The Precision Forestry Cooperative

Citizens of Washington State expect the state's forests to provide multiple products and amenities, including wood products, a place to work, water to drink, recreational opportunities, aesthetic beauty, and plant and wildlife habitat. This is both a tremendous challenge and an opportunity, requiring the tools to make the right choices. The Precision Forestry Cooperative (PFC), under the umbrella of the state-funded Advanced Technology Initiative (ATI), is forming partnerships among government, industry, and universities to leverage money and resources to develop new technologies that will bring economic benefits to the state. Overall, the forest products industry supports 7% of Washington's economy. Because most commercial forestry is in rural portions of the state, these areas will benefit the most from the technologies developed and deployed. The PFC, a collaboration of the University of Washington's School of Forest Resources and College of Engineering, is conducting research in forest production, management, and products manufacturing at a new scale of resolution and accuracy with the goal of producing both economic and environmental benefits. Precision Forestry will provide the tools to make the right choices. It will produce detailed forest engineering, management, and habitat plans that can be implemented accurately and are subject to rigorous review. Guidance from a stakeholder executive review committee will ensure that the cooperative has a strong and diverse pool of researchers to draw upon and that appropriate and timely technology transfer is a priority.

What is Precision Forestry?

Precision Forestry is a cluster of technologies using high-resolution data and modeling to support site-specific decision-making. It provides highly repeatable measurements, actions, and processes to initiate, cultivate, and harvest trees, as well as enhance riparian zones, wildlife habitat, and other environmental resources. It provides valuable information linkages between resource managers and processors.

Precision Forestry provides opportunities for forest managers and forest products manufactuers to better meet growing the demand for wood and fiber products by insuring the best use of raw materials and by taking advantage of variation instead of accommodating it. Precision forestry allows forest managers to inventory chain of custody controls for forest product certification. The tools of precision forestry can improve plant and wildlife habitat, enable the proactive management of riparian zones, and enhance other environmental resources. Taken together, these opportunites will provide more and better jobs in rural areas of Washington State.

The PFC will focus on four areas: decision support systems, data collection and monitoring, mechatronics, and silvicultural and ecological engineering. These technologies will gather data about trees, animals, water, soil, and other forest resources to a high level of resolution. They will support the development of precise forest plans that will provide both wood products and fish and wildlife habitat.

Decision Support Systems

Example: Visualization

With new technology, researchers can construct visible presentations of numerical data to help viewers form a mental image. Visualizing data facilitates communication and enhances public perception of complex management decisions. For example, a

Species	Dbh	Height	Crown ratio	Trees per acre
DF	10	71	0.42	23.56
DF	14	87	0.40	18.54
DF	18	101	0.37	17.62
DF	22	112	0.37	11.78
DF	26	130	0.35	9.87
DF	30	145	0.29	4.50

Table 1. Simple stand table.

forester can visualize the trees and forest that Table 1 describes, but what about everyone else? A simple computer image helps viewers to see the forest in a number of ways (see Figure 1). The simulated forest can be viewed from any angle with computer graphics.

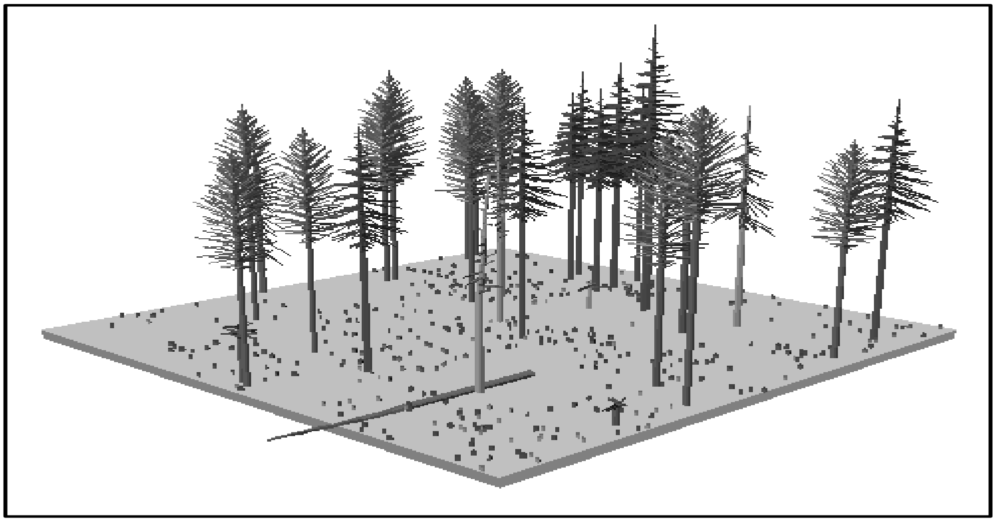

Figure 1. Stand Visualization System (SVS) computer image (Image courtesy of Luke Rogers)

Data Collection and Monitoring

Example: LIDAR

Light Detection and Ranging (LIDAR) is a technology that can be used to create detailed topographic maps, identify streams, and measure the canopy more accurately than traditional methods. LIDAR emits 15,000 laser pulses per second, some reaching the forest floor, while others reflect from trees.

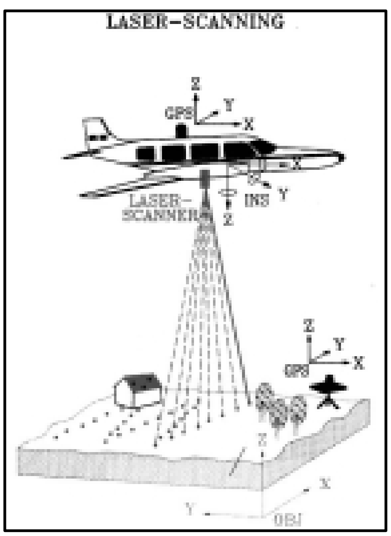

Figure 2. The laser scanning process with GPS on the aircraft and on the ground for increased accuracy

Mechatronics

Example: RFID

Mechatronics integrates mechanical and electronic systems to construct better devices. For example, Radio Frequency Identification (RFID) tags use wireless technology and can be embedded in people, animals, plants, or objects. RFID works something like the bar code that is used to identify merchandise. Instead of using light waves like the bar code, however, RFID uses radio waves and may be used to identify individual trees—a useful tool in the process of deciding among forest management alternatives.

Silvicultural and Ecological Engineering

Example: Engineered Wetlands and Stream Channels

Silvicultural engineering enables the design of vegetation treatments that are both biologically sound and operationally feasible. Ecological engineering works to develop products or processes that are accomplished by ecosystems themselves. For example, engineered wetlands can perform water treatment functions and engineered stream channels can provide fish spawning habitat. Both silvicultural and ecological engineering, using inputs from data collection and monitoring and mechatronics, will support the complex and multiple objectives of precision forestry.

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