

Special Technology Development Program Progress Report

Complete a copy of this form for: ~~1) each multi-year project active in the current fiscal year and not requesting funds, and~~ 2) each multi-year project active in the current fiscal year and requesting funds. Add lines within the form as necessary.

PROJECT NUMBER (from original application form): **R1-2000-03**

PROJECT TITLE (from original application form): **Improved risk rating, detection, and impact assessment of balsam woolly adelgid and hemlock woolly adelgid.**

PROJECT STATUS: **Continuing** (funds are being requested for the next fiscal year to continue the project)

EXPECTED PROJECT DURATION (total years for project): **Three**

EXPECTED COMPLETION DATE OF THE PROJECT (fiscal year): **2002**

SUBJECT (from original application form): **Improving detection technology, quantifying the impact on stand structure, remote sensing, *Adelges piceae*, *Adelges tsugae*.**

STATUS OF SUBJECT SPECIES (select one by deleting inapplicable option): **non-native noxious**

PROJECT OBJECTIVES (from original application form): The overall objective of this project is to develop the use of remotely sensed data to improve the detection and monitoring of balsam woolly adelgid and hemlock woolly adelgid infestations. Preliminary risk rating of stands and impact assessments will also be conducted for balsam woolly adelgid in stands of subalpine fir. The four specific objectives of the project are to:

1. Develop the use of hyperspectral and multispectral remote sensing data for detection and delineation of subalpine fir decline and the presence of balsam woolly adelgid in affected stands.
2. Develop GIS-based technologies for the combination of remote sensing and other data types for a preliminary risk rating of stands of subalpine fir for infestation by balsam woolly adelgid.
3. Determine the impact of balsam woolly adelgid on stand structure and regeneration of subalpine fir.
4. Develop the use of hyperspectral and multispectral data for detection and delineation of hemlock woolly adelgid infestations affecting eastern and Carolina hemlock in the eastern United States.

BRIEF DESCRIPTION OF THE PROJECT: (Describe primary activities for each year, summarizing key accomplishments from prior year(s), this year's activities, and objectives for future years. This may be a clearly worded bulleted list or graphic of milestone activities. Each year's progress report should stand on its own without requiring the reader to wade through multiple previous reports to gain an understanding of the project's progress and accomplishments.)

Balsam woolly adelgid (BWA), *Adelges piceae*, is an introduced forest pest of true firs. It is widely established in North America, but is only recently expanding its range into the interior west. Currently, visible and color near-infrared aerial detection surveys are among the primary techniques used to detect and delineate insect infestations within forests. However, BWA damage is often not visible using this technology, even when infestations are in advanced stages. In addition, another introduced adelgid, the hemlock woolly adelgid (HWA), *Adelges tsugae*, is currently causing significant mortality to native hemlocks in the eastern United States. The proposed project will develop methodologies that will allow forest managers to take advantage of two important developments in remote sensing: a) the decreasing cost and greater availability of multispectral data from Landsat 7 and NASA/Earth Observing System (EOS) sensors and b) the ability to obtain low-cost high-resolution imagery in selected narrow bands with digital cameras and digital video systems. Both of these advances in remote sensing technology will be used in

developing schemes for early detection and monitoring of BWA and HWA infestations as well as the impact of BWA on stand structure. The monitoring system we seek to develop has two important stages. First, multispectral data sets will be combined with existing information in a GIS to generate risk maps for large areas. Then, the areas identified as high-risk can be targeted for more detail monitoring with narrow-band remote sensing aerial surveys. The methodology for these surveys will be developed using ground and aircraft measurements over controlled plots with various stress factors, and refined and tested under typical conditions for aerial surveys. This technology may allow forest managers to discriminate between various agents that can be involved in fir decline (such as BWA, root rots and western balsam bark beetle), as well as distinguishing between those agents and other plant stresses such as moisture stress. Following the determination and delineation of BWA infestations, ground measurements will be used to examine the impact of BWA on fir regeneration within the infested stands.

At the end of the first year, the University of Idaho is to provide:

1. Field test and provide improved data for the detection of balsam woolly adelgid infestations using narrow band filters and available hyperspectral data (i.e. NASA AVIRIS data).
2. Ground and foliar-based spectral characterization of trees impacted by balsam woolly adelgid and other agents.
3. Identification of narrow bands containing the most information about the balsam woolly adelgid infestation.

As funding is available, at the end of the second year, provide:

1. Continued ground and foliar-based spectral characterization of trees, concentrating on varying degrees of balsam woolly adelgid infestation.
2. Develop and validate a GIS-based risk assessment methodology for balsam woolly adelgid using a combination of remotely sensed and other data types.

As funding is available, at the end of the third year, provide:

1. Improve validation of the system for balsam woolly adelgid.
2. Extend the system for hemlock woolly adelgid in the Eastern United States.

As funding is available, provide at the conclusion of the project:

1. Spectral characterization of fir foliage impacted by several potential agents involved in subalpine fir decline, but concentrating on balsam woolly adelgid.
2. Spectral characterization of hemlock foliage infested with hemlock woolly adelgid.
3. Impact assessment of balsam woolly adelgid on subalpine fir.
4. A preliminary hazard risk rating scheme for balsam woolly adelgid infestation of subalpine fir stands in the interior west.
5. Bill the Forest Service for their prorated share of actual costs incurred to date, less program income excluding any previous Forest Service payment(s) made on this instrument to the date of the invoice.

(Candidly describe what has worked and what hasn't worked in the project, and within reason provide explanations that might help others to understand the limitations of techniques, approaches, technologies, and practices used or tried in the project).

CHANGES TO ORIGINAL PROJECT SCOPE OR OBJECTIVES (changes that need to be made to the original proposal and reasons for the changes): No changes have been made to date.

ADDITIONS TO ORIGINAL PROJECT SCOPE OR OBJECTIVES (describe additional accomplishments expected from the project): No additions have been made to date.

STATUS OF PRODUCTS/PRESENTATIONS: No due dates have been reached to date.

FHP LEAD CONTACT (FHP person submitting proposal):

Name
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PRINCIPAL INVESTIGATOR(S) (add lines as necessary):

<u>Name</u>	<u>Affiliation (Office or Dept.)</u>	<u>Phone, E-mail, Fax</u>
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COOPERATORS (contributing to, but not leading, the project) (add lines as necessary):

<u>Name</u>	<u>Affiliation (Office or Dept.)</u>	<u>Phone, E-mail, Fax</u>
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COOPERATOR INVOLVEMENT (add lines as necessary):

<u>Name</u>	<u>Role</u>	<u>Time Commitment</u>
Carol Randall	Technical Contact –USFS – entomologist	approx. 5 days

PRODUCTS AND DUE DATES (from original application form):

During Year 1, the focus will be on: 1) development and validation of the GIS-based risk assessment methodology for BWA using a combination of remotely sensed and other data types; 2) ground and foliar-based spectral characterization of trees with varying degrees of BWA infestation and other stresses and 3) identification of narrow bands which contain the most information about infestation.

During Year 2, the emphasis will be on field testing the detection of BWA infestations using narrow band filters in combination with an aircraft mounted digital camera or digital video system.

During year 3, we will extend the work done on BWA detection and delineation in the west to HWA in the eastern U.S. Site selection and assessment will be coordinated with Rusty Rhea of the FHP office in Asheville, North Carolina and Fred Hain at North Carolina State University

STATUS OF PRODUCTS/PRESENTATIONS: (If products or presentations are not completed by the due date, explain why and indicate when the products will be completed. Indicate whether the Region/Area considers current progress on the project to be acceptable; if not, what corrective measures are planned?)

ACCOMPLISHMENTS TO DATE:

- Acquisition of a NASA AVIRIS flight to provide hyperspectral data for a balsam woolly adelgid infestation in the St. Joe National Forest (near Clarkia, ID). Although the flight occurred this past summer, the data has not yet been transmitted to us from NASA. It is scheduled to arrive shortly.
- Acquisition of a second hyperspectral data flight from a commercial enterprise (Earth Search Systems, Inc.) for the same infestation in the St. Joe National Forest and for a second infestation located in Latah County, ID. As with NASA, the flight occurred this past summer but we have not yet received the data. It is scheduled to arrive shortly.
- We have initiated ground-based measurements on infested trees in one infestation. The data have not yet been analyzed.
- We have identified several locations in northern Idaho on which to conduct work next summer.

Products:

Publications:

Technology Transfer:

FIRST FISCAL YEAR FUNDED:

The University of Idaho received the funding less than 2 months ago. Other than salary money, little has been spent to date. The first monthly accounting balance from University of Idaho bookkeepers is not yet available. The allocated FY 2000 funds are necessary as requested.

FUNDS OBLIGATED FROM BEGINNING OF PROJECT THROUGH CURRENT FISCAL YEAR (extend table as needed)(Ignore this section if not requesting funds):

	Item	Requested Funding	Expended Funding	Unused Funding
FIRST YEAR				
Administration	Salary			
	Overhead			
	Travel			
Procurements	Contracting			
	Equipment			
	Supplies			
Year Totals				
SECOND YEAR				
Administration	Salary			
	Overhead			
	Travel			
Procurements	Contracting			
	Equipment			
	Supplies			
Year Totals				
CURRENT YEAR		Requested FHP STDP Funding	Other Source Funding	Source
Administration	Salary			
	Overhead			
	Travel			
Procurements	Contracting			
	Equipment			
	Supplies			
Year Totals				
PROJECT TOTALS				

FUNDS NOT USED FROM PREVIOUS FISCAL YEAR (If there are unused funds, what is the reason for not using them? How will the project continue without these funds?)

Fiscal Year	STDP Funding Allocated	Funds Obligated	Funds Unused

EXPECTED BUDGET FOR NEXT FISCAL YEAR, FY 2001 (extend table as needed):

	Item	Requested FHP STDP Funding	Other-Source Funding	Source
Administration	Salary	34,277	23,130	U. of Idaho
	Overhead		21,265	U. of Idaho
	Travel	6,500		
Procurements	Contracting			
	Equipment			

	Supplies	3,600		
		44,377	44,395	U. of Idaho
Totals				

DIFFERENCE BETWEEN ORIGINAL AND AMENDED REQUESTS AND JUSTIFICATION (the difference between originally requested funds and funds needed based on changes in the budget or scope of the project):

STDP FUNDING NEEDED:

Total estimated additional future funding needed beyond the current fiscal year:

Estimated STDP funding needed in remaining year(s) of the project by fiscal year. Show separately the funding to be requested/provided from other sources (extend the table as necessary).

Fiscal Year	STDP Funding	Other-Source Funding	Source
2001	44,377	44,395	U. of Idaho
2002	46,430	48,421	U. of Idaho