

# Taxonomy and Nomenclature of Baldcypress, Pondcypress, and Montezuma Cypress: One, Two, or Three Species?

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SUMMARY. As interest in issues such as seed source, provenance, genetic pollution, and threatened and endangered plant species grows, so does the need for an understanding of the relatedness and evolutionary history of plants. Appropriate taxonomy and nomenclature become much more important. *Taxodium* (L.) Rich. is a genus of landscape trees included in many plant materials courses across the country. It has been treated variously in the horticulture literature as having one, two, or three species. The most appropriate treatment is one species with three botanical varieties: baldcypress [*Taxodium distichum* (L.) Rich. var. *distichum*], pondcypress [*T. distichum* var. *imbricarium* (Nutt.) Croom], and montezuma cypress [*T. distichum* var. *mexicanum* Gordon].

The appropriate taxonomy and nomenclature for plant taxa (taxonomic groupings) are often overlooked by the nursery industry and may seem of little importance. However, names frequently do not reflect the most current taxonomic classification. This may seem of little importance. However, names take on a new importance when we realize that binomials are intended to convey information beyond distinguishing one plant from another. Binomials reflect relationships and relatedness among groups of plants. We ignore that information if we do not use the most appropriate name as decided by a taxonomic specialist. Ecologically and environmentally friendly industry practices are growing in importance along with public interest. Issues such as provenance are receiving more and more interest and research (Bresnan et al., 1996; Giridhar et al., 1995; Lickey et al., 2002; McMillian, 1974; Schrader and Graves, 2000; Shoemaker et al., 2004; Wood et al., 1998). Appropriate classification of taxa is of the utmost importance in these types of studies, because they attempt to investigate the geographic component to genotypic variation. Erroneous conclusions may be drawn if

incorrect taxonomic classification is used.

Often horticulturists are frustrated, irritated, and sometimes baffled by the seemingly arbitrary nomenclatural changes taxonomists and systematists make to plants. We often wonder aloud, "Why can't they just leave things alone?" We often ask students the importance of scientific names while teaching plant materials classes. Answers range from "because plants can have more than one common name" to "so each plant has a standard name that everyone uses." Almost invariably the answers deal with distinguishing plants from each other. We spend very little time on the importance of scientific names for conveying relatedness among plants or evolutionary history of taxa. Yet, this is the objective of the hierarchical system Linnaeus created. Otherwise, all that would matter is that each taxon has a unique name. Name changes are not always meaningful if all we are concerned with is distinguishing one plant from another. However, as interest grows for issues like seed source, provenance, genetic pollution, and threatened and endangered plant species, so does the need for an understanding of the relatedness and evolutionary history of plants. Correct plant nomenclature becomes more important regarding to which genus a species belongs or whether two taxa are distinct species or subspecies or botanical varieties. Names

must adhere to the nomenclatural rules set by the International Code of Botanic Nomenclature (Greuter et al., 2000), including those dealing with status, typification, and priority of names.

There are several very useful online nomenclatural data bases that are readily accessible. These include the International Plant Names Index (2006), the Missouri Botanical Garden's VAST nomenclatural database accessed through the W<sup>3</sup>TROPICOS interface (Missouri Botanical Garden, 2006), and the U.S. Department of Agriculture (USDA) National Plant Germplasm System (USDA, 2006).

## Taxonomy of *Taxodium*

Baldcypress, pondcypress, and montezuma cypress are three taxa recognized historically in the genus *Taxodium*. Baldcypress has a range along the Atlantic and Gulf Coast Plains of the United States. It can be found naturally as far north as Maryland and Illinois, and south into Florida and central Texas (Middleton and McKee, 2004). Pondcypress is restricted in distribution to Florida and the Gulf Coast east of Texas, and up the Atlantic coast to North Carolina (Middleton and McKee, 2004). Montezuma cypress is the southernmost taxa, occurring in Mexico and far southern Texas (Turner and Watson, 1999).

*T. distichum* is widely accepted as the correct name for baldcypress (Arnold, 2002; Liberty Hyde Bailey Hortorium, 1976; Lickey and Walker, 2002; Lickey et al., 2002; McMillian, 1974; Murphy and Stanley, 1975; Schopmeyer, 1974; Tsumura et al., 1999; Turner and Watson, 1999; Vines, 1960; Watson, 1983, 1993). Disagreement arises with respect to the classification of the other two taxa. Authors treat the genus as having three species (Arnold, 2002; Griffiths, 1994; Krüssmann, 1985; Turner and Watson, 1999); others, as two species, with one having two botanical varieties (Liberty Hyde Bailey Hortorium, 1976; Vines, 1960). Pondcypress has been treated as a distinct species, *T. ascendens* Brongn., by some authors (Arnold, 2002; Griffiths, 1994; Krüssmann, 1985; Turner and Watson, 1999) and as a botanical variety of *T. distichum* by

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others (Liberty Hyde Bailey Hortorium, 1976; Lickey and Walker, 2002; Lickey et al., 2002; Murphy and Stanley, 1975; Schopmeyer, 1974; St. Hilaire, 2001; Vines, 1960; Watson, 1983, 1993). The botanical variety name most commonly assigned is *T. distichum* var. *nutans* (Ait.) Sweet. Pondcypress has been segregated from baldcypress based on vegetative morphology, sometimes in combination with poorly defined and inconsistent habitat or community-type differences (Watson, 1983). Watson (1983) reported that there exist numerous individuals and populations that “exhibit morphological intermediacy or curious admixtures of the characters representative of the morphological extremes. (p. 192)” This phenomenon has also been personally observed by the authors of this paper. Watson (1983) contends that the vegetative and ecological differences are insufficient to support specific rank for pondcypress. Also, there is no significant difference in reproductive morphology and anatomy, embryology, leaf flavonoid and bioflavonoid profiles, and nuclear DNA content of meristematic root cells (Watson, 1983). All these characters have been reliable criteria for distinguishing between species of other conifers (Watson, 1983). Therefore, Watson (1983) classified pondcypress as a botanical variety of *T. distichum*. Also, Tsumura et al. (1999) concluded that pondcypress should only be given botanical variety status based on DNA analysis using cleaved amplified polymorphic sequences. Based on allozyme analysis, botanical variety status for pondcypress was also supported by Lickey and Walker (2002).

Montezuma cypress is often treated as a distinct species, *T. mucronatum* Tenore (Arnold, 2002; Liberty Hyde Bailey Hortorium, 1976; Creech and Yunlong, 2003; Griffiths, 1994; Krüssmann, 1985; McMillian, 1974; St. Hilaire, 2001; Turner and Watson, 1999; Vines, 1960). However, according to Watson (1983) it has also been treated as a botanical variety, *T. distichum* var. *mexicanum* Gordon. DNA and phytochemical analyses are not available for montezuma cypress. However, there are several factors that suggest botanical variety status is appropriate. Montezuma cypress differs only by “minor phe-

**Table 1. Key to botanical varieties of *Taxodium distichum*.**

1a. Determinate short shoots mostly ascending in a vertical plane; awllike leaves narrowly lanceolate, 0.1–0.4 inch long, appressed, and imbricate in five to eight ranks on shoots. . . . .	var. <i>imbricarium</i>
1b. Determinate short shoots mostly spreading in a horizontal plane; flattened leaves narrowly linear, 0.2–0.6 inch long, divergent, and appearing two ranked on shoots. . . . .	2
2a. Leaves deciduous; branches (catkins) containing male cones short and crowded, often divided into compact secondary branches. . . . .	var. <i>distichum</i>
2b. Leaves semievergreen; branches (catkins) containing male cones long and slender, open, made up of single cones or clusters of several cones . . . . .	var. <i>mexicanum</i>

<sup>1</sup>1 inch = 25.4 mm.

Adapted from Watson (1983) and Correll and Johnston (1970).

nological characters,” as indicated by Watson (1993) in his treatment of *Taxodium* for the *Flora of North America*. McMillian (1974) indicated morphological and physiological gradients exist between *T. distichum* and the Mexican populations. Montezuma cypress has been planted in close proximity in areas of central Texas to native baldcypress stands. Large numbers of offspring with intermediate characteristics and heavy seed set were observed there in the fall 2003 (G. C. Denny, pers. obs.). These observations, in the absence of molecular evidence, indicate that botanical variety status is more appropriate for montezuma cypress. See Table 1 for a key to the botanical varieties of *T. distichum*.

## Nomenclature

After the taxonomic questions are answered, the question of appropriate nomenclature arises. Baldcypress was originally described by Linnaeus (1753) as *Cupressus disticha*. Richard (1810) transferred to the genus *Taxodium* as *T. distichum*. The correct botanical name for baldcypress is *T. distichum* var. *distichum* when the genus is treated as one species with three botanical varieties.

Pondcypress is commonly cited as *T. distichum* var. *nutans* (Ait.) Sweet, when it is given botanical variety status (Liberty Hyde Bailey Hortorium, 1976; Murphy and Stanley, 1975; Schopmeyer, 1974; St. Hilaire, 2001; Vines, 1960). According to Watson (1983), *Cupressus disticha* (L.) var.

**Table 2. Abbreviated synonymy for baldcypress, pondcypress, and montezuma cypress.**

<b>Baldcypress</b>	
1810. <i>Taxodium distichum</i> (L.) Richard var. <i>distichum</i>	
1810. <i>Taxodium distichum</i> (L.) Richard	
1753. <i>Cupressus disticha</i> L.	
1789. <i>Cupressus disticha</i> var. <i>nutans</i> Aiton	
1827. <i>Taxodium distichum</i> var. <i>nutans</i> (Aiton) Sweet	
1938. <i>Taxodium distichum</i> f. <i>confusum</i> Palmer and Steyermark	
1939. <i>Taxodium distichum</i> f. <i>pendens</i> Rehder	
<b>Pondcypress</b>	
1837. <i>Taxodium distichum</i> var. <i>imbricarium</i> (Nuttall) H.B. Croom	
1818. <i>Cupressus disticha</i> L. var. <i>imbricaria</i> Nuttall	
1833. <i>Taxodium ascendens</i> Brongniart	
1902. <i>Taxodium imbricarium</i> (Nuttall) R.M. Harper	
1927. <i>Taxodium ascendens</i> var. <i>nutans</i> (Aiton) Rehder, pro synonym, non Aiton	
<i>Taxodium ascendens</i> var. <i>nutans</i> (Aiton) Sweet, sensu authors, non Aiton	
1982. <i>Taxodium ascendens</i> ssp. <i>nutans</i> (Aiton) E. Murray, pro synonym, non Aiton	
<b>Montezuma cypress</b>	
1858. <i>Taxodium distichum</i> var. <i>mexicanum</i> (Carrière) Gordon	
1855. <i>Taxodium mexicanum</i> Carrière	
1853. <i>Taxodium mucronatum</i> Tenore	
1854. <i>Taxodium montezumae</i> Decaisne	
1906. <i>Taxodium distichum</i> var. <i>mucronatum</i> (Tenore) A. Henry	

Adapted from Watson (1983) and Missouri Botanical Garden (2006).

*nutans* was originally described by Aiton (1789) and *C. disticha* var. *imbricaria* by Nuttall (1818). It appears *nutans* has priority. However, the plant described by Aiton (1789) was not pondcypress; rather, it was a long-leaf, drooping form of baldcypress (Watson, 1983). Therefore, *imbricaria* has priority (Watson, 1983). The name *imbricaria* became *imbricarium* in 1837 when Croom (1837) classified pondcypress as a botanical variety of *T. distichum* (Watson, 1983). The correct botanical name for pondcypress is *T. distichum* var. *imbricarium* (Nutt.) Croom adopted by modern authors (Lickey and Walker, 2002; Lickey et al., 2002; Tsumura et al., 1999; Watson, 1983, 1993).

Nomenclature of montezuma cypress is much less complicated. When it is treated as a distinct species, the name is *T. mucronatum* Tenore (Arnold, 2002; Liberty Hyde Bailey Hortorium, 1976; Creech and Yunlong, 2003; McMillian, 1974; St. Hilaire, 2001; Turner and Watson, 1999; Vines, 1960). However, because the most appropriate taxonomic treatment is as a botanical variety, the correct botanical name is *T. distichum* var. *mexicanum* Gordon (Watson, 1983).

In summary, we suggest the following classification of *Taxodium*: baldcypress (*T. distichum* var. *distichum*), pondcypress (*T. distichum* var. *imbricarium*), and montezuma cypress (*T. distichum* var. *mexicanum*). See Table 2 for an abbreviated list of synonymy of the three taxa.

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