



ree Advisor

Useful Trees & Shrubs for the Great Plains

Species Attributes and Codes

Tree Advisor contains a database of species attributes which are used to calculate the purpose ratings. This document provides a list of the attributes used and the codes assigned to these attributes.

Column	Label	Data Range
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PLANT NAMES

Common Name	common name
Scientific Name	genus, species
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SUB-REGION [symbol]

Native Status	3 (native), 2 (native elsewhere in North America, 1 (not native in N.A.)
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MORPHOLOGY and GROWTH CHARACTERISTICS

Crown Size/Form	1 (small shrub) - 4 (large tree)
Crown Height	1 (short) – 3 (tall)
Growth Rate	1 (slow) – 3 (fast)
Life Span	1 (short) – 3 (long)
Stem Form	1 (single) – 2 (multiple)
Foliage Retention	1 (deciduous) – 2 (evergreen)
Shade Density	1 (light) – 3 (dense)
Foliage Porosity	1(low) – 3 (porous)
Root Structure	1 (shallow lateral) – 3 (deep, lateral or taproot)
Vegetative Spread Rate	0 (none) – 3 (fast)
Seeding Spread Rate	1 (slow) – 2 (fast)
Stand Form	1 (dispersed individuals) – 3 (dense clonal thickets)
Resprout Ability	0 (no ability) – 2 (high ability)
Nitrogen Fixation	0 (not significant) – 1 (significant)
Water Use	1 (low) – 3 (high)

ENVIRONMENTAL TOLERANCES

Flood Tolerance	1 (low) – 3 (high)
Drought Tolerance	1 (low) – 3 (high)
Salt Tolerance	1 (low) – 3 (high)

Shade Tolerance	1 (low) – 3 (high)
Breakage Resistance	1 (low) – 2 (high)

ENVIRONMENTAL RISKS

Spread Risk	Text description of weedy, invasive qualities
Pest Risks	Text description of serious insect/disease/other damage agents
Other Issues	Text description of other potential hazards associated with a species

WILDLIFE BENEFITS

Bird & Mammal Habitat	1 (average) – 2 (high)
B&M Habitat Quality Ty	Text description of type of high habitat quality for birds, mammals
Pollinator Habitat	1 (average) – 2 (high)

POTENTIAL ECONOMIC PRODUCTS

Product Potential	0 (none) – 2 (significant commercial)
Product Type	Text description of the type of product that has potential

VISUAL AESTHETICS

Visual Quality	0 (none) – 1 (exhibits a special quality)
Visual Quality Type	Text description of the specific kind of visual quality exhibited

PURPOSE RATINGS

Alley Cropping	0 (none) – 10 (highest)
Aquatic Habitat	0 (none) – 10 (highest)
Carbon Sequestration	0 (none) – 10 (highest)
Flood Protection	0 (none) – 10 (highest)
Native Ecosystem Restoration	0 (none) – 10 (highest)
Particle Drift Reduction	0 (none) – 10 (highest)
Pollinator Habitat	0 (none) – 10 (highest)
Polluted Runoff Treatment	0 (none) – 10 (highest)
Streambank Stabilization	0 (none) – 10 (highest)
Stormwater Treatment	0 (none) – 10 (highest)
Wetland Restoration	0 (none) – 10 (highest)
Wildlife Habitat	0 (none) – 10 (highest)
Visual Aesthetics	0 (none) – 10 (highest)
Vision & Noise Screen	0 (none) – 10 (highest)

See Purpose Rating Algorithms document for more information on how ratings were calculated.

PLANT NAMES

Common Name

- Entries are common names of species of trees and shrubs that can grow well relatively unmanaged under rural conditions in this sub-region. The list is not comprehensive, but contains those for which the full range of characteristics could be found. Additional and alternative species may be recommended by various organizations and state agencies within this sub-region. Some of the species listed have multiple varieties and hybrids.
- Some species have several common names. Those thought to be widely recognizable are listed here.

Scientific Name

- Entries are scientific names of the species. Some species have changed species and even genus names over the years. Those thought to be their most widely recognizable scientific names are listed here.

SUB-REGION [map symbol]

Native Status

- Entry codes are:
 - 3 = Native to this sub-region
 - 2 = Not native to this sub-region, but native to elsewhere in North America
 - 1 = Not native to North America
- Native Status is approximated from several sources of information:
 - **Native** range— Where a species historically has naturally reproduced and grown. It does not include naturalized species (i.e., not historically present until their introduction by people). Different sources may indicate different native ranges for a given species because they include or exclude spurious geographical occurrences. For some species, native range may be broader than what is useful for conservation purposes because they do not grow well at the fringes of their native range. More commonly, however, native range is more restrictive than *useful* range because planting of nursery-grown stock and modified environmental conditions (e.g., wildfire elimination) and management (e.g., weed control) have eliminated major vectors that historically limited native range.
 - **Found** range — Where a species is commonly found. “Found” range is typically broader than native range because it includes areas where a species has become naturalized and/or have hybridized into varieties that have become naturalized.
 - **Preferred** or **Recommended** species lists — Species that are recommended by state forestry agencies for planting in the state. They grow well there, are not invasive, have desirable growth characteristics, and do not suffer serious insect and disease problems. Some state lists include species appropriate only for urban areas (e.g., Colorado, North Dakota, Wyoming) where environmental conditions and management can be very different than in rural conservation settings. Unfortunately, these sources do not distinguish between suitability for urban or for rural conservation settings.
- Translating range data into sub-regions:
 - Most sources describe species ranges relative to state political boundaries (e.g. “Kansas” or “eastern two-thirds of South Dakota”). These designations had to be translated, to the extent possible, into the Hardiness Zone x Precipitation Zone sub-regions delineated in this guide. “Native” and “Found” range data, primarily from the latter 20th century, was

- translated by comparison to the 1990 USDA Hardiness Zone map. “Preferred” range data primarily from 2005 to 2012 was translated by comparison to 2012 USDA Hardiness Zone map.
- Climate change will lead to continual shift in plant ranges over time. For example: Comparison of 1990 and 2012 USDA Hardiness Zone maps shows a northward march of minimum winter temperatures amounting to about 100 miles in the northern Great Plains to 200 miles in the central Great Plains.
 - Species that have a wide geographical range will grow and perform better if produced from a *local* seed source. Also, some species have multiple varieties and/or hybrids that grow better under local conditions, and, new ones are continually being developed and tested. Check local sources of planting stock for availability of locally-appropriate seed sources, varieties, and hybrids.
 - Future development of varieties and hybrids likely will extend useful geographic ranges of many species beyond the ranges specified in this guide.

MORPHOLOGY and GROWTH CHARACTERISTICS

Crown Size/Form

- Entry codes are:
 - 4 = Large tree (Typically single central trunk; mature ht > 30 ft)
 - 3 = Small tree (Typically single central trunk; mature ht < 30 ft)
 - 2 = Large shrub (Typically smaller than a small tree & multiple stems; mature ht > 7 ft)
 - 1 = Small shrub (Typically smaller than a large shrub & multiple stems; mature ht < 7 ft)
- Mature height in the Great Plains is typically less than what is indicated in national databases, such as the USDA Plants Database which specifies ideal growing conditions. The Great Plains is the fringe or outside of the native ranges of most species, has a relatively harsh climate for trees and shrubs, and, consequently, they generally do not grow as large here as they do nearer the heart of their native ranges.

Crown Height

- Entry codes are:
 - 3 = Tall trees (>30 ft)
 - 2 = Short trees or tall shrubs (7-30 ft)
 - 1 = Short shrubs (< 7ft)
- All trees and shrubs provide some visual interest due to their vertical structure in a landscape otherwise dominated by low-growing agricultural crops and pastures.

Growth Rate

- Entry codes are:
 - 3 = Fast
 - 2 = Medium
 - 1 = Slow
- Relative height growth rate under good growing conditions. A "Medium" rating correlates roughly to a stem growth rate range of 1-2 ft/yr.

Life Span

- Entry codes are:
 - 3 = >100 years
 - 2 = 40-100 years
 - 1 = < 40 years
- Shrubs were assumed to have a life span < 40 yr for individual stems, whether individual plants or clonal sprouts, unless otherwise noted in databases.

Stem Form

- Entry codes are:
 - 2 = Multiple stems
 - 1 = Single stem
- Most trees have a single, central, vertical trunk from which branches grow. Some trees and many shrubs divide at the root collar or a few feet above it into two or more (multiple) stems. It can be somewhat arbitrary to categorize a species as multi-stemmed or as single-stemmed with very large, low branches. Most trees and large shrubs that normally form multiple stems can be trimmed to have a single stem. This category is intended to characterize the form that a tree or shrub would naturally take in the absence of trimming.

Foliage Retention

- Entry codes are:
 - 2 = Evergreen
 - 1 = Deciduous

Shade Density

- Entry codes are:
 - 3 = Casts relatively dense shade under its crown
 - 2 = Casts medium shade under its crown
 - 1 = Casts light shade under its crown
- Based on USDA Plants database for "Foliage Density".

Foliage Porosity

- Entry codes are:
 - 3 = Porous to wind
 - 2 = Moderately porous
 - 1 = Low porosity to wind
- Porosity to wind during the growing season (i.e., summer). In winter, porosity of evergreens does not change, but deciduous plants increase to “Porous” after leaf fall. A few deciduous species hold on to their dead leaves until spring (e.g., pin oak).

Root Structure

- Entry codes are:
 - 3 = Deep lateral and taproot systems
 - 2 = Medium-depth lateral root system
 - 1 = Shallow lateral root system
- Assumed to be “Medium” depth if not indicated in the references.

Vegetative Spread Rate

- Entry codes are:
 - 3 = Fast
 - 2 = Moderate
 - 1 = Slow
 - 0 = None
- Propensity to reproduce vegetatively by root suckers or sprouts, rhizomes, stolons, and/or layering (i.e., by adventitious rooting of low branches that touch the ground).

Seeding Spread Rate

- Entry codes are:
 - 2 = Fast; typically a prolific seeder
 - 1 = Slow
- Propensity to reproduce from seed. Seeding spread rate integrates seed production, seed viability, and effectiveness of seed dispersal to describe how effectively a species can regenerate on a disturbed site.

Stand Form

- Entry codes are:
 - 3 = Dense clonal thickets
 - 2 = Loose clonal colonies, clusters, or patches
 - 1 = Dispersed individuals
- Some single plants can, over time, grow into dense clonal stands (i.e., thickets) by suckering, rhizomes, stolons, and layering, a characteristic generally limited to shrubs. Others species can form more-widely spaced clonal stands (i.e., colonies, clusters, or patches). Species that do not reproduce vegetatively remain individual stems where they are planted. Assumed to be “2” if not explicitly stated in information sources and the vegetative spread rate is not “0”.

Resprout Ability

- Entry codes are:
 - 2 = High ability to sprout new shoots after cutting or breakage
 - 1 = Low ability
 - 0 = No ability
- Resprout ability is indicated by propensity for stump or root collar sprouting after damage by cutting, fire, or breakage. For tree species, high ability is assumed if data sources indicate both “Resprout Ability” and “Coppice Potential”; Low ability if data sources indicate only “Resprout Ability” and not “Coppice Potential”. For shrubs, only “Resprout Ability” is considered.

Nitrogen Fixation

- Entry codes are:
 - 1 = Significant; Improves growth of the tree and surrounding vegetation
 - 0 = None or not significant
- Some species form symbioses between roots and soil microbes that fix nitrogen from the atmosphere into nitrate that can be taken up by roots of the tree and surrounding plants.

Water Use

- Entry codes are:
 - 3 = High
 - 2 = Medium
 - 1 = Low
- Relative rate of soil water uptake by mature plants under moist soil conditions.

ENVIRONMENTAL TOLERANCES

- Site conditions that a species can tolerate without seriously reducing its growth. A single rating is estimated to describe an average characteristic for a species and its cultivars relative to other species in this Guide. Wide disagreement among data sources is common depending on which cultivar of a species was observed and on what species/cultivar it was compared to in a given database. To reconcile disagreements, more weight was given to data sources specific to the Great Plains region and the species and cultivars typically grown here.

Flood Tolerance

- Entry codes are:
 - 3 = High; Can survive flood lasting for half or more of the growing season
 - 2 = Moderate; Can survive flood lasting for a couple of weeks to 40% of the growing season
 - 1 = Low; Can survive only brief periods of flooding
- Flood tolerance is the ability to survive and grow well after periods of flooding during the growing season. Floods saturate the soil and limit the supply of oxygen to roots. If this condition persists for long enough, the root system and the plant dies. Plants are most susceptible to flooding injury during the growing season when oxygen demand by roots is highest.

Drought Tolerance

- Entry codes are:
 - 3 = High; Can survive and grow where drought is frequent and periodically severe

2 = Moderate; Can grow well where drought is never more than occasional and moderate

1 = Low; Can grow well only where drought is never more than infrequent and mild

- Drought tolerance is the ability of a species to survive and grow well after periods of drought. Drought (i.e., limited soil moisture) typically halts plant growth and can injure the plant to the extent that the plant dies or future growth under moist conditions is severely stunted.

Salt Tolerance

- Entry codes are:
 - 3 = High; Can grow well under relatively high saline soil conditions
 - 2 = Moderate; Can grow well under no higher than moderate saline soil conditions
 - 1 = Low; Grows well only under relatively low saline soil conditions
- Salt tolerance is the ability of species to maintain good growth in soil that has elevated levels of salts. High concentrations of salts (mainly sodium) in the soil can damage root systems. This problem is common in drier parts of the Great Plains where salts leach out of sedimentary rocks and accumulate in evaporation basins. It is also a problem along roadways where salts are applied in winter to melt ice and snow. Where not mentioned directly in data sources, it is assumed to be low, or, moderate if its native range typically has alkaline soils.

Shade Tolerance

- Entry codes are:
 - 3 = High; Can grow well under deep shade
 - 2 = Moderate; Can grow well under shade that is not more than partial
 - 1 = Low; Will not grow well in partial or deep shade
- Shade tolerance is the ability to grow well in the shade of overstory trees. Species that are highly tolerant grow reasonably well in deep shade while intolerant species cannot grow well, if at all, under even partial shade. Shade tolerance is assumed to be moderate if not mentioned explicitly in data sources.

Breakage Resistance

- Entry codes are:
 - 2 = Not prone to severe limb breakage in ice and wind storms
 - 1 = Prone to severe limb breakage in ice and wind storms
- Some species have brittle wood and are particularly prone to limbs breaking off during wind storms and/or under the weight of ice. Excess breakage can substantially reduce plant growth, performance, and longevity. A species is assumed to be not prone to breakage if the quality is not mentioned explicitly in data sources.

ENVIRONMENTAL RISKS

Spread Risk

- Entries are text descriptions.
- A spread risk is noted if data sources indicate a propensity to become a weedy nuisance or invasive within the planting area or in adjacent crop fields and pastures. High spread risk is often associated with high reproduction rate, either vegetatively, through seeding, or both.

Pest Risks

- Entries are text descriptions.
- A pest risk is noted if data sources indicate a propensity to be attacked by pests that seriously reduce its growth and longevity, to harbor serious pests of other species, or to be particularly resistance to pests. The kind of pest is noted where such information was found.

Other Issues

- Entries are text descriptions.
- Listed are other plant qualities that may be important in certain agricultural situations including sensitivity to herbicides (e.g., 2, 4-D) and toxicity to browsing livestock.

WILDLIFE BENEFITS

Bird & Mammal Habitat

- Entry codes are:
 - 2 = High
 - 1 = Average
- A “High” rating identifies a species that has an especially high value compared to others of the same growth form (i.e., tree or shrub). A rating of “Average” acknowledges that all tree and shrub plantings provide significant habitat value compared to annually-cropped agricultural fields and heavily-grazed pastures.

B&M Habitat Quality Type

- Entries are text descriptions.
- For species having a “High” rating, the particular quality that yields the high rating is indicated. Examples include: Important food source types (e.g., seeds, fruit, browse) and timing of availability (esp. in winter); Effective cover for shelter from harsh weather, for hiding from predators, and for safe nesting sites.

Pollinator Habitat

- Entry codes are:
 - 1 = High
 - 2 = Average
- A “High” rating identifies a species that has an especially high value compared to others of the same growth form (i.e., tree or shrub). High value species provide important nectar and pollen sources for bees, esp. late fall and early spring when there are few other sources. A rating of “Average” acknowledges that all tree and shrub plantings provide significant habitat value for cover and nesting sites compared to annual tilled agricultural fields.

POTENTIAL ECONOMIC PRODUCTS

Product Potential

- Entry codes are:
 - 2 = Potential for significant commercial product or two or more local market products
 - 1 = Potential for a single local market product

0 = Negligible or No product potential

- This rating identifies species that can be managed and harvested for potentially significant economic return. “Commercial” products have significant potential for sale in geographically broad commodity markets. “Local market” products are most suitable for home use or sale in local farmers markets.

Product Type

- Entries are text descriptions
- There are four general categories of products: Food, Wood, Decorative florals, and Botanicals/Medicinals. Product type in capital letters indicates a product having significant commercial market potential; Products in lower case letters indicate products more suitable for home use or local farmers markets.

VISUAL AESTHETIC

Visual Quality

- Entry codes are:
 - 1 = Exhibits a quality that creates special visual interest in a conservation planting.
 - 0 = No special visual quality
- Identifies if a species has special visual qualities that may be desirable in a conservation planting, such as conspicuous foliage or flowers.

Visual Quality Type

- Entries are text descriptions
- There are three general categories of special visual quality: Fall Leaf Color, Winter Leaf Color, and Showy Flowers. Descriptions also indicate time of year and color (e.g., winter green foliage, fall red foliage, spring white flowers) which will enable a user to look for a desired type. Winter Leaf Color is provided by evergreen trees and shrubs; Fall Leaf Color is provided by deciduous trees and shrubs that have particularly bright shades of yellow, orange, or red.