- Direct spruce-fir management toward the following composition and structure goals:
  - At least 60% of the management area remains in stands with an average tree diameter of 4 inches or greater.
  - No more than 30% of the area with an average tree diameter less than 4 inches or without adequate stocking
  - Designate at least 10% to remain unharvested.

percent

- Consult with NHNHB to minimize impacts to protected plant species or exemplary natural communities and NH Fish and Game to minimize impact on protected wildlife.

N.H.

CROSS REFERENCE

Soil Productivity x.x, Cavity Trees, Dens and Snags 3.7, Rare Plants and Natural Communities x.x, Seeps x.x, Old Growth Forests x.x

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Good Forestry in the Granite State: Draft Sensitive Areas - Steep Slopes

X.X STEEP SLOPES

BACKGROUND

Steep slopes are especially vulnerable to erosion.
Good judgment is needed when determining harvest size and timing, when selecting the appropriate silvicultural method and harvesting system, and when laying out skid trails and truck roads. Proper use of the best management practices (BMPs) is needed during harvest operations and closeout. Extra care is needed when harvesting on steep slopes since misjudgments ~~will~~ be ~~greatly~~ amplified.

OBJECTIVE

can define how the percentage of slope is determined and over what size area or distance e.g. 25% on 500 ft vs 2,500 ft.

Limit erosion, maintain water quality and drainage patterns, and aesthetics on steep slopes.

CONSIDERATIONS

- ~~The term "steep slopes" can be subjective, ranging anywhere from 15-60%~~ to percent in pertinent ~~literature and local ordinances.~~ For the purposes of this document slopes greater than 25-35% to will be considered steep.
- Logging equipment continues to develop, becoming more powerful and capable of operating on slopes that were inaccessible in the past.
- Some logging equipment may be better suited to operating on steep slopes and may have less impact to the ground, resulting in less erosion.
- Skid trails and forest roads create more erosion potential than any other harvest activity particularly on steep slopes. Proper skid trail and truck road layout, installation, use and maintenance minimizes erosion even on steep slopes.
- Steep slopes often contain intermittent streams that are important to seasonal run-off but may not be apparent at some times of the year. Intermittent streams can fill rapidly with fast moving water during rain or at wet times of the year, and may pose serious erosion, water quality, and drainage pattern issues if they are compromised during harvest activities.
- The size of the harvest area and the silvicultural techniques used can ~~drastically~~ change the forest cover, resulting in less interception and uptake of precipitation, which may result in increased run-off on steep slopes.
- Steep slopes may contain thin, fragile, and unique soils, uncommon plants, exemplary natural communities and habitats.
- Steep slopes are often visible to surrounding viewsheds and the choice of silvicultural techniques may impact the aesthetic appeal of a harvest.

RECOMMENDED PRACTICES

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- Select a harvesting system that is appropriate for the terrain and conditions.
- Schedule harvests during periods of dry or frozen ground conditions to minimize impacts.
- Increase buffer widths and riparian management zones along wetlands, streams, rivers, ponds and lakes on slopes greater than 25%. percent
- Minimize the potential of increased run-off and erosion, as well as possible impacts on surrounding viewsheds by avoiding clearcuts on slopes greater than 35% except when salvage operations are necessary, or when a well established understory is present. percent
- Layout skid trails and truck roads prior to the start of operations. Identify intermittent streams in the harvest area and minimize temporary crossings. To help slow down and spread out run-off, avoid long continuous skid trails. Use the natural contours of the land to establish breaks in the grade and to create small bends and turns.
- During the course of the operation apply liberal amounts of slash and tree tops to help stabilize skid trails.
- Monitor weather forecasts throughout the operation and prepare skid trails in advance of heavy rains. Construct temporary water bars and suspend operations in severe weather when erosion potential is the greatest.
- When operations are completed, close out skid trails and truck roads as soon as possible. Remove temporary crossings and install water bars and ditches as recommended in the BMPs. Seed and mulch skid trails and truck roads to further stabilize exposed areas.
- Check local ordinances, some towns have regulations pertaining to harvesting on steep slopes.
- Check with the N.H. Natural Heritage Bureau for rare plants and wildlife or exemplary natural communities.

CROSS REFERENCE

Choosing the Right Harvesting System, Logging Aesthetics, Soil Productivity, Water Quality, Riparian

ADDITIONAL INFORMATION

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Good Forestry in the Granite State: Draft Sensitive Areas - Cultural Resources

6.6 CULTURAL RESOURCES

BACKGROUND

Cultural resources are the evidence left by people who once inhabited the land. They can be inadvertently damaged during logging operations.
Knowing about these resources can provide an important link to the past. They might have religious significance, provide information to archeologists, be of interest to the local historical society, or provide an attraction for visitors.

Cultural resources include stone walls, cellar holes, sugar shacks, logging camps, old dam sites, cemeteries, Native American ceremonial grounds, or the trash dumps of old farmhouses. Landscapes can also be cultural resources, generally a combination of structures and sites that give a sense of a time or lifestyle. Old farmsteads with fields and apple orchards and lilac bushes are a good example.

The key to protecting cultural resources is to identify clues on the ground and plan management activities accordingly.

OBJECTIVE

Protect cultural resources during harvesting operations.

CONSIDERATIONS

- In some cases it may be impossible not to damage a cultural resource.
- Native American sites and cemeteries have certain legal protections (RSA 227-C). Stone walls along scenic roads also may have legal protection, depending on whether the town has designated the road as scenic under RSA 231:157-158. Stone walls serving as boundaries are protected under RSA 472:6.

RECOMMENDED PRACTICES

- When a evaluating a property for timber, include cultural resource locations and issues.
- Management strategies around the cultural feature may include:
  - No disturbance.
  - Minimal disturbance such as felling but no equipment.
  - Minimal disturbance such as using light equipment or operations on frozen ground.
- Flag the area and show the contractor and crew the areas to protect.
- Fell trees away from cellar holes, quarry sites, or other depressions with historic significance~~,and~~ don't pile slash or garbage in ~~them.~~ these areas.

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- Avoid skidding over stone-faced bridges or culverts. Use a deck to cover old culverts, if existing roads and bridges are used.
- Use existing stone wall openings (barways) when possible. Limit the number of new openings and cut only the minimum width necessary. Leave openings for future use or restore the wall when work is completed.
- Protect wells by installing concrete well covers whenever possible.
- When a cultural resource can't be protected from damage, photograph the site and mark its location on a map for future historians.
- Contact the New Hampshire Division of Historical Resources for additional advice about documenting cultural resources. N.H.

CROSS REFERENCE

Permanent Openings 3.2.

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Good Forestry in the Granite State: Draft Nontimber Forest Products - Additional Reading

Topics in this section

Non-Traditional Forest Products
Maple Sugaring
Ecosystem Services

Good Forestry in the Granite State: Draft Non-timber Forest Products - Non-traditional forest products

X.X NON-TRADITIONAL FOREST PRODUCTS

BACKGROUND

Non-timber forest products (NTFPs) are part of a functioning ecosystem and may be vulnerable to over-harvesting.

NTFPs are products from the forest that don't involve harvesting trees. They include nuts and seeds, berries, mushrooms, oils, foliage, and medicinal plants. People collect them for a variety of reasons. X connect X them to the land, increases understanding of woodland ecology, and provides products for home use or for sale for extra income.

These activities

A complete list of all NTFPs is too lengthy for this chapter. There are about 2,000 plants that grow in the state and they all have value as NTFPs, if not for home use or market potential, then for education and study. Table 1 lists examples of NTFP found in New Hampshire.

OBJECTIVE

To increase knowledge and awareness of non-timber forest products and avoid over-harvesting.

CONSIDERATIONS

- It is unlawful to collect plants protected under the Native Plant Protection Act of 1987 without landowner permission. However, "Nothing in this section shall limit the rights of private property owners to take protected species on their own lands" (RSA 217-A).
- On the White Mountain National Forest, a permit is required to remove plants or other types of forest products.
- Rules relating to all state-owned parks and to N.H. NH Department of Resources and Economic Development (DRED) properties state that "No person shall remove or damage any structure, plant, marine life, or natural feature on DRED properties." (Res 7301.05).
- More research is needed to determine strategies for sustainable management of NFTPs.
- Accurate identification is essential to prevent poisoning from wild plants and mushrooms and to prevent picking of threatened and endangered species or plants of special concern. Any harvesting of these species, such as American ginseng, is unsustainable.
- Removing whole plants without consideration for regeneration isn't sustainable.
- Different habitats support different NTFPs. Riparian areas and other forest wetlands typically provide habitat for a large number of plants. Fields, meadows, and other open spaces within or adjacent to woodlands are also important for sun-loving NTFPs, for example weedy edible greens.
- Because they don't spend enough time outdoors to appreciate the abundant values

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offered in nature, our kids have "nature deficit disorder." The study of NTFPs is a hands-on, mostly outdoor activity which should be of great interest to our children.

- For business enterprises:
  - Adding value beyond collecting NTFPs increases income. Examples include balsam fir branches made into wreaths, mushrooms dried to concentrate their flavor and wildflowers pressed and applied to lampshades.
  - Locating markets, no matter how small, increases income. Direct marketing, where products are sold directly to the consumer (e.g., farmers markets), is usually the most profitable for NTFP entrepreneurs and is often the most appropriate option for small-scale NTFP businesses. Wholesale marketing involves a broker, who then sells to the customer. Niche markets are small specialty areas. Drying mushrooms to enhance flavor is an example of a niche market.

RECOMMENDED PRACTICES

- Don't harvest threatened or endangered species or species of concern.
- To maintain sustainable populations of NTFPs:
  - Collect only moderate quantities.
  - Gather from a large group, rather than a small group with a few individuals.
  - Understand the growth and regeneration habits of the specific plants and use collection techniques that maintain healthy populations. Taking just leaves, tender tips, and stems may encourage growth.
  - Learn plant parts at all stages of development during different seasons to be sure you know what you are harvesting.
- Coordinate with timber harvesting and tending to help the sustainable flow of all forest products including NTFPs. Mapping locations of NTFPs prior to harvesting and then taking care of those sites will help provide high-quality NTFPs. For example, white birch trees could be located, and their birch bark removed prior to timber harvesting.
- Whether you are interested in casual collecting or starting a small business, inventory the natural resources on your land, including NTFPs. This will help determine whether an NTFP enterprise is viable given the availability and sustainability of the resource. Understanding what you have is the best way to make sustainable choices about collection.

Table 1. Examples of Non-timber Forest Products

NTFP	Uses	Examples of Species in NH Forests
bark	• medicinal extractions • baskets	• slippery elm (*Ulmus rubra*) • birch (*Betula spp.*) • black ash (wood strips)
berries and wild fruit	• wine • jams and preserves • sauces • cider	• apples (*Malus spp.*) • wild blackberry (*Rubus spp.*) • blueberry (*Vaccinium spp.*) • red and black raspberry (*Rubus spp.*) • currants and gooseberries (*Ribes spp.*)

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cones and seeds	• floral and wreath arrangements • fire starters • wildflower seed mixes	• white pine (*Pinus strobus*) • red spruce (*Picea rubens*) • balsam fir (*Abies balsamea*) • eastern hemlock (*Tsuga canadensis*) • switchgrass (Panicum virgatum) • creeping red fescue (*Festuca rubra*)
forest botanicals	• herbs and spices • edible greens, roots or tubers • medicinal plants	• red raspberry leaves • rose hips (*Rosa spp.*) • dandelion (*Taraxacum officinale*)
greenery, transplants, and floral products	• decoration • crafts • landscaping	• balsam fir (*Abies balsamea*) • winterberry holly (*Ilex verticillata*) • grape (*Vitis spp.*) • dogwoods (*Cornus spp.*) • cinnamon fern (*Osmunda cinnamomea*) • various wildflowers
honey	• food	• blackberries and raspberries (Rubus spp.) • blueberries (Vaccinium spp.) • American basswood (*Tilia americana*) • black locust (*Robinia pseudoacacia*) • asters (*Aster spp.*) • goldenrod (*Solidago spp.*) • Clover (*Melilotus spp.*)
mushrooms	• food • medicine	• black trumpet (*Craterellus fallax*) • chantarelle (*Cantharellus cibarius*) • hen of the woods (*Grifolia frondosa*) • oyster mushroom (*Pleurotus ostreatus*) • shiitakes (*Lentinus edodes*) • birch conk (*Piptoporus betulinus*) • chaga (*Inonotus obliquus*) • tinder conk (*Fomes fomentarius*)
nuts	• food	• shagbark hickory (*Carya ovata*) • hazelnuts (*Corylus americana and C. cornuta*) • beechnut (*Fagus grandiflora*) • butternut (*Juglans cinerea*) • black walnuts (*Juglans nigra*)
spruce gum	• medicine • gum • patching birch bark canoes	• red, white and black spruce (*Picea rubens, P. glauca, P. mariana*)

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Good Forestry in the Granite State: Draft Non-Timber Forest Products - Maple Sugaring

x.x MAPLE SUGARING

BACKGROUND

Sap production in a sugarbush relies on developing and maintaining large, spreading crowns in maple trees.

A sugarbush, or sugar orchard, is a stand tapped for maple syrup. Sugarbushes can become overcrowded and tree vigor and sap production can decline. Rarely do maple trees develop large, spreading crowns naturally in the competitive forest setting. To achieve such crowns, the tops of maples must be released through thinnings and improvement cuts – preferably throughout all stages of development. Often sap-producing maples growing in a mixed forest compete with other maples and with other kinds of trees. Overcrowding and competition for light and other resources negatively affects sugar content and sap amount and reduces stand vigor.

OBJECTIVE

Manage existing maples in sugarbushes to have large, spreading crowns. Regenerate maples to replace declining or overmature maples. Tap maple trees so tree health and vigor won't be adversely affected, and so market value of the upper logs won't be compromised.

CONSIDERATIONS

- Sugar maples produce the sweetest and the most sap, but red maples can be tapped.
- Red maple "buds out" earlier than sugar maple. Sap from "budded-out" trees can produce an off-flavor. Bucket collection systems are better adapted to mixed red and sugar maple bushes than tubing collection systems. When red maple buds swell, collection from those buckets can stop.
- Maples are often found in mixed stands with other trees suitable for timber production, wildlife habitat or aesthetics and not maple sap production
- Silvicultural actions taken to develop large, full crowns in maples will most likely result in an open park-like appearance to the stand.
- Tree vigor and production will decline in older maples. Establishing a new crop of trees through regeneration harvests and release of advanced regeneration sustains sap production.
- Sugarbushes can either be even-aged or uneven-aged. Each stand structure requires its own silvicultural prescription ~~in order~~ to maintain vigor and health and ~~in order~~ to regenerate a new cohort of maple trees.
- Some sugarbushes are declining because they (1) have been established and tapped ~~a long time~~ for many years, (2) aren't on soils ideal for optimal maple development, and (3) have root and stem damage from logging or yearly maintenance. Stand age and the effects of tapping, combined with off-site development can all lead to stand decline.

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- While coniferous cover around the sugar bush edge may help minimize wind damage, conifers may create habitat for unwanted wildlife such as porcupines and squirrels that are apt to gnaw on tubing.
- Sugarbush health can be affected by ~~a number of~~ several factors out of landowner control. Ice storms, insect outbreaks, drought, acid deposition, and other stressors affect sap production and sugar content. Sugarbushes in good health and on better sites will be better able to tolerate these uncontrollable forces.
- Tapping injures the tree. The tree's ability to recover from this injury, and the overall health and productivity of the sugarbush, is closely related to tree health and environmental stresses.
- When tapped correctly, healthy, vigorous trees will respond to tapping by compartmentalizing the wound and close the tap hole within one to three years. Trees in poor health and those under stress during the growing season won't respond as quickly as healthier individuals. This slow response to injuries may result in a greater area of decay and potentially a decline in health, production and quality.
- Traditional tapping guidelines allowed for tapping smaller trees and using more taps. Newer, more conservative tapping guidelines minimize the impact of tapping while maintaining or in some cases even increasing sap production.
- Trees harvested from sugar orchards for firewood for maple syrup production are exempt from the yield (timber) tax (RSA 79).

is it just from sugar bush or is all wood cut & burned exempt?

RECOMMENDATIONS

- Manage for a diversity of species, but select for healthy maples. An abundance of species and age classes will meet other forest stewardship objectives and create a resilient, diverse forest.
- Select maple crop trees for large crowns, sugar content, vigor, and form. Timber quality may not be a priority, but a maple with good form will tolerate the stresses of wind, snow and ice better than one with decay, cavities and poor branching patterns. Crop tree release maple trees to promote large, full crowns.
- Improvement cuts and thinnings shouldn't immediately reach the final spacing or density of a mature sugar bush. Instead, thin gradually to promote crown development. Excessively releasing maples may over-expose them and cause die-back or mortality. Thinnings should follow silvicultural guidelines based on stand density and tree and crown size.
- Time thinnings with tubing system replacements.
- Regenerate when appropriate and encourage new trees through releasing and thinning to grow to production size, especially in long-established sugarbushes.
- Follow best management practices (BMPs) to maintain water and soil quality, nutrients, wildlife habitat and forest health.
- Follow these tapping guidelines for tree health
  - Tap only trees 12 inches dbh and larger.
  - Place one tap hole in trees 12 to 18 inches dbh and two tap holes in trees greater than 18 inches dbh. Place no more than two tap holes per tree.
  - Drill tap holes at a slight upward angle to avoid pooling of sap.
  - Use the smaller diameter "health spouts" (5/16 or 19/64 inch spouts). Health spouts are preferred but the 7/16 inch spouts are still acceptable and common

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when using buckets to collect sap.
    - Avoid tapping when the wood is frozen.
    - Drive spouts with care to avoid splitting the bark and wood.
    - For 7/16 inch spouts, place the tap hole no more than 2 1/2 inches deep and for the smaller diameter spouts, no more than 1 1/2 inches deep.
    - Tap only white, clean wood. To avoid areas of discoloration and decay, don't place new tap holes within 6 inches horizontally and at least 2 feet directly above or below old tap holes.
    - Make sure "drops" (tubing attached directly to the spout) are of sufficient length so tap holes can be placed on all sides of the tree. This avoids clustering of tap holes.
    - Don't re-tap existing holes in any given year to expose new wood or drill new holes to prolong the sap run.
    - Don't use a tap hole sanitizing agent.
    - Remove spouts from tap holes immediately after the season.
- Attach tubing systems, including mainlines, to trees with protectors, such as wooden blocks, to protect the tree from stem injury or girdling. Avoid driving nails, lags, screw eyes, or other hardware into the trees.
- Prevent damage to tree trunks and roots, and roads and trails from sap-gathering or maintenance vehicles, such as tractors, trucks, sleds or trailers. Set collection containers so they are easily accessible.
- Avoid tapping trees that may yield high quality logs, if growing sugar maple sawlogs is an objective,
- Allow other native tree species to grow, especially if they aren't competing with maples and don't attract nuisance wildlife that cause damage to tap lines.

CROSS REFERENCE

x.x Regeneration, x.x Managing for High Value Trees, x.x Insects and Disease, x.x Ice and Wind Damage, x.x Controlling Logging Damage

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Good Forestry in the Granite State: Draft Non-Timber Forest Products - Ecosystem Services

x.x ECOSYSTEM SERVICES

BACKGROUND

Forests provide a myriad of services that are beneficial to human welfare- wildlife habitat, water quality, storage and regulation of storm flows, erosion control and sediment retention, recreation, aesthetics and carbon storage. These public benefits, known as ecosystem services, are provided by the forests of thousands of private landowners who keep their forest as forest.

Historically, ecosystem services haven't been given a dollar value in the market, but this is changing. Programs to compensate landowners for the services their lands provide are emerging. The intention of these programs is to provide an incentive to landowners to keep their land in forest.

Although there are regional projects where landowners are compensated for the services their land provides, carbon is currently the only ecosystem service that has a global market. Work and research continues on the valuation of other services. New markets for ecosystem services may emerge as the public becomes more aware of their importance. Wetlands banking, conservation banking, and other landscape-level efforts to protect the values and services provided by natural landscapes are already established in regions around the country. Private landowners stand to benefit from growing markets for ecosystem services. Compensation for services provided by the forest may some day provide an income stream and thus an incentive to participate in ecosystem services markets.

Carbon Sequestration Markets (Carbon Offset Markets)

All forests store carbon. The rate and quantity of carbon stored varies by forest type, age and structure. Carbon markets, which provide credible standards by which carbon storage is measured and verified, are developing and give forest landowners an opportunity to measure and monitor the carbon stored in their forests and sell credits on an open market. Carbon credits are purchased by carbon emitters seeking to offset their carbon emissions. Currently these markets within the United States are entirely voluntary, though the development of a mandatory national carbon "cap-and-trade" system would change this situation considerably.

The Regional Greenhouse Gas Initiative (RGGI), a consortium of 11 eastern states that creates mandatory emission reduction targets for large electric generation facilities, is currently the nation's only regulated carbon cap-and-trade system. However, managed forest projects are not currently eligible for offset credits under RGGI.

Carbon credit transactions may be private transactions between parties or coordinated through centralized registries or exchanges. The primary registry for forest carbon offset

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credits that has emerged is the Climate Action Reserve (CAR).

Developing a carbon offset project is complex and expensive, involving inventory, monitoring and verification costs above and beyond what is necessary for a normal forest management plan. Currently, participation in these markets is only feasible for large landowners, though Congress is considering proposals that would make these markets more accessible to smaller landowners. Some carbon offset project development companies are developing programs to aggregate multiple smaller landowners. Participation in these markets also imposes long-term commitments and expenses.

These markets have reached the point where they currently provide a viable source of income for at least some landowners, though because the field is changing rapidly, the long-term prospects for participation by a range of landowners, as well as the financial value of these markets, is difficult to predict.

Other Markets

There are other models of compensating landowners for their good stewardship to ensure their forests continue to provide ecosystem services. Wetland mitigation banking and conservation banking for endangered species mitigate unavoidable impacts on aquatic resources and endangered species from development or other activity. The "bank" is a restored, enhanced or conserved area maintained to specific contractual standards by the bank owners. The banks are subject to regulatory review. Mitigation or conservation credits, which provide a specific ecosystem function, are sold to companies whose projects have an unavoidable impact on a similar resource. For example, if a project impacts a specific endangered species habitat the purchased credit must support that same species habitat in the bank. These mitigation banks aren't currently in New Hampshire but have been used in other states, such as California and Florida, for decades.

CONSIDERATIONS

- Forest ecosystems converted to other land uses cease to provide ecosystem services.
- Protecting forest land in perpetuity with a conservation easement is one way to ensure that forests continue to provide ecosystem services.
- Human-engineered systems that replace ecosystem services lost through forest conversion generally are expensive, require technology not yet developed or perfected, and aren't as efficient or cost-effective as what a natural ecosystem provide.
- Voluntary carbon markets and standards by which carbon is measured and traded continues to develop and change.
- Carbon markets and carbon trading are in their infancy. It has yet to be proven whether participation in carbon exchange programs will be successful at providing an income stream and an incentive for landowners to participate in this market.
- Landowners interested in participating in carbon markets will need to establish a baseline inventory of their woodlot. Protocals for carbon inventories are being developed.
- The Farm Bill of 2008 authorizes the U.S. Secretary of Agriculture to "establish technical guidelines that outline science-based methods to measure the environmental services benefits from conservation and land management activities in order to facilitate the participation of farmers, ranchers, and forest landowners in emerging

environmental services markets.

RECOMMENDED PRACTICES

- Discuss your interest with your forester.
- Establishing a baseline inventory of their woodlot.
- Participate in a forest certification system, such as the American Tree Farm System, Forest Stewardship Council, or the Sustainable Forestry Initiative. This may be required to participate in carbon markets and is likely to be required as markets for other ecosystem services are created.
- Identify aggregators, or organizations that put together the carbon stocks from several landowners, in their state or region. Private forest landowners will need to work with aggregators to participate in carbon trading.

CROSS REFERENCE

x.x Setting Objectives, x.x Forest Management Planning

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Good Forestry in the Granite State: Glossary

Please note that this glossary isn't complete and being added to as people request clarifications of terms in the manual.

GLOSSARY

Access road: A temporary or permanent route into forest land for over-the-road vehicles.

Age class: intervals of tree age used to describe stand characteristics, for example, 10 or 20 year age class.

Aquatic organism ??

Area Regulation: ??

Basal area: A measure of tree density. It is determined by estimating the total cross-sectional area of all trees measured at breast height (4.5 feet) and expressed in square feet per acre.

Beaver flowage: Flat water behind a beaver dam.

Best management practices (BMPs): A practice or combination of practices determined to be the most effective and practicable means of preventing negative impacts of silvicultural activities.

Biodiversity: The variety and variability of all living organisms.

biomass ??

Borrow pit: The area from which gravel is removed to build up a road bed.

Browse: Leaves, buds and woody stems used as food by woodland mammals like deer and moose.

Bucking: cutting a felled tree into segments.

Cambium ??

Canopy: The more or less continuous cover of branches and foliage formed by the crowns of adjacent trees and other woody growth.

Cavity trees: Trees, either alive or dead, which contain hollowed out areas. Used as shelter for a variety of animal species.

Clearcutting: see even-aged managment

Circumneutral seepage swamp ??

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Crop tree: A tree which is retained for maximum longevity in a stand due to desired characteristics such as commercial quality or biotic contribution.

Crown: The above-ground portion of a tree extending up and out from the first main branches on the stem.

Cutting cycle: The interval between harvesting operations when uneven-aged methods are employed using group or single-tree selection.

DBH.: (diameter at breast height) The average diameter of a standing tree, measured outside the bark, at a point 4.5 feet above the ground.

Diameter class: Intervals of tree size, often 1 or 2 inches used to describe stand characteristics. For example, 10" or 12" diameter class.

Diameter limit cutting: Harvesting practice in which trees within a designated diameter class are cut.

Early successional habitat - ??

Ecosystem: A community of species (or group of communities) and its physical environment, including atmosphere, soil, sunlight and water.

Ecosystem Integrity: The ability of an ecosystem to continue to function over the long term without the loss of biological diversity or productive capacity. The ecological integrity of an area is maintained when the following conditions are met:

1. All community types and successional stages are represented across their natural range of variation.
2. Viable populations of all native species are maintained.
3. Ecological and evolutionary processes, such as disturbance, nutrient cycling, and predation, are maintained.
4. The biological diversity in the area can respond naturally to change.

Ephemeral: Existing for a short time; short lived.

Epicormic sprouting: Small branches occuring on the stem and branches of some tree species, as a response to increased light often from thinning or removal of substantial portions of the tree crown.

Even-aged management: A timber management system that results in the creation of stands in which trees of essentially the same age grow together. Regeneration in a particular stand is obtained during a short period of time at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Cutting methods producing even-aged stands are (1) clearcutting; (2) patch clearing; (3) strip clearcutting; (4) shelterwood; and (5) seed tree.

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1. Clearcutting: an even-aged cutting method whereby most or all trees within a given area are removed in one cutting which leads to the establishment of an even-aged forest or stand. Reproduction of the new stand, either artificial or natural, is secured after cutting. Modifications of the clearcutting method include: patch clearcutting and strip clearcutting.
2. Patch clearcutting: a modification of the clearcutting method where the area being treated is removed in a series of clearcuts made in patches. Often employed to regenerate even-aged stands which cannot be reproduced by natural seeding if all trees are removed in a single cutting.
3. Strip clearcutting: a modification of the clearcutting method where the area being treated is removed in a series of clearcuts made in strips. Trees on the uncut strips furnish all or part of the seed for stocking the cut strips and protect the cutover area and the new crop. The width of the cut strips depends on the distance of effective seed dispersal, usually not exceeding 5 times tree height.
4. Shelterwood: a series of two or three harvests that gradually open the stand and stimulate natural reproduction of a new even-aged stand.
5. Seed tree method: an even-aged cutting method that removes most of the trees in one cutting except for a small number of trees left singly or in small groups to serve as a seed source for the establishment of regeneration.

Even-aged stand: All trees are the same age or at least of the same age class. A stand is considered even-aged if the difference in age between the oldest and the youngest trees does not excceed 20 percent of the length of the rotation. From an ecological viewpoint, the minimum size of an even-aged stand could be considered as the size of the largest opening entirely under the influence of adjacent mature timber. The opening of critical size might be that which, at the very center, exhibited the same temperature regime as any larger opening. Such an opening is probably about twice as wide as the height of mature trees.
Extirpation

Forb: An herb other than grass.

Ford: A structure built for crossing a stream.

Forester: A person trained in the science of developing, caring for and cultivating forests.
licensed in NH.

Forest Management: The application of business methods and technical forestry principles to a forest property to produce desired values, resource uses, products, or services from a forest (see Forest sustainability).

Forest Type: A natural group or association of different species of trees which commonly occur together over a large area. Forest types are defined and named after one or more dominant species of trees in the type.

Forest sustainability: The capacity of a forest to produce the goods we desire today without compromising the productive capability and biological integrity on which future generations

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will depend.
Girdling ??
Group selection: See uneven-aged management.

High-grading: An exploitive logging practice that removes only the best, most accessible and marketable trees in the stand.

Hydrology: The properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere..

Integrated resource management: The simultaneous consideration of various disciplines to balance competing demands on a natural system to maintain or enhance its health, diversity, and cultural and aesthetic value.

Landing: A place where trees and logs are gathered in or near a harvest site for further processing and transport.

Lopping: Cutting off branches, tops and small trees after felling, into lengths such that the resultant slash will lie close to the ground.
Natural resource professional
Overstory: The upper crown canopy of a forest, usually stated in reference to the largest trees.

Patch clearcutting: See even-aged management

Patch Retention: ??

Plantation: A stand of trees that has been planted or direct seeded.

Pole timber: A DBH size-class representing trees that are usually more than 4.0 inches DBH and less than 10.0 inches DBH.

Predation: The act of capturing and killing other animals for food.

Regeneration: The renewal of a stand of trees either by natural or artificial means.

Residual trees: Trees that are left to grow in the stand following a silvicultural treatment.

Revegetation: The re-establishment of vegetation on bare soil by natural or artificial means.

Rotation: The age at which a stand is considered ready for harvest.

RSA: Revised Statutes Annotated, the compilation of the laws of the State of New Hampshire.

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Sapling: Trees that are more than 4.5 feet tall but less than 5.0 inches DBH.

Sawlog: A log considered suitable in size and quality for producing lumber.

Scarification: Loosening topsoil, or breaking up the soil, in preparation for regeneration by planting, direct seeding or natural seed-fall.

Seedlings: Trees that are less than 4.5 feet tall.

Seed tree method: See even-aged management

Seep: A spot where groundwater oozes to the surface, forming a small pool.

Selection harvesting: The removal of trees, either as single scattered individuals or in small groups at relatively short intervals, repeated indefinitely, so that the continuous establishment of reproduction is encouraged and an uneven-aged stand is maintained.

Shelterwood: see even-aged management

Silviculture: The art and science of managing a forest.

Single tree selection: see uneven-aged management.

Site index: A measure of the relative productive capacity of an area based on tree height growth.

Site preparation: Removal of unwanted vegetation and other material, followed by cultivation as preparation for the planting or seeding of trees. Site preparation may include removal of slash and other debris, removal or control of competing vegetation, or exposure of bare soil.

Size class: Descriptive term defining the most common tree size in a stand, for example poletimber or saw-timber stand.

Slash: The residue left on the ground after felling, lopping, storm, fire, girdling or poisoning. It includes nonmerchantable portions of trees such as stumps, broken branches, dead trees and other debris left on the ground.

Snag: A standing tree generally left for wildlife management purposes.

Stand: A group of trees reasonably similar in age structure and species composition as to be distinguishable from adjacent areas.

Stocking: An indication of the number of trees in a stand as compared to the optimum number of trees to achieve some management objective, usually improved growth rates or timber values.

Strip cut: See even-aged management

Succession: The orderly and predictable replacement of one plant community by another over time in the absence of disturbance.

Supracanopy trees: Super dominant trees whose crowns protrude above the main crown canopy.

Sustainable forest management: See forest sustainability

Sustained yield: An annual or periodic output of products from the forest that does not impair the productivity of the land, generally harvesting equal to growth.

Take- capturing, killing, wounding, disturbing, harrying and similar acts against wildlife. This includes for threatened and endangered species, disturbances to active nests, dens or other shelter while it is being used for reproduction, raising of young, overwintering or other critical needs.

Timber – ??

Timber stand improvement (TSI): Silvicultural activities that improve the composition, constitution, condition and growth of a timber stand.

Uneven-aged management: The application of actions needed to maintain a continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a wide range of ages and sizes to provide a sustained yield of forest products. Cutting methods that develop and maintain uneven-aged stands include: (1) single tree selection; and (2) group selection.

1. Single tree selection: removal of trees as either single, scattered individuals or in exceedlingly small groups at relatively short intervals, repeated indefinitely, by encouraging the continuous establishment of reproduction and maintaining an uneven-aged stand.
2. Group selection: periodic removal of trees in small groups producing openings smaller than the minimum feasible acreage for a single stand under even-aged management leading to the formation of an uneven-aged stand with a mosaic of small and variable sized age class groups. Differing from single tree selection in that the predominant characteristics of the group rather than the individual stems, are evaluated for treatment.

Uneven-aged stand: A stand of trees that contains at least three well-defined age classes intermingled on the same area.

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Vernal pool: An ephemeral body of water that fills in the spring, holds water for at least 10 days, and dries up by the fall in some or all years and that does not contain fish.

Windfirm: The ability of the root system of a tree to withstand wind pressure and keep the tree upright.

Windrow: Slash, residue and debris raked together into piled rows.

Good Forestry in the Granite State: Appendix - Information Directory

INFORMATION DIRECTORY

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Good Forestry in the Granite State: Draft Appendix - Important Forest Soils

Important Forest Soil Groups

New Hampshire soils are complex and highly variable due primarily to their glacial origins. The Natural Resource Conservation Service (NRCS) soil mapping has recognized and inventoried these complex patterns and organized them into a useful and understandable planning tool, Important Forest Soil Groups. The objective is to provide a simplified yet accurate tool which is helpful natural resource professionals and landowners.

Important Forest Soil Groups managers evaluate the relative productivity of soils and to better understand patterns of plant succession and how soil and site interactions influence management decisions. All soils have been grouped into one of six categories, as described below. For a complete list, contact your local NRCS field office.

Group IA consists of the deeper, loamy, moderately well drained and well drained soils. Generally, these soils are more fertile and have the most favorable soil moisture relationships. Successional trends are toward climax stands of shade tolerant hardwoods, such as sugar maple and beech. Early successional stands frequently contain a variety of hardwoods such as sugar maple, beech, red maple, yellow, gray, and white birch, aspen, white ash, and northern red oak in varying combinations with red and white spruce, balsam fir, hemlock, and white pine. The soils in this group are well suited for growing high quality hardwood veneer and sawtimber, especially, sugar maple, white ash, yellow birch, and northern red oak. Softwoods are usually less abundant and are best managed as a minor component of predominantly hardwood stands. Hardwood competition is severe on these soils. Successful natural regeneration of softwoods and the establishment of softwood plantations requires intensive management.

Group IB generally consists of soils that are moderately well drained and well drained, sandy or loamy over sandy, and slightly less fertile than those in group 1A. Soil moisture is adequate for good tree growth, but may not be quite as abundant as in group 1A. Successional trends and the trees common in early successional stands are similar to those in group IA. However, beech is usually more abundant on group IB and is the dominant species in climax stands. Group IB soils are well suited for growing less nutrient and moisture demanding hardwoods such as white birch and northern red oak. Softwoods generally are scarce to moderately abundant and managed in groups or as part of a mixed stand. Hardwood competition is moderate to severe on these soils. Successful regeneration of softwoods and the establishment of softwood plantations are dependent upon intensive management. The deeper, coarser textured, and better drained soils in this group are generally suitable for conversion to intensive softwood production.

Group IC soils are derived from glacial outwash sand and gravel. The soils are coarse textured and are somewhat excessively drained to excessively drained and moderately well drained. Soil moisture and fertility are adequate for good softwood growth but are limiting for hardwoods. Successional trends on these soils are toward stands of shade-tolerant softwoods, such as red spruce and hemlock. White pine, northern red oak, red maple, aspen,

gray birch, and paper birch are common in early successional stands. These soils are well suited for high quality softwood sawtimber, especially white pine, in nearly pure stands. Less site-demanding hardwoods such as northern red oak and white birch have fair to good growth on sites where soil moisture is more abundant. Hardwood competition is moderate to slight. With modest levels of management, white pine can be maintained and reproduced. Although chemical control of woody and herbaceous vegetation may be desirable in some situations, softwood production is possible without it.

Group IIA consists of diverse soils and includes many of the soils that are in groups IA and IB. The soils in IIA, however, have limitations such as steep slopes, bedrock outcrops, erodibility, surface boulders, and extreme stoniness. Productivity of these soils isn't greatly affected by those limitations, but management activities such as tree planting, thinning, and harvesting are more difficult and more costly.

Group IIB soils are poorly drained. The seasonal high water table is generally at a depth of 12 inches or less. Productivity is lower than in IA, IB, or IC. Fertility is adequate for softwoods but is a limitation for hardwoods. Successional trends are toward climax stands of shade-tolerant softwoods, such as red spruce and hemlock. Balsam fir is a persistent component in nearly all stands. Early successional stands frequently contain a variety of hardwoods such as red maple, yellow, gray, and paper birch, aspen, and white and black ash in varying mixtures with red spruce, hemlock, balsam fir, and white pine. These soils are well suited for spruce and balsam fir pulpwood and sawtimber. Advanced regeneration is usually adequate to fully stock a stand. Hardwood competition isn't usually a major limitation, but intensive management by chemical control of competing woody and herbaceous vegetation may be desirable.

Not Rated Several mapping units in New Hampshire are either so variable or have such a limited potential for commercial production of forest products that they haven't been placed in a group. Examples are very poorly drained soils and soils at high elevations.

Good Forestry in the Granite State: Draft Appendix - Wildlife Species of Greatest Conservation Need

Species of Greatest Conservation Need (excluding coastal non-forested habitats, extensive grasslands or high alpine)				
Common Name	**Scientific Name**	**Status**	**Habitat**	**Recommendations in these chapters in GFGS will help these animals. "Sustainable Forestry" means that careful forest operations will benefit this animal. "Special" means this animal needs some particular management technique.**
INVERTEBRATES				
Dwarf wedge mussel	Alasmidonta heterodon	E	Stream	Forest Management in Riparian Habitats
Brook floater mussel	Alasmidonta varicosa	E	Stream	Forest Management in Riparian Habitats
Eastern Pondmussel	Ligumia nasuta	SC	Pond	Forest Management in Riparian Habitats
Ringed boghaunter dragonfly	Williamsonia lintneri	E	Wetlands, Pond	Wetlands
Scarlet Bluet	Enallagma pictum	SC	Wetlands, Pond	Wetlands
Pine Barrens Bluet	Enallagma recurvatum	SC	Wetland, Pond	Wetlands
Rapids Clubtail	Gomphus quadricolor	SC	Stream	Wetlands
Skillet Clubtail	Gomphus ventricosus	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Riverine Clubtail	Stylurus amnicola	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Coppery Emerald	Somatochlora georgiana	SC	Wetlands	Wetlands
Ebony Boghaunter	Williamsonia fletcheri	SC	Wetlands	Wetlands
Cobblestone tiger beetle	Cicindela marginipennis	E	Connecticut River	Forest Management in Riparian Habitats
Puritan tiger beetle	Cicindela puritana	E	Connecticut River	Forest Management in Riparian Habitats
Frosted elfin butterfly	Callophrys irus	E	Forest	Pine Barrens
Karner blue butterfly	Lycaeides melissa samuelis	E	Forest	Pine Barrens, Special
Persius duskywing skipper	Erynnis persius	E	Forest	Pine Barrens
Pine pinion moth	Lithophane lepida lepida	T	Forest	Pine Barrens
Sleepy Duskywing	Erynnis brizo brizo	SC	Forest	Pine Barrens
Barrens itame	Itame sp. 1	SC	Forest	Pine Barrens
Barrens xylotype	Xylotype capax	SC	Forest	Pine Barrens
Broad-lined catopyrrha	Erastria coloraria	SC	Forest	Pine Barrens
Cora moth (bird dropping moth)	Cerma cora	SC	Forest	
Phyllira tiger moth	Grammia phyllira	SC	Forest	Pine Barrens

P[illegible]barrens zanclognatha moth	Zanclognatha martha	SC	For[illegible]	Pine Barrens
FISH				
American brook lamprey	Lampetra bifrenatus	E	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Shortnose sturgeon	Acipenser brevirostrum	E	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Bridle shiner	Notropis bifrenatus	T	Stream, Pond	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Alewife (sea run only)	Alosa psuedoharengus	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
American Eel	Anguilla rostrata	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
American Shad	Alosa sapidissima	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Blueback Herring	Alosa aestivalis	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Rainbow Smelt (sea run only)	Osmerus mordax	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Sea Lamprey	Petromyzon marinus	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Banded Sunfish	Enneacanthus obesus	SC	Pond	Forest Management in Riparian Habitats
Finescale Dace	Phoxinus neogaeus	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Lake Whitefish	Coregonus clupeaformis	SC	Pond	Forest Management in Riparian Habitats
Northern Redbelly Dace	Phoxinus eos	SC	Stream, Pond	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Redfin Pickerel	Esox americanus americanus	SC	Stream	Streams, Stream Habitat and Crossings; Forest Management in Riparian Habitats
Round Whitefish		SC	Pond	Forest Management in Riparian Habitats
Swamp Darter	Etheostoma fusiforme	SC	Pond	Forest Management in Riparian Habitats
AMPHIBIAN				
Marbled salamander	Ambystoma opacum	E	Vernal Pool	Vernal Pools; Dead and Down Woody Material
Jefferson Salamander	Ambystoma jeffersonianum	SC	Vernal Pool, Wetland	Vernal Pools; Dead and Down Woody Material
Blue-spotted Salamander	Ambystoma laterale	SC	Vernal Pool, Wetland	Vernal Pools; Dead and Down Woody Material
Fowler's Toad	Anaxyrus fowleri	SC	Forest	
Northern Leopard Frog	Lithobates pipiens	SC	Grasslands, Grassy areas in Forests	Temporary Openings Created by Forest Management; Permanent Openings; Forest Management in Riparian Habitats
REPTILE				
Blanding's turtle	Emydoidea blandingii	E	Vernal Pool, Wetland	Vernal Pools; Wetlands
Spotted turtle	Clemmys guttata	T	Wetlands	Wetlands

Wood Turtle	Glyptemys insculpta	SC	Riparian Forest	Forest Management in Riparian Habitats
Eastern Box Turtle	Terrapene carolina	SC	Forest	
Eastern hognose snake	Heterodon platirhinos	E	Forest	Pine Barrens; Dead and Down Woody Material
Timber rattlesnake	Crotalus horridus	E	Forest	
Black racer	Coluber constrictor	T	Forest, openings	Temporary Openings Created by Forest Management; Permanent Openings; Dead and Down Woody Material
Smooth Green Snake	Opheodrys vernalis	SC	Grasslands, Forests	Permanent Openings
BIRD				
Northern Harrier	Circus cyaneus	E	Grasslands	
Golden eagle	Aquila chrysaetos	E	Forest	
Common nighthawk	Chordeiles minor	E	Forest	Pine Barrens
Sedge wren	Cistothorus platensis	E	Wetlands	Wetlands
Pied-billed grebe	Podilymbus podiceps	T	Wetlands	Wetlands
Common loon	Gavia immer	T	Pond	Forest Management in Riparian Habitats
Bald eagle	Haliaetus leucocephalus	T	Pond	Woodland Raptors; Forest Management in Riparian Habitats
Peregrine falcon	Falco peregrinus	T	Forest	High Elevation Forests
American three-toed woodpecker	Picoides dorsalis	T	Forest	High Elevation Forests; Cavity Trees, Dens and Snags
Spruce Grouse	Falcipennis canadensis	SC	Forest	
Least Bittern	Ixobrychus exilis	SC	Wetlands	Wetlands
Osprey	Pandion haliaetus	SC	Pond	Cavity Trees, Dens and Snags; Forest Management in Riparian Habitats
American Kestrel	Falco sparverius	SC	Forest	Cavity Trees, Dens and Snags
Sora	Porzana carolina	SC	Wetlands	Wetlands
Common Moorhen	Gallinula chloropus	SC	Wetlands	Wetlands
Whip-poor-will	Caprimulgus vociferus	SC	Forest	Pine Barrens
Olive-sided Flycatcher	Contopus cooperi	SC	Forest	
Horned Lark	Eremophila alpestris	SC	Grasslands	
Purple Martin	Progne subis	SC	Forest	Special
Bank Swallow	Riparia riparia	SC	Riparian banks	Forest Management in Riparian Habitats
Cliff Swallow	Petrochelidon pyrrhonota	SC	Grasslands	Special
Bicknell's Thrush	Catharus bicknelli	SC	Forest	High Elevation Forests
Golden-winged Warbler	Vermivora chrysoptera	SC	Forest	Temporary Openings Created by Forest Management; Permanent Openings
Cerulean Warbler	Dendroica cerulea	SC	Forest	
Eastern Meadowlark	Sturnella magna	SC	Grasslands	
Rusty Blackbird	Euphagus carolinus	SC	Wetlands	Wetlands
MAMMAL				
ll footed bat	Myotis leibii	E	Fo	

New England cottontail	Sylvilagus transitionalis	E	Shrub	Temporary Openings Created by Forest Management; Perma Openings; Pine Barrens
Canada lynx	Lynx canadensis	E	Forest	High Elevation Forests
Gray wolf (federally listed, not yet in NH)	Canis lupus	E	Forest	
American marten	Martes americana	T	Forest	High Elevation Forests
Eastern Red Bat	Lasiurus borealis	SC	Forest	Cavity Trees, Dens and Snags
Hoary Bat	Lasiurus cinereus	SC	Forest	Cavity Trees, Dens and Snags
Silver-haired Bat	Lasionycteris noctivagans	SC	Forest	Cavity Trees, Dens and Snags
Northern long-ear bat	Myotis septentrionalis	SC	Forest	Cavity Trees, Dens and Snags
Tricolored bat (fomerly Pipistrelle)	Perimyotis subflavus	SC	Forest	Cavity Trees, Dens and Snags
Northern Bog Lemming	Synaptomys borealis sphagnicola	SC	Forest	

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Appendices

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