

Using The Internet to Bring Remote Sensing to Your Desktop

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Working Paper #48
Louisiana Forest Products Laboratory
Louisiana State University Agricultural Center
Baton Rouge, LA

July 25, 2001

Introduction

The paper presents an overview of key drivers which are going to bring wide spread usage of remote sensing in the forest products industry. Some of the key drivers are: availability of satellite images, cost of satellite images, information and imaging storage cost, and delivery mechanisms through the Internet. This article discusses reasons behind the surge of interest in remote sensing, surveys its present status in the industry, and attempts to envision the short- and medium-term future. The paper also provides an example of a decision analysis tool which uses satellite images to monitoring forestland.

Remote Sensing Comes of Age in the Forest Industry

Did you know that you may sign up to get paged if lightning strikes your timber, anywhere on the North American continent?¹

Foresters and landowners have never had easier access to timely and accurate geo-spatial information. And this trend will continue with proliferation of the Internet, larger number of higher-resolution satellites, and a growing number of decision analysis applications built for the forestry sector. Consequently, there has been increasing interest in remote sensing in the forestry sector. The June 2000 issue of the *Journal of Forestry*² was dedicated completely to remote sensing, and our survey showed overwhelming interest from timberland managers. Is this increased interest a harbinger of a dramatic increase in adoption of this technology?

In his famous book, "Only the Paranoid Survive," Andrew Grove defines an inflexion point where many different factors come together to make possible a fundamental shift in an industry. Whether we are yet at an inflexion point with remote sensing is debatable. However, there are many distinct trends that are impacting the acquisition, distribution, cost and demand of remote sensing. Almost all these trends are not new and have been maturing over the last fifteen years. There is not much doubt that these trends will combine forces to fundamentally change the way land is managed globally. The key question is whether the time is NOW? The author believes that the answer to this question is YES.

The key factors behind this upsurge are:

Increasing Use of the Internet

Currently, more than 56% of all personal computers, in 31.3 million households in the U.S., access the Internet regularly³. While there are other ramifications of the ubiquity of the Internet in forestry,⁴ it has dramatically increased the ease with which one can access geo-spatial data. Sites such as Terraserver, GlobeXplorer, and Forest One can provide geo-spatial visualization of forest cover through information that is stored on remote servers. While none of these sites replace the complete functionality of GIS software such as ArcView, each has definitely reduced the cost of the infrastructure required in viewing geo-spatial data.

Increasing Number of High Resolution Satellite

¹ www.lightningstorm.com

² *Journal of Forestry*, June 2000, Volume 98, Number 6

³ <http://eincubator.flashcommerce.com/articles/99/06/03/112349220.html>

⁴ Timber Producers Association of MI & WI, "*The Timber Industry and the Internet*", September 2000.

While the medium to distribute and view geo-spatial data becomes easier, there has been a scramble to position satellites to beam back high-resolution images. Private organizations such as Space Imaging, EarthWatch, and OrbImage have launched high-resolution satellites or will be launching very soon. Space Imaging owns IKONOS, the first commercial satellite and is planning for more satellites in the future. Countries such as France (SPOT), Israel (EROS-A1), India (IRS), and Russia have satellites which provide images in the U.S. market and plan to launch newer high-resolution satellites. Growing supply should reduce prices of images and increase the options available for consumers.

***✍* Reduction in Storage and Processing Costs**

A typical satellite image in standard format is 500 MB, which would cost \$250 to store in 1995 but only \$5 today.⁵ The reduction in cost of processing, RAM and computers over the last five years has been well documented. As this trend continues, it has become cost effective for servers to host satellite images, process the images on demand and deliver the content to a distributed marketplace of foresters.

***✍* Increasing Focus on Forest Management**

A long-standing goal of the USFS and the state forest-related departments has been to increase the attention land owners give to their timber assets. There have been many local and federal programs instituted to give tax benefits to landowners to bring their forestland under a management plan. However in the last five years, certified “green” timber is gaining importance and is consequently providing the critical motivation to landowners to take care of their property – higher prices for their timber. This “greening” trend has increased interest among landowners and foresters to use automation and remote sensing to monitor timberland. The author believes this trend will increase demand for remote sensing tools while the previous three trends increase their supply.

Results of a National Remote Sensing Study⁶

In 2000, a questionnaire was sent to 1,000 private timberland owners in the United States. The mailing list included the top 25 industrial timberland holders. The survey sought opinions on the use of remote sensing in timberland management. 115 surveys were returned as undeliverable. 140 surveys were returned for an adjusted response rate of 16%. Following are some highlight summary results from this study.

Have you used remote sensing data for managing your timberland?

?? NO: 73%

?? YES: 27%

If NO, Why? (Percent of Respondents)

?? Too Expensive: 10%

?? Low Accessibility to data and service providers: 7%

?? Don't know enough about it: 52%

?? Used it before and it was useless: 4%

⁵ Using an approximate cost of \$250 for a 500 MB hard drive in 1995 and \$100 for a 10 GB hard drive in 2000.

⁶ Conducted by Richard P. Vlosky, Ph.D., Louisiana State University Agricultural Center, Baton Rouge, Louisiana. (email: vlosky@lsu.edu)

IF YES, What are the reasons? (Percent of Respondents)

- ?? Look for changes in canopy to track for bug infestation, dead trees, blow down etc.: 8%
- ?? For inventory mapping by species: 14%
- ?? To monitor plantations: 6%

What is the typical frequency of remote sensing usage for your company? (Percent of Respondents that Use Remote Sensing)

- ?? 3 or more times a year: 19%
- ?? 2 times a year: 4%
- ?? 1 time a year: 8%
- ?? Once every 2 years: 8%
- ?? Once every 5 years: 46%
- ?? Less frequently than 5 years: 15%

Please estimate how much your company currently pays per acre for forestland remote sensing. (Percent of Respondents)

- ?? Less than \$0.50/acre: 66%
- ?? \$0.50/acre: 10%
- ?? \$1-\$2/acre: 24%

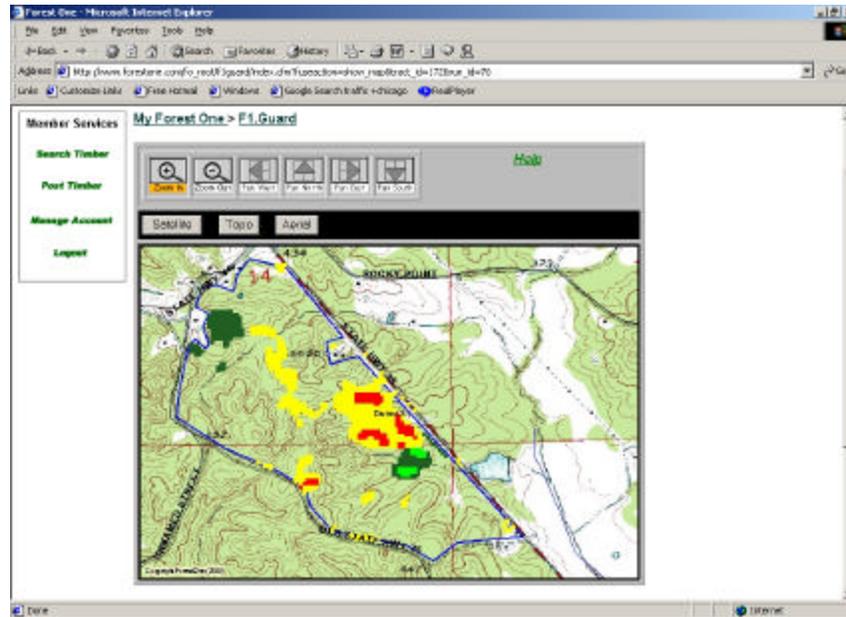
The numbers in this survey need to be compared with similar information from the past years to prove a growth in the usage of remote sensing. However, the survey does indicate a large potential demand for remote sensing which will be ready to be harnessed as the right technologies mature. During the survey, the respondents expressed an enthusiastic interest in participating (as indicated by the 16% response rate, which typically is about 4-6%) and were also very interested in knowing the status of the industry.

Case Study: F1Guard

How do these trends come together? Satellite imagery, analysis, and Internet distribution. An example of these technologies is provided by **F1.Guard**, a remote forestland monitoring tool by **Forest One**.⁷ F1.Guard is an Internet-based application designed for monitoring large tracts of timberland. Users visit the site to get access to geo-spatial data and draw the boundary of the tract that needs to be monitored. This data is then hosted on Forest One servers. F1.Guard then accesses Landsat 7 satellite images to capture location specific data and uses proprietary image processing algorithms to detect changes in the timberland. The software then reports the locations and size of areas that have major changes in vegetation composition. A screen shot of the results on one typical tract from F1.Guard is shown in Figure 1.

⁷ Forest One, Inc is a software company based in Evanston IL. The first author is an employee of Forest One. F1.Guard can be accessed through www.ForestOne.com

Figure 1. Results from F1.Guard overlaid on a topographic map. The red and yellow pixels indicate locations of significant and moderate decrease in vegetation while the dark and light green pixels indicate locations of significant and moderate increase.



Summary

Increase in the availability of satellite and aerial remote sensing data along with the reduction in the cost of viewing and distributing geo-spatial data are some of the key factors driving the increased interest in remote sensing recently. This will translate into increased demand as the cost of satellite imagery reduces with increased supply and an increased focus on intensive timberland management.