

	Elevation Range m (ft)	Regeneration Strategy	Shade Tolerance *¹	Drought Tolerance*²	Minimum Mean Temperature of Coldest Month °C (°F)	Maximum Mean Temperature of the Warmest Month °C (°F)	Max-Min Temperature Difference °C (°F)	Precipitation Range mm (in)
blue spruce; <i>Picea pungens</i>	1830-3050 (6000-10000)	wind-dispersed seed; ~100 ft	3.5	2.9	-12.1 (10)	18.5 (65)	30.6 (55)	370-672 (14-26)
Douglas-fir; <i>Pseudotsuga menziesii</i>	1830-2590 (6000-9000)	wind-dispersed, ~350ft	2.8	2.6	-10.7 (13)	18.5 (65)	29.2 (52)	418-1760 (16-69)
Engelmann spruce; <i>Picea engelmannii</i>	2743-3353 (9000-11,000)	wind-dispersed, ~100 ft	4.5	2.6	-11.7 (11)	17.5 (63)	29.2 (52)	402-1231 (15-48)
limber pine; <i>Pinus flexilis</i>	1600-3300 (5500-11,000)	animal dispersed seed; large seed	1.6	4.7	-11.3(12)	19.4 (67)	30.7 (55)	346-659 (13-25)
lodgepole pine; <i>Pinus contorta</i>	2000-3300 (6600-11000)	serotiny, wind-dispersed ~150 ft	1.5	4.2	-20.4 (-5)	16.8 (62)	37.2 (67)	410-1709 (16-69)
ponderosa pine; <i>Pinus ponderosa</i>	1800-3050 (5500-10000)	wind-dispersed, ~350 ft	1.6	4.3	-7.9 (18)	22.1 (72)	30.0 (53)	357-1110 (13-46)
quaking aspen; <i>Populus tremuloides</i>	1980-3050 (6500-10000)	vegetative reproduction (suckering); wind-dispersed seed ~1600 ft	1.2	1.8	-26.8 (-16)	20.7 (70)	47.5 (86)	314-1083 (13-45)
subalpine fir; <i>Abies lasiocarpa</i>	2743-3353 (9000-11000)	wind-dispersed, ~100ft	4.8	2.0	-23.5 (-10)	16.7 (62)	40.2 (72)	344-1206 (13-48)

*=information derived from Niinemets, Ü., & Valladares, F. (2006). Tolerance to shade, drought, and waterlogging of temperate northern hemisphere trees and shrubs. *Ecological Monographs*, 76(4), 521–547. [https://doi.org/10.1890/0012-9615\(2006\)076\[0521:TTSDAW\]2.0.CO;2](https://doi.org/10.1890/0012-9615(2006)076[0521:TTSDAW]2.0.CO;2)

¹= Values closer to 5 indicate high shade tolerance, values closer to 1 indicate low shade tolerance

²= Values closer to 5 indicate high drought tolerance, values closer to 1 indicate low drought tolerance

	Fire Ecology; Return Interval	Fire Resistance at Maturity	Damaging Biotic Agents*	Susceptibility determinants	Other Abiotic Concerns
blue spruce; <i>Picea pungens</i>	Stand Replacing; Centuries	Low	Spruce bark beetle; spruce engraver beetle; western spruce budworm; red heart rot; red ring rot; big white pocket rot; Cooley's adelgid; spider mites; tussock moth; needle scale; wood wasps; needle scale; armillaria root disease	See PIEN below	see PIEN below
Douglas-fir; <i>Pseudotsuga menziesii</i>	Mixed-Severity; Decades-Centuries	Moderate- High	Dwarf mistletoe; Douglas-fir beetle; Douglas-fir pole and engraver beetles; twig beetles; Douglas-fir tussock moth; wood wasps; needle scale; western spruce budworm	Weakened and stressed trees are more vulnerable to attack	generally considered mid-drought tolerant (in between pines and true fir and spruce)
Engelmann spruce; <i>Picea engelmannii</i>	Stand Replacing, climate-limited; Centuries	Low	Spruce bark beetle; spruce engraver beetle; western spruce budworm; Cooley's adelgid; spider mites; tussock moth; needle scale; wood wasps; armillaria root disease; spruce broom rust	Layered canopies for budworm; bark beetle risk increases with increasing spruce QMD, BA and % stand in PIEN	Susceptible to wind-throw and wind damage due to shallow root; high water requirement in seedling stage
limber pine; <i>Pinus flexilis</i>	Mixed-Severity; Decades	Low- Moderate	white pine blister rust; mountain pine beetle; <i>Ips</i> beetle; roundhead pine beetle; flathead wood borer; wood wasps; needle scale; white pine weevil; dwarf mistletoe; needle casts	All sizes susceptible to WPBR; mature/larger individuals susceptible to bark beetles	can be found on very harsh, rocky sites and in better soils; environmental generalist
lodgepole pine; <i>Pinus contorta</i>	Stand Replacing; Decades-Centuries	Low	mountain pine beetle; <i>Ips</i> beetle; lodgepole engraver beetle; pandora moth; flathead wood borer; wood wasps; needle scale; white pine weevil; dwarf mistletoe; <i>Cytospora</i> ; comandra blister rust; western gall rust; needle casts	Susceptibility to bark beetle increases with PICO QMD, SDI and BA	drought stress interacts with bark beetles to produce epidemic outbreaks
ponderosa pine; <i>Pinus ponderosa</i>	Low-severity, frequent fire; Years-Decades	High	Mountain pine beetle, red turpentine beetle, roundhead pine beetle, <i>Ips</i> , twig beetles roundhead borers, wood wasps, western pine beetle, western conifer seed bugs, pitch mites, pitch canker, red ray rot, various foliage diseases, pine shoot blight	Susceptibility to bark beetle increases with PIPO QMD, SDI and BA	drought stress interacts with bark beetles to produce epidemic outbreaks
quaking aspen; <i>Populus tremuloides</i>	Stand Replacing; Decades	Low	numerous fungal diseases (white mottled rot, aspen trunk rot, black canker; sooty bark canker; <i>Cytospora</i> , <i>Hypoxylon</i>); aspen tortrix moth; western tent caterpillar; aspen leafminer; aspen bark beetle; bronze poplar borer; oystershell scale; aphids; melampsora leaf rust	Aspen wound easily, indicating the importance of harvesting practices to reduce incidence; stress-induced attacks	Sudden aspen decline characterized as drought-induced (inciting incident) followed by contributors of mortality
subalpine fir; <i>Abies lasiocarpa</i>	Stand Replacing climate-limited; Centuries	Low	Annosus root rot; armillaria root disease; western balsam bark beetle; wood wasps;	Typically mortality caused through interaction of effects of both bark beetles and fungi	Drought, sun-scorch, and heat girdling

*=Information derived from Field Guide to Diseases and Insects of the Rocky Mountain Region, RMRS-GTR-241

Abbreviation	Meaning
PIEN	<i>Picea engelmannii</i> ; Engelmann spruce
PICO	<i>Pinus contorta</i> ; lodgepole pine
PIPO	<i>Pinus ponderosa</i> ; ponderosa pine
QMD	Quadratic Mean Diameter
BA	Basal area
SDI	Stand Density Index
WPBR	white pine blister rust