

ASABE/NAAA TECHNICAL SESSION

December 05, 2011

INCREASING SPRAY EFFICACY – AN INTEGRATED APPROACH

5 Year Project
(2006-2011)

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OBJECTIVES OF THE 5-YEAR PROJECT

- 1) To enhance methods of drop size measurement
- 2) To develop a decision support system that maximizes net present value of crops in response to pest control programs
- 3) To improve existing aerial application technologies for maximum on-target deposition (leaf/needle/ground/block/compromise) AND minimize off-target deposit/environmental concerns

Core Technologies

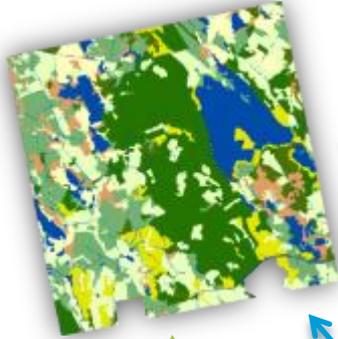
- Objective 1 - Wind Tunnel
- Objective 2 – Decision Support System
- Objective 3 – Aircraft Technology
 - Auto boom control
 - Flow control
 - Aircraft-based real time meteorology measurement
 - Aircraft altitude real time above target
 - AGDISP– Spray deposition modeling
 - Offset spraying



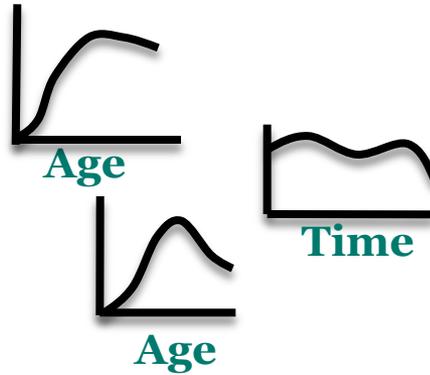
- ▶ **Operational With New Modifications/Instrumentation 2010**
- ▶ **Up to 300 kph, 1 m test section**
- ▶ **Filtering system captures real product**
- ▶ **Provides Droplet Spectrum Data For Real Product Runs For Specific Nozzles At Aircraft Speeds**

ForPRO DSS

GIS Stand Inventory
(area, types, age)



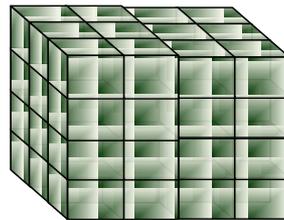
Stand Volume



Defoliation
scenarios



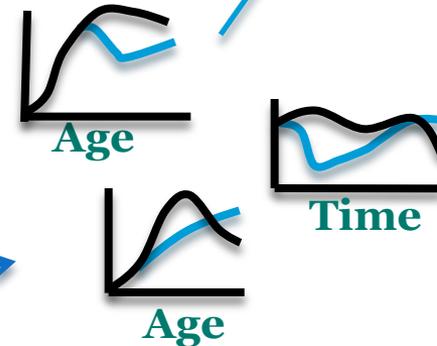
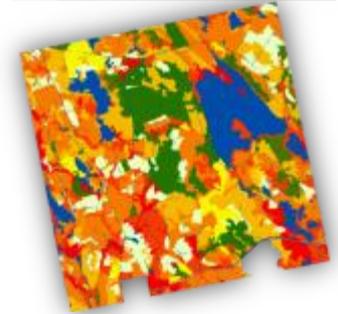
Stand Impact Matrix



Microsoft Access
Geo-database Or
Woodstock Model

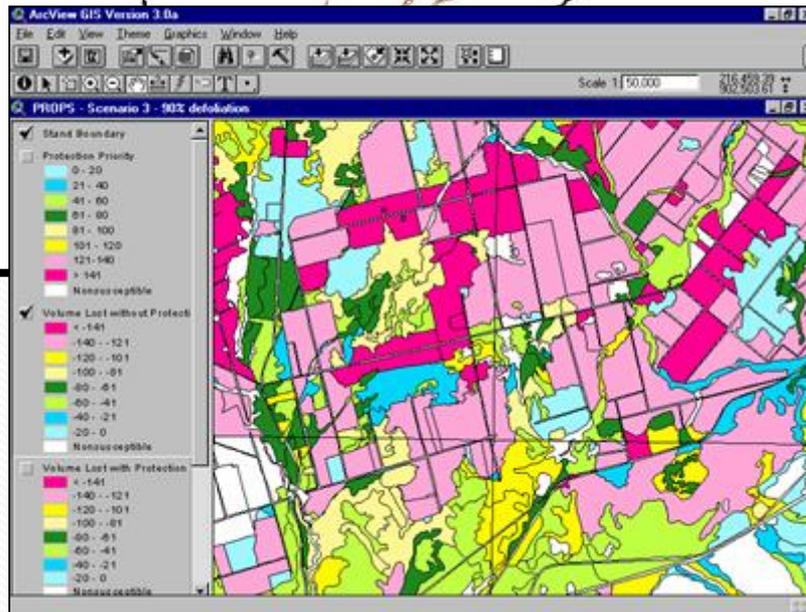
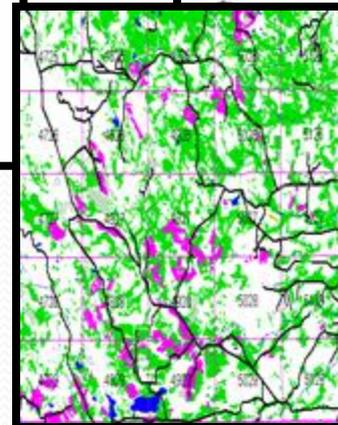
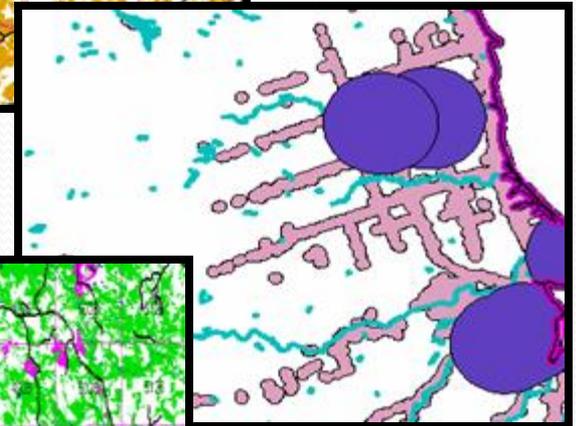
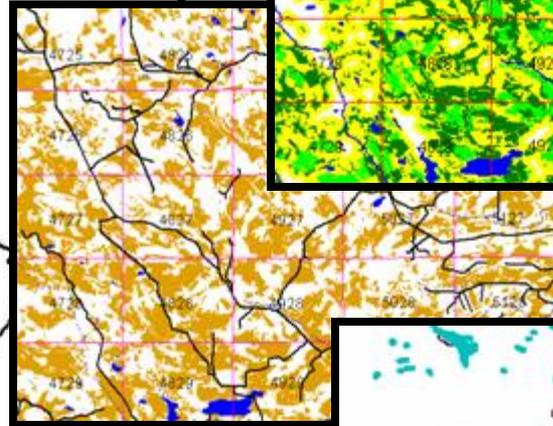
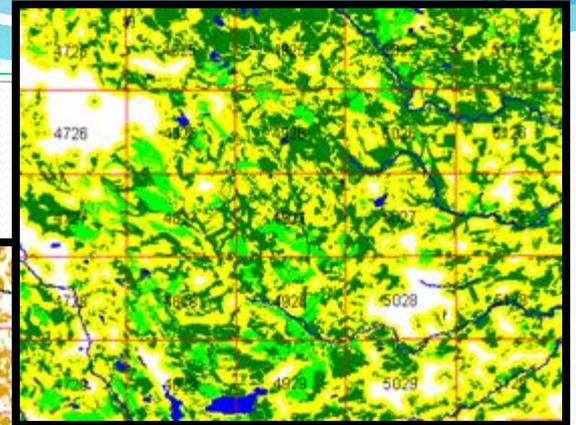
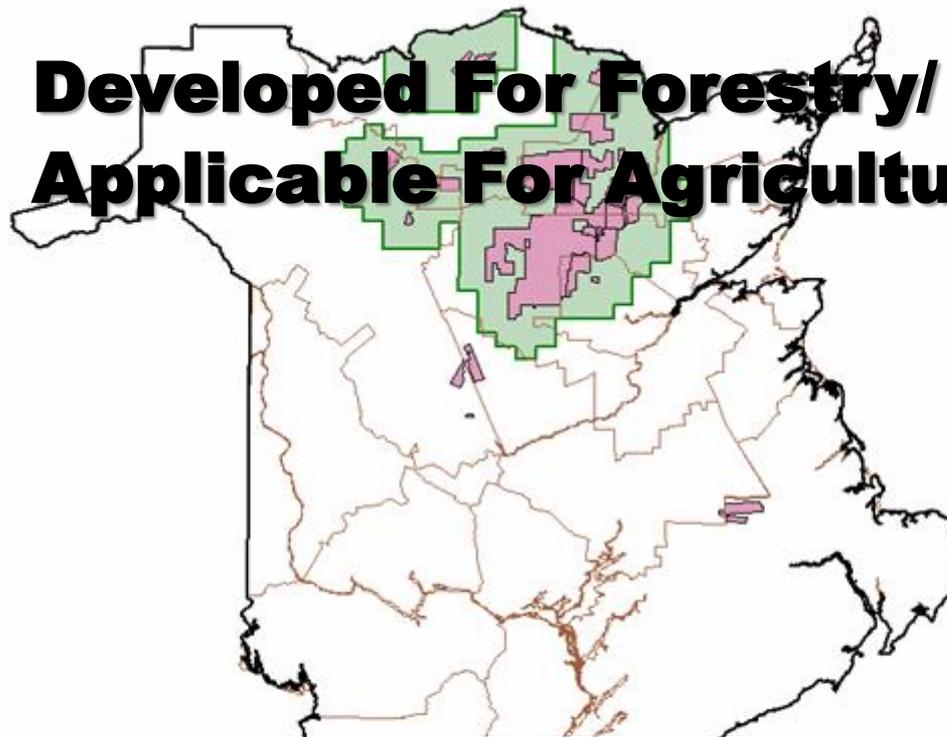
Results:

Maps of spruce-fir
volume impact for
future time periods.
Forest level spruce-fir
growing stock impact.



Volume Impact Predictions

Developed For Forestry/ Applicable For Agriculture



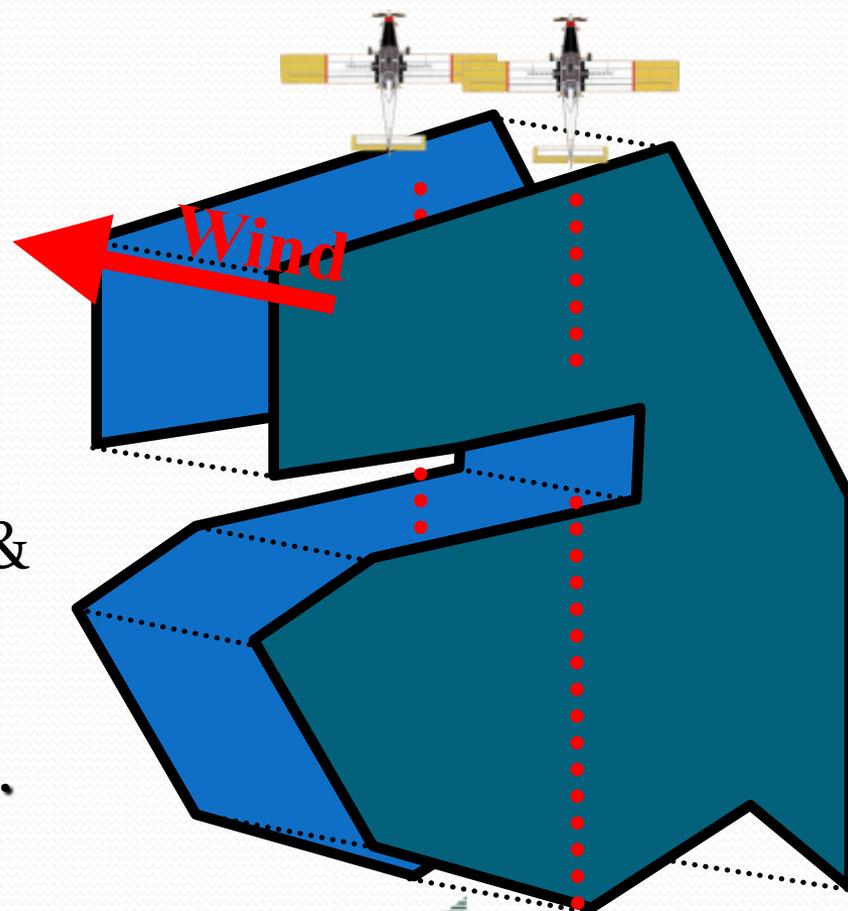
Aerial Management System

➤ Standard Spray:

- No data used to account for drift due to met and other conditions.

➤ Offsetting Spray:

- Variables such as droplet spectrum, met conditions & release height are used to determine an offset distance for each spray run.



Key Real-Time Components



2003. 5. 16

Aircraft Meteorology

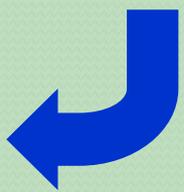
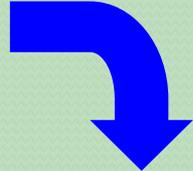
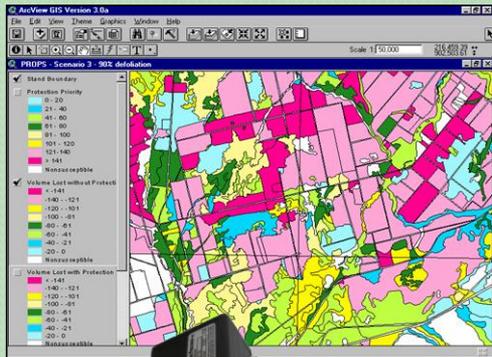
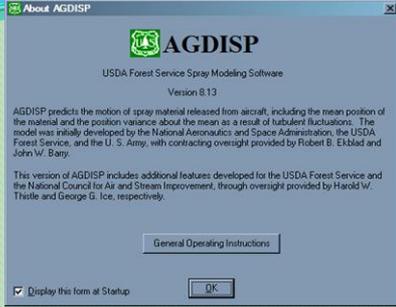


Laser/Radar Altimeter

Knew What We Needed!

(Black Box)

ACCUAIR
Aerial
Management
System/Drift
Reduction
Technology
(DRT)

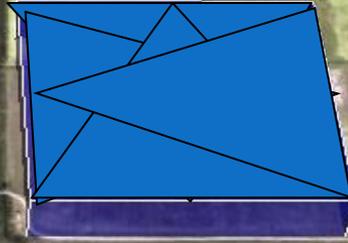


2006 Florida Trials

Grass Farm

400 m

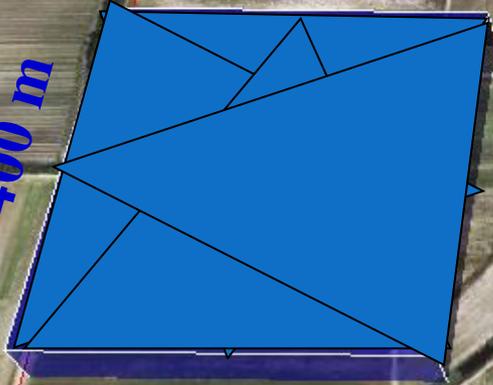
400 m



Optimized

400 m

400 m

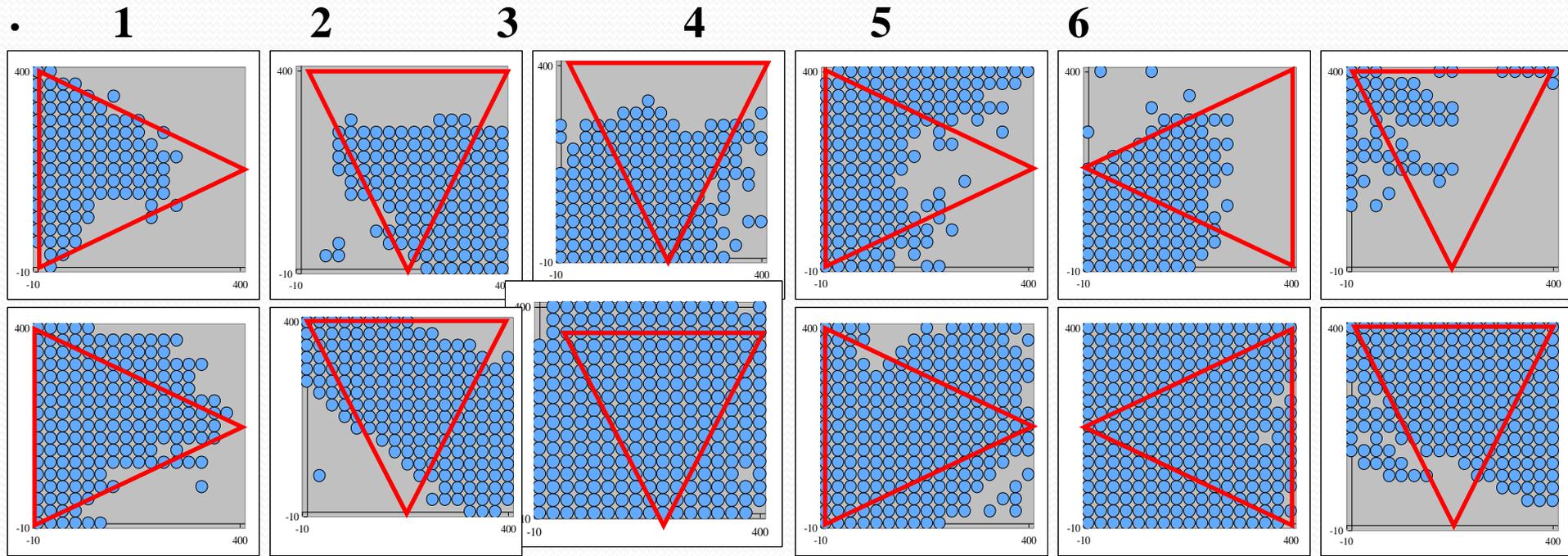


Standard



Where Drops/cm² > 0

Standard Applications



Optimized (offsetting) Applications – Deposits Inside Block Increased Substantially

www.sergreport.net

“Optimized Aerial Application to PROPS Forest Polygons”



Source: (gr) SERG-I 2007

2006 FLORIDA RESULTS

Optimization strategies using offset flight lines show deposit & droplet densities increase up to 2.8 fold

Improved deposition was achieved using off set spraying

In some instances droplet densities per cm² were increased by a factor of 10X

2007 Ontario Trials (JPB)

Spray Block Folder



70000 ha
500 polygons
40 files



Block1.shp
Block2.shp
Block3.shp
Block4.shp
Block5.shp
Block6.shp
Block7.shp
Block8.shp



2007

70 000 ha Treated By 5 Fixed Wing Aircraft, 2 Helicopters

- 2 700 ha were optimized and deposit was compared to standard application
- First time offsetting spray applications were used operationally in a forestry program
- 2007 Results From CFS
 - Combined Deposit From All Samples – Average Deposit INSIDE Block (IU of Btk/g dry weight of foliage)
 - Standard Application 32.19
 - Offset Application 100.11
 - 3 FOLD Deposit On Offset

2008 Ontario Trials Gypsy Moth Virus



2008 Ontario Trials

- Five blocks were treated with Gypchek® and the Aerial Management System (Optimization)
- Included two Provincial parks (campground) and a Butterfly Conservation Area
- Offset spraying used successfully

2009 Retooling

- Hardware/Software Change
- Transport Canada Flight Approval
- October - Aerial Application Trials, NB

2010 Quebec Operation

- AT-802F applied 17000 L of Btk for SBW control during 13 missions using offsetting technology
- For the first time real-time aircraft height above canopy was used as a variable to calculate the offset distance
- Subsequent to Quebec applications additional hardware refinements were tested for incorporation

2011 Quebec & New Brunswick Operations

- Two ACCUAIR AMS aircraft (AT802F) were used operationally QC SBW and NB BFS (70% offsetting) programs
- Record individual RPMs from 10 AU4000 atomizers
- Incorporate this technology into fire suppression operations
- ACCUAIR AMS branding adopted and the system is now available on the market.

Goal of 2006 - 2011 Trials/Operations

- To answer with empirical data:
 - “Do we obtain a better deposit using offset spray compared with a standard spray?”

YES!

Up To 3 Fold Depending Block Size

Future Work (2012 & Beyond)

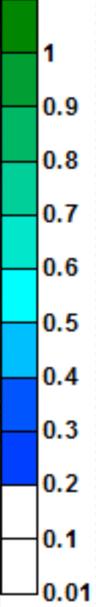
- Fine tuning
- Improving Met Prediction
- Improving Offset Locations
- Maybe Drones (But Not During My Career)

No FlightLine Offset – Standard Spray

9.3kph



Label
Rate



1354 m

Image © 2011 GeoEye,
© 2011 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google earth

Using AMS FlightLine Offset

9.3kph



Label
Rate

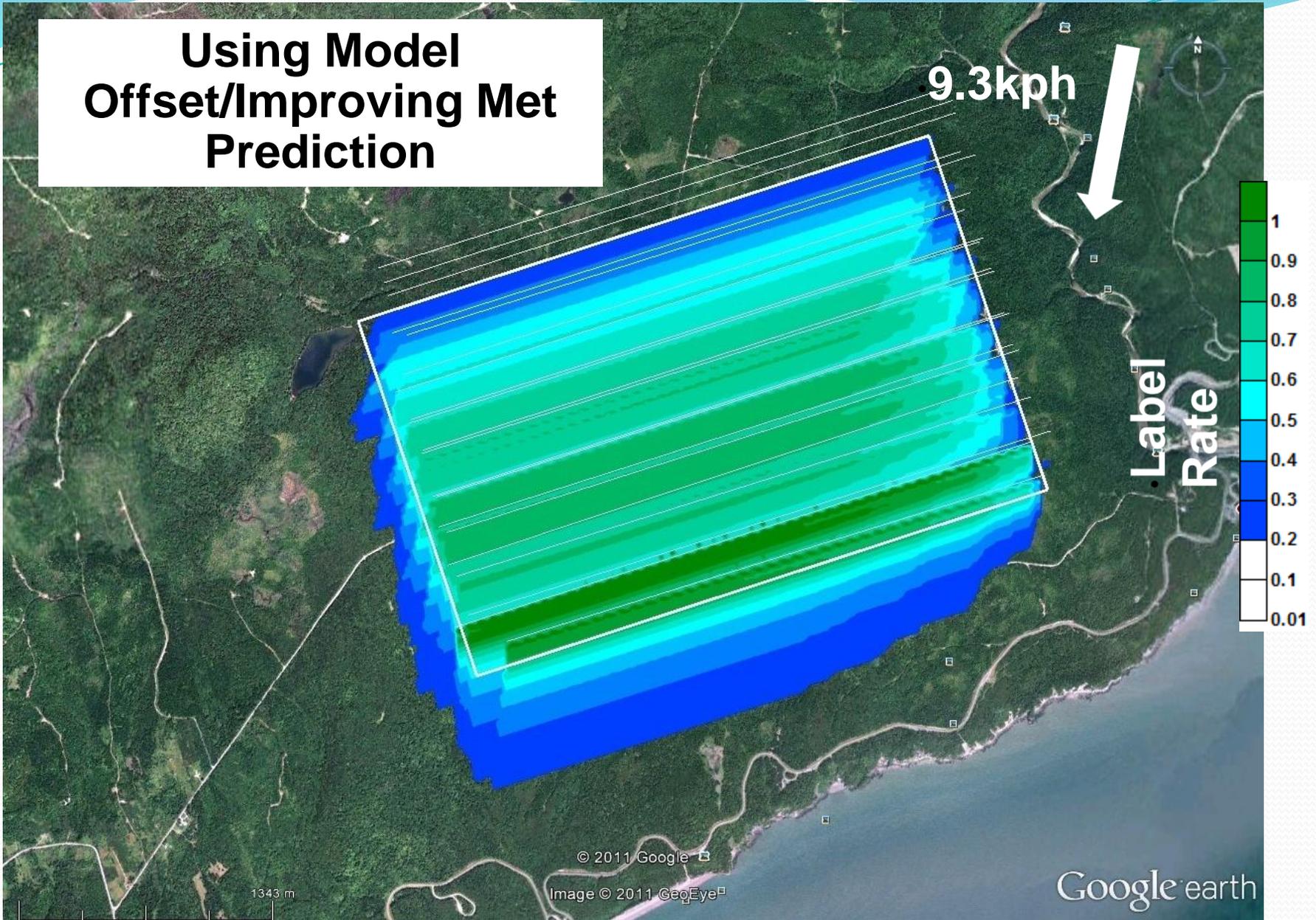


1354 m

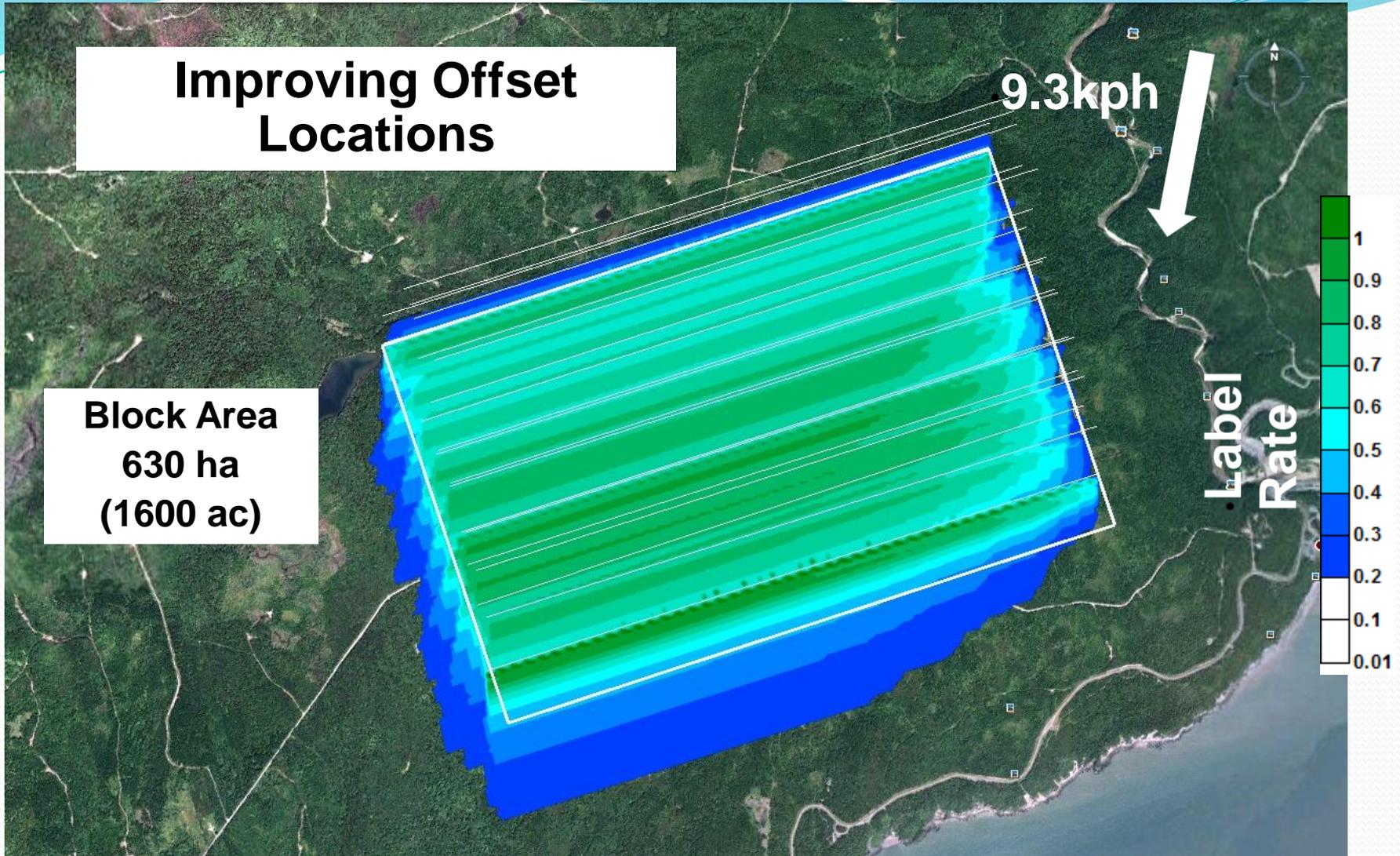
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Google earth

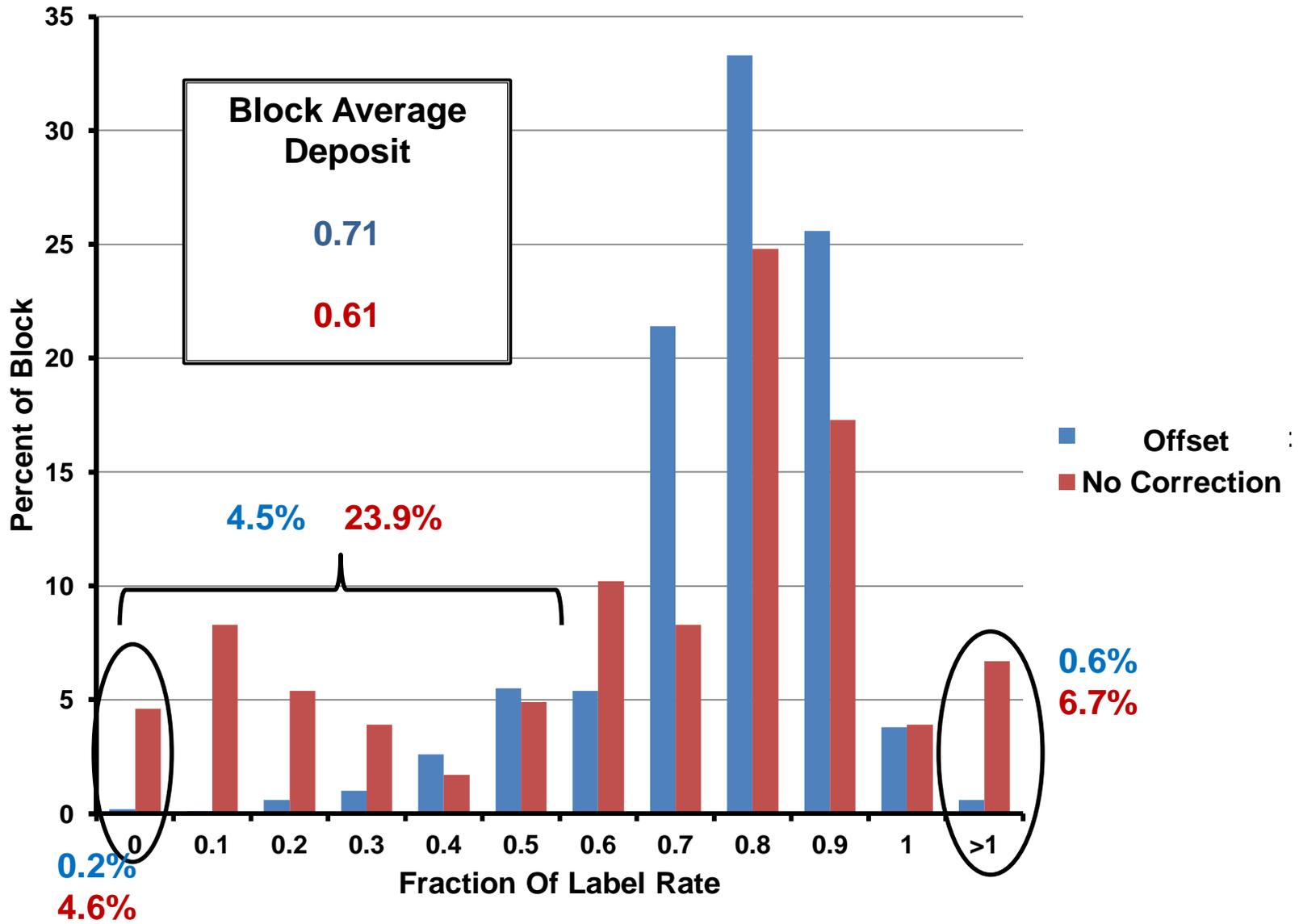
Using Model Offset/Improving Met Prediction



Improving Offset Locations



- Increase In Deposit On Block From Standard Spray: 17%
- Increase In Area That Received 70-100% Of Label Rate: 30% (54% to 84%)
- Net Value Of Additional Pesticide Applied To Block: \$5,400

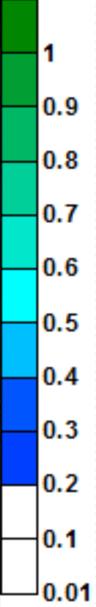


No FlightLine Offset – Standard Spray

9.3kph



Label
Rate



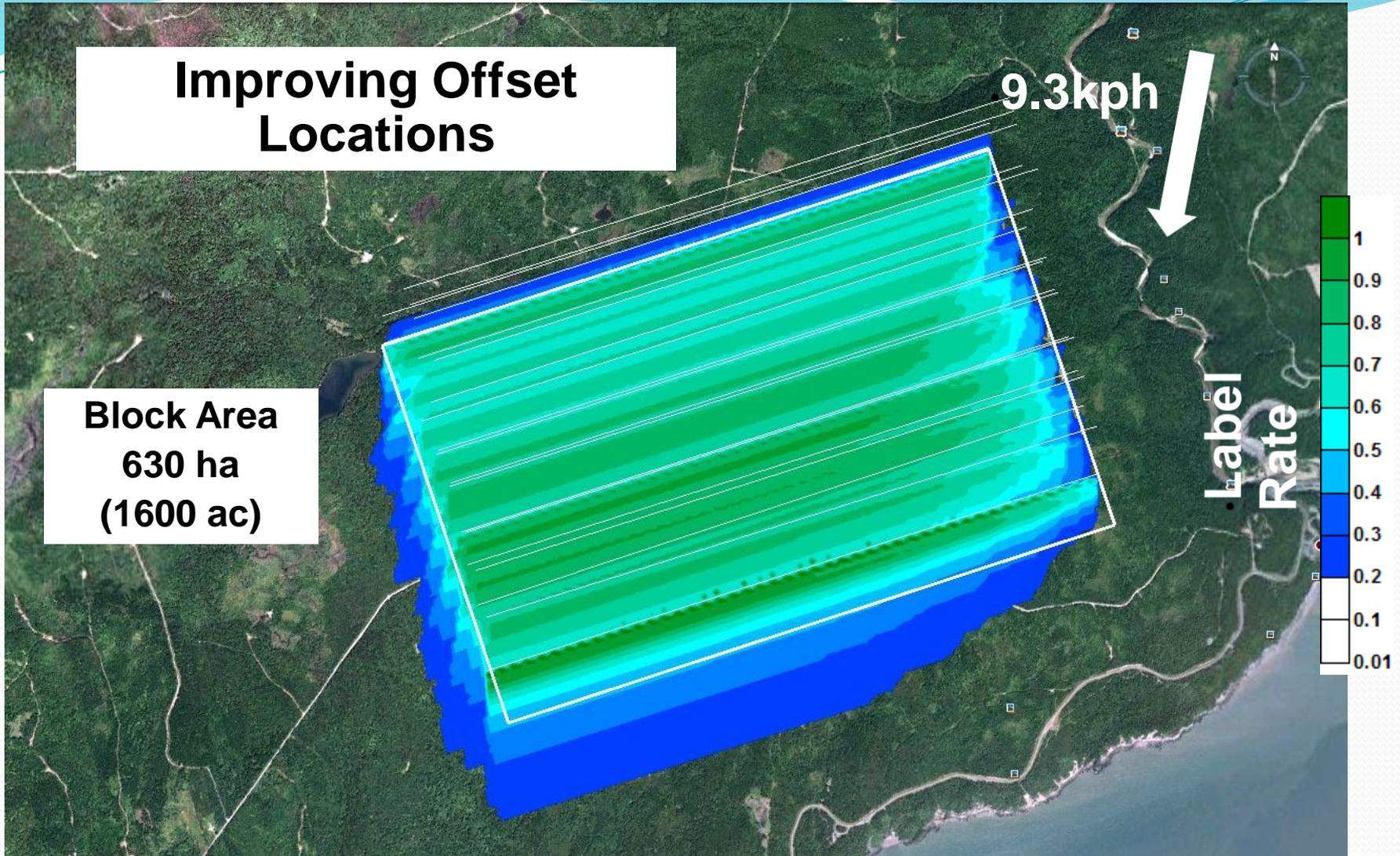
1354 m

Image © 2011 GeoEye,
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Google earth

Improving Offset Locations

Block Area
630 ha
(1600 ac)



- Increase In Deposit On Block From Standard Spray: 17%
- Increase In Area That Received 70-100% Of Label Rate: 30% (54% to 84%)
- Net Value Of Additional Pesticide Applied To Block: \$5,400

MAJOR PARTNERS



Forest Protection Limited (FPL)[®]



AG-NAV



BioAtlantech (BA)



Canadian Forest Service (CFS)



NB Dept. of Natural Resources (DNR)



Sylvar Technologies Inc. (ST)



University of New Brunswick (UNB)



Acknowledgements/Other Collaborators

Sylvar Technologies Inc

Envenio Inc United States Forest Service

Ontario Ministry of Natural Resources Forus Research

Timberline Natural Resource Group Ltd AGNAV Atlantic Canada Opportunities Agency

University of New Brunswick Société de protection des forêts contre les insectes et maladies

Natural Sciences Engineering Research Council of Canada REMSpC Consulting ADAPCO

New Brunswick Department of Natural Resources Manitoba Conservation

Alberta Sustainable Resource Development Canadian Forest Service

Manatee County Mosquito Control District BioAtlantech

Valent Biosciences Counties of Dufferin Norfolk Simcoe

Saskatchewan Environment

SERG International



Thank You!

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