

Hinds Walnut (*Juglans hindsii*) in Oregon

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It was the summer of 1965. I had graduated from Marshfield High School in Coos Bay and moved to West Vilas Road in Central Point, where I began exploring nearby Bear Creek. There I encountered scattered populations of walnut trees that followed the riparian zone as far north as the Rogue River. This intrigued me because Peck listed no walnut in his *Manual of the Higher Plants of Oregon*, which I had just purchased at J.K. Gill's bookstore for \$6. Shortly after this discovery, my botanizing took a tropical detour, as in Vietnam. More than three years later, after a 13-month stint in South Vietnam and a year and a half in Hawai'i, I returned to Central Point. Having left seedy *Musa* species (bananas), jackfruit (*Artocarpus heterophyllus*) and

Semper Fidelis (the USMC) behind me, I began college on the G.I. bill. Classes and work left little time for botanical treks, but in June 1976 I collected a specimen of *Juglans hindsii* from the Kirtland Road site for the herbarium at Southern Oregon College (SOC5260). I also discovered that 30 to 40 of the trees I'd seen in 1965 were gone; an aggregate operation (gravel extraction) had taken their place.

In September 1977, I traveled to Orange County, California, to collect *Juglans californica* (SOC4142) in the Santa Ana Mountains for comparison with my former collection of *Juglans hindsii*. At the time, there was only one other specimen of Hinds walnut in the SOC herbarium, by J. Athey, Striehl, & Callan, 19 May 1968, north of Ashland, Oregon (SOC5840).

Decades later, Hinds walnut is still not recognized by current floras as occurring in Oregon (Kozloff 2005, Wittemore and Stone 1997). Determined to learn the status of Hinds walnut in Oregon, I planned a survey of the entire Bear Creek drainage and its tributaries, as well as the Rogue River from Gold Hill to Grants Pass. I walked at least 40 miles, mapping walnut trees, all the way from Emigrant Lake north to Gold and Blackwell hills. I covered the entire Greenway path on foot, from south of Ashland to the fairgrounds at Central Point, including the equestrian trails to lower Bear Creek. Beyond that, I surveyed numerous parcels of private property and landowner cooperation was positive. A myriad of questions were asked, and the terms "Greenie" and "Tree hugger" came up at several points. Conversations with local, somewhat defensive, ranchers were usually kept on a positive note. I completely avoided the squatter camps off the equestrian trails.

Why do I have such an enduring interest in Hinds walnut? Perhaps because of my fascination with trees, and my amazement that a native plant this large growing on the valley floor among us could have been overlooked by botanists for so many years! As my grandfather Walter LaMinter remarked to me when I was 10 years old: "you are from a long line of pioneers, you need to go out and make discoveries."

Walnut (*Juglans*) Taxonomy

Worldwide, *Juglans* comprises 21 species, ranging from Europe to east Asia and from North to South America (Mabberly 1993). *Juglans* derives from two Latin words *jovis glans* "Jupiter's nut;" and walnut derives from the Germanic *wal* "foreign," noting it is not a nut native to northern Europe. The genus is closely



Frank Callahan standing next to a Hinds walnut (*Juglans hindsii*) along Meyers Creek, Jackson County. Photo by Bob Korfhage, June 2008.

allied to *Carya*, from which it differs by having a chambered pith with uniform diaphragms and a husk that does not separate from the nut. In *Carya*, the pith is homogeneous and the husk is usually dehiscent along four sutures (Harlow and Harrar 1958). In North America, *Juglans* is represented by six species, ranging from large shrubs to tall trees. Only two species are known in the Pacific Coast States: California black walnut (*Juglans californica*) and Hinds walnut (*Juglans hindsii*). Hinds walnut is sometimes known as northern California black walnut, but the Oregon Flora Project prefers the name Hinds walnut, which is also used commercially (although the lumber is also called “claro walnut”).

Nomenclature in this article follows the Oregon Flora Project, which concurs with Flora of North America (Vol. 3, Wittemore and Stone 1997) and the 6th edition of the California Native Plant Society (CNPS) Inventory of Rare Plants of California. However, in the Jepson Manual Hinds walnut is treated as a variety of California black walnut, *J. californica* var. *hindsii* (treatment by Dieter H. Wilken in Hickman 1993).

The history of the two taxa is an interesting story. *Juglans californica* was described by Sereno Watson (1875). The type specimen,

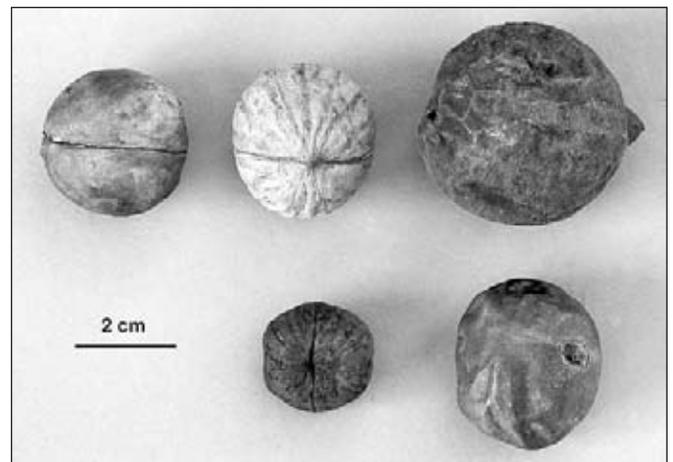
collected in December 1860 by W. H. Brewer (#65) from Sierra Santa Monica, California, is now stored in Gray Herbarium at Harvard University. Hinds walnut was discovered in 1837 by Richard Brinsley Hinds (1812-1847), the botanist traveling on the British ship HMS Sulphur during the exploration of 1836-1842. Willis Jepson described the expedition in his journal, quoting from the preface to George Bentham’s *Botany of the Voyage of HMS Sulphur* (1844): “It was late in the autumn of 1837 when an expedition up the Rio Sacramento [from the HMS Sulphur] penetrated from San Francisco some distance into the interior. The country exhibited a vast plain, rich in deep soil and subject to periodical immersion. Occasional clumps of fine oak and planes [sycamores] imparted an appearance of park land. They were already shedding their leaves; a small grape was abundant on the banks; and we sometimes obtained a dessert of the fruit of *Juglans*.” After this first reference to northern California walnut, over 70 years passed before it was formally named. Ironically, although Richard Brinsley Hinds discovered his walnut 23 years before Brewer collected California black walnut, Jepson (1908) described the former as a variety of the latter, *Juglans californica* var. *hindsii* (obviously recognizing who first collected it). After this, R.E. Smith pointed out the distinct morphological differences between it and California black walnut, and the following year, Smith and Jepson elevated Hinds walnut to species status: *Juglans hindsii* Jepson ex R.E. Smith (Smith and Jepson 1909, Little 1953, 1978, 1979). However, Jepson failed to designate a type specimen for Hinds walnut. John Thomas Howell, noting this oversight, formally designated a lectotype specimen: “W.L. Jepson No. 2189, May 3, 1903, on the east slope of the Napa Range near Wooden Valley, Napa County, JEPS 58696 (Howell 1973). The original collection by Richard Hinds is at the Kew Herbarium in England, among his herbarium specimens from the expedition, which were dated at the time of accession, 1854 (Luscombe, pers. comm. 2007).

Morphological Differences

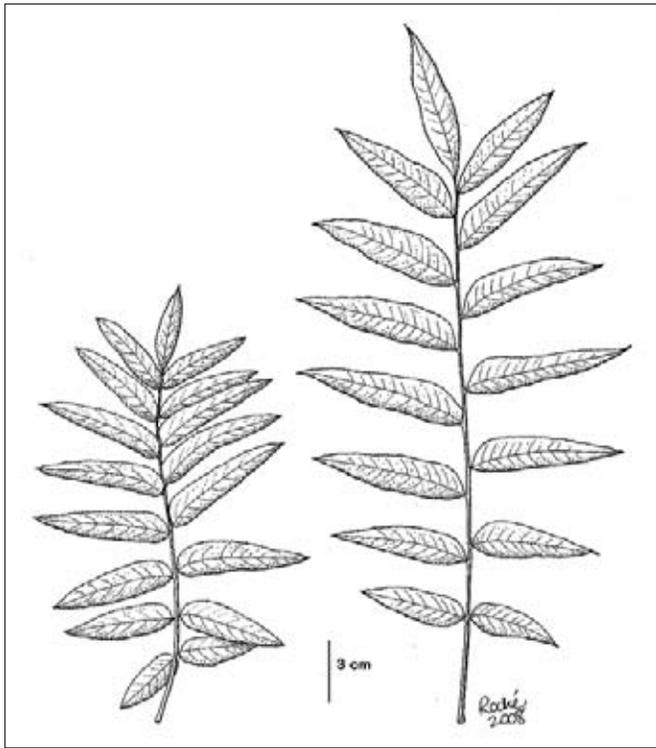
Because there has been some confusion over the taxonomic status of *Juglans hindsii*, a brief discussion of morphological differences is warranted. Both taxa have round nuts, nearly smooth, with fine, subtle longitudinal grooves and a small distal point. The defining



Scan of the original collection of *Juglans hindsii* by Richard Brinsley Hinds in 1837 at Rio Sacramento, accessioned as Herbarium Benthamianum in 1854. Image ©The Board of Trustees of the Royal Botanic Gardens, Kew. Reproduced with the consent of the Royal Botanic Gardens, Kew.



Nuts and fruits of California black and Hinds walnuts. Top row: *Juglans hindsii* side and top views of nuts, side view of fruit (showing dried husk). Bottom row: *Juglans californica*, top view of nut and side view of fruit. Photo by Bob Korfhage.



Leaves of California black walnut (*Juglans californica*), left, and Hinds walnut (*Juglans hindsii*), right. Illustration by Cindy Roché, based on collections by Frank Callahan at SOU Herbarium.

difference is size. California black walnuts are smaller, up to $\frac{3}{4}$ inch in diameter compared to 1.1 to 1.3 inches in diameter for Hinds walnuts. Leaflet length is also diagnostic. California black walnut leaflets are 0.8 to 2.6 inches long, compared to 2.4 to 4 inches long in Hinds walnut.

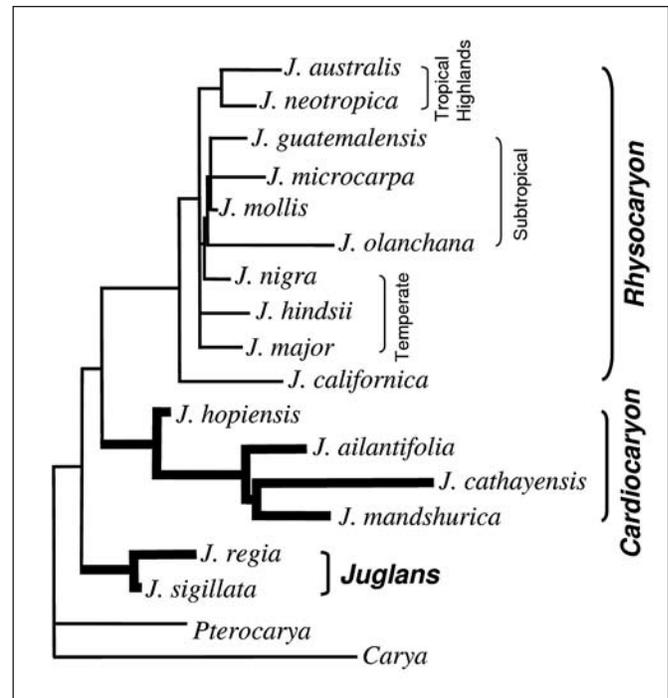
California black walnut trees are not as tall nor as robust as Hinds walnut trees. McMinn and Maino (1974) described California black walnut as “an arborescent shrub or small tree, 15 to 30 feet high, commonly with several stems from the ground or a single stem branching within one to four feet of the ground, forming a shrub-like growth as broad as high.” In contrast, Jepson’s report gives some credence to the arboreal stature of this species: “The largest tree yet reported in southern California stands in the upper Ojai Valley, in very deep and rich soil, at an altitude of 1300 feet. The diameter of the crown is 92 feet and all the lower limbs creep on the ground. The circumference of the trunk is 12 feet 8 inches” (Jepson 1910). Thus, Jepson’s tree was just over 4.5 feet in diameter at the base. E.N. (Gene) Anderson (2002) reported a tree with “a spread of 51 feet. It branches a foot off the ground; the trunk below that is 102 inches around.” At 2.7 feet in diameter and 51 feet tall, his tree was much smaller than Jepson’s giant. Jon E. Keeley measured the largest walnut he encountered during his surveys in southern California: it was 49 feet tall and 3 feet in diameter (Keeley 1990). Based on these reports and my own field observations, I conclude that California black walnut is the smallest of the North American walnuts. The data given in American Forests Big Tree Register for *Juglans californica* are incorrect; that tree is actually Hinds walnut, an identification I verified in 2007.

Hinds walnut is the robust, heavyweight giant of western North America. It would score as the largest walnut in the US, if not for the record-holding eastern black walnut, *Juglans nigra*.

The nation’s largest Hinds walnut reigns from Napa, California. In 1986, this tree measured 25.3 feet in circumference at 4.5 feet above the ground, 76 feet tall and 107 feet diameter crown spread (Kearns 2006). However, an Oregon tree measured in 1947 (see History section) was over 9 feet total diameter and over 29 feet in circumference with a certified height of 80 feet. To date, the Oregon tree is the largest known Hinds walnut ever measured. The largest Hinds walnut located in my recent survey is 18 feet in circumference (5.7 feet in diameter).

Genetic Differences

DNA found in chloroplasts (cpDNA) is used to study plant phylogeny, the evolutionary relationships among taxa. By comparing mutational changes at a molecular level researchers separate taxa and identify closer and more distant relatives in plant family trees. Aradhya *et. al.* (2007) reported on the relationships among *Juglans* species using cpDNA. To test the strength of the relationships in the *Juglans* complexes, they used *Carya* and *Pterocarya* as outgroup taxa. Old and New World taxa separated into different clades (groups), affirming that distances between them are not only geographic, but also genetic. New World black walnuts form a group (Section) called Rhysocaryon, and Old World walnuts are in Cardiocaryon and *Juglans* (see sketch of family tree). Interpretation of the sequence of evolution is complicated by extinct lineages that are well represented in the fossil records, but the lack of survivors leave gaps in the evolutionary family tree. The phylogenetic cladogram (family tree) for *Juglans* shows a closer relationship between *J. hindsii* and *J. major* in the North American



A sketch (modified by David Oline from Figure 2 in Aradhya *et al.* 2007) showing the evolutionary relationships within the genus *Juglans* based on chloroplast DNA sequence data. Bold lines indicate Old World species, thin lines, New World species. There is no close relationship between *J. californica* and *J. hindsii*, as *J. californica* is the most divergent of all the New World species, having branched off earliest from the common ancestor.

walnuts, both of which are more distantly related to *J. californica*. *Juglans nigra* branched from a common ancestor at a later date. Because walnuts are distinguished by the surface architecture of the nuts, the degree of similarity of *J. californica* and *J. hindsii* nuts is perplexing. In contrast, the nuts of *J. major* are quite different, with deep furrows. But, according to Aradhya, "*Juglans californica* is well separated from its putative relatives *J. hindsii* and *J. major*; *J. hindsii* is definitely not a variety of the highly variable *J. californica*" (M. Aradhya, pers. comm., 2008). That California black walnut is genetically highly variable is consistent with its morphology. Variation in leaflet shape and hair characteristics require "care in identifying it" (Whittemore and Stone 1997).

Walnut Hybrids

Hinds walnut crosses with eastern black walnut, which has been in cultivation since 1686 in England (Schopmeyer 1974). Widely planted in the West, eastern black walnut has naturalized in some places. It is North America's largest walnut, with maximum heights of 165 feet and diameters of 10 feet recorded (Elias 1980). Under favorable conditions trees have lived over 300 years. The largest eastern black walnut tree found in Jackson County grows in front of the Beall House on west Beall Lane in Central Point, just west of Highway 99. This tree is about 150 years old and measures 21 feet 10 inches in circumference and is 130 feet tall. Using a dated photograph (Warren collection), I determined that it was planted as a small tree in 1864. In contrast, the largest tree measured in England was 120 feet tall and 21.5 feet in circumference at 168 years of age (Mitchell 1996). The present owner of the Beall walnut, Irvin Warren, said that he once received an offer of \$35,000 for the tree. The wood is highly prized for gunstocks, furniture and cabinetry. Although the offer was tempting, the tree was deeply rooted in his heart. Otherwise, the cost and effort of cleaning up the walnuts every fall as well as \$1500 to have the tree pruned in 1982 would have led to the tree's demise (Sweet 1994). Despite its persistence around old farm houses and homesteads, eastern black walnut rarely escapes cultivation in the Rogue Valley. However, its pollen readily creates crosses with Hinds walnut. The resulting hybrid, known as 'Royal' walnut, grows at several locations in the valley. Walnuts have never been an agricultural commodity of any consequence in the Rogue Valley, especially compared to the Willamette Valley. Nuts of eastern black walnut have excellent flavor, but are difficult to extract. The nuts are round to oval in girth and widest at the equator, 1.4 to 1.6 inches in diameter, with a small blunt protuberance at the apex. The surface is harsh to the touch, with prominent longitudinal warty-rugose, keeled ridges.

Hinds walnut rootstocks have been widely used for grafting of Persian, English or Carpathian walnut (*Juglans regia*), which is the primary walnut of commerce. This walnut is rarely planted in the Rogue Valley, but I mention it because it also hybridizes with Hinds walnut; the offspring is known as 'Paradox.' This cross was championed by Luther Burbank, with promises of high nut production. Ironically, it has a high rate of sterility (poor yield of nuts), so that its greatest asset is its strong wood. A 'Paradox' walnut tree or hybrid Carpathian that I measured south of Redding, California, had a crown spread of 48 m (160 feet), a testament to the wood's extreme tensile strength!

Distribution of California Black and Hinds Walnuts

In California. California black walnut is restricted to southern California: Santa Barbara, Ventura, Los Angeles, Orange, southwestern San Bernadino, and northwestern San Diego counties. This walnut is very frost-sensitive, limited to below 3,500 feet elevation in its native range, and is relatively short-lived: maximum 150 years (Huxley 1992). There is a 275-mile gap between the northern end of the distribution of California black walnut and the southern end of the distribution of Hinds walnut.

Hinds walnut ranges from north of Mt. Hamilton (in the Diablo Mountains east of San Jose in Santa Clara County), California, to Jackson County, Oregon. Jepson's concept of the native range of Hinds walnut was that it radiated inland (north, south and east) from the San Francisco Bay area, extending northeast along the banks of the Sacramento River just into Yolo County, north to the Wooden Valley region east of Napa, Napa County, and southward to Mt. Hamilton in Santa Clara County (Griffen and Critchfield 1972). Walnut Creek in Contra Costa County and Walnut Grove on the Sacramento River were named for fine old stand of Hinds walnut (Peattie 1953). When Jepson mapped the distribution of Hinds walnut, he apparently missed several vouchered collections that showed the northern range: Blankenship at Clear Lake, Lake County, Kelsey Creek, Lake County (1928); same location by Lyman Benson (1933, 1937, 1941) and Healdsburg, Russian River, Sonoma County by R. Hartwell (1938). Griffin and Critchfield (1972) underreported the northern distribution of Hinds walnut, suggesting that either Jepson would have known these locations or "there is the older question of Indian influence on walnut distribution." They were referring to an range extension by Native Americans purported by Jepson in his statement, "these northern trees are found about ancient Indian village sites and were probably introduced from the southern part of the state" (Abrams 1923). Thomsen (1963) questioned Jepson's conclusion, and used the fossil record to show that Hinds walnut is indeed indigenous to central California. She asserted that there was undoubtedly fortuitous use of walnuts by indigenous people because riparian areas were favorable both for trees and for encampments. She doubted that the presence of walnut trees at numerous non-riparian locations could be fully explained by "accidental seeding by man or rodents" (Thomsen 1963). Also, a fossil walnut from the Oligocene San Ramon formation, southwest of Walnut Creek, California, is about half as old as the Middle Eocene Clarno Formation in Oregon (see Paleobotany section). This seed cast is similar in size to *Juglans clarnensis*, but it more closely resembles *Juglans hindsii* (Manchester 1987). This gives further evidence that Hinds walnut (or its ancestor) presence in northern California predates human activities.

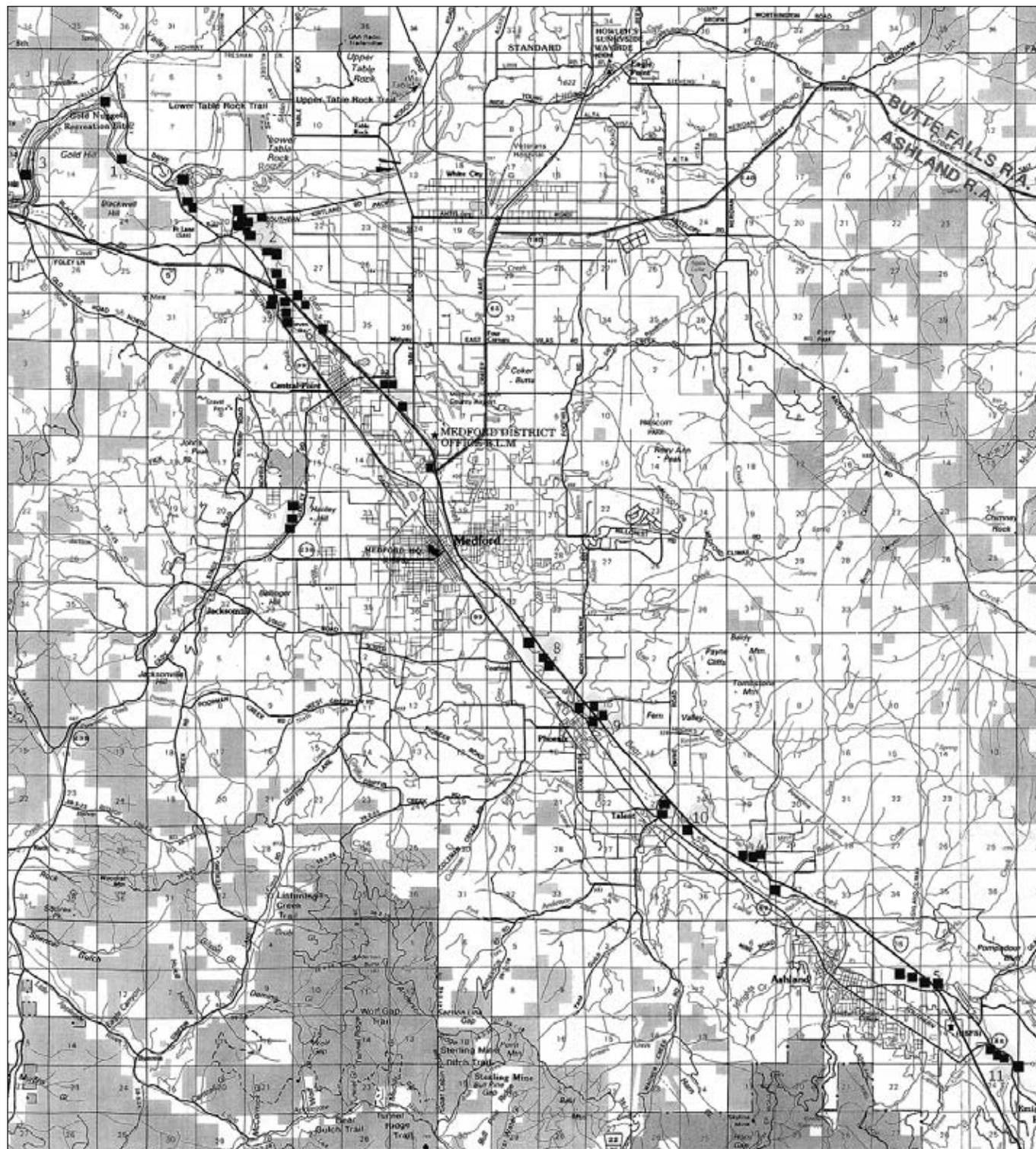
There is no doubt that Native Americans in this region carried seeds that were utilized for food on their travels. But there is little chance that this led to range extension for Hinds walnut. These tribes were hunters and gatherers, leaving no evidence of an agricultural base like the Pueblos in Arizona. In September 1977, I visited both Wooden Valley in Napa County and Kelsey Creek in Lake County and found large mounds (up to about a meter tall) of walnut shells at sites previously occupied by Native Americans. I discussed walnut use with several local landowners as well as members of the Elém Pomo Nation of Sulfur Bank Rancheria at

the east end of Clear Lake. I learned that intact walnuts were not carried far from the trees, but were processed on site using a hammerstone for crushing, after which the nutmeats were separated from the shells. The nutmeats were often added to dried fruits and jerky to form a very nutritious trail cake (pemican), much like the energy bars marketed today. This information was substantiated by the mounds of crushed shells still evident at the site.

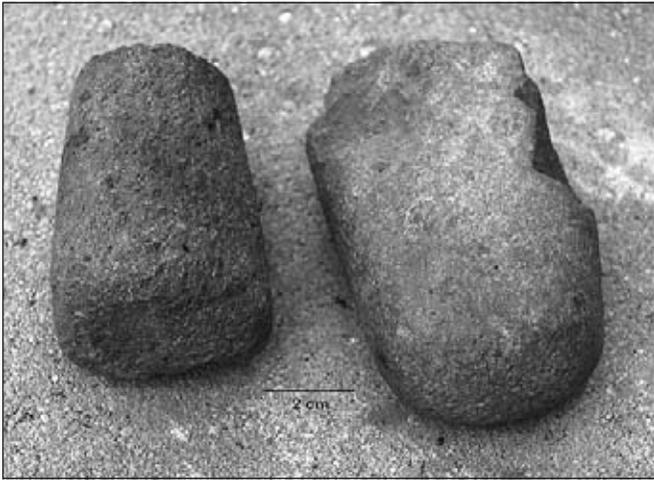
Jepson also lacked adequate understanding of soils and geology, especially fossils. “If Jepson had only known a little more geology,

he would have recognized that ‘shale’ for what it was—highly fractured and friable serpentinite rock” (Kruckeberg 1984). The current known distribution of Hinds walnut in California includes Glen, Shasta, Siskiyou, Sutter, and Tehama counties, with the northern-most populations along the Klamath River, not far from the Oregon border.

More recently, both species have been planted as landscaping or street trees in cities where they are adapted, outside their native ranges (Hoover 1970, Labadie 1978).



Distribution of Hinds walnut in Jackson County as mapped by the author in late 2007.



Hammerstones used by Native Americans, found along Bear Creek near Central Point, Jackson County, Oregon. Courtesy of the Ivan Skyrman collection. Photo by Cindy Roché.

In Oregon. No *Juglans californica* trees were found during my survey in Jackson County, Oregon; they are not hardy here. Our nursery trials conducted over several years proved the tree was very frost sensitive. Plants were killed outright when temperatures fell into the teens. These critical temperatures were also noted by Huxley (1992).

The major population of Hinds walnut in Oregon is in Jackson County. Most of the trees grow along Bear Creek which flows from Emigrant Lake (south of Ashland) northwest through Medford and empties into the Rogue River near Lower Table Rock north of Central Point. From there the population extends along the Rogue River to Gold Hill (see distribution map). Surveys along the Rogue River downstream from Gold Hill to Grants Pass yielded negative results. Neither did I find walnut trees in another survey conducted by raft and on foot from Lost Creek Dam to the confluence of the Rogue River and Bear Creek. There is a population in Douglas County along the south Umpqua River near Myrtle Creek. The largest Hinds walnut in Oregon has been designated a Heritage tree. It grows near the Yellow Creek bridge northwest of Sutherlin just south of Highway 138. Recent measurement indicated that this tree is 86 feet tall, 21 feet 5 inches in circumference, with a crown spread of 140 feet. No other Hinds walnuts grow nearby, but the area has been severely logged. In Josephine County, Keir Morse noted Hinds walnut in his inventory of plants on the Deer Creek Ranch near Selma (Morse 2008). Don Heinze reported Hinds walnut at Fish Hatchery Park near Grants Pass. Without historical data, it is not possible to determine whether the trees in Douglas and Josephine counties are native or were naturalized. Walnuts were planted by settlers throughout the Willamette and Umpqua river valleys and it is quite possible that crows are responsible for many



Hinds walnut Heritage Tree near the Yellow Creek Bridge just south of Highway 138, northwest of Sutherlin, Douglas County, Oregon. This tree may be a hybrid with eastern black walnut. Photo by Frank Callahan.

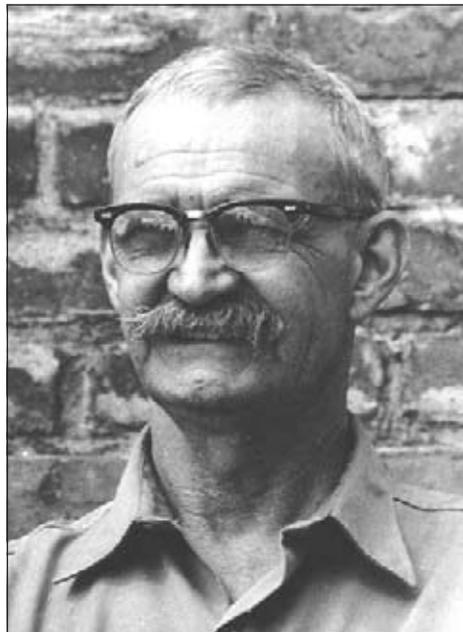
of the trees that appear native along rivercourses. Based on nut morphology, it appears that some of the Douglas County trees may be hybrids with eastern black walnut. Hinds walnut trees have also been planted in parks in the Willamette Valley. Please report any additional locations to me, especially trees that might be native, so I can more accurately assess its rarity.

History of Hinds Walnut in Oregon

The best information I have on the history of Hinds walnut in Oregon is what I learned from conversations with the late Ivan Skyrman (1907-1988) during the late 1970s and early 1980s. Ivan's father, Carl T. Skyrman was a pioneer in Jackson County, who emigrated from Sweden in 1880 and eventually settled in 1889 when he established a cattle ranch nine miles up Trail Creek. The

ranch still exists (Wally Skyrman, pers. comm., 2007). As a young man, Ivan had a keen interest in trees and their products, lumber and firewood. My first visit to the Skyrman property included a tour of his *Pinetum*, a collection of all of Oregon's known conifers and an introduction to his woodworking and metal fabrication shop. His goal was to have a representative of each of Oregon's native conifers. What began as a grand idea ended up as an experiment in natural selection: the high elevation species suffered under the high heat stress of summer in the valley. The best adapted species was gray pine (*Pinus sabiniana*), which today stands as an Oregon State Champion Tree, the largest reported in the state. This tree grew from seed collected at Blackwell Hill near Central Point.

Following the tree tour, we returned to the shop where I discovered that Ivan was a highly skilled woodworker and



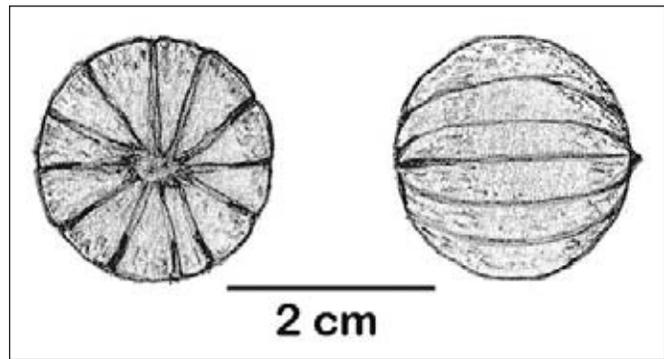
Ivan Skyrman, circa 1970. Photo courtesy of his son, Wally Martin Skyrman.

metal machinist. He handed me a finished gunstock carved out of walnut. I was impressed with his workmanship, however, the wood had dynamic color patterns unlike eastern black walnut, with which I was familiar. Four years of high school woodshop had not prepared me for the characteristics of this walnut wood; it was lighter, softer, and much easier to work than eastern black walnut. In the wood trade, Hinds walnut is termed “claro walnut” (*claro* means light or bright colored in Spanish, the first European language in much of California). The wood exhibits an array of colors: reds, tans, golds, browns and blacks. I later learned that John Bidwell propagated California Claro Walnut at Rancho Chico Nursery in Chico, California, in the late 1800s. I asked Ivan where he obtained his stock of walnut lumber. He replied, “This is the native Hinds walnut that grows all along Bear Creek.” I responded, “How do you know that it is native?” He answered,

“My father Carl introduced me to this tree and its lumber when I was a teenager. The lumber was available when he settled in the valley. The trees were being logged along Bear Creek. Logging began in the 1850s, during the time of European settlement. The wood was similar to eastern black walnut that was familiar to the settlers. In my teenage years, I measured some very large walnuts in the Phoenix area that were six to seven feet in diameter, and the same was true for the black and white oaks. Most of the old growth hardwoods were taken out in the 1920s to 1940s; all the old growth trees in the [Rogue] Valley were logged by the 1950s. Mills were scattered from Ashland to Tolo, processing lumber for flooring in Medford to the milling of cottonwood for pear boxes. Hinds walnut commanded the highest prices for cabinet stock and gunstock blanks. In 1947, Delmar Smith (1911-1988) and I visited the largest known walnut in the valley. [Delmar Smith was founder of the Crater Rock Museum and a member of the Rock Garden Society with Ivan and the two shared a keen interest in trees.] A walnut broker had purchased the tree and it was in the process of being logged. The tree was north of Central Point and Weldon Downey (1920-1994), a scaler, was measuring the tree. Weldon measured the height at 80 feet and the diameter of the stump at 9.5 feet, not including the bark. Delmar tried to negotiate a sawn round off the log, but the price was exorbitant. We were unable to obtain any of the wood as the entire tree, including limbs, was shipped out by truck. The stump was solid and free of defects and our best efforts at a ring count indicated that the tree was at least 327 years old. We noted that growth had been rapid for the first 75 years, and the remainder of the rings had a uniform spacing, until the last 50 years when growth had slowed considerably¹. Years later, the stump was doused with diesel and burned. The resulting cavity was so large that it took a small dump truck load of soil to level the site.”

For the record, the trunk was over 29 feet in circumference. The current national champion Hinds walnut is 25 feet 4 inches in circumference, 76 feet tall, with a 107-foot diameter crown spread, measured in 1986 (by author). It appears that the Central Point tree was slightly larger and taller, although the crown diameter was not given. The ring count of 327 years indicates that the tree was a seedling in 1720, long before European settlement in the valley.

¹ Delmar Smith’s notes on the age and chronology of this tree agree with those of Ivan Skyрман.



Silicified nuts of fossil *Juglans clarnensis*. Pencil drawing by Frank Callahan.

Given the age of these trees and the strictly riparian distribution (human planting would have occurred around home sites), it is clear that Hinds walnut was not introduced by homesteaders. Neither have these walnut trees been found around known Indian campsites, just as the case in California (Thomsen 1963). All of this is strong evidence that Hinds walnut is native in Jackson County, Oregon.

Paleobotany—Is Hinds Walnut a Living Fossil?

As Thomsen (1963) pointed out, Jepson (1910), Griffen and Critchfield (1972) failed to consult the paleobotanical records of walnuts in western North America. The fossil record at the John Day Fossil Beds in eastern Oregon indicates the presence of silicified walnuts in the Clarno Formation of *Juglans clarnensis* Scott, dated in the Middle Eocene (49 to 41 million years ago). This small walnut, the earliest confirmed *Juglans* fruit known (Scott 1954), is nearly indistinguishable from *J. hindsii*. This is significant because in Juglandaceae, the most important structure for generic level determinations is the fruit: “Each modern genus is defined such that it can be recognized on the basis of its fruit, with or without information from other organs” (Manchester 1987). This raises the possibility that this branch of the Section Rhysocaryon (New World black walnuts) originated in northeastern Oregon and the mild climate of the Rogue Valley provides a refugia suited for survival in Oregon of its descendants. The fossil collection from the Clarno Formation ranges from moist tropical species of bananas (*Ensete oregonense*) and tree ferns (*Cyanthea pin-nata*) to temperate species of walnut (*Juglans clarnensis*), sycamore (*Macginitiea angustilobia*) and alder (*Alnus clarnoensis*). One could speculate that the former range of Hinds walnut may have extended southward from northcentral Oregon to western Oregon and central California. Volcanism and uplift that created the present Cascade range and subsequent harsher climatic conditions may have forced the walnut to retreat to milder climate regimes to the west. Throughout its modern range, Hinds walnut thrives in a Mediterranean climate with hot dry summers and cool moist winters, such as found in the Bear Creek Valley. The species is certainly not hardy east of the Cascade Mountains. Trees planted in Klamath Falls soon succumb to hard winter freezes (Gary Goby, pers. comm.). Even in areas where it can survive, heavy snowfalls break limbs off, creating open wounds, making it vulnerable to insect and disease damage. According to Gary Goby of Goby Wood Products, “The wood is lighter and softer than either eastern black walnut, or any of the orchard hybrid walnuts.” Thus, the lower tensile strength of the wood of Hinds walnut is a disadvantage.

A black walnut fossil collection from Nevada, *Juglans nevadensis* Berry, dates to the Miocene, about half the age of the Oregon Clarno Formation material. Nevada is outside the present range of black walnuts, but this collection indicates their former presence there. “Since *Juglans* no longer occurs in Nevada, Berry (1928) suggested that the local population became extinct due to increasing aridity caused by the uplift of the Sierra Nevada Mountains” (Manchester 1987).

Similarly, California black walnut survives in the canyons and ravines of southern California, “as if it were clinging to all the shadow and coolness and moisture it could find in the bright aridity of this region. As soon as the summer droughts begin, the delicate-looking foliage is apt to turn to a dull gold or crisp brown, and by early autumn it may have dropped entirely... One cannot help feeling that this is a tree which must be left over from a different climate and now fights a losing battle with its environment” (Peattie 1953).

Alternatively, Hinds walnut may have migrated north from the Sacramento Valley, and arrived here as late as post-Pleistocene, during the warm Hypsithermal 4,000 to 8,000 years ago, a pattern suspected for California buckeye (Callahan 2005).

Is the Rogue Valley a Haven for Post-Pleistocene Relicts?

California’s Gray Pine Belt and Oregon’s Rogue River Valley are mapped as climatic Zone 7 (Brenzel 2001). Zone 7 in Oregon is the northernmost extension of a climatic zone that lies primarily within California, with sharply defined seasons of hot summers and mild, but pronounced winters. So it should come as no surprise that some of California’s zone 7 plants are found in this small southwestern Oregon zone. That the most northern populations of Hinds walnut are in Jackson County is not an anomaly. A number of other trees reach their northern distribution limit here, including the indicator species for Zone 7—gray pine (*Pinus sabiniana*), as well as California buckeye (*Aesculus californica*) (Callahan 2005), Baker cypress² (*Cupressus bakeri*), Brown dogwood (*Cornus glabrata*), blackfruit dogwood (*C. sessilis*) and California redbud (*Cercis occidentalis*). Oracle oak (*Quercus xmoreheus*), the hybrid of California black oak (*Quercus kelloggii*) and Interior live oak (*Q. wislizenii*) has also been documented in the county. However, it ranges north to near Sutherlin, Oregon. The presence of this hybrid



Male flowers (catkins) and newly emerged leaves of Hinds walnut. Flowers appear in May in the Rogue Valley. Photo by Cindy Roché.

oak is strong evidence that Interior live oak recently resided here. Another southern tree species recently reported for Jackson County is Fremont poplar (*Populus fremontii*), based on a voucher specimen collected by Tonia Blum (SOC 8523) May 9, 1992 near Ashland and my 2008 collection of leaves below Gold Ray Dam (herbarium voucher sent to Oregon State University Herbarium).

Dispersal of Hinds Walnut Seeds

Stream activity, especially flooding, and American Crows (*Corvus brachyrhynchos*) disperse Hinds walnut seeds. Crows collect and cache individual nuts, some of which are forgotten, securing reproduction for the walnut. In California, Yellow-billed Magpie (*Pica nuttali*) also caches fruits of oaks, gray pine and walnuts. To date, this magpie has not been reported in Oregon (pers. comm., Stewart Janes, 2008). Oregon’s native Black-billed Magpie (*Pica hudsonia*) also caches seeds, but does not range into the Bear Creek Valley.

Ecology

Hinds walnut is a long-lived species and restricted to riparian habitats throughout its range. From my surveys, I concluded that it is limited to depositional floodplain zones, a habitat described in California as riparian forest (Thompson 1961). Narrow, eroded riparian corridors are unsuitable. This may explain its



Globose fruits develop from the female flowers, which often occur in pairs. Photo By Bob Korfhage.

²*Cupressus bakeri* has been found on Flounce Rock near Prospect, upslope from the Rogue River.

Hinds Walnut Cultivation—Grow Your Own

absence along the Rogue River, a waterway with few depositional floodplains to provide opportunity for seed germination and establishment. This depositional character applies to all of the habitats of Hinds walnut in California as well (Thompson 1961). The species appears to be quite sensitive to hydrology, requiring a consistent water supply, whether surface or subsurface. It was not found in ephemeral drainages. In the survey, two populations were found on islands in the Rogue River: one just above and one below Gold Ray Dam.

Hinds walnut grows in openings or as a subcanopy tree, but canopy closure by taller trees retards its growth or eliminates it from the site. Tall trees that form the overstory canopy above Hinds walnut include black cottonwood (*Populus trichocarpa*), white alder (*Alnus rhombifolia*), and Oregon ash (*Fraxinus latifolia*). Black cottonwood is the tallest, most conspicuous tree in the riparian landscape along Bear Creek, with heights of 150 feet. However, most of surviving trees are “second growth,” much smaller than the potential height and size of this species³. It is a comparatively short-lived tree, with 250 years being about the maximum age (Carder 1995). A black cottonwood measuring 10 feet in diameter was recently felled along Wagner Creek near Talent. Unfortunately, the height and crown diameter were not measured. The second most common tree in the riparian forest is white alder, growing up to 120 feet tall with 4.5 ft. boles. Oregon ash is the tree most commonly found with Hinds walnut. In the Rogue Valley it often reaches 75 feet in height, but rarely over 3 feet in diameter. Bigleaf maple (*Acer macrophyllum*) is rare along Bear Creek.

The strategy of Hinds walnut is rapid juvenile growth, combined with individual longevity. Hinds walnut trees can live over 300 years. Its wood is much stronger than black cottonwood, which is susceptible to wind shearing. Lost limbs on cottonwood trees create gaps in the canopy that favor the walnut. Young trees are readily killed by fire but old growth Hinds walnuts are highly fire resistant. Mature trees will also resprout from the base.

Two vines, California grape (*Vitis californica*) and California smilax (*Smilax californica*) brighten the canopy, particularly after deciduous leaf fall. Several willows also grow in the river corridor. Shining willow (*Salix lucida*) is somewhat competitive with Hinds walnut. It grows as large and spreading trees, reaching 70 feet in height, but rarely living to 80 years. The other willows (narrow-leaved willow, *Salix exigua*, and sandbar willow, *Salix sessilifolia*) are even shorter lived (to 40 years), and rarely reach 40 feet in height. Both have narrow gray leaves and strictly upright habits. Arroyo willow (*Salix lasiolepis*) sprawls and rarely reaches 30 feet tall. Hawthorns are very rare in this riparian zone, with *Crataegus suksdorfii* being the sole representative. Both native oaks, Oregon white (*Quercus garryana*) and California black (*Q. kelloggii*) are found occasionally in the riparian zone, but are rarely a direct associate of Hinds walnut.

On Meyer Creek near Ashland, Hinds walnut is the climax species in a grove containing 25 walnut trees. Its deep taproot enables it to dominate the site by reaching the deep water table. Black cottonwood and white alder are shallow-rooted. However, along Bear Creek where water is closer to the surface, the taller black cottonwood easily dominates the riparian forest.

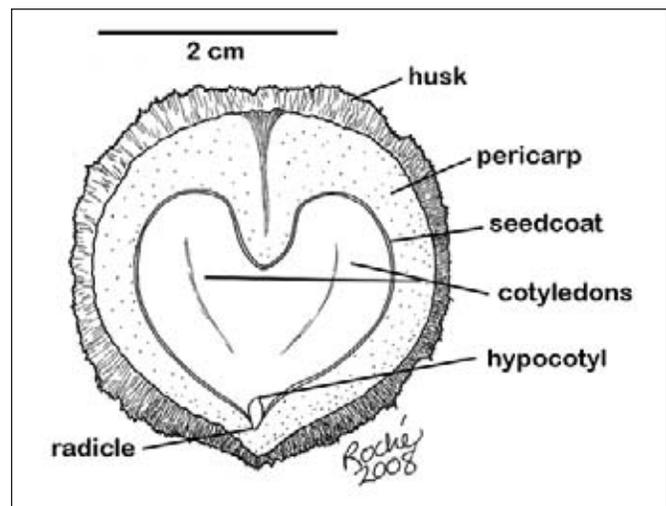
³Black cottonwood trees measuring 225 feet in height and 10 feet in diameter grew on the Olympic Peninsula (Henry 1915) and 200 feet tall, 9 feet in diameter along the Columbia River Flats (Jensen 1999).

Walnuts are easy to grow from seeds. However, all species require a long period of cold stratification (up to six months) for germination. It is best to sow the cleaned nuts after harvest in the fall, and cover with about 1 to 2 inches of duff or topsoil. Protect them from rodents. If growing the seedlings in pots, use deep containers known as avocado pots. If growing them in seedbeds, remove the small plants for outplanting before they reach a foot in height. Walnuts quickly develop a vigorous taproot and resent transplanting. If buying container stock at a nursery, reject rootbound plants. Juvenile walnuts grow very vigorously and perform best in deep rich topsoil where ground water is available.

Walnuts can be grown in almost any horticultural setting, provided their cultural requirements are met. Within the genus *Juglans*, there are species adapted to climates ranging from cold temperate (lows of -30°F, *Juglans nigra*) to tropical (lows of 50°F, *Juglans guatemalensis*).

In Oregon, only two walnuts from North America survive east of the Cascades: eastern black walnut (which rarely produces nuts in the Bend area due to severe spring freezes that damage the catkins and flowers) and butternut (*Juglans cinerea*). Both of these walnuts also perform well west of the Cascades. The following walnuts are hardy in the major valley systems west of the Cascades: Hinds walnut, Nogal or Arizona walnut (*Juglans major*) and little walnut (*Juglans microcarpa*) which ranges as far west as New Mexico. California black walnut, a very tender species, freezes out in the Rogue Valley, but might be grown at Brookings. It is not hardy in the British Isles, although Hinds walnut thrives there (Bean 1978).

Walnuts should be planted away from buildings, concrete driveways, lawns, and gardens because they can be messy trees; they shed nuts that stain and give off the allelopathic chemical juglone that inhibits growth of other plants. Juglone occurs naturally in leaves, roots, bark and husks of all species of *Juglans* (Mabberly 1993). Open parks or field settings are optimal planting situations. Give these trees room to grow, or years later pay an arborist to cut



Longitudinal cross-section of a germinating Hinds walnut. The nut splits along the longitudinal grooves and the radicle emerges out the distal end. By the time of germination much of the original husk has disintegrated. Illustration by Cindy Roché.



The leaves of a seedling Hinds walnut emerge from between the two halves of the walnut. Photo by Cindy Roché.

off huge limbs overwhelming your residence. All walnuts need ample ground water or irrigation. Those native to desert regions, *Juglans major* and *J. minor*, grow only along watercourses.

Except for California black walnut, which tends to be limby and shrubby, all of the native walnuts can be grown for lumber production. Both eastern black walnut and Hinds walnut are grown commercially.

As food, nutmeats of all of our native walnuts have excellent flavor and are very nutritious. They are difficult to extract, hence the English walnut dominates the world market. Native walnuts provide food for crows and rodents. All walnuts are wind pollinated, but I have seen bees gathering the pollen and small birds foraging the catkins.

A Future for Hinds Walnut?

I found the entire riparian ecosystem in a state of chaos. Himalayan blackberry dominates nearly the entire streambank zone of Bear Creek. Escaped arboreal species included northern catalpa (*Catalpa speciosa*), golden weeping willow (*Salix alba tristis*), black locust (*Robinia pseudoacacia*), tree of heaven (*Ailanthus altissima*), eastern box elder (*Acer negundo*), silver poplar (*Populus alba*), and eastern black walnut (*Juglans nigra*). However, none of these exotic trees have prospered to the extent that they presently pose a threat to the riparian corridor. Human development into the Bear Creek floodplain is a disaster in the making: gravel and sand extraction, logging and land clearing for views and river access have severely reduced suitable habitat. During the survey, all classes except old growth were noted. Seedling establishment requires open floodplains, but these are rapidly being converted to development. Despite limited habitat, I found recruitment at

a few sites, although the number of seedlings was not high. At the time of the survey, the entire population of Hinds walnut (14 mature trees) and associated Oregon ash was being logged to make way for storage units at the Interstate-5 interchange near Phoenix. Fortunately all the trees were milled on site for lumber. Oregon ash lumber is just as valuable as walnut.

When I surveyed Griffin Creek, I expected to locate potential habitat for Hinds walnut. However, both Griffin Creek and Jackson Creek have been artificially channeled, which almost completely destroyed the riparian habitat. At the intersection of Griffin Creek and Scenic Avenue in Central Point, the incised creek channel has vertical sidewalls cut through 20 feet of alluvial soil down to the quartz diorite bedrock. The channeling of creeks for flood control has been extremely detrimental to soils and hydrology, lowering the water table, obliterating a floodplain and any habitat for riparian species, both flora and fauna. Some of the best soils in the Valley (deep, rich soil that is productive farm land) are post-Pleistocene in origin, nearly 10,000 years in the making; now converted to planned urban sprawl of housing subdivisions and sports parks.

The planting of non-native walnuts near the riparian corridor is also a problem, as noted by the presence of hybrids.

In conclusion, the human footprint has been an almost interecine element to the Bear Creek drainage in the Rogue Valley. Both humans and the natural environment will be losers if conservation measures are not taken to sustain and nurture what is left of our dwindling riparian forests. In the closing chapter of this play, Hinds walnut could play a starring role in restoration of these habitats. Managers at the Medford Parks Department and the Bear Creek Greenway are searching for that special riparian tree with longevity (Bill Harrington, Arborist, Medford Parks Dept., pers. comm.).

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References

- Abrams L. 1923. An Illustrated Flora of the Pacific States, Washington, Oregon and California. Vol. 1, Stanford (CA): Stanford University Press. pp. 509-510.
- Anderson EN. 2002. Some preliminary observations on the California black walnut (*Juglans californica*). Fremontia 30(1):14.
- Aradhya MK, Potter D, Gao F, Simon CJ. 2007. Molecular phylogeny of *Juglans* (Juglandaceae): a biogeographic perspective. Tree Genetics & Genomes 3:363-378.

- Bean WJ. 1978. Trees and Shrubs Hardy in the British Isles. 8th ed. Vol. II. St. Martins Press. p. 473.
- Bentham G, Belcher E, Hinds RB. 1844. The botany of the voyage of H. M. S. Sulphur, under the command of Captain Sir Edward Belcher, during the years 1836-42. London: Smith, Elder.
- Berry J. 1928. *Juglans nevadensis* Washington Acad. Sci. 18:158-160.
- Brenzel KN. 2001. Sunset Western Garden Book. The West's Climatic Zones. Menlo Park (CA): Sunset Publ. p. 40.
- Callahan F. 2005. California buckeye (*Aesculus californica* (Spach) Nutt.). Kalmiopsis 12:9-15.
- Carder A. 1995. Forest Giants of the World—Past and Present. Markham (Ontario, Canada): Fitzhenry & Whiteside.
- Elias TS. 1980. The Complete Trees of North America, Field Guide and Natural History. New York (NY): Times Mirror Magazines Book Division. Pp. 269-275.
- Griffin JR, Critchfield WB. 1972. The Distribution of Forest Trees in California. Berkeley (CA): USDA Forest Service Pacific Southwest Experiment Sta. p. 22, 69, Map 31.
- Harlow WM, Harrar ES. 1958. Textbook of Dendrology, covering the important forest trees of the United States and Canada. 5th Ed. New York: McGraw Hill Book Co. pp. 238-242.
- Henry JK. 1915. Flora of Southern British Columbia and Vancouver Island. Toronto (Ontario): WJ Gage & Co. Ltd. p. 101.
- Hickman JC, ed. 1993. The Jepson Manual, Higher Plants of California. Berkeley (CA): University of California Press. pp. 709-711.
- Hoover RF. 1970. The Vascular Plants of San Luis Obispo County, California. Berkeley (CA): University of California Press. p. 102.
- Howell JT. 1973. Notes and News. A Lectotype for the Hinds Walnut. Madroño 22:144.
- Huxley A. 1992. The New Royal Horticultural Society Dictionary of Gardening. New York: MacMillan Press.
- Jensen EC, Ross CR. 1999. Trees to Know in Oregon. Corvallis (OR): Oregon State University Coop. Ext. p. 80.
- Jepson WL. 1908. Juglandaceae *Juglans californica* S. Watson var. *hindsii* Jeps. Bull. S. Calif. Acad. Sci. 7(1): 24. Jepson WL. 1910. The Silva of California. Memoirs of the University of California. Pp. 195-196.
- Kearns E. 2006. Big Tree Register. American Forests 112(1):15, 42.
- Keeley JE. 1990. Demographic structure of the California black walnut (*Juglans californica*; Juglandaceae) woodlands of southern California. Madroño 37:241.
- Kozloff EN. 2005. Plants of Western Oregon, Washington & British Columbia. Portland (OR): Timber Press. 512 pp.
- Kruckeberg A. 1984. The flora on California's serpentine. Fremontia 11:4.
- Labadie EL. 1978. Native Plants for Use in the California Landscape. 1st Ed. Sierra City (CA): Sierra City Press. p. 128-129.
- Little EL Jr. 1953. Atlas of United States Trees. 1st Ed. USDA Forest Service Misc Pub. Washington, DC: US Govt. Printing Office.
- Little EL Jr. 1978. Atlas of United States Trees. USDA Forest Service Misc Pub. Washington, DC: US Govt. Printing Office.
- Little EL Jr. 1979. Checklist of United States Trees. USDA Forest Service Handbook No. 451. Washington (DC): US Govt. Printing Office. p. 152.
- Mabberley DJ. 1993. The Plant Book. Cambridge (MA): Cambridge Univ. Press. p. 301.
- Manchester SR. 1987. The fossil history of the Juglandaceae. Monographs in Systematic Botany. Missouri Bot. Gard. 21:5, 81, 83, 105, 106, 107, 109, 117.
- McMinn HE, Maino E. 1937. An Illustrated Manual of Pacific Coast Trees. Berkeley (CA): University of California Press. Pp. 156-158. Fig. 147.
- Mitchell A. 1996. Trees of Britain. London: Harper Collins. p. 244-245.
- Morse K. 2008. Plant Inventory of Deer Creek Property, Selma, Oregon. MS Thesis, Southern Oregon University.
- Peattie DC. 1953. A Natural History of Western Trees. 3rd Printing. Boston (MA): The Riverside Press, Cambridge. Pp. 370, 373.
- Schopmeyer CS. 1974. Seeds of Woody Plants in the United States. Washington (DC): USDA Forest Service Agriculture Handbook No. 450. p. 456.
- Scott RA. 1954. Fossil fruits and seeds from the Eocene Clarno Formation of Oregon. Palaeontographica 96B 66-9.
- Smith RE, Jepson WL. 1909. Juglandaceae *Juglans hindsii* (Jeps.) Jeps. ex R.E.Sm. in Univ. Calif. Agric. Exper. Stat. Bull. No. 203, 27.
- Sweet R. 1994. Looking for Generals. Forest Log, May-June. Oregon State Department of Forestry, Salem, OR. Pp. 27-29.
- Thompson K. 1961. Riparian forest of the Sacramento Valley, California. Ann. Assoc. Am. Geogr. 51:294-315.
- Thomsen HH. 1963. *Juglans hindsii*, the central California black walnut, native or introduced? Madroño 17:1-32.
- Watson S. 1875. Proc. Am. Acad. Arts Sci. 10:349.
- Wittmore AT, Stone DE. 1997. *Juglans*. Pp. 425-428 in Flora of North America Vol. 3. Oxford University Press.

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