

# Cypress Species in Oregon

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Although not widely known, four species of cypress are native in southwestern Oregon, a northern extension of the California Floristic Province. These are Baker cypress (*Hesperocyparis bakeri*), Mendocino cypress (*H. pygmaea*), MacNab cypress (*H. macnabiana*), and Sargent cypress (*H. sargentii*). (New World cypresses, formerly *Cupressus*, are currently classified as *Hesperocyparis*; see sidebar.) I will tell the story of how and where they were discovered and named, what is known about their ecology and management, and speculate on the prospects for their survival.

## Baker Cypress<sup>1</sup>

In 1914 Forest Ranger William “Bill” C. Fruit discovered the first cypress found in Oregon on Steve Peak in the Siskiyou Mountains while clearing the route for a phone line to the lookout. Unfortunately, he did not document his discovery with specimens (Matthews 1963).

Three years later, on 24 August 1917, Forest Ranger Joseph L. Mackechnie and Matt W. Gorman, Superintendent of the Forestry Building in Portland, collected voucher specimens from the site. Dr. Elmer Applegate also collected specimens there on 29 July 1930. Unfortunately, all of the foresters and Applegate misidentified these trees as MacNab cypress when in fact the trees were Baker cypress. I traced the misidentification to *Forest Trees of the Pacific Slope* (1908) by George B. Sudworth, US Forest Service dendrologist, where he described the northern extent of Macnab Cypress as “on the west end of the Siskiyou, at a point about 10 miles from the mouth of Seiad Creek.” Even though the discoveries in Oregon were all made after Jepson’s 1909 publication (see footnote), none of the foresters caught the error. Adding to the confusion, Jepson (1923) subsequently submerged *Cupressus bakeri* into *C. macnabiana* as var. *bakeri*. In 1965, James Griffin correctly annotated Mackechnie’s collections as *C. bakeri*.

In 1926 Nelson Nye (1871-1946) found an “an old juniper patch” on Willits Ridge, north of Flounce Rock near Prospect in Jackson County, Oregon, about 70 miles northeast of Steve Peak. When Nye’s trees were shown to Dave Neville (1902-1985), he told

<sup>1</sup> Milo Samuel Baker (1868-1961) discovered Baker cypress in 1898 on basaltic lava flows in the Timbered Crater Grove in southwestern Siskiyou County, California. Jepson (1909) named the species in Baker’s honor, using the following collection as a type specimen: California, Siskiyou Co., Near Dana, between Hills Farm and Little Hot Springs Valley, Aug 1898, Baker s.n. (JEPS).



Bob Adams standing next to a Baker cypress trunk; note the characteristic flaking bark. Photo by Frank Callahan.

two botanists from Southern Oregon College (SOC) who concluded that they were Baker cypress. This site is the northernmost cypress population in North America. Ted Maul, state forest patrol ranger, Sam Taylor of Elk Lumber Company and Ed Marshal, US Forest Service, measured the Baker cypress at Flounce Rock in 1953; the



Wind-thrown Baker cypress at Willits Ridge; the trees were exposed to wind damage when the area to the northeast was clearcut in 1986 in a timber sale called the Cypress Garden. Photo courtesy of the Medford District BLM archives.



Female cones of Baker cypress (*Hesperocyparis bakeri*) are covered with resin-filled warty protuberances. Photo by Robert Korfhage.

tallest trees were 75 feet tall and 22 inches in diameter (Anon. 1953). The trees varied from 30 to 40 years and older (Sam Taylor, pers. comm.). In a letter to Oliver Matthews, Warren R. Randall stated that there were “old cypress stumps throughout the stand that indicated that there had been cypress in the area for several hundred years” (ltr. dated Sep. 23, 1953).

In 1948 Carl B. Wolf added subspecies *matthewsii* in *C. bakeri* in honor of Oliver V. Matthews, who described morphological differences between populations of Baker cypress. (See more information on Matthews on pages 6-11) This subspecies is no longer recognized; *C. bakeri* is “treated as a monotypic species” (Afzal-Rafii 1994; Elbert L. Little and Jim Bartel, pers. comm.).

In 1950 entomologist Dr. “Rosy” Robert George Rosensteil (1910-1995) visited the region west of O’Brien, Oregon, and collected about fifteen specimens of native plants including Baker cypress “8 miles west of O’Brien” (77599OSC). I verified the herbarium specimen at Oregon State University, annotated by Helen M. Gilkey. Although I have relocated all the other species he collected there, I have not found his cypress despite extensive searches of most of the roads and old trails. Much of this vast area of rocky, rugged ultramafic terrain burned in the 2002 Biscuit Fire. If the distance indicated on the label was air miles, the specimen was collected in Curry County, in the Baldface Creek drainage.

In 1973 Jim Frazier and his wife reported discovering a small grove of Baker cypress in the Sky Lakes Wilderness, Klamath County, where an old wooden sign bolted to a tree read “Iron Lake.” Jim knew the species from Flounce Rock, but unfortunately, he did not collect specimens. He described the trees as “at about 45 to 50 feet in height and branched with foliage nearly to the ground [without a] browse line like we observed at Willits Ridge,

Flounce Rock. The trees were well spaced with trunks exceeding 2 feet in diameter at chest height.” Not long afterwards, Jim moved away, and I lost contact. I checked with the Prospect and Butte Falls Ranger Districts, but no one had ever heard of Iron Lake. An intensive search of the Sky Lakes Basin map produced over 100 unnamed lakes or small ponds, any of which could be Iron Lake. To date, these cypress have not been relocated.

## Mendocino Cypress<sup>2</sup>

Oregon’s second cypress might never have been discovered but for a series of serendipitous events. In the early 70’s, I had purchased property near Gold Hill about the same time as my new neighbors, Earl and Ruby Millhouse. Soon after Earl and I met, I learned that he was a certified millright and licensed electrician. In return for his assistance in preparing for a house on my property, I helped him landscape his property with junipers, pines and Arizona cypresses. These prompted Earl to tell about logging in the redwoods in 1947 and 1948 in the Brookings/Harbor area where he had encountered a stand of trees on the lower Winchuck River that really puzzled him. After felling several of the trees he examined the foliage and cones and concluded that they must be cypress. He took the samples to the foreman, who was unimpressed and remarked, “We will market the logs as Port Orford cedar as the price is right.” Earl kept quiet about it because “In those days, you did not argue the issue, I needed the job and could ill-afford to be fired or blacklisted.” But after work, he went about collecting cones, foliage and bark samples in order to get these trees identified; he also collected seeds for later planting. He put the dry foliage samples in newsprint in a leather suitcase along with some bark samples and about a pound and a half of seeds. He noted that the largest stumps were only about 300 to 500 years old and none of the trees showed any decline. They cleared the bottomland along the Winchuck, blasting, bulldozing and burning the stumps because the landowner wanted to convert the area to pasture. At that point in our conversation, Earl opened his suitcase to display



Female cones of Mendocino cypress (*Hesperocyparis pygmaea*) have an almost smooth surface and the scales bear a small broad prickle. Photo by Robert Korfhage.

<sup>2</sup> Mendocino cypress was described as *Cupressus pygmaea* (Lemm.) Sargent in 1901 in the Botanical Gazette 31:239: “Sparsely found on the ashen ‘white plains’ back from the coast near Mendocino” (1895) Lemmon and Wife [Plummer] s.n. (lectotype) designated by C.B. Wolf 1948.



the specimens and asked “What cypress is this?” The samples certainly resembled the Mendocino cypress shown in Sudworth and McMinn (McMinn 1939) and I promised that I would collect Mendocino cypress specimens at Ft. Bragg for comparison, which I did in May 1975 and September 1976. The Winchuck and Ft. Bragg specimens were identical.

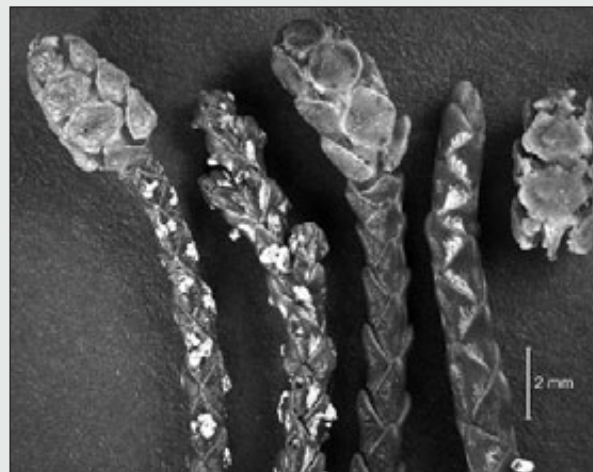
### MacNab Cypress<sup>3</sup>

During the 1970s I visited the UC Berkeley-Jepson Herbarium, where one of the curators brought me a specimen of *Cupressus macnabiana* from “Foothills west of O’Brien [homestead], Josephine County, Oregon, 1920.” The O’Brien homestead comprised about 80 acres located near the present town of O’Brien (Greg Walter, pers. comm., 2012). John Thomas Howell (1903-1994) annotated the specimen in 1926. There was a bold ink stamp on the sheet that read, EXTRALIMITAL, and the curator said to me, “You are from Oregon and what is your opinion of this, as we don’t think it is valid.” I examined the specimen and verified that the species determination was certainly correct; however, the locality might be questionable because it is well out of the known range. On the other hand, the O’Brien area is characterized by ultramafic geology that is a common habitat for the MacNab cypress. The curator told me that the specimen was in transit (not part of the accessioned herbarium collection), so was slated for discard as they had no idea who the collector was. Upon researching the issue, I suspect the collector was Thomas McGrew (for whom McGrew Mountain is named). The McGrew road, built in 1853, is located west of O’Brien off Wimer road and travels from the basin to the summit of the ridge where it connects with several other roads. The collection is certainly from the area where McGrew resided for many years and today his stone corral stands in testimony of his settlement. I gave the curator my address and asked that, if he were to discard the specimen, to mail it to me and I would place it in an Oregon herbarium. I never heard back from him and, when I returned to the herbarium in 2009, the specimen was gone. Later, Ray Godfrey and I spent considerable time trying to relocate both MacNab and Baker cypress in the O’Brien area. In 2010, Joey Malone and I searched the area using GPS and aerial photography but were unable to locate either grove of trees. Today locations of both species remain a mystery.

Although I had searched for cypress on many ultramafic sites in Oregon, by 2007 I had not yet explored Sprignett Butte in the Wells Creek drainage in northern Jackson County near the confluence of the West and East Forks of Evans Creek. Starting at the southern base of Sprignett Butte, I hiked to the summit, staying east of a timber harvest that was taking place in the draw. On my return from the summit (4036 ft. elev.), I noticed that the logging had concluded for the day and decided to walk along the road instead of bushwacking. There I noticed some unusual chunks of cordwood with a bark pattern that was gray and quite furrowed. I strapped the largest piece to my backpack and took it home, where it joined my collection of wood disks for later identification.

Three years later, I returned to Sprignett Butte with Mike Backen of Lone Rock Timber Management Company. At a spring

<sup>3</sup> Andrew Dickson Murray named *Cupressus macnabiana* in 1855, honoring James MacNab (1810-1878) of Irish ancestry, a founder and president of the Edinburgh Botanical Society and curator of the Edinburgh Botanic Garden (Little 1979). The type locality was Whiskeytown, California, where the entire stand was destroyed by construction of Whiskeytown Lake (Griffin J.R. 1967).



Left to Right: Baker, MacNab, Mendocino, and Sargent cypress. Photo by Cindy Roché and Robert Korfhage.

### Foliage and Pollen Cones of Oregon Cypresses

Cypress leaves are scale-like, toothed on margins, decussate and closely appressed to the branch. The branching is 4-angled, except MacNab cypress, which forms planar spraylets. The yellow-orange pollen cones are deciduous after pollen is released from the peltate, toothed scales, except for MacNab cypress, which has persistent pollen cones.

MacNab cypress leaves are thick, often much longer than broad, with margins that are waxy from resin glands. (Pollen cone not shown.)

Mendocino cypress leaves are dark green and thick, but lack resin glands and wax. Pollen cones have rhombic to round scales (scales are elliptical in the three other cypresses).

Sargent cypress leaves are thick, large and coarse. Resin glands are rare; note the two distinct waxy bands on the edge of the leaf at the bottom of photo.

we discovered a single cypress that was just over two feet in height. Looking in a debris pile, I found several cones and made a collection for the OSU herbarium (OSU229705). It was MacNab cypress, so I asked Mike if they planted cypresses to which he replied, no, only ponderosa pine and Douglas fir. When I returned home, I pulled the piece of cordwood out and examined it closely, it was clearly MacNab cypress and its flared base indicated that it was cut near the ground. It was about twelve inches in diameter with a ring count of about 145 years; therefore the tree would have been a seedling in 1862. After the first 20 years it had grown very slowly. From the trunk diameter, I would estimate the tree would have been anywhere from 20 to 40 feet tall. I could not determine the number of trees before the timber harvest, either from debris on the ground or aerial photography. Approximately a year later, Mike discovered a second MacNab cypress (which he later protected with a fence). As the second collection of MacNab cypress in Oregon, this discovery lends credence to the 1920 Josephine County collection. Sprignett Butte is private timber land; access to the cypress is by accompanied written permission only.



Distribution of cypress species in Oregon and northern California.  
 ●: *H. macnabiana*; ▲: *H. bakeri*; ■: *H. sargentii*; ★: *H. pygmaea*. Map redrawn from Little (1971) by Cindy Roché.

### Sargent Cypress<sup>4</sup>

The first report of Sargent cypress in Oregon came from a chance meeting with a miner. After teaching the Conifer Class at the Siskiyou Field Institute (SFI) in July 2009, I stopped for lunch in Selma. A scruffy looking character walked up to me and asked, “What brings you out here?” I teach conifers at SFI. “You mean the Deer Creek Ranch,” he commented, “You must know about the Sargent cypress west of Selma.” I countered that Sargent cypress is not known this far north, “are you sure they aren’t Baker cypress?” He answered, “I worked for many years mining in Lake County, California, where Sargent cypress is very common on the serpentine in the hills and canyons south of Middletown along Highway 29. The trees I found in the foothills west of Selma are identical, about 45 feet tall and resemble incense cedar in form, with small round cones about an inch in diameter; there were 5 or 6 trees that burned in the 2002 Biscuit Fire. The Forest Service was back-burning the area and I’m certain the trees were destroyed. You will just have to search the area for survivors.” We shook hands and I thanked him for the information. He was quite private and never even gave me his name. In October 2010, I went up the Squaw Creek Road at the Deer Creek Center and discovered four small trees that looked quite different. When I knelt down to inspect the trees, I found burnt cypress cones on the ground. I found no trees further upstream, only the charred remains of

<sup>4</sup> Jepson (1909) named *Cupressus sargentii* after Charles Sprague Sargent (1841-1927) using a specimen from Red Mountain, Mayacamas Range, southeastern Mendocino County, as the type. Collected June 17, 1908, W.L. Jepson 3027.

burnt-out stumps and a debris pile of blackened limbs, cones and strips of bark. The seedlings must have established from cones that were flushed downstream following the Biscuit Fire. I collected a voucher specimen (OSC229704) from this site for the OSU herbarium. In Selma again the next fall, I struck up a conversation with the driver of a pickup loaded with firewood, and asked about cutting firewood in the Biscuit Fire area. I mentioned Squaw Creek and that I was looking for cypress wood. To my surprise, the woodcutter had cut firewood near the Squaw Creek Road after the fire. I described what cypress looked like and he responded, “We bucked up some logs that had thin bark peeling off them and round cones on the limbs. We limbed the logs and put the debris in a brush pile and considered milling some lumber out of the wood. I guess we cured the wood wrong, as it split, so we cut it up for firewood. I still have the largest chunks of wood left if you could use them.” I followed him to a nearby woodshed where he gave me two rounds of firewood that I had no doubt was cypress, because there was a cluster of cones still attached. At home I sawed and sanded a number of disks from the cordwood and counted 70 to 74 rings. The rounds were about thirteen inches in diameter; the clear, widely-spaced, uniform rings indicated rapid growth. Matching this diameter to the height given by the miner (45 feet), the cut must have been low on the bole, so I added another ten to



Baker cypress cones grow from the bole of the tree, a common trait in *Hesperocyparis*, but not in *Chamaecyparis* or *Callitropsis*. Photo by Frank Callahan.



twelve years for the total age. The five or six burned stumps I found matched the number that the miner had given me. That there were so few trees can be attributed to the logging history of the site that was previously harvested by Rough & Ready Lumber Company.

### Ecology of Oregon Cypresses in the Klamath Mountains

All four species of cypress grow in Oregon as very isolated populations; there are also large gaps among populations in California. In both states these trees are always located on marginal soils. The Oregon species are all located in the Klamath-Siskiyou Bioregion in the California Floristic Province. This mountainous region is characterized by old, complex geology, a mild, relatively moist climate, high species diversity, and a great number of endemic taxa.

### Habitats

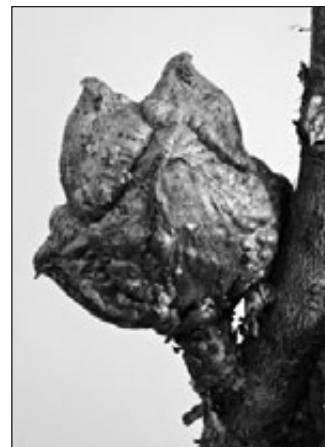
#### Baker Cypress

Baker cypress grows as a slender spire and is by far the most tolerant of cold and snow of all North American cypresses. At Miller Peak, Baker cypress grows up to 6,000 feet elevation on shallow soil veneers in a post-glacial cirque, where snows up to 30 feet deep have been recorded (Matthews, pers. comm. 1973). Associated species at that site are Brewers spruce, mountain hemlock, western white pine, white and noble fir. It has survived temperatures as low as -30°F at Timbered Crater, California, but

cold dry winds damage foliage. Baker cypress seldom grows below 3,000 feet elevation. It occupies soils derived from a wide range of parent materials: Miocene basalt-andesite residuals (Willits Ridge at Flounce Rock), quartz mica schist (Miller Lake-Steve Peak), ultramafic (Seiad Creek, California, and Iron Mountain, Oregon), and granitics (Independence Creek, Marble Mountain Wilderness, California). Baker cypress has very small gray cones with resin-filled warty protuberances and very fine resinous foliage with a white waxy bloom. Baker and Mendocino cypress have the smallest and lightest seeds among western North American cypress species.

#### MacNab Cypress

MacNab cypress has a broad, open crown that is often as wide as the tree is tall (much like an open grown Monterey cypress). The consequence of this architecture is that MacNab cypress cannot handle heavy snow loads and hence grows only below 4,000 feet elevation. MacNab cypress also tolerates a wide range of nutrient imbalanced soils: Mesozoic serpentines, Devonian Meta-rhyolites, Eocene marine sediments and Pleistocene and recent basalts (Griffin and Stone 1967). MacNab cypress tolerates blistering summer heat on some of the most inhospitable sites where the only other trees are also thermophiles: gray pine (*Pinus sabiniana*) and Douglas oak (*Quercus douglasii*). The broad crown conserves moisture by shading the soil surface over the root system, which reduces soil temperatures during the summer heat. Once, when the air temperature was 115°F, I measured soil temperature differences of 60°F between soils exposed to the sun and those shaded by trees: the shaded ground was a cool 80°F compared to the sunlit soil at 140°F. A good character for identifying MacNab cypress in the field are its flat (planar) spraylets or short sprays of foliage that are highly resinous (resin glands



Female cones of MacNab cypress (*Hesperocyparis macnabiana*) have large conical horns that are often hooked at the apex; cones are up to ¾ inch in diameter. Photo by Robert Korfhage.



The largest known MacNab cypress, which grows near Midway south of Highway 44 in Shasta County, California, has a basal diameter of nearly four feet and is 60 feet tall with a canopy spread of 60 feet wide. Photo by Frank Callahan.

exude a glaucous waxy coating on the leaves to counter the high heat of direct solar exposure); the odor is quite pleasant, almost like citrus. The cones vary from rounded without strong prickles to cones with spur-like projections; the Oregon trees exhibit the latter trait. The tree is used for firewood and the bark is used for basket weaving (Callahan, K.H. pers. comm.) and has no use for lumber as the trees lack a distinct bole.

### Sargent Cypress

Sargent cypress is seldom found off serpentine (ultramafic) soils. It is adapted to hot interior climates, but also thrives in the milder wet areas of the California Coast Ranges<sup>5</sup>. With a rounded crown at maturity, it tolerates some snow loading, which allows it to grow at elevations up to 3,000 feet. It is often found with McNab cypress; in several areas the two have hybridized (Lorraine *et. al.* 1975, Little 2004). Both trees have similar fibrous, gray bark, so hybrids were detected by foliage differences and terpene analysis. Sargent cypress often grows near redwood in the more mesic bottoms of ravines or on open slopes of the inner Coast Range where fog drip is nearly continuous. As a component of the chaparral in the outer Coast Range, Sargent cypress perseveres under very harsh conditions. But it is not as drought hardy as McNab cypress and its range extends no further east in California than the outer Coast Range, where on the summits of ridges, the lack of adequate moisture and hot drying summer winds create bonsai-like growth forms.

Under favorable conditions, juvenile trees grow rapidly, with very sharp pointed leaves that possibly deter browsing. Trees growing in the moister Inner Coast Range and on ultramafic sites with springs and ample subsurface water become the largest of the species and may live up to 300 years. My observations of ring counts indicate that trees from drier sites in the Outer Coast Range seldom live beyond 150 years. The trees are often used as firewood by local ranchers, but due to size and heart rot, are seldom milled for lumber. Sargent cypress foliage is coarser than the other three Oregon cypress species; it is a dull glaucous green and feels harsh to the touch. Sargent cypress cones in Oregon have a long peduncle, small prickles, and are gray at maturity (but lack the wartiness of Baker cypress cones). The seeds are quite large and exhibit a waxy coating similar to that in McNab cypress. The larger seeds with greater endosperm allow the seedlings greater time to establish a deep taproot and the waxy seed coat reflects ground heat that might kill exposed seeds. The resin glands are somewhat active, but not to the extent of excessive resin droplets on Baker and McNab cypress.

### Mendocino Cypress

Mendocino cypress is easily recognized by its dark green foliage, inactive resin glands on the scale-like leaves and long whip-like leaders. Its black or dark brown seeds are the smallest and lightest of the cypress species. The specific epithet *pygmaea* was chosen to describe the stunted trees initially discovered on the flat barrens or “white plains” near Fort Bragg, California. This habitat has poor growing conditions because its podsolized<sup>6</sup> rusty-white sandy soils

are poorly drained due to a cemented hardpan layer about 12 inches below the soil surface. I use the common name Mendocino cypress, not pygmy cypress, because on better soils, trees of this species grow as large as 8 feet in diameter and nearly 200 feet tall (Wolf *et al.* 1948), larger than any other species of cypress in North America. Mendocino cypress is a tree of extreme vigor; its upward growth can compete with coast redwood for sunlight. The largest Oregon trees were about 300 to 500 years old at the time they were logged (Earl Millhouse, pers. comm. 1947-48 information), but their growth was still accelerating. The climate at Fort Bragg and near Brookings, Oregon, is characterized by summers with mild temperatures (averaging around 65°F) and intense fog which blankets the immediate coastal forests, both of which are optimal conditions for survival and growth of Mendocino cypress. The Winchuck River site where the cypress grows receives more precipitation than other sites, an average of 14 inches of rain from April through September, and up to 175 inches in a year (Maguire 2001). The Winchuck River site is 195 miles north of Fort Bragg but still in the coast redwood zone (see distribution map).



Sharon Siewert standing next to Mendocino cypress in the Strauss Arboretum, on Emigrant Creek Road, near Ashland. This cypress was grown from seeds collected by Earl Millhouse along the Winchuck River, Oregon. Photo by Frank Callahan.

### Serotinous Cones and Fire

All cypress species in Oregon and California have serotinous cones, which require heat or the death of the branch to open and release seeds. The degree of heat or drying differs among species; the three

5 In California, there are two mountain ranges parallel to the coast: the Inner Range lies closer to the coast (more western) and the Outer Range is more inland (to the east of the Inner Range).

6 Acidic soils under forests that have been severely leached of minerals; pH levels between 2.8 and 4.3 limit nitrification by soil organisms and the availability of nutrients to plant roots.





Figure 12. Female cones of Sargent cypress (*Hesperocyparis sargentii*) have a large peduncle at base of cone and minor resin pustules on the cone scale; at an inch in diameter, these cones are twice as large as Baker cypress cones. Photo by Robert Korfhage.

inland species usually require a fire or excessively high summer temperatures. Cones of the coastal Mendocino cypress open when temperatures reach 80 to 90°F, or with senescence of lower branches. At Miller Lake where there has not been a wildfire in well over 250 years, encroachment by other conifers is overwhelming the Baker cypress population. Based on ring counts of downed trees, I estimate that the Miller Lake cypress trees are close to 300 years old, which is approaching the normal lifespan of this species.



MacNab cypress cones consumed by western gray squirrels, which eat only the fleshy outer parts of the cone. When left in the sun afterwards, the cones release the seeds as they dry, but the squirrels have not been known to return to eat the seeds. Photo by Frank Callahan.

Wind has toppled many of the larger trees, indicating that the root systems in shallow soil are not equipped to support trees over 100 feet tall. Baker cypress is holding its own with Brewers spruce on the site, but is losing ground to the more shade tolerant true firs and mountain hemlocks that are establishing more seedlings. The cypress depends on fire to expose mineral soil, open the site to sun, and release seeds from its cones. Fires that are too frequent can be devastating to cypress populations because it usually takes at least ten years for saplings to produce fertile seed cones. Baker cypress has thin flaking or fibrous bark at maturity, so even mature trees are quite susceptible to fire damage and can be killed outright by ground fires. Sargent cypress is less fire dependent because cones open on the trees as the lower branches die. Thus it grows as mixed age stands at many locations.

### Squirrels and Seed Dispersal

Downhill establishment of seedlings is easily explained by gravity, but I spent years wondering how cypress seeds are moved upslope. Then one day while sitting on a stump eating lunch, I noticed a local western gray squirrel doing the same. I think we were observing each other with equal interest, wondering what the other participant was having for lunch, but the squirrel was extra vigilant because it did not want to become someone else's lunch. Using my binoculars, I saw that it was dining on MacNab cypress cones. This was news to me, so after lunch, I inspected the cones, and found that the squirrel had eaten only the outside of the cones, which left the seeds unscathed. It did not take long for the chewed cones left on sunny stumps to dry out and begin releasing intact seeds. I was fascinated that the squirrel left behind what was obviously the more nutritious food, but perhaps it was deterred by the sharp, bladed edges of the seeds. I looked around noting all stages of young cypress trees in the stand and that the squirrel's dining outposts were uphill from the main population where there was a better view of overhead predators. So the uphill movement of cypress all came down to the botanical assistance of the western gray squirrels (Callahan 2012). And how did all of the great botanists miss this event? Well, they never went to lunch with the squirrels!

### Paleobotany

*Cupressaceae* is an ancient family (some 160 million years old), probably derived from an extinct conifer family (*Voltziaceae*) that persisted until the lower Jurassic, about 200 million years ago (Farjon 2008). Unlike many ancestral conifer families, the cypress family has members that have persisted to the present. In the Western Hemisphere, the center for diversity is the California Floristic Province (twelve species and one variety); an additional four species grow in Mesoamerica. Baker cypress is the most northern (southwestern Oregon) while cedro blanco or teotlate (*Cupressus lusitanica*) in Honduras, El Salvador and Costa Rica is the most southern.

Botanists have categorized cypresses as originating from the New World (North/Mesoamerican) and Old World (Asiatic/North African); however, this distinction becomes somewhat blurred when one considers possible lineages of modern taxa. Raven and Axelrod (1978) proposed the Madrean-Tethyan link to explain the relationships between Old and New World cypresses through

migration between the Asian and North American continents before they drifted apart. For example, Kvacek and others (2000) found cones, foliage and seeds of *Tetraclinis*, a cypress relative, in the Lost Creek Reservoir fossil floras of eastern Oregon. The modern species of *Tetraclinis* (*T. salicornioides*) is known only from southern Spain, Malta and North Africa. The presence of *Tetraclinis* in the fossil record of Western North America and its absence in eastern Asia (both the fossil and current floras) suggests that the taxon migrated across the North Atlantic during the early or middle Tertiary (Kvacek *et al.* 2000).

Predecessors of Oregon and California cypress species could have migrated from the Old World during the Tertiary (65 to 5.5 million years ago) when the Bering Land Bridge connected North America with Eurasia and Africa (Ickert-Bond *et al.* 2009), or during two later time periods: 1) when sea levels fell as much as 397 feet between 20,000 and 18,000 years ago, or 2) when coastal land along the Bering Strait was exposed from eastern Asia to Alaska during the Pleistocene (about 11,000 years ago). Mao and others (2010) hypothesized that all New World cypresses derived from Asian ancestors sometime after 49.9 million years ago, when junipers also diverged. Other evidence suggests that the cypresses and their close relatives (Alaska yellow cedar and Port Orford cedar) migrated from eastern Asia during the Pleistocene. For example, because the morphology and DNA of newly described *Xanthocyparis vietnamensis* from North Vietnam strongly resembles Alaska yellow cedar, Farjon (2008) placed the two in the same genus.

Chaney (1927) first recognized the striking similarities between the Eocene flora of the John Day Basin and those of modern Asian forests. During the Cenozoic (65 million years ago) deciduous angiosperms and conifers are thought to have crossed this land bridge which may have been situated as far north as 80 degrees N Lat. (O'Connor and Dorsey 2009). During the late Pliocene, mountain building episodes combined with a cold off-shore current drastically changed the climate, replacing the great subtropical rainforests that covered most of Oregon and Washington during the Eocene and early Oligocene with a summer dry Mediterranean climate (Raven and Axelrod 1978). During the Pleistocene, scores of species

that flourished under the previous summer rainfall disappeared from the landscape. Others, such as Mendocino and Monterey cypresses, survived in mesic, north-facing canyons or in coastal habitats with cool, summer fog typical of a maritime climate. The discontinuities in their present distribution may have arisen when the xerothermic period (ca. 8,000 to 3,000 ago) brought a hotter, drier climate to coastal habitats (Axelrod 1980). The distribution of "closed-cone" forests (including most of the coastal cypresses as well as pines with serotinous cones) contracted severely as a result of the changing climate. Fossil records suggest that Sargent cypress grew over a large area during the Pliocene (5 to 6 million years ago), when the climate was much moister than it is today.

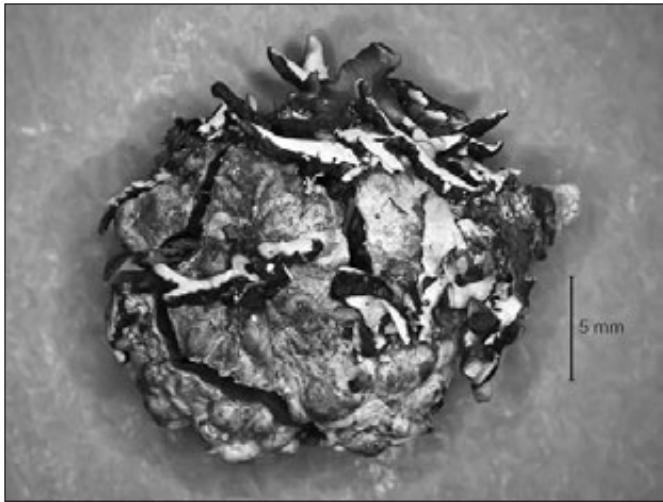


Cattle damage to a MacNab cypress; note the browse line on tree and the exposed roots from trampling by cattle. Michelle Sesock, the author's sister, is standing next to the tree on the Strauss property near Ashland. Photo by Frank Callahan.

"Paleobotanists Peter Raven and Daniel Axelrod believe that it became restricted to moist serpentine soils when a drying climate forced it out of other areas" (Hensen *et al.* 1993). The development of modern vegetation patterns occurred only in the last 1,500 to 3,500 years. Although no fossil records were found for Baker cypress and Mendocino cypress, fossil records in general indicate



a recent contraction in the ranges of all cypresses north of Mexico, most of which have highly fragmented distributions and occur on soils that are inhospitable to competing species. In contrast, regions with summer monsoonal precipitation, (e.g., Arizona, northern Mexico and central and southern Mexico's cloud forests) still support large populations of cypress in mixed conifer forests.



Baker cypress serotinous cones remain closed up to 15 years; five species of lichens grow on the surface. Photo by Cindy Roché and Robert Korfhage.



MacNab cypress collected from the Oregon site: note: prickles modified to horn-like projections on scale. Photo by Robert Korfhage.

### A Future for Cypress in Oregon?

Timber harvest, firewood cutting and conversion of forest to farmland have been the primary threats to cypress species in Oregon. In California, entire populations have been destroyed by dams (Whiskeytown Lake and Shasta Lake), conversion of forest land to vineyards, and housing developments. Planting of non-native Monterey cypress near our native cypresses may lead

to hybridization. Fortunately, wind does not carry cypress pollen (which lacks air bladders) long distances, so adequate spacing can protect the genetic integrity of native populations. Native cypresses planted in proximity with each other also hybridize, for example Mendocino and Arizona cypresses (Adams *et al.* 2012). In addition, like most conifers, cypresses are highly sensitive to many commercial herbicides. Grazing by domestic livestock (goats, cattle and sheep) has severely damaged cypress populations worldwide. A browse line on the Baker cypress trees on Willits Ridge and the failure of seedling recruitment, along with soil compaction and erosion, are effects of poor range management on these BLM lands. Similar effects are evident from cattle grazing in MacNab cypress stands as well.

Decline of the world's species of cypresses should be a warning that human activities are rapidly destroying plant diversity of the planet. Habitats in the Klamath-Siskiyou bioregion of Oregon have provided refugia in the past and may continue to into the future. In addition to conserving the remaining native habitats, plantations for the presently endangered cypresses could be created as is being done by the Arboretum de Villardebelle in France. Individual citizens could also contribute to the conservation of native cypresses. Consider adding native species to your Oregon landscaping. The non-native Arizona and Monterey cypresses that are commonly planted in western Oregon could be replaced by our native cypress species. DO NOT plant Leyland cypress, which is a hybrid between Monterey cypress and Alaska yellow cedar and is an aggressive, fast-growing pest.

Baker, MacNab, Sargent and Mendocino cypresses are not well known in Oregon's nursery trade, but two nurseries in southwestern Oregon sell them (Plant Oregon at Talent and Forestfarm at Williams). Baker cypress has been planted on the Southern Oregon University campus and as highway corridor tree in Grants Pass where it grows with knobcone and gray pine. So far, MacNab, Sargent, and Mendocino cypresses occur primarily as novelties in private collections and arboreta but are well suited to being more widely planted (individually, to prevent hybridization) in home and public landscapes.

Recent phylogenetic investigations of the subfamily *Cupressoidae* have found evidence to suggest that *Cupressus* is not monophyletic. The genus splits into two distinct geographical clades: Old World cypresses (OWC) and New World cypresses (NWC) rendering *Cupressus* polyphyletic, with *Juniperus* as a sister to a clade of Old World *Cupressus* species. In light of this evidence, Little (2006) placed all NWC in the genus *Callitropsis* including the type: *Callitropsis nootkatensis* (D. Don in Lambert). Further research by Terry and others (2012) determined that there was evidence of four distinct clades: *Callitropsis (nootkatensis)*, *Xanthocyparis (vietnamensis)*, *Hesperocyparis* (all NWC), and *Cupressus* (all OWC). Baldwin *et al.* 2012 recognize *Callitropsis nootkatensis* (formerly *Chamaecyparis*) and *Hesperocyparis* (formerly a part of *Cupressus*). In short, all New World cypresses are now grouped under the genus *Hesperocyparis*, with *H. bakeri* as the first lineage within the genus.

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