



# Stewardship Handbook

for Family Forest Owners

## Stewardship Handbook for Family Forest Owners

*A Helpful Pocket Guide for Planning, Managing  
and Protecting Your Forest, Your Investment  
and Your Environment*

First Printing August 2005  
Second Printing August 2009

Published by the

**National Association of State Foresters**

with support from the  
U.S. Forest Service



A helpful pocket guide from the National Association of State Foresters for planning, managing and protecting your forest, your investment and your environment.





**ABOUT THIS PUBLICATION**

This publication is an updated version of the 2005 document, "A *Stewardship Handbook for Family Forest Ownerships*," which was developed by the NASF Forest Resource Management Committee and the (now inactive) Sustainable Forestry Implementation Committee. Both versions of the handbook are based on the 2003 NASF position statement, "Principles and Guides for a Well-Managed Forest."

**ABOUT NASF**

NASF is a non-profit organization that represents the directors of forestry agencies from the fifty states, eight U.S. territories and associated states, and the District of Columbia.

Through public-private partnerships, NASF seeks to discuss, develop, sponsor and promote programs and activities which will advance the practice of sustainable forestry, the conservation and protection of forest lands and associated resources and the establishment and protection of forests in the urban environment.

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***"The handbook was very helpful to me and my husband in working with our consulting forester and others on the Landowner Forest Stewardship Plan for our property; and I continue to use it extensively in interactions with others about sustaining the forest assets of our region and state."***

Ruth McWilliams  
Co-owner, Catamount Lodge & Forest LLC



## PREFACE AND PURPOSE

The National Association of State Foresters deeply respects and appreciates the role and contribution of family forests in creating and sustaining the nation's beauty and bounty. NASF has written this handbook for the nation's nearly 10 million non-industrial forest and woodlot owners, with particular focus on those of you who are in the early stages of considering how best to care for your forest and become a successful steward.

First we discuss our seven principles of stewardship and the kinds of issues they raise. Then we help you apply these principles as you develop your own stewardship plan. Finally, we offer a sample framework of "indicators" to help you determine how well your plan is working.

We hope this handbook gives you the initial guidance and tools you need to organize and carry out your stewardship objectives. State forestry agencies are another resource that can provide vital assistance to forest landowners and communities to manage, maintain, and improve their forests and green spaces.

## INTRODUCTION

Today's forests are recognized as more than just trees—they are an interactive community of plants, animals, soils and water that influence their surroundings. Collectively, sustainably managed trees and forests provide thousands of jobs, serve as a renewable source of energy, mitigate and adapt to climate change and provide other societal benefits such as clean air and water, wildlife habitat, recreation opportunities and thousands of forest products. The public appreciation of and responsibility to our natural resources gives renewed emphasis to the concept of stewardship—reinforcing the idea that a forest owner can be more than just a guardian or investor, but also a steward who pursues personal goals today while sustaining opportunities for tomorrow.

Stewardship is the pursuit of a forest owner's personal goals within a set of principles that result in the overall and long-term health and vigor of a forest or woodlot. But the family forest owner who wants to “do right by the land” encounters both opportunities and challenges. This handbook is designed to help the family forest owner:

- understand the many issues involved,
- develop a stewardship plan, and
- recognize the results of good stewardship on the ground.

Your own ideas and goals form the basis for your plan and your actions. However, local professional expertise from your state forestry agency can provide specific information, data and effectiveness to support your progress and success.



## NASF STEWARDSHIP PRINCIPLES

Because forests are living and ever-changing, stewardship is always a work in progress; the sooner begun, the more regularly tended, the better the results. The first step is to lay the groundwork with sound principles.

- Principle 1** Contribute to the conservation and biological diversity of the forest and the surrounding landscape
- Principle 2** Maintain and improve productive capacity
- Principle 3** Maintain and improve the health and vigor of the forest and its landscape/watershed
- Principle 4** Protect soil and water resources
- Principle 5** Pursue carbon-friendly management and promote biomass as a renewable energy source
- Principle 6** Consider socioeconomic benefits
- Principle 7** Comply with laws, rules and guidelines

These principles apply to your forest or woodlot in ways that are specific to your own property and your own goals. This section will expand on what each principle means and on some of the issues that each principle addresses.

**PRINCIPLE 1**

*Contribute to the conservation and biological diversity of the forest and surrounding landscape*

Like all forests, yours includes both trees and other plant life such as shrubs, ground cover and even mosses and algae in your shady places or around your seeps and springs. Your forest is also a habitat for resident and migrating animals, including game and non-game, and even for the insects in your soil and water.

Your forest's community of plants and animals (referred to as biodiversity) is part of a broader mix of communities across your surrounding landscape (or watershed), like a patch in a quilt.

**PRINCIPLE 2**

*Maintain and improve productive capacity*

Like most forests, yours could provide income from timber sales, as well as a broad range of other goods and services, such as habitat leaseable to local hunting clubs, mushroom gatherers, or trail enthusiasts. But productivity also includes such nonmarket services as stormwater filtration for your local watershed, the nesting cavities and insects offered to songbirds by a snag (standing dead tree), and even your success in preventing the establishment of invasive species, such as kudzu, emerald ash borer or cogongrass.

On a broader scale, your forest's productivity also contributes to the local potential to attract and sustain economic investment. Be it a lumber or paper mill, trail networks, clean and productive waters or tourism for bird-watching, investments such as these sustain your local community as well as the regional economy.

**PRINCIPLE 3**

*Maintain and improve the health and vigor of the forest and its landscape/watershed*

The life cycles of your forest's plants and animals ebb and flow with age and climate, as well as with the cycles of natural risks such as storms, insect invasions, wildfire, drought and even with similar events on adjacent lands and watersheds.

The degree of your forest's potential to influence and be influenced by the health and vigor of its surrounding landscape varies with its history and general condition, e.g., mix of species and ages.

**PRINCIPLE 4**

*Protect soil and water resources*

Your forest plays an important role in the fertility of its own soils (through such dynamics as leaf/needle-fall and its contribution to topsoil health), as well as the health and vigor of the food web of plants and animals that rely on that topsoil.

Your forest's role as a filter is critically important for both your own and your neighbor's land in your watershed. The filtering is achieved by forest litter, which catches water-borne sediment; by the cushion of foliage, which softens the impact of storm-driven rain; and by the sponge effect, which catches stormwater for gentle release over time.



#### PRINCIPLE 5

*Pursue carbon-friendly management and also promote biomass as a renewable energy source*

The release of greenhouse gases is an ongoing contributor to global warming. Research shows that this release can be significantly countered by a forest's use of carbon for growth and energy storage (called carbon sequestration). This stored carbon—quantified as “carbon credits” —is now a commodity that is traded on the Chicago Climate Exchange and a growing range of other markets.

Carbon credits from managed forests can provide income to some forest landowners who meet certain requirements.

Biomass (all forest-related organic matter, living or dead) can be used to create thermal, electric, and liquid energy products. Biomass harvested from sustainably managed forests is considered “carbon neutral,” that is, the carbon that is emitted from the combustion or other use of biomass is offset through carbon captured in new forest growth.



#### PRINCIPLE 6

*Consider socioeconomic benefits for local communities and economies*

In meeting your personal goals, consider also how your forest contributes to your community's economy and quality of life through such factors as providing local payrolls, supporting the local tax base and attracting related investment. Consider also such complementary elements as forest-based cultures, traditions and sense of well-being.



#### PRINCIPLE 7

*Comply with laws, rules and guidelines*

As with all forests, yours not only serves your personal goals but is also subject to laws and guidelines designed to serve your community and the nation at large. Therefore, it is in your best interest to abide by them, not only to avoid legal consequences but also to be a good neighbor and to help achieve the goals such laws and regulations serve, including such benefits as clean water, public safety and protection of rare plants or animals.

Your forest's potential to be influenced by certain laws and regulations typically has little to do with its size, but often a lot to do with its location and its past management. Even in those states not using a regulatory approach, the opportunity to voluntarily serve the common good lies at the heart of being a good forest steward.



## STEWARDSHIP PLANNING

*Blueprint for action, guide for the future*

Sooner or later, a family forest owner recognizes that the best way to capture the full benefit of blending personal goals with stewardship principles is to take the time to develop a stewardship plan. Such a plan, geared to the size and condition of your ownership, is not only a blueprint for action; it also confirms your objectives, guides your progress and determines changes as both your forest and your knowledge grow. Indeed, professional managers in both the public and private sectors routinely develop, employ, monitor and, over time, amend, plans to assure their own good stewardship.

In developing an initial framework for a stewardship plan, ask this question for each of the seven NASF Stewardship Principles:

*What goals do I have here, and what steps will I take to adhere to this principle?*

Professional assistance can prove very helpful in developing your stewardship plan and is available from your local state forestry office, professional consulting foresters, extension and academia, and such sources as the Natural Resource Conservation Service (NRCS), National Association of Conservation Districts (NACD) and Resource Conservation and Development Councils.



## INDICATORS OF GOOD FOREST STEWARDSHIP

*How to tell how well you're doing*

Forest stewardship is an ongoing, long-term and adaptive process. You will learn from your actions, investments and even inaction, as each begins to display results—or “indicators”—of your progress. This progress, however, can be complex because a forest’s health and vigor is governed by variables such as climate, soils, and the interaction among its trees, plants and animals. These and other factors often make progress subtle, intermittent and difficult to gauge.

Taking the time to consider what efforts, events, milestones or accomplishments—stewardship indicators—you might use to track your plan’s success will help focus your work, avoid surprises and maximize satisfaction and return on your investment. Below is an entire framework of generic “indicators” built around the NASF Stewardship Principles. There are occasional duplications, but these are necessary to address the multiple roles some forest elements play in a forest’s health and vigor (e.g., addressing soil for growth, soil erosion and soil as sediment).

***"This book has been a useful source of information for new or novice landowners that are concerned about stewardship of their forest resources. It has also been beneficial to foresters and other natural resource professionals in developing stewardship principles among non-industrial private landowners."***

James P. Jeter  
Alabama Licensed Registered Forester #881



### **A SAMPLE FOREST STEWARDSHIP PLAN**

*A framework with generic indicators*

Below you will find some examples of indicators and activities for each principle that you might incorporate into your own stewardship plan. This framework can help you organize your plans, practices and achievements and then recognize the results of your good stewardship on the ground.



### **PRINCIPLE 1**

*Contribute to the conservation and biological diversity of the forest and the surrounding landscape*

You use the local expertise necessary to assess your forest/woodlot's potential for habitat, biodiversity and uniqueness, as well as its role across your landscape/watershed. For example, you might work with your state forestry and wildlife agencies, extension service, forestry consultants, state natural heritage programs or specialized interest groups like the Audubon Society, the Izaak Walton League or NatureServe.

You manage your woodlot by making use of a variety of tree species and ages as well as promoting diverse understory vegetation as a means to promote adequate habitat, travel corridors and food webs across and within your forest and its landscape/watershed.

For their collective roles in contributing to both local habitat and food webs, you manage for

snags (standing dead trees), for den trees, and for coarse woody debris (limbs and trunks) that collects on your forest's floor and in your forest's waterways, (e.g., streambed structure where such materials can be critical to spawning beds and micro/macrobenthic habitat).

You are aware of and, where practicable, you track your ownership's diversity (plant and animal) and wildlife (both game and non-game and perhaps even insects when they might be important), as well as cover and forage options.

Where appropriate, you cooperate with local interests working to maintain habitats and diversity in your watershed.

You coordinate and monitor your management activities to maintain and enhance your forest's biodiversity. For example, you avoid operations during song/game-bird nesting season, track and manage the species and ages of your trees, and manipulate the size, shape and orientation of your stand openings to consider the importance of understory to both plants and animals.

You monitor and respond to forest change (natural mortality and regeneration, aging, succession, pests and catastrophic events such as severe storms or wildfire), and you factor these into your decision making. You also track overall growth, the success of your own planned regeneration, and overall forest health and vigor for their effects on both your own and adjoining ownerships.





## PRINCIPLE 2

*Maintain and improve productive capacity*

You've determined and mapped your forest's timber types and its productive capacity for timber as well as for other products that might be gathered/harvested, taking into account factors that might influence your decisions, such as steep slopes, fragile soils, wetlands and uniqueness (raptor nests, vernal pools, cultural sites and grave sites).

In those areas targeted for timber production, you've calculated and documented your forest's growth rates by timber type, rotation ages and harvest schedules (be they even age [clear-cut] or uneven age [selection-cut]). You include regeneration programs to assure sustainable yields.

You monitor harvests and mortality to schedule regeneration in order to maintain long-term growth and harvest balance and to sustain your forest's overall capacity to assure and enhance its community of plants and animals.

You use science and technology appropriate to the size of your forest or woodlot, ranging from herbicide/pesticide use to computer models for growth and risk potentials. Regarding your potential use of forest chemicals, stewardship stresses prudent use, label compliance, ensured safety, legal and environmental compliance, training, record keeping and appropriate neighbor notification of pending application.

Your operations maintain the overall long-term

vigor of your timber's growth (e.g., you track issues such as tree spacing, pests and mechanical damage) as well as critical elements such as the fertility of your forest's soils. Soil regeneration—as provided by decay of fallen leaves/needles, twigs, limbs and even trunks of downed trees, as well as the organisms that feed on them—should be managed and valued as important to your forest's long-term productivity.

Whenever you decide to use a contractor for professional services (e.g., consulting foresters, loggers, chemical applicators, road builders/maintainers), you are sure each is appropriately trained (BMPs, etc.), credentialed and insured.

Your contracts are written and then monitored to assure safe and efficient operations, minimal harvest damage/waste and sale of the materials removed to the best available markets.



## PRINCIPLE 3

*Maintain and improve the health and vigor of the forest and its landscape/watershed*

You manage your forest or woodlot's vegetation, species-mix, stocking, spacing, age-classes, regeneration, prescribed fire, fire-breaks, etc., to reduce risk from wildfire, pests and invasive species and to ensure long-term forest health and vigor.

You cooperate with your neighbors and your local, state and federal agencies in monitoring, prevention and response efforts regarding risk assessments from wildfire, insects, diseases and invasive species.

You track forest health issues such as fuel loads, insects and disease, mortality and invasive species by recording your own observations or accessing records from professional sources, such as state forestry agencies.

Where grazing is involved, you protect your forest water bodies (springs, wetlands, streams, ponds, etc.) and vegetation with such practices as riparian zone protection and rotational pasturing. Where necessary, you work with local wildlife officials to assist in the management of wildlife populations.



#### PRINCIPLE 4

*Protect soil and water resources*

You understand and effectively apply your state's Best Management Practices, or where applicable, Forest Practices Act, as they relate to your forest and your management activities.

When contracting for forestry services, you specify BMP training and performance requirements (and penalties for noncompliance). You monitor performance on all your forestry-related operations.

You use practices that promote soil stability and water quality. For example, you use appropriate water bars, rolling dips, road and turnout maintenance and contoured site prep, and you time your harvests to avoid heavy rains. You have your soil's fertility analyzed before fertilization and use that analysis to maximize effectiveness of fertilizer and prevent excess nutrient runoff.

#### *Soil-related steps*

- You have taken the time to learn about your forest's soils and to observe their influences using topographical sources (e.g., National Resource Conservation Service soils maps, U.S. Geological Survey topographic maps). You factor this information into your planning and overall management.
- You manage the potential consequences to your soils from storms, fire and other damage (blow-down, run-off, etc.) especially on your sensitive sites (steep slopes/erodible soils), as well as during activities with elevated risk for associated soil damage, such as road maintenance, harvests or site preparation.
- You are careful regarding wild and prescribed fire in soil-sensitive situations, e.g., steep slopes and/or erodible soils, and you are vigilant in such practices as installation and maintenance of firebreaks, fire suppression activities and timing and intensity of prescribed fires.

#### *Water-related steps*

- You've identified, mapped and taken into account your forest's water and riparian resources by noting important elements, such as high-water marks, springs, ephemerals, streams, vernal pools, ponds and wetlands. You use this information as you:
- Identify, design, establish, map and manage your forest's streamside and water-body buffers.
- Conserve the plants and animals of your forest's riparian areas.

- Track weather events and their results because disturbances to both your forest and its watershed (e.g., seasonal flooding) could be influenced by your operation's roads and harvests.
- Determine your need for forest chemicals and monitor their selection, application and safety.
- Determine any site preparation needs, practices and oversight.
- Place, build and maintain roads, especially at stream crossings.
- Plan and implement fire use and wildfire prevention and response, especially as these activities pertain to establishing and maintaining firebreaks.
- Plan and track pest monitoring, risk management and outbreak response.
- Plan and operate recreational activities (personal and leased) and track the impact of associated equipment and disturbance (deerstands, ATV use, cross-country skiing, trash accumulation, etc.).
- Carry out and monitor resource management activities, especially use/movement of vehicles, heavy equipment and stand disturbance (skid trails, landings, trash accumulation).

**PRINCIPLE 5**

*Pursue carbon-friendly management practices and promote biomass as a renewable energy source*

You consider the carbon cycle's role in your forest's health, vigor and management. This knowledge is

reflected in your rotation age selection, site preparation activities and forest litter treatments.

You learn about and work to meet the requirements to qualify for managed forest carbon credits in order to participate in carbon trading and other ecosystem markets.

If appropriate, you participate in markets for woody biomass as a fuel source.

**PRINCIPLE 6**

*Consider socio-economic benefits for local communities and economies*

You avoid waste and work to maximize the contribution of stewardship to your own as well as your community's economy and quality of life.

You pay your taxes, and where appropriate, consider local forest tax incentive programs.

You respect local customs and the role traditions, settings and sites may play in the heritage and values of others, such as a Civil War site or a historic road or trail.

Where feasible, you allow public access. You also participate in local activities addressing trespass, dumping and timber theft.

In carrying out your forestry practices, you consider your community's aesthetic values (e.g., attractive views from the road).

You remain aware and considerate of your neighbor's concerns and issues.

When practical, you collaborate with your local forestry organization's public education and outreach efforts, e.g., youth programs, field days.

You are careful to minimize your operation's potential for "neighborhood impacts." You track such sources as noise, dust, smoke, chemical use, accidents and trash accumulation.



#### PRINCIPLE 7

*Comply with laws and rules, and guidelines*

You take the time to learn of and comply with all local, state and national laws and regulations as they relate to your forest and your stewardship plan (e.g., seasonal road use, Best Management Practices, State Forestry Practices Acts, the Clean Water, Clean Air, and Endangered Species Acts). In addition, you comply with any relevant, collaboratively developed forestry guidelines and standards, and comply with local labor, safety and wage laws.

Where feasible, you take the time to contribute to state and local efforts to develop all the above regulations and guidelines in order to ensure that the viewpoint of the small/family forest owner is considered.

***"NASF's Stewardship Handbook has served as a guide for Kansas family forest owners and foresters to consider the principles, planning framework and indicators necessary to sustain our forest and agroforestry resources."***

Bob Atchison  
Rural Forestry Coordinator  
Kansas Forest Service, KSU

Where feasible, you take the time to be an active member of your local forest landowner community and take advantage of opportunities to make your ideas and priorities known, especially regarding issues that affect your lands and your objectives.

You take the time necessary to ensure that your plans and operations adequately address safety and respect all cautions and safeguards suggested by forestry-related expertise and advisories. For example, you obey periodic bans on open burning and seasonal road load limits, you seek appropriate professional advice and you comply with all safety advisories.

If you convert land to other uses, you comply with local land use plans and ordinances.

#### SUMMING UP

Forest stewardship is a challenging but rewarding endeavor. Given how long it takes some trees to grow, it is clear that stewardship spans generations. Like most other worthy undertakings, however, successful stewardship should be measured in terms of both your steps along the journey and the achievement of your personal goals. It is a commitment to paying at least as much attention to the forest that remains as you pay to the harvests. It is process of discovery: As forests evolve and grow, so too do the science and practices used in their stewardship. As a result, our collective commitment to trees and forests will serve not only today's members of society, but generations of Americans to come.

## GLOSSARY

Below are some brief descriptions of some of the terms used in this handbook. More formal definitions of these terms should be sought from other relevant texts, dictionaries, glossaries and local expertise.

### ***Algae***

Aquatic plants important in some forests' diversity, food webs and habitat

### ***Aquatic***

Pertaining to water and the forest-based plants and animals that reside or migrate therein

### ***Assessment***

Periodic tracking and recording of progress relative to goal-based plans

### ***Best Management Practices (BMP)***

State-specific guides relative to water influencing forest practices

### ***Biological Diversity***

Diversity in forest-related plant and animal populations relative to expected local circumstances

### ***Biomass***

The sum of forest-related organic matter (both living and dead) in a given area

### ***Carbon***

A chemical element critical to plant growth and the earth's life and atmosphere

### ***Carbon Cycle***

The transfer of carbon between the earth (soils, coal, oil etc.), use (leaves, fuels), and the atmosphere

### ***Carbon Sequestration***

The capacity of plants and their products to "store" carbon removed from the atmosphere

### ***Catastrophic Event***

Storms, fires, etc. of a serious enough nature to totally alter a forest

### ***Clean Water Act***

Federal law prescribing water protection

### ***Clear Cut***

Removal of all merchantable material for the purpose of regenerating a new forest

### ***Connectivity***

Forest management that assures wildlife cover between habitats (see corridor)

### ***Consulting Forester***

A trained forestry professional available for periodic advice and technical assistance

### ***Contractor***

A trained professional available for circumstance-specific services

### ***Corridor***

A dedicated wildlife travel route (see connectivity)

### ***Course Woody Material***

Branch, trunk and stumps on a forest's floor critical to food-webs habitat and soil regeneration

### ***Endangered Species Act***

Federal law prescribing wildlife protection

### ***Ephemeral***

Seasonal water flow directly feeding a recognizable watercourse (typically a stream)

### ***Even/Uneven Age***

Terms describing forests that are managed by focus upon the age of their trees

### ***Extension Forester***

A specially trained academically based forester available for forest owner advice

### ***Forest-based Cultures***

Peoples/customs with special connections to forest

settings or a particular forest feature

**Filtration**

A forest's capacity to remove water-borne solids as water moves through

**Fire Break**

A specially designed disruption to a forest's flammable materials to inhibit fire spread

**Forest Practice Act**

State legislation specifically designed to direct forest-related activities

**Food Web**

The interconnected relationship between plants and animal food requirements

**Forest Vegetation**

All of a forest's plant material from the deepest root to the highest leaf and all plants in between

**Fossil-based**

When referring to energy sources, specifically those from coal, oil and natural gas

**Fragile Soils**

Soils especially susceptible to water or wind erosion and/or landslides

**Fuel Load**

Accumulated forest materials judged to be susceptible to combustion and fire spread

**High Water Mark**

Location along/surrounding a water body where seasonal flows/accumulations reach highest level

**Invasive Species**

Introduced plants or animals (including insects) whose competition with natives make them pests

**Landscape**

Surroundings

**Forest Litter**

Accumulation of dead plant material on a forest floor

**Mechanical Damage (Residual Stand Damage)**

Damage to standing trees caused by forestry equipment

**Micro/Macro-Invertebrate**

The smallest of animal organisms typically found in soils and waters

**Monitoring**

Practices to regularly observe (see assessment) and judge activities and progress

**Natural Mortality**

Death from natural causes

**Nesting Cavity**

A sheltering opening-interior space within a tree used by wildlife

**Nesting Season**

That portion of a year when wildlife bear and raise their young

**Photosynthesis**

Green plant use of sunlight, water, minerals and carbon dioxide to make food

**Prescribed Burn**

Use of a controlled fire to achieve a forest management goal

**Raptor**

Bird of prey

**Regeneration**

A program or the product of efforts to re-establish trees on a forest site

**Riparian**

Areas along or surrounding forest water bodies

**Riparian Management Zone**

A zone for special management along or surrounding forest water bodies

**Rolling Dip**

An angled depression across a road designed to prevent damage by redirecting the flow of water away

from the road's surface

**Rotation (age)**

The age or life-span target for scheduling final timber harvests

**Rotational Pasturing**

Regulated rotation of cattle among grazing areas

**Sediment**

Water borne soil

**Seep**

Seasonal water movement associated with elevation change

**Selection Cut**

Harvests targeting specific species, age and location of trees

**Snag**

A standing dead tree

**Socio-economic Benefits**

A forest's contribution to local communities and economies

**Spawning Bed**

A stream bed's capacity to support successful local fish egg laying/hatching

**State Natural Heritage Program**

Local programs cataloging and promoting protection of unique natural features

**Streamside Zone**

[see Riparian Management Zone]

**Stewardship**

Pursuit of a forest owner's personal goals within a set of stewardship principles

**Site Preparation (Site Prep)**

Preparations for planting/replanting of trees

**Storm-Water**

Large water flows associated with storm events

**Succession**

Natural replacement of plants and their associated animals as life cycles proceed

**Terrestrial**

Land-based plants and animals (as opposed to aquatic)

**Threatened or Endangered**

Plants or animals deemed to be at risk regarding their long-term viability

**Timber Type**

A forestry designation for a variety of trees typically found together

**Turnout**

A road ditch segment designed to divert flow to a stream's buffer rather than breach a stream's bank

**Under-story**

Vegetation below a forest's canopy

**Vernal Pool**

A small, shallow, seasonal water accumulation usually critical to a forest's aquatic biodiversity and food web

**Water Bar**

An angled rise across a road to redirect any water prone to flow down its surface

**Water Course**

A body of water's recognizable location

**Watershed**

A recognizable area associated with a water course's drainage

**Wetland**

Locations of natural water cumulation





