

Grapes in the Dragoons

Guide 5 · Viticulture

Cochise County Vineyard Practice

Version 2026.05 · Revised 2026-05-16

Contents

1 • Why the Dragoons Are a Viable Wine Region	5
Comparison to established Arizona AVAs	5
The Dragoon advantage	5
2 • Terroir & Site Selection	7
Site evaluation checklist	7
Frost risk management	8
3 • Variety Selection	9
Recommended red varieties	9
Recommended white varieties	11
4 • Soil Preparation & pH Management	14
Soil targets for viticulture	14
Irrigation water bicarbonate treatment	14
Pre-plant soil preparation — timeline	15
5 • Planting & Trellis Systems	16
Rootstock vs own-rooted	16
Vine spacing	16
VSP trellis system — recommended setup	17
6 • Irrigation & Water Management	18
Irrigation targets by stage	18
Salt management — critical for SE Arizona	19
7 • Vine Nutrition	20
Annual fertiliser programme	20
Deficiency quick reference for Dragoon conditions	21
8 • Seasonal Management Calendar	22
9 • Pruning & Canopy Management	26
Spur pruning vs cane pruning	26
Pruning rules of thumb	26
Canopy management for monsoon season	26
10 • Pest, Disease & Wildlife Management	28
11 • Harvest	30
Harvest timing targets	30
Harvest best practices	30
Post-harvest vine care	31
12 • Year 2+ Dormancy & Fruit-to-Wine Handoff	32
12.1 Overwintering established vines	32
12.2 Fruit-to-wine handoff	33

12.3 Brix at harvest — what each destination wants	34
Sources & references	36
Local resources	36
Books & references	36
Online resources	36
Closing	38



RELATED GUIDES

This guide is one of seventeen in the Dragoon Mountains Growing Guides Library: - **Guide 1 — Hydroponic Primer & Library Map** · the front door + master multi-crop calendar - **Guide 2 — Peppers in the Dragoons** · soil + hydroponic + variety-specific staking - **Guide 3 — Bato Bucket Hydroponic Systems** · system build, water treatment, operations - **Guide 4 — Hydroponic Nutrients** · Masterblend + DIY + pH + Indoor/LED - **Guide 5 — Grapes in the Dragoons** (this guide) · Cochise County viticulture - **Guide 6 — Cool-Season Crops** · brassicas + alliums + greens + roots - **Guide 7 — Warm-Season Companions** · tomatoes, cucurbits, beans, corn, sweet potatoes - **Guide 8 — Herbs in the Dragoons** · annual + perennial · soil & hydroponic - **Guide 9 — Backyard Orchard in the Dragoons** · figs, pomegranates, jujubes, stone fruits - **Guide 10 — Pest, Disease & Wildlife** · IPM + Cochise wildlife exclusion - **Guide 11 — Foundations: Soil & Seed** · soil-building, composting, seed-starting, propagation - **Guide 12 — Harvest, Preservation & Storage** · canning, fermenting, drying, cellaring - **Guide 13 — Water in Cochise County** · sourcing, testing, treatment, rainwater, conservation - **Guide 14 — Season Extension Structures** · cold frames, low tunnels, hoop houses, high tunnels - **Guide 15 — Native Food Crops of the Sonoran-Madrean Region** · the indigenous food complex of the Dragoons and the wider sky-island region - **Guide 16 — Companion Plantings & Polycultures** · the design layer — companion matrix, anti-companions, cover crops, 9 Dragoons-specific guild designs - **Guide 17 — Recipes & Kitchen Integration** · what to cook with what came out of the garden this morning · by-crop recipes + seasonal menus

Grapes share more with this landscape than most crops — the same alkaline caliche soils, the same monsoon, the same diurnal swing. Where this guide touches water treatment, pH chemistry, or hydroponic adaptation (table grapes in Bato buckets), it points back to Guides 2 and 3 rather than restating their content. The closest perennial companion is **Guide 9 — Backyard Orchard in the Dragoons**, which covers the rest of the woody fruit (figs, pomegranates, jujubes, stone fruits, pome fruits) on the same caliche soils at the same elevation.

1 · Why the Dragoons Are a Viable Wine Region

Sonoita and Willcox neighbours · elevation advantage · the Pierce's-free zone

The Dragoon Mountains sit squarely between two of Arizona's established wine appellations — the Sonoita AVA to the west and the Willcox AVA to the north. Both operate at 4,500–5,500 ft elevation, on high-pH limestone and granite soils, with monsoon rainfall patterns and large diurnal temperature swings. The Dragoons share every one of these conditions.

Comparison to established Arizona AVAs

Factor	Sonoita AVA	Willcox AVA	Dragoon Mountains
Elevation	4,500–5,500 ft	3,800–4,500 ft	4,500–7,500 ft
Annual rainfall	17–22"	12–15"	15–22"
Soil type	Sandy loam, limestone, caliche	Sandy loam, volcanic, limestone	Sandy loam, granite, caliche
Soil pH	7.5–8.2	7.0–8.0	7.5–8.5
Summer high	88–95 °F	90–98 °F	85–95 °F
Diurnal swing	30–40 °F	35–45 °F	30–45 °F
Frost risk	Oct–Apr	Nov–Mar	Oct–Apr
Phylloxera risk	Very low (dry conditions)	Very low	Very low
Pierce's disease risk	Low (cold winters control it)	Low	Very low — elevation and cold winters

The Dragoon advantage

The Dragoons run cooler than Willcox — higher elevation means longer hang time, which develops complexity and acidity without baking the fruit. The dry, rocky, alkaline soils make life nearly impossible for phylloxera, so own-rooted vines are viable. Pierce's disease is essentially absent because cold winters at elevation eliminate the glassy-winged sharpshooter and the blue-green sharpshooter vectors — a major advantage over low-elevation California growing regions. Sonoita's track record is proven: the nearest established wineries grow identical varieties on near-identical soils at the same elevation, and their results translate directly to Dragoon conditions. Finally, the monsoon delivers 8–12" of summer rainfall, reducing irrigation demand and naturally flushing soil salts.

Pierce's Disease vector window. The bacterium *Xylella fastidiosa* is spread by xylem-feeding leafhoppers (sharpshooters), and the disease only establishes where winter temperatures stay above ~28 °F long enough for the vector to overwinter. At 4,500+ ft in the Dragoons, winter lows reliably drop below this threshold for weeks each year — the vector simply does not establish. Treat this as your single largest viticultural advantage over coastal California.

LOCAL TIP

Callaghan Vineyards in nearby Elgin — same elevation and soil type as the Dragoons — has produced wines that were served at the White House for three US Presidents. The terroir here is world-class when managed correctly.

2 · Terroir & Site Selection

The 20–30 year decision · frost pockets · slope, aspect, caliche

Read this before you order vines. A vineyard is a 3–5 year wait for the first real crop and a 20–30 year commitment to a piece of ground. Almost nothing else in this library has that kind of time horizon. The decisions in this chapter (site, slope, aspect, caliche depth, frost-pocket avoidance) and the next (variety) are *one-shot* — they cannot be cheaply revised once vines are in the ground. Walk the candidate site at dawn in October *and* April before committing, soil-test before you buy plants, and budget for 12 months of soil prep before planting. If you are unsure on any of these, slow down. The vines will wait.

Site selection for a vineyard is a 20–30 year decision. In the Dragoons, the right site dramatically reduces frost risk, disease pressure, and irrigation demand. The wrong site — a frost pocket on a valley floor — can cost you an entire vintage to a late spring freeze.

Site evaluation checklist

Factor	Ideal	Acceptable	Avoid
Slope	5–15 % gentle slope	2–5 % or 15–25 %	Flat valley floor or steep > 30 %
Aspect (facing)	South or south-east facing	East or west facing	North-facing — insufficient sun hours
Air drainage	Cold air flows downhill away from vines	Slight cold-air risk	Bowl or basin shape — frost collects
Caliche depth	36"+ before hardpan — roots penetrate freely	24–36" — manageable with preparation	< 18" — severely limits root depth
Soil depth	24"+ workable soil over well-drained subsoil	18–24"	< 12" — nutrient and water holding too limited
Wind exposure	Moderate — good air movement, no sustained gales	Sheltered — higher disease risk	Exposed ridge — sustained high winds damage canes

Factor	Ideal	Acceptable	Avoid
Water source	Well + monsoon collection within 1,000 ft	Well only — sufficient for drip	No reliable water — unsustainable
Sun hours	2,800+ hours/year — typical at Dragoon elevation	2,400-2,800	< 2,400 — higher elevations with tree cover

Frost risk management

Late spring frosts (April-May) are the primary threat to young shoots and flower clusters. Bud break typically occurs March-April at Dragoon elevations, so frost protection is essential.

Plant on slopes, not floors. Cold air drains to valley bottoms, and even 50 ft of elevation above a frost pocket can save a vintage. **Delay bud break with late pruning** — prune in late February or early March rather than January, which postpones bud break 1-2 weeks past the worst frost window. **Keep lightweight frost fabric on hand** for late-April surprise frosts; cover vines at dusk when temperatures are forecast below 32 °F. At commercial scale, **wind machines** that mix warm air from above into the cold surface air are effective down to about 28 °F.

WARNING

The worst single mistake a new Dragoon vineyard can make is planting in a visually attractive but topographically wrong site — typically a flat, deep-soil swale in a valley floor. Soil and water look perfect, but the site is a cold-air sink. Walk the candidate site at dawn on a clear, calm night in October or April before committing. If the air is noticeably colder than the surrounding slope, you have found a frost pocket.

3 · Variety Selection

Spanish and Rhône varieties · Bordeaux at lower elevations · whites for early ripening

Variety selection is your most critical decision. Choose based on what succeeds at Sonoita and Willcox — your closest analogue growing regions. Spanish and Rhône varieties perform best, as they evolved in hot, dry Mediterranean conditions similar to SE Arizona. Classic Bordeaux varieties also succeed here with the right site. All recommendations below are cultivars of *Vitis vinifera*.

Recommended red varieties

Variety	Origin	Vigour	Harvest	Why it works here	Rating
Tempranillo	Spain	Medium	Late Aug-Sep	The benchmark Arizona variety. Thick skin resists monsoon rot. Big diurnal swing builds complexity and acidity. Proven at Sonoita.	●●●●●
Grenache (Garnacha)	Spain / Rhône	High	Late Aug	Extremely heat- and drought-tolerant. Low disease pressure. Makes excellent rosé and rich reds. Widely grown in Sonoita and Willcox.	●●●●●

Variety	Origin	Vigour	Harvest	Why it works here	Rating
Syrah	Rhône	Medium-High	Late Aug-Sep	Rune Wines' flagship in Sonoita. Loves hot days, cool nights. Deep colour and complex spice notes. Widely grown across Arizona AVAs.	●●●●●
Mourvèdre (Monastrell)	Spain / Rhône	Low-Medium	Sep-Oct	Very late ripening — needs long hang time the Dragoons can provide. Heat- and drought-tolerant. Thicker skin resists monsoon rot.	●●●●○
Petit Verdot	Bordeaux	Low-Medium	Sep-Oct	Called the "Volvo grape" by Sonoita growers for sturdiness. Resists bunch rot. Late ripening. Grown widely at Los Milics Vineyards.	●●●●○

Variety	Origin	Vigour	Harvest	Why it works here	Rating
Sangiovese	Italy	Medium	Aug-Sep	Excellent in Sonoita and Willcox. High acidity works well at this elevation. Suits the Italian-varieties programme at Lightning Ridge.	●●●●○
Cabernet Sauvignon	Bordeaux	Medium	Sep-Oct	Proven at Sonoita Vineyards (served at the White House). Needs a full season. Best at lower Dragoon elevations with longer heat accumulation.	●●●●○
Tannat	S. France / Uruguay	Medium	Sep	Thick skin resists rot and high UV. Grown at Sonoita Vineyards. Produces structured, long-lived wines with high tannin.	●●●○○

Recommended white varieties

Variety	Origin	Harvest	Why it works here	Rating
Malvasia Bianca	Italy	Aug	Top white performer across the Sonoita AVA. Aromatic, heat-tolerant, early-ripening before monsoon rot risk peaks. Grown at Dos Cabezas and Pronghorn.	●●●●●
Viognier	Rhône	Late Jul-Aug	Early ripening avoids heaviest monsoon period. Aromatic and full-bodied. Grown at Rune Wines in Sonoita. Excellent food wine.	●●●●●
Vermentino	Sardinia / S. France	Aug	Drought- and heat-tolerant. High natural acidity. Grown at Los Milics. Crisp, mineral style suits the terroir.	●●●●○
Roussanne	Rhône	Aug-Sep	Rich, complex white. Disease-resistant. Pairs well with Grenache Blanc for blending. Increasingly planted in AZ.	●●●○○

Variety	Origin	Harvest	Why it works here	Rating
Picpoul Blanc	Languedoc	Aug	High acid retention in heat — exactly what you want at this elevation. Grown at Dos Cabezas. Crisp, food-friendly style.	●●●○○

WARNING

Avoid early-budding Pinot Noir and Chardonnay at most Dragoon sites — spring frosts and summer heat make consistent ripening difficult. If your heart is set on these varieties, plant at the highest, coolest elevations (6,000 ft+) with strong frost protection.

4 · Soil Preparation & pH Management

Pre-plant timeline · sulphur acidification · acidified irrigation

Grapes prefer pH 6.0–6.5. Dragoon soils commonly test at 7.5–8.5. This is the same challenge faced by Sonoita and Willcox growers — and they have solved it through a combination of site selection, sulphur acidification, high organic matter, and targeted irrigation water management. Grapevines are more tolerant of alkalinity than most crops, but the micronutrient lockout above pH 7.5 must be managed.

Soil targets for viticulture

Two of the parameters below need a quick gloss for readers new to viticulture. **pH** is the standard acidity/alkalinity scale (0–14, where 7 is neutral); grapes want soil between 6.0 and 6.5, while the Dragoons natively run 7.5–8.5, which is why sulphur amendment matters here. **EC** is electrical conductivity (in millisiemens per centimetre, mS/cm) — a measure of total dissolved salts; high EC in soil or irrigation water locks up nutrients and burns roots.

Parameter	Target	Typical Dragoon reading	Correction method
pH	6.0–6.5	7.5–8.5	Elemental sulphur (pre-plant); acidified irrigation water (ongoing)
EC (soil)	< 1.5 mS/cm	0.5–2.0 mS/cm	Deep leaching irrigations; switch to low-EC rainwater
EC (irrigation water)	< 0.5 mS/cm	0.3–0.8 mS/cm	Blend with monsoon rainwater; RO for critical periods
Organic matter	2–3 %	< 1 %	Compost, cover crops, grape marc return each season
Caliche depth	36" + for roots	18–36"	Rip or auger through caliche at each planting hole
Drainage	Water infiltrates freely	Variable — can waterlog over caliche	Break caliche layer; plant on slopes

Irrigation water bicarbonate treatment

SE Arizona well water is consistently alkaline and high in bicarbonates. Drip irrigation that delivers untreated well water at 7.5–8.5 pH directly to the root zone slowly

resets all the pH-correction work the sulphur is doing. Treat the irrigation water itself.

RELATED GUIDES

See **Guide 3 — Bato Bucket Hydroponic Systems**, §4 (Water Treatment) for the canonical 5-step bicarbonate protocol — vineyard irrigation uses the same approach, simply scaled to the vineyard reservoir or injection tank. The chemistry is identical: test source water, dose acid until the fizz stops, fine-tune pH to ~6.0–6.5, then deliver to the drip line.

For the acid options used — phosphoric acid, citric-acid stock, prickly-pear vinegar, oak-ash lye — see **Guide 4 — Hydroponic Nutrients**, Part 3 (pH adjustment).

For a small vineyard (under 1 acre), a 250–500 gal poly tank on a stand with a venturi injector or a simple stir-paddle works well: fill from the well, treat per the Guide 3 protocol, then gravity-feed or pump to the drip mains. For larger blocks, a continuous-injection acid dosing pump on the supply line achieves the same result without batching.

Pre-plant soil preparation — timeline

Timeline	Action
12 months before planting	Soil test — full panel (pH, OM, NPK, EC, micronutrients). Apply elemental sulphur at 2–4 lb per 100 sq ft if pH > 7.5. Irrigate in and allow to work through the season.
6 months before planting	Apply 3–4" compost and work into top 12". Plant a cover crop of legumes (vetch, clover, cowpeas) to build organic matter and fix nitrogen.
3 months before planting	Re-test pH. Second sulphur application if still above 7.0. Terminate cover crop and incorporate as green manure.
1 month before planting	Final compost application. Rip or auger through caliche at each planting position to 36" depth. Install drip irrigation lines.
At planting	Backfill auger holes with 50 % native soil + 50 % compost mix. Do not amend the hole heavily with rich mix — grapes need to search for nutrients.

5 · Planting & Trellis Systems

Own-rooted vines · spacing · VSP setup

Grapevines in the Dragoons can often be planted on their own roots — phylloxera cannot establish in the dry, rocky, alkaline soils. This simplifies planting considerably. Trellis design should prioritise canopy airflow (reducing monsoon-season fungal risk) and ease of management.

Rootstock vs own-rooted

Option	Recommendation	Notes
Own-rooted vines	Viable and recommended for most sites	Dry, rocky, alkaline soils suppress phylloxera. Sonoita Vineyards grows many own-rooted varieties successfully.
1103 Paulsen rootstock	Use on heavier, damper soils	Drought- and lime-tolerant. If irrigation water pools or soil stays moist, use rootstock.
110R rootstock	Best for very dry, rocky sites	Extreme drought tolerance. Widely used in Spain and southern France — ideal for Dragoon conditions.
Avoid SO4, 3309C	Not suited to this region	These prefer cool, moist soils. Poor performance on alkaline desert soils.

Vine spacing

System	Row spacing	Vine spacing	Vines/acre	Best for
High density	6 ft	4 ft	~1,800	Small plots, hand-tended. Maximum quality, lowest yield. European style.
Standard ●	8 ft	5-6 ft	~900-1,100	Best balance of quality and manageability for Dragoon conditions.

System	Row spacing	Vine spacing	Vines/acre	Best for
Wide row	10-12 ft	6-8 ft	~450-700	Allows tractor access. Lower density but easier management at scale.

VSP trellis system — recommended setup

Vertical Shoot Positioning (VSP) is the standard system for most SE Arizona wineries. It maximises airflow through the canopy — critical during monsoon humidity — and makes harvesting and canopy management straightforward.

Component	Specification
End posts	4" × 4" treated wood or steel T-post, 8 ft long, driven 3 ft deep. Brace outward.
Line posts	2" × 2" treated wood or metal T-post, every 20-25 ft.
Footing wire (cordon wire)	12.5-gauge high-tensile wire at 36" height. Main fruiting zone.
Catch wires (movable)	Two pairs of catch wires at 48" and 60" height. Tuck growing shoots upward.
Post height above ground	5-6 ft above ground to allow 24" working clearance below cordon.
Vine tie	Soft vine ties or grafting tape. Never wire directly on young trunks.

LOCAL TIP

Table grapes in containers. If you are also growing table grapes (Thompson Seedless, Flame, Concord) on a homestead scale rather than for wine, they adapt well to large Bato-style buckets with perlite media and drip fertigation — useful for patio production or for evaluating new varieties before committing a vineyard row. The bucket build and the daily-operations rhythm are covered in **Guide 3 — Bato Bucket Hydroponic Systems**, §7 (Adapting the System). Nutrient targets for fruiting grapes follow the same ratios as fruiting peppers — see Guide 4.

6 · Irrigation & Water Management

Deficit irrigation · stage-by-stage gal/vine/day · salt management

Grapes are more drought-tolerant than most crops but require precisely managed irrigation, especially on the alkaline, fast-draining soils of the Dragoons. Deficit irrigation — deliberately limiting water to stress the vine slightly — produces higher-quality fruit than abundant watering.

Irrigation targets by stage

Growth stage	Water need	Strategy	EC limit
Dormancy (Nov-Feb)	Very low	One deep soak per month to prevent complete desiccation	N/A
Bud break (Mar-Apr)	Low-moderate	Begin drip at 1-2 gal/vine/day. Increase as canopy develops	< 0.8
Shoot growth (Apr-Jun)	Moderate	2-4 gal/vine/day. Consistent moisture for cell division	< 1.0
Flowering (May-Jun)	Moderate — critical	Do NOT water-stress during bloom — causes shatter. Maintain even moisture	< 0.8
Fruit set & sizing (Jun-Aug)	Moderate	3-5 gal/vine/day. Monsoon begins July — monitor rainfall closely	< 1.2
Veraison → harvest (Aug-Sep)	Low — deficit irrigation	Reduce to 1-2 gal/vine/day after veraison. Stress concentrates flavours	< 1.5
Post-harvest (Oct-Nov)	Low	2 gal/vine/day until leaf fall to replenish root reserves	< 1.2

Salt management — critical for SE Arizona

Test irrigation water EC before every season. SE AZ well water commonly reads 0.3–0.8 mS/cm — already approaching grape tolerance limits. In March, before bud break, run an annual **deep leaching irrigation** at 2× normal volume to flush accumulated salts below the root zone. **Use the monsoon as a salt flush:** it naturally leaches salts, so reduce or eliminate drip irrigation during heavy monsoon periods. **Fertilise with sulphate of potash** (K_2SO_4), not muriate of potash (KCl), because chloride accumulates in soil and is toxic to grapes above 350 ppm. **Blend water sources:** mixing well water with collected monsoon rainwater dilutes EC, and even a 50 % blend significantly reduces salt load.

LOCAL TIP

Sonoita technique. Sonoita Vineyards founder Dr. Gordon Dutt developed a water-harvesting system using hillside berms to capture monsoon runoff and channel it to vines — reducing irrigation demand and providing free, low-EC water. This approach is directly applicable to any sloped Dragoon Mountain vineyard site. Combined with a roof-catchment tank for the working zone, monsoon harvest can supply 30–50 % of annual vineyard water needs.

7 · Vine Nutrition

Annual programme · foliar interventions · deficiency quick-reference

Grapevines are relatively light feeders compared to annual vegetables. Over-fertilising — especially with nitrogen — produces excessive vegetative growth at the expense of fruit quality. The goal is balanced nutrition that supports fruit production without pushing rampant shoot growth.

Annual fertiliser programme

Nutrient	Annual target	Application timing	Best local source
Nitrogen (N)	40–60 lb N/acre (moderate)	Split: 60 % at bud break, 40 % at fruit set. STOP after veraison.	Compost, alfalfa meal, fish emulsion (Willcox feed stores)
Phosphorus (P)	Low — desert soils often adequate	Pre-plant only unless test shows deficiency	Bone meal, bat-guano tea, composted manure
Potassium (K)	40–60 lb K ₂ O/acre	At bud break and again at veraison — critical for fruit quality	Sulphate of potash (purchase). Oak ash provides K but also raises pH.
Magnesium (Mg)	Foliar spray if deficient	At bud break and again 3 weeks later if chlorosis appears	Epsom salt — 1 lb per 100 gal water. Natural epsomite from Sulphur Springs Valley.
Iron (Fe)	Foliar chelated iron as needed	When interveinal chlorosis appears (common above pH 7.5)	Chelated iron (EDDHA form preferred at high pH). Oak tannin + clay extract locally.
Zinc (Zn)	Foliar spray if deficient	At bud break — zinc affects fruit set. Deficiency = small, seedless berries.	Zinc sulphate foliar spray or Bisbee-area zinc-ore extract (diluted)
Boron (B)	Foliar — very small amounts	Just before flowering — critical for pollen tube development	Borax solution (¼ tsp per gallon). Desert caliche soil tea.

RELATED GUIDES

The full locally-sourced recipes for iron (oak tannin + red-clay chelate), potassium (oak-ash potash), phosphorus (bat-guano tea), and the trace minerals live in **Guide 4 — Hydroponic Nutrients**. Those brews work as well for foliar-spray applications on vines as they do for a reservoir.

Deficiency quick reference for Dragoon conditions

Symptom	Likely cause	Fix
Yellow between green veins — older leaves	Magnesium (common in sandy Dragoon soils)	Foliar spray: 1 lb Epsom salt per 100 gal water. Apply 2-3 times at 2-week intervals.
Yellow between green veins — new growth	Iron or manganese (pH lockout above 7.5)	Lower irrigation water pH to 6.0. Apply chelated iron EDDHA foliar spray. Long-term: lower soil pH with sulphur.
Small, seedless berries, poor fruit set	Zinc deficiency	Foliar spray of zinc sulphate at bud break (¼ tsp per gallon).
Flower cluster shatter, poor set	Boron deficiency or water stress at bloom	Foliar boron before flowering. Maintain even irrigation through bloom — never stress at this stage.
Red/purple leaves in summer	Phosphorus deficiency or cold root zone	Usually resolves as soil warms. If persistent, apply bone-meal drench.
Stunted shoots, pale green leaves	Nitrogen deficiency or waterlogged roots	Check drainage first — root death prevents N uptake. If drainage is fine, apply fish-emulsion drench.

8 · Seasonal Management Calendar

Month-by-month tasks · vine status · frost and monsoon watch points

Month	Stage	Key tasks	Vine status
January	Dormancy	Vines fully dormant. Plan pruning strategy. Order supplies. Take soil samples if not done in fall. Apply dormant-season elemental sulphur for pH correction.	No active growth
February	Late dormancy	Begin pruning in late February — delay slightly to reduce frost risk to new buds. Apply compost around vine bases. Install frost cloth on standby.	Buds swelling
March	Bud break	Bud break begins — FROST WATCH begins now. Begin drip irrigation at low rate. Apply first nitrogen (compost tea or fish emulsion). Cover with frost cloth on cold nights.	First green shoots emerging
April	Active shoot growth	Rapid shoot growth. Begin shoot positioning on trellis wires. Frost still possible — keep cloth accessible. Apply zinc foliar spray for fruit-set support.	Shoots 6-18" long

Month	Stage	Key tasks	Vine status
May	Flowering	Flowering — CRITICAL MONTH. Maintain even irrigation. Apply boron foliar BEFORE flowers open. Do NOT apply copper fungicides during bloom — toxic to pollen.	Flower clusters visible and opening
June	Fruit set & pre-monsoon	Fruit set complete. Begin canopy management — remove excess shoots, position canes. Increase irrigation as heat rises. Prepare monsoon water-harvest systems.	Small green berries sizing up
July	Monsoon begins & berry growth	Monsoon begins mid-July. Monitor rainfall — reduce drip irrigation accordingly. WATCH for powdery mildew in humid conditions. Apply sulphur or copper preventively.	Berries growing rapidly

Month	Stage	Key tasks	Vine status
August	Veraison → harvest approaches	Veraison (colour change) occurs. REDUCE irrigation to deficit levels from now. Take weekly <i>Brix</i> readings (sugar content in degrees, measured with a refractometer from a single crushed berry — see §11). Remove leaves on east side to improve air circulation. White varieties often harvest late August.	Berries changing colour and ripening
September	● Harvest	PRIMARY HARVEST MONTH. Most red varieties ready in September. Pick by <i>Brix</i> , pH, and taste — not calendar. Harvest early morning when cool. Post-harvest: apply fish emulsion and potassium to replenish reserves.	Harvest reds. Monitor <i>Brix</i> daily.
October	Post-harvest care	Continue irrigation until leaf fall. Apply compost around vines. Plant cover crop between rows (vetch, clover, winter rye). Last chance for pH-correction sulphur application before dormancy.	Leaves yellowing, vine winding down

Month	Stage	Key tasks	Vine status
November	Leaf fall & dormancy begins	Irrigation taper to monthly deep soak. Mow or terminate cover crop. Soil test for next season planning. Return grape marc (skins/seeds) to compost.	Dormant — no active growth
December	Full dormancy	Vines fully dormant and cold-hardened. Final soil-amendment applications. Review season notes — what worked, what didn't. Plan variety additions.	Dormant

9 · Pruning & Canopy Management

Spur vs cane · late-February timing · monsoon airflow

Pruning determines your yield, fruit quality, and vine health for the coming season. In the Dragoons, canopy management has an added critical function — maintaining air-flow through the vine during the humid monsoon season to prevent powdery mildew and botrytis.

Spur pruning vs cane pruning

Method	Best varieties	Description	Dragoon recommendation
Spur pruning (Cordon system)	Tempranillo, Grenache, Syrah, Mourvèdre	Permanent cordon arms along wire. Cut each cane back to 2-bud spurs. Simple and consistent.	● Preferred for most varieties. Easier management, less skilled labour.
Cane pruning (Guyot system)	Sangiovese, Cabernet, Viognier	One or two long canes tied along wire each year. Old canes removed completely.	Use for varieties that fruit poorly from basal buds. More complex but higher quality.

Pruning rules of thumb

Prune to the vine's capacity — a general rule is 20–30 buds per pound of cane pruned off; a weak vine gets fewer buds, a vigorous vine more. Delay until late February in the Dragoons to avoid exposing tender new growth to late frosts. Bleeding from cut canes is normal and harmless. Always cut to a healthy bud: make clean cuts ¼" above the bud, angled slightly away from it, with sharp, clean secateurs. Remove all prunings from the vineyard — pruning wood harbours mildew spores; burn or compost them away from vines.

Canopy management for monsoon season

This is the most important canopy task specific to SE Arizona. The sudden humidity of the monsoon creates ideal conditions for powdery mildew in a dense canopy. **Open the canopy before July.**

- **Shoot thinning (May-June)** — remove suckers, double shoots, and any shoots growing toward the inside of the canopy; target 4–6 shoots per foot of cordon.
- **Shoot positioning (May-June)** — tuck growing shoots upward into the catch wires; this lifts the fruiting zone off the ground and improves airflow.

- **East-side leaf removal (July)** — remove 2-3 leaves around the fruit zone on the east side; improves airflow without sunburn risk (afternoon sun on west-side leaves still shades the fruit).
- **Hedging (July-August)** — trim shoot tips that extend beyond the top catch wire; reduces canopy mass and improves spray penetration.

The single rule that prevents most fungal loss in the Dragoons: open the canopy *before* the monsoon arrives, not after disease appears. Once powdery mildew is established on a dense canopy in July humidity, you are managing damage rather than preventing it. East-side leaf pull by July 1 is the deadline that matters.

10 · Pest, Disease & Wildlife Management

Monsoon disease window · vertebrate exclusion · the bird-netting cutoff

Disease pressure in the Dragoons is generally lower than in humid wine regions, but the monsoon creates a concentrated 6–8 week window of risk each summer. The key is preventive management before the rains arrive, not reactive spraying after disease is established.

Threat	Season	Signs	Prevention & control
Powdery mildew ● #1 threat	Jul-Sep (monsoon)	White powdery coating on leaves, shoots, and berries	Sulphur dust or wettable sulphur spray every 14 days from June. Open canopy before July. Never spray sulphur above 95 °F — burns vines.
Botrytis (bunch rot)	Aug-Sep (late monsoon)	Grey fuzzy mould on grape clusters, especially tight clusters	Open canopy for airflow. Leaf removal in fruit zone. Copper-based spray preventively. Choose loose-clustered varieties.
Phytophthora (root rot)	Post heavy rain	Sudden wilting, dark basal trunk discolouration	Plant on slopes with good drainage. Break caliche layer. Avoid waterlogging.
Leafhoppers	Spring-Fall	White stippling on leaves; small jumping insects	Tolerate low levels. Insecticidal soap for heavy infestations. Beneficial wasps.
Spider mites	Jun-Aug (hot, dry)	Fine webbing under leaves; stippled, bronzed foliage	Sulphur sprays suppress mites. Avoid broad-spectrum insecticides that kill natural predators.
Grape berry moth	May-Aug	Entry holes in berries; small caterpillars inside clusters	Pheromone traps for monitoring. Spinosad spray if threshold exceeded.

Threat	Season	Signs	Prevention & control
Javelina	Year-round	Vine browsing, trunk damage, uprooted young vines	Welded wire fence 4 ft high around vineyard perimeter. Individual trunk wraps for young plants in first 3 years.
Deer	Year-round (worse in drought)	Browsing of shoots and clusters, especially in dry years	8 ft fence for reliable deer exclusion. Motion-activated deterrents.
Birds	Aug-Sep (harvest)	Pecked, damaged berries — invites secondary rot	Bird netting over rows from veraison to harvest. Reflective tape and scare devices for small plots.

Bird-netting cutoff date. Get bird netting on every fruiting row *the day veraison starts* — typically the first week of August for whites, mid-August for reds. Once flocks discover the vineyard, they return daily and a small block can lose 30-50 % of its crop in under two weeks. Once netted, do not lift the netting until harvest morning; partial coverage just teaches the birds where to enter.

11 · Harvest

Brix / pH / TA targets · early-morning picking · post-harvest vine care

Harvest timing is the most critical decision of the entire growing season. The large diurnal temperature swings of the Dragoons are a major asset here — they naturally preserve acidity as sugars accumulate, giving you a wider harvest window than low-altitude growers have.

Harvest timing targets

Three measurements drive the pick decision: *Brix* (sugar content in degrees, measured by refractometer — predicts the finished alcohol), *pH* of the must (the acidity of the crushed juice, which sets fermentation stability), and *TA* (titratable acidity, in grams per litre of tartaric acid — the perceived tartness on the palate and the back-stop against microbial spoilage). A typical Dragoons pick falls between 22 and 27 °Brix, must pH 3.2–3.7, and TA 5.5–7.5 g/L, depending on variety and style.

Variety	Typical harvest	Target Brix	Target pH (must)	Target TA (g/L)
Viognier / Malvasia Bianca	Late July–Aug	22–24 °Bx	3.2–3.5	6.0–7.5
Vermentino / Picpoul	August	21–23 °Bx	3.1–3.4	6.5–8.0
Grenache	Late August	24–26 °Bx	3.3–3.6	5.5–6.5
Syrah	Late Aug–Sep	24–26 °Bx	3.4–3.7	5.5–7.0
Tempranillo	September	23–25 °Bx	3.3–3.6	5.5–7.0
Sangiovese	September	23–25 °Bx	3.2–3.5	6.0–7.5
Cabernet Sauvignon	Late Sep–Oct	24–26 °Bx	3.4–3.7	5.5–6.5
Mourvèdre / Petit Verdot	Sep–Oct	25–27 °Bx	3.5–3.8	5.0–6.5

Harvest best practices

Pick early morning — ideally starting before dawn. Cool grapes preserve aromas and slow oxidation. Avoid harvesting in afternoon heat. **Test Brix and taste:** Brix measures sugar but not flavour development; walk the rows and taste daily in the two weeks before projected harvest. **Use a refractometer** for field Brix readings — inexpensive (\$25–40) and gives instant results from a single berry. **Use small 30–40 lb bins or lugs**, not large containers; weight crushes bottom berries, which matters in the warm Dragoon harvest conditions. **Process promptly** — get harvested fruit to a cool location within 2–4 hours; in September temperatures, grapes begin fermenting in the bin.

Post-harvest vine care

Continue irrigation at 2-3 gal/vine/day until leaf fall — this replenishes root carbohydrate reserves for winter hardening. Apply balanced compost and potassium fertiliser within 2 weeks of harvest; vines are still actively translocating nutrients to roots. Return grape marc (pressed skins and seeds) to between vine rows as mulch and organic matter — Sonoita Vineyards has done this since founding. Plant cover crop between rows in October — winter vetch, clover, or winter rye protects soil and fixes nitrogen. Take soil samples in October for off-season amendment planning.

12 · Year 2+ Dormancy & Fruit-to-Wine Handoff

Overwintering established vines · juice, wine, and raisins · the cellar door

A grapevine is a perennial 30+ year crop, and from Year 2 onward the calendar repeats with one big advantage: the root system is already established, the trellis is already built, and the vine “remembers” how to grow. The two questions this chapter answers are *what does an established vine need over winter* and *what happens to the fruit after harvest*.

12.1 Overwintering established vines

Unlike tender perennials (peppers, tomatoes) that have to come indoors to survive a Dragoon winter, *Vitis vinifera* is genuinely cold-hardy. Mature wood tolerates 0 to –5 °F without protection, which is well below the Dragoon winter low at typical vineyard elevations (5–25 °F). Dormancy is not a problem to manage — it is a phase to leverage. The vine needs the cold to set buds for the following season.

Year-2+ winter task	Timing	Purpose
Post-harvest deep irrigation	Oct, until leaf fall	Charges root carbohydrate reserves before dormancy.
Final compost & potassium top-dress	Within 2 weeks of harvest	Vine is still translocating nutrients to roots — last useful uptake window.
Cover crop planting between rows	October	Vetch, clover, or winter rye. Fixes N, protects soil from winter rain compaction.
Mow / terminate cover crop	Late November	Leaves residue on surface; do not incorporate yet.
Dormant-season sulphur (pH correction)	Dec-Jan	Cheapest time to apply — full season for it to react before bud break.
Soil and water tests	Dec-Jan	Test before planning next year’s amendments. Re-test irrigation water EC.
Tool, post, wire inspection	Jan	Replace broken catch wires, re-tension cordon wire, repair end-post bracing. Order pruning supplies.
Late-February pruning	End of Feb	The single most important winter task — see §9.

LOCAL TIP

Young vines need a little more help. Year-1 and Year-2 vines with thin, immature bark are more vulnerable to mid-winter cold snaps and to sunscald on south-facing trunks. Wrap young trunks with grow tubes, milk-carton sleeves, or commercial vine guards through the first three winters. By Year 4 the trunk is corky and self-protecting.

WARNING

Do not prune in January. It is tempting to get pruning out of the way during a warm winter week, but early pruning advances bud break by 1–2 weeks and walks new shoots directly into the April frost window. Wait until late February at minimum — late frost damage to an established vineyard is the most expensive single mistake in the Dragoons.

12.2 Fruit-to-wine handoff

This guide stops at the cellar door — winemaking is a separate craft — but the handoff from vineyard to processing happens fast and affects fruit quality more than almost any cellar decision. The grower controls what arrives at the crushpad.

Destination	Window from pick to process	Key considerations
Wine (red)	4–12 hours, ideally same day	Crush and destem the day of harvest. Cool fruit below 65 °F before crushing if possible. Warm fruit ferments wild before you can inoculate.
Wine (white)	2–6 hours	Whole-cluster press as soon as possible — oxidation is the enemy. Cold-soak overnight in the press tank if you cannot press immediately.
Fresh juice	2–4 hours	Filter or settle out solids, then refrigerate or freeze. Unfiltered juice begins spontaneous fermentation by Day 2.

Destination	Window from pick to process	Key considerations
Raisins (sun-dried)	Same day	Lay clusters on trays in single layers on south-facing racks. The Dragoon September sun and low humidity make this trivial — 10-14 days to finished raisins for most varieties.
Cold storage (fresh eating)	Process same day	Table grapes only; wine grapes do not hold well. Loose pack in shallow trays, refrigerate at 32-40 °F, eat within 2 weeks.

12.3 Brix at harvest — what each destination wants

Destination	Target Brix	Why
Dry red wine	24-26 °Bx	Yields ~13.5-15 % alcohol — typical SE Arizona style.
Dry white wine	21-23 °Bx	Lower sugar preserves acidity and aromatic freshness.
Rosé	22-24 °Bx	Intermediate — pick reds slightly early for rosé.
Sweet / dessert wine	28-32 °Bx	Hang late or shrivel partially on the vine. Mourvèdre and Petit Verdot are well-suited.
Fresh juice	18-22 °Bx	Balanced sugar/acid for drinking.
Raisins	24+ °Bx at pick	Higher sugar produces sweeter, richer raisins after drying.

LOCAL TIP

The Dragoon vintage curve. Because the diurnal swing here is so large (30-45 °F), acid retention is unusually high relative to sugar accumulation. Compared to a low-elevation California vineyard, the Dragoon grape at any given

Brix will have noticeably higher TA and lower pH. In practice, this means you can pick at a higher Brix without losing acid structure — the wider hang-time window is the single biggest stylistic advantage of growing here.

Sources & references

Reference material consulted, suggested for further reading, and where to verify or extend the claims in this guide.

Local resources

- **UA Cooperative Extension — Cochise County office (Sierra Vista)** — soil testing, water-chemistry workups, and the closest extension office for any specific viticulture question. Phone 520-458-8278.
- **UA Viticulture Program (College of Agriculture)** — research plots in Willcox and Sonoita; published variety trials directly applicable to Dragoon sites.
- **Arizona Wine Growers Association** — grower meetings, harvest crush-pad introductions, and the unofficial registry of which varieties are working at which AZ AVA. Worth attending one annual meeting before planting.
- **Callaghan Vineyards, Sonoita Vineyards, Los Milics, Dos Cabezas, Rune, Lightning Ridge** — neighbouring producers whose plantings are referenced throughout this guide. Most welcome visits during harvest by appointment.
- **Sulphur Springs Valley feed and farm supply** — elemental sulphur, sulphate of potash, drip irrigation supplies at agricultural pricing.

Books & references

- *From Vines to Wines* by Jeff Cox — the standard small-scale vineyard-and-winemaking reference for North America; the chapters on trellis construction, pruning, and harvest timing apply directly here.
- *The Vintner's Apprentice* by Eric Miller — a practical handoff between viticulture and cellar work for the home-scale grower.
- *General Viticulture* by A. J. Winkler — the deeper textbook reference; the Winkler heat-summation method underpins variety selection logic across Arizona AVAs.
- *Growing Food in a Hotter, Drier Land* by Gary Paul Nabhan — Sonoran-Desert context, dry-adapted growing techniques, and the cultural backdrop for SE Arizona perennial agriculture.
- *Plant Propagation: Principles and Practices* by Hartmann & Kester — propagation chapters useful for taking own-rooted cuttings from existing vines.

Online resources

- **UC Davis Viticulture & Enology** (wineserver.ucdavis.edu) — the leading North American academic resource; cultivar database, rootstock selection guides, and the canonical references on canopy management.
- **UA Cooperative Extension publications** (extension.arizona.edu) — SE Arizona viticulture, salinity, and pest bulletins.
- **AVA TTB maps for Sonoita and Willcox** (ttb.gov) — the official appellation boundaries and supporting petition documents, useful for understanding the regional ter-

roir framework.

- **Penn State Extension — Powdery Mildew and Botrytis IPM** (extension.psu.edu) — generic but well-illustrated references for the two monsoon-driven diseases that matter most here.
- **OMRI (Organic Materials Review Institute)** (omri.org) — verify sulphur, copper, and any input intended as organic before applying.

Closing

The Dragoon Mountains sit in one of the most promising emerging wine landscapes in North America. Neighbouring Sonoita has produced wines that have been served at the White House. Neighbouring Willcox grows grapes that win international competitions. The Dragoons have the same elevation, the same soils, the same monsoon, and the same sky.

From Tempranillo at 24 °Bx to a hillside catchment berm directing free monsoon water to the rows, from a late-February pruning that buys you a frost-safe bud break to a Year-15 own-rooted Grenache producing better fruit than it did at Year 5 — this is patient, place-rooted agriculture. Plant for the next thirty vintages, not the next one.