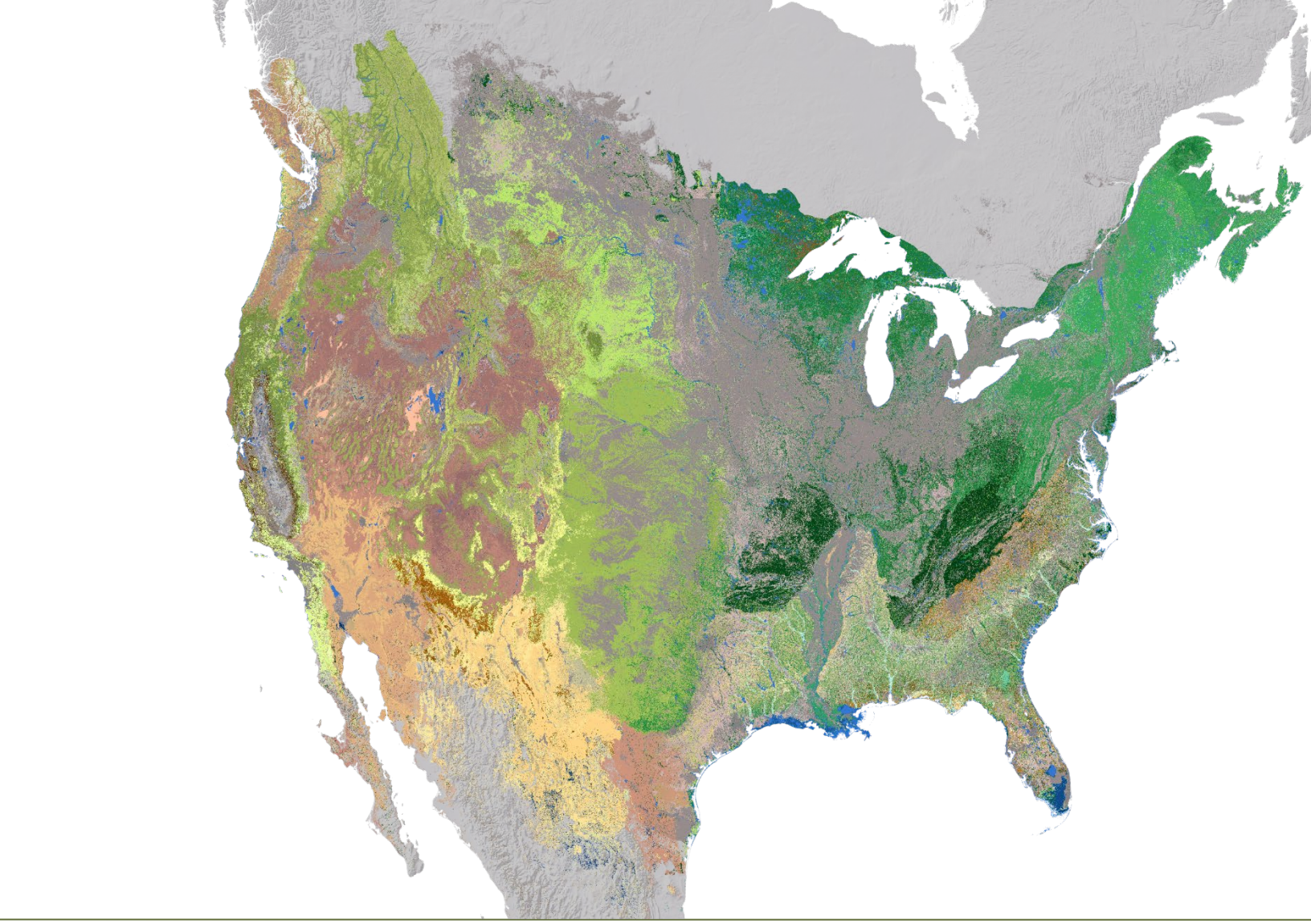
Map of Ecosystems of North America, V1.0

Conterminous U.S. and Adjacent Areas

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 distribution. Here we provide a first *Map of Ecosystems of North America V1.0: Conterminous US and Adjacent Areas* 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.



U.S. NVC Map of Ecosystems in North America v1.0

The Map

The *Map of Ecosystems of North America V1.0* consists of a 30m resolution raster with each pixel representing a unique ecosystem or anthropogenic cover type; it is published as a series of hexagon-based range maps for each ecosystem type. The 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 of Ecosystems of North America V1.0* 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 types (Rollins et al. 2009). We developed methods to map USNVC groups using the LANDFIRE map (see "Summary of Key Methods"), building from previous versions that LANDFIRE created using the Ecological Systems classification (Comer et al. 2003), which is closely aligned with, but not the same as the USNVC.

Recommended Uses of the Map

1. **What it is**
    a. The most comprehensive map of ecosystems of the US, using the group level of the USNVC hierarchy
    b. A good source for understanding both the global extent and range of US ecosystems, as well as their regional extent and distribution
    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.
    d. Appropriate for assessments from regional to national jurisdictions, and scalable from the group to biome level of the USNVC hierarchy
    e. A version 1.0 that will be upgraded with new information and improved methods
    f. An update and replacement for previous ecosystem maps for the US and adjacent areas in Canada and Mexico published by NatureServe (Comer et al. 2022)
2. **What it is not**
    a. Reliably accurate at fine scales, compared to state-level or other more local mapping efforts.
    b. Consistent in methodology across ecosystem types and political jurisdictions. Some LANDFIRE types contained complexes of groups, others were over or under mapped, thus requiring 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. Limited for types that had modeling errors in the original ecological system source maps
    b. Limited time and resources for systematic expert engagement to review distributions
    c. Mapping for adjacent areas of Canada and Mexico, where older source data and methodology results in inconsistencies in group mapping across national borders

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 Systems mapped by LANDFIRE. Ecologists reviewed the USNVC group (and alliance) concepts to develop a cross-walk between the two classification systems. 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 of the distribution of USNVC groups. The remaining 15% of more complex relationships required additional review.

2. **Initial draft ecosystem maps (USNVC groups) for expert review:** We used two primary map datasets to develop the initial version of the *Map of Ecosystems of North America*: (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 and USNVC macrogroups for ecosystems extending into adjacent Canada and Mexico (Comer et al. 2022). By joining the cross-walk between Ecological Systems and USNVC groups to both the LANDFIRE EVT map and the downscaled NatureServe map, map pixels were translated from systems to USNVC groups to generate an initial map of groups for the 85% of systems with clean relationships to groups.

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., checking for biogeographic accuracy). As part of this review, recommendations were 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 the following spatial factors or combinations of them:

    a) **Ecoregions (Environmental Protection Agency, Commission for Environmental Cooperation, and US Forest Service)**
    b) **Elevation**
    c) **Digitized custom polygons from expert review**
    d) **Range maps for diagnostic species of a group**

4. **Final Map.** The various expert based revisions to individual ecosystems were merged together to generate a final map, the 30-meter *Map of Ecosystems of North America V1.0*. Hexagon-based range maps. A series of hexagon based range maps for each ecosystem were then generated from the raster map at multiple scales. In the final map, ecosystems that are fully within the conterminous US fundamentally reflect modifications of LANDFIRE's Existing Vegetation Types (EVT) map. Ecosystems whose range extends into Canada or Mexico are based on modifications of LANDFIRE in combination with NatureServe's map of USNVC macrogroups and Ecological Systems (see Comer et al. 2022), supplemented with Canadian land cover data.

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