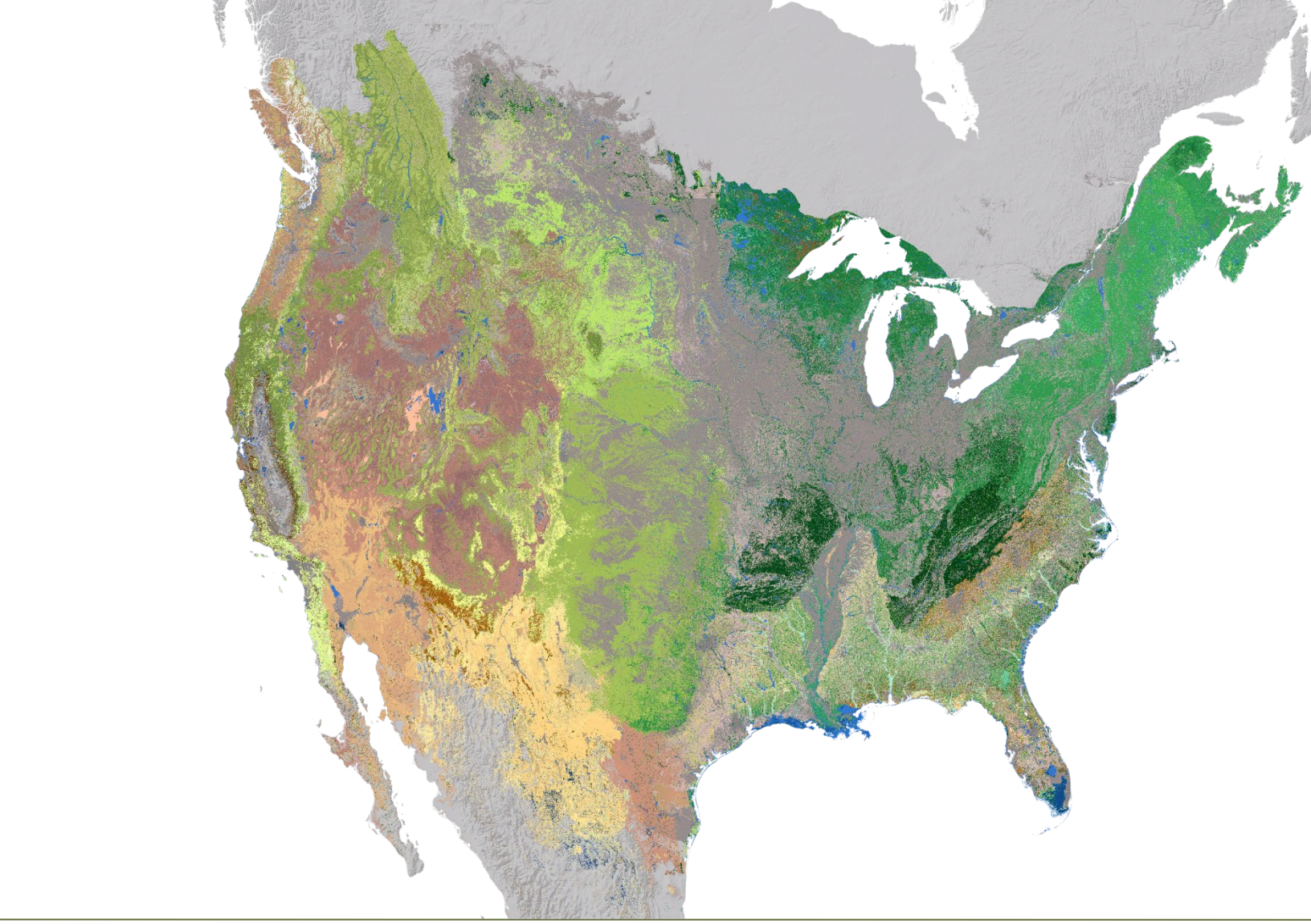
Map of Ecosystems of the Conterminous US and Adjacent Areas, v1.0.

Purpose

Our knowledge of ecosystems, the services they provide, and their changing distributions due to human pressures requires maps that track their historic and current status, coupled with descriptions of their composition, structure and function (Faber-Langendoen et al. 2018, 2025). To date, ecologists in the US have classified and described ecosystems at multiple scales in the US National Vegetation Classification (USNVC; see usnvc.org) without a detailed view of their spatial distribution. Here we provide a first *Map of Ecosystems of the Conterminous US and Adjacent Areas*, v1.0. reflecting the distribution of terrestrial ecosystems at a mid-scale ecosystem unit - the group level of the USNVC hierarchy. The goal of the map is to capture the spatial distribution of USNVC ecosystems for conservation and resource management applications across the conterminous US. The map includes 321 USNVC groups and nine additional land cover and anthropogenic land use categories.



Map of Ecosystems of the United States v1.0

The Map

The *Map of Ecosystems of the Conterminous US and Adjacent Areas*, v1.0 consists of a 30m resolution raster with each pixel representing a unique ecosystem or anthropogenic cover type, with a primary goal of reporting the distribution and density of each ecosystem; therefore, it is also published as a series of hexagon-based range maps for each ecosystem type. The pixel-based map can be displayed and analyzed from the group to the biome level of the USNVC hierarchy to provide a view of US ecosystems at multiple spatial scales. The map was developed using a 2022 LANDFIRE data product, the 30m map of Existing Vegetation Types (EVTs), which encompasses the continuum from natural to ruderal and cultural vegetation (Rollins et al. 2009). The LANDFIRE map is based on the Ecological Systems classification (Comer et al. 2003), which served as a prototype for and is now largely integrated into the USNVC (Faber-Langendoen 2018, 2025). The USNVC is both a federal standard and a NatureServe Network standard, is maintained through peer review by the Ecological Society of America, and is hierarchical, thereby providing the ability to view ecosystems at multiple thematic scales (i.e., from group to biome). For that reason, we developed methods to link the Ecological Systems type to USNVC groups to build a revised vegetation map (see “Summary of Key Methods”).

Recommended Uses of the Map

1. **What it is**
    a. The most comprehensive map of distributions of ecosystems of the US and scalable from the group level of the USNVC to its coarser biome levels.
    b. A good source for understanding the full extent and distribution of US ecosystems.
    c. A synthetic map, based on a sequence of expert-based revisions to LANDFIRE's Ecological Systems map using a detailed cross-walk to the USNVC classification concepts.
    d. Appropriate for assessments from regional (e.g. scales >100km^2 such as counties, mountain ranges, watersheds) to national jurisdictions.
    e. A version 1.0 aligned with the USNVC as a federal standard and, in conjunction with ongoing peer review, will be upgraded with new information and improved methods.
2. **What it is not**
    a. Reliably accurate at local spatial and jurisdictional scales (individual or small groups of pixels), compared to state-level or other more local mapping efforts.
    b. Consistent in methodology across ecosystem types and political jurisdictions. Some Ecological System types contained complexes of NVC groups which required resolution through expert input. Other types had incorrectly mapped ranges. Addressing these issues required a variety of methods to improve the assignment of pixels to USNVC groups.
    c. Comprehensive for all ecosystems (groups). For example, small-patch groups, such as wetland seeps and rocky outcrops, are often not mapped.
3. **Limitations**
    a. Where local accuracy was limited by modeling errors in the original source maps and where there was limited review by local experts. Funding this important effort to move beyond v1.0 is a continuing goal.
    b. Mapping for adjacent areas of Canada and Mexico, where older source data and methodology results in inconsistencies in group mapping across national borders.
    c. Preparations are under way to add in Alaska and explore mapping options for Canada.

Summary of Key Methods

1. **Linking ecosystem classifications: matching USNVC groups to Ecological Systems**: The first step in producing a map of USNVC groups was linking them to the Ecological System types mapped by LANDFIRE. Ecologists reviewed the systems concepts and the USNVC group (and alliance) concepts to determine how best to link them. The vast majority (~85%) of systems unambiguously matched USNVC groups: either a single system directly matched a single group or multiple systems uniquely linked to a single group. This formed the basis for an initial map. The remaining 15% with more complex relationships required additional review.

2. **Initial draft USNVC group maps for expert review:** We used two primary map datasets to develop the initial version of the map: (1) LANDFIRE's 2022 EVT 30-meter raster map for the conterminous US and (2) a downscaled version of NatureServe's 90-meter raster map of Ecological Systems for ecosystems extending into adjacent Canada and Mexico (Comer et al. 2022). By joining the classification cross-walk between system types and USNVC groups to both the LANDFIRE EVT map and the downscaled NatureServe map, map pixels could be translated from systems to USNVC groups to generate an initial map of groups for the 85% of systems with clean relationships to groups. An important caveat is that even when a system concept had a direct correspondence with a USNVC group concept, the mapped expression of the system concept may have had some inaccuracies. Thus, a system mapped into states or ecoregions where it is not known to occur was a particular red flag (see step 3 below).

3. **Review, Modification, and Creation of USNVC Group Distributions:** NatureServe and NatureServe network ecologists reviewed each ecosystem's (USNVC group) distribution and recommended corrections. All groups were assessed for range-wide accuracy (e.g., biogeographic distribution). Recommendations were then made to either keep pixels as is, re-assign them to a different USNVC group, or assign them to an unknown group category. Pixel assignment changes were based on a set of spatial factors, singly or in combination:
    a) Ecoregions (Environmental Protection Agency, Commission for Environmental Cooperation, and US Forest Service).
    b) Elevation
    c) Digitized custom polygons from expert review provided a more accurate representation of the known distribution of the USNVC type.
    d) Range maps for diagnostic species of a group.

    In the majority of cases, these edits were designed to constrain the mapped concept to the known distribution of the USNVC classification concept. These concepts and distributions have been systematically reviewed by professional ecologists over many years.

4. **Final Map.** The various expert based revisions were merged together to generate a final map, the 30-meter *Map of Ecosystems of the Conterminous US and Adjacent Areas, v1.0.* A series of hexagon based range maps for each ecosystem were then generated from the raster map and are available on request at multiple scales. Ecosystems fully within the conterminous US fundamentally reflect translations of LANDFIRE's Existing Vegetation Types (EVT) map to the NVC ecosystem type at the group level. Ecosystems whose range extends into Canada or Mexico are based on modifications of LANDFIRE in combination with the map of Ecological Systems (see Comer et al. 2022), supplemented with Canadian land cover data.

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