

# **The Forest Public Access Resource Center**

## **(ForestPARC)**

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**Operations Report – January 2004**

**PART C**

**STRATEGIC PLAN**

Compiled by Alistair Smith, January 2004

## 1. Coordinator's Statement

To be competitive within a constantly evolving research community, the Forest Public Access Resource Center (ForestPARC) must continually strive to encourage collaboration across the lead institutions through innovative research programs in strong research areas (i.e. fire interactions, LiDAR, and Advanced Remote Sensing), the sharing of data and resources, and through participation in research workshops and journal publications. This strategic plan describes how ForestPARC will aim to guide the participant researchers, to not only meet and excel expectations, but to also excel as an internationally recognized group of researchers.

In 2003, ForestPARC was initiated under the auspices of the Upper Midwest Aerospace Consortium (UMAC), which focuses on the development of remote sensing and other spatial technologies to benefit agricultural and other land users. The UMAC region covers Idaho, Montana, Wyoming, South Dakota, and North Dakota and contains large areas of forest, rangeland, and wilderness areas. The remit of ForestPARC was to assess the development of such remote sensing and spatial technologies to the application of forest and wildland ecology, with initial focus on the role of fire-interactions within such environments. ForestPARC was initiated to develop coordination amongst the lead institutions and potential end-users through the development of integrated collaborative research programs that apply remote sensing and other spatial technology tools to real-world problems.

ForestPARC is set apart from other research collaborations due to its rich diversity of both experimental field sites and technical expertise. The lead institutions are located in a geographical transect that incorporates several natural gradients that include species composition, topology, and elevation. Technical expertise covers the acquisition and analyses of LiDAR, TIR data, hyperspectral data, and of numerous broadband satellite sensors.

Prior, to production of this strategic plan, it was decided that ForestPARC would concentrate its efforts on collaborative research programs that build on existing mutual fire-interactions research programs within the lead institutions. The main research foci that were identified (Part B) within the field of fire-interactions were:

- (i) The determination of fire severity and the factors that effect it,
- (ii) The acquisition and analysis of LiDAR data for fuels and carbon mapping,
- (iii) The assessment of how fire effects the role of biogeochemical cycling,
- (iv) The assessment of advanced remote sensing techniques to map biophysical properties and landscape change, and
- (v) The establishment of experimental validation sites for remotely sensed technologies.

ForestPARC aims to produce research proposals based on good ideas, good science, and good research linkages; rather than producing proposals for any particular research announcement.

ForestPARC is committed to achieving these goals and to becoming an internationally recognized group of researchers. To do so, this strategic plan describes the approach that ForestPARC will embark on in the next year by highlighting the principle priorities that ForestPARC will undertake to realize the strategic goals.

*Alistair Smith*

**Alistair M. Smith**

## 2. Mission, Vision, and Goals

### 2.1 Mission

- Foster, encourage and conduct collaborative research projects amongst the participating institutions to better meet the technical challenges in accurately assessing forested and wildland ecosystems using remotely sensed imagery and other spatial technologies.
- Provide responsive, professional advice and products relating to changes within the forested and wildland ecosystems, to participating researchers and potential end users.
- Stage workshops to discuss the implementation of potential research themes, with participants from both the wider research community as well as potential end-users.
- Report research findings in peer-reviewed journal publications and international conferences.

### 2.2 Vision

ForestPARC aims to be:

- A world-class provider of remote sensing products to end-user and researchers interested in fire interactions within forested and wildland ecosystems
- A mechanism to reduce time, money, and research redundancy by getting the lead participants to pursue funding proposals under one organization with one identity
- A center internationally recognized as responsible for setting standards in the remote sensing of forested ecosystems

### 2.3 Goals

Goals are essential for the success of ForestPARC to accomplish its mission and achieve its vision. The goals are directly linked to the vision of ForestPARC as follows:

*A world-class provider of remote sensing products to end-user and researchers interested in fire interactions within forested and wildland ecosystems*

**Goal:** Identify potential end users and end-user needs

**Goal:** Have end-users participate within user-orientated workshops to discuss the development and results of research projects that meet their needs

**Goal:** Have the wider research community participate within technical workshops discuss the development and results of innovative research projects

**Goal:** To help forest managers and the public understand the next wave of interdisciplinary issues that will define interactions between human needs and forest ecosystems

*A mechanism to reduce time, money, and research redundancy by getting the lead participants to pursue funding proposals under one organization with one identity*

- Goal:** To use the natural gradients that exists throughout the ForestPARC region as test beds for gauging the regional-scale applicability of landscape-scale algorithms
- Goal:** Encourage collaboration between graduate students and researchers within the ForestPARC community through data sharing, workshops, and joint research projects
- Goal:** Identify and develop collaborative research projects by integrating the intellectual strengths and departmental resources that exist across the participating institutions
- Goal:** To obtain funding from national funding organizations to facilitate the program f collaborative research
- Goal:** Ensure each participant is working towards the same vision and can inter-connect what they are doing to help make the vision a reality
- Goal:** Share access to experimental sites, specialized equipment, data, resources, and technical expertise within ForestPARC

*A center internationally recognized as responsible for trusted and innovative research as well as responsible for setting standards in the remote sensing of forested ecosystems*

- Goal:** Establish experimental validation sites within the ForestPARC region and have private organizations and other researchers used these sites to validate their remote systems.
- Goal:** To use ForestPARC as a mechanism to launch a large-scale interdisciplinary research project to investigate interactions between people, wildlife, forest fires, atmospheric interactions, biogeochemical cycles, and impacts on forest structure

### **3. Core Values**

The core values of ForestPARC are:

#### **A. Collaboration**

*To work together to further science and knowledge of how remote sensing, and other spatial technologies can be used to assess forest and fire interactions.*

ForestPARC strives to encourage collaborative research and participation between the principal investigators and amongst the affiliated graduate students at each of the lead ForestPARC institutions

#### **B. Service, Outreach and Relevance**

*To ensure that the research is not just conducted for research sake but will directly or indirectly benefit potential end-users*

ForestPARC endeavors that the program of collaborative research listens to the opinions of end-users to ensure that the research is relevant, useable, and understandable by non-remote sensing experts.

#### **C. Innovation and Scientific Integrity**

*To generate proposals based on scientific ideas and research strengths and not to 'hash' together proposals for each new research announcement*

ForestPARC aims to produce 'ready-made' research proposals based on core-science questions that have thus evaded focused research. ForestPARC aims to be an active research innovation group and not reactionary to each new research announcement.

*To ensure that the research does not replicate existing or past programs and that the research is conducted in a transparent and traceable fashion*

ForestPARC aims to research redundancy, not create it by repeating old research within identical study areas or within single species stands. ForestPARC will utilize the natural gradients of the region to conduct research in multiple environments and thus test the applicability of locally derived algorithms at the regional scale.

#### **D. Assessment**

*To ensure the conducted research is of internationally accepted quality*

The main findings of ForestPARC research projects will be submitted as papers to international conferences and as peer-reviewed articles to international journals.

#### **4. Specific 3-6 Month Objectives**

ForestPARC will aim to achieve the goals by targeting specific objectives at different stages. Over the next 3-6 months stage 1 will be undertaken with additional stages planned and implemented as progress is made.

##### **Stage 1:**

##### **A. Promote collaboration through the organization of a technical-orientated LiDAR workshop to discuss LiDAR acquisition methods and the potential future of LiDAR in forested Applications**

[http://www.cnr.uidaho.edu/remotesensing/Workshops/workshop\\_main.html](http://www.cnr.uidaho.edu/remotesensing/Workshops/workshop_main.html)

##### Objectives and Overview

The workshop will provide a regional forum for presentations and discussion of both technical and user needs of LIDAR technology development and applications. The main sessions are expected to entail:

##### **Session 1: Forestry Applications of LIDAR**

Introduction into LIDAR for real-world forestry applications focusing on users, such as land managers.

Keynote presentation: A Multiple Resource Inventory of Delaware Using Airborne LIDAR Profiling Data: Application to Biomass and Carbon Estimation by: Dr. Ross Nelson.

##### **Session 2: LIDAR User's Session: Concept and Use**

Introduction to use and understanding of LIDAR.

Keynote presentation: The application of small-footprint LIDAR, alone and in combination with high-resolution multispectral and hyperspectral imagery, to estimate forest volume and biomass in eastern deciduous, mixed, and coniferous forests by. Dr. Randolph Wynne

##### **Session 3: LIDAR Technical Forum**

Discussion of current technical problems of LIDAR technology.

Keynote presentation: Correlation analysis for canopy structural indices and fire stand indices by: Dr. Michael Leftsky

##### **Session 4: Technical and Users Roundtable Discussion**

Open discussion on the future of LIDAR for regional forestry applications.

## **B. Promote Collaboration through Fire Severity – Carbon Stocks Research**

The belowground storage of carbon within forested ecosystems is a critical component of the global carbon cycle. Therefore, the accurate determination of this carbon is necessary to understand how disturbances (land use change/natural hazards) perturb the cycle. One such disturbance is fire. Although fire is commonplace within the forests of the northwestern Rocky Mountains (United States), studies assessing the impact of fire on the carbon cycle have mainly been limited to those conducted during the BOREAS project (c.f. Sellers *et al.* 1997; O’Niel, 1997; Ryan *et al.* 2000).

- Can we relate both above and underground carbon flux to fire severity?
- How might climate change predictions, which impact on the future fire severity, affect this considerable storage of carbon?
- Can we remotely predict (say via hyperspectral sensors) the severity and thus the carbon flux within such fires?
- Do such relations (if any) change over species and topographic gradients?

Current Progress:

- Proposed research to relate fire severity to fluxes of underground (and aboveground) carbon stocks
- Received interest from Prof. P. Morgan (UOI), Prof. J. Marshall (UOI), Dr. A. Robinson (UOI), Dr. P. Gessler (UOI), and Dr. A. Hudak (RMRS-M)
- An open discussion brainstorming session is tentatively proposed for February 3<sup>rd</sup>.
- Aim to submit letter of intent – due 02/11/2004

## **C. Promote Collaboration through the establishment of Experimental Validation Sites**

### **The Need for Remote Sensing Standards and Validation Sites across a Diversity of Forested Environments**

- Based on a suggestion by Carl Seielstad (University of Montana) during the ForestPARC telecom of Jan 6<sup>th</sup> 2004

To obtain the establishment of such experimental validation sites a five stage plan is proposed:

1. The identification of technologies that might require standards and/or reference and validation sites
2. The identification and establishment of designated experimental sites and the assessment of existing and necessary ground-based data at those sites
3. Seek funding to establish experimental sites and initially test with current ForestPARC resources and technologies
4. Solicitation to other University Researchers as well as private and government organizations

5. Seek funding to have dedicated experimental validation sites and present results to external review through peer-review journal articles

**D. Promote Collaboration through LiDAR – Carbon Stocks Research**

Acquiring LiDAR and TM? To assess the aboveground carbon storage within a variety of forested environments across the ForestPARC region

**E. Promote Collaboration through TIR – Carbon Stocks Research**

The application of thermal infrared sensors to assess the emissions and carbon losses within a fire (using the fire radiative energy) by monitoring the full duration of a prescribed or natural (with rapid response) – Relating the FRE to severity and loss of aboveground/underground carbon.

**F. Promote Collaboration through Frequent Research Discussions by E-mails, Telecom and potential Video Conferencing**