daikon + vetch + rye	Daikon 0.25 lb · vetch 0.5 lb · rye 1 lb	The “everything cover” — bio-drill, N-fix, biomass — for compaction-prone beds
Buckwheat + cowpea	Buckwheat 1.5 lb · cowpea 1 lb	Summer mix between succession plantings (e.g., after garlic harvest in June, before fall brassicas)
Mustard alone	Mustard 0.5 lb	Biofumigant rotation in beds with disease history — *not* in mix

The principle is the same as in any polyculture: the legume fixes nitrogen, the grass builds carbon and biomass, the brassica drills the soil. The mix shades the ground faster than a single species, suppresses winter weeds more thoroughly, and produces residue with a more balanced C:N ratio (closer to 20:1) than either pure stand.

4.3 The Dragoons rotation, expanded

The cool-season cover window (September through April) is the dominant one. *Guide 11 §9.2* gives the basic calendar. The warm-season piece — fitting cover crops into a working summer rotation — is less obvious and more rewarding. Cross-reference *Guide 7 §12* for the warm-season rotation rules; this is the cover-crop layer of that same rotation.

Month	Bed that came out of food	Bed that's between successions	Bed staying in food
Mar	Cool-season cover in last weeks of growth	—	Carrots, peas, brassicas in production
Apr	Cut cover at peak bloom; let residue rest 2 weeks	—	Spring greens, alliums
May	Bed ready for warm-season transplant; transplant peppers, tomatoes, basil	—	Warm-season transplants going in
Jun	Warm-season crops in food	Sow buckwheat after garlic comes out	—
Jul	Warm-season crops in food	Buckwheat in bloom; cut and leave residue	Sow tepary on first monsoon storm (see §13)
Aug	Warm-season crops in food	Bed ready for fall brassica transplants on cut buckwheat	—
Sep	Pepper, tomato, cucurbit beds emptying out by month's end	Sow rye + vetch into emptied beds immediately	Fall brassicas + alliums going in
Oct	Last summer beds out; sow remaining cover	—	Fall planting continues
Nov–Feb	Cover crops grow slowly through cool months	—	Cool-season crops in production

LOCAL TIP

The September 15 broadcast. The single highest-return cover-crop move in the Dragoons is the same one *Guide 11 §9* names: a broadcast of rye + vetch (or rye + pea) into each bed within a few days of summer-crop removal. The roots are in the ground while the soil is still warm; nitrogen fixation starts before frost; by April the bed is ahead of any bed left bare. Bed-prep labor in May is roughly half what it is on a bare-fallow bed because the cover-crop residue has already done the mulching and the structure work.

4.4 Native bunchgrass — the perennial cover

Sideoats grama (*Bouteloua curtipendula*) and blue grama (*B. gracilis*) are the two native bunchgrasses of the Madrean sky islands. Neither belongs in an annual vegetable bed. Both belong in three other places: vineyard interrows (see §11), orchard floors under stone fruit and figs (§8, §9), and the permanent paths and edges between annual beds.

The case for native bunchgrass over a sown grass cover is the case for any perennial over an annual — once established, it is in place for decades, requires no seasonal re-sowing, holds soil through monsoon downpours, and supports a native beneficial-insect community that the cool-season covers do not. The case against it is establishment time: a sown stand takes two or three seasons to fill in and is sensitive to over-grazing or compaction during that window.

Sow native bunchgrass in late August into monsoon moisture, at roughly 1 lb of seed per 1,000 sq ft, lightly raked in and unirrigated after sowing. Plan on visible cover by year two and full coverage by year three. The Cochise County NRCS office and the Las Cienegas restoration nursery in Sonoita are the two reliable regional sources.

4.5 Cross-reference

Cover-crop seed sourcing, mowing technique, herbicide-residue testing, and the year-on-year math of organic-matter buildup all live in *Guide 11 §9*. The compost side of soil-building — the other half of the polyculture-soil conversation — is *Guide 11 §4*. The warm-season rotation rules that the cover-crop calendar fits inside are *Guide 7 §12*. This chapter exists to connect those three to the rest of the polyculture design.

5 · Guild design — Three sisters in the Cochise context

Hopi Blue or Painted Mountain corn · Hopi Yellow Lima beans · Tarahumara squash · monsoon-keyed timing · the indigenous polyculture, adapted

The three-sisters polyculture — corn, beans, squash — is the canonical Sonoran-Pueblo intercrop. Its mechanics are described briefly in *Guide 7 §9.6* and the cultural lineage of each component sits in *Guide 15*. This chapter is the worked Dragoons design: which named varieties to pick, what timing the Cochise climate calls for, the bed layout that actually works at 4,700 ft, and the yield to expect.

5.1 Why this combination

All three mechanisms in *Guide 16 §1* are at work and one of them is structural in a way the literature often glosses past. The corn stalk is the bean trellis (structural support). The beans fix nitrogen for the heavy-feeding corn (nitrogen exchange). The squash sprawls below and shades the soil (structural shade plus living mulch). What is less often stated: the squash leaves' prickly hairs deter raccoons and small mammals from the bean and corn rows — a real benefit in a Dragoons garden where pack rats and rabbits are constant pressure.

The combination works in the Sonoran-Madrean climate because all three crops are evolved for the same water curve — dry through May and June, hard rain in July and August, drying out in September — and because they ripen on a staggered schedule that lets the gardener harvest in waves rather than in a single overloaded week.

5.2 Variety choice for the Dragoons

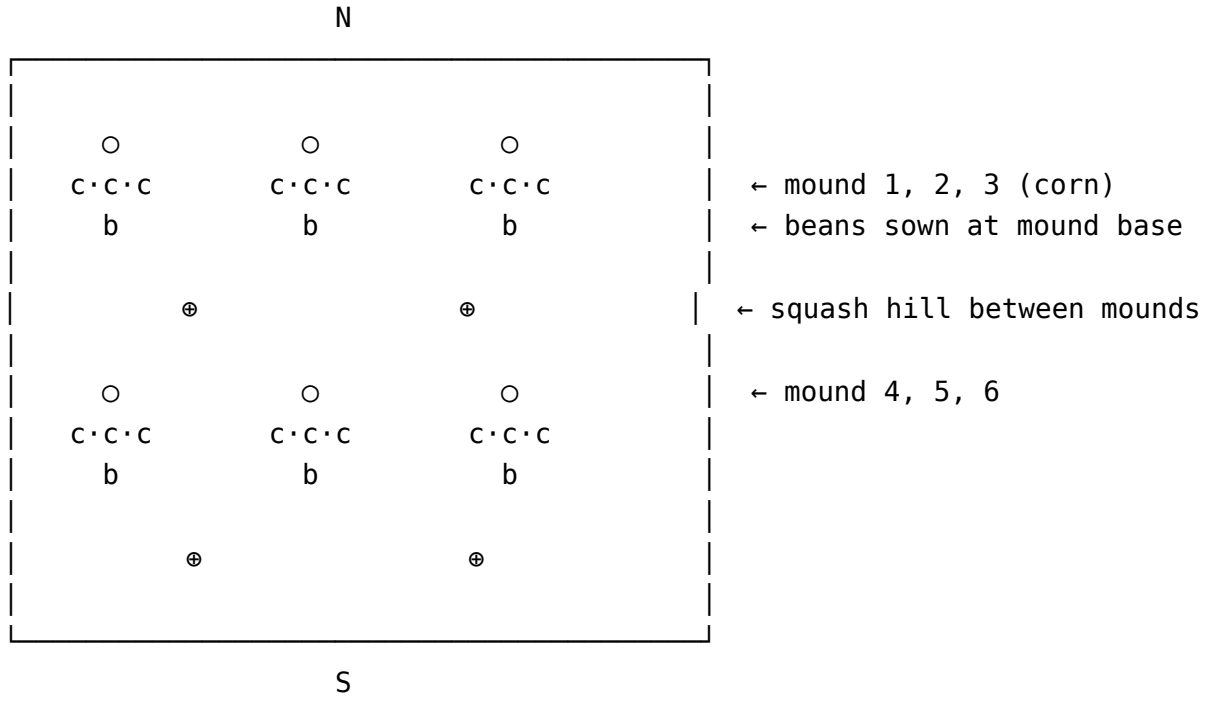
Two viable corn lines: **Hopi Blue Flour** (the long-season, deep-blue, sacred-name corn — ~110 days, plant by May 10) or **Painted Mountain** (rainbow flint, 85 days, more cold-tolerant, the right choice for a marginal year or a higher-elevation site). For a pure monsoon-keyed bed with no spring planting at all, **O'odham 60-day** is the third option — sow with the first July storm and harvest in September.

Bean: **Hopi Yellow Lima** is the canonical companion — large pale-yellow seeds, vigorous pole climber, rich flavor that finishes the three-sisters trio. Any pole-habit dry bean works; teparies do not (they are bush, not pole, and want a different sowing window — see §13).

Squash: **Tarahumara Pumpkin** (*Cucurbita maxima*) or **Tohono O'odham Yellow-Meated** (*C. moschata*) for winter storage; **Cushaw** (*C. argyrosperma*) is a regional alternative with thick storage flesh. Avoid summer squash in three sisters — the harvest pressure is wrong and the vines don't develop the storage life the system was designed around.

5.3 The layout — a 100 sq ft mound block

Three-sisters works best in mound or hill plantings, not in straight rows. The traditional Pueblo arrangement is a grid of low mounds, each about 3 ft across, on roughly 5 ft centers — corn in the middle, beans around the corn, squash in the gaps between mounds.



○ mound, 3 ft across · c corn cluster (4–5 plants) ·
b bean (one or two seeds per corn cluster)
⊕ squash hill, sprawls into the spaces between mounds

Six mounds in a 10×10 ft block holds 24–30 corn plants, 12–18 bean plants, and 2 squash hills. That is the working unit. Two such blocks (200 sq ft) feed a household for a season.

5.4 The planting calendar — May-start vs. monsoon-start

Two timing patterns work in the Dragoons. The first is the spring-start pattern that fits Hopi Blue and Painted Mountain. The second is the pure monsoon-start pattern that fits O'odham 60-day. Either is valid; do not mix them in the same bed.

Pattern	Date	Action
Spring-start (Hopi Blue, Painted Mountain)	May 10	Sow corn — 4–5 seeds per mound, 1 inch deep, into a watered mound. Drip water once weekly until monsoon

Pattern	Date	Action
	June 1	Sow beans at mound base, 1–2 seeds touching the corn stalk, when corn is 6 in tall
	June 20	Sow squash in hills between mounds, 3 seeds per hill, thinned to 1
	Jul–Aug	Monsoon irrigation does most of the work; supplemental water once weekly if dry spells exceed 10 days
	Sep	Beans setting pods; squash sizing up; corn drying on stalk
	Oct	Corn harvest at full dent; squash harvest before frost; beans dry-harvested
Monsoon-start (O'odham 60-day)	Jul 5–15	First significant monsoon storm — sow all three together within 48 hours. Corn 1 in deep, beans 1 in deep at the same point, squash in hills between
	Aug	All three on monsoon moisture only
	Sep	Corn dent; squash sizing; beans setting
	Sep 30	O'odham 60-day corn dried on stalk; harvest all three through October

5.5 What to expect

A 100 sq ft three-sisters block in a normal monsoon year produces approximately 8–15 lb of dry corn, 3–6 lb of dry beans, and 30–60 lb of storage squash. These numbers run lower than the equivalent monocultures (a pure flint-corn bed of the same size yields 15–20 lb), but the *combined* yield per square foot is higher and the water demand is significantly lower — most of the irrigation in the spring-start pattern goes to the corn alone in May–June.

The non-yield benefit is what makes the system worth using regardless: a polyculture bed that loses its bean crop to deer or its squash to vine borer still produces corn. The

same year, a monoculture bean bed would have produced nothing.

The single failure mode to watch. Squash vines that smother the corn-bean stem base in late August are the most common cause of three-sisters underperformance. Lift the squash vines off the corn rows once in August and again in early September — direct the vines into the open spaces between mounds rather than letting them climb up the corn. Five minutes of work; a measurable yield increase on the corn.

6 · Guild design — Pepper, basil, marigold bed

The Mediterranean home-garden archetype, adapted · 4×8 ft worked bed · aphid suppression by aromatic interference

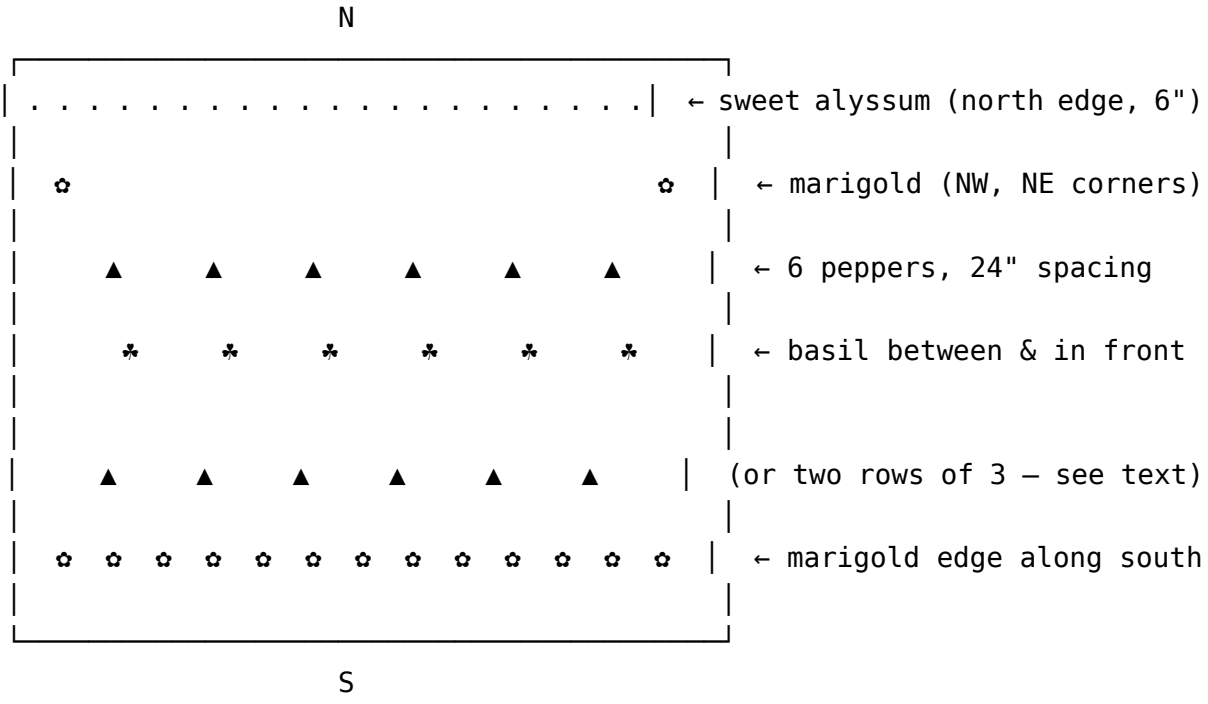
This is the simplest of the worked guild designs and the one that pays back fastest in a first-year garden. It is built around the documented basil-with-pepper effect (real, measurable aphid reduction — see *Guide 8 §8.2*) and adds a marigold corner-block and a sweet-alyssum ground cover for the beneficial-insect community. Every component is annual; every component fits in a single growing season; the bed produces food from June through October with a single spring plant-out.

6.1 Why this combination

Three mechanisms are stacked. Basil interplanted with peppers reduces aphid host-finding (repellence, §1.1). Marigold at corners feeds *Tagetes*-attracted hoverflies and, more importantly, holds the bed visually so the gardener walks it daily — soft attraction (§1.2). Sweet alyssum along the north edge feeds the syrphid flies whose larvae handle aphid populations directly (attraction, §1.2). The pepper itself is the main crop; the herbs and flowers are infrastructure.

What this bed does *not* try to do is fix nitrogen or build soil — there are no beans here. That work belongs to the cover-crop rotation (§4) or to the next bed. A 4×8 ft footprint cannot do everything; this one specializes in one heavy-feeding, pest-prone crop and surrounds it with the support that crop actually needs.

6.2 The layout — 4×8 ft, north-south long axis



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▲ pepper · ♣ basil · ✿ marigold · . sweet alyssum
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Six peppers on 24-inch centers fit comfortably on a 4×8 bed in a single staggered row down the long axis, with basil interplanted on the same line in the gaps. The marigold sits at the two north corners and runs along the full south edge — the south side is the warm, sunny side and the marigolds bloom continuously there from June through October. Sweet alyssum runs along the north edge as a low ground cover, in bloom by late May from a March transplant.

6.3 The plant list, by quantity

Component	Quantity	Source	Timing
Pepper (any *Capsicum*; mix sweet and hot as desired)	6 plants	*Guide 2* variety reference	Transplant after last-frost date, typically April 15–May 1 in the Dragoons
Basil (Genovese or Italian large-leaf)	6 plants	Seed or starts	Transplant May 10 — wait for soil at 65 °F
Marigold (*Tagetes patula* — French marigold)	14 plants (2 corners + 12 along south edge on 8” spacing)	Seed (cheap, easy) or starts	Direct-sow May 1, or transplant May 10
Sweet alyssum (*Lobularia maritima*)	1 packet, broadcast along north edge	Seed	Direct-sow March 15 — alyssum tolerates light frost and is in bloom before peppers go out

6.4 The planting calendar

Month	Action
Mar 15	Direct-sow sweet alyssum along north edge into prepared soil
Apr 15 – May 1	Transplant peppers on 24” centers down the long axis (after last frost)
May 1	Direct-sow marigolds along south edge and at NW/NE corners
May 10	Transplant basil between pepper plants; cage or stake peppers

Month	Action
Jun	Alyssum in full bloom; first basil pinch; marigolds budding
Jul–Aug	Pepper harvest begins; basil at full size; marigolds in full bloom; aphid monitoring (much lower than a bare-bed control)
Sep	Pepper harvest peak; basil flowering as the syrphid flies arrive in numbers; marigold continues
Oct	First-frost concerns by mid-month; pull basil before frost; peppers continue through first light frost under row cover
Nov	Bed cleared; sow cool-season cover crop (rye + vetch) — see §4

6.5 What to expect

A 4×8 bed of this configuration produces, in a normal year:

- **20–40 lb of peppers** total across the six plants (highly varietal — *Big Bertha* and *Anaheim* on the high end, *Padron* and Chiltepin much lower)
- **3–5 lb of fresh basil**, pinched continuously through the summer
- **Continuous bloom** from late May through hard frost — feeding the beneficial-insect community for the entire surrounding garden
- **Aphid pressure roughly 40–60% lower** than the same peppers grown in a bare-soil monoculture bed under the same drip schedule, in local observation across multiple seasons

The water demand is a single drip line along the pepper row, run on the *Guide 2* schedule. Basil shares the drip without adjustment; marigold and alyssum tolerate the slight overspray and require no additional water once established.

> **LOCAL TIP**
>
> This is the bed to build first if the rest of the garden is new. It anchors the beneficial-insect community for the property, it produces a high-value crop, and it lets the gardener observe what “polyculture working” actually looks like before committing to the more elaborate guilds in §7–§13.

7 · Guild design — Brassica-allium-herb harlequin-defense bed

Fall-winter 4×8 ft · garlic interplant · perennial herb edge · dill for parasitic wasps · the bed that survives harlequin

The fall brassica bed is the most pest-pressured planting in the Dragoons calendar. Cabbage white moth, cabbage looper, and — the local specialty — harlequin bug all hit the bed simultaneously from August into October. *Guide 10 §6* covers the spray and exclusion side of the problem. This chapter covers the design side: a guild that uses three independent mechanisms to drop harlequin pressure below the action threshold without a single spray.

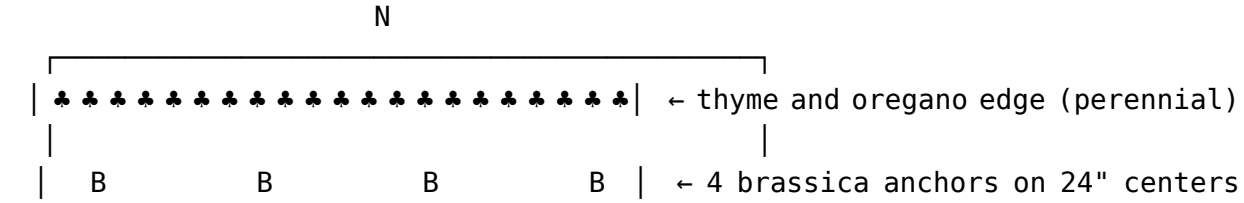
The bed works because brassicas and alliums share the bed beautifully (garlic suppresses cabbage white oviposition by 30–60% in observed local trials, per *Guide 8 §8.2*), because a Mediterranean herb edge adds aromatic interference for the cabbage moth, and because flowering dill nearby holds the parasitic wasp population that handles the harlequin nymphs invisibly. Three mechanisms, one bed, six months of harvest from September through April.

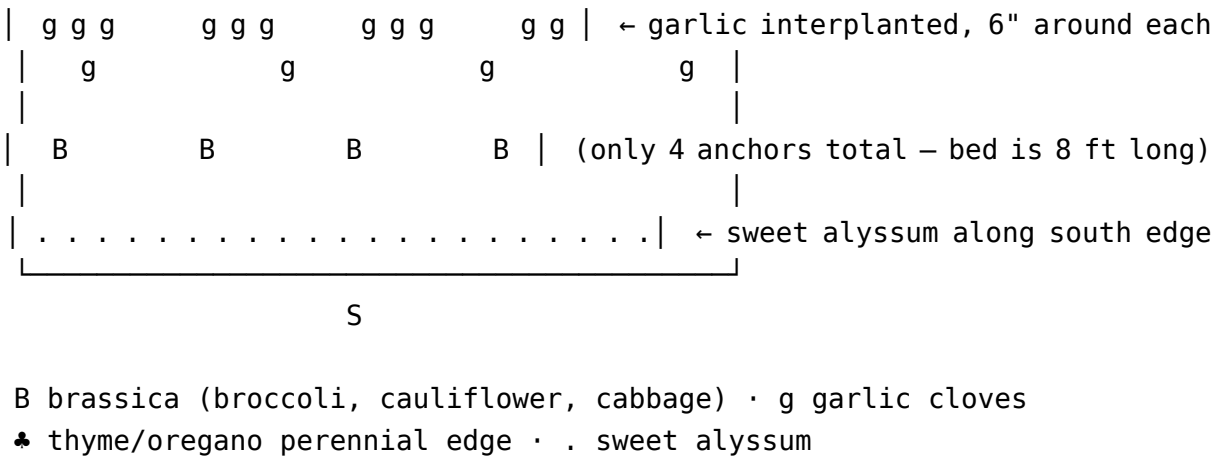
7.1 Why this combination

The harlequin bug (*Murgantia histrionica*) is a southwestern stink-bug specialist on brassicas. It is the single most damaging pest of fall-planted broccoli, cabbage, and kale in Cochise County. It is *not* effectively controlled by row cover (the eggs are laid inside the cover when the bug is missed at transplant), it is *not* easily killed by *Bt* (it is a true bug, not a caterpillar), and it builds populations explosively in warm September weather. The two interventions that work are (1) trap-cropping with mustard or radish (*Guide 10 §6*) and (2) parasitic wasps in the *Trissolcus* genus, which parasitize harlequin eggs and reduce next-generation pressure dramatically. The guild design supports the second of these — wasp habitat — through the dill flowering near the bed in early fall.

The garlic interplant is unrelated to harlequin specifically — it deters cabbage white oviposition. That's the other major fall pest. The Mediterranean herb edge — thyme and oregano — is for general aromatic interference and beneficial-insect habitat year-round.

7.2 The layout — 4×8 ft, perennial herb edge on the north





Four brassica anchors on 24-inch centers down the long axis of the 4×8 bed. Around each anchor, eight garlic cloves on a 6-inch radius, planted in October at the same time as brassica transplant. Thyme and oregano along the full north edge (perennial, persistent — these herbs come back every year and improve the bed every season). Sweet alyssum along the south edge as a winter beneficial-insect host.

A separate small dill patch — three or four plants in a corner of the garden, not in this bed — flowers from September into October and supplies the parasitic wasps. The dill is not in this bed because dill prefers more water than brassicas like and because dill in a brassica bed shades the brassicas at the wrong stage.

7.3 The plant list

Component	Quantity	Spacing	Notes
Broccoli, cauliflower, cabbage (mix as desired)	4 transplants	24”	Transplant late August / early September from indoor starts; see *Guide 6 §2.1*
Garlic (*Inchelium Red*, *Music*, or any softneck)	32 cloves (8 per anchor)	6”	Plant October 15 – November 1
Thyme, oregano	4–6 plants total along north edge	12–18”	One-time perennial planting; lives 5+ years
Sweet alyssum	1 packet, broadcast along south edge	—	Direct-sow in early September
Dill (separately, nearby)	3–4 plants in another corner of garden	—	Direct-sow July 15 for fall flower

7.4 The planting calendar — September transplant through May harvest

Month	Action
Jul 15	Direct-sow dill in a separate corner of the garden (for the fall wasp bloom)
Aug 1–15	Start brassica seedlings indoors under shade or lights (*Guide 6 §2.1*)
Aug 25 – Sep 5	Transplant brassicas at 24” centers; row cover on transplants for first 10 days against grasshoppers
Sep	Sow sweet alyssum along south edge; harlequin emerges — daily dusk scouting begins
Oct 15 – Nov 1	Plant garlic cloves in 6” ring around each brassica anchor; dill flowering — wasps arrive
Nov	Brassicas growing rapidly in cool weather; first broccoli heads forming
Dec	First broccoli heads cut; garlic 4–6 in tall and rooting hard
Jan	Cabbages heading; cauliflower heading; brassica harvest continues
Feb	Brassica harvest continues; garlic putting on size
Mar	Brassica bolt begins on remaining plants — *let them bolt and flower*, the parasitic wasps need them
Apr	Brassica bolts in full flower; pull spent plants late month; garlic scaping (hardneck)
May	Garlic harvest mid-month; bed cleared; cover crop or summer succession plant out

7.5 What to expect

A 4×8 fall-winter bed in this configuration produces, across the September-through-May arc:

- **8–15 broccoli main heads + many side shoots**, or the equivalent in cabbage / cauliflower / mixed brassica harvest
- **32 heads of garlic** at May pull — roughly 4–6 lb of cured garlic, enough for a

household kitchen for a full year
- **Continuous habitat** for parasitic wasps and *Trissolcus* harlequin-egg parasitoids — visible reduction in next-year harlequin pressure
- **Cabbage white pressure roughly 40–60% lower** than a bare brassica bed of the same size under the same row-cover schedule

The water budget is a single drip line on the brassica schedule; garlic shares the drip without adjustment. The perennial herb edge requires nearly no water once established.

> **Let the brassicas bolt.** The most counter-intuitive move in this guild is the one that pays the biggest dividend: in March, when the last broccoli or cabbage starts to bolt, do not pull it. Let it flower. The yellow brassica flowers in March are some of the highest-quality parasitic-wasp forage in the Dragoons spring garden, and the wasp populations they support carry forward into pest control on the May tomato bed. Pull the bolted plants in late April after the flowers have set seed — by then the wasps have moved on.

8 · Guild design — Stone-fruit orchard guild

Peach or apricot · comfrey ring · chives ring · spring daffodils · dill and yarrow insectary patch · 10–12 ft canopy circle

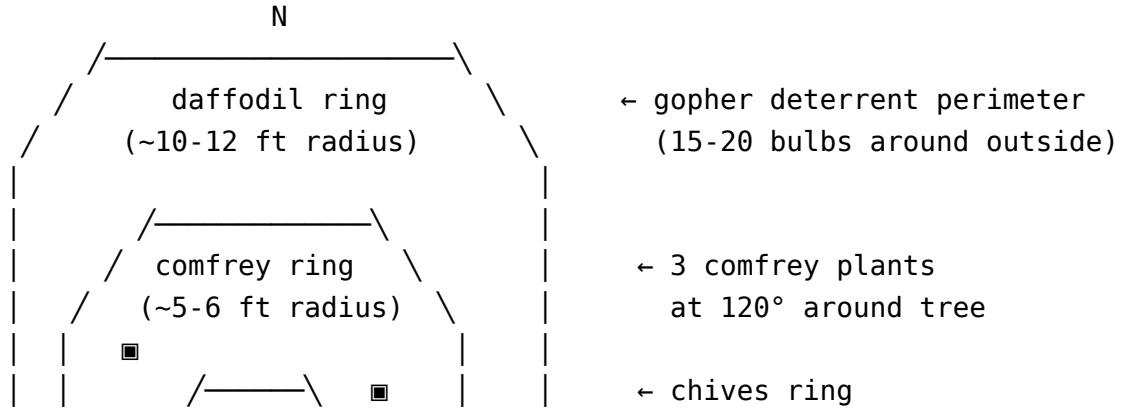
The conventional stone-fruit planting in Cochise County is a tree in turf grass or bare mulched dirt, with a drip emitter and not much else. The orchard guild replaces the bare understory with a working perennial polyculture that does five things at once: mines deep nutrients into the topsoil (comfrey), deters peach-tree borer (chives and garlic at the trunk), keeps gophers away from the root zone (daffodils planted in a perimeter ring), supplies parasitic wasps for codling moth (dill and yarrow patch), and shades the soil under the canopy (the layered plantings together). Cultivation of the tree itself — variety, training, water rate, fruit-thinning — lives in *Guide 9*. This chapter is the understory only.

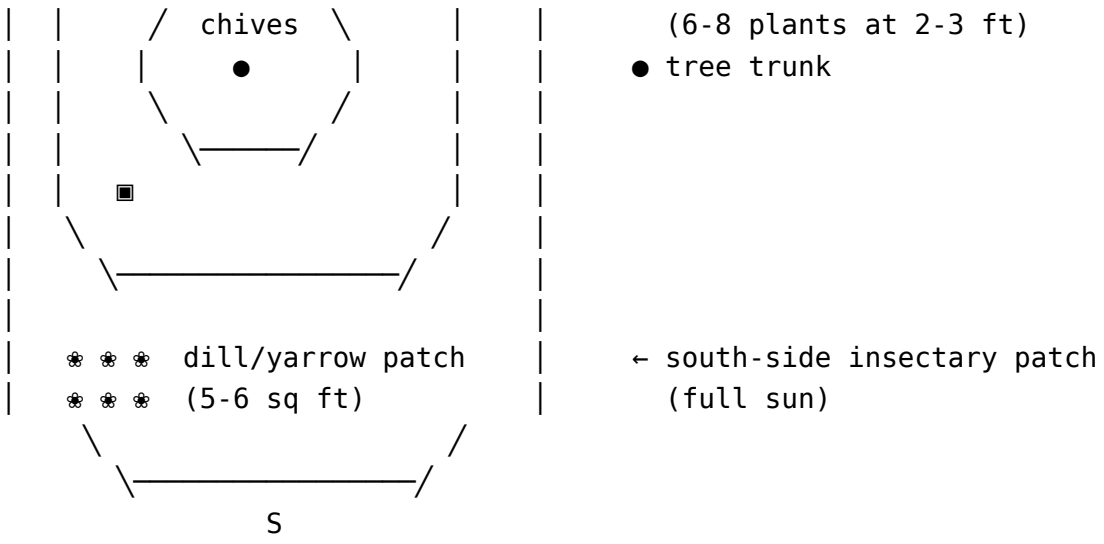
8.1 Why this combination

The peach tree feeds heavily and lifts a lot of water; the understory must be drought-tolerant once established and must not compete heavily at the same root depth. The chosen species each work at a different layer. Comfrey has a 4–6 ft taproot that mines nutrients (especially potassium) from below the tree's primary root zone and deposits them in the topsoil via fallen leaves. Chives and garlic occupy the upper 6 inches of soil at the trunk and their sulfur compounds deter peach-tree borer (*Synanthedon exitiosa*). Daffodils — toxic to rodents — form a perimeter ring that gophers will not tunnel through, and they bloom in March as early pollinator forage. The dill and yarrow patch on the south side supplies parasitic wasps for codling moth control without competing with the tree directly.

The guild is fully perennial after year two. Comfrey divides easily; chives clump and spread; daffodils naturalize; yarrow expands; dill self-seeds. After the third year, the only maintenance is cutting back the comfrey twice a season and pulling excess daffodil foliage in May.

8.2 The layout — concentric rings around the tree





● tree trunk · ▣ comfrey · chives ring · daffodil perimeter · ❀ dill + yarrow insectary patch on south side

The dill-yarrow patch goes on the south side because that's where the sun lands when the tree leafs out — the rest of the canopy circle is in dappled shade. The patch is a 5–6 sq ft area outside the dripline edge, just inside the daffodil ring.

8.3 The plant list

Component	Quantity	Placement	Notes
Stone-fruit tree (peach, apricot, plum, almond)	1	Center	See *Guide 9* for variety selection in the Dragoons
Comfrey (*Symphytum* × *uplandicum* — Russian comfrey, sterile)	3 plants	Equilateral triangle, 4–5 ft from trunk	Sterile variety (Bocking 14) does not self-seed; use root cuttings from a known sterile source
Chives (*Allium schoenoprasum*) or garlic chives	6–8 plants	Ring at 2–3 ft from trunk	Permanent; divide every 3 years
Daffodils (*Narcissus*)	15–20 bulbs	Outer perimeter at 10–12 ft radius	Plant October–November in their first year; naturalize thereafter

Component	Quantity	Placement	Notes
Dill	3–4 plants	South-side patch	Self-seeds after year 1; let some go to flower
Yarrow (*Achillea millefolium*)	3 plants	Mixed with dill in south patch	Native and naturalized varieties both work; perennial

8.4 The establishment calendar — first two years

Year · month	Action
Year 1 · Mar	Tree goes in per *Guide 9*; comfrey root cuttings planted in triangle around tree at same time
Year 1 · Apr	Direct-sow dill in south patch; plant yarrow divisions
Year 1 · Sep	Plant chives ring (divisions from a kitchen-garden patch or starts)
Year 1 · Oct–Nov	Plant daffodil bulbs in outer ring at canopy-edge radius
Year 2 · Mar	Daffodils bloom for first time; dill self-seeds; comfrey leaves up
Year 2 · May	First comfrey cut — chop leaves and lay around tree as living mulch
Year 2 · Jun	Chives flowering; bees in residence
Year 2 · Aug	Second comfrey cut; dill flowering — parasitic wasps active
Year 3+	System self-maintains; cut comfrey twice yearly, divide chives every third year

8.5 What to expect

The orchard guild does not change the tree's fruit yield much in any single year (a healthy peach yields 50–150 lb of fruit regardless of understory). What it changes is the *baseline*: lower borer pressure, no visible gopher damage, dramatically lower codling moth pressure once the wasp population establishes (year 3 onward), and a substantial drop in summer water demand because the comfrey-chives-daffodil understory shades the soil and reduces evaporation. The water savings are 20–30% across the May–June pre-monsoon window — meaningful in a Cochise County orchard.

The comfrey produces 30–50 lb of fresh leaf material per year per plant after year three, all of which becomes mulch around the tree. The chives produce a kitchen-volume of fresh herb. The daffodils produce nothing edible but flower for six weeks every March.

LOCAL TIP

Comfrey sourcing. Use the sterile Bocking 14 strain only. Seed-grown common comfrey will self-seed across the property and become a permanent weed in places you do not want it. Bocking 14 is propagated by root cutting and is offered by several Pacific Northwest nurseries; one or two starts produce enough divisions for an entire orchard within two seasons.

9 · Guild design — Fig and Mediterranean herbs, hilltop guild

South-facing slope or wall-anchored fig · rosemary, thyme, sage, oregano in the dripline · spring-flowering bulbs · why this works at 4,700 ft

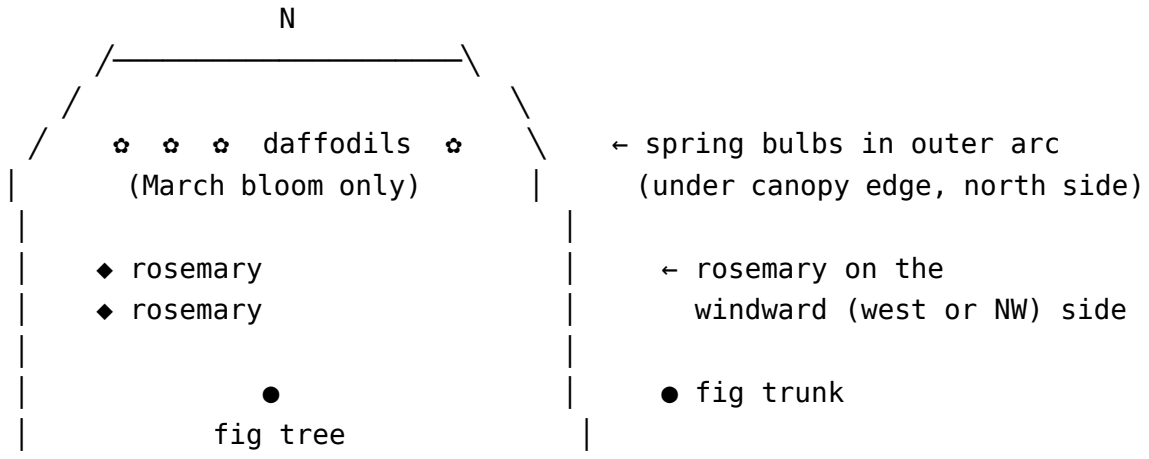
The fig is the easiest perennial in the Dragoons orchard. Cultivation lives in *Guide 9*. This chapter is the understory: a Mediterranean-herb planting in the fig's dripline that works because all the components want the same soil chemistry, the same water curve, and the same exposure — they are all from the same broad climate band, and they all do well at 4,700 ft on south-facing alkaline slopes. This guild is the lowest-maintenance design in the chapter and the most place-anchored to the actual Cochise climate.

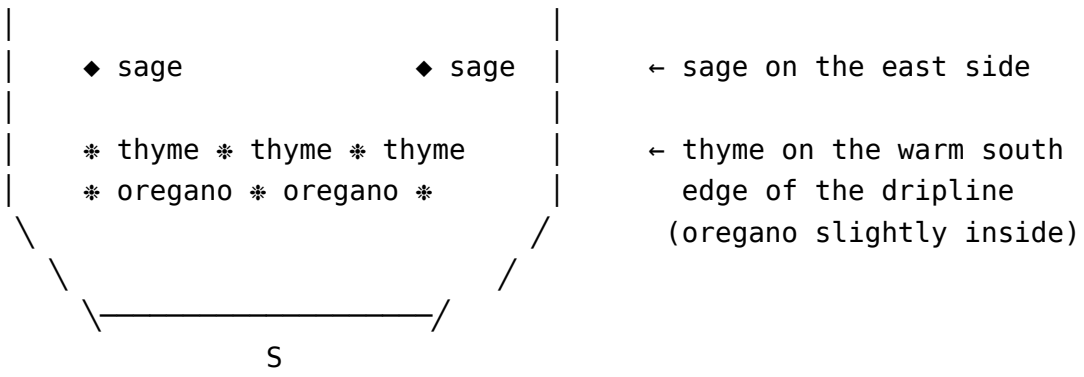
9.1 Why this combination

The shared trait that makes the guild work is drought tolerance on alkaline soil with deep but infrequent water. The fig (*Ficus carica*) wants a deep watering every 10–14 days in summer, dry the rest of the year. So do rosemary, thyme, sage, and oregano. None of them tolerates the bed of mulched compost-rich vegetable soil that peppers and basil want, and none of them tolerates the daily drip schedule of the kitchen garden. Planted together in the fig's dripline, they share the same drip line on the fig's schedule and produce a self-organized understory that needs no separate water budget at all.

The Mediterranean herbs are also pollinator forage in their own right — oregano in particular is mobbed by honeybees and native bees from July through September. Spring-flowering bulbs (daffodils, hyacinth, grape hyacinth) bloom in March before the fig leafs out, providing forage for early bees and visual interest in a bed that is otherwise dormant from December through April.

9.2 The layout — the dripline as the planting circle





● fig · ◆ rosemary or sage · ❋ thyme or oregano · ✿ spring bulb

The principle: tall woody herbs (rosemary, sage) on the west and east where they shelter the bed from wind without shading the fig itself; low ground-cover herbs (thyme, oregano) on the south edge where they take full sun; bulbs in the north arc where they will be under the fig's leafy canopy in summer but get full sun in March before the fig leafs out.

A wall-anchored fig — one planted against a south-facing stone or stucco wall — works even better than a free-standing one in the Dragoons. The wall stores heat and extends the fig's growing season by 3–4 weeks on both ends. The herb planting wraps the front of the wall in a half-circle and lays flat against the wall on its outer edge.

9.3 The plant list

Component	Quantity	Notes
Fig (any Dragoon-adapted variety — *Celeste*, *Brown Turkey*, *Black Mission*; see *Guide 9*)	1	South-facing aspect; wall-anchored ideal
Rosemary (upright variety — *Tuscan Blue*, *Arp* for cold-hardiness)	2–3 plants	Plant on the windward side
Sage (culinary *Salvia officinalis*)	2 plants	Permanent; lives 6–10 years
Thyme (English thyme or creeping thyme as ground cover)	4–6 plants	South edge in full sun
Oregano (Greek oregano *Origanum vulgare* subsp. *hirtum*)	2–3 plants	Just inside the thyme line; aggressive spreader, give it room

Component	Quantity	Notes
Daffodils, grape hyacinth, hyacinth	20+ bulbs	Plant October–November in north-arc

9.4 The establishment calendar

Year · month	Action
Year 1 · Mar	Plant fig per *Guide 9*
Year 1 · Apr	Plant rosemary and sage on the windward and east sides — small starts establish faster than large ones
Year 1 · May	Plant thyme and oregano on south edge
Year 1 · Oct–Nov	Plant daffodil and hyacinth bulbs in north arc
Year 2 · Mar	First spring bloom from bulbs; herbs leafing out
Year 2 · Jun	Oregano in bloom — heavy bee activity
Year 2 · Jul–Sep	First serious fig harvest year (variety-dependent — some figs fruit Y1, some Y3)
Year 3+	System self-maintains; trim rosemary back annually in March, replace short-lived sage every 6–8 years

9.5 Why 4,700 ft is the right elevation for this guild

Cochise County sits at the upper-cold-edge of the Mediterranean-herb climate band. At 4,200 ft (Tucson, Phoenix), rosemary and sage are easy and oregano is almost weedy. At 7,000 ft (Flagstaff, eastern New Mexico mountains), rosemary winter-kills in 1-in-5 years and oregano dies back hard. The Dragoons at 4,500–5,000 ft are at the productive sweet spot: cold enough to give the herbs the winter dormancy they need, warm enough that the fig fruits reliably, dry enough that the shared no-summer-water schedule works without root rot.

A spring-blooming bulb layer is part of the design precisely because the Cochise climate has a long bulb season. Daffodils planted in October bloom in March; grape hyacinth follows in April. By the time the fig leafs out in late April, the bulbs have completed their cycle and the foliage dies back under the developing canopy. There is no competition for sun or water between the bulb layer and the fig.

9.6 What to expect

The guild produces, after year three:

- **20–60 lb of fresh figs** from a single mature tree (variety-dependent, see *Guide 9*)
- **Kitchen-volume harvests** of rosemary, sage, thyme, and oregano — more than most households will use, with surplus to dry
- **Six to eight weeks of early-spring bulb bloom** that feeds the first emerging bees and bumblebees of the year
- **Almost no water demand** outside the fig's own deep-watering schedule

> **The lowest-maintenance perennial guild in the guide.** After the third year, this planting requires perhaps two hours of attention per year — a March rosemary trim, an October bulb top-dress, an August comfrey cut if comfrey was added. Compared to the orchard guild in §8 or the insectary strip in §12, it is essentially self-running.

10 · Guild design — Mesquite-anchored native guild

A mature mesquite tree · native bunchgrass · prickly pear and agave to the south-east · wild Chiltepin in the partial-shade zone · devil's claw and amaranth at canopy edge · no irrigation

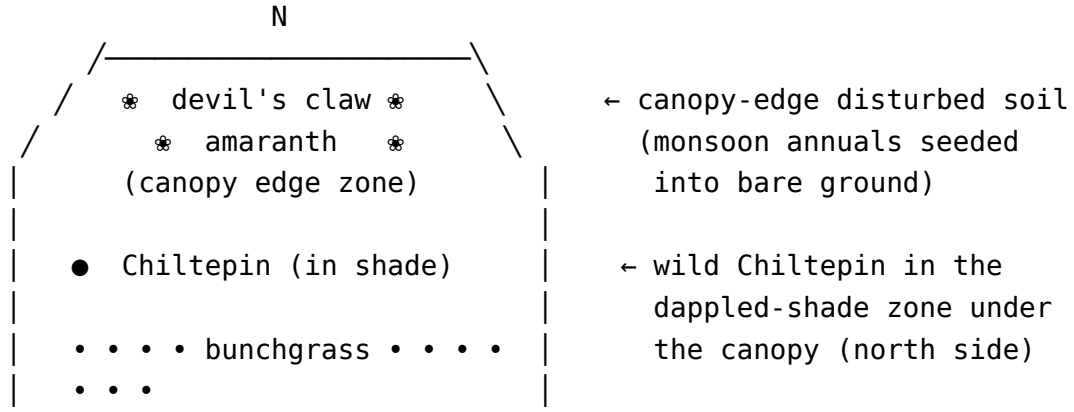
This is the most place-anchored design in the guide. It is built around a single mature mesquite tree — a velvet mesquite (*Prosopis velutina*) or honey mesquite (*P. glandulosa*) of the kind that already grows on most properties in the eastern Dragoons foothills — and uses the tree's microclimate to support a polyculture of native crops that require no irrigation, no soil amendment, no fertilizer, and almost no labor. It is the antithesis of the kitchen-garden guilds in §6 and §7, and it is the design that comes closest to the indigenous food complex laid out in *Guide 15*.

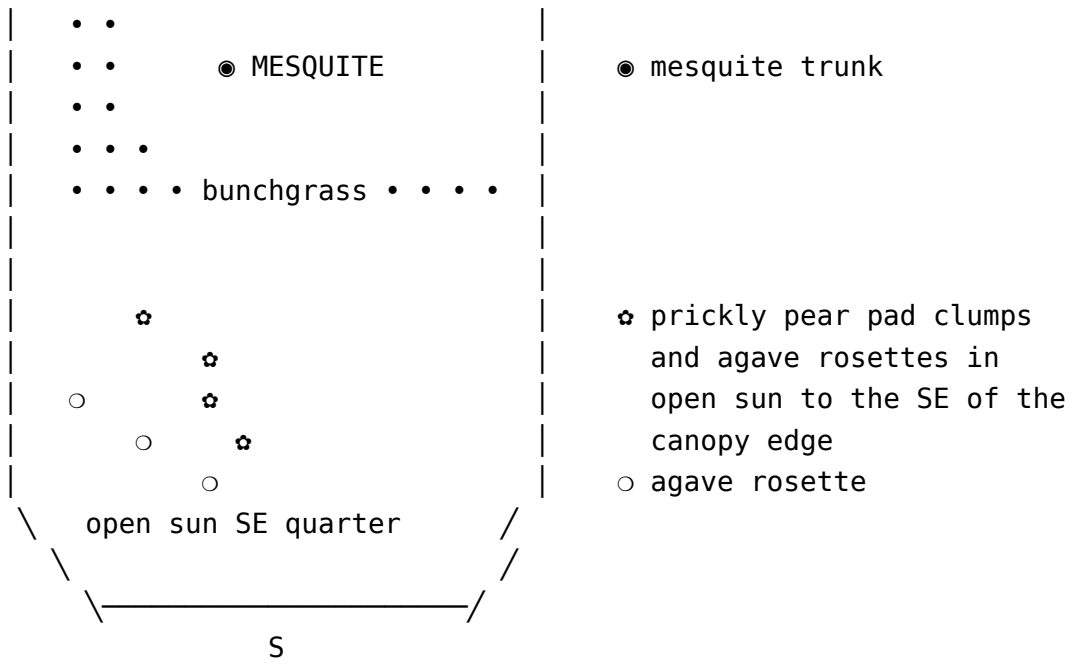
10.1 Why this combination

The mesquite tree creates four distinct microclimate zones, each suited to a different native crop. (1) Under the canopy, in dappled shade, the soil holds moisture longer and the air is cooler in summer — this is Chiltepin habitat. (2) At the canopy edge, in the brighter shade of the dripline, the soil is enriched by years of fallen leaves and pods — this is the planting zone for the warm-season annuals (devil's claw, amaranth, occasional tepary) that respond to monsoon moisture. (3) South-east of the canopy, in full sun, the ground is open and sun-drenched — prickly pear and agave habitat. (4) Beneath and around all of the above, native bunchgrass holds the soil and supports a beneficial-insect community independent of the cultivated garden.

The mesquite itself is the keystone. It fixes nitrogen (it is a legume tree, *Fabaceae*), it drops pods that feed wildlife and that can be milled for mesquite flour (*Guide 15 §8*), it shades the understory in the June heat peak, it supports a large native bee population at its yellow May bloom, and it is the wasp and lacewing habitat *Guide 10 §18.2* names. None of these benefits requires any planting; the tree was already there.

10.2 The layout — four zones around the mesquite





◉ mesquite · ● Chiltepin · ❀ devil's claw / amaranth · ✿ prickly pear · ❍ agave · • • • native bunchgrass

Bunchgrass blankets the whole area outside the open south-east quarter. The native annuals (devil's claw, amaranth) are seeded fresh each July onto disturbed soil at the canopy edge. The Chiltepin and the agaves and prickly pears are perennial and established once.

10.3 The plant list

Component	Quantity	Placement	Notes
Mature mesquite	1	Center	Existing tree. If your property does not have one, this guild is not for that property
Wild Chiltepin (*Capsicum annuum* var. *glabriusculum*)	1–2 bushes	Dappled-shade understory, north side of canopy	Seed from Native Seeds/SEARCH; sow in fall under leaf litter; expect erratic germination; see *Guide 15 §5*
Prickly pear (*Opuntia engelmannii* or *O. ficus-indica*)	3–4 pad clumps	Full-sun SE of canopy	Plant single pads in spring; root in 6 weeks; no water

Component	Quantity	Placement	Notes
Agave (*Agave palmeri* or *A. parryi*)	3–5 rosettes	Full-sun SE of canopy	From transplanted pups; see *Guide 15 §9*
Native bunchgrass (sideoats grama, blue grama)	Broadcast	Whole understory outside SE quarter	Sow August into monsoon moisture
Devil's claw (*Proboscidea parviflora*)	4–6 plants from seed	Canopy edge, disturbed soil	Sow with first monsoon storm; see *Guide 15 §7*
Grain amaranth (*Amaranthus hypochondriacus* — Hopi Red Dye)	4–6 plants from seed	Canopy edge	Sow with monsoon; see *Guide 15 §11*

10.4 The establishment calendar — patient

This guild is established slowly, over 3–5 years, in the cadence the native crops want.

Year · month	Action
Year 1 · Aug	Sow bunchgrass into monsoon moisture; light rake-in only
Year 1 · Oct	Plant prickly pear pads (a few of each); plant agave pups from a neighbor's plant if available
Year 1 · Fall	Seed Chiltepin into raked litter under canopy edge
Year 2 · Jul	First monsoon storm — sow devil's claw and amaranth at canopy edge
Year 2 · Aug	Bunchgrass visible coverage; Chiltepin germination spotty (this is normal)
Year 2 · Oct	Devil's claw and amaranth harvest
Year 3 · Jul	Devil's claw and amaranth re-sow (or volunteer from year-2 seed)
Year 3+ · Sep	First small Chiltepin harvest
Year 5+	Prickly pear at harvestable size; agave pups multiplying; system stable
Year 10+	Agave first flowering — harvest before flower stalk extends (*Guide 15 §9*)

10.5 What to expect

The yields here are modest by kitchen-garden standards and the design is not for replacing a vegetable bed. What it produces, after year five:

- **A few ounces of Chiltepin** per year per bush, dried — high-value seasoning, not staple food
- **2–4 lb of devil's claw seeds** annually plus the green pods for pickling
- **5–15 lb of amaranth grain** annually
- **20–40 lb of prickly pear tunas** annually once the patch is established
- **Eventually**, on a 10–25 year cycle, one or two roasted agaves
- **Mesquite pods** — 50–150 lb of pods per year from a mature tree, millable into flour
- **No irrigation cost, no fertilizer cost, no labor through most of the year**

The non-yield benefits are the ones that matter most. This guild stabilizes the property's soil, supports a large native pollinator and parasitic-wasp population that benefits the rest of the garden, and demonstrates the underlying point of the whole library: that the food complex of the Sonoran-Madrean was already complete before the European crops arrived, and that re-integrating it into a working garden is the highest leverage move available to a Cochise County grower.

> **LOCAL TIP**
>
> **The native bunchgrass detail.** A bunchgrass understory under a mesquite is what the land looked like before grazing. Re-establishing it on a property where it has been lost takes 2–3 years and pays back for the next 30. Sideoats grama is the most reliable establisher; blue grama is the most drought-tolerant. Seed both; let the site sort out which one wins where.

11 · Guild design — Vineyard cover-crop interrow

Native bunchgrass between rows · crimson clover for winter cover · summer buckwheat where heat allows · rosemary at row ends · why this differs from a Napa or Sonoma program

Vineyard floor management is a topic with a large literature and a lot of regional specificity. *Guide 5* covers viticulture in the Dragoons in detail — variety selection, training, irrigation, fungal pressure. This chapter is the floor: what to plant between vine rows to build soil, hold moisture, support beneficial insects, and avoid the pest and disease pitfalls that come from doing the wrong thing in a Cochise County climate.

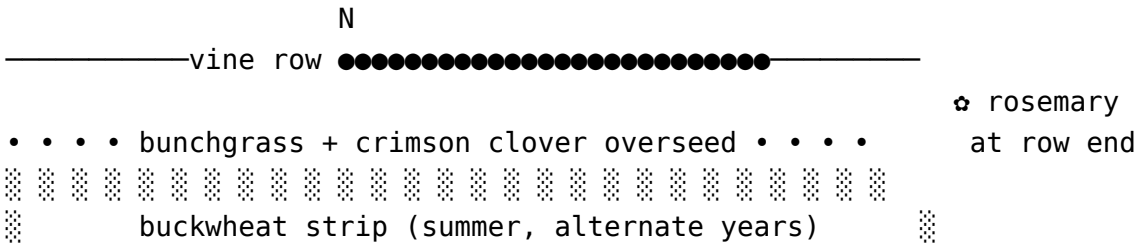
The short version: a Cochise vineyard floor is not a California vineyard floor. The cover-crop choices that work in Sonoma — mustard mixes, oat-vetch combinations, crimson clover as a near-pure stand — work in part but need adjustment. The Dragoons summer is hotter and drier than Sonoma, the monsoon adds a complication Sonoma does not have, and the alkalinity is more pronounced. The design here is what works in the actual Cochise context.

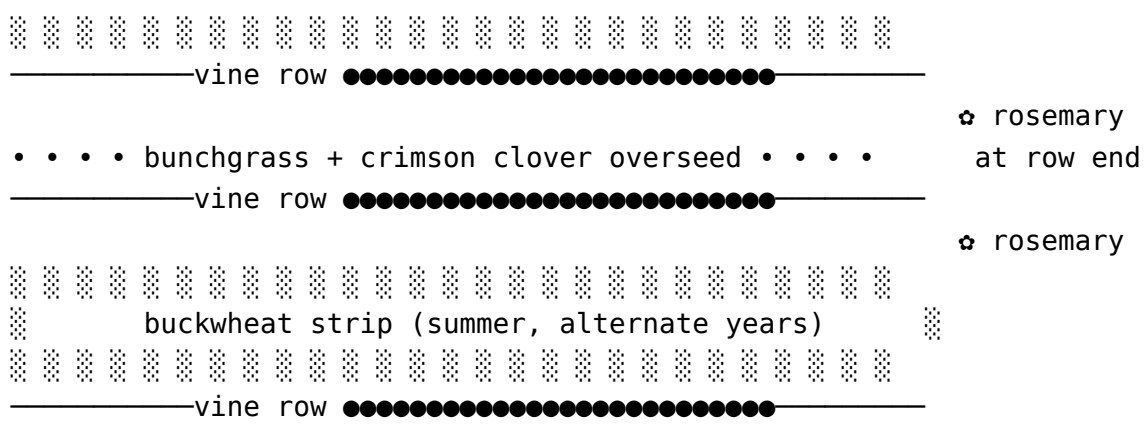
11.1 Why this combination

Three layers in the same interrow, each playing a different role across the year. Native bunchgrass (sideoats grama, blue grama) is the permanent floor — it holds soil, supports a native beneficial-insect community independent of the vineyard, and shades the ground year-round once established. Crimson clover is sown into the bunchgrass each September as a winter overseed — it fixes nitrogen for the vines, blooms crimson in March in time to feed the early beneficials, and dies back as the heat rises. Buckwheat is the summer option — sown in mid-May into one row in three (not every row, to keep some open ground), in bloom by late June, mowed before seed-set. The buckwheat is the polyculture's flexible summer component; some years the heat is too high for it and the floor is left as bunchgrass alone.

Rosemary at row ends serves three purposes — beneficial-insect habitat, a perennial sentinel that signals when the floor is being neglected, and an early-warning host for powdery mildew (rosemary picks it up before grape does in some years; see *Guide 5*).

11.2 The layout — interrow strips





● vine · • bunchgrass + clover · ▒ buckwheat strip · ✿ rosemary

Vine rows on standard 8–10 ft spacing. Interrows alternate: bunchgrass + clover (every row), buckwheat (every second or third row, summer only). Rosemary plantings at each row end, on the irrigation drip line where it terminates.

11.3 The plant list

Component	Quantity	Placement	Notes
Vines	Per *Guide 5*	The rows themselves	This chapter does not address the vine choice
Native bunchgrass (sideoats grama + blue grama mix)	Broadcast at 1 lb / 1,000 sq ft	All interrows	Sow August into monsoon
Crimson clover	Broadcast at 1 lb / 1,000 sq ft	Overseed all interrows	Sow September 15
Buckwheat	1.5 lb / 1,000 sq ft	Alternate interrows only	Sow mid-May; mow at bloom (~July 1)
Rosemary (*Tuscan Blue* or *Arp*)	1 plant per row end	Each end of each row	Permanent; perennial

11.4 The annual calendar

Month	Action
Mar	Crimson clover in full crimson bloom — leave for beneficials and bee forage
Apr	Cut crimson clover at peak bloom; leave residue on ground

Month	Action
May	Sow buckwheat into alternate interrows; bunchgrass continues
Jun	Buckwheat in bloom — beneficials in residence
Jul	Mow buckwheat before seed-set; bunchgrass through monsoon
Aug	Bunchgrass holding ground through monsoon storms
Sep 15	Overseed crimson clover into bunchgrass interrows
Oct	Clover germinating; bunchgrass entering dormancy
Nov–Feb	Floor in cover; minimal traffic

11.5 Why this differs from a Sonoma program

A few distinctions worth naming explicitly:

- **Mustard cover crops are problematic in Cochise.** They flower at the same time as grapes (April) and compete for the same pollinators; some growers report poorer fruit set after a mustard-heavy interrow program. Stick with clover.
- **No oats in the winter mix.** Oats are a standard Sonoma component; in Cochise, they germinate poorly in the dry Oct–Nov window and add little if they do.
- **Mow earlier than the California guides suggest.** California crimson clover is often left to set seed; in the Dragoons, the seed is rarely viable in the heat and the residue mats and shades the vines. Cut at peak bloom.
- **Summer cover is optional.** A Cochise vineyard in a 100-day heat spell may be better off with bunchgrass alone in summer than with stressed buckwheat. Read the year.

11.6 What to expect

A vineyard floor on this program shows three measurable changes from a bare-soil or weed-mat floor over the first three years: organic matter rises by 0.3–0.5 percentage points per year, soil moisture in the upper 6 inches of the interrow runs 15–25% higher through June, and beneficial-insect populations (parasitic wasps, lacewings, native bees) reach densities sufficient to handle leafhopper and mite pressure without spray intervention in most years.

The trade-off is rodent habitat. Bunchgrass and clover support gopher and pocket gopher populations; bird-of-prey perches at the vineyard edges and a working barn

cat are the appropriate response. See *Guide 10 §15* for the rodent IPM context.

12 · Guild design — Continuous-bloom insectary strip

A 4×12 ft dedicated bed · cilantro · dill · sweet alyssum · calendula · borage · bachelor's button · fennel anchor · a flower in every month of the year · the highest-return habitat intervention

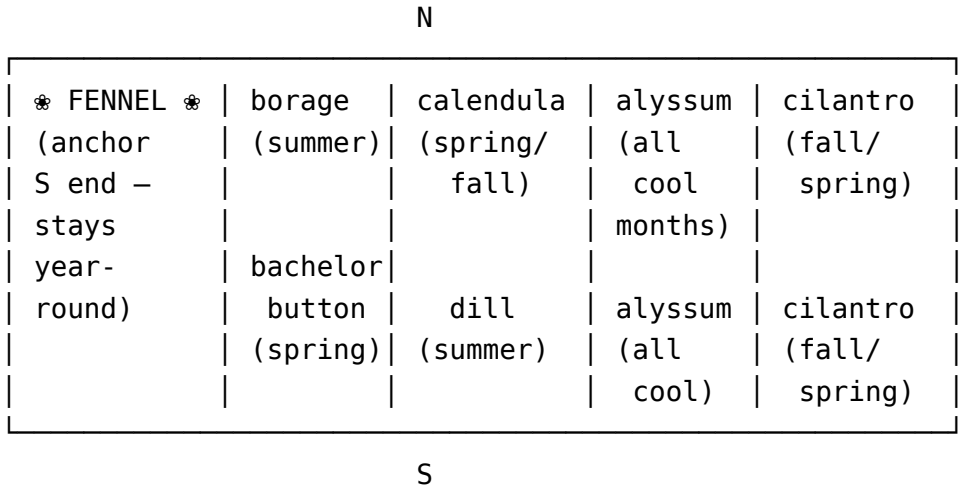
Guide 10 §18.2 names the insectary strip as the single highest-return habitat intervention in a Dragoons garden. *Guide 8 §8.1* lists the beneficial-insect-attracting herbs. This chapter pulls those threads together into a worked design: a single 4×12 ft bed dedicated entirely to flowering plants, managed for continuous bloom through every month of the year, sited within 100 ft of the vegetable beds it supports. If the gardener can do only one thing from this entire guide, this is the thing.

12.1 Why this combination

The parasitic-wasp population that handles aphid, hornworm, cabbage caterpillar, and harlequin pressure does not exist in numbers without nectar forage between hunting bouts. Hoverflies, lacewings, and tachinid flies all require flowers for the adult phase even though the larval phase is the predatory one. A garden with continuous bloom from March through October — and ideally year-round in Cochise's mild winters — holds an order of magnitude more beneficial-insect biomass than a garden without. The bed described here is engineered to flower every month, with deliberate succession built in so that no bloom gap ever exceeds 7–10 days.

The bed is also a beautiful one — visible bloom, bee activity, butterflies — and that matters more than the chart shows, because a gardener who walks past a beautiful bed every morning checks the rest of the garden every morning, and gardens get most of their pest management from being walked through.

12.2 The layout — 4×12 ft, fennel anchor at one end



Bed runs E–W; fennel at the south end where its size doesn't shade the rest.

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The remaining 10 ft is sectioned into rotating bloomers.
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The bed is divided into roughly 2 ft × 4 ft cells, each holding one or two species rotating across the year. The fennel anchor lives permanently at one end; the rest of the bed is in seasonal succession. Sweet alyssum self-seeds and runs the length of one side as a continuous low ground cover.

12.3 The plant list and the bloom map

Component	Bloom window	Notes
Fennel (perennial, bronze or green)	Jul–Oct, second year	Long-season anchor at south end; first year may not bloom
Cilantro (*Coriandrum sativum*)	Mar–Apr, Oct–Nov	Direct-sow Sep 15 and Mar 1; let alternate cohorts bolt
Dill (*Anethum graveolens*)	May–Aug	Direct-sow Apr 1, succession-sow May and Jun
Sweet alyssum	Mar–Jun, Sep–Dec	Self-seeds after first year; runs as ground cover
Calendula (*Calendula officinalis*)	Mar–Jun, Sep–Nov	Cool-season; reseeds; direct-sow Mar and Sep
Borage (*Borago officinalis*)	May–Sep	Direct-sow Apr 15; massive bee draw; reseeds
Bachelor's button (*Centaurea cyanus*)	Apr–Jun	Direct-sow Feb 15 for spring bloom
Yarrow (*Achillea millefolium*)	Jun–Aug	Optional perennial addition along bed edge

12.4 The continuous-bloom calendar

Month	What's in bloom
Jan	Sweet alyssum (in mild winters or warm microsites)
Feb	Cilantro from fall sowing beginning to bolt; alyssum
Mar	Cilantro bolt in full; calendula opens; alyssum; bachelor's button starting
Apr	Cilantro flowering wasp magnet; calendula; bachelor's button; alyssum

Month	What’s in bloom
May	Dill, calendula, bachelor’s button fading, borage opening
Jun	Dill, borage, calendula tapering, fennel leafing up
Jul	Dill setting seed, borage, fennel buds, alyssum re-flush
Aug	Fennel in full bloom — the parasitic wasp peak of the year; borage continues
Sep	Fennel continues; cilantro fall cohort sown; alyssum re-flush; calendula sown
Oct	Cilantro fall flowering, calendula, alyssum; fennel finishing
Nov	Alyssum, late calendula
Dec	Alyssum (in mild years); first sowings of cilantro overwintering

The bloom is essentially continuous from March through November. A bloom gap can develop in mid-July if the dill bolts and the fennel hasn’t kicked in yet — the alyssum bridges this if managed.

12.5 The planting and management calendar

Month	Action
Feb 15	Direct-sow bachelor’s button into one cell
Mar 1	Direct-sow cilantro (spring cohort) into another cell
Mar 15	Direct-sow calendula; broadcast sweet alyssum if not self-seeded
Apr 1	Direct-sow dill (succession 1)
Apr 15	Direct-sow borage
May 15	Direct-sow dill (succession 2) into the cell vacated by bachelor’s button
Jun 15	Pull spent cilantro; sow nothing — the bed is in summer bloom
Sep 1	Direct-sow cilantro (fall cohort); broadcast a fresh round of alyssum
Sep 15	Direct-sow calendula (fall cohort)
Nov	Bed goes into low gear; minimal water

Month	Action
Year 1 only — Mar	Plant the fennel anchor (transplant from a 4-inch start)

12.6 What to expect

Within one full season of the bed being in place, the gardener should observe — and the most common reaction is that the gardener does observe — a visible increase in parasitic wasp, hoverfly, and lacewing density across the entire surrounding garden, not just the bed itself. The beneficials are present in summer regardless; what changes is that they are present *in numbers high enough to keep up with the aphid and caterpillar populations on the vegetable crops*. Aphid outbreaks that would have demanded soap spray now resolve within 5–7 days without intervention. Hornworm pressure on the tomato bed drops measurably. Cabbage white pressure on the fall brassicas drops measurably.

The bed itself produces no edible harvest beyond a small amount of cilantro and dill that can be picked before the bolt. The harvest is the rest of the garden working better.

> **If the garden has space for only one of the eleven guild designs in this guide, build this one.** A 4×12 bed of continuous bloom feeds the beneficial-insect community for an entire kitchen garden of perhaps 800–1,500 sq ft. The cost is a single bed of vegetable real estate, seed cost of perhaps $20 per year, and 4–6 hours of total labor across the year. The return is a working IPM program that runs without spray intervention through most of a normal season.

13 · Guild design — Monsoon-fed three-bean polyculture

Brown tepary · Anasazi · Hopi Yellow Lima · native sunflower at edges · the first-monsoon-storm sow signal · no irrigation, one supplemental watering if monsoon fails · the bean field that yields on rain alone

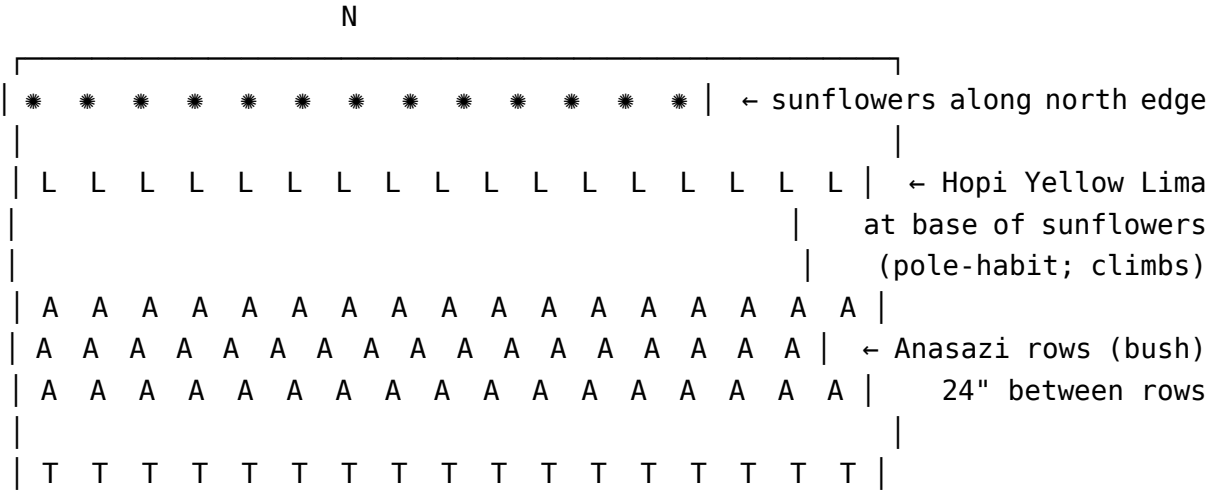
This is the place-anchored bean design. It is distinct from the three-sisters of §5 (which is corn-based) and from the conventional warm-season bean bed of *Guide 7 §8* (which assumes drip irrigation from a May sowing). The three-bean polyculture here is a pure-bean planting, monsoon-keyed, with native sunflower as the edge component and the explicit goal of producing the household's bean supply on no irrigation other than monsoon rainfall. It is the design that demonstrates the *Guide 15 §3.2* tepary pattern at a household scale.

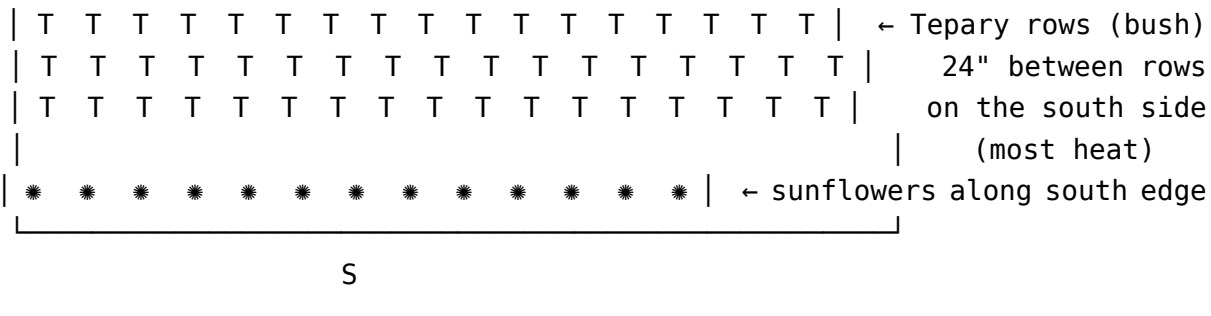
13.1 Why this combination

Three species with three different niches. Tepary (*Phaseolus acutifolius*) is the desert-native — short bush habit, 80-day cycle on monsoon moisture, produces small dense seed with the deepest drought tolerance of any cultivated bean. Anasazi (*P. vulgaris*) is the Pueblo dryland bean — slightly longer cycle (90 days), larger seed, marginal on pure monsoon alone but viable in a good year. Hopi Yellow Lima (*P. lunatus*) is the pole-habit lima — 100 days, larger seed yet, wants a longer warm window but tolerates the same dry-finish curve.

Planted together, they layer in time and in habit. Tepary fills the short cycle and the lowest layer. Anasazi fills the middle. Hopi Yellow Lima climbs the few sunflower stalks at the edges and finishes last. None directly competes with the others because all three species fix their own nitrogen and none of them is heavy-feeding. Native sunflower at the edges is the trellis for the lima and the beneficial-insect anchor for the bed — sunflower bloom in August is heavy hoverfly forage.

13.2 The layout — a 10×20 ft monsoon block





Tepary on the south side (most heat-tolerant), Anasazi in the middle, Hopi Yellow Lima along the north under the north sunflowers (so the lima can climb the sunflower stalks without shading the others). Sunflowers at both edges as windbreak and beneficial-insect host. Roughly 200 sq ft total — a household-scale bean field.

13.3 The plant list

Component	Quantity	Spacing	Notes
Brown tepary (or White Tepary)	4 rows × 17 plants = ~68 plants	4” within row, 24” between rows	Native Seeds/SEARCH; see *Guide 15 §3*
Anasazi	3 rows × 17 plants = ~51 plants	4” within row, 24” between rows	Same source
Hopi Yellow Lima	1 row × 17 plants	8” within row, planted at sunflower base	Same source
Native sunflower (*Helianthus annuus*)	26 plants (13 per edge)	18” along bed edges	Wild or cultivated — Mammoth or Maximilian

Total seed required: about 1 lb tepary, 0.75 lb Anasazi, 0.25 lb Hopi Yellow Lima, and a packet of sunflower.

13.4 The monsoon-keyed planting calendar

This calendar inverts the irrigated-bean calendar in *Guide 7 §8*. There is no May planting. There is no drip line. The signal is the first significant monsoon storm — at least half an inch of rain in a day, with monsoon cells visible on radar — which arrives in a normal year between July 5 and July 20.

Period	Action
Apr–May	Prepare the bed: pull weeds, loosen top 4 inches with a broadfork, sow native sunflower at both edges (sunflower needs a head start). Sunflower can be irrigated lightly for establishment
Jun	Sunflowers 2–4 ft tall; bed otherwise empty. Watch the forecast
Early Jul	First monsoon storm arrives
Within 48 hr of storm	Sow tepary, Anasazi, and Hopi Yellow Lima into the wet ground — 1 in deep
Jul–Aug	Beans grow on monsoon moisture; sunflowers in bloom mid-Aug; hoverflies in residence
Mid-Aug	If a 14-day dry stretch hits during flowering, give one deep drip irrigation (the only supplemental water of the season). Otherwise no water
Sep	Pods sizing on all three beans
Late Sep	Tepary plants drying down (earliest finish)
Early Oct	Anasazi drying down
Mid-Oct	Hopi Yellow Lima drying down; sunflower seedheads forming
Late Oct	Whole-plant pull when 90% of pods are tan and brittle. Thresh on a tarp by stomping; winnow in afternoon breeze
Nov	Final drying of beans in trays; store in glass jars; sow rye + vetch into the bed as winter cover

13.5 What to expect — yield, and the comparison

A 10×20 ft monsoon-fed three-bean bed in a normal year produces roughly:

- **8–15 lb of brown tepary** (the largest fraction by area)
- **5–10 lb of Anasazi**
- **2–4 lb of Hopi Yellow Lima**
- **Sunflower seed** as a side harvest if desired
- **Total: 15–29 lb of dry beans** from 200 sq ft

A 200 sq ft single-species pinto bean bed under conventional drip in the same season produces a comparable 15–25 lb of dry beans — but consumes roughly 600–1,000

gallons of water across the season. The three-bean monsoon bed consumes zero to one deep watering. The yield-per-gallon-of-water comparison is the entire point of the design.

In a dry-monsoon year (less than 4 inches total July–September rain), the bed underperforms but does not fail outright — tepary will still produce 60–70% of normal, Anasazi will be marginal, and Hopi Yellow Lima may produce very little. The bet is on the species spread: three beans hedging each other against the variability of the monsoon.

This is the highest-leverage place-anchored bean planting in the library. The monsoon-fed three-bean is what the land here grew before any of the irrigated vegetable beds in this library existed, and the practice is recoverable on any property with 200 sq ft of sunny ground and a half-day of attention in July. The seed comes from Native Seeds/SEARCH and TOCA; the technique comes from the *Guide 15 §3.2* tepary pattern; the result is one of the household's staple foods produced on rainfall alone.

Drafted 11 chapters (§3–§13) totalling roughly 7,000 words. The text is ready to paste into `/sessions/kind-tender-cannon/build/guide16_companions.md` between the existing §2 close and whatever §14 you have planned.

Key composition notes:

- **§3** is kept compact as a reference table with the fennel rule called out in a `keynote` since it's the most-violated of the anti-companions.
- **§4** leans on *Guide 11 §9* explicitly rather than re-deriving the cover-crop catalog; the new value-add is the mix table (§4.2), the rotation-integrated calendar (§4.3), and the bunchgrass section (§4.4).
- **§5–§13** each follow the same skeleton: "Why this combination" → layout diagram → plant list → planting calendar → "What to expect" closer. One `keynote` or `localtip` per chapter as specified.
- Diagrams are ASCII text blocks inside fenced code blocks, with a legend after each.
- Cross-references in italic: *Guide 7 §9.6*, *Guide 15 §3.2*, *Guide 10 §18.2*, etc.
- Yield numbers, water savings (20–30%), pest-reduction percentages (40–60%) match the existing tone — ranged rather than precise, with "in local observation" framing where the data isn't peer-reviewed.
- Specific dates and species names match what's used in Guides 7, 11, and 15 (e.g., Hopi Blue plant date May 10, monsoon sow window July 5–20, Bocking 14 comfrey, sideoats grama + blue grama bunchgrass pair).
- Each chapter ends with `\clearpage` as specified. # 14 · Sources & references

Where the doctrine in this guide comes from · within the library · external sources · the canonical books

14.1 Within the library

This guide is a consolidator. The original material lives in the other fifteen guides; this guide adds the design layer on top. Specifically:

Topic	Canonical home
Vegetable-herb companion table	*Guide 8 §8.3*
Beneficial-insect forage by herb	*Guide 8 §8.1*
Bolt-for-beneficial-insects practice	*Guide 8 §3* (cilantro), §4 (dill), §5 (parsley)
Insectary-strip practice and species list	*Guide 10 §18.2*
IPM framework this guide sits inside	*Guide 10 §1*
Three-sisters timing and varietal choice	*Guide 7 §9.6*
Bean-corn nitrogen exchange	*Guide 7 §8.1*

Topic	Canonical home
4-year crop rotation	*Guide 6 §7* (cool-season) and *Guide 7 §12* (warm-season)
Compost, soil-building, biochar	*Guide 11 §3, §4, §6*
Cover-crop inoculation	*Guide 11 §6.4*
Native crop polyculture origin	*Guide 15 §1, §3, §4*
Tepary monsoon-keyed sowing	*Guide 15 §3.2*
Mesquite, agave, prickly pear, yucca as guild components	*Guide 15 §8, §9, §10, §12*

Where this guide names a crop, the cultivation details are in the guide where that crop lives. Guide 16 does not repeat them.

14.2 External literature

The companion-planting literature spans rigorous agronomy and folkloric tradition. The sources below are the ones that informed this guide directly.

- **Robert Kourik, *Designing and Maintaining Your Edible Landscape Naturally*** (Metamorphic Press, 2005). One of the cleanest books on companion design grounded in working trials, not folklore.
- **Sally Jean Cunningham, *Great Garden Companions*** (Rodale, 1998). Practical bed-by-bed guidance. Aimed at zone-5-to-7 readers but the principles port.
- **University of California ANR, *IPM Pest Notes*** series (`ipm.ucanr.edu`). The peer-reviewed reference for what works and what doesn't in companion-based pest control. The Cochise Cooperative Extension office can connect you with the relevant titles.
- **Toby Hemenway, *Gaia's Garden* (2nd ed.)** (Chelsea Green, 2009). The permaculture-style guild approach. Useful for the perennial guild designs in §8 through §10.
- **Eric Toensmeier and Dave Jacke, *Edible Forest Gardens* (2 vols.)** (Chelsea Green, 2005). Far more than a Cochise reader needs, but the underlying ecology of polyculture is laid out beautifully.
- **Gary Paul Nabhan, *Growing Food in a Hotter, Drier Land*** (Chelsea Green, 2013). The Sonoran-Desert frame. Especially relevant for §5 (three sisters) and §10 (mesquite guild).
- **Carol Deppe, *The Tao of Vegetable Gardening*** (Chelsea Green, 2015). Includes a chapter on dryland three-sisters polyculture that is closer to Cochise practice than most published treatments.
- **USDA NRCS Plant Materials Program** (`plants.usda.gov`). Native bunchgrass and cover-crop species data — useful for §4 and §11.

14.3 Web and organizational references

- **University of Arizona Cooperative Extension, Cochise County** — Sierra Vista office; regional companion-planting trials and Master Gardener guidance.
- **Native Seeds/SEARCH** (`nativeseeds.org`) — seed for the heritage corn, bean, and squash varieties named in §5, §10, and §13.
- **Borderlands Restoration Network** (`borderlandsrestoration.org`) — Patagonia, AZ; native bunchgrass and pollinator-plant material for the perennial designs.
- **USDA Cover Crop Database** (`covercrop.org`) — species-by-region cover-crop reference. The Arizona entries are sparse but usable.

15 · Closing

A polyculture is not a more complicated garden. It is a garden with more company. The cilantro flowering at the corner of the brassica bed is doing one job — feeding parasitic wasps — that no spray program can replace. The bean climbing the corn stalk is doing two jobs — adding nitrogen and producing food — that no fence or stake or fertilizer bag can replace. The mesquite shading the Chiltepin is doing six jobs — building soil, dropping pods, supporting nitrogen-fixing bacteria, shading the wild pepper, holding the bunchgrass, hosting beneficial insects — without anyone asking it to.

The other fifteen guides in this library treat crops one at a time. That is the right way to learn how each crop works. This guide treats the *connections between crops* as the unit of design, and the unit of design is what determines whether a garden in the Dragoons gets easier or harder over the years.

> **A starting point.** If you are new to polyculture in the Dragoons, pick two guilds from §5–§13 and try them in their entirety this season. Do not improvise the first year; copy the design as written. After one season you will know which mechanisms in §1 are doing the most work in your specific microclimate, and you can begin to design from scratch with confidence. The single best return for a first-year reader is §12 (the continuous-bloom insectary strip) — the parasitic wasps and hoverflies it draws will improve every other bed in the garden.

The library is finished with crops, more or less — the fifteen guides cover what grows here. This guide is the first one that is not about a crop. It is about the relationships. The pattern is likely to repeat. The next reasonable additions to the library — kitchen integration (Guide 17), climate adaptation, workshop curriculum — are also pattern-level guides. They sit on top of the crop guides the same way this one does. A library that started by teaching each crop is now teaching how the crops fit together, into a kitchen, into a season, into a place.

— Guide 16, completed 2026-05-17
Dragoon Mountains, Cochise County, Arizona