

Appendix

State Responses to RFI on Federal Old-Growth and Mature Forests

Minnesota Department of Natural Resources, Division of Forestry:

https://www.dnr.state.mn.us/forests_types/oldgrowth/characteristics.html

Characteristics of Old Growth

The DNR defines old growth forests as forests that have developed over a long period of time, essentially free from catastrophic disturbances. They contain large, old trees of long-lived species that are beyond traditional rotation (harvest) age. High-quality old growth forests also have relatively complex stand structure (such as snags and woody debris), high stand mortality, and few invasive species. They also include rare species or native plant communities.

This section describes different forest cover types and the characteristics of old growth conditions found within each. Cover types are based on the most dominant tree species in the forest. The descriptions of old growth characteristics within each cover type are general and vary considerably within a cover type. Although the size and age characteristics are provided for comparative purposes, each type of old growth forest below contains additional old growth characteristics than those listed.

The DNR continues to manage old growth forests and is working on completing a **designation process** for lowland conifer old growth forests.

Black Ash Forests

Black ash forests are found in wet areas such as narrow bands at wetland margins, in ground depressions that accumulate moisture, or where groundwater seeps to the soil's surface. The most abundant trees in black ash forests are, not surprisingly, black ash. These grow in almost pure forests or are mixed with green ash, red maple, and sometimes bur oak. In northern Minnesota, black ash forests can include white cedar and balsam fir trees. Young black ash can become established and grow beneath their parent trees.

Old growth characteristics

Old growth black ash forests are at least 120 years old but may be 200 years old or more. The size of trees varies depending on the soil moisture and latitude of a site; they can grow to be 15-20 inches in diameter.

Lowland Hardwood Forests

Lowland hardwood forests are found in stream and river floodplains and in swamp settings away from flowing water. The kinds of trees that grow in this forest type vary from south to north. In southern Minnesota, lowland hardwood forests consist of silver maple, American or red (slippery) elm, and green ash trees together with a large variety of other tree species. In the northern part of the state, ash is the most common tree species, often growing with basswood and oak.



Old growth characteristics

Characteristics of old growth lowland hardwood forests vary by location within the state. In addition to old and medium-aged trees, old growth lowland hardwoods will have some seedlings and young trees. Trees are at least 120 years old and may have diameters more than 10 inches. It is rare to find species that require large amounts of light, such as willow, cottonwood, aspen, birch, and balsam poplar.

Northern Hardwood Forests

This forest type can be subdivided into maple-basswood forests in southern Minnesota and northern hardwood forests in northern Minnesota. These forests contain sugar maple, basswood, yellow, red oak, American elm, and black ash. The types of dominant trees depend largely on moisture: red oak is common in the driest sites, while American elm and black ash can be found on wet sites. Northern hardwoods also support conifers: white pine, balsam fir, white spruce, and white cedar. White pine was historically largely removed from northern hardwood forests because it was so desirable for wood products.

Old growth characteristics

Northern hardwood old growth forests have the classic look of old growth forests. These forests appear dense with layers of vegetation. Seedlings and saplings grow vigorously, especially those of sugar maple. These forests perpetuate themselves over many centuries if they are not disturbed by severe storms or cutting. The young trees tolerate living for years in deep shade until a gap opens in the canopy. Then, the young trees under that canopy gap race upward to take the place of the fallen giant that previously occupied the space. Forests are at least 120 years old, and the oldest trees can live for 300–400 years. While tree diameters are often 10-15 inches, trees can grow to diameters of 20 inches in the north and 26 inches in the south. Species that require sun, such as aspen, are rare or occur in scattered, small clumps of a few trees. White pine and yellow birch were historically favorite trees for building materials, and therefore they are much rarer than they were historically.



Oak Forests

Oak forests grow in the driest landscapes. They are dominated by red oak and white oak, individually or in combination. Aspen, paper birch, and black cherry often grow with these oaks. In southern Minnesota, black oak, bur oak, bitternut hickory, and pignut hickory are prevalent. Oak forests will be invaded by northern hardwoods unless they experience some kind of disturbance (e.g., fire) that clears away old leaves, shrubs, and saplings. Oak forests are made up of species that do not tolerate deep shade. Such forests are known as "seral" forest communities: forests that transition to more shade-tolerant species over time.

Old growth characteristics

The oldest trees in an old growth oak forest are often 150–200 years old or older with diameters of 20 inches in the north and 30 inches in central and southern Minnesota. However, forests are considered old growth if they are at least 120 years old or have an average tree diameter between

10-15 inches. Nearly all oak forests in the state were pastures at some point. If the number of cattle in a forest was not excessive, an oak forest will have few nonnative species and only small amounts of shrubs bearing prickles and thorns. It will also support a diverse group of wildflowers, grasses, sedges, and shrubs.

Red & White Pine Forests

Red pine and white pine forests are largely restricted to northeastern and north-central Minnesota. The white pine subtype also can be found along steep slopes and knobs of creek and river valleys in the southeast. Red and white pine form a canopy either together or separately. White pine tends to grow on moister sites than red pine. Paper birch, red maple, and other deciduous trees occur with white pine on the moistest soils. On the driest sites, red pine is joined by jack pine; on moister sites, it is accompanied by white spruce or balsam fir. Historically, frequent surface fires and rare canopy fires perpetuated this type for many centuries, but in the absence of fire, maple, balsam fir, or white cedar will eventually take over on many sites.

Being somewhat tolerant of shade, white pine can grow beneath a pine canopy and its saplings will grow up to fill canopy gaps. Red pine, however, requires nearly direct sunlight in all its life stages. Formerly common, old growth red and white pine forests are now rare due to their high demand for building material from 1850 to 1920.

Old growth characteristics

Old growth pine forests usually consist of distinct age groups that were established after a disturbance that cleared the ground of old needles, leaves, and brush, or opened the canopy. To be considered old growth, pine forests are at least 120 years old or have a tree diameter greater than 20 inches. Trees can be as old as 400 years with diameters of 3 feet or more. Most remaining pine forests have experienced some recent cutting.



Upland White Cedar Forest

White cedar often grows in pure forests over large areas of moist soils. Cedar trees growing in swamp settings are not considered part of the upland white cedar type. These forests can contain extensive tracts of balsam fir, yellow birch, paper birch, white spruce, and black spruce. Upland white cedar forests are most common on Lake Superior's north shore, but occur throughout northeastern and north-central Minnesota. Although it is a long-lived and shade-tolerant tree, white cedar has difficulty reproducing itself.

Old growth characteristics

Seedlings and young saplings are rarely found in old growth upland white cedar forests. One reason is that deer use white cedar forests for shelter in winter and eat young white cedar in the spring. To be considered old growth, these forests are at least 120 years old or have an average tree diameter greater than 10 inches. However, many trees are at least 200 years old, and commonly more than 400 years old. In one old growth forest, researchers found a cedar tree that was nearly 600 years old. Because their wood is dense, white cedar trees may not be large. The cedars often grow in clusters with spaces between them, giving the impression of an open forest.



White Spruce Forests

Along with white spruce, many other tree species can be found in white spruce forests, including balsam fir and paper birch. This type is restricted to north-central and northeastern Minnesota.

Old growth characteristics

Because white spruce does not live as long as the trees of other forest types, these forests are considered old growth at 90 years old. The oldest trees can reach 150 years of age. During the lifetimes of the oldest spruce trees, several generations of balsam fir will have come and gone. As a result, these forest types are filled with small- and medium-sized pieces of fallen wood.



Vermont Department of Forests, Parks and Recreation

Old Forest and Old Growth in Vermont – Introduction

To acknowledge the geographically expansive and long history of human land use across the New England landscape, Vermont natural resource professionals commonly differentiate “old growth” from “old forest.”

Vermont Department of Forests, Parks, and Recreation’s (VTFR) interpretation of these conditions generally aligns with the soon-to-be published document by D’Amato & Catanzaro (2022), “**Restoring Old Growth Characteristics in New England and New York’s Forests.**” In this resource, “old growth” is narrowly defined as forest that was “never directly impacted by intensive human land uses...”. On the other hand, this resource defines “old forests” as those “that contain a critical mass of characteristics associated with old-growth forests.” Based on these definitions, in practice, no new “old growth” can be created, but old forest can be attained on a site when sufficient old growth characteristics have accrued.

It is worth noting that “old growth” and “old forest” are concepts that have recently garnered significant public attention. An informal definition that has emerged in some circles deviates from the definition of “old forest” used by VTFR, most notably by excluding any allowance of active management to accelerate attainment of, or maintain, old forest characteristics. While some management actions can be in conflict with goals of advancing old forest characteristics, many others can be extremely valuable to restore large diameter trees, snags, coarse woody material, protect native biodiversity or other characteristics that confer value and function associated with old forests. For this reason, VTFR has been intentional about defining old forests more by the characteristics they exhibit and ecological functions and values they provide than by the exclusion of human involvement or restorative management.

Old forests are defined for conservation and management purposes in Vermont, including:

Use Value Appraisal

CONTEXT: Vermont’s Use Value Appraisal program (UVA), or “Current Use” as it is commonly known allows eligible, privately and municipally owned forestland to be taxed on its use value for farming or forestry purposes as opposed to its highest and best real estate value -- on the condition that land is managed by certain standards under an approved management plan. The primary forest management objective on most enrolled parcels must be the long-term production of forest products in accordance with established forest practices; however, lands exhibiting certain ecologically significant conditions where timber is not necessarily the primary objective, may also be eligible. Among the conditions eligible for enrollment without the requirement to manage for forest products, is “Old Forest.” For purposes of this program old forest is coarsely defined and the definition applies to matrix natural community types in the Northeast.

Old Forest Ecologically Significant Treatment Areas (ESTAs, as applied in Vermont's Use Value Appraisal Program)

Definition and Criteria for Old Forest: Old forests are biologically mature forests, typically in late-successional stages of development, having escaped stand-replacing disturbance for more than 100 years and exhibiting limited evidence of human-caused disturbance beyond ecological management emulating old forest conditions. Most forestland in Vermont has experienced some level of human caused disturbance; however, those areas identified as old forest shall have well developed structural characteristics of an old forest. Old forests exhibit the following characteristics: 1) native tree species characteristic of the forest type or natural community present in multiple ages; and 2) complex stand structures including a broad distribution of tree diameters, multiple vertical vegetative layers, abundant coarse woody material (reflecting the diameters of the standing trees) in all stages of decay, numerous large standing dead trees, and when old forest patches are sufficiently large, natural canopy gaps. Most forest types exhibiting these characteristics will have trees exceeding 150 years old, though some forests may develop these conditions at different times. For instance, they may develop earlier in balsam fir (100 years), or later for Eastern hemlock (200 years).

Process for Identifying Old Forests: Land to be enrolled as an ESTA based on its eligibility as old forest, shall be identified and mapped by a plan preparer. These areas shall be included in the forest management plan for approval by the VTFPR county forester, along with a reasonable justification for the proposed management and appropriate documentation of the forest condition which may include species lists, plot data, age class distribution, description of structural characteristics reflecting old forest conditions, and tree core data describing ages for the older trees in the forest.

Note: *Precise, diagnostic measures for any attribute are intentionally omitted; however, examples for some forest types and regions can be found in Tyrell and Crow, 1994, Ecology (75)2; Old Growth Forests: A Literature Review of the Characteristics of Eastern North American Forests, Lapin, 2005 Vermont Natural Resources Council and Hunter and White, 1997, Natural Areas Journal (17)4.*

Vermont Conservation Design

CONTEXT: Vermont Conservation Design is a state-level planning effort to protect and enhance Vermont's ecological function into the future. The final products do not have regulatory application but provide an important lens through which to evaluate success.

The lands and waters identified in the project are the areas of the state that are of highest priority for maintaining ecological integrity. Together, these lands comprise a connected landscape of large and intact forested habitat, healthy aquatic and riparian systems, and a full range of physical features (bedrock, soils, elevation, slope, and aspect) on which plant and animal natural communities depend.

Among the habitat features considered in this planning effort is "old forest." This definition of old forest was originally designed to align with the Use Value Appraisal (UVA) definition, but the UVA definition has since been modified to de-emphasize specific tree ages as a critical defining characteristic.

Vermont Conservation Design Old Forest Definition

Old forests are biologically mature forests, often having escaped stand-replacing disturbance for more than 100 years and exhibiting minimal evidence of human-caused disturbance as well as continuity of process, senescence of trees, and regeneration response. In addition, these forests may exhibit many of the following associated characteristics: 1) some trees exceeding 150 years in age for most forest types (100 years for balsam fir, 200 years for eastern hemlock); 2) native tree species characteristic of the forest type present in multiple ages; and 3) complex stand structures that include a broad distribution of tree diameters, multiple vertical vegetative layers, natural canopy gaps, abundant coarse woody material (reflecting the diameters of the standing trees) in all stages of decay and numerous large standing dead trees. It is expected that old forests operate under natural disturbance regimes and may include small areas of regenerating forest as a result of these disturbances.

(See page 15 of Vermont Conservation Design – Part 2 Natural Community and Habitat Technical Report – March 2018)

Vermont State Natural Areas:

CONTEXT: Vermont Natural Areas are a statutory designation that can be applied to lands owned by the State of Vermont Department of Forests, Parks and Recreation. These generally are important natural communities, sites for rare plants and animals, or areas of geologic interest. Though protected, they are open to compatible uses by the public, including but not limited to, recreation of various forms, educational activities, research, and nature study.

A 1991 VTFPR policy defines the process for designating State Natural Areas, and provides limited management guidance. A workgroup of VTFPR staff are currently updating the Natural Areas policy to provide more complete guidance about appropriate uses of and management within State Natural Areas. Reference to “old forest” in both the existing and draft future policies are discussed below.

Use: The existing Natural Areas Policy does not specifically define “old forest,” but instead focuses on *“limited areas of land which have retained their wilderness character, although not necessarily completely natural and undisturbed...”* (10 VSA 2607). The policy goes on to say that *“Land uses and practices and Natural Areas shall be subject to regulations of the Department to carry out the purposes of this chapter to manage or maintain the areas for the preservation of their natural condition.”* By this guidance, the VCD and UVA definitions of Old Forest provided above would likely guide management.

The Natural Areas Policy draft update goes further than the existing policy in defining Natural Area conditions and management. It specifically guides managers to “allow natural processes to prevail,” but allows forest management when natural forest conditions are highly altered as a result of past human disturbances, and when management will catalyze the development of old forest conditions. Certain management activities which restore or protect natural processes are compatible with Natural Area management (ex., invasive species removal, road restoration, etc.).

New York Department of Environmental Conservation, Division of Lands and Forests

New York does have a statutory definition of “old growth” which is found in Section 45-0105 of the NYS Environmental Conservation Law (ECL) and reads as follows:

“The term "old-growth forest" shall mean a parcel of at least ten acres which includes all of the following: an abundance of late successional tree species, at least one hundred eighty to two hundred years of age in a contiguous forested landscape that has evolved and reproduced itself naturally, with the capacity for self perpetuation, arranged in a stratified forest structure consisting of multiple growth layers throughout the canopy and forest floor, featuring canopy gaps formed by natural disturbances creating an uneven canopy and a conspicuous absence of multiple stemmed trees and coppices. Typically, old-growth forest sites also are characterized by an irregular forest floor containing an abundance of coarse woody materials which are often covered by mosses and lichens, show limited signs of human disturbance since European settlement, have distinct soil horizons that include definite organic, mineral, alluvial accumulation, and unconsolidated layers, and have an understory that displays well developed and diverse surface herbaceous layers.”

Texas A&M Forest Service

Definitions

Mature Forest – A term generally applied in an economic sense to indicate a forest that has attained the desired harvest size or age. The rate of forest growth diminishes once forests mature.

Overmature – A stand of trees that is older than normal rotation age for that type of tree or for the intended objective. Often net growth is negligible.

Old-Growth Forest – A general term describing a forest that has reached a late stage of successional development, often perceived as never having been cut and with little human intervention.

Questions

- 1) What criteria are needed for a universal definition framework that motivates mature and old-growth forest conservation and can be used for planning and adaptive management?**

When determining old growth or mature forest structure you must consider stand age, vigor, and overall health condition. Old growth forests should only be reserved for “virgin” forests that have never been harvested. Much of the forestland across the country has been harvested at least once, rare cases of virgin forests remain. This factor alone should be the deciding factor for when to use the term “old growth”. Outside of those situations forests should be considered either “mature” or “over mature”.

2) What are the overarching old-growth and mature forest characteristics that belong in a definition framework?

Stand age, vigor, growth rate, and overall forest health conditions. Any data used to support a new framework must be science based and not hypothesized. Biological maturity should be the main thing considered here but again those parameters must be science based.

Since we know how long tree species can live in most cases, stand age should be a defining part of determining mature forests. As managers we understand that at a certain age tree will succumb to biotic and abiotic stressors which can be increased with changing climatic conditions.

3) How can a definition reflect changes based on disturbance and variation in forest type/composition, climate, site productivity, and geographic region?

That is tricky since the terms “old growth”, “mature”, and “over mature” technically only rely upon stand age and growth rate. These two parameters are independent of geographical regions but site productivity, climate, and stand type can all impact growth rates. Obviously stands on poor soils with low site productivity have slower growth rates but compound that with climatic changes such as drought and overly dense stands then growth will stagnate quicker. These conditions aren’t necessarily indicative of “old growth” or “mature” stands as stands 10 years of age can exhibit these conditions and poor growth habits.

4) How can a definition be durable but also accommodate and reflect climate and forest composition changes?

Not sure you can, if a composition change occurs then the forest would no longer be considered mature or old growth but rather early successional depending on change. Climatic conditions coupled with lack of management can lead to composition changes due to overstory dying out and being replaced by lesser or invasive species.

5) What, if any, forest characteristics should a definition exclude?

It seems over time “old growth” and “mature” have become common place conditions on most federally owned lands and in most circles, those desiring these conditions confuse the term “preservation” with “conservation”. Preservation is the act of doing nothing vs conservation which allows for and requires actual management. So, definitions should be based solely on growth rate, tree age, and health condition.

Standard definitions as defined by Merriam-Webster:

- *Mature* – having completed natural growth and development: having attained a final or desired state: having achieved a low but stable growth rate
- *Old growth* - of, relating to, or being a forest characterized by the presence of large old trees, numerous snags and woody debris, and a multilayered canopy and that is usually in a late stage of ecological succession

It would seem from a conservation standpoint that once growth has stopped or become greatly diminished then steps should be taken to encourage new growth if not already happening. From an economic standpoint once trees have maximized their growth rate/potential then management should incorporate reestablishment either through artificial or natural regeneration methods. Once forests surpass their productivity then they begin to decay becoming susceptible to insect, disease, and wildfire outbreaks which are all exacerbated by climatic conditions.

California Department of Forestry and Fire Protection

Current definitions of Old-Growth and Mature forests in use in California

California Forest Practice Rules: https://bof.fire.ca.gov/media/3qebuoma/2021-forest-practice-rules-and-act_final.pdf

Old growth - stands where 70% or more of the countable trees over 36 inches (91.4 cm) d.b.h. are more than 200 years old

Late Seral - Forests not previously harvested should be at least 80 acres in size to maintain the effects of edge. The area should include a multi-layered canopy, two or more tree species with several large coniferous trees per acre (smaller subdominant trees may be either conifers or hardwoods), large conifer snags, and an abundance of large woody debris.

“Late Succession Forest Stands”, pursuant to PRC § 4597.2(g)(3), means stands of dominant and predominant trees that meet the criteria of the California Wildlife Habitat Relationships System class 5D, 5M, or 6 with an open, moderate, or dense canopy closure classification, often with multiple canopy layers, and are at least ten (10) acres in size. Functional characteristics of late succession forest stands include large decadent trees, snags, and large down log

A description of late succession forest stands in the plan area and how the total acreage of this type of habitat will be maintained across the plan area under a constraint of no net loss. Retention measures for existing biological legacies such as snags, trees with cavities or basal hollows, and down logs, and address how those legacies shall be managed over time appropriate with the forest type, climate, and landowner's forest fire fuels and wildlife management object.

Late succession forest stand types or strata shall be mapped.

The FRAP 2017 Assessment (<https://frap.fire.ca.gov>) defines old growth and late seral

Old Growth Forest: A stand or stands of natural forest trees that have developed over a long period of time with trees that are at least 150 years old, without experiencing severe stand replacing disturbance, and have developed a complex structure characterized by large, live and dead trees, down woody

debris, multiple canopies and multi-aged trees, and a distinctive habitat with a diverse group of plants, fungi and animals.

Questions

1) What criteria are needed for a universal definition framework that motivates mature and old-growth forest conservation and can be used for planning and adaptive management?

Old growth is a subjective term that is open to interpretation. The definition needs to be specific to forest type, site conditions, and disturbance history. Develop quantitative criteria that can be applied to the definition.

2) What are the overarching old-growth and mature forest characteristics that belong in a definition framework?

Criteria needs to consider: stand age, structural characteristics by forest type and site class; tree size, tree density, multi-canopy structure, amount of snags and down large woody debris. Also, consider presence of wildfire and other disturbance agents that periodically sustain forest stand characteristics.

3) How can a definition reflect changes based on disturbance and variation in forest type/composition, climate, site productivity, and geographic region?

Include forest type and ecological zone in the definition.

4) How can a definition be durable but also accommodate and reflect climate and forest composition changes?

Include quantitative criteria that can be monitored and assessed regularly.

5) What, if any, forest characteristics should a definition exclude?

None given

Mississippi Forestry Commission

Old Growth – Typically refers to age and how timber is grown. This is old, slow-grown timber in the climax stage of forest development. Theoretically it could be either naturally or artificially regenerated, but primarily it is natural regeneration with the different successional stages leading to the climax stage without experiencing a significant disturbance such as thinning/harvesting. One would also expect this to be mixed species at various canopy levels with some gaps in the canopy. Individual trees would be slow growing and thereby have a greater ring count and higher wood density.

Mature –Typically a biological term referring to the age of the trees, but often also refers to the age of the stand. A mature specimen of a specific tree species may live to be much older than the target

“mature” age a landowner or forester is managing for in a stand. Mature stands have peaked in their growth rate and stand volume, which have both levelled off. These stands may be natural or artificially regenerated. Mature stands may have had significant disturbances such as thinning/harvesting and may be either mixed stands or a single species management regime. Individual trees in this category can exhibit either fast or slow rate of growth.

An **over-mature** stand is showing decreased volumes due to mortality which is usually in relation to site conditions and stocking levels.

Connecticut Department of Energy and Environmental Protection, Division of Forestry

The State of Connecticut has no regulatory or statutory definition of mature or old-growth forests. However, the CT Division of Forestry’s service foresters have developed the following definition of old-growth forests:

A term referring to the physical and ecological condition of a forest stand. **Old-growth** is characterized jointly by its structure and function. Old-growth forests are dynamic systems, each unique in appearance.

This definition is disseminated through the service foresters’ outreach and education targeted at forest landowners, natural resource professionals, and the general public.

1) What criteria are needed for a universal definition framework that motivates mature and old-growth forest conservation and can be used for planning and adaptive management?

There must be a clear distinction between mature forests and old-growth forests.

There must be an articulation of the values associated with mature forest and old-growth forest (why do we need these types of forests? Ecologically, socially/culturally, economically, etc.).

There must be a separate explanation of how mature forests and old-growth forests are created. This involves natural succession, natural disturbance, active human management, and combinations thereof. This must include multiple management pathways and outcomes, including

- Mature forest actively managed to create old-growth forest
- Mature forest passively managed to create old-growth forest
- Mature forest actively managed to create other conditions such as young forest
- Old-growth forest actively managed to maintain old-growth characteristics
- Old-growth forest passively managed

The definition framework for old-growth forests should place emphasis on complexity. Complexity is the single most defining characteristic of old-growth forest. This includes

complexity in forest structure, above and below ground structure, as well as in functional processes.

2) What are the overarching old-growth and mature forest characteristics that belong in a definition framework?

Old-growth and mature forests each have their own definition. These are two separate terms, they are not synonymous, and they must be defined, explained, and managed separately.

Old-growth forests contain the following characteristics:

- Old-growth forests are structurally complex systems that contain various structural elements, including:
 - Size classes (tree seedlings, tree saplings, pole-sized trees, large living trees)
 - Age classes (adolescent trees, mature trees, senescent trees, standing dead trees in a variety of size and decay classes)
 - Arrangement (spatial variability of CWD in a variety of size and decay classes, patches of open canopy, variable densities, diverse understories, active foliage in all vertical layers)
- Old-growth forest have functional processes, including:
 - A functional representation of trees in many age and size classes
 - Unique carbon accumulation and storage dynamics
 - Specific rainwater infiltration dynamics
 - An ability to recover abiotic and biotic disturbances without compromising old-growth attributes

3) How can a definition reflect changes based on disturbance and variation in forest type/composition, climate, site productivity, and geographic region?

The definition must convey an understanding that old-growth forest characteristics, achievement thereof, and associated benefits/values vary based on forest cover type and geographical region.

The structural and/or functional characteristics of an old-growth forest in one region/forest type may not be relevant to an old-growth forest in a different region/forest type. One cannot necessarily apply definitions/research from a certain region/forest type to a different one. We do not believe that there is a specific relationship between whether or not a forest is old-growth and when it was most recently disturbed. A recent disturbance does not preclude a forest from being old-growth. This includes natural and human disturbances.

- Old-growth forests can be created by active human management. In the US northeast, this often expedites the achievement of structural characteristics relative to passive management
- Old-growth forests can be created by passive human management

- Old-growth forests can be created by natural disturbances
- It does not matter if and when a forest was logged; if the forest meets the criteria put forth for an old-growth forest, it is an old-growth forest
- Old-growth is not to be considered as age relative to surrounding forests
- Old-growth forests can be maintained by active human management, passive human management, natural disturbances, and any combination thereof

4) How can a definition be durable but also accommodate and reflect climate and forest composition changes?

As written/provided above, the definition created for old-growth forests is durable and accommodating to change because it relies upon structure and function. Avoid including specific requirements for tree species, species compositions, or disturbance types when defining old-growth forests.

Climate change is changing the types of forest disturbances and their intensities and frequencies. This may create an old-growth forest where one did not previously exist, or it may change a forest from old-growth to a different type of forest, at least temporarily. As such, an old-growth forest condition is not limited to the occurrence of a disturbance.

5) What, if any, forest characteristics should a definition exclude?

- Tree or stand age
- Land-use history
- Logging
- Ownership
- Conservation status
- Tree size
 - Definition must include presence of different size classes
 - Definition must NOT include specific diameter/height/volume requirements
- Species composition, specific tree/plant/wildlife species

Montana Department of Natural Resources and Conservation, Forestry Division

Montana has an Old Growth definition that applies to forested School Trust lands. It is codified in the state through Administrative Rule and reads as follows:

"**Old growth**" means forest stands that meet or exceed the minimum criteria for number, diameter, age of large trees, and stand basal area as noted in "Old-Growth Forest Types of the Northern Region" by P. Green, J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann (1992 and subsequent revisions, USFS Northern Region, internal report).

Maryland Forest Service

LAWRENCE J. HOGAN, JR., Governor Ch. 339 – 1 – Chapter 339 (House Bill 884) AN ACT concerning State Conservation Land – Old–Growth Forests – Protection Management FOR the purpose of establishing protections for old–growth forests located on State conservation land requiring the Department of Natural Resources to manage certain State conservation land in a certain manner under certain circumstances; providing that nothing in this Act may be interpreted to prohibit the Department from taking certain actions to protect old–growth forest from certain harms subject to certain conditions; and generally relating to old–growth forests. BY adding to Article – Natural Resources Section 1–406 Annotated Code of Maryland (2018 Replacement Volume and 2021 Supplement)

Whereas, The State of Maryland recognizes the unique cultural and ecological benefits of preserving old–growth forests; and whereas, At present, many of the old–growth forests located on land preserved under the State’s land conservation programs lack formal protection; now, therefore,

SECTION 1. BE IT ENACTED BY THE GENERAL ASSEMBLY OF MARYLAND, That the Laws of Maryland read as follows:

Article – Natural Resources 1–406. (A) (1) IN THIS SECTION THE FOLLOWING WORDS HAVE THE MEANINGS INDICATED.

(2) “OLD–GROWTH FOREST” MEANS A FOREST:

(I) AT LEAST 5 ACRES IN SIZE WITH A PREPONDERANCE OF OLD TREES, OF WHICH THE OLDEST EXCEED AT LEAST HALF THE PROJECTED MAXIMUM ATTAINABLE AGE FOR THE SPECIES; AND Ch. 339 2022 LAWS OF MARYLAND – 2 –

(II) THAT EXHIBITS SEVERAL OF THE FOLLOWING CHARACTERISTICS: 1. SHADE–TOLERANT SPECIES ARE PRESENT IN ALL AGE AND SIZE CLASSES; 2. RANDOMLY DISTRIBUTED CANOPY GAPS ARE PRESENT; 3. A HIGH DEGREE OF STRUCTURAL DIVERSITY CHARACTERIZED BY MULTIPLE GROWTH LAYERS REFLECTING A BROAD SPECTRUM OF AGES IS PRESENT; 4. AN ACCUMULATION OF DEAD WOOD OF VARYING SIZES AND STAGES OF DECOMPOSITION ACCOMPANIED BY DECADENCE IN LIVE DOMINANT TREES IS PRESENT; AND 5. PIT AND MOUND TOPOGRAPHY CAN BE OBSERVED.

(3)

(I) “STATE CONSERVATION LAND” MEANS LAND THAT IS PROTECTED UNDER A LAND CONSERVATION PROGRAM ADMINISTERED BY THE DEPARTMENT OR THE MARYLAND ENVIRONMENTAL TRUST.

(II) “STATE CONSERVATION LAND” INCLUDES MEANS: 1. (I) STATE PARKS; AND 2. STATE FOREST RESERVES; 3. (II) WILDLIFE MANAGEMENT AREAS; AND (III) NATURAL RESOURCES MANAGEMENT AREAS;. 4. NATURAL RESOURCES MANAGEMENT AREAS; 5. STATE WILDLANDS; AND 6. LAND SUBJECT TO A CONSERVATION EASEMENT: A. WITHIN A DESIGNATED RURAL LEGACY AREA; B. HELD BY THE MARYLAND ENVIRONMENTAL TRUST; OR LAWRENCE J. HOGAN, JR., Governor Ch. 339 – 3 – C. FUNDED UNDER PROGRAM OPEN SPACE.

(B) WHENEVER THE DEPARTMENT OR THE MARYLAND ENVIRONMENTAL TRUST IDENTIFIES AN OLD–GROWTH FOREST ON STATE CONSERVATION LAND, THE LAND SHALL BE MANAGED IN A MANNER THAT:

PROHIBITS LOGGING.

- (1) MINIMIZES DISTURBANCE TO THE OLD–GROWTH FOREST;
- (2) PRIORITIZES PASSIVE RECREATIONAL OPPORTUNITIES;
- (3) PROHIBITS LOGGING OR THE CONSTRUCTION OF PUBLIC AMENITIES WITHIN THE OLD–GROWTH FOREST; AND
- (4) MINIMIZES RISKS TO THE OLD–GROWTH FOREST POSED BY DISEASE AND INVASIVE SPECIES.

(C) NOTHING IN THIS SECTION MAY BE INTERPRETED TO PROHIBIT THE DEPARTMENT FROM TAKING ACTIONS TO PROTECT OLD–GROWTH FOREST FROM FIRE, ANIMALS, INSECTS, DISEASE, AND EROSION IN A MANNER THAT HAS MINIMAL ADVERSE EFFECTS ON THE ECOSYSTEM AND SUBJECT TO CONDITIONS THE SECRETARY CONSIDERS NECESSARY. SECTION 2. AND BE IT FURTHER ENACTED, That this Act shall take effect October 1, 2022. Approved by the Governor, May 12, 2022

Wisconsin Department of Natural Resources

WI Division of Forestry/DNR Old Growth Definitions

Old Growth definitions can be found primarily in 2 locations:

The first is a general definition that can be found in the Wisconsin Biodiversity Report (WDNR, 1995). It defines old growth as

“a community with dominant trees at or near biological maturity. The structure of an old growth community varies with species and site. Old growth stands are sometimes characterized by a multi-layered, uneven age and size class structure; a high degree of compositional and structural patchiness and heterogeneity; and significant amounts of woody debris and tip-up mounds.”

This definition is primarily used to identify old growth stands.

The second place a definition is found is in the Old-Growth and Old Forests Handbook (2480.5) for planning and management purposes and is intended to capture both what is currently present as well as desired future conditions. **Old-growth** is broadly defined as:

The general definition for old-growth, as developed by the Wisconsin DNR is a forest that is “relatively old and relatively undisturbed by humans.”

And then there is a detailed classification system that breaks forest into ecological and management classes.

WDNR Classes Of Old-growth And Old Forest

Three ecological classes and four management classes of relatively old forest are conceptually and operationally defined. Stand level evaluations are emphasized, but a landscape perspective is maintained. In order to maintain definitions as simple and useful as possible, only a limited number of

criteria are emphasized, including disturbance history, age and age structure, and commitment to specified forest management goals.

The three ecological classes are defined based on disturbance history, age thresholds, and structural thresholds. Important considerations include developmental and successional stages, compositional and structural attributes, and site variability. *Ecological classes:*

- Relict Forest (includes Relict Old-growth Forest)
- Old-growth Forest
- Old Forest

The four management classes are defined based on long-term management goals and commitments. Each class has different management limitations. For any given stand or landscape, the potential commitment to different management goals and limitations would result in the long-term development of distinctive forest conditions. *Management classes:*

- Reserved
- Managed
- Extended Rotation (includes Big Tree Silviculture)
- Uncertain Management

The following section provides conceptual definitions. In practice, for a given stand or landscape, the ecological and management classes would be combined to describe current condition, developmental expectations, and management commitments and limitations. Within the cover type chapters, operational definitions for designating classes, ecological characterization of ecological classes, and management considerations for management classes are further refined.

This classification system is what we use to define old-growth and old forests and management for master planning purposes. The classes are combined to create a classification (e.g., managed old-growth).