

Customized Backpack Sprayers for Site-Specific Herbicide Application in Forestry Operations

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PROBLEM STATEMENT

- Significant amount of forestry herbicide application in Southeast US applied using manual labor
- Concerns about accurate labor records
- Quality of work performed unknown
- Unable to document manual labor used during forestry silvicultural operations
 - site preparation
 - regeneration
 - stand management

BACKPACK CONCERNS

- **Worker Safety & Compliance**
 - Walking Through the Contaminated Vegetation All Day (Reentry Issues)
 - Improper Personal Protective Equipment
 - Compliance with worker regulations
- **Quality Issues**
 - Proper Ground Speed
 - Skips and Double Sprayed Rows
 - Tank Mix Not Correct
 - Dumping Product
 - Wand Height Not Correct



PRECISION FORESTRY

- The use of geospatial-based tools and technologies
 - for planning and conducting site-specific and condition-specific forest management activities and operations
 - to improve wood product quality and utilization, reduce waste, increase profits, and maintain environmental quality
 - for quality assurance and compliance of timber management practices

OBJECTIVES

- Design a new style of backpack sprayer for chemical application in forestry operations
- Develop a compact spatial data logger system for documenting worker activity

SITE-SPECIFIC DATA

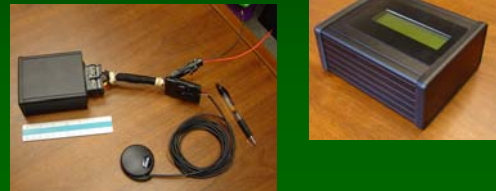
- **End Users**
 - Landowner
 - Consultants
 - Contractor
- **Information**
 - Verification of services provided
 - Input to management decisions
 - Audits for SFI compliance
 - Certification

DATALOGGER DESIGN

- Small and lightweight
- Mounted at the top of backpack
- Tamper proof by worker
- Use low-cost GPS to document worker activity
- Ground speed readout for worker
- Record data to a compact storage device
 - Position, Speed, and Spray activity (On/Off)
- Used for spatially documenting other operations
 - Machine spraying, tree planting, site prep, etc.

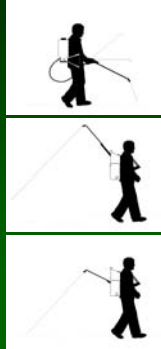
SPATIAL DATALOGGERS

- Microcontroller based system
- 4 analog inputs
- Garmin 18 DGPS receivers
- Data recorded to compact flash card
- Data downloaded into GIS to generate as-applied maps and analyses



SMARTPACK SOLUTION

- Meet and exceed all safety standards
 - Nozzle at the rear of sprayer
 - Battery-powered pump unit to decrease worker energy output
 - High-quality backpack frame and harness for worker comfort
- Collect spatial data for worker performance and production
- Quality Issues
 - Real-time ground speed feedback for worker
 - Data collection for evaluating and reporting actual ground speed, product dumping, skips, and double sprayed rows
 - Rear adjustable fix mount wand to assure proper wand height



SMARTPACK SYSTEM



Speed Display



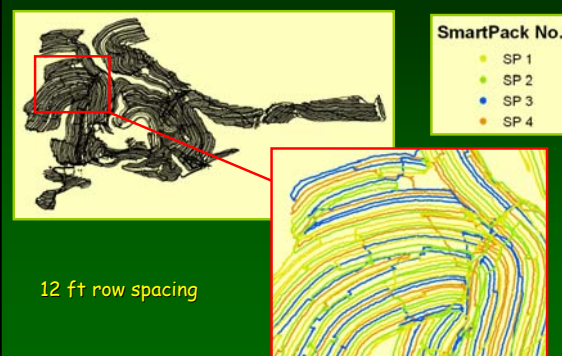
Toggle Switch

SMARTPACK



Banded application

AS-APPLIED MAP



12 ft row spacing

SmartPack Activity Report Landowner



Contractor	NA
Data of Application	3/15/2005
Amount of Product Used	10.1 oz/acre Velpar 2.9 oz/acre SFM 75
Total Acres Covered	74.6 acres

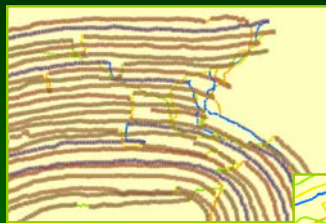
SmartPack Activity Report Contractor

SmartPack	AVG Speed	Target +/- 15%
1	2.6	68.0%
2	2.6	68.0%
3	2.5	69.0%
4	2.6	69.0%

Target Speed = 2.5 MPH

SmartPack	Feet of Row Sprayed	----- Acres -----		
		Treated	Gross	Acres per Hour
1	70,118	6.4	19.3	1.9
2	65,750	6.0	18.1	1.8
3	68,231	6.3	18.8	1.9
4	66,467	6.1	18.3	1.8
Totals	270,566	24.8	74.6	7.5

Quality Control Contractor



SmartPack No.
SP 1
SP 2
SP 3
SP 4

Spray ON/OFF

Indicate skips



Rows Double-Sprayed

SUMMARY

- A new site-specific backpack system developed with primary considerations for worker safety and comfort
- Spatial datalogger permits the collection of worker activity
- Provide contractor, consultants, and landowners various feedback on worker performance and compliance

QUESTIONS

