

Forest Innovation Platform

Forest Assessment Tool Indicator Metadata

This document contains metadata and citation information for the indicator datasets included in the Forest Innovation Platform (FIP) Forest Assessment Tool, as of September 8, 2026. Listed in alphabetical order, these indicators are:

Burn Area (Projected)	Live Tree Basal Area (2024)
Burn Probability (2025)	Merchantable Timber Volume (2024)
Climatic Water Deficit (Projected)	Percent Fire Return Interval Departure (2024)
Consecutive Dry Days (Projected)	Precipitation (Historical)
Crown Fire Probability (2025)	Precipitation (Projected)
Disturbance (Historical)	Precipitation Seasonality (Projected)
Disturbance Severity (Historical)	Precipitation Yearly Anomalies (Historical)
Drought-Driven Tree Mortality (Projected)	Relative Stand Density Index (2024)
Forest Carbon Density (Grow-Only Projection)	Snow Water Equivalent (Projected)
Forest Types (2022)	Soil Moisture (Projected)
Habitat Suitability (Projected)	Temperature (Historical)
Imperiled Species Extinction Risk (2024)	Temperature (Projected)
Insect-Driven Tree Mortality (Projected)	Temperature Yearly Anomalies (Historical)
Land Cover (2024)	Vapor Pressure Deficit (Projected)
Land Ownership (circa 2022)	

Burn Area (Projected)

Keywords	burned area, wildfire, fire disturbance, wildfire risk, fire activity, climate-driven fire, forest disturbance, climate projections
Summary	Projected burn area describes the modeled amount of land expected to burn from wildfire under future climate conditions under two future climate change scenarios (higher and lower change). It helps show where wildfire activity may increase or decrease over time.
Technical Description	The CarbonPlan Forest Risks dataset maps modeled wildfire risk across forested areas of the contiguous United States. Fire risk represents the probability of experiencing at least one moderate- or high-severity fire within a 30-year period, with results summarized for four 30-year periods used in the FIP: 1980–2009, 2010–2039, 2040–2069, and 2070–2099. Future projections in the FIP use multiple global climate models under a lower-change (SSP2-4.5) and higher-change scenario (SSP5-8.5) and are provided at 4-km resolution. Higher values indicate a greater probability of wildfire occurrence over the 30-year period. The dataset helps identify forested areas where wildfire risk may increase under changing climate conditions.
Non-Technical Description	This dataset predicts the probability of experiencing at least one moderate- or high-severity wildfire across a forested area within a 30-year period, and can inform forest management decisions, as well as community resilience planning.
Source	CarbonPlan
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1980-2099
Temporal Resolution	30-year periods (1980-2009, 2010-2039, 2040-2069, 2070-2099)
License	Creative Commons Attribution-NonCommercial (CC BY-NC 4.0)
Publication Date	2022
Citation	Anderegg, W. R., Chegwidan, O. S., Badgley, G., Trugman, A. T., Cullenward, D., Abatzoglou, J. T., ... & Hamman, J. J. (2022). Future climate risks from stress, insects and fire across US forests. Ecology Letters, 25(6), 1510-1520.
DOI	https://doi.org/10.1111/ele.14018

Burn Probability (2025)

Keywords	annual burn probability, wildfire probability, wildfire likelihood, fire hazard, fire occurrence, wildfire exposure, FSim, wildfire risk
Summary	Annual burn probability describes the likelihood that a location will burn in a wildfire during a given year. Higher values indicate areas with a greater annual probability of experiencing wildfire based on modeled fuels, weather, topography, ignitions, and fire spread.
Technical Description	Annual burn probability estimates the probability that each location will experience wildfire in a given year based on simulated wildfire occurrence and spread. The modeling framework incorporates landscape fuels, topography, historical fire-weather patterns, ignition likelihood, fire growth, and suppression to simulate thousands of potential wildfire seasons and estimate how frequently each location burns. Higher values indicate locations that burn more frequently across the modeled simulations. This indicator represents wildfire occurrence at a location rather than ignition probability or expected fire intensity, making it useful for comparing relative wildfire exposure across a landscape. FSim is used by Vibrant Planet and Pyrologix for burn-probability modeling within broader wildfire-risk assessments.
Non-Technical Description	Some parts of a landscape are more likely to experience wildfire than others. This indicator shows the estimated chance that a location will burn in any given year, helping identify areas with greater exposure to wildfire. This differs from projected burn area as it is not projected over 30-year periods based on climate data from general climate models.
Source	Vibrant Planet
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2025
Temporal Resolution	Annual
License	Licensed under Creative Commons Attribution–NonCommercial–ShareAlike 4.0 International (CC BY-NC-SA 4.0). You may share and adapt this dataset for noncommercial purposes with attribution under the same license.© 2025 Pyrologix, a Vibrant Planet company. Distributed by Vibrant Planet Data Commons. Licensed under CC BY-NC-SA 4.0.
Publication Date	2025
Citation	Moran, C.J., Thompson, M.P., Young, B.A. et al. Benchmarking performance of annual burn probability modeling against subsequent wildfire activity in California. Sci Rep 15, 23699 (2025).
DOI	https://doi.org/10.1038/s41598-025-07968-6

Climatic Water Deficit (Projected)

Keywords	climatic water deficit, water deficit, moisture deficit, drought stress, evaporative demand, soil moisture, water balance, climate projections
Summary	Projected climatic water deficit describes expected changes in the difference between potential and actual evapotranspiration under two future climate change scenarios (higher and lower change). Higher climatic water deficit generally reflects greater atmospheric moisture demand relative to the water available from soils, indicating greater potential water stress for forests.
Technical Description	The Multivariate Adaptive Constructed Analogs (MACAv2) dataset contains projections of climatic water deficit (CWD) across the contiguous United States, representing the difference between potential evapotranspiration and actual evapotranspiration over a future time period. The dataset includes projections from multiple climate models under two climate change scenarios: a lower-change scenario (RCP 4.5) and a higher-change scenario (RCP 8.5). These scenarios represent different possible climate futures based on greenhouse gas emissions, climate feedbacks, and other forcings. The 20 general climate model (GCM) ensemble is from the CMIP5 generation and is downscaled to 4 km. Higher CWD values indicate that atmospheric demand for water is greater relative to the amount of water available from soils and vegetation, reflecting drier conditions and greater potential water stress. Lower values indicate that water availability is better able to meet atmospheric demand. CWD is an important indicator of drought stress, forest growth, and vulnerability to mortality and can help assess how forest water stress may change in the future.
Non-Technical Description	Climatic water deficit (CWD) measures the dryness in the atmosphere and in the soils. As CWD increases, the atmosphere becomes more dry and soil moisture decreases. Thus, higher CWD drives drought-like conditions that lead to poor forest health and mortality. If CWD is lower, than this means that there is a lot of moisture in both the atmosphere and soil, which promotes tree growth and vigor.
Source	ClimateToolbox
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2099
Temporal Resolution	30-year periods (1971-2000, 2010-2039, 2040-2069, 2070-2099)
License	The MACA datasets were created with funding from the US government and are in the public domain in the United States. For further clarity, unless otherwise noted, the MACA datasets are made available with a Creative Commons CC0 1.0 Universal dedication. In short, John Abatzoglou waives all rights to the work worldwide under copyright law, including all related and neighboring rights, to the extent allowed by law. You can copy, modify, distribute, and perform the work, even for commercial purposes, all without asking permission. John Abatzoglou makes no warranties about the work, and disclaims liability for all uses of the work, to the fullest extent permitted by applicable law. To the extent possible under law, John Abatzoglou has waived all

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Publication
Date 2020

Citation Abatzoglou J.T. and Brown T.J. A comparison of statistical downscaling methods suited for wildfire applications, International Journal of Climatology (2012), 32, 772-780

Hegewisch, K. C., Abatzoglou, J. T., Brown, T. J., & Mote, P. W. (2020). Climate Toolbox: Visual analytics for regional climate resilience. Bulletin of the American Meteorological Society, 101(8), E1219–E1222.

DOI <https://doi.org/10.1175/BAMS-D-19-0253.1>

Consecutive Dry Days (Projected)

Keywords	consecutive dry days, dry periods, drought, precipitation deficit, moisture stress, climate projections, future dryness
Summary	Projected consecutive dry days describes expected changes in the number of days without meaningful precipitation under two future climate change scenarios (higher and lower change). It helps show where longer dry periods may become more common over time.
Technical Description	The Multivariate Adaptive Constructed Analogs (MACAv2) dataset contains projections of consecutive dry days across the contiguous United States, representing the maximum number of consecutive days with little or no precipitation over a given time period. The dataset includes projections from multiple climate models under two climate change scenarios: a lower-change scenario (RCP 4.5) and a higher-change scenario (RCP 8.5). These scenarios represent different possible climate futures based on greenhouse gas emissions, climate feedbacks, and other forcings. The 20 general climate model (GCM) ensemble is from the CMIP5 generation and is downscaled to 4 km. Higher values indicate longer periods without precipitation, while lower values indicate shorter dry periods. Consecutive dry days are an important indicator of drought conditions and water stress, influencing vegetation health, wildfire risk, and forest resilience. This dataset supports climate-informed planning and helps assess how the duration of dry periods may change in the future.
Non-Technical Description	Consecutive dry days is an indicator that describes the number of days where minimal, if any, precipitation falls. Therefore, this is a measurement that could also be considered as "flashy" drought conditions and can initiate widespread tree and seedling mortality events.
Source	ClimateToolbox
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2099
Temporal Resolution	30-year periods (1971-2000, 2010-2039, 2040-2069, 2070-2099)
License	The MACA datasets were created with funding from the US government and are in the public domain in the United States. For further clarity, unless otherwise noted, the MACA datasets are made available with a Creative Commons CC0 1.0 Universal dedication. In short, John Abatzoglou waives all rights to the work worldwide under copyright law, including all related and neighboring rights, to the extent allowed by law. You can copy, modify, distribute, and perform the work, even for commercial purposes, all without asking permission. John Abatzoglou makes no warranties about the work, and disclaims liability for all uses of the work, to the fullest extent permitted by applicable law. To the extent possible under law, John Abatzoglou has waived all copyright and related or neighboring rights to MACA Datasets. This work is published from: United States.

Publication Date	2020
Citation	Abatzoglou J.T. and Brown T.J. A comparison of statistical downscaling methods suited for wildfire applications, International Journal of Climatology (2012), 32, 772-780 Hegewisch, K. C., Abatzoglou, J. T., Brown, T. J., & Mote, P. W. (2020). Climate Toolbox: Visual analytics for regional climate resilience. Bulletin of the American Meteorological Society, 101(8), E1219–E1222.
DOI	https://doi.org/10.1175/BAMS-D-19-0253.1

Crown Fire Probability (2025)

Keywords	crown fire, crown fire probability, wildfire behavior, active crown fire, passive crown fire, canopy fire, torching, WildEST, wildfire risk
Summary	Crown fire probability describes the likelihood that a wildfire, if one occurs, will spread into or through the forest canopy. Higher values indicate a greater likelihood of passive or active crown fire behavior under the range of historical weather conditions represented in the model.
Technical Description	Many forests are now experiencing fire either more or less often than they did historically. This indicator helps identify where fire has become unusually infrequent, potentially allowing fuels to accumulate, or unusually frequent, potentially limiting vegetation recovery and changing ecosystem conditions.
Non-Technical Description	Crown fires burn through the tops of trees and can produce intense fire behavior that is difficult to control. This indicator shows where existing forest and weather conditions are more likely to support crown fire if a wildfire occurs, with higher values indicating greater potential for fire to move into or through the canopy.
Source	Pyrologix Vibrant Planet
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2025
Temporal Resolution	Annual
License	Licensed under Creative Commons Attribution–NonCommercial–ShareAlike 4.0 International (CC BY-NC-SA 4.0). You may share and adapt this dataset for noncommercial purposes with attribution under the same license.© 2025 Pyrologix, a Vibrant Planet company. Distributed by Vibrant Planet Data Commons. Licensed under CC BY-NC-SA 4.0.
Publication Date	2025
Citation	https://www.vpdatacommons.org/datasets/crown-fire-probability
DOI	-

Disturbance (Historical)

Keywords	forest disturbance, historical disturbance, wildfire, prescribed fire, timber harvest, insects, disease, vegetation change, LANDFIRE
Summary	Historical disturbance describes where and when landscape disturbances have occurred from 2014-2023. It helps show recent patterns of wildfire, harvest, insects, disease, and other events that have changed forest conditions.
Technical Description	The LANDFIRE Historical Disturbance (HDist) dataset maps the location, timing, and type of landscape disturbances across the contiguous United States from 2014-2023. HDist is developed from annual LANDFIRE disturbance products, with each year's disturbance information checked against vegetation conditions from the corresponding time period to identify and correct inconsistencies. The dataset captures disturbances such as wildfire, prescribed fire, timber harvest, insects, disease, and other events that alter vegetation and fuels. Higher disturbance frequency or more recent disturbance indicates areas that have experienced greater recent landscape change, while areas with little or no recorded disturbance have remained comparatively stable over the period. The dataset helps characterize recent disturbance history and provides context for understanding current forest condition, recovery, fuels, and future vulnerability.
Non-Technical Description	This dataset provides the latest 10 years of disturbance data that shows where landscapes have seen change. These events include wildfire, timber harvest, insects, disease and other events that alter vegetation and change land-cover. Disturbance history provides context for understanding current forest condition, recovery, fuels and future vulnerability.
Source	LANDFIRE
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2013-2024
Temporal Resolution	Annual
License	https://www.landfire.gov/policies
Publication Date	2023
Citation	La Puma, I.P., ed., 2023, LANDFIRE technical documentation: U.S. Geological Survey Open-File Report 2023-1045, 103 p.
DOI	https://doi.org/10.3133/ofr20231045

Disturbance Severity (Historical)

Keywords	disturbance severity, wildfire severity, burn severity, vegetation disturbance, land cover change, high severity disturbance, forest disturbance, LANDFIRE
Summary	Disturbance severity describes how strongly wildfire or other disturbances affected vegetation and land cover. Higher severity indicates greater changes to vegetation, while lower severity indicates more limited effects.
Technical Description	LANDFIRE Historical Disturbance (HDist) identifies landscape disturbances by year, disturbance type, and severity. Severity represents the relative effect of a disturbance on land cover and is classified as low, medium, or high; the HDist product compiles these disturbance attributes across a 10-year period (2014-2023). Severity information may be derived from satellite-based change detection and fire-severity products, including sources such as MTBS, RAVG, BARC, and Landsat burned-area data. This indicator can be used to identify where recent disturbances have caused relatively minor versus substantial changes in vegetation structure and cover.
Non-Technical Description	Not all disturbances affect forests in the same way. This indicator shows where wildfire and other disturbances caused relatively low, moderate, or high impacts to vegetation, helping identify areas where forest structure and recovery may have been more strongly affected.
Source	LANDFIRE
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2013-2024
Temporal Resolution	Annual
License	https://www.landfire.gov/policies
Publication Date	2023
Citation	La Puma, I.P., ed., 2023, LANDFIRE technical documentation: U.S. Geological Survey Open-File Report 2023-1045, 103 p.
DOI	https://doi.org/10.3133/ofr20231045

Drought-Driven Tree Mortality (Projected)

Keywords	drought stress, tree mortality, forest mortality, drought mortality, forest health, climate risk, water stress, forest vulnerability
Summary	Drought-driven tree mortality describes the modeled risk of tree death associated with drought and water stress under two future climate change scenarios (higher and lower change). It helps identify forests that may be more vulnerable to drought-related mortality under changing climate conditions.
Technical Description	The CarbonPlan Forest Risks dataset maps modeled drought-driven tree mortality across forested areas of the contiguous United States. Drought risk represents the expected fraction of tree mortality associated with climate and water stress, summarized for four 30-year periods: 1980–2009, 2010–2039, 2040–2069, and 2070–2099. Future projections in the FIP use multiple global climate models under a lower-change (SSP2-4.5) and higher-change scenario (SSP5-8.5) and are provided at 4-km resolution. Higher values indicate greater expected tree mortality associated with drought stress. The dataset helps identify areas where forests may be more vulnerable to drought-related mortality under changing climate conditions.
Non-Technical Description	Drought stress is a key driver in tree mortality. This variable shows where trees are expected to die because of drought. Changes in variables such as precipitation and temperature impact drought stress. Understanding where forests are more likely to be impacted can help inform climate-adaptive management and restoration planning.
Source	CarbonPlan
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1980-2099
Temporal Resolution	30-year periods (1980-2009, 2010-2039, 2040-2069, 2070-2099)
License	Creative Commons Attribution-NonCommercial (CC BY-NC 4.0)
Publication Date	2022
Citation	Anderegg, W. R., Chegwiddden, O. S., Badgley, G., Trugman, A. T., Cullenward, D., Abatzoglou, J. T., ... & Hamman, J. J. (2022). Future climate risks from stress, insects and fire across US forests. Ecology Letters, 25(6), 1510-1520.
DOI	https://doi.org/10.1111/ele.14018

Forest Carbon Density (Grow-Only Projection)

Keywords	total forest carbon, forest carbon stocks, carbon storage, ecosystem carbon, biomass carbon, soil carbon, NFCMS, grow-only projection
Summary	Total forest carbon describes the amount of carbon stored across major forest carbon pools, including vegetation, dead material, and soils. Future projections are grow-only and do not account for climate change, wildfire, harvest, insects, or other disturbances.
Technical Description	The National Forest Carbon Monitoring System (NFCMS) provides estimates of total forest carbon stocks across the contiguous United States by combining carbon stored in major ecosystem pools, including live vegetation, dead wood, litter, and soils. Future estimates for 2050 and 2070 use a grow-only scenario in which forests continue to age without disturbance or changes in climate. These projections therefore represent potential carbon accumulation under undisturbed growing conditions rather than forecasts of future carbon storage under climate change. The "aboveground biomass" pool includes the carbon in all live aboveground woody material such as trunk, branches, stems and bark, but not leaves. The "other live biomass" pool includes the carbon contained in leaves, aboveground non-woody biomass, and coarse and fine roots. The "dead biomass" includes the carbon in snags, litter, and aboveground and belowground coarse woody debris and roots. The "soil carbon" pool contains the carbon in the organic and mineral soil layers, but not roots or coarse woody debris.
Non-Technical Description	Total forest carbon shows how much carbon is stored throughout a forest ecosystem, including in trees, other vegetation, dead material, and soils. Future values assume forests continue growing without climate change or disturbances such as wildfire, harvest, or insects.
Source	USFS
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2020-2070
Temporal Resolution	Annual (2020, 2050, 2070)
License	The Clark University scientists who developed the data and the USDA Forest Service make no warranty, expressed or implied, including the warranties of merchantability and fitness for a particular purpose, nor assume any legal liability or responsibility for the accuracy, reliability, completeness or utility of these geospatial data, or for the improper or incorrect use of these geospatial data. These geospatial data and related maps or graphics are not legal documents and are not intended to be used as such. The data and maps may not be used to determine title, ownership, legal descriptions or boundaries, legal jurisdiction, or restrictions that may be in place on either public or private land. Natural hazards may or may not be depicted on the data and maps, and land users should exercise due caution. The data are dynamic and may change over time. The user is responsible to verify the limitations of the geospatial data and to use the data accordingly.

Publication Date	2025
Citation	Hasler, Natalia; Williams, Christopher A. 2025. National Forest Carbon Monitoring System (NFCMS) version 3.0 - Carbon stocks and potential sequestration over conterminous U.S. forests. Fort Collins, CO: Forest Service Research Data Archive.
DOI	https://doi.org/10.2737/RDS-2025-0019

Forest Types (2022)

Keywords	forest type, forest composition, tree species, forest classification, vegetation, FIA, TreeMap
Summary	Forest type describes the dominant tree species or species group occurring across a landscape. It provides a snapshot of current forest composition.
Technical Description	The U.S. Forest Service Forest TreeMap Algorithm Forest Type Code dataset maps forest type across the United States based on classifications used by the USFS Forest Inventory and Analysis (FIA) program. Forest type describes the dominant tree species or species group that defines a forested area and is commonly used for reporting, planning, and analysis. Most areas are assigned a forest type using modeled data based on field observations and spatial environmental data, with classifications reflecting the dominant forest condition on the landscape. In some cases where tree cover is very low, areas may be classified as “nonstocked,” indicating that forests were previously present but currently lack sufficient tree density. This dataset supports landscape-scale understanding of forest composition and helps inform management, restoration, and climate adaptation decisions.
Non-Technical Description	This dataset models the dominant forest types within their landscape, reducing the need for a field inventory. Different forest types have different responses and vulnerabilities to climate change, so understanding the forest types in your landscape can influence management, restoration, and climate adaptation decisions.
Source	USFS TreeMap
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2022
Temporal Resolution	Annual
License	Data publications are made freely available to the public under our data use agreement outlining conditions of use such as redistribution, citation, notification, and distribution liability. The Open Access - Data Use Agreement is implicitly agreed to by anyone acquiring data from this repository. Formally, Archive-published datasets are released under the Creative Commons CC-BY license structure. This allows for broad use and re-use, while preserving the expectation of citation of the data publication to document that use and credit the intellectual work of the author(s). https://www.fs.usda.gov/rds/archive/datauseinfo/open
Publication Date	2025
Citation	Houtman, Rachel M.; Leatherman, Lila S. T.; Zimmer, Scott N.; Housman, Ian W.; Shrestha, Abhinav; Shaw, John D.; Riley, Karin L. 2025. TreeMap 2022 CONUS: A tree-level model of the

forests of the conterminous United States circa 2022. Fort Collins, CO: Forest Service Research Data Archive.

Riley, Karin L.; Grenfell, Isaac C.; Finney, Mark A.; Wiener, Jason M. 2021. TreeMap, a tree-level model of conterminous US forests circa 2014 produced by imputation of FIA plot data. Scientific Data. 8: 11.

DOI

<https://doi.org/10.2737/RDS-2025-0032>

Habitat Suitability (Projected)

Keywords	habitat suitability, tree species, species suitability, climate suitability, future habitat, species distribution, climate change, forest adaptation, climate-informed reforestation, assisted migration, PBGJAM
Summary	Habitat suitability describes how suitable environmental conditions are for individual tree species and how those conditions may shift under future climate change. Higher values indicate more suitable habitat for a given tree species, though this does not necessarily indicate habitat within a species' natural range. Comparing current and future suitability can help identify areas where species may become more or less well suited to the landscape over time.
Technical Description	The PBGJAM framework models current and projected habitat suitability for species using environmental conditions and observed species distributions. The joint modeling approach evaluates multiple species simultaneously, allowing projected responses to climate change to reflect broader patterns within ecological communities rather than treating each species entirely independently. Future projections using a lower-change scenario (SSP2-4.5) and higher-change scenario (SSP5-8.5) can be compared with current conditions to identify areas where habitat suitability may increase, decrease, or remain relatively stable. These values represent potential habitat suitability, not predictions that a species will necessarily occur at a location, because establishment and persistence also depend on factors such as dispersal, disturbance, competition, regeneration, and management.
Non-Technical Description	Tree species are adapted to particular environmental conditions, and climate change may shift where those conditions occur. This indicator shows where conditions may become more or less suitable for individual species, helping managers consider future species selection and climate-informed reforestation. Note that suitable habitat does not necessarily indicate habitat within a species' natural range.
Source	PBGJAM
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	2018-2099
Temporal Resolution	30-year periods (2018 baseline, 2040-2069, 2070-2099)
License	-
Publication Date	-
Citation	Clark JS, Nemergut D, Seyednasrollah B, Turner PJ, Zhang S. 2017. Generalized joint attribute modeling for biodiversity analysis: Median-zero, multivariate, multifarious data. Ecological Monographs 87: 34–56.

Swenson J, Clark JS, Wilson A, et al. Predicting Biodiversity with Generalized Joint Attribute Modeling (PBGJAM). Duke University and NASA Earth Science Technology Office.

DOI

<https://doi.org/10.1002/ecm.1241>

Imperiled Species Extinction Risk (2024)

Keywords	imperiled species, biodiversity, extinction risk, range-size rarity, species rarity, conservation priority, threatened species, biodiversity hotspots
Summary	Imperiled species extinction risk identifies areas with concentrations of globally rare or significantly imperiled species based on how restricted their geographic ranges are. Higher values indicate areas that may be especially important for avoiding the extinction of at-risk species.
Technical Description	The NatureServe Summed Range-size Rarity dataset maps concentrations of imperiled species across the contiguous United States using modeled habitat distributions for species ranked as globally critically imperiled (G1), globally imperiled (G2), or listed under the U.S. Endangered Species Act. Range-size rarity is calculated as the inverse of each species' modeled habitat extent, giving greater weight to species with smaller geographic distributions. Values are summed across species to identify areas where multiple rare or imperiled species are concentrated. Higher values indicate areas with greater concentrations of imperiled and range-restricted species, where forest disturbance or habitat loss may have greater consequences for biodiversity, while lower values indicate areas with fewer imperiled species or that harbor imperiled species with broader geographic ranges. The dataset includes a taxonomically diverse group of plants, vertebrates, freshwater invertebrates, and pollinators and is intended to support conservation planning and identification of areas important for protecting imperiled biodiversity. As a forest vulnerability indicator, it represents the potential biodiversity consequences of forest change rather than the likelihood that a forest will experience disturbance.
Non-Technical Description	This dataset identifies specific areas that provide habitat for a wide range of plant and animal species at high risk of becoming extinct, and therefore in need of increased biodiversity protection. The values for each pixel are based on a common conservation science statistic, range-size rarity, which accounts for species with very narrow geographic ranges and therefore very few opportunities for conservation interventions. Higher values indicate a greater likelihood of habitat for multiple imperiled species or the presence of a large amount of habitat for one or more imperiled species with an extremely limited range. These data represent the potential biodiversity consequences of forest disturbance and provide land managers with knowledge of where imperiled species will likely need to be protected.
Source	NatureServe
Spatial Coverage	CONUS
Spatial Resolution	330-m
Temporal Coverage	2024
Temporal Resolution	Annual
License	https://creativecommons.org/licenses/by-nc-sa/4.0/

Publication Date	2022
Citation	Hamilton, H., Smyth, R.L., Young, B.E., Howard, T.G., Tracey, C., Breyer, S., Cameron, D.R., Chazal, A., Conley, A.K., Frye, C. and Schloss, C. (2022), Increasing taxonomic diversity and spatial resolution clarifies opportunities for protecting imperiled species in the U.S.. Ecological Applications. Accepted Author Manuscript e2534.
DOI	https://doi.org/10.1002/eap.2534

Insect-Driven Tree Mortality (Projected)

Keywords	insect mortality, tree mortality, forest mortality, insect disturbance, bark beetles, forest health, climate risk, forest vulnerability
Summary	Insect-driven tree mortality describes the modeled risk of tree death associated with insect outbreaks under two future climate change scenarios (higher and lower change). It helps identify forests that may be more vulnerable to insect-related mortality under changing climate conditions.
Technical Description	The CarbonPlan Forest Risks dataset maps modeled insect-driven tree mortality across forested areas of the contiguous United States. Insect risk represents the expected fraction of tree mortality associated with insect disturbance, summarized for four 30-year periods: 1980–2009, 2010–2039, 2040–2069, and 2070–2099. Future projections in the FIP use multiple global climate models under a lower-change (SSP2-4.5) and higher-change scenario (SSP5-8.5) and are provided at 4-km resolution. Higher values indicate greater expected tree mortality associated with insect disturbance. The dataset helps identify areas where forests may be more vulnerable to insect-related mortality under changing climate conditions.
Non-Technical Description	A key driver of tree mortality is insects. Warming temperatures and moisture imbalances are influencing tree susceptibility to insect infestation. Land managers can use this information to locate areas of high risk of insect-driven tree mortality and adjust management plans accordingly.
Source	CarbonPlan
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1980-2099
Temporal Resolution	30-year periods (1980-2009, 2010-2039, 2040-2069, 2070-2099)
License	Creative Commons Attribution-NonCommercial (CC BY-NC 4.0)
Publication Date	2022
Citation	Anderegg, W. R., Chegwiddden, O. S., Badgley, G., Trugman, A. T., Cullenward, D., Abatzoglou, J. T., ... & Hamman, J. J. (2022). Future climate risks from stress, insects and fire across US forests. Ecology Letters, 25(6), 1510-1520.
DOI	https://doi.org/10.1111/ele.14018

Land Cover (2024)

Keywords	land cover, NLCD, forest cover, developed land, agriculture, wetlands, grasslands, shrublands, vegetation, landscape composition
Summary	Land cover describes the dominant type of surface cover across the landscape, such as forest, shrubland, grassland, wetlands, agriculture, or developed land. It provides a broad view of landscape composition and where different cover types occur.
Technical Description	The National Land Cover Database (NLCD) maps land cover across the contiguous United States using Landsat-based satellite imagery at 30-m resolution. The dataset classifies each pixel into one of 16 land cover classes based on a modified Anderson Level II classification system, including developed land, agriculture, forest, shrubland, grassland, wetlands, and open water. In the FIP, land cover provides broad landscape context for understanding where forests occur relative to other vegetation and land-use types. Different land cover classes can influence forest fragmentation, connectivity, disturbance exposure, and management opportunities, making this dataset useful for interpreting forest condition and vulnerability across the landscape.
Non-Technical Description	Land cover shows what is physically covering the ground, such as forests, grasslands, wetlands, farms, or developed areas. It helps provide context for how forests are distributed across the landscape and what other land uses or vegetation types surround them.
Source	NLCD
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2024
Temporal Resolution	Annual
License	Annual NLCD has no restrictions on the use of science products. Annual NLCD does ask that if you use the data as part of a publication or presentation that you use the following citation below; however, it is not a requirement to use the data.
Publication Date	2024
Citation	U.S. Geological Survey (USGS), 2024, Annual NLCD Collection 1 Science Products: U.S. Geological Survey data release
DOI	https://doi.org/10.5066/P94UXNTS

Land Ownership (circa 2022)

Keywords	forest ownership, land ownership, land management, public lands, private lands, federal lands, state lands, tribal lands, ownership boundaries
Summary	Land ownership identifies the primary ownership or management category of forested and non-forested lands across the United States. It helps show which categories of public agencies or private entities may be responsible for forest management and decision-making in a given area.
Technical Description	This dataset maps land ownership across the contiguous United States, identifying major ownership categories and distinguishing between forested and non-forested lands. It was developed by compiling and harmonizing multiple national datasets, including the Protected Areas Database of the United States (PAD-US), U.S. Forest Service forest ownership data, and U.S. Census Bureau TIGER/Line American Indian Tribal Subdivisions. Overlapping areas were resolved using a prioritization approach, with Tribal lands from the U.S. Census Bureau taking precedence, followed by the Forest Service dataset for private, state, and local ownership and PAD-US for federal lands. Forest cover information from the U.S. Forest Service TreeMap dataset was then used to distinguish forested from non-forested lands. This dataset provides critical context for identifying land ownership categories that may influence forest management, restoration opportunities, and stakeholder engagement in landscape-scale planning.
Non-Technical Description	This dataset identifies categories of land ownership (for both forested and non-forested land) across the United States. This information can be used to understand potential management approaches and opportunities in your area and to help identify important stakeholders to engage in collaborative projects and land management planning.
Source	American Forests
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	Circa 2022
Temporal Resolution	Annual
License	In process
Publication Date	2026
Citation	U.S. Department of Commerce, U.S. Census Bureau, Geography Division, Spatial Data Collection and Products Branch. 2020. TIGER/Line Shapefile, 2020, Nation, U.S., American Indian Tribal Subdivisions. https://catalog.data.gov/dataset/tiger-line-shapefile-2020-nation-u-s-american-indian-tribal-subdivisions Harris, Vance; Caputo, Jesse; Butler, Brett J. 2025. Forest ownership in the conterminous United States circa 2022: distribution of seven ownership types - geospatial dataset. Fort Collins, CO:

Forest Service Research Data Archive. <https://doi.org/10.2737/RDS-2025-0045>

U.S. Geological Survey (USGS) Gap Analysis Project (GAP). 2024. Protected Areas Database of the United States (PAD-US) 4.1: U.S. Geological Survey data release, <https://doi.org/10.5066/P96WBCHS>.

Houtman, Rachel M.; Leatherman, Lila S. T.; Zimmer, Scott N.; Housman, Ian W.; Shrestha, Abhinav; Shaw, John D.; Riley, Karin L. 2025. TreeMap 2022 CONUS: A tree-level model of the forests of the conterminous United States circa 2022. Fort Collins, CO: Forest Service Research Data Archive. <https://doi.org/10.2737/RDS-2025-0032>.

DOI

In process

Live Tree Basal Area (2024)

Keywords	live tree basal area, basal area, forest structure, tree density, stand density, live trees, forest biomass, forest condition
Summary	Live tree basal area describes the amount of area occupied by the cross-sections of live tree stems within a given area. It provides a measure of forest stocking and tree density.
Technical Description	The Vibrant Planet Data Commons live tree basal area dataset maps forest density and structure across the contiguous United States. Basal area reflects how much of the ground is occupied by tree stems and is a key indicator of how dense or open a forest is. Higher values indicate denser forests with greater tree stocking and biomass, while lower values represent more open or sparsely treed areas. Because basal area relates to forest growth, carbon storage, and fire behavior, it is widely used to assess forest condition and management potential. The dataset supports landscape-scale assessments of forest structure and can help inform planning, restoration, and management decisions.
Non-Technical Description	Live tree basal area describes the amount of area occupied by the cross-sections of live tree stems within a given area. This is an important variable for land managers to understand the density of forests, as this relates to forest growth, fire behavior, and carbon storage, and can inform management options.
Source	Vibrant Planet
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2024
Temporal Resolution	Annual
License	https://creativecommons.org/licenses/by-nc-sa/4.0/
Publication Date	Upcoming publication
Citation	Upcoming publication Data story: https://vpdc-staging.webflow.io/data-story/forest-structure-density-timber-data
DOI	In process

Merchantable Timber Volume (2024)

Keywords	merchantable timber volume, timber volume, live tree volume, forest biomass, forest structure, wood products, timber resources, forest condition
Summary	Merchantable timber volume describes the amount of live tree wood that meets size and quality standards for potential timber use within a given area. It provides a measure of available commercial wood volume across the landscape.
Technical Description	The Vibrant Planet Data Commons merchantable timber volume dataset maps the estimated volume of live tree wood suitable for commercial use across the contiguous United States. Merchantable volume generally reflects the portion of tree stems that meets minimum size and quality requirements for timber products. Higher values indicate areas with greater quantities of potentially usable wood, while lower values indicate less available merchantable volume. Timber volume is closely related to forest structure, biomass, and stand development and can help identify areas with greater potential for wood products or biomass utilization. The dataset supports landscape-scale assessments of forest resources and can help inform restoration, thinning, and forest management decisions.
Non-Technical Description	Merchantable Timber Volume is the amount of live trees that can be used for wood products such as lumber and pulp. This information helps show where forest management activities, like thinning or reforestation, may be supported by timber revenue, and where economic or infrastructure constraints may limit operations through cost-benefit analyses. Examples of this variable being used are woodshed-scale supply analyses and treatment feasibility planning.
Source	Vibrant Planet
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2024
Temporal Resolution	Annual
License	https://creativecommons.org/licenses/by-nc-sa/4.0/
Publication Date	Upcoming publication
Citation	Upcoming publication Data story: https://vpdc-staging.webflow.io/data-story/forest-structure-density-timber-data
DOI	In process

Percent Fire Return Interval Departure (2024)

Keywords	fire return interval, pFRID, fire regime departure, historical fire frequency, fire deficit, fire surplus, wildfire frequency, altered fire regime
Summary	Percent Fire Return Interval Departure (pFRID) shows how much current wildfire frequency differs from historical fire frequency. Positive values indicate areas burning less often than historically, while negative values indicate areas burning more often.
Technical Description	The Vibrant Planet pFRID dataset compares contemporary wildfire return intervals from 1950–2024 with estimated historical fire return intervals derived from the LANDFIRE Biophysical Settings. These historical baselines represent fire return intervals (i.e., the inverse of fire frequency) to which contemporary ecosystems are relatively well-adapted, and mismatches between the baseline and contemporary conditions are associated with ecosystem type conversion and uncharacteristic fire behavior. Positive pFRID values indicate a fire deficit, where fires are occurring less frequently than historically, while negative values indicate a fire surplus, where fires are occurring more frequently. The pFRID data here cover all burnable ecosystem types in the LANDFIRE Biophysical Settings, but areas that have been permanently converted for anthropic use are masked out. Anthropic use is based on the 2024 National Land Cover Database and includes the following land cover classes: developed, pasture/hay, cultivated crops.
Non-Technical Description	Many ecosystems are now experiencing fire either more or less often than they did historically. This indicator helps identify where fire frequency has departed from historical baselines, potentially compromising resilience and increasing the probability of uncharacteristic fire behavior and ecosystem type conversion.
Source	Vibrant Planet
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2024
Temporal Resolution	Annual
License	Licensed under Creative Commons Attribution–ShareAlike 4.0 International (CC BY-SA 4.0). You may share and adapt this dataset with attribution under the same license. Distributed by Vibrant Planet Data Commons. Licensed under CC BY-SA 4.0.
Publication Date	2026
Citation	Koontz, M. J., A. Duane, K. A. Duffy, J. M. Varner, M. C. Stambaugh, and H. D. Safford. (2026). The precariousness of fire-prone ecosystems in the contiguous United States. https://www.vpdatacommons.org/data-story/pfrid-2023

Precipitation (Historical)

Keywords	precipitation, historical precipitation, observed precipitation, annual precipitation, climate normals, rainfall, snowfall, PRISM, climate history
Summary	Historical precipitation describes observed average annual precipitation over past 30-year climate periods. It provides a baseline for understanding how precipitation varies across the landscape and how recent conditions compare with past climate.
Technical Description	The Parameter-elevation Regressions on Independent Slopes Model (PRISM) historical precipitation dataset maps observed precipitation across the contiguous United States using climate observations interpolated across the landscape. In the FIP, precipitation is summarized as 30-year averages of total annual precipitation for 1971–2000, 1981–2010, and 1991–2020 at 4-km resolution. Higher values indicate wetter average conditions, while lower values indicate drier conditions. These historical precipitation normals provide a baseline for understanding long-term moisture patterns, comparing recent conditions with earlier periods, and identifying areas where forests have historically received more or less precipitation.
Non-Technical Description	This historical precipitation dataset describes average precipitation from 1971 to 2020 in 30-year average timeframes. Historical precipitation patterns provide a baseline for understanding the impact of long-term climate patterns on forests.
Source	PRISM
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2020
Temporal Resolution	30-year normals (1971-2000, 1981-2010, 1991-2020)
License	https://prism.oregonstate.edu/terms/
Publication Date	2025
Citation	Daly, C., Halbleib, M., Smith, J. I., Gibson, W. P., Doggett, M. K., Taylor, G. H., ... & Pasteris, P. P. (2008). Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States. <i>International Journal of Climatology: a Journal of the Royal Meteorological Society</i> , 28(15), 2031-2064.
DOI	https://doi.org/10.1002/joc.1688

Precipitation (Projected)

Keywords	precipitation, average precipitation, annual precipitation, precipitation change, rainfall, snowfall, climate projections, future precipitation
Summary	Projected precipitation describes expected changes in average precipitation under two future climate change scenarios (higher and lower change). It helps show where landscapes may become wetter or drier over time.
Technical Description	The Multivariate Adaptive Constructed Analogs (MACAv2) dataset contains projections of precipitation across the contiguous United States, representing a 30-year average of total annual precipitation, including rain and snow, for a future time period. The dataset includes projections from multiple climate models under two climate change scenarios: a lower-change scenario (RCP 4.5) and a higher-change scenario (RCP 8.5). These scenarios represent different possible climate futures based on greenhouse gas emissions, climate feedbacks, and other forcings. The 20 general climate model (GCM) ensemble are from the CMIP5 generation and are downscaled to 4 km. Higher values indicate wetter future conditions, while lower values reflect drier environments. Projected precipitation is a key driver of water availability, influencing forest growth, drought stress, and ecosystem resilience. This dataset supports climate-informed planning and helps assess potential future impacts on forests and water resources.
Non-Technical Description	Precipitation patterns are projected to change dramatically over the 21st century, although there is great amount of uncertainty around how these are going to change. Trees are dependent on precipitation to increase soil moisture and allow the uptake of soil water from their roots to their leaves, stems, and branches. Drying conditions could lead to poor forest conditions and tree mortality, whereas wetting conditions could lead to increased growth and overcrowding in certain forest types.
Source	ClimateToolbox
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2099
Temporal Resolution	30-year periods (1971-2000, 2010-2039, 2040-2069, 2070-2099)
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Hegewisch, K. C., Abatzoglou, J. T., Brown, T. J., & Mote, P. W. (2020). Climate Toolbox: Visual analytics for regional climate resilience. Bulletin of the American Meteorological Society, 101(8), E1219–E1222.

DOI <https://doi.org/10.1175/BAMS-D-19-0253.1>

Precipitation Seasonality (Projected)

Keywords	precipitation seasonality, seasonal precipitation, precipitation timing, wet season, dry season, precipitation distribution, rainfall seasonality, climate variability
Summary	Projected precipitation seasonality describes how the timing and distribution of precipitation throughout the year may change under future climate scenarios. It helps show where forests may experience shifts in wet and dry seasons over time.
Technical Description	The MACAv2 dataset contains projections of precipitation seasonality across the contiguous United States, representing how precipitation is distributed throughout the year and the degree to which precipitation is concentrated in particular seasons over a future time period. Seasons are defined as winter (December–February), spring (March–May), summer (June–August), and fall (September–November). The dataset includes projections from multiple climate models under two emissions scenarios: a moderate scenario (RCP 4.5) and a high scenario (RCP 8.5). The 20 general climate model (GCM) ensemble is from the CMIP5 generation and is downscaled to 4 km. Higher values indicate greater seasonality, with precipitation concentrated into fewer parts of the year, while lower values indicate precipitation that is more evenly distributed throughout the year. Changes in precipitation seasonality can affect the timing of soil moisture recharge, drought stress, plant growth, and wildfire risk.
Non-Technical Description	Precipitation seasonality shows how much rainfall and snowfall are concentrated into certain parts of the year. Future changes in this pattern could shift the timing of water availability, drought stress, and growing conditions for forests.
Source	ClimateToolbox
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2099
Temporal Resolution	30-year periods (1971-2000, 2010-2039, 2040-2069, 2070-2099)
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Citation	Abatzoglou J.T. and Brown T.J. A comparison of statistical downscaling methods suited for wildfire applications, International Journal of Climatology (2012), 32, 772-780 Hegewisch, K. C., Abatzoglou, J. T., Brown, T. J., & Mote, P. W. (2020). Climate Toolbox: Visual analytics for regional climate resilience. Bulletin of the American Meteorological Society, 101(8), E1219–E1222.
DOI	https://doi.org/10.1175/BAMS-D-19-0253.1

Precipitation Yearly Anomalies (Historical)

Keywords	precipitation anomalies, annual precipitation, wet years, dry years, precipitation variability, rainfall, snowfall, PRISM, climate variability
Summary	Precipitation yearly anomalies show how much annual precipitation differs from the long-term average for a location. They help identify unusually wet or dry years and show how precipitation varies over time.
Technical Description	The Parameter-elevation Regressions on Independent Slopes Model (PRISM) precipitation anomaly dataset shows how total precipitation for an individual year differs from the long-term average precipitation for the same location. Anomalies are calculated relative to a historical climate normal, allowing annual conditions to be compared consistently across the landscape. Positive anomalies indicate years that were wetter than average, while negative anomalies indicate drier-than-average years. Examining yearly precipitation anomalies helps characterize interannual climate variability and identify periods of unusually wet or dry conditions that may affect soil moisture, drought stress, vegetation growth, wildfire risk, and forest recovery.
Non-Technical Description	Precipitation can vary substantially from one year to the next. This indicator shows whether a particular year was wetter or drier than normal, helping identify periods when forests may have experienced unusually high water availability or increased drought stress.
Source	PRISM
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1991-2025
Temporal Resolution	Annual
License	https://prism.oregonstate.edu/terms/
Publication Date	2026
Citation	Daly, C., Halbleib, M., Smith, J. I., Gibson, W. P., Doggett, M. K., Taylor, G. H., ... & Pasteris, P. P. (2008). Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States. <i>International Journal of Climatology: a Journal of the Royal Meteorological Society</i> , 28(15), 2031-2064.
DOI	https://doi.org/10.1002/joc.1688

Relative Stand Density Index (2024)

Keywords	relative stand density index, rSDI, stand density, forest density, stocking, competition, forest structure, stand development
Summary	Relative stand density index describes how densely trees occupy a forest relative to the maximum density the site can support. It helps show where competition among trees for light, water, and nutrients may be greatest.
Technical Description	The Vibrant Planet Data Commons relative Stand Density Index (rSDI) dataset maps forest density across the contiguous United States relative to the maximum density a forest can support. rSDI compares current stand density with an estimated maximum stand density, providing a standardized measure of how fully a site is occupied by trees. Values below 1% generally indicate non-forest areas; values from 1–35% indicate open or understocked forests; values from 35–55% indicate full site occupation or fully stocked forests; values from 55–67% indicate fully stocked forests with increasing competition among trees; and values above 67% indicate dense forests where competition-driven tree mortality may occur. Because these density classes describe forest structure rather than management quality, their interpretation depends on forest type, site conditions, and management objectives.
Non-Technical Description	Relative Stand Density Index (rSDI) shows a forest's current stock and how that compares to the natural capacity which can be analyzed across forest types and regions. This is important because knowing if a forest is overcrowded will inform future management decisions like prescribed burns and forest thinning. Anything above 67% is considered to be overcrowded and could use management actions.
Source	Vibrant Planet
Spatial Coverage	CONUS
Spatial Resolution	30-m
Temporal Coverage	2024
Temporal Resolution	Annual
License	https://creativecommons.org/licenses/by-nc-sa/4.0/
Publication Date	Upcoming publication
Citation	Upcoming publication Data story: https://vpdc-staging.webflow.io/data-story/forest-structure-density-timber-data
DOI	In process

Snow Water Equivalent (Projected)

Keywords	snow water equivalent, SWE, snowpack, snow accumulation, snowmelt, water availability, winter precipitation, climate projections
Summary	Projected snow water equivalent describes expected changes in the amount of water stored in snowpack under two future climate change scenarios (higher and lower change). It helps show where changes in snowpack may affect seasonal water availability for forests.
Technical Description	The Multivariate Adaptive Constructed Analogs (MACAv2) dataset contains projections of snow water equivalent (SWE) across the contiguous United States, representing the amount of water stored in snowpack over a future time period. The dataset includes projections from multiple climate models under two climate change scenarios: a lower-change scenario (RCP 4.5) and a higher-change scenario (RCP 8.5). These scenarios represent different possible climate futures based on greenhouse gas emissions, climate feedbacks, and other forcings. The 20 general climate model (GCM) ensemble is from the CMIP5 generation and is downscaled to 4 km. Higher SWE values indicate more water stored in snowpack, while lower values indicate reduced snowpack water storage. SWE is an important indicator of seasonal water availability because snowmelt contributes to soil moisture, streamflow, and water available to forests during the growing season. This dataset supports climate-informed planning and helps assess how future changes in snowpack may affect forest water availability and resilience.
Non-Technical Description	Snow Water Equivalent (SWE) is the measure of how much water is in a sample of snow. SWE is a good measure of how much precipitation falls as snow, mostly during the winter, and then slowly infiltrates into soils. Thus, this recharges soil water and provides trees with water during the spring and possibly through the rest of the growing season. If SWE is increasing, then trees will have more water available for faster growth rates and more vigor. On contrary, if SWE is decreasing, then trees will have less soil water to uptake and will exhibit more stressful growing conditions and vulnerability to mortality.
Source	ClimateToolbox
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2099
Temporal Resolution	30-year periods (1971-2000, 2010-2039, 2040-2069, 2070-2099)
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DOI <https://doi.org/10.1175/BAMS-D-19-0253.1>

Soil Moisture (Projected)

Keywords	soil moisture, soil water, water availability, drought, moisture stress, climate projections, future soil moisture
Summary	Projected soil moisture describes expected changes in the amount of water held in soils under two future climate change scenarios (higher and lower change). It helps show where forests may experience increasing or decreasing water availability over time.
Technical Description	The Monthly Water-Balance Model (MWBM)- Multivariate Adaptive Constructed Analogs (MACAv2) dataset contains projections of soil moisture across the contiguous United States, representing a 30-year average of mean annual soil moisture, the amount of water stored in the upper layers of soil, for a future time period. The dataset includes projections from multiple climate models under two climate change scenarios: a lower-change scenario (RCP 4.5) and a higher-change scenario (RCP 8.5). These scenarios represent different possible climate futures based on greenhouse gas emissions, climate feedbacks, and other forcings. The 20 general climate model (GCM) ensemble are from the CMIP5 generation and are downscaled to 4 km. Higher values indicate wetter soils, while lower values reflect drier conditions. Soil moisture is a key indicator of drought stress and ecosystem health, influencing forest growth, wildfire risk, and overall resilience. This dataset supports climate-informed planning and helps assess potential future impacts on forests and water availability.
Non-Technical Description	Soil moisture is a strong indicator for the amount of soil water that is available for trees to uptake through their roots and is strongly correlated with the amount of precipitation. Current forests that have a decrease in soil moisture projected over the 21st century are more susceptible to drought-related mortality. On the contrary, areas projected to increase in soil moisture will likely have better forest health and growth rates.
Source	ClimateToolbox
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2099
Temporal Resolution	30-year periods (1971-2000, 2010-2039, 2040-2069, 2070-2099)
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Hegewisch, K. C., Abatzoglou, J. T., Brown, T. J., & Mote, P. W. (2020). Climate Toolbox: Visual analytics for regional climate resilience. Bulletin of the American Meteorological Society, 101(8), E1219–E1222.

DOI <https://doi.org/10.1175/BAMS-D-19-0253.1>

Temperature (Historical)

Keywords	temperature, historical temperature, observed temperature, average temperature, climate normals, temperature variability, PRISM, climate history
Summary	Historical temperature describes observed average air temperature over past 30-year climate periods. It provides a baseline for understanding how temperature varies across the landscape and how recent conditions compare with past climate.
Technical Description	The Parameter-elevation Regressions on Independent Slopes Model (PRISM) historical temperature dataset maps observed air temperature across the contiguous United States using climate observations interpolated across the landscape. In the FIP, temperature is summarized as 30-year climate normals for 1971–2000, 1981–2010, and 1991–2020 at 4-km resolution. Higher values indicate warmer average conditions, while lower values indicate cooler conditions. These historical temperature normals provide a baseline for understanding long-term climate patterns, comparing recent conditions with earlier periods, and identifying areas where forests have historically experienced warmer or cooler climates.
Non-Technical Description	This historical temperature dataset describes average air temperature from 1971 to 2020 in 30-year average timeframes. Historical temperature patterns provide a baseline for understanding the impact of long-term climate patterns on forests.
Source	PRISM
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1961-2020
Temporal Resolution	30-year normals (1971-2000, 1981-2010, 1991-2020)
License	https://prism.oregonstate.edu/terms/
Publication Date	2025
Citation	Daly, C., Halbleib, M., Smith, J. I., Gibson, W. P., Doggett, M. K., Taylor, G. H., ... & Pasteris, P. P. (2008). Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States. <i>International Journal of Climatology: a Journal of the Royal Meteorological Society</i> , 28(15), 2031-2064.
DOI	https://doi.org/10.1002/joc.1688

Temperature (Projected)

Keywords	temperature, average temperature, mean temperature, temperature change, warming, climate projections, future temperature
Summary	Projected temperature describes expected changes in mean air temperature under two future climate change scenarios (higher and lower change). It helps show where warming may be greatest over time.
Technical Description	The Multivariate Adaptive Constructed Analogs (MACAv2) dataset contains projections of temperature across the contiguous United States, representing a 30-year average of mean annual temperature for a future time period. It is based on the average of daily high and low temperatures. The dataset includes projections from multiple climate models under two climate change scenarios: a lower-change scenario (RCP 4.5) and a higher-change scenario (RCP 8.5). These scenarios represent different possible climate futures based on greenhouse gas emissions, climate feedbacks, and other forcings. The 20 general climate model (GCM) ensemble are from the CMIP5 generation and are downscaled to 4 km. Higher values indicate warmer future conditions, while lower values reflect cooler areas. Projected temperature is a key driver of forest vulnerability, influencing growth, water demand, disturbance risk, and species distributions. This dataset supports climate-informed planning and helps assess potential future impacts on forests and ecosystems.
Non-Technical Description	Increasing temperatures leave forests at risk of growth impacts, water stress, changes in species distributions, and disturbance risks. However, increasing temperatures at higher elevations and more northerly latitudes might increase growth rates and expand species distributions into new areas.
Source	ClimateToolbox
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2099
Temporal Resolution	30-year periods (1971-2000, 2010-2039, 2040-2069, 2070-2099)
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Temperature Yearly Anomalies (Historical)

Keywords	temperature anomalies, annual temperature, warm years, cool years, temperature variability, PRISM, climate variability, historical temperature
Summary	Temperature yearly anomalies show how much the average temperature for a given year differs from the long-term average for a location. They help identify unusually warm or cool years and show how temperature varies over time.
Technical Description	The Parameter-elevation Regressions on Independent Slopes Model (PRISM) temperature anomaly dataset shows how average temperature for an individual year differs from the long-term average temperature for the same location. Anomalies are calculated relative to a historical climate normal, allowing annual conditions to be compared consistently across the landscape. Positive anomalies indicate years that were warmer than average, while negative anomalies indicate cooler-than-average years. Examining yearly temperature anomalies helps characterize interannual climate variability and identify unusually warm or cool periods that may influence drought stress, snowpack, growing-season conditions, wildfire risk, and forest health.
Non-Technical Description	Temperatures can vary considerably from one year to the next. This indicator shows whether a particular year was warmer or cooler than normal, helping identify periods when forests may have experienced increased heat stress or unusually cool conditions.
Source	PRISM
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1991-2025
Temporal Resolution	Annual
License	https://prism.oregonstate.edu/terms/
Publication Date	2025
Citation	Daly, C., Halbleib, M., Smith, J. I., Gibson, W. P., Doggett, M. K., Taylor, G. H., ... & Pasteris, P. P. (2008). Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States. <i>International Journal of Climatology: a Journal of the Royal Meteorological Society</i> , 28(15), 2031-2064.
DOI	https://doi.org/10.1002/joc.1688

Vapor Pressure Deficit (Projected)

Keywords	vapor pressure deficit, VPD, atmospheric dryness, evaporative demand, plant water stress, drought stress, climate projections, future VPD
Summary	Projected vapor pressure deficit describes expected changes in atmospheric dryness under two future climate change scenarios (higher and lower change). It helps show where trees may experience greater atmospheric water stress over time.
Technical Description	The Multivariate Adaptive Constructed Analogs (MACAv2) dataset contains projections of vapor pressure deficit (VPD) across the contiguous United States, representing average atmospheric moisture demand over a future time period. The dataset includes projections from multiple climate models under two climate change scenarios: a lower-change scenario (RCP 4.5) and a higher-change scenario (RCP 8.5). These scenarios represent different possible climate futures based on greenhouse gas emissions, climate feedbacks, and other forcings. The 20 general climate model (GCM) ensemble is from the CMIP5 generation and is downscaled to 4 km. Higher VPD values indicate drier atmospheric conditions and greater evaporative demand, while lower values indicate more humid conditions. VPD is an important indicator of plant water stress because high values can increase water loss and reduce photosynthesis and growth. This dataset supports climate-informed planning and helps assess future drought stress and forest vulnerability.
Non-Technical Description	Vapor pressure deficit (VPD) measures the dryness in the atmosphere. The higher the VPD, the dryer the atmosphere, which leads to slower growth, poor forest health and tree mortality for forests that aren't adapted to dry conditions.
Source	ClimateToolbox
Spatial Coverage	CONUS
Spatial Resolution	4-km
Temporal Coverage	1971-2099
Temporal Resolution	30-year periods (1971-2000, 2010-2039, 2040-2069, 2070-2099)
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DOI	https://doi.org/10.1175/BAMS-D-19-0253.1