

Disturbance data for forests and rangelands developed for the 2020 Resources Planning Act (RPA) Assessment^{1,2} and related efforts. These data can be used for numerous applications by private and public land management and research constituents. The disturbance data include major types of disturbance including wildfire, insect and disease outbreaks, drought, and invasive plants, and they can be used to determine whether these disturbances are becoming more or less common over time. These dynamics have the potential to alter ecosystem goods (e.g., forest products) and services (e.g., clean water) coming from US forests and rangelands. Disturbance is a natural process, and it is important to understand it within the context of the local ecosystem. All datasets are available in raster format, unless otherwise stated.

DATA DESCRIPTION	UNITS	SPATIAL EXTENT	SPATIAL RESOLUTION	TEMPORAL DOMAIN	POTENTIAL USE*
<u>Current and Recent Past</u>					
<u>Standardized Precipitation-Evapotranspiration Index (SPEI)[†]</u>	SPEI index <i>unitless value ranging from -3 to +3</i>	Conterminous U.S.	4 km	1950-2018 <i>Monthly timestep</i>	National-level to Broad-level applications. Recent drought exposure serves as an indicator of ecological stress in forests and rangelands. The SPEI is a climatic water balance-based measure of drought that incorporates precipitation and potential evapotranspiration. Monthly values of 6-month and 36-month SPEI are available based on PRISM data³. In the RPA, 36-month SPEI values were used to assess drought exposure in forests, and 6-month SPEI values were used for rangelands.
Recent Trends in Fire for Forests and Rangelands	Aggregated burn severity categories <i>high, moderate, other</i>	Conterminous U.S.	30 m	1984-2017 <i>Annual timestep</i>	National-level applications. Used to quantify the area burned in each of three burn severity categories as well as changes in the totals for these categories since 1984. Can be used alongside other information to evaluate if the annual burned area, altogether or for a particular burn severity category, is typical for a given region. Monitoring Trends in Burn Severity (MTBS)⁴ data map the extent and severity of all fires ≥1000 acres in the Western U.S. and ≥500 acres in the Eastern U.S. For the RPA, the MTBS data were reclassified (with “other” combining the original unburned/low, low, and increased greenness categories) and overlaid on areas identified as forest lands or rangelands.

DATA DESCRIPTION	UNITS	SPATIAL EXTENT	SPATIAL RESOLUTION	TEMPORAL DOMAIN	POTENTIAL USE*
<u>Invasive Plants in Forests</u>	% of FIA plots invaded by invasive plant species; mean number and % cover of invasive plant species on FIA plots	Conterminous U.S., Alaska, and Hawaii	Summarized by County	2005-2018 <i>Static</i>	National-level to Broad-level applications. The Forest Inventory and Analysis (FIA) program collects invasive plant data based on lists of problematic invasive plant species of any growth form. These are species determined by local experts as likely to cause economic or environmental harm and do not constitute a complete list of all non-native plants present. Invasive plant species occurrence data provide insight into the potential ecological stress from invasive plants. Invasive plants can alter ecosystem composition, structure, and function, with implications for habitat, forest products, and ecosystem services. Note: occurrence data collected by Bugwood⁵ can be summarized for counties with rangelands.
Forest Insects & Disease	Hectares of forest canopy area exposed to mortality and defoliation	U.S.	Summarized by RPA region <i>AK & HI included in Pacific Coast Region</i>	1997-2018 <i>5-year timestep</i>	National-level applications. Total forest canopy area exposed to mortality and defoliation is from the Forest Health Monitoring National Status, Trends, and Analysis report⁶ which analyzes the data from aerial detection surveys. Forest canopy area exposed to mortality and defoliation is summarized by insect and disease agents, native and nonnative agents, and insect feeding guilds (for insect-associated mortality only). Proportions of total mortality and defoliation within these classes are also calculated for each RPA region. These data allow for the evaluation of trends in the extent, severity, and periodicity of major insect and disease threats. Forest insects and diseases, particularly nonnative invasive agents, are among the most serious threats to U.S. forests and cause widespread ecological and economic impacts.

DATA DESCRIPTION	UNITS	SPATIAL EXTENT	SPATIAL RESOLUTION	TEMPORAL DOMAIN	POTENTIAL USE*
Attribution of Forest Cover Loss Events^{7,‡}	Meters	Conterminous U.S.	30 m	1986-2010 <i>Annual timestep</i>	National-level applications. The NAFD-Att dataset provides information on the timing and causes of forest cover loss events, which can help identify areas of mitigation or adapting to change. Documents forest cover loss over 25-year time period and attributes that loss to removal (harvest), fire, stress (e.g., slow mortality from insects or drought), wind, conversion, and other. Most forest area over this time period (about 70%) is stable, with no observed disturbance or conversion. Data can be summarized by RPA or other regions, year, or causal agent.
<u>Future Projections</u>					
<u>Standardized Precipitation- Evapotranspiration Index (SPEI)[†]</u> <i>Available for each RPA climate scenario</i>	SPEI index <i>unitless value ranging from -3 to +3</i>	Conterminous U.S.	4 km	1950-2070 <i>Monthly timestep</i>	National-level to Broad-level applications. Drought projections can help plan for a range of future scenarios and assess the need for potential adaptation and mitigation measures. The SPEI is a climatic water balance-based measure of drought that incorporates precipitation and potential evapotranspiration. Monthly values of 6-month and 36-month SPEI are available for the ten combinations of climate futures and climate projections (two RCPs and five climate projections) selected for the RPA⁸. In the RPA, 36-month SPEI values were used to assess drought exposure in forests, and 6-month SPEI values were used for rangelands.

* A description of FS business applications by spatial scales is available in Table 1-1 of the [Existing Vegetation Classification, Mapping, and Inventory Technical Guide, v2.0](#)

[†] Denotes corresponding datasets exist in both the *Current and Recent Past* and *Future Projection* sections of the table

[‡] Work was not funded through the RPA Assessment

References and Footnotes:

- ¹ Costanza, Jennifer K.; Koch, Frank H.; Reeves, Matt; Potter, Kevin M.; Schleeweis, Karen; Riitters, Kurt; Anderson, Sarah M.; Brooks, Evan B.; Coulston, John W.; Joyce, Linda A.; Nepal, Prakash; Poulter, Benjamin; Prestemon, Jeffrey P.; Varner, J. Morgan; Walker, David M. 2023. Disturbances to Forests and Rangelands. In: U.S. Department of Agriculture, Forest Service. 2023. Future of America's Forest and Rangelands: Forest Service 2020 Resources Planning Act Assessment. Gen. Tech. Rep. WO-102. Washington, DC: xxx-xxx. Chapter 5. <https://doi.org/10.2737/WO-GTR-102-Chap5>
- ² The RPA website provides links to current and past RPA Assessments, as well as supporting data, technical reports, and webinars: <https://www.fs.usda.gov/research/inventory/rpaa>
- ³ PRISM Climate Group, Oregon State University. 2020. Parameter-elevation Regressions on Independent Slopes Model. <https://prism.oregonstate.edu>. (Accessed 16 December 2020).
- ⁴ Monitoring Trends in Burn Severity (MTBS) data are publicly available (<https://www.mtbs.gov/direct-download>). For an overview of the MTBS methodology: Eidenshink, Jeff; Schwind, Brian; Brewer, Ken; Zhu, Zhi-Liang; Quayle, Brad; Howard, Stephen. 2007. A project for monitoring trends in burn severity. *Fire Ecology* 3(1): 3-21. <https://doi.org/10.4996/fireecology.0301003>
- ⁵ Data on invasive plant species can be obtained by contacting Bugwood (www.bugwood.org).
- ⁶ Potter, Kevin M.; Conkling, Barbara L., eds. 2020. Forest health monitoring: national status, trends, and analysis 2019. Gen. Tech. Rep. SRS-250. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 189 p. <https://www.fs.usda.gov/treesearch/pubs/60380>
- ⁷ Schleeweis, K.G.; Moisen, G.G.; Schroeder, T.A.; Toney, C.; Freeman, E.A.; Goward, S.N.; Huang, C.; Dungan, J.L. US National Maps Attributing Forest Change: 1986–2010. *Forests* 2020, 11, 653. <https://www.fs.usda.gov/rmrs/publications/us-national-maps-attributing-forest-change-1986-2010>
- ⁸ Joyce, Linda A.; Coulson, David. 2020. Climate scenarios and projections: A technical document supporting the USDA Forest Service 2020 RPA Assessment. Gen. Tech. Rep. RMRS-GTR-413. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 85 p. <https://doi.org/10.2737/RMRS-GTR-413>