Terrestrial & Palustrine Plant Communities of Pennsylvania 2nd Ed.

Section 1

Introduction

Plant communities are groups of plants sharing a common environment that interact with each other, animal populations, and the physical environment. As plant communities tend to co-occur on the landscape due to shared environmental requirements, they provide a valuable framework for organizing biological information creating mappable units for land management and conservation planning. Communities are often defined by dominant plant species and these plant associations provide useful habitat information for many animal species and provide an efficient starting point for biological surveys.

Terrestrial and Palustrine Plant Communities of Pennsylvania 2nd Edition represents the Pennsylvania Natural Heritage Program's best approximation of the upland and wetland plant community types of Pennsylvania and can be used to classify and describe patterns in vegetation seen across the landscape.

Click on the links above to go the descriptions of Terrestrial and Palustrine plant community types. In addition to information on species commonly associated with each community type, the links and tabs on this site contain useful identification keys, resources for identification and management and research information.

PNHP welcomes feedback from users of this classification, please send comments or data to the following address.

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Past Efforts

Terrestrial and Palustrine Plant Communities of Pennsylvania 2nd Edition represents the 3rd approximation of plant communities for Pennsylvania. Plant communities of Pennsylvania were first published in draft form by the Pennsylvania Natural Heritage Program in 1983 by Tom Smith with major revisions in 1991 and again with minor revisions in 1994. The entire classification was re-done in 1999 for a DCNR Bureau of Forestry publication entitled *Terrestrial and Palustrine Plant Communities of Pennsylvania* by Jean Fike.

The focus of the Smith classification was the Natural Community, and community types ranged from broad definitions of habitats (e.g., “Floodplain Swamp” or “Serpentine Barren”) to more discrete types defined by the specific landform and soil characteristics (e.g., “Oligotrophic Glacial Kettlehole Bog”). Smith also included aquatic and subterranean communities. Smith’s Natural Community concept was closer to an ecosystem approach where the individual plant communities are not the focus of classification but rather the focus is the entire landform – based ecosystem. For instance, Smith treated the unique suite of habitats found on serpentinite bedrock as a single unit, a “Serpentine Barren,” for classification and conservation purposes, rather than listing the many community types found there.

The Fike classification shifted to a Plant Community Concept using species and physiognomy (tree, shrub, herbaceous, etc.) per the International Vegetation Classification System (IVC) developed by NatureServe. In a plant community classification, the plant communities are defined by dominant species. In the “Serpentine Barrens” example above, each plant community is described and mapped as an individual unit and each has its own conservation status, rarity and quality ranks and management needs. In Fike, these plant communities include Serpentine Pitch Pine – Oak Forest, Serpentine Virginia Pine – Oak Forest, Red Cedar – Pine Serpentine Shrubland, Serpentine Grassland, Serpentine Gravel – Forb Community, Serpentine Seep and it is common that a give Serpintine Barren will not contain all of these and often several other types that may exist more broadly are found. Fike addressed ecological systems, or groups, by describing Community Complexes – groups of communities occurring together in a given ecosystem, such as River Bed – River Floodplain Community Complex.

Terrestrial and Palustrine Plant Communities of Pennsylvania 2nd Edition builds upon the Fike text organizing the plant communities by species composition and physiognomy (tree, shrub, herbaceous, etc.). We have added to the Community Complex concept by identifying the Ecological Groups, which are categories composed of communities that are often found together on the landscape and respond similarly to similar ecosystem processes. Identifying Ecological Groups allows us to refer to Smith's Natural Community concept and also link the Pennsylvania Community Types with NatureServe's Ecological Systems.

Since its creation in 1999, the Fike document has been used by DCNR and PNHP to classify, describe, and map state forest and park lands across Pennsylvania. These described community types provide a foundation for management activities on state, private, and federal lands in the state.

Terrestrial and Palustrine Plant Communities of Pennsylvania 2nd Edition is a significant update to Terrestrial and Palustrine Plant Communities of Pennsylvania (Fike 1999). Ecology, conservation, and management information not included in Fike is included in this edition. Both wetland (palustrine) and terrestrial plant communities are included in this revised classification; however, descriptions of terrestrial types are from Fike. As we refine and update the terrestrial component of the classification in 2012, the links to Fike types will be updated with new information. As with the original Fike classification, this version does not include vegetation types characterized by a high degree of direct human influence (e.g., roadsides, agricultural fields, lawns, forest plantations), nor does it include aquatic or subterranean communities.

The classification effort is ongoing. Our understanding of the patterns of variation in the natural world is constantly evolving; as we gather more information and come to better understand these patterns, the classification will be modified to reflect that understanding, as well as changes in Pennsylvania's ecology and vegetation over time. The living document allows us to provide the most up-to-date information on species composition, ecology, and management of these communities.

Terrestrial and Palustrine Plant Communities of Pennsylvania 2nd Edition is a product of PNHP, which is a partnership among the Department of Conservation and Natural Resources (DCNR), the Pennsylvania Game Commission (PGC), the Pennsylvania Fish and Boat Commission (PFBC), and Western Pennsylvania Conservancy. PNHP worked with the Pennsylvania Biological Survey (PABS) to form a Community Classification Standing Committee to provide peer review and assist in the process of developing and updating the Pennsylvania Plant Community Classification. The standing committee meets regularly to review existing types, nominate new types for inclusion in the classification, develop applications for the classification, and assist PNHP in developing plans for future community/ecosystem research.

Concepts

Terrestrial and Palustrine Plant Communities of Pennsylvania 2nd Edition builds on Fike (1999) in that the plant community concept is based on characteristic vegetation and physiognomy; hydrology, ecological processes, and distribution are also presented.

The following presents the PNHP concept of a plant community, describes how communities were named, and identifies data sources used.

Community Concept

Plant communities are groups of plants sharing a common environment that interact with each other, animal populations, and the physical environment. *Terrestrial and Palustrine Plant Communities of Pennsylvania 2nd Edition* shares the definition of community concept with NatureServe, which bases communities on characteristic vegetation and growth as they currently exist on the landscape. Ecological conditions, such as landform, soils and other ecological and geographical factors are not directly considered classification criteria, but are used to guide the structure of the classification (Faber-Langendoen et al. 2012). While this classification only includes natural or semi-natural vegetation types and does not include "managed" vegetation types (e.g. roadsides, agricultural fields, forest plantations), it is acknowledged that all plant community types have experienced some degree of direct human influence.

Community Descriptions

Community descriptions include a list of characteristic species that may or may not be dominant, but are either commonly associated with or serve to distinguish that type from other closely related types. An individual example of a community type is not likely to contain all of the species listed in the description, and the description includes only a fraction of the species that may be present in a community. Environmental descriptions may include information on soils, geology, hydrology, chemistry, hydrology, and disturbance. In many cases we do not yet have sufficient information to describe the environmental processes associated with different community types.

Data

The majority of the plant community types described in this edition is supported by quantitative data collected in several PNHP studies and determined through statistical analysis. Specifically, floodplain, vernal pool, and wet-thicket (shrub wetland) communities were assessed and described (Podniesinski and Wagner 2002, Zimmerman and Podniesinski 2008, Leppo et al. 2009, Furedi 2011a, 2011b). The plant communities of all National Park lands in Pennsylvania were classified, described, and mapped by PNHP using standard quantitative mapping and classification protocols (Perles et al. 2004, 2007, 2008). These data are available through PNHP and the partner agencies that manage the lands studied.

Community Name

Community type names are merely labels, and are not meant to describe community types in and of themselves. Types cannot be understood from the names alone; the entire description must be read. Where possible, the name of an individual community includes one or more of the dominant species and possibly defining ecological factors, such as physiographic setting or landscape position. Where species names are separated by a dash ("-") the both species are commonly both present. Where the community type does not have clear dominants or ecological descriptors, general descriptors are used.

Organization

Plant community types can be organized in a number of ways. Initially, we have provided the user with the ability to organize the classification two ways – by Physiognomic Category (e.g. forest, woodland, shrubland), and by Ecological Group, which organizes the plant communities by biogeography and ecosystem factors. An additional tool to organize community types is the Wetland Community Key, which has a slightly different structure than the Physiognomic Category and Ecological Group and based on categirues easily identifiable in the field.

Physiognomic Categories

In the physiognomic classification, the community types are first divided into two major systems, palustrine (wetlands) and terrestrial (non-wetlands). These systems are then divided into physiognomic categories (e.g. forest, woodland, shrubland). For terrestrial types, a dichotomous key from Fike (1999) is provided for the this introduction to assist the user in determining which system and physiognomic category best describe a given site. One additional division is made within some physiognomic categories. In categories dominated by woody plants (forests, woodlands, and shrublands), the division is based on the dominant species' leaf type (conifer, broadleaf, or combined conifer-broadleaf). This hierarchical arrangement allows the user to classify a site at a coarser scale if that is more appropriate, or if a specific community type cannot be determined.

Ecological Group

Ecological Groups were created for wetlands types and are made up of communities occurring together on the landscape, often dictated by physical ecological processes. Ecological Groups are similar to the first edition's Community Complexes, which listed community types commonly associated with the physiographic setting, such as "River bed – bank – floodplain complex." Instead of only including representative types as Community Complexes, the Ecological Groups include all communities found within the system, even commonly occurring, broader types that may be present in many environmental settings. Thus, there is a great deal of overlap in Ecological Groups. Ecological Groups were based on definitions of ecological systems adapted from the U.S. Fish and Wildlife Service wetland classification (Cowardin et al. 1979) and NatureServe's Ecological Systems. Wetland types fall within one or more of the River Floodplain, Peatland Wetland, Great Lakes Region Wetland, Basin Wetland, Tidal Wetland, Coastal Plain Wetland, and Seepage Wetland categories.

As updates to the terrestrial community classification occur, PNHP will be identifying Ecological Groups for uplands as well as wetland types.

The classification is designed to identify plant communities in the field based on descriptions of plant species composition and structure of a given site. The rarity and quality rankings can be used to guide

natural resource management and planning decisions. For example, state regulators may wish to require additional protection and management activities in rare and/or high quality communities.

Using the Classification

This classification is intended for a variety of agencies and organizations. Its potential applications include mapping, environmental impact assessment, development planning, site selection for long term monitoring, preserve design, and a variety of other activities related to the setting of priorities for conservation. It may also be useful in providing a common language to researchers and managers, as well as for educational purposes.

In addition to the community descriptions, two dichotomous keys for field identification of plant communities are included in this on-line resource to assist managers, wetland delineators, and biologists in determining the plant communities of a given area. The Terrestrial Community key follows Fike (1999). The key for the palustrine communities was developed through a program funded by DEP. These keys can be printed and brought into the field for assessment activities.

Ultimately, users will need to rely on their best judgment to determine which community type description best fits a site. Thus, the descriptions and community key provided in this classification will be a useful guide in assigning community names to sites in the field.

The following information is presented within the descriptions for each community type:

Organization

Plant community types can be organized in a number of ways. Initially, we have provided the user with the ability to organize the classification two ways – by Physiognomic Category (e.g. forest, woodland, shrubland), and by Ecological Group , which groups the communities into ecological systems, based on shared location and ecosystem processes. An addition tool to organize and determine the communities is the Wetland Community Key , which has a slightly different structure, based on categorized and grouped easily in the field.

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categories (e.g. forest, woodland, shrubland). For terrestrial types, a dichotomous key from Fike (1999) is provided for the this introduction to assist the user in determining which system and physiognomic category best describe a given site. One additional division is made within some physiognomic categories. In categories dominated by woody plants (forests, woodlands, and shrublands), the division is based on the dominant species (conifer, broadleaf, or combined conifer-broadleaf). This hierarchical arrangement allows the user to classify a site at a coarser level of detail if that is more appropriate, or if a specific community type cannot be determined.

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With updates to the terrestrial communities in 2012, PNHP will be identifying Ecological Groups for uplands as well as wetland types.

Classification

Characteristic species by structural vegetation layer, the origin of the concept, and "crosswalks" and links to NatureServe Community Association and relation to previous Pennsylvania classification efforts.

Origin

To assist with understanding of how our plant communities were developed, each community contains information on origin (from what study the type was developed) and how it relates to types in previous Pennsylvania Classifications (Fike 1999). Additional resources are provided through a web-links to species information, references, and conservation/management guides.

Related Types:

Each community is briefly compared to other related community types with which it might be confused. Each type is crosswalked (related) to NatureServe's International Vegetation Classification (IVC). Community types in this classification are also assigned codes developed for the Pennsylvania Bureau of

Forestry and Pennsylvania Game Commission cover-typing manuals (Stone et al. 2006, Pennsylvania Department of Conservation and Natural Resources (DCNR) 1999).

Conservation

Conservation concerns, threats, and management information is provided at this section. This section may change with additional research into these topics.

Range

The Pennsylvania range of each community type is given in terms of ecologically defined regions.

References

We provide references to research used to define each plant community type and to provide conservation, management, and range information.

Gallery

We provide multiple photos of each community type to show the range in variability in composition and structure.

Glossary

Acidic: describes soil or water with a pH lower than 5.5.

Alluvium: unconsolidated material deposited by running water, including gravel, sand, silt, clay, and various mixtures of these.

Annual: a plant that completes its entire life cycle in a single growing season.

Anthropogenic: induced or altered by the presence or activities of humans.

Aquatic bed: a wetland or deepwater habitat dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years.

Assemblage: a group of organisms that occur together; does not imply a particular scale.

Bar: an elongated mass of sand, gravel, or alluvium deposited on the beds of streams or lakes or at the mouth of streams.

Barrens: Woodland or shrubland communities where tree establishment or growth is suppressed by environmental conditions and/or disturbance regime. Most often associated with thin or excessively drained soils.

Bedrock: the solid rock that is exposed at the surface or underlies the soil or other unconsolidated material at the surface.

Biomass: the total dry weight of all organisms in a particular area, sample, or community.

Bog: a nutrient-poor, acidic peatland that receives water primarily from direct rainfall, with little or no input from groundwater or runoff; vegetation consists primarily of peat mosses (Sphagnum spp.) and ericaceous shrubs.

Bryophyte: members of division Bryophyta: the liverworts, hornworts, and mosses.

Calcareous: Describes soil, groundwater, or surface water with high calcium concentrations, often derived from limestone or calcium-rich glacial deposits.

Canopy: the branches and leaves of plants that form the uppermost layers of vegetation in a community. A canopy is said to be closed (or have 100% cover) when the ground and lower strata are completely hidden when viewed from above the canopy during the growing season.

Characteristic species: a species strongly associated with a particular community type, either as a dominant, a ubiquitous non-dominant component, or as particularly diagnostic of that community type.

Circumneutral: having a pH between 5.5 and 7.4.

Codominant: a species with relatively high abundance or percent cover; two or more species providing roughly equal cover, abundance, or influence in a community or stratum.

Community: an assemblage of plants and/or animal populations sharing a common environment and interacting with each other and with the physical environment.

Community complex: a set of community types that tend to occur together under a specific set of environmental circumstances.

Composition: all the species present in a community and their relative abundance.

Conifer: any of a large group of cone-bearing trees and shrubs, mostly evergreens such as the pine, spruce, fir, cedar, yew, etc.

Cover: the percentage of the ground surface that is covered or shaded by the leaves or stems of a plant species or a group of plant species during the growing season.

Disturbance regime: a repeating pattern of natural disturbances such as fire, flooding, ice scouring, windthrow, erosion, etc.

Dominant: a species with the greatest abundance, percent cover, or influence in a community or stratum.

Edaphic: pertaining to the soil.

Emergent: upright, rooted vegetation that may be temporarily to permanently flooded at the base, while the upper portions of the plant grow erect above the water surface; these plants do not tolerate prolonged inundation of the entire plant; e.g. cattail (Typha spp.).

Ericaceous: members of the heath family (Ericaceae).

Exotic: refers to species not native to Pennsylvania, or to the area in which they occur.

Fen: an open-canopy peatland that has developed under the influence of base-rich waters.

Floodplain: flat to nearly-flat areas along rivers and streams that are subject to at least intermittent flooding.

Forb: a broad-leaved (not grass-like) herbaceous plant; may include ferns and fern-allies.

Forest: a type of community dominated by trees greater than five meters in height, and having at least 60% canopy closure, crowns usually interlocking; may be terrestrial or palustrine.

Frost pocket: a small, low area that has poor aerial drainage and is subject to frequent frosts.

Graminoid: refers to grass-like, narrow leaved herbaceous plants; includes grasses (Poaceae), sedges (Cyperaceae), rushes (Juncaceae), and others.

Grass: a member of the grass (Poaceae) family.

Grassland: an open-canopy community dominated by graminoids; forbs may be common, but there are relatively few shrubs and very few trees.

Groundlayer: the herbs, shrubs, and woody vines beneath the trees in a forest; or the lowest layer of vegetation in an open-canopy community.

Groundwater: water found underground in openings in rock strata and soils.

Gravel: a mixture composed primarily of small rock fragments between 2mm and 7.6cm in diameter.

Hardwood: (in our region, with the exception of Ilex opaca — American holly) deciduous trees that are not conifers.

Heath: a member of the family Ericaceae.

Herb, Herbaceous: describes plants with no persistent woody stem above the ground, as distinct from trees and shrubs.

Herbaceous layer: the layer of vegetation in which herbs are common or dominant, usually the groundlayer.

Hydric: wet; describes soils that are sufficiently wet to at least periodically produce anaerobic conditions in the root zone, thereby influencing the growth of plants.

Hydrology: describes the way water is distributed in the landscape, moves over the ground surface and underground, includes precipitation, evaporation, transpiration, and flow.

Hydrophyte, Hydrophytic: describes any plant adapted to growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

Levee: a low ridge or embankment that impounds water.

Loam: soil composed of a mixture of particle sizes, specifically: 7% to 27% clay, 28% to 50% silt, and less than 52% sand.

Marsh: a wetland dominated by herbaceous (often graminoid) vegetation and usually having little or no peat accumulation.

Mesic: describes areas of intermediate soil moisture content; moist but well drained.

Microtopography: the fine scale of topography on a site.

Mineral soil: soil composed of primarily mineral rather than organic materials. For more information see Appendix D in Cowardin et al. (1979).

Minerotrophic: groundwater-fed; influenced by water that has been in contact with soil or bedrock, and is richer in mineral content than rainwater.

Mosaic: in a landscape, a complex pattern composed of different types of communities, aspects or assemblages that are intermingled.

Muck: highly decomposed organic material in which the plant parts are no longer distinguishable (sapric peat).

Native: describes species that occurred in Pennsylvania or in the area in which they are found prior to European settlement; not introduced by human activities; indigenous.

Nonpersistent emergent vegetation: emergent hydrophyptes whose leaves and stem normally break down before the beginning of the next growing season. The breakdown may be the result of normal decay or the physical force of waves or ice. There is normally some portion of the year in which there are no visible traces of the plants above the surface; e.g. wild rice (Zizania aquatica), arrow arum (Peltandra virginica).

Oligotrophic: poor to extremely poor in nutrients, typically describes dilute waters with low base metal ion concentrations.

Organic matter: material derived from the decay of dead organisms.

Organic soil: soil composed of primarily organic rather than mineral materials. For more information see Appendix D in Cowardin et al. (1979).

Outcrop: the exposure of bedrock projecting through the overlying soil or other unconsolidated material at the surface.

Oxbow: an abandoned meander loop formed when a stream takes a new course. This crescent-shaped body of water becomes filled over time with fine-grained "back swamp" material.

Palustrine: describes wetlands; areas intermediate between aquatic and terrestrial habitats, supporting predominantly hydrophytic vegetation, where conditions are at least periodically wet enough during the growing season to produce anaerobic soil conditions and thereby influence plant growth.

Peat: partially decomposed remains of plant material in which at least some of the plant parts are still distinguishable (here fibric or hemic peat). Peatland: a community or group of communities occurring over peat of at least 40 cm depth.

Perennial: a plant that persists and produces reproductive structures year after year.

Persistent emergent vegetation: emergent hydrophytes that normally remain standing at least until the beginning of the next growing season; e.g. cattails (Typha spp.) or bulrushes (Scirpus spp.).

pH: a symbol denoting the negative logarithm of hydrogen ion concentration in a solution; pH values run from 0 to 14, the lower the value, the more acidic the solution, that is, the more hydrogen ions it contains; pH 7 is neutral, less than 7 is acidic; more than 7 is alkaline.

Physiognomy: The general physical structure of vegetation (e.g. forest, woodland, shrubland etc.).

Relative cover: the aerial cover of a species or group of species expressed as a percent of the total cover of the stratum in which it occurs; the relative cover values for all species in a given stratum will always total 100%.

Rich: describes either environments where nutrients are abundant, or communities with high species diversity.

Sandspit: a small point or narrow embankment of land, consisting primarily of sand deposited by longshore drifting, and having one end attached to the mainland and the other terminating in open water.

Scarp: a line of cliffs or a wall-like steep slope formed by faulting or erosion.

Scrub: vegetation consisting primarily of stunted or dwarf trees and shrubs.

Seep: an area where groundwater discharges in a diffuse flow.

Sedge: grasslike herbaceous plant of the family Cyperaceae, especially members of the genus Carex.

Seral: of, relating to, or characteristic of an ecological sere.

Sere: a series of ecological communities that follow each other in the course of the biotic development of an area.

Serpentine: a secondary material, resulting from "hot water" alteration of magnesium silicates, such as peridotite. The name includes at least two minerals, antigorite and chrysolite.

Serpentinite: a rock consisting almost wholly of serpentine minerals derived from the alteration of olivine and pyroxene.

Shrub: a perennial, woody plant that differs from a tree in its short stature (less than five meters in height) and typically multi-stem growth form.

Shrubland: a community dominated by shrubs, with less than 25% total cover by trees.

Silt: soil composed of fine-grained mineral sediments—particles are of intermediate size between sand and clay (particle size between 0.074 and 0.002 mm)— and are carried in or deposited by moving water.

Site: a place or location.

Sphagnum: members of the moss genus Sphagnum.

Stratum layer: here a layer of vegetation, e.g. tree, shrub, herbaceous.

Structure: the spatial arrangement of vegetation layers within a community.

Spring: location of concentrated groundwater discharge. Spring run: body of running water adjacent to and originating at a spring.

Subcanopy: in a forest community, the tops and branches of the small trees and tall shrubs that form a distinct layer beneath the high tree canopy and above the shrub layer (if present).

Substrate: the foundation to which an organism is attached, or upon which a community occurs.

Succession: directional change in species composition on a site following a disturbance.

Successional: describes communities that are changing in composition relatively quickly in response to a disturbance.

Swamp: a wooded wetland, intermittently or permanently flooded.

Talus: rock fragments of any size or shape, derived from and lying at the base of a cliff or very steep rocky slope.

Terrestrial: uplands; where vegetated, supporting vegetation that is not predominantly hydrophytic.

Till: unstratified drift deposited by a glacier and composed of sand, clay, gravel, cobble and boulders in any combination and proportion.

Tree: a woody perennial plant, usually having one principle stem, that has a definite crown and characteristically reaches a mature height of at least five meters.

Ultramafic: describes soil or rock types high in magnesium and iron

Upland: sites with well-drained dry to mesic soils.

Understory: the lower layers of vegetation in a community; in a forest, all the vegetation layers beneath the canopy and subcanopy.

Utter: fresh or partially decomposed organic debris such as leaves, twigs, fruit, etc.

Vascular plants: plants with a vascular system; includes trees, shrubs, and herbs, but not bryophytes, lichens or algae.

Vernal: occurring in the spring.

Wetlands: areas intermediate between aquatic and terrestrial habitats; characterized by a predominance of hydrophytes, where conditions are at least periodically wet enough, during the growing season, to produce anaerobic soil conditions and thereby influence plant growth.

Woodland: a community with a sparse tree canopy (10%-60% cover), usually with an herbaceous and/or shrub layer. Characteristic of environments where tree establishment or growth is suppressed by edaphic conditions or disturbance regime.

Woody: describes plants having lignified stem tissue (trees, shrubs, and woody vines).

Xeric: very dry, describes areas with dry, well drained to excessively well-drained soils.

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