Understanding Forestry Concepts: A Forest Ecology Series for Loggers, Landowners and Foresters

UNIT ONE

FOREST TERMINOLOGY AND ECOLOGICAL SYSTEMS

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Introduction

This bulletin series is designed to introduce information that loggers, landowners and foresters should know to properly manage forest lands while understanding how forest systems work and interact so that long-term forest productivity is maintained. These bulletins are not an exhaustive discussion of important forest ecology topics. Instead, they are a brief introduction to the depth and breadth of knowledge that is necessary to manage forest stands properly. This first bulletin describes some common forest ecology terms.

Technical terms represent multi-word definitions that simplify communication between individuals working in the same field. Also called jargon, terminology is found in all professions, including logging and forestry. The problem with jargon is that we often forget to leave it behind when talking with people outside the profession. The result can be a lack of communication between two sides discussing an issue. Further help in understanding general forestry terms used by loggers and foresters can be found in a glossary available from local county extension or state natural resource offices (3).

The field of ecology often uses abundant jargon to describe how plant and animal species become established and develop. The word ecology means the study of how our natural world works. Ecological studies can occur on many different levels and attempt to understand how plants and animals establish, develop, reproduce, die, and interact with the other parts of their environment. They also evaluate how plants and animals react to changes in their environment. In particular, forest ecologists study how forests work, which provides foresters with information to predict how the forest will respond to different forest management decisions. This information, describing how plants and animals react to change, is the scientific basis for both forest and wildlife management.

The term ecosystem is often seen and heard in the media. To define and understand what an ecosystem is, it helps to understand the meaning of system. A system isn't much different than, lets say, a piece of equipment such as a skidder (Fig. 1). A skidder is made up of subsystems, such as the electrical, hydraulic and engine, to name a few. These subsystems are also made up of smaller but no less important sub-subsystems which can be made up of other sub-sub-subsystems and so on.

Examples of subsystems include the fuel pump, the carburetor on an engine, the ignition switch in the electrical system and the hydraulic pistons that move the skidder blade (Fig. 1). Although not regularly thought of as systems, each of these items can be broken down into parts to determine how they work and how to fix them when broken. All of these systems are crucial for the skidder to run and work efficiently over time, and each one can be examined independently of the other. In addition, other factors can also affect the skidder. For instance, cold and wet weather can cause one or more of the skidder's subsystems or sub-subsystems to malfunction.

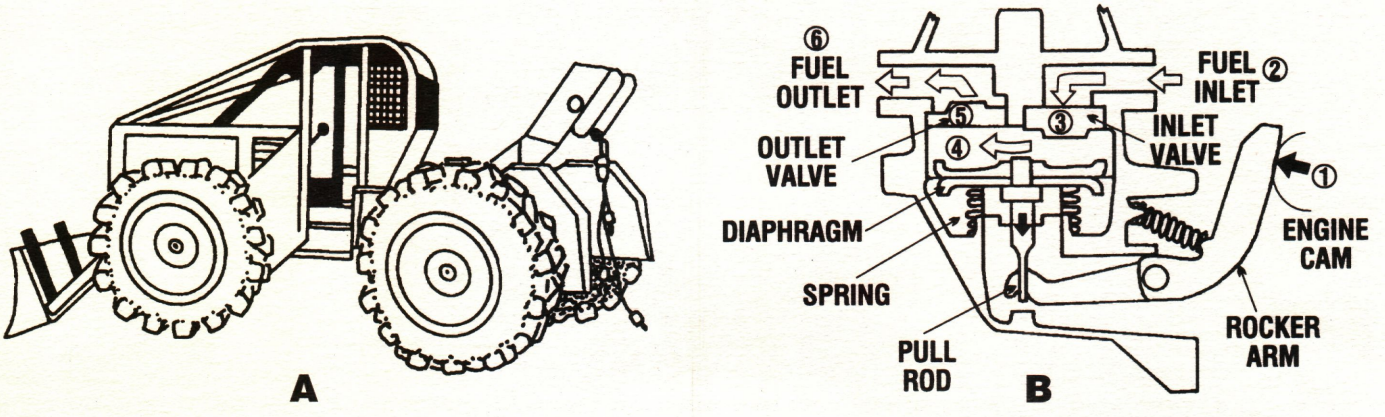

Figure 1: A skidder is a piece of machinery (a system) that is built from a number of other interacting subsystems (A). Subsystems include such things as the hydraulics and engine. In addition, these subsystems can be broken down into other subsystems as shown in the enlarged view of a fuel pump (B).

Although we defined the skidder as a system, we could also have defined the logging operation as the system of interest. With the logging operation, subsystems would include the feller, the skidder, the slasher, the loader, and the truck, among other things. Each of these subsystems can be further subdivided as we did with the skidder. The efficiency of the logging operation is affected by how well the subsystems are maintained and external influences, such as prevailing weather, soil type and tree size. These are all important considerations when dealing with the efficiency of the entire harvesting system. Applying this knowledge of systems and subsystems to the forest helps us to understand the many levels within ecosystems that can be found within any component of the forest. However, the complexity of nature is not as easy to break into pieces or subsystems as is the skidder or harvesting operation.

Ecological systems (ecosystems) are the combination of living and non-living entities such as plants, animals, rain, and soil particles that are found in an area of interest (Fig. 2) (4). The ecosystem may be a pond within the forest (similar to the skidder system example) or it may be the entire forest, including the pond (similar to the entire harvesting operation example). The size of the system to be studied is defined by the interest of the scientist.

Forest ecosystems change constantly. They change because of disturbances such as timber harvesting, fire, wind or insect damage and because trees grow old and die. When overstory trees (the tallest trees on the site) are harvested or die, the amount of sunlight reaching the forest floor increases. This causes an explosion in the number of new understory plants and in the growth of plants that were present before the disturbance.

In cases where there are only small canopy openings, the crowns of surrounding trees expand and fill in the space. With larger openings in the forest canopy, the holes can be filled with new stems that started as understory regeneration in the low light conditions of the forest floor. Plants in the understory may not be younger than trees in the overstory, as they may have remained surpressed by the lack of light. These surpressed trees may not be able to respond with new growth, and the canopy gap may be filled with a set of newly established and faster growing individuals.

Following a disturbance, the tree species that are most able to survive in low light conditions (shade tolerant regeneration) usually are the successors in the overstory canopy. This is true particularly if the species is able to respond favorably to the increased light conditions and if no other external factors affect the outcome. This manner of change in the forest over time is called succession (4).

Forest succession occurs because trees are adapted to different growing conditions (1, 2). Young jack pine and aspen do not survive in low light conditions. Therefore, these species do not regenerate until any

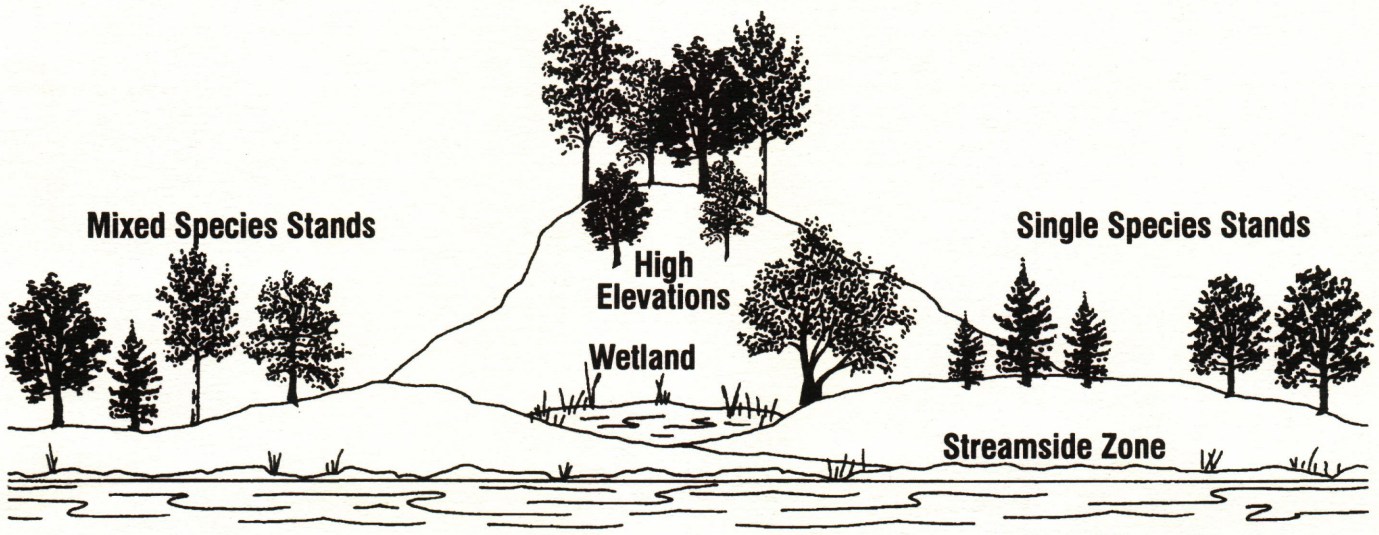

Figure 2: This landscape can be viewed as a system. It can also be viewed in terms of its ecological subsystems, such as the higher elevations, the wetland areas, the areas adjacent to streams, the hardwoods, the conifers, and the mixed stands of hardwoods and conifers. The organization and layout of the harvesting operation within an area can also be considered a system. Knowing which systems exist on a landscape and how each system may be interacting can help loggers and landowners minimize impact during management.

existing overstory is removed. Species that require full sunlight to regenerate are known as "shade intolerant" species (4). If the overstory is not removed, other tree species that can regenerate in low light conditions become established and eventually dominate the site.

In contrast, sugar maple and beech regeneration are very tolerant of low light conditions (2). The regeneration is established in the low light of the understory and grows slowly until an opening occurs in the canopy. Trees that can survive and grow in low light conditions are referred to as shade tolerant species (4).

Summary

Understanding how forest systems work and interact is crucial to the long-term maintenance of site productivity (4). Therefore, loggers and landowners who better understand how the forest ecosystem works can better predict how they will affect a forest through timber harvesting. They will also be better able to communicate their concerns and thoughts to foresters.

Acknowledgment

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