United States
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USNVC

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The U.S. National Vegetation Classification 3.0

User Guide

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The U.S. National Vegetation Classification 3.0: User Guide

Esteban Muldavin[1], Don Faber-Langendoen[2], Anne Davidson[3], and Alexis Conley[4]

EXECUTIVE SUMMARY

Purpose: The U.S. National Vegetation Classification Vegetation (USNVC) is a classification of the terrestrial vegetation of the U.S. It is developed and maintained as a partnership between U.S. federal agencies, the Ecological Society of America (ESA), and NatureServe under the auspices of the Federal Geographic Data Committee (FGDC) Vegetation Subcommittee with additional engagement from state and local agencies, universities, and Non-Governmental Organizations. In this guide, we describe the 8-level hierarchy that covers all terrestrial vegetation at multiple thematic scales from global biomes to local associations based on USNVC 3.0. The full classification with descriptions of all types at each level is available as a spreadsheet catalog and on USNVC.org.

Classification Approach: Vegetation classification is the process of grouping stands of vegetation together into vegetation types. For the USNVC, this process uses an ecosystem-based approach that factors in shared biotic and abiotic characteristics, in what is called the EcoVeg approach; EcoVeg types are based on distinct ecosystem processes (e.g., dryland vs wetland, tropical vs temperate and boreal, degree of anthropogenic influence) that structure vegetation properties along environmental gradients. The vegetation types are placed into a multi-scale hierarchy to summarize these patterns and processes, ranging from global type to local types. The overall approach is one among a variety of approaches for defining ecosystems.

Structure:

Upper Levels: The top three levels (biome, subbiome, ecobiome) are coarse, describe major ecological categories on a global scale, and closely align with the Global Ecosystem Typology (GET). These levels emphasize ecosystem drivers and vegetation properties, including vegetation growth forms, physiognomy, and horizonal vertical structure

Middle Levels: The middle levels (division, macrogroup, group) reflect distinctive combinations of species in the context of regional and continental environmental variables and processes such as water cycles and fire patterns. Biogeography and floristics are increasingly integrated at the three middle levels.

Lower Levels: The lowest levels (alliance and association) are the most fine-grained, based on diagnostic and/or dominant species and compositional similarity reflecting local to regional environmental factors.

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- Description Template**:** All types are described using a standard description template that documents the ecological and vegetation properties of the types, classification issues, and their relation to previously published types.
- Classification Data Management: The USNVC information is managed by the NatureServe data management team and published on USNVC.org, which is hosted by the U.S. Geological Survey. All USNVC types are also integrated into NatureServe's International Vegetation Classification (IVC), which is hosted on NatureServe Explorer (explorer.natureserve.org).
- Plot Data Collection: Vegetation types are best documented through field surveys and standardized vegetation plot samples.
- Distribution Maps: Distribution maps are available for USNVC vegetation types, covering the conterminous U.S. and adjacent areas in Mexico and Canada. The map is based on a 30m spatial resolution map that is a realignment of map units developed between NatureServe and LANDFIRE. The map documents 308 USNVC group types, along with eight additional land cover and anthropogenic land use categories. The map units can be aggregated to higher levels, from macrogroup up to biome.
- Federal and State Collaboration: The USNVC serves as both a federal standard for federal agencies, who are expected to link /crosswalk their agency classifications to it, and as a state standard, including by the NatureServe Network, whereby the 50 state programs collaborate with the USNVC partners. As part of the regional review meetings, we reviewed all existing types listed for a state, and where a state had alternative classifications, we reviewed crosswalks to ensure that we updated them as we revised the USNVC.

Outcome and next Steps: The USNVC 3.0 is the first multi-scaled vegetation classification of the United States that systematically lists and describes each level, from biome to association, and that includes input from state partners, federal partners, and international colleagues per the Global Ecosystem Typology. Further, the ecosystem-based (EcoVeg) approach has advanced our understanding of not just the floristic and physiognomic composition of types, but also the patterns and processes along environmental gradients that shape them. Through the dynamic updating process, the catalog of types has become a living document whereby new information on their status, distribution, and management is constantly gathered and compiled to support periodic new versions that will further meet user needs.

The content of any classification can always be improved. Priorities of the ESA Vegetation Panel and the Peer Review Board in the next few years will be to:

1) Complete all descriptions for alliances and advance descriptions of associations;

2) Develop standard summary tables based on quantitative plot data to further support the physiognomy, floristic, environment, and location information of each type, and

3) Build diagnostic, computerized keys to the types.

ACKNOWLEDGEMENTS

We wish to acknowledge the members of the USNVC Peer Review Board and the many colleagues around the United States in the course of developing version 3.0. An extensive network of ecologists, including many from state Natural Heritage Programs and federal agencies, weighed in on various aspects of the classification. We gratefully acknowledge the substantial annual contributions from the U.S. Forest Service and the U.S. Geological Survey that provided the ESA Vegetation Panel and Review Board with the needed resources to conduct peer review and manage the classification. We gratefully acknowledge the additional support of NatureServe, especially the Data Management Committee in maintaining USNVC content. Special thanks to Tom Wentworth for his editorial contributions to this document.

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INTRODUCTION

The U.S. National Vegetation Classification (USNVC) is the national standard for describing the full range of variation of vegetation types of the United States—from tropical rain forests to tundra, deserts to wetlands—along with their environments (FGDC 2008). It provides a consistent, well-documented hierarchical framework to support research and management of the nation's ecosystems from global to local scales (ESA Vegetation Classification Panel 2015). Built under the auspices of the Federal Geographic Data Committee (FGDC) Vegetation Subcommittee in partnership with the Ecological Society of America Vegetation Classification Panel (ESA Vegetation Panel) and NatureServe, it is designed as flexible classification to meet a wide variety of natural resources management needs of agencies, non-governmental organizations (NGOs), and private sector interests, now and into the future.

As an evolving framework, there have been several updates to the classification content since its inception in the late 1990's (USNVC 1.0 and 2.0). Here, we provide a guide to the most recent version, USNVC 3.0, the product of a 10+ year process of analysis and peer review by experts from around the country. The intent of the guide is to provide users with foundational information on the approach and guiding principles of the classification, an overview of hierarchy structure with definitions of the levels, tools for accessing the content, ways to contribute to USNVC including updates and support, example applications at local to national scales, and the future vision for the USNVC.

USNVC PARTNERSHIP and STANDARDS

Building a Federal/non-federal Partnership

The USNVC was initially developed in the 1990s, under the guidance of FGDC (Federal Geographic Data Committee), that resulted in the first national standard 1.0 (FGDC 1997). In 1995, the ESA Vegetation Panel was established to further coordinate and foster the development of a national vegetation classification per the standard (https://esa.org/vegpanel/). In 2002, the FGDC established a specific Vegetation Subcommittee whose charge was to: 1) define and adopt standards for vegetation data collection and analysis, 2) facilitate inter-agency collaboration and inter-agency product consistency, 3) foster accuracy, consistency, and clarity in the structure, labelling, definition and application of a systematic vegetation classification for the U.S., 4) establish a national set of standards for classifying existing vegetation, 5) develop minimum metadata requirements, and 6) collaborate between state, federal, and international efforts.

The FGDC Vegetation Subcommittee formalized the federal/non-federal partnership composed of the following:

1) agency personnel (US Forest Service, US Geological Survey, Bureau of Land Management, Natural Resources Conservation Service, National Park Service, among others) responsible for developing the federal standard and providing resources for implementation of the standard under the leadership of the Forest Service;

2) the ESA Vegetation Panel that manages the development of a national vegetation classification on behalf of FGDC Vegetation Subcommittee (https://esa.org/vegpanel/). Panel members are volunteers who provide impartial scientific expertise to agencies and partners, and they represent the expertise of professional ecologists spanning academic, agency, and non-governmental sectors. To this end, there are subcommittees on applications, outreach and communication, and nomenclature. The Panel also oversees a USNVC Peer Review Board that provides updates to the classification that are published in the Panel's USNVC Proceedings. The Panel maintains the USNVC Proceedings to track its activities and classification revisions of the Review Board through its Proceedings documents, along with a reference library of publications associated with the classification (https://usnvc.org/publications/); and

3) NatureServe, which is responsible for data management of the classification, and which coordinates with the network of Natural Heritage ecologists to provide expertise in vegetation classification. This coordinated effort allows for the development of an ecologically sound classification that documents the existing status of vegetation across all lands, that is publicly available over the web (https://usnvc.org/), and that helps guide land stewardship with a variety of tools and resources.

USNVC Federal Standard 2.0

In 2008, the FGDC Vegetation Subcommittee released a revised 2.0 version of the USNVC Standard that reflected the need for a new approach to developing the classification (FGDC 2008). It provided a new organizing framework for the USNVC that included a new hierarchy structure, guidance on sampling, classifying and describing types, and the establishment of a Peer Review Board to oversee updates to the classification, in keeping with the dynamic content concept of the standard. The standard is driven by this vision:

> *The Vegetation Classification Standard enables federal agencies to produce uniform statistics about vegetation resources across the nation, facilitates interagency cooperation on vegetation management issues that transcend jurisdictional boundaries, and encourages non-Federal partners to utilize and contribute to a common system when working with their Federal partners* (FGDC 2008).

Key elements are:

- The national standard requires all federal vegetation classification efforts to meet core data requirements that are the same across all federal agencies to permit aggregation of data from all federal agencies. This will facilitate the ongoing, dynamic development of a vegetation classification content standard that is the USNVC.
- The Standard also requires that vegetation mapping and inventory units crosswalk to the NVC. That is, the composition of any map unit or inventory unit should be described in terms of one or more vegetation types at an appropriate level of the NVC hierarchy.
- The USNVC is a reporting standard for federal agencies, but each federal agency has the option to develop additional vegetation classification systems that meet their own information and business needs. It is intended to facilitate an orderly development of a national vegetation classification as well as collaboration with local to international vegetation classification activities.

Federal and State Collaboration

The USNVC serves as both a federal standard for federal agencies, who are expected to link /crosswalk their agency classifications to it, and as a NatureServe Network standard whereby the 50 state programs in the U.S. collaborate with the USNVC partners to develop the USNVC. For example, the review process often includes review of existing types listed for a state programs, and where state have alternative classifications, USNVC crosswalks are developed to incorporate as many types as possible into the USNVC hierarchy.

A Dynamic Content Standard

The FGDC standard (FGDC 2008) mandates that the USNVC be revised through a formal peer review process. Accordingly, USNVC Peer Review Board (Review Board) was established in 2018 by the FGDC Vegetation Subcommittee and is managed by the ESA Vegetation Panel and NatureServe. It is made up of professional vegetation scientists from agencies, NGOs, universities, and consultants, along with interested individuals. The Review Board is designed to conduct well-structured reviews of the entire classification. To this end, the country is divided into a set of regions and subregions for the U.S. and adjacent Canada (Table 1).

The Editor-in-Chief (EIC) oversees the work of a set of regional editors that are, with the help of associate editors with local experience, responsible for reviews of their region. The EIC is responsible for coordinating the activities across regions, mediating disputes, and ensuring that accepted revisions are, with the help of a managing editor, entered into proceedings and the USNVC database. Editors from Canada are included because the USNVC standard also mandates that types be described across their “total range (present and historic)” and because the CNVC shares the same hierarchy as the USNVC. Accepted revisions are published as part of the USNVC Proceeding of the ESA Vegetation Panel (https://usnvc.org/proceedings/). The peer review

process used by the Review Board to produce USNVC 3.0 is fully described in Faber-Langendoen et al. (2025a). The USNVC classification database is housed in Biotics database and curated by the NatureServe data management team (see details below – Classification Data Management).

Table 1. USNVC Peer Review Board oversees the classification by regions and subregions. Each subregion is led a regional editor with one or more associate editors to assist in reviews and updates. An Editor-in-Chief oversees the editorial process across regions at a national level.

Region	Subregion
WEST	Warm Desert
	Cool Semi-Desert
	Californian
	Pacific Northwest
	Rocky Mountain
	Western Wetlands
GREAT PLAINS	Great Plains
EAST	Laurentian-Acadian
	Central Interior-Midwest
	Appalachian-Northeast
	South-Central United States
	Southeast Coastal Plain
CARIBBEAN	Caribbean - Puerto Rico
BOREAL & ARCTIC	Boreal
	Arctic
OCEANIA	Hawaiian Islands

The entire review process and products are managed by the NatureServe Ecology Data Management Committee in the Biotics database (NatureServe 2025) and are published on USNVC.org, with classification itself hosted by the U.S. Geological Survey, as well as on NatureServe Explorer, which hosts the International Vegetation Classification (See Classification Content below).

A key requirement for any authoritative list of types that is subject to ongoing revision is to document the lineage process. This lineage documents when types are split, lumped, newly created, and simply archived. In the revision process for USNVC 3.0, the key requirement is to document all of the types that have changed since USNVC 2.0. Thus, for each type change, the Editor-in-Chief works with the Data Management Committee to record the basis for the change in the lineage tracking field, whether for an old type being archived or for a new type (see USNVC Peer Review Board (2025), Appendix E).

USNVC Hierarchy Versions.

Over the course of the development of the USNVC, there have been three main updates or "versions" of the classification itself, i.e., the actual classification content versus the guidance provided by the standards. USNVC 1.0 corresponded to the hierarchy specified under the USNVC Standard 1.0. Similarly, USNVC 2.0 was a response to the FGDC 2.0 standard with its fully revised hierarchical structure. With USNVC 3.0, a new version was needed to reflect the changes to the upper levels of the USNVC 2.0 hierarchy and incorporate peer review-based revisions to the content at lower levels (see Box 1). At this time, the changes were within the scope of the FGDC 2.0 standard (FGDC 2008) and did not warrant revising that standard.

Box 1. The primary differences between USNVC 2.0 and USNVC 3.0.

1. A Peer Review Board was created to oversee all vegetation type changes.
2. Scope is focused on the terrestrial realm (including wetlands) versus freshwater or marine realms (see *Terrestrial Global Realms below)*.
3. For the upper levels, biome concepts replace Formation concepts, and greater emphasis is placed on ecosystem drivers in alignment with the Global Ecosystem Typology (Keith et al. 2022).
4. Mid to Lower levels from division to alliance were systematically reviewed and realigned as needed.
5. USNVC3.0 is published as a stable version for mid and upper levels for at least five years, with limited periodic updates of units at the lower levels at the discretion of the Peer Review Board. This stability is designed to encourage the use of the USNVC among stakeholders.

CLASSIFICATION FRAMEWORK

Guiding Principles

The goal of the U.S. National Vegetation Classification (USNVC) is to classify terrestrial ecosystems based on vegetation and ecological processes (FGDC 2008, Jennings et al. 2009). Vegetation is a critical component of terrestrial ecosystems given its role in energy capture, biomass production, nutrient and water cycling, trophic webs, and its contribution to niche diversity. In this context, the USNVC vegetation units that make up the classification are based on vegetation species composition, growth form and structure, biogeography, and ecological drivers of vegetation pattern using the EcoVeg hierarchical approach of the ecologically-based International Vegetation Classification (IVC; Faber-Langendoen et al. 2014, 2025b). This approach provides for fully classifying the diversity of ecosystems from global biomes to local plant communities. The guiding principles of the USNVC 3.0 are outlined in Box 2.

BOX 2. Guiding Principles of USNVC 3.0

The USNVC is a terrestrial ecological vegetation classification based on the following key principles:

- **Describe existing vegetation/ecosystem patterns.** All existing vegetation is classified, including cultural types (planted and dominated by human processes), natural types (spontaneously formed and driven primarily by non-human ecological processes) and ruderal, often novel ecosystem types (spontaneously formed but driven by natural processes strongly altered by people).
- **Focus on terrestrial vegetation:** The USNVC uses the EcoVeg approach of the ecologically-based International Vegetation Classification (eIVC) and integrates elements of the Global Ecosystem Typology (GET) to classify terrestrial vegetation. The USNVC follows the GET in explicitly recognizing the Terrestrial Realm and Wetland Transitional Realms as distinct from Freshwater, Marine, and Subterranean realms. Aquatic vegetation in permanent open water bodies with no emergent vegetation is excluded; that is, ecosystems with only floating and submerged macrophytes (e.g., seagrass beds, freshwater submerged vegetation).
- **Include entire terrestrial realm.** The USNVC includes types where vegetation biomass or cover is minimal and may not be detectable with remote sensing. Even glaciers and icesheets can be classified as terrestrial ecosystems with microbial biota and placed with cryogenic vegetation to ensure comprehensive coverage of the USNVC on land (Anesio and Laybourn-Parry 2012). Similarly, sand dunes and hyper-arid deserts with minimal or no vegetation can be placed with their vegetated counterparts.
- **Emphasize ecological properties alongside vegetation.** The USNVC is based on an integrated ecosystem approach to vegetation classification, where vegetation patterns (including growth forms, life-histories, and productivity) are interpreted along ecological and biogeographic gradients.
- **Describes vegetation types at multiple thematic scales.** Scales range from thematically broad biomes to fine-scale plant communities (e.g. alliances and associations)
- **Document types using field-based data.** Key data are vegetation plots, which differentiate types based on growth forms, species composition, site factors, ecological processes, and disturbances.
- **Organize types hierarchically.** Criteria are provided for each level, which are structured hierarchically with types within and among levels developed using a coordinated peer review process.

The USNVC 3.0 Classification Structure

Global Ecosystem Realms

The USNVC 3.0 hierarchy encompasses elements that fall under the global Terrestrial Realm along with its transitions to freshwater and marine realms: Terrestrial-Freshwater Transitional Realm and Terrestrial-Marine Transitional Realm per the GET (Fig. 1). In addition, it integrates the full range of both natural and anthropogenic ecosystems within a single hierarchical structure. Unlike previous versions, natural and intensively managed (cultural) types are placed within their respective realms in USNVC 3.0 to better reflect the relationships between natural and intensively managed ecosystems rather than treated as separate natural versus cultural classification hierarchies.

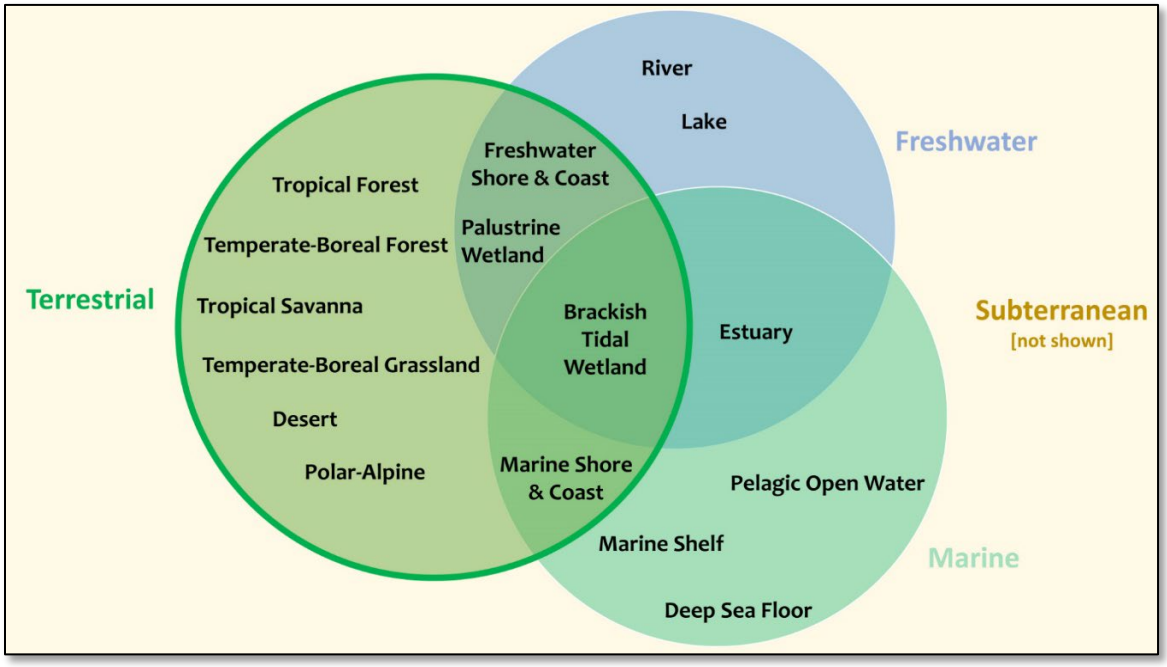


Figure 1. The scope of the USNVC as defined by the Terrestrial Realm and Transitional Realms. The dark green circle includes both the core "upland/dryland" biomes and the transitional wetland biomes. Anthropogenic biomes in each realm are not shown. Figure adapted from Keith et al. (2022) including names of Biomes in the Freshwater and Marine realms. The Subterranean Realm is not shown for clarity.

Eight Level Hierarchy

The USNVC 3.0 uses an 8-level hierarchical structure from continental- to global-scale ecosystem biomes, through mid-scale national and regional ecosystem units, down to fine-scale, local associations (plant communities) (Fig. 2). Across the hierarchy there are 9,268 vegetation types (classification units) distributed across the levels (Table 2). Brief summary definitions of each level are provided in Table 3 (extensive guidance on the application of these levels is provided in Faber-Langendoen et al. 2014; 2025b).

The top three levels (biome, subbiome, ecobiome) are major ecological categories on a global scale and closely align with the top tiers of the Global Ecosystem Typology (GET) developed by Keith et al. (2022). These units are based on synthetic interpretations of ecological and vegetation patterns at global scales that emphasize major ecosystem drivers, dominant vegetation growth forms, and broad physiognomic features (Fig. 3). The middle levels (division, macrogroup, group) reflect distinctive combinations of species in the context of regional and continental environmental variables and processes such as water cycles and fire patterns (Fig. 4). Biogeography and floristics are increasingly integrated at the three middle levels. The lowest levels (alliance and association) are the most fine-grained and are based on diagnostic and/or dominant species with compositional similarity reflecting local to regional environmental factors (Fig. 5). The nomenclature for naming the types is provided in Appendix B.

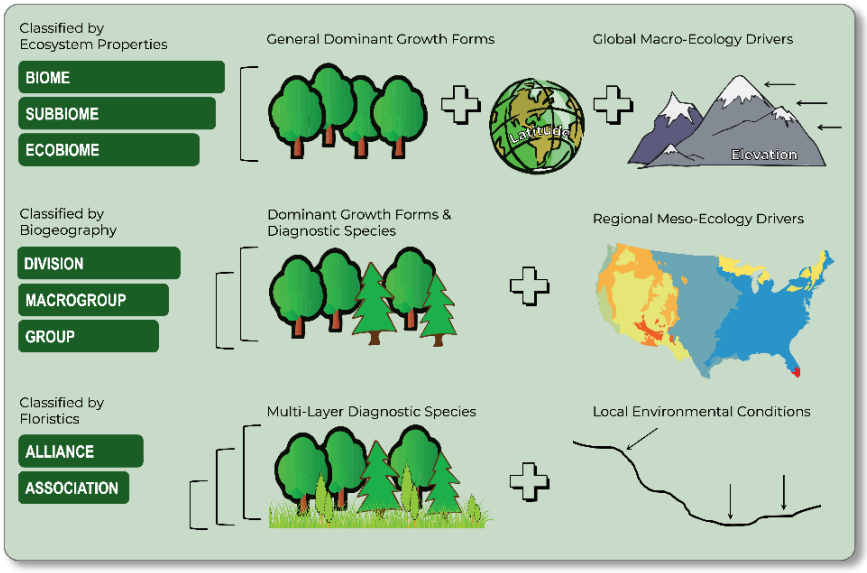


Figure 2. The eight-tiered USNVC hierarchy in the FGDC (2008) national standard reflects a combination of ecosystem properties at global scales (L1-L3), continental biogeographic patterns of species and ecological gradients at mid-scales (L4-L6), and floristics and environments at local scales (L7-L8).

Table 2. The distribution of USNVC 3.0 natural and semi-natural vegetation types among all 50 states.

Hierarchy	Types
Upper levels	
L1 – Biome	11
L2 – Subbiome	25
L3 – Biome	41
Mid-levels	
L4 – Division	77
L5 – Macrogroup	178
L6 – Group	441
Lower levels	
L7 – Alliance	1520
L8 – Association	6975

Table 3. Summary definitions of the 8-level hierarchy of the U.S. National Vegetation Classification (USNVC) 3.0.

Upper Levels
Realm and Transitional Realm. One of four core components of the biosphere that differ fundamentally in ecosystem organisation and function: terrestrial, freshwater, marine, subterranean. Transitional Realms describe overlaps among the realms.
L1. Biome. A broad combination of dominant general growth forms and structure regulated by common major ecological drivers, including basic moisture, temperature, substrate, and/or disturbance regimes.
L2. Subbiome. A combination of general dominant and diagnostic growth forms and structure that are regulated by global ecological drivers, such as mega- or macroclimatic factors driven primarily by latitude and continental position, or that reflect overriding substrate and disturbance regimes.
L3. Ecobiome. A combination of ecosystem properties (especially dominant and diagnostic growth forms and structure) that share common ecological drivers, such as global macroclimatic conditions (modified by altitude and seasonality of precipitation), substrates, hydrologic, and disturbance regimes.
Mid-levels
L4. Division. A combination of dominant and diagnostic growth forms and a broad set of diagnostic plant species that reflect biogeographic differences in composition and continental differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.
L5. Macrogroup. A moderate set of diagnostic plant species and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.
L6. Group. A relatively narrow set of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect regional mesoclimate, geology, substrates, hydrology, and disturbance regimes.
Lower Levels
L7. Alliance. A characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically at least one of which is found in the uppermost or dominant stratum of the vegetation. Alliances reflect regional to subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes.
L8. Association. A characteristic range of species composition, diagnostic species occurrence, habitat conditions and physiognomy. Associations reflect topo-edaphic climate, substrates, hydrology, and disturbance regimes.

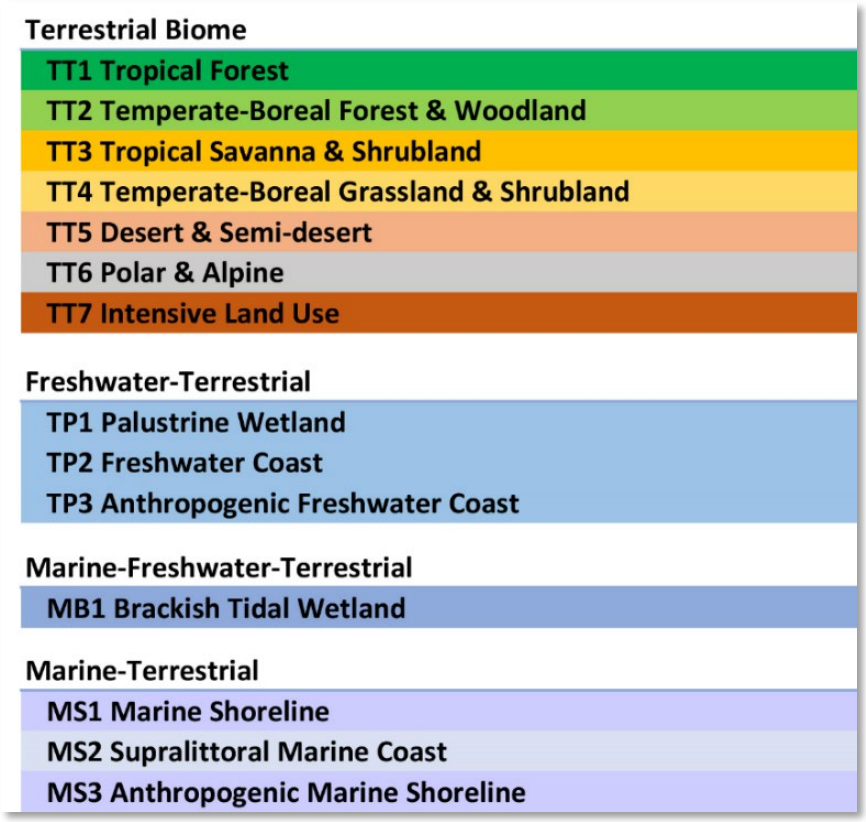


Figure 3. Biome and subbiomes of the Terrestrial Realm per the Global Ecosystem Topology (Keith et al. 2022).

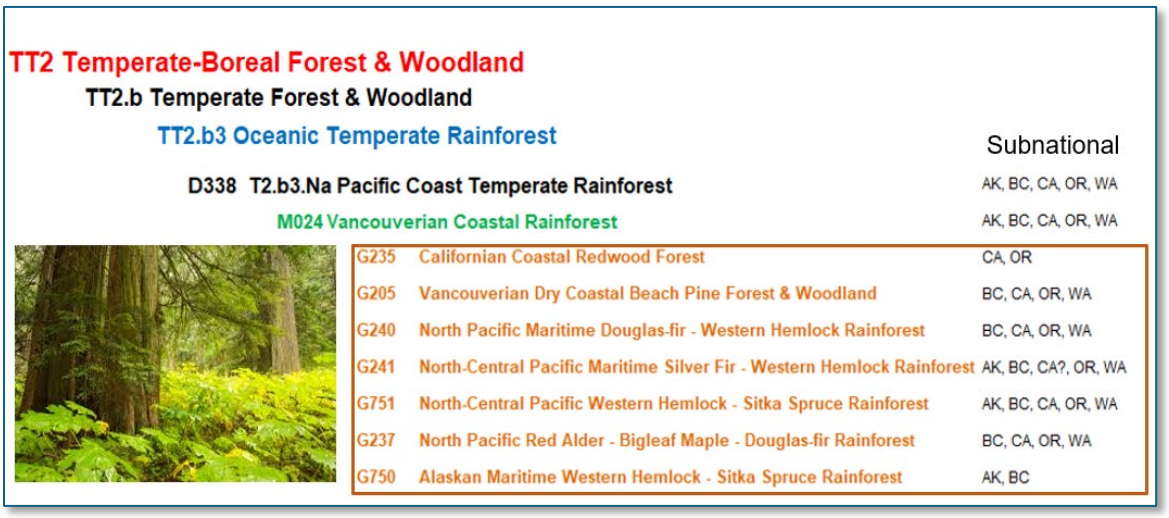


Figure 4. An example of mid-level units of division, macrogroups, and groups that hierarchically fall under the Temperate-Boreal Forest & Woodland Biome, Temperate Forest & Woodland Subbiome, and Oceanic Temperate Rainforest Ecobiome derived from the Global Ecosystem Topology (Keith et al. 2022).

G235	Californian Coastal Redwood Forest		
	A0104	Port Orford-cedar Forest Alliance	
			Port Orford-cedar - Douglas-fir / (Pacific Rhododendron) / Common Beargrass Forest
			Port Orford-cedar - Douglas-fir / Tanoak / Salal Forest
			Port Orford-cedar - Western Hemlock / Salal - Pacific Rhododendron Forest
			Port Orford-cedar - Western Hemlock / Western Swordfern Forest
			Port Orford-cedar / Western Azalea Forest
			Port Orford-cedar / California Huckleberry Forest
	A3403	Coastal Redwood Terrace Forest Alliance	
			Douglas-fir - Redwood / Western Swordfern Forest
			Douglas-fir - Redwood / Pacific Rhododendron / California Huckleberry Forest
			Redwood - Douglas-fir Forest
			Redwood / Tanoak / California Huckleberry Forest

Figure 5. An example of alliances and plant associations at the lowest hierarchy level below the group (California Coastal Redwood Forest). The group and alliance codes refer to the database codes in the USNVC database (plant association codes at the lowest level are not shown).

Classification Content

A variety of tools, tutorials, publications, and other resources have been developed to assist in accessing, using, and interpreting the USNVC (a collaborative effort by the ESA Vegetation Panel, US Geological Survey (USGS), and NatureServe). These are available at USNVC.org, the primary portal to the USNVC.

USNVC Hierarchy Explorer

Descriptions of every vegetation type in the hierarchy are available through USNVC Hierarchy Explorer developed by USGS and available at USNVC.org (USNVC Database Version 3.0 2025). With the explorer, the entire hierarchy can be searched by keywords, which generates a hierarchy tree of the results (Fig. 6). Each level of the hierarchy has an active link to a description of the unit at that level and is in a standard format that includes a concept summary of geography, topology, ecology, and disturbance processes (Fig. 7). This is followed by sections on vegetation, environment, distribution, plot sampling and analysis, confidence level, conservation status, hierarchy concept history, synonymy, authorship, and references (See Appendix A for a full example). The interface is collapsible, allowing the user to explore the descriptions of the different levels and learn how each unit fits into the hierarchy and its relationship to similar units.

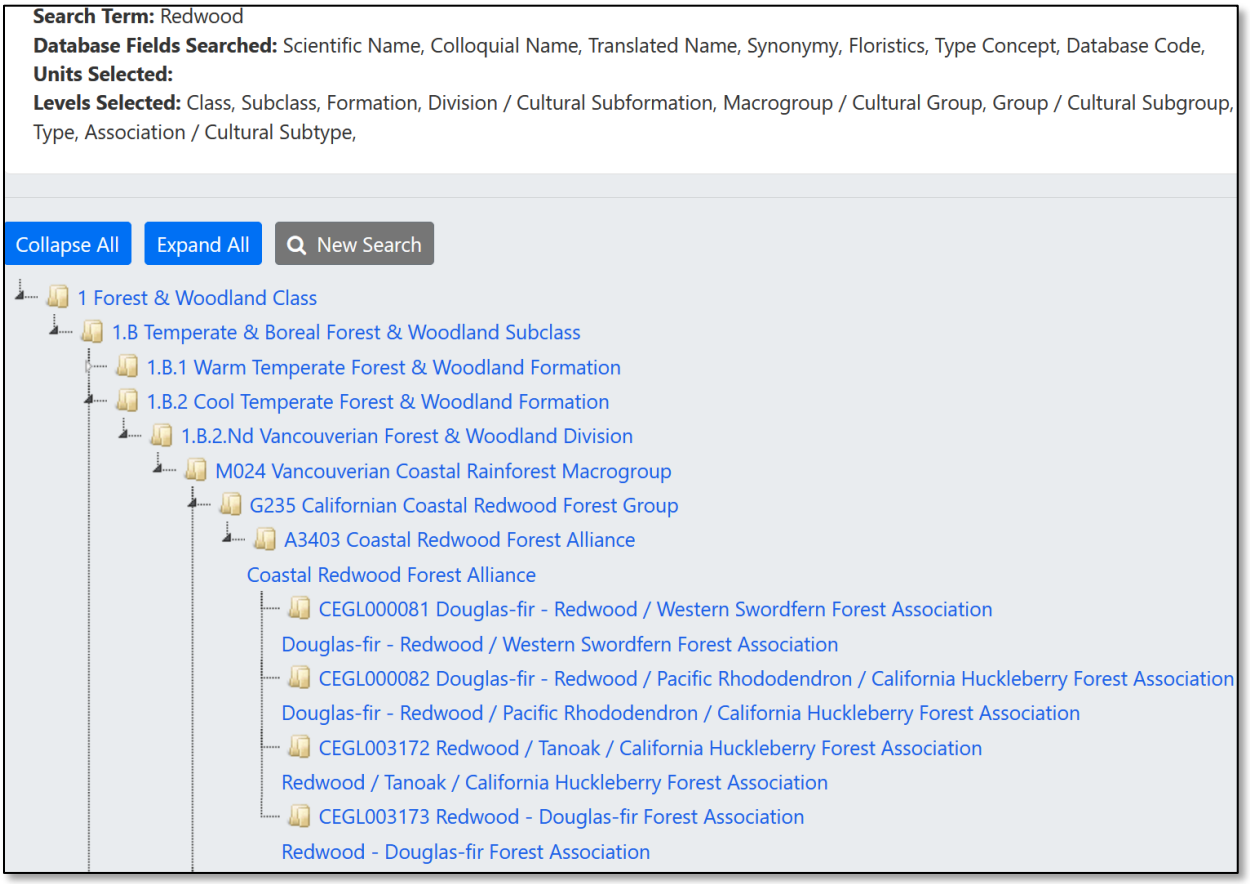
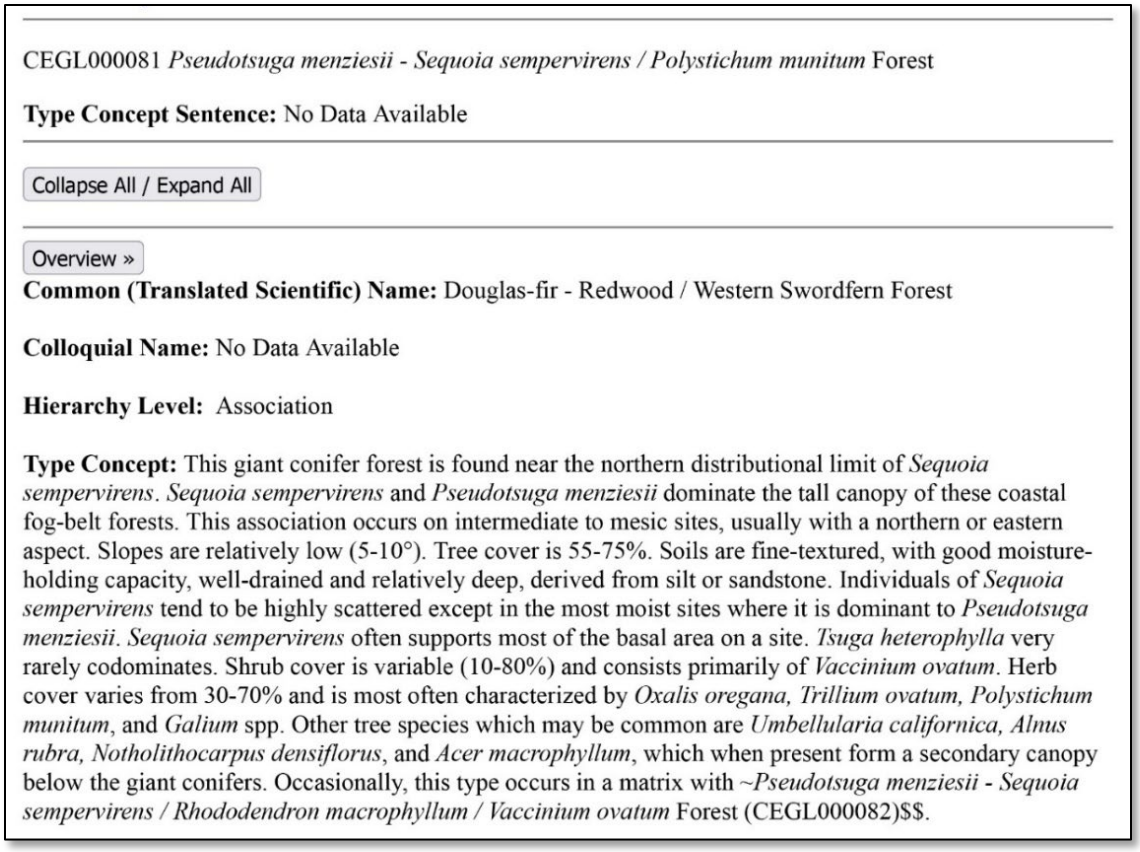


Figure 6. An example of the search outcome at USNVC.org. Each level of hierarchy links to a description of that unit (see Fig. 7).

USNVC Catalog

The USNVC Catalog is a detailed Excel spreadsheet of all units in the hierarchy (Fig. 8). The content was compiled by the USNVC Peer Review Board (2025) and is maintained by NatureServe and is available at USNVC.org in on-line and desk-top versions. It is designed to provide an easy to use alternative to the web-based hierarchy explorers where specific levels or specific units, or specific states or regions can be filtered in the context of the entire hierarchy. It also contains abbreviated descriptions that allow for easy comparison of closely related types. Along with the catalog, there is a lineage tracker spreadsheet that covers the history of all changes to the classification from version 2.0 to 3.0 (USNVC Revisions Process Appendix E).



CEGL000081 *Pseudotsuga menziesii - Sequoia sempervirens / Polystichum munitum* Forest

Type Concept Sentence: No Data Available

Collapse All / Expand All

Overview »

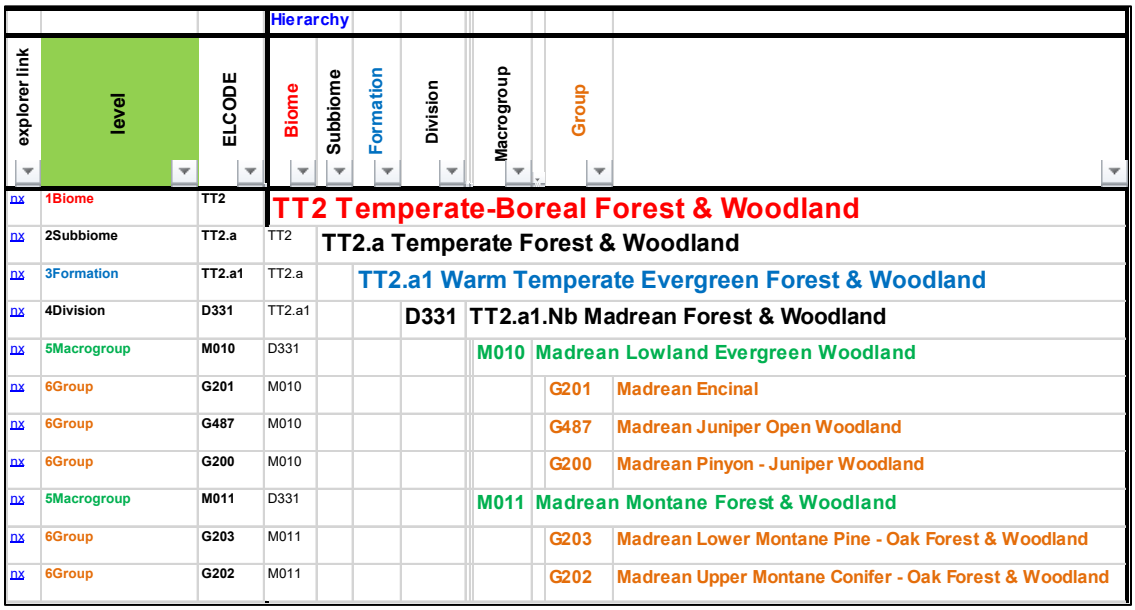
Common (Translated Scientific) Name: Douglas-fir - Redwood / Western Swordfern Forest

Colloquial Name: No Data Available

Hierarchy Level: Association

Type Concept: This giant conifer forest is found near the northern distributional limit of *Sequoia sempervirens*. *Sequoia sempervirens* and *Pseudotsuga menziesii* dominate the tall canopy of these coastal fog-belt forests. This association occurs on intermediate to mesic sites, usually with a northern or eastern aspect. Slopes are relatively low (5-10°). Tree cover is 55-75%. Soils are fine-textured, with good moisture-holding capacity, well-drained and relatively deep, derived from silt or sandstone. Individuals of *Sequoia sempervirens* tend to be highly scattered except in the most moist sites where it is dominant to *Pseudotsuga menziesii*. *Sequoia sempervirens* often supports most of the basal area on a site. *Tsuga heterophylla* very rarely codominates. Shrub cover is variable (10-80%) and consists primarily of *Vaccinium ovatum*. Herb cover varies from 30-70% and is most often characterized by *Oxalis oregana, Trillium ovatum, Polystichum munitum*, and *Galium* spp. Other tree species which may be common are *Umbellularia californica, Alnus rubra, Notholithocarpus densiflorus*, and *Acer macrophyllum*, which when present form a secondary canopy below the giant conifers. Occasionally, this type occurs in a matrix with ~*Pseudotsuga menziesii - Sequoia sempervirens / Rhododendron macrophyllum / Vaccinium ovatum* Forest (CEGL000082)$$.

Figure 7. Each classification unit, here an association, has a full description that includes the summary type concept followed by sections on vegetation, environment, distribution, etc. (not shown, see Appendix A).



			Hierarchy						
explorer link	level	ELCODE	Biome	Subbiome	Formation	Division	Macrogroup	Group	
nx	1Biome	TT2	TT2 Temperate-Boreal Forest & Woodland						
nx	2Subbiome	TT2.a	TT2	TT2.a Temperate Forest & Woodland					
nx	3Formation	TT2.a1	TT2.a		TT2.a1 Warm Temperate Evergreen Forest & Woodland				
nx	4Division	D331	TT2.a1			D331	TT2.a1.Nb Madrean Forest & Woodland		
nx	5Macrogroup	M010	D331				M010	Madrean Lowland Evergreen Woodland	
nx	6Group	G201	M010					G201	Madrean Encinal
nx	6Group	G487	M010					G487	Madrean Juniper Open Woodland
nx	6Group	G200	M010					G200	Madrean Pinyon - Juniper Woodland
nx	5Macrogroup	M011	D331				M011	Madrean Montane Forest & Woodland	
nx	6Group	G203	M011					G203	Madrean Lower Montane Pine - Oak Forest & Woodland
nx	6Group	G202	M011					G202	Madrean Upper Montane Conifer - Oak Forest & Woodland

Figure 8. The USNVC catalog. The catalog provides a complete listing of all units (figure is filtered down to group, but alliance and association units are available), along with some basic information including Confidence Level, Type Concept Summary, Classification Comments, and Subnational Distribution.

NatureServe Explorer

The USNVC and the classification of all of the Americas is also accessible through the NatureServe Explorer, (www.natureserve.org\explorer), which also hosts the International Vegetation Classification (IVC). The IVC primarily covers the ecosystems of the Americas (Faber-Langendoen et al. (2018) but has ongoing collaborations with European, Australian, and African colleagues (Sayre et al. 2013, Muldavin et al. 2021, Willner and Faber-Langendoen 2021) and with the Global Ecosystem Typology (Faber-Langendoen et al. 2025b). Beyond the content of USNVC.org, the NatureServe Explorer provides range maps of groups (Fig. 9) along with assessments of conservation status (see Applications).

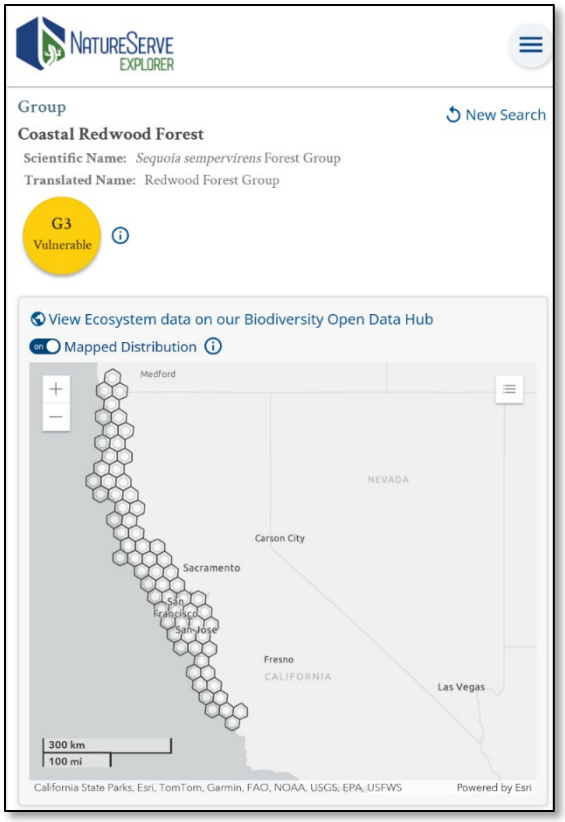


Figure 9. An example of a range map for a group derived from the map of Terrestrial Ecosystems of the Conterminous U.S developed by NatureServe (Faber-Langendoen et al. 2025c).

Macrogroup Fact Sheets

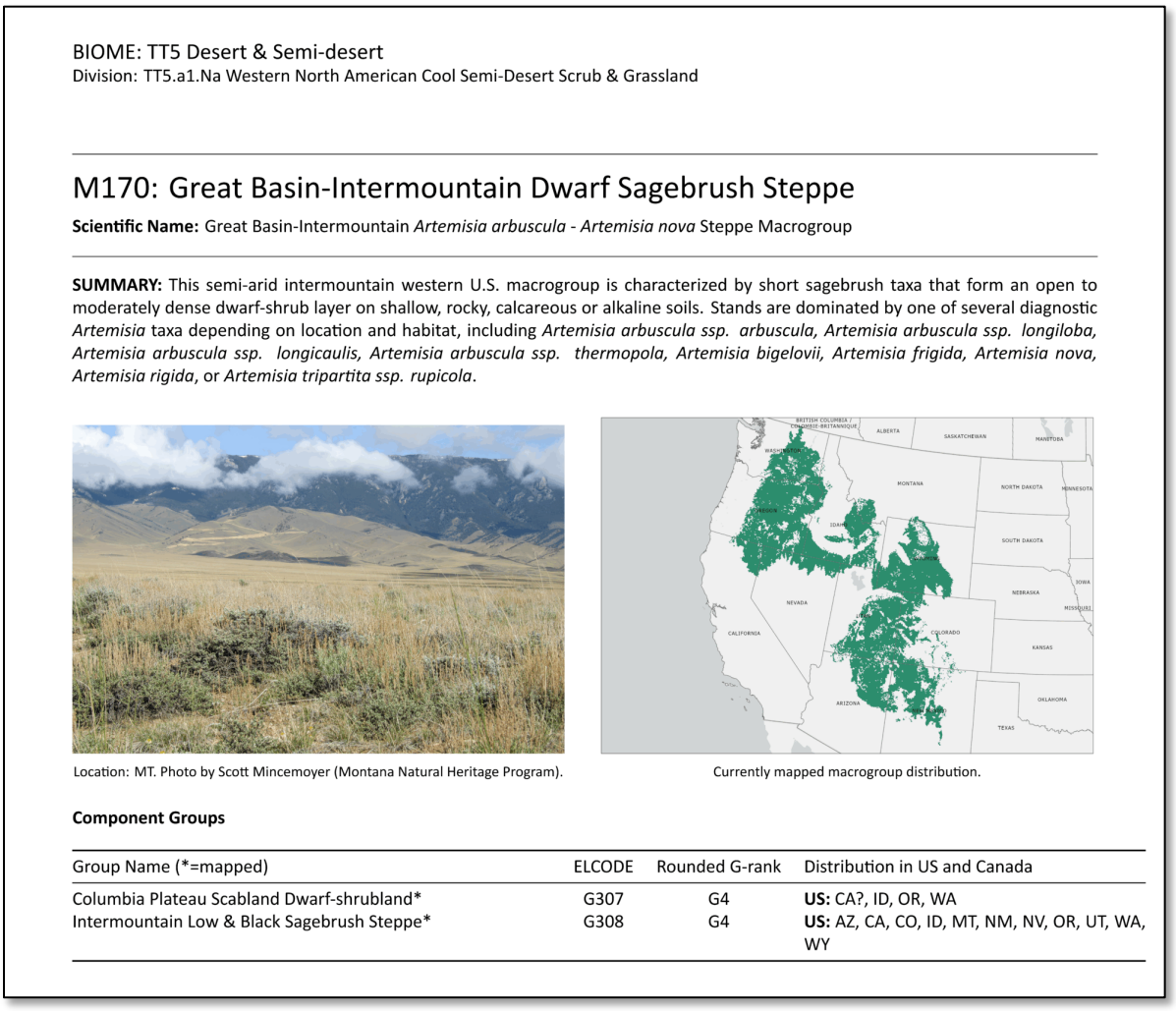
In addition to the web-based explorers, summary factsheets have been produced for each of the 178 macrogroups (Fig. 10). These provide a short summary of the environment and diagnostic species of a macrogroup along with a representative photo and distribution map based on the Map of the Terrestrial Ecosystems of the Conterminous U.S. developed by NatureServe (see Applications). These are provided in a separate PDF document at USNVC.org

Vegetation Plot Data – VegBank

Per the USNVC Standard, one of the goals of the USNVC is to have vegetation plot data collected in support of the classification be made available in a public database for broad use by practitioners, researchers, and students for projects related to vegetation ecology, ecosystem assessment, and natural resources management. To this end, the ESA Vegetation Panel established VegBank as a repository for vegetation plot data (Peet et al. 2012). VegBank has options for uploading field collected data and downloading the data archived by other users. Ideally, plot data are accumulated to the point where datasets are robust enough to test USNVC

type concepts as well as to provide data points for mapping, ecological assessments, and setting conservation targets. The USNVC partners continue to work together to achieve this goal.

For the purposes of the classification, field data collection for vegetation should center on documenting plant species composition and structure along with environmental information associated with a discrete, defined sample area. With these data, a plot can be classified according to the USNVC and then archived for future use in VegBank. While the approach to selecting areas to sample and the protocols for gathering data all depend upon the intended uses of the sample data, there are many common field attributes shared across many protocols that can be used for classification and other research. These summaries and the scientific rationale for common data standards are outlined by Jennings et al. (2009). Uses of VegBank data extend beyond their role in classification, including providing information to evaluate the accuracy of a vegetation map, to assess the condition of vegetation, to monitor vegetation change, or to evaluate the effectiveness of vegetation treatments, among others.



BIOME: TT5 Desert & Semi-desert
Division: TT5.a1.Na Western North American Cool Semi-Desert Scrub & Grassland

M170: Great Basin-Intermountain Dwarf Sagebrush Steppe

Scientific Name: Great Basin-Intermountain *Artemisia arbuscula - Artemisia nova* Steppe Macrogroup

SUMMARY: This semi-arid intermountain western U.S. macrogroup is characterized by short sagebrush taxa that form an open to moderately dense dwarf-shrub layer on shallow, rocky, calcareous or alkaline soils. Stands are dominated by one of several diagnostic *Artemisia* taxa depending on location and habitat, including *Artemisia arbuscula ssp. arbuscula, Artemisia arbuscula ssp. longiloba, Artemisia arbuscula ssp. longicaulis, Artemisia arbuscula ssp. thermopola, Artemisia bigelovii, Artemisia frigida, Artemisia nova, Artemisia rigida*, or *Artemisia tripartita ssp. rupicola*.

Location: MT. Photo by Scott Mincemoyer (Montana Natural Heritage Program).

Currently mapped macrogroup distribution.

Component Groups

Group Name (*=mapped)	ELCODE	Rounded G-rank	Distribution in US and Canada
Columbia Plateau Scabland Dwarf-shrubland*	G307	G4	**US:** CA?, ID, OR, WA
Intermountain Low & Black Sagebrush Steppe*	G308	G4	**US:** AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

Figure 10. An example of a macrogroup fact sheet available at USNVC.org (Faber-Langendoen et al. In prep.).

APPLICATIONS

The USNVC is designed to meet the growing need for a standardized approach for conducting applied research, ecosystem mapping and inventory, and natural resources and conservation planning. Here, we provide some examples of mapping from a local level for on-site management to continental scales that can support regional spatial analysis of ecosystem distributions and trends. Similarly, we present the use of the classification for both state-level planning (state wildlife action plans) and for understanding the global status of ecosystems for broad-scale planning efforts.

Mapping vegetation using the USNVC

The USNVC has been used to guide many vegetation mapping projects (e.g., all National Parks). But the classification of vegetation types in the USNVC using plot data and other ecological information is a separate process from the spatial representation of those types in the form of a map and its legend of map units. While a map legend can and should be guided conceptually by a classification such as the USNVC, ultimately map units are constrained by the quality and type of spatial layers available to detect and delineate vegetation pattern across a landscape. Further, a given landscape can be a complex of intergrading and intertwined classification units, requiring special map units. In other cases, the mapping may reveal vegetation types that are not well represented in the current USNVC. Accordingly, a map legend can and often does reflect a variety of vegetation categories, but the vegetation classification still provides the thematic guide to mapping the ecosystems.

Given this context, the hierarchical structure of the USNVC has provided a classification structure for vegetation that can guide global to local mapping efforts. The National Park Service used the USNVC to guide mapping of all the National Parks, large and small (see https://www.nps.gov/im/vegetation-inventory.htm). For example, the map for Fort Davis National Historic Site has a hierarchical legend tied to the group level of the USNVC and a second level tied to alliances and associations or sometimes combined entities where the vegetation forms a complex matrix of vegetation types (Fig. 11). All elements of a legend are tied back to the USNVC as well as the descriptions of the vegetation types and all the associated ecological information.

In contrast, working at a national scale, NatureServe recently completed a “Map of the Terrestrial Ecosystems of the Conterminous U.S.” that was an application of USNVC 3.0 to an existing map product developed by the LANDFIRE program. In brief, a crosswalk was developed between USNVC Version 3.0 groups and Ecological System map units of Comer et al. (2003) that LANDFIRE used to map the vegetation of the U.S. The resulting map of groups was reviewed by experts based on jurisdictional and geographic distribution information described for each group (Fig. 12). The review also included equivalent spatial information available for adjacent areas in northern Mexico and adjacent Canada (Comer et al. 2022). The outcome is a map that

covers 323 USNVC groups and eight additional land cover and anthropogenic land use categories across the entire map extent, with 308 groups present in the conterminous U.S. Full details of the map, and its submission as a product to the Global Ecosystem Atlas, are described in Faber-Langendoen et al. (2025c). The map is available in the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) license as a 30m ecosystems raster dataset and as a complete series of individual ecosystem range maps mapped at five spatial scales using NatureServe's standard Nested Hexagon Framework (see Fig. 8).

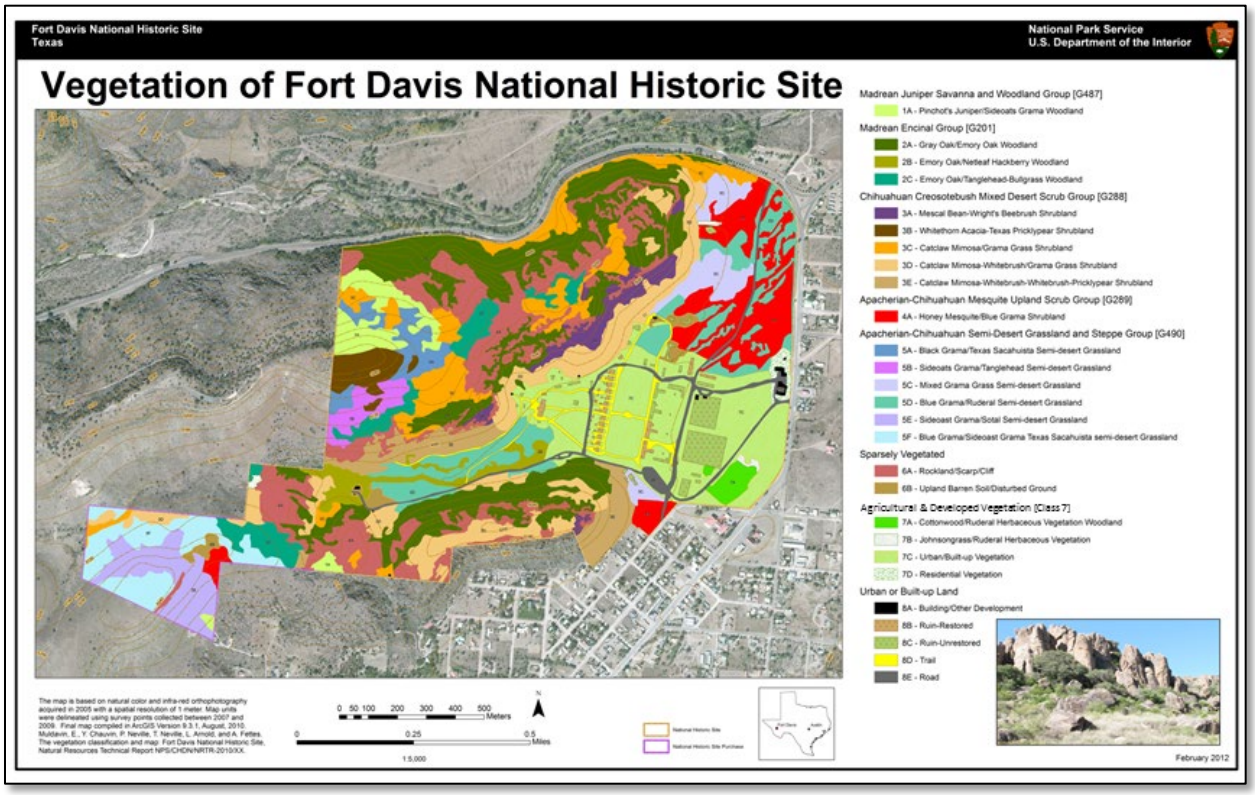


Figure 11. The map legend of the Fort Davis Historical Site vegetation map has to two tiers tied to the USNVC. The top is focused on the more general group level of the hierarchy while the second level is at the finer scales of the alliance and plant association.

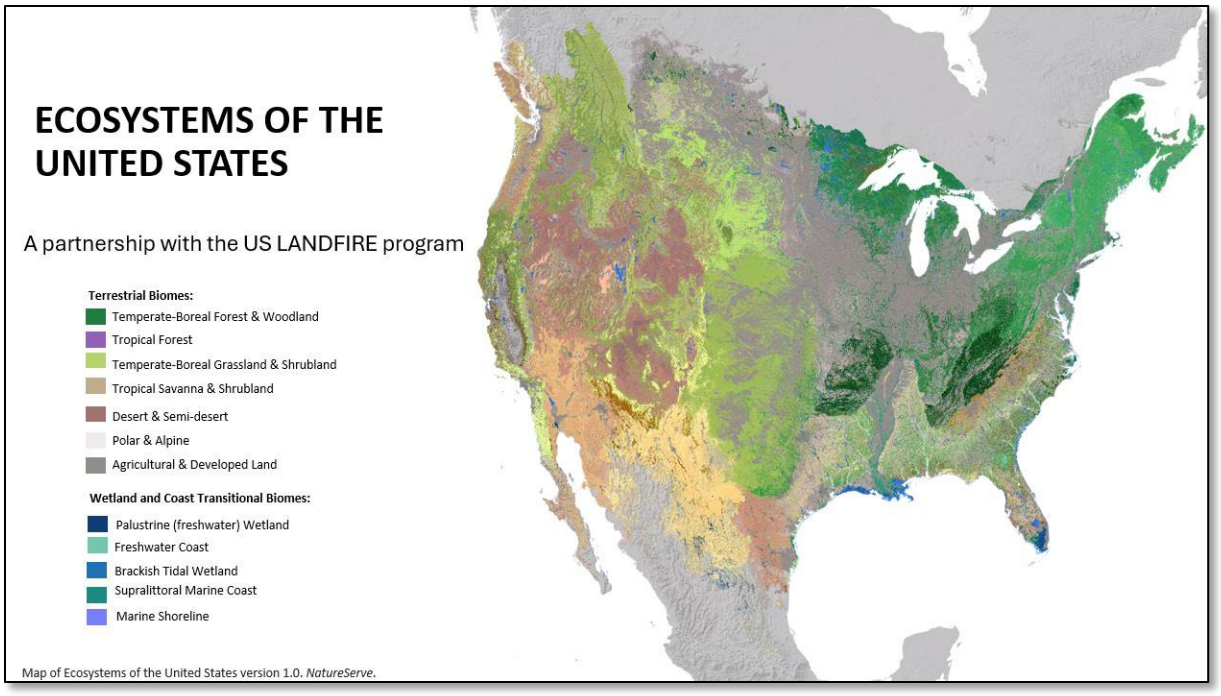


Figure 12. Map of the Terrestrial Ecosystems of the Conterminous U.S. developed by NatureServe from LANDFIRE map products (Faber-Langendoen et al. 2025c).

Natural Resources Management and Conservation Planning

The USNVC has been and can be used in a wide variety of natural resources and conservation applications. For example, the macrogroup level of the classification was used as a guiding element in the organization of the New Mexico State Wildlife Action Plan or SWAP (Fig. 13). Each macrogroup defined the key wildlife habitats of the state with summary local descriptions derived from the USNVC macrogroup descriptions. Then all SWAP "Species of Greatest Conservation Concern" (SGCN) were linked to those habitats. This provided an ecosystem framework on how to manage these species rather than a species by species approach that had been traditionally followed for SWAPs (see https://nmswap.org/habitats).

Similarly, USNVC units can be used to assess and track the status of ecosystems. For example, NatureServe used the Map of the Terrestrial Ecosystems of the Conterminous U.S. to understand current ranges of USNVC groups and then applied the conservation status assessments methodology of Master et al. (2012) to assign global status ranks of imperilment (Figure 14).

Figure 13. The New Mexico State Wildlife Action Plan was designed around habitats that are directly linked to the USNVC macrogroup level (e.g., Chihuahuan Desert Scrub = M086 *Larrea tridentata - Flourensia cernua - Prosopis* spp. Chihuahuan Desert Scrub Macrogroup).

Global Rank	Number of Groups
G1 or G2	63
G3	83
G4 or G5	191
No Status Rank	120

Figure 14. The NatureServe global status methodology was applied to the USNVC group level elements where G1 or G2 refer to Critically Imperiled and Imperiled, respectively; G3, vulnerable, and G4 and G5 Apparently Secure or Secure. (NatureServe 2023).

DISCUSSION AND THE FUTURE

Per the efforts of the USNVC partnership from 2019 to 2025, and in particular the Review Board, the USNVC is now very complete in the conterminous U.S. and even much of Alaska and Hawaii, especially for alliance and above. All types from biome to group are now fully described. All alliances have been systematically reviewed, and 75% have complete descriptions (information on the remaining 25% is available and will be incorporated). Alaska boreal and Arctic alliances and Hawaiian alliances have yet to be fully reviewed. There is still significant work to be done to validate and fully describe the associations (20% still need descriptions).

Moving forward, for the lower 48 states, we will essentially treat all units from biome to alliance as a definitive part of USNVC 3.0 through 2030, with the caveat that some alliances, when described, may warrant revision. However, associations will remain open to updates on a regular basis. This is in keeping with the dynamic content directive from the FGDC 2.0 standard where the USNVC is open to ongoing revision while maintaining an authoritative version for use in most workflows and projects by stakeholders. The release of USNVC 3.0 represents an important milestone in our understanding of the full range of ecosystem types in the U.S. This version will undoubtedly benefit from further field surveys, including addressing the shortcomings at the lower levels noted above.

Overall, USNVC 3.0 is the first multi-scaled vegetation classification of the United States that systematically lists and describes each level, from biome to association, and that includes input from state partners, federal partners, and international colleagues per the Global Ecosystem Typology. Further, the ecosystem-based (EcoVeg) approach has advanced our understanding of not just the floristic and physiognomic composition of the type but also the patterns and processes along environmental gradients that shape the ecosystems. Lastly, through the dynamic updating process, the catalog of types has become a living document whereby new information on the status, distribution, and management of these ecosystems within states and across the nation is constantly gathered and compiled in a systematic and standard way to support periodic new versions that will further meet user needs.

The content of any classification can always be improved, and these are the main objectives of the ESA Vegetation Panel and Review Board for the coming years:

1) Complete all descriptions for alliances and plant associations.
2) Develop standard summary tables based on quantitative plot data to further support the physiognomy, floristic, environment, and location information of each type within the USNVC. This will primarily be the responsibility of Review Board.
3) Build diagnostic keys to the types. The ESA Vegetation Panel is currently developing computerized keys to the macrogroups.

REFERENCES

Anesio, A.M. and J. Laybourn-Parry. 2012. Glaciers and ice sheets as biomes. Trends in Ecology and Evolution 27: 219-225.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K.Snow, and J. Teague. 2003. *Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems.* NatureServe, Arlington, Virginia.

Comer, P.J., J.C. Hak, D. Dockter, and J. Smith. 2022. Integration of vegetation classification with land cover mapping: lessons from regional mapping efforts in the Americas. Vegetation Classification and Survey 3: 29-43.

Faber-Langendoen, D., Keeler-Wolf, T., Meidinger, D. Tart, D., Hoagland, B., Josse, C., Navarro, G., Ponomarenko, S., Saucier, J.-P., Weakley, A. & Comer, P. 2014. EcoVeg: A new approach to vegetation description and classification. Ecological Monographs 84:533-561.

Faber-Langendoen, D., K. Baldwin, T. Keeler-Wolf, D. Meidinger, E. Muldavin, R.K. Peet, and C. Josse. 2018. The EcoVeg approach in the Americas: U.S., Canadian, and International Vegetation Classifications. Phytocoenologia 48: 215-237. (http://dx.doi.org/10.1127/phyto/2017/0165)

Faber-Langendoen, D., E. Muldavin, R. Boul, J. Ratchford, J. Evens, M. Reid, K. Schulz, P. McIntyre, J. Rocchio, T. Ramm-Granberg, D. Meidinger, K. Labounty, F.J. Triepke, S. Franklin, C. Murphy, M. Manning, G. Kittel, B. Hoagland, E. Zimmerman, M. Pyne, M. Hines, A. Weakley, K. Palmquist, T. Jorgenson, T. Nawrocki, L. Flagstad, T. Boucher, A. Wells, K. Snow, and M. Harkness. 2025d. U.S. National Vegetation Classification 3.0: The revisions process. Proceedings of the U.S. National Vegetation Classification. USNVC-Proc-7. October 2025a. Ecological Society of America, Washington, DC., USA. 41 p. + Appendices.

Faber-Langendoen, D., D. Keith, J. Loidi, E.H. Helmer, W. Willner, G. Navarro, J. Hunter, C. Liu, R.T. Guuroh, and P. Pliscoff. 2025b. Advancing the EcoVeg Approach as a terrestrial ecosystem typology: From global biomes to local plant communities. Ecosphere 16: e70237 https://doi.org/10.1002/ecs2.70237

Faber-Langendoen, D., P. McIntyre, M. Harkness, C. Tracey, I. La Puma, M. Wiltermuth, and R. Sayre. 2025c (submitted). Mapping the terrestrial ecosystems of the conterminous United States. Open-File Report; ID Number: 2025-0000. National Land Imaging Program, Science Synthesis, Analysis, and Research Program, U.S. Geological Survey.

Faber-Langendoen, D., K. Schulz, E. Muldavin, M. Pyne, T. Ramm-Granberg, A. Wells, J. Rocchio, G. Kittel, and L. Flagstad. (In prep). Terrestrial vegetation of the United States: A continental perspective based on USNVC macrogroups. A publication produced by NatureServe in cooperation with the Ecological Society of America, U.S. Forest Service and U.S. Geological Survey. NatureServe, Arlington, VA.

FGDC (Federal Geographic Data Committee). 1997. Vegetation Classification Standard. FGDC-STD-005. Vegetation Subcommittee, Federal Geographic Data Committee, FGDC Secretariat, U.S. Geological Survey. Reston, VA. 58p.

FGDC (Federal Geographic Data Committee). 2008. FGDC-STD-005-2008. *National Vegetation Classification Standard, Version 2.* Vegetation Subcommittee, U.S. Geological Survey, Reston, VA. 55 pp. + Appendices.

Keith, D. A., J. R. Ferrer-Paris, E. Nicholson, M. Bishop, B. A, Polidoro, E. Ramirez-Llodra, M. G. Tozer, J. L. Nel, R. Mac Nally, E. J. Gregr, K. E. Watermeyer, F. Essl, D. Faber-Langendoen, J. Franklin, C. E. R. Lehmann, A. Etter, D. J. Roux, J. S. Stark, J. A. Rowland, N. A. Brummitt, U. C. Fernandez-Arcaya, I. M. Suthers, S. K. Wiser, I. Donohue, L. J. Jackson, R. T. Pennington, N. Pettorelli, A. Andrade, A. Lindgaard, T. Tahvanainen, A. Terauds, M. A. Chadwick, N. J. Murray, J. Moat, P. Pliscoff, I. Zager, and R. T. Kingsford. 2022. A function-based typology for Earth's ecosystems. Nature 610, 513–518. DOI:10.1038/s41586-022-05318-4.

Jennings, M. D., D. Faber-Langendoen, O.L. Loucks, R.K. Peet, & D. Roberts. 2009. Standards for associations and alliances of the U.S. National Vegetation Classification. Ecological Monographs 79:173–199.

Master, L. L., D. Faber-Langendoen, R. Bittman, G.A. Hammerson, B. Heidel, L. Ramsay, K. Snow, A. Teucher, and A. Tomaino. 2012. NatureServe conservation status assessments: Factors for evaluating species and ecosystem risk. NatureServe, Arlington, Virginia.

Muldavin, E.H., E. Addicott, J.T. Hunter, D. Lewis, and D. Faber-Langendoen. 2021. Australian Vegetation Classification and the International Vegetation Classification Framework: an overview with case studies. Australian Journal of Botany 69: 339-356. https://doi.org/10.1071/BT20076

NatureServe. 2023. Biodiversity in Focus: United States Edition. NatureServe, Arlington, Virginia.

NatureServe. 2025. Biotics 5 database. NatureServe, Arlington, Virginia.

Peet, R. K. 2008. A decade of effort by the ESA Vegetation Panel leads to a new federal standard. Bulletin of the Ecological Society of America 89:210–211.

Peet, R. K., Lee, M. T., Jennings, M. D. and Faber-Langendoen, D. 2012. VegBank: a permanent, open-access archive for vegetation plot data. *Biodiversity & Ecology* 4:233-241.

Sayre, R., P. Comer, J. Hak, C. Josse, J. Bow, H. Warner, M. Larwanou, E. Kelbessa, T. Bekele, H. Kehl, R. Amena, R. Andriamasimanana, T. Ba, L. Benson, T. Boucher, M. Brown, J. Cress, O. Dassering, B. Friesen, F. Gachathi, S. Houcine, M. Keita, E. Khamala, D. Marangu, F. Mokua, B. Morou, L. Mucina, S. Mugisha, E. Mwavu, M. Rutherford, P. Sanou, S. Syampungani, B. Tomor, A. Vall, J. Vande Weghe, E. Wangui, and L. Waruingi. 2013. A New Map of Standardized Terrestrial Ecosystems of Africa. Washington, DC: Association of American Geographers. 24 p.

USNVC (U.S. National Vegetation Classification) Database Version 3.0. 2025. USNVC Hierarchy Explorer, Science Analytics and Synthesis (SAS) Program, U.S. Geological Survey. (Federal Geographic Data Committee, Vegetation Subcommittee). Washington D.C.

USNVC (U.S. National Vegetation Classification) Peer Review Board. 2025. A catalog of terrestrial vegetation types in USNVC 3.0, from biome to association. A publication produced by NatureServe in cooperation with the Ecological Society of America Vegetation Classification Panel, U.S. Forest Service and U.S. Geological Survey. NatureServe, Arlington, Virginia.

Willner, W. and D. Faber-Langendoen. 2021. Braun-Blanquet meets EcoVeg: a formation and division level classification of European phytosociological units. Vegetation Classification and Survey 2: 276-291.

APPENDICES

Appendix A. Example of a Vegetation Type Description

This is an example of a full description format and content that is used for any type within the USNVC 3.0 hierarchy. Elcode refers to the USNVC database code. See Appendix B for the nomenclature on naming the types.

TT6. Polar & Alpine
TT6.b1.Xa. Arctic Tundra & Barrens

M173. Arctic Dry-Moist Tundra

Type Concept Sentence: This macrogroup is characterized by upland graminoid- or shrub-dominated vegetation underlain by continuous permafrost, which occupies the landscape located inland from coastal zones and north of latitudinal treeline in arctic Alaska and Canada as well as the region west of longitudinal treeline in subarctic Alaska.

View on usnvc.org View on NatureServe Explorer

OVERVIEW

Hierarchy Level: Macrogroup

Placement in Hierarchy: TT6.b1.Xa. Arctic Tundra & Barrens (D044)

Elcode: M173

Colloquial Name: Arctic Dry-Moist Tundra

Scientific Name: *Salix alaxensis - Dryas octopetala - Eriophorum vaginatum* Tundra Macrogroup

Common (Translated Scientific) Name: Feltleaf Willow - Eight-petal Mountain-avens - Tussock Cottongrass Tundra Macrogroup

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Type Concept Summary: This macrogroup is consists of low shrub, herbaceous and sparsely vegetated tundra in North American arctic and subarctic zones of continuous permafrost, located in non-coastal areas north of latitudinal treeline of arctic Alaska and Canada and includes subarctic Alaska west of longitudinal treeline. Tundra here comes is several forms: **Tussock grasslands** dominated by *Eriophorum vaginatum*, and/or *Carex bigelowii* often with dwarf-shrubs and low shrubs; **Moist sedge-dominated, non-tussock tundra** with dominant sedges including *Eriophorum angustifolium, Carex aquatilis var. stans, Luzula arctica*, and non-tussock forms of *Carex bigelowii*, often with a scattered (<25% cover), low- and dwarf-statured shrub layer that can include *Salix pulchra, Betula nana, Ledum palustre ssp. decumbens, Vaccinium vitis-idaea, Cassiope tetragona*, and *Dryas integrifolia*; **Mesic herbaceous tundra** with >25% cover, and dominant species that include *Carex microchaeta ssp. nesophila, Alopecurus magellanicus, Artemisia arctica, Polygonum bistorta, Valeriana capitata, Pedicularis* spp., *Polemonium acutiflorum, Salix rotundifolia*, and *Salix reticulata*; **Mesic low and dwarf-shrub**, including low-shrub species *Salix richardsonii, Salix pulchra, Salix glauca, Betula nana*, and *Vaccinium uliginosum* and dwarf-

shrub species including *Dryas ajanensis ssp. beringensis* (Alaska, NWT, Yukon, Russian Far East)*, Dryas octopetala* (Greenland, Europe), *Ledum palustre ssp. decumbens, Vaccinium vitis-idaea, Cassiope tetragona, Salix polaris, Salix reticulata, Salix rotundifolia*, and *Salix phlebophylla* with an understory that can be sparse to thick, with graminoids *Carex bigelowii, Arctagrostis latifolia*, forbs such as *Petasites frigidus*, and lichens *Flavocetraria cucullata, Flavocetraria nivalis* and *Thamnolia vermicularis*; ***Dryas* tundra** common on exposed, windswept areas, and in Alaska and western Canada is dominated by *Dryas ajanensis ssp. beringensis* and/or *Dryas integrifolia*, often with graminoids *Anthoxanthum monticola ssp. alpinum* and *Carex scirpoidea*; and **Sparse dry-site prostrate-shrub tundra** on exposed bedrock and unstable substrates, total vascular plant cover is typically ≥25% but may be as low as 10–24% in areas with abundant bryophytes and lichens, and is characterized by *Dryas species, Loiseleuria procumbens* (= *Kalmia procumbens*), and/or *Salix phlebophylla*. Foliose and fruticose lichens may dominate (with well above 25% cover) and include *Umbilicaria* spp., *Rhizocarpon geographicum, Cladina stellaris, Racomitrium lanuginosum, Flavocetraria* spp., and/or *Alectoria ochroleuca*.

Diagnostic Characteristics: This macrogroup is characterized by graminoid- or shrub-dominated vegetation underlain by continuous permafrost, which occupies the landscape located inland from coastal zones and north of latitudinal treeline in arctic Alaska and Canada as well as the region west of longitudinal treeline in subarctic Alaska.

Classification Comments: This macrogroup contains numerous types ranging from sparsely-vegetated alpine types to closed low shrublands in uplands. Considering the heterogeneity of this macrogroup, vegetation that does not represent tundra in the strict sense have been moved from this macrogroup. For instance, lichen - sparse dwarf-shrub has been moved to Arctic Scree, Rock & Cliff Barrens (M175). In addition, riverine tall shrub has been moved to Arctic Freshwater Marsh, Wet Meadow & Shrubland macrogroup (M870) which includes wetland and riparian graminoid- and shrub-dominated vegetation underlain by continuous permafrost located inland from coastal zones and north of latitudinal treeline in arctic Alaska and Canada as well as the region west of longitudinal treeline in subarctic Alaska.

Similar IVC Types:

Elcode	Scientific or Colloquial Name	Note
M404	Western Boreal Alpine Tundra	This macrogroup includes similar herbaceous and dwarf shrub communities in alpine settings in the boreal zone.
M175	Arctic Scree, Rock & Cliff Barrens	This macrogroup includes barren (<10% vascular plant cover) and partially vegetated (10–24%) areas within the same geography as M173.

VEGETATION

Physiognomy and Structure Summary: This macrogroup is defined by treeless, low-stature vegetation that is mostly graminoid-, dwarf-shrub-or low shrub-dominated but can include sparse, lichen-dominated alpine tundra, mesic herbaceous meadows.

Floristics Summary: This macrogroup includes the Northern Alaska and Beringian Alaska floristic subprovinces. Differing histories of connectivity due to intercontinental bridging and glaciation as well as geographic barriers such as mountain ranges contribute to differing regional floristics within the range of this macrogroup. Tundra vegetation types range from upland and lowland to alpine and in physiognomy from graminoid to shrub. **Sparse cover** in the high alpine is characterized by crustose lichens of the *Umbilicaria* genus in combination with the forbs *Potentilla elegans* and *Smelowskia calycina var. porsildii* and the prostrate dwarf-shrub *Loiseleuria procumbens*. Dwarf-shrub tundra is grouped by *Dryas*, ericaceous or willow species dominance. ***Dryas* dwarf-shrub tundra** occurs in dry, windswept areas with little retention of snow cover and is characterized by *Dryas ajanensis ssp. beringensis* in the Brooks Range and foothills (bioclimatic subzone E), which transitions to *Dryas integrifolia* on Alaska's Arctic Coastal Plain (bioclimatic subzones C and D). **Dwarf willow shrub tundra** occurs in small patches on exposed sites across the geographic range of the macrogroup and is characterized by *Salix reticulata, Salix polaris, Salix rotundifolia*, and *Salix phlebophylla*. Ericaceous dwarf-shrub tundra is common in more protected, mesic sites where snow cover is retained. The group is characterized by the ericaceous shrubs *Ledum palustre ssp. decumbens, Cassiope tetragona*, and *Vaccinium vitis-idaea*. **Low-shrub tundra** may be dominated by willows such as *Salix richardsonii, Salix pulchra*, and *Salix glauca* or *Betula nana*. Both types commonly occur on mesic to moist sideslopes and ridges and high-centered polygonal tundra. **Mesic herbaceous tundra** is an uncommon type occupying small patches in areas of late-lying snow and headwater and beaded streams. Characteristic species include the forbs *Chamerion angustifolium, Lupinus arcticus, Polemonium boreale*, and *Valeriana capitata* and the grasses *Calamagrostis stricta, Arctagrostis latifolia, Deschampsia cespitosa*, and *Poa arctica*. **Tussock tundra** is characterized by high abundance of the tussock-forming sedges *Eriophorum vaginatum* and/or *Carex bigelowii* often in combination with dwarf- and low shrubs. Polygon tundra is a mosaic of dwarf-shrub, low shrub and wet sedge tundra (described under M870), with shrub and tussock tundra types occupying mesotopographic highs such as the centers of high-centered polygons and the ridges of low-centered polygons, and wet sedge tundra occupying the bounding troughs.

Dynamics: In areas of fine-grained, ice-rich sediment, thermo-erosional processes such as permafrost degradation and aggregation, cryoturbation, and solifluction are active. Changes in exposure or drainage associated with changes to the thermo-regime are likely drivers of successional change for dwarf-shrub and tussock tundra types. While infrequent, wildland fire may have extensive and severe impact on tundra ecosystems. Fire may revert shrub types to a graminoid-dominated system, whereas shrubs may assume dominance with amelioration of climate or site condition. Fire may also result in a change to the thermo-regime triggering thermokarst and shift to wetland vegetation.

ENVIRONMENT

Environmental Description: This macrogroup includes strong latitudinal, elevational and continentality gradients ranging from the high-latitude, low-elevation arctic tundra of the coastal plain to the high-elevation, alpine tundra of the Brooks Range. The entire area is underlain by continuous permafrost and thermokarst features are common in ice-rich sediment. Substrate chemistry varies from acidic to circumneutral with occurrences of carbonate bedrock in the Brooks Range. Lake density is notably high on the coastal plain and decreases with rising topography.

DISTRIBUTION

Geographic Range: This macrogroup occupies the landscape located inland from coastal zones and north of latitudinal treeline in arctic Alaska and Canada as well as the region west of longitudinal treeline in subarctic Alaska.

Nations: Canada; Greenland; Iceland; Norway; Russian Federation; United States

States/Provinces: AK, LB, MB, NT, NU, QC, YT

CONFIDENCE LEVEL

USNVC Confidence Level (n/a for non-US): Moderate

USNVC Confidence Comments (n/a for non-US):

IVC Confidence Level: Moderate

AUTHORSHIP

Primary Concept Source: Faber-Langendoen et al. (2016)

Author of Description: L. Flagstad, G. Kittel, A.F. Wells

Acknowledgments:

Appendix B. Nomenclature Of Types

NOMENCLATURE OF TYPES

All first letters of English words in a vegetation type name are capitalized, and as needed, are separated by either a hyphen, with spaces (-), a comma and space (,) or the "and" symbol with spaces (&). All names use a singular capitalized terms for all types; i.e., *Temperate Pyric Humid Forest*.

Upper Biome Level Nomenclature

Biome types (L1 -L3) are named, defined, and organized by structure and physiognomy to reflect global climatic and site factors. A single name is used both as a scientific and common name. Naming the biomes is aided by the use of common terminology (FGDC 2008) reflecting the habitats occupied by a unit (Whitmore 1984, pg. 155). The result is a recognizable set of names that describe concisely the ecological characteristics of the unit. All three biome level units have been published in Faber-Langendoen et al. (2025), in alignment with L2 and L3 units of the Global Ecosystem Typology (GET) (Keith et al. 2022). Coding of the types also corresponds with GET.

Division Nomenclature

As with biome levels, a single name is used both as a scientific and common name. Names are expected to include biogeographic terms, as large scale biogeographic patterns play a large role in their concepts, along with physiognomy. In some cases, key diagnostic species may be used. Coding of the division contains information on the biogeographic realm where it is found (Dinerstein et al. 2017).

Macrogroup to Association Nomenclature

For these levels, types have separate scientific and common names (and even the scientific name, which includes Latin names of species, can have a translated scientific name (based on the vernacular plant name)). The names can include both physiognomic-ecologic terms (forest, grassland, bog, tundra) and plant species names, and may also include a biogeographic term. Translated names and common names are provided in English and other languages.

For macrogroups, a biogeographic term is always used in the name and comes first, followed by species names, with an optional ecological term, followed by a physiognomic term.

For groups, alliances, and associations, the species names come first, followed by optional ecological and biogeographic terms, followed by a physiognomic term. For the group, consideration is being given to consistently using a biogeographic term and placing it first.

For all four levels, among the taxa that are chosen to name the type (up to three species for macrogroup, group, and alliance, and up to five for association), those occurring in the same

stratum or growth form (tree, shrub, herb, nonvascular, floating, submerged) are separated by a hyphen (-), with a space on each side, and those occurring in different strata are separated by a slash (/), also with a space on either side. Diagnostic taxa occurring in the uppermost stratum are listed first, followed successively by those in lower strata. The order of taxon names within a stratum or growth form generally follow this order: a dominant of high constancy (whether or not strongly diagnostic), a dominant of moderate to strong diagnostic value, and a strong diagnostic species, whether or not dominant. Species may meet one or more of these criteria.

Physiognomic terms used for middle and lower levels should be as consistent and specific as possible within biomes and division. For example, various mid or lower level units may use physiognomic terms such as grassland, marsh, bog, woodland. A catalog of terms and their usage is being maintained to ensure consistency (see Peer Review below). For example, the term “scrub” is used to describe vegetation where shrub and tree-like growth forms are hard to distinguish, as in desert and alpine regions, whereas “shrubland” refers to more typical multi-stemmed, weakly canopied, mesomorphic-dominated vegetation.

Types that fall under the category of natural vegetation but are dominated by invasive species or found on strongly human-disturbed habitats (such as old fields on abandoned farm sites or invasive grass-dominated rangelands), and which clearly have no analog to historic native vegetation, should be placed in a distinct macrogroup with the term “ruderal” in the name. Occasionally, localized ruderal types that have a native overstory and a strongly nonnative understory may be placed in the natural alliances when the overstory species is diagnostic.

Nomenclature for vascular plant taxa should follow the name in an accepted botanical reference (e.g., in U.S., United States Department of Agriculture (USDA) PLANTS database (see http://plants.usda.gov)). Each plant taxon used in a scientific name shall have only one common name that shall form the basis for the common name of types (e.g., quaking aspen, but not aspen or trembling aspen).

Anthropogenic Types Nomenclature

Anthropogenic types, such as orchards, plantations, and lawns, are named using the same hierarchy as natural, but physiognomic terms are specific to those anthropogenic ecosystem types and in the scientific name of type from L4 Division to L6 Group, the name of the level is prefaced with “Anthro” (e.g. Anthro-division”), and for L7 and L8 the name of levels are Type and Subtype, respectively, in recognition of the fact that alliance and association have historically only been applied to natural and ruderal vegetation types.