Pinyon Pine as Bonsai: March 3, 2020
Rocky Mountain Bonsai Society
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Pinyon pine ecology and notes: Mike Britten

Primary sources:

- Gymnosperm database (https://www.conifers.org/index.php)
- Chambers, et al. 1999. Seed and seedling ecology of pinyon and juniper species in the pygmy woodlands of western North America. The Botanical Review.

Pines are divided into two major sections, "hard pines" (subgenus *Pinus* also called "yellow pines" which have harder wood) and "soft pines" (subgenus *Strobus* also called "white pines"). There are two hard pines in Colorado, ponderosa and lodgepole pine. The other four Colorado pines are soft pines: Rocky Mountain bristlecone, limber, southwestern white, and pinyon pine.

Our pinyon pine (*Pinus edulis*) is in the *Cembroides* subsection of soft pines which includes 10 other distinct pinyon species. Together the pinyon pines make up ~10% of the total number of pine species worldwide. Pinyon pines evolved and diversified relatively recently (9-30 million years ago) in the Mexican highlands of North America. Since then, several species (mostly *P. edulis* and *P. monophyla*) have moved northward as far N as southern Idaho and southern Wyoming. (Note: *P. monophyla* is the only 1-needle/bunch pine in the world – this is probably an adaptation to conserve water).

Pinyon pines live along the margins of North American deserts (Chihuahuan, Great Basin, Mojave, and Sonoran) and are among the most drought tolerant pines in the world.

All pinyon pines have large wingless seeds that highly nutritional and eaten by many animals including people. There is one bird, the pinyon jay, that focuses on pinyons as its primary food source during much of the year. The jay caches pinyon nuts for use during the winter. The relationship between pinyon pine and jay is symbiotic benefiting both species; the jay obviously gets nutrition while the pine seeds are dispersed widely (as far as 10-20 km).

The pinyon jay has competition though; other birds like the Clark's nutcracker and scrub and Steller's jays also eat pinyon nuts as wells as many rodents and people. There are several insects that also specialize in pinyon pines including a cone beetle and cone worms (a moth larvae).

***Pinus edulis* distribution map by E.J. Little, USFS, 1971:**
https://commons.wikimedia.org/wiki/File:Pinus_edulis_range_map_1.png

In Colorado, pinyons grow primarily in the S and W although there is an isolated population north of Fort Collins possibly planted Indians several centuries ago. This population is along US 287 near Owl Canyon and some of the land is being strip mined. Is it possible the owners would allow collecting in areas of planned mining?

Pinyon pine (*Pinus edulis*) description

P. edulis is a smallish often globe-shaped pine that grows in more arid areas of the SW U.S. It grows up to 60 feet tall and 5 feet in stem diameter although they are usually much smaller (around 20 feet tall and 1-foot diameter). They have 2 needles/fascicle or bundle (rarely 1 to 3). The needles are short (0.8 – 1.6 inches long), upcurved, and persist on the tree from 4-6 years. Pinyons also have a distinct needle like juvenile foliage much like junipers. The seed cones are oval to globe shaped and about 1.4 – 2 inches long and take 2+ years to mature. The seeds (or pine nuts) are elliptical or oval and large (0.4-0.6 inches long) and nutritional. The Latin specific name *edulis* means "eatable."

Pinyons are easy to differentiate from other pines in Colorado due to their short needles in bunches of 2 and the fact that they grow in drier areas compared to other pines.

Pinyon pine (*P. edulis*) juvenile foliage (the lightest blue-green foliage in photo) (Mike Britten photo)

Pinyon pine (*P. edulis*) notable statistics
Tallest tree: 21 m or 69 feet (Gymnosperm Database (https://www.conifers.org/index.php))
Thickest trunk diameter: 172 cm or 5.6 feet (Gymnosperm Database (https://www.conifers.org/index.php))
Oldest tree: 1,101 years (Rocky Mountain Tree Ring Research (http://www.rmtrr.org/)

Pinyons ecology informs bonsai cultivation
Pinyons grow in dry habitats. These are places where they don't face intense competition for sunlight. As conditions grow wetter, they face competition with other species like ponderosa pines (ponderosas grow taller relatively quickly and can outcompete pinyons for light). However, this doesn't mean pinyons in bonsai cultivation prefer drought conditions; pinyons in a container don't have the benefit of long roots that reach deep sources of water during dry spells. If you provide plenty of light you should also provide adequate water so your pinyon bonsai has a good balance of water and oxygen.
In the near desert conditions where pinyons grow, it is hard to imagine fungi growing. However, all pines (and virtually all vascular plants) grow in association with mycorrhizae and pinyons are no exception. When transplanting pinyon pines, never bare root them so you preserve the beneficial fungi these trees need.

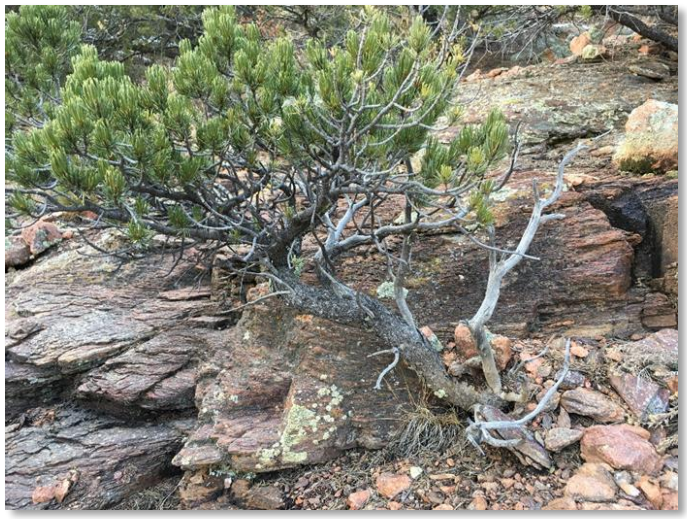
P. edulis grows on a wide range of soil types and is not limited by the character or geologic origin of the soils (https://www.fs.fed.us/database/feis/plants/tree/pinedu/all.html). Soils may be shallow to moderately deep and are often rocky, well drained, and low in fertility. Pinyons growing in deeper soils generally grow faster than those in shallow soils. *P. edulis* occurs on a range of parent materials, including sandstone, limestone, shale, basalt, granite, and mixed alluvium.

P. edulis is a short-needle single flush (at least in Colorado) pine. Since it is related more closely to limber and bristlecone pines, you should likely cultivate as you would those species, at least initially. In bonsai cultivation, collected pinyon pines may revert to juvenile foliage (as do some junipers). This may be related to watering amount and pattern.

Pinyon pine (*P. edulis*) female cone showing pine nuts, High Park, Colorado (Mike Britten photo)

Pinyon pine (*P. edulis*) with abundant seed cones, High Park, Colorado (Mike Britten photo).

Small pinyon pine (*P. edulis*) on bedrock in High Park, Colorado (Mike Britten photo).



Mature pinyon pine (*P. edulis*) growing in open conditions, High Park, Colorado (Mike Britten photo)

Pinyon Pines as Bonsai: Tom Anglewicz

Pinyon Pines are seldom seen in bonsai exhibitions, and this is unfortunate because they have inherent qualities that make them excellent subjects for bonsai. Collected trees often exhibit attractive bark, graceful movement, a strong propensity to back-bud and naturally short needles.

Foliage Management :

Pinyon Pines are a short-needle, single flush pine. This means that they will only generate one flush of growth during a given year.

Are They Multi-Flush Pines? A few years ago, there was some debate about whether Pinyons could be considered and treated as multi-flush pines, similar to Japanese Black Pines. My experimentation revealed that when newly emerging Pinyon candles were cut in early summer, at the same time as Black Pines, several new buds would emerge from the cut site, but the resultant foliage would all be juvenile. These results confirmed that Pinyons are not true multi-flush pines, but rather that they should be managed as single-flush trees.

What About Juvenile Foliage? Pinyon Pines will revert to juvenile foliage if the tree is subject to trauma or inappropriate treatment. Pinyon foliage is soft and somewhat delicate. My impression is that its needle cuticles are not as robust as those on other pine species, with the result that Pinyon foliage is more susceptible to damage from excessive sunlight, heat or contact with some chemicals. For example, three years ago I sprayed all of my pines with a solution of Phyton 35, a copper sulfate anti-fungal product. Both Black Pines and Pinyons experienced needle burn from this application. As a result, I only recommend spraying Pinyons with a mild solution of Daconil or Cleary's to prevent or address needle cast.

In working with Pinyon foliage, it appears very similar to Italian Stone Pine (Pinus Pinea), which also has a proclivity for reverting to juvenile form under certain conditions. If juvenile foliage appears on a Pinyon, there is not much one can do except to feed the tree and let it continue to grow. Mature needles will ultimately return.

Development Techniques:

Short-Needle Pine Development - Pinyons are short-needle pines. As such, they can be heavily fertilized during the growing season from spring to fall, with no concern that the newly emerging growth will generate excessively long needles.

When short-needle single-flush pines are in development and there is a desire to generate back-budding on individual branches, it is best to allow the expansion of foliage mass at the terminus of the branch. This foliage mass will stimulate the significant movement of water from the roots, which will, through photosynthesis, generate the reverse flow of sugars and carbohydrates. It is this traffic that will stimulate the formation of back-buds on the branch. Pruning or thinning the terminal foliage mass

prematurely during the development process actually reduces this flow of nutrients and is antithetical to back-bud generation.

Soil and Potting – I use my usual potting mix of equal parts akadama, pumice and scoria for Pinyon Pines, with particle sizes ranging from 1/16 to ¼ inch. As noted above, Pinyons tend to like a higher ratio of water to oxygen (a wetter, but not soggy soil). In our hot, dry summer climate I have taken to planting Pinyons in somewhat deeper containers to prevent them from drying out too quickly. Nevertheless, the soil mix still must drain freely. Placement of organic fertilizer nuggets on the soil surface seems to be an effective method for feeding.

Wiring – Copper wire for structural and secondary wiring is appropriate for Pinyons. In general, they are pretty flexible, but it is best to apply raffia to the trunk or major branches before bending. Because new adventitious buds are extremely vulnerable when they appear in spring, the best time to apply wire is in the fall.

Refinement Techniques:

Once the development process has yielded back-budding that has evolved into interior foliage mass, and the overall design direction and shape of the tree has been established, pinching and pruning can be employed to achieve refinement.

Pinching New Shoots – As new terminal shoots are emerging in spring, but before the actual needles emerge, these shoots can be pinched and a portion, not all, of the candle is removed. This should not be confused with candle-cutting, which only applies to multi-flush pines such as Japanese Black or Red Pines. Removal of the entire candle on a single-flush, short–needle pine will result in the death of that branch tip.

Pinching new shoots on a Pinyon Pine has two benefits. It suppresses the Auxin flowing to the terminal bud and forces that energy back into the interior shoots, thereby strengthening the ramification within the branch. Secondly, it prevents the elongation of the terminal shoot beyond the desired design profile of the tree.

Pinching new shoots only applies to short-needle, single-flush pines, such as Pinyons, and should not be applied to long-needle, single-flush pines. That will only result in making needles even longer.

Pinching is a discretionary process. It does not apply to, and should not be implemented on, every emerging candle on the tree. If a branch needs to elongate in order to complement the overall design direction, a terminal shoot may be allowed to run. If new candles on interior branches are short and weak, they should not be pinched, etc. Every situation should be viewed in the context of the overall design.

Pruning – In the refinement process, pruning can be used in several ways. First, if the needles on some new shoots have begun to open it is too late to pinch them without dislodging the entire candle. In that case, the shoot should be allowed to grow and harden off, at which point it can be pruned.

Similarly, if back-buds have developed into emerging foliage masses, the coarse or congested terminal growth on the branch can be pruned or thinned out. This has the effect of potentially refining the profile of the tree and further redirecting energy into the weaker interior shoots.

Finally, post-flush pruning can be utilized to actually cut back and reduce the length of shoots that have grown beyond the desired profile of the tree, or to prevent them from shading branches below. Pruning can also be utilized to remove branches that are growing straight up or down, and to reduce the number of shoots at a given juncture in order to prevent swelling and inverse taper.

Overwintering – Controversy continues about the extent of cold-hardiness of Pinyon Pines. In my discussions with Ryan Neil, he has noted that Pinyons "should be" cold hardy in a bonsai container, but he's not positive. Perhaps they would be in the Pacific Northwest. I have been cautious in this regard. For the past several years, I have placed all Pinyons in my greenhouse during the winter, along with Black Pines. Temps do not go much below 40 degrees and can climb into the 70's on a sunny day in mid-winter. I have been reluctant to place them in my cold frame with Colorado natives where temps will obviously go much lower. I should note that I have a 10-foot tall Pinyon growing vigorously adjacent to our house, but this is a tree in the ground, not in a bonsai pot.

Todd Schlafer: "Pro-tips"
I place my Pines where they get the most sun possible. The do take up a lot a water, but I treat them like a limber pine which is on the dryer side. So my treatment is different than above. The trees I have were collected in New Mexico in desert like conditions.

I have some that I keep outside, but I do keep some in my green house where they freeze, but still is in the 20's. They also seem to be quite flexible but have used raffia on some branches. I've never done a wedge cut on them, but I believe it would work as well.