

**Vegetative Environmental Buffers to Mitigate  
Odor and Aerosol Pollutants Emitted from  
Poultry Production Sites**

**Multi-State Project: Delaware, Iowa,  
Pennsylvania**

**Spring 2005**



# **New NRI Project: Vegetative Environmental Buffers to Mitigate Odor and Aerosol Pollutants Emitted from Poultry Production Sites**

**- Started May, 2004**

- **Iowa State University**

- **PIs: Joe Colletti, John Tyndall (now at Univ. of North Dakota), Jan Thompson, Steve Hoff, Gene Takle, & Ray Arritt; collaborator Gwyn Beattie**

- **University of Delaware**

- **PIs: George (Bud) Malone, Dave Hansen & Gary Van Wicklen**

- **Pennsylvania State University**

- **PIs: Paul Patterson, Michael Hulet, & Ricky Bates**

# Outline

- Objectives
- Procedures
- Progress Made
- Outcomes/Impacts



# **Project Objectives**

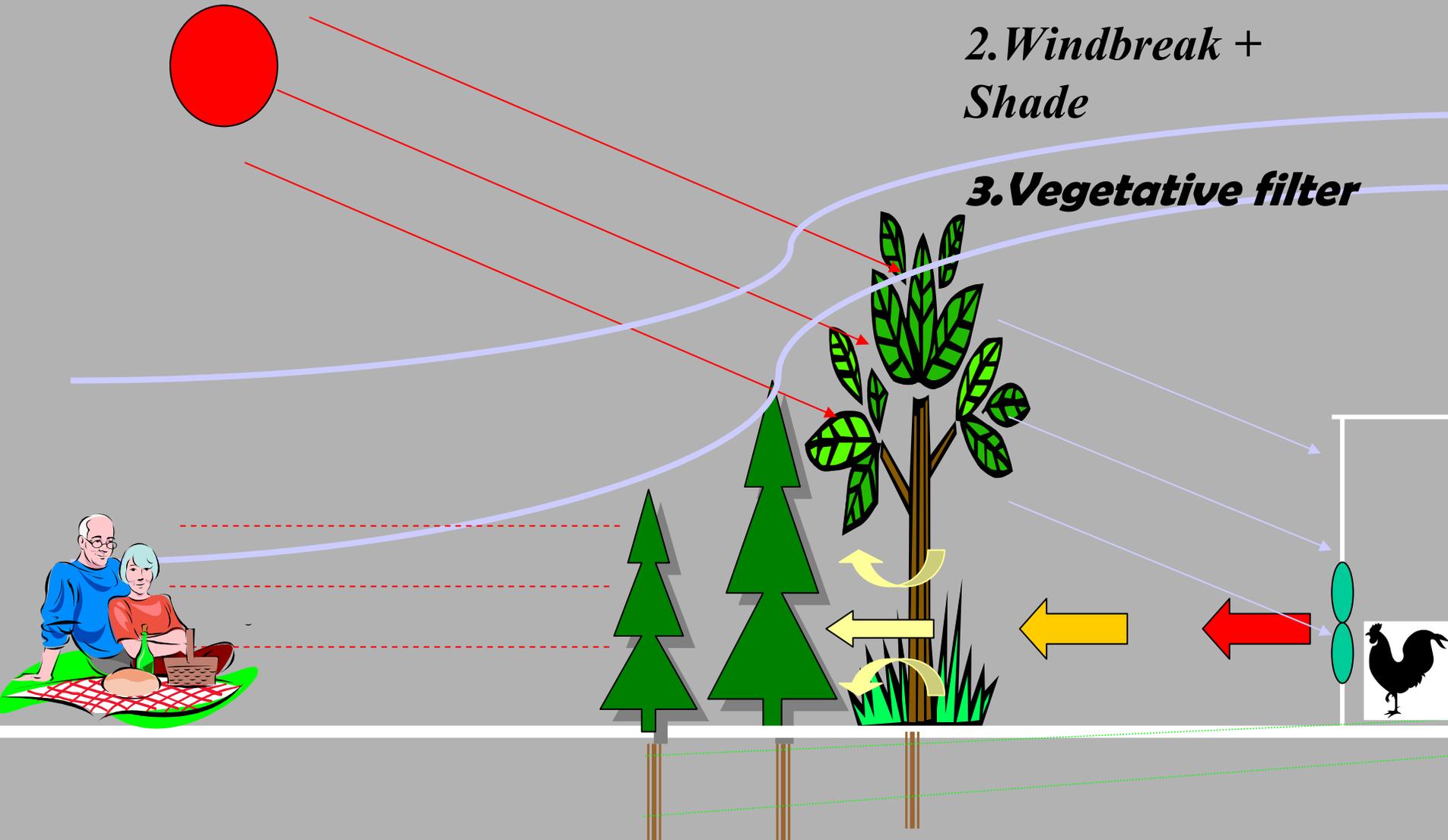
- **Farm & field level atmospheric quantification of VEB efficacy – odor, particulates, ammonia & species hardiness**
- **Simulation of emission behavior**
- **Greenhouse & lab studies of biochem/biophysical VEB & poultry emissions interactions**
- **Analysis of VEB costs with/ without governmental assistance**
- **Integration of research, outreach and education efforts**

# Goals of Vegetative Environmental Buffer

*1. Visual screen*

*2. Windbreak + Shade*

*3. Vegetative filter*



# Procedures

- **Linked field, greenhouse & lab studies across 3 states – Delaware, Penn, Iowa**
- **Field – evaluate air, soil, water quality (Del) & microclimate - fate of pollutants captured by VEBs (Del, Penn, IA)**
- **Total particulates (PM<sub>10</sub> & PM<sub>2.5</sub>), ammonia, & odor**

# "Before and After" Shelterbelt Field Study

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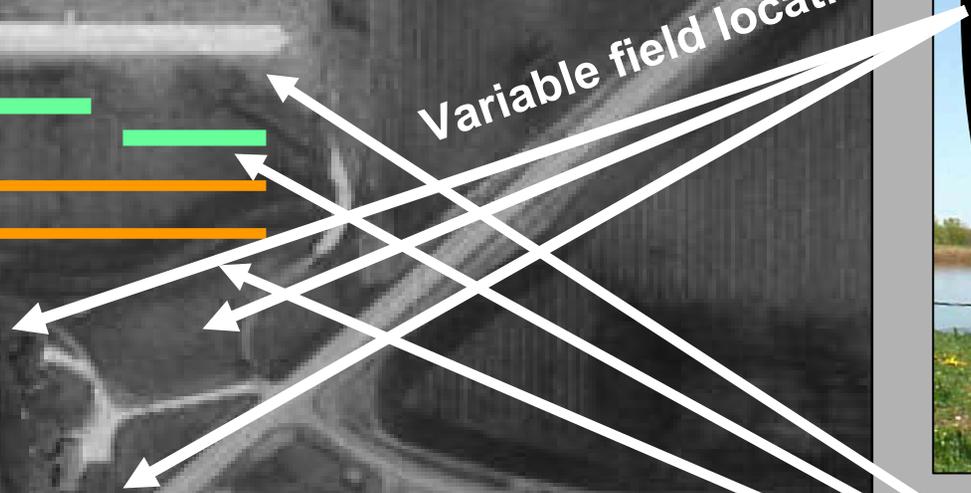


R. Cedar



willow

Variable field locations



## Air samples:

- Odor
- Ammonia
- PM 10
- PM2.5

Mobile Emissions Lab

# Tree Type & Planting Distance from Tunnel Fans - 2002

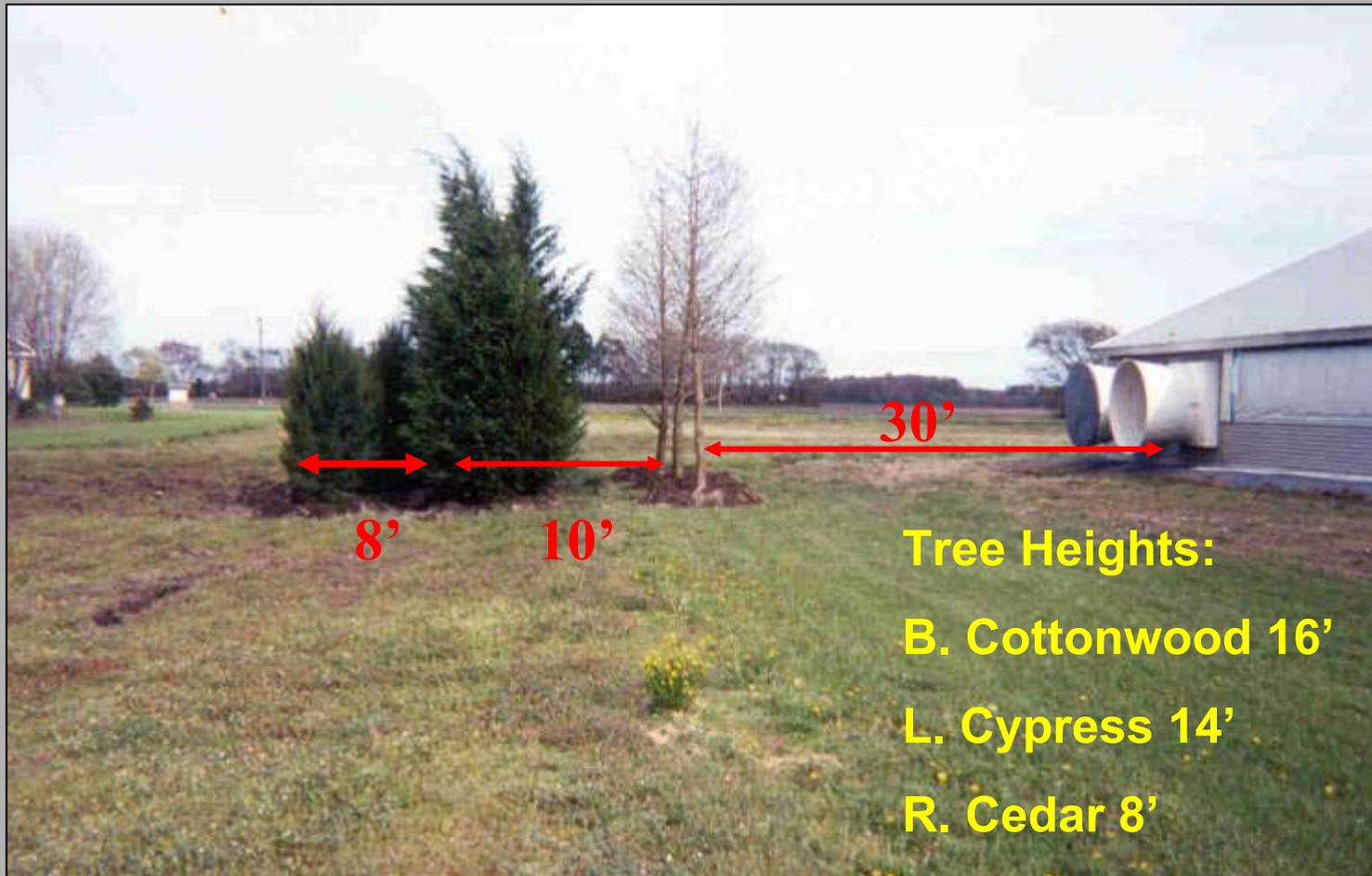
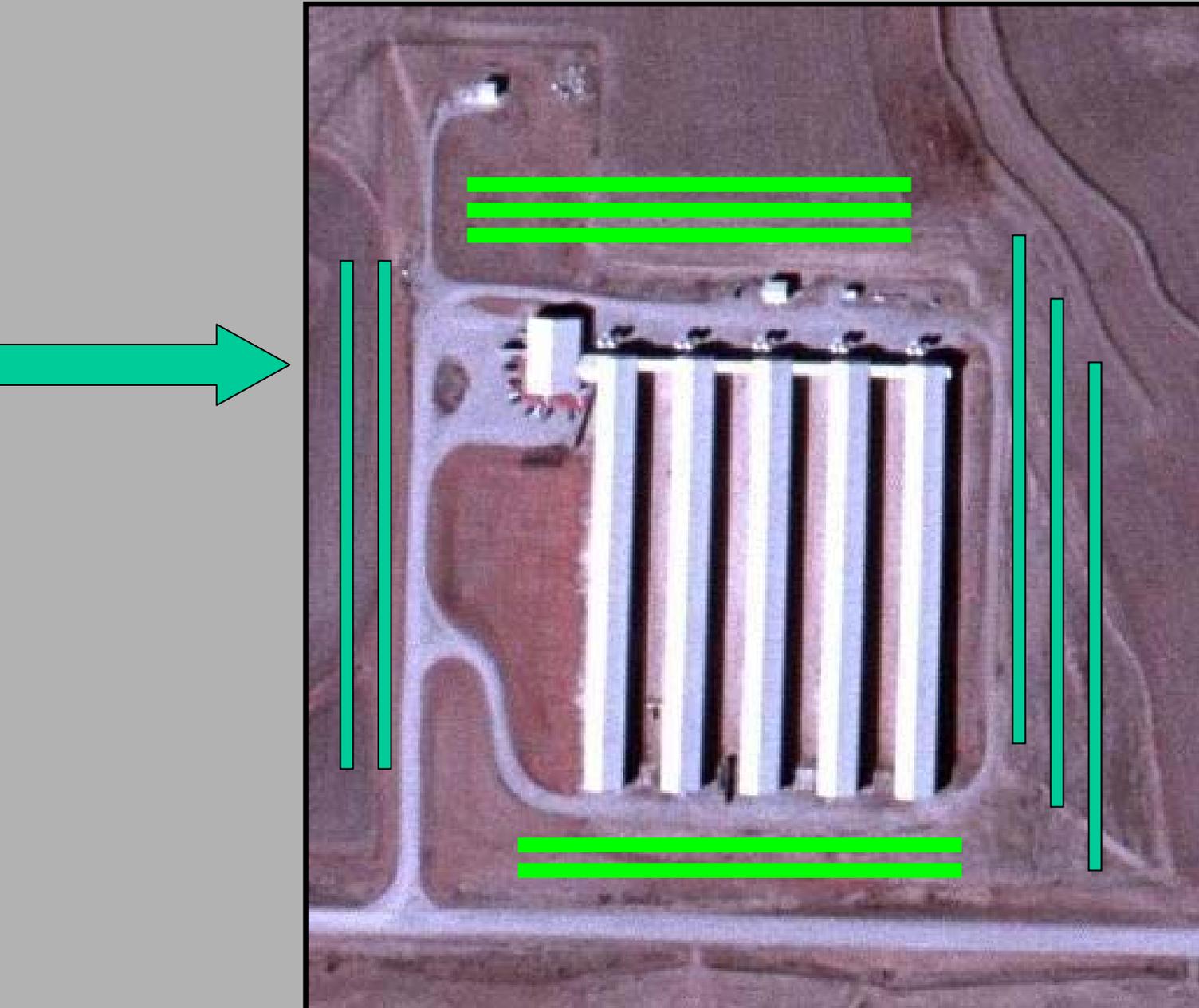


Photo: B. Malone, U of D

# Procedures

- **Simulation of Emission Behavior**
  - **Virtual Particulate transport model - ISU**
  - **Smoke/ gradient system – Delaware**
- **Greenhouse & Lab Studies**
  - **Tree & ammonia – Penn State**
  - **Particulates – ISU**
- **Cost Analysis**
- **Integrate Research, Outreach & Education**

# VEBs – Virtual Particulate Simulation



# **Progress Made all States**

- **Established more VEBs**
- **Developed common protocols**
- **Evaluated VEBs**

# VEB Planting at University of Delaware Environmental House

South



North



East

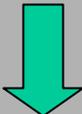


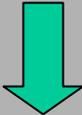
West

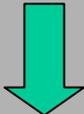


# Progress Made

- **Delaware – 22 ft three row VEB**

- **Ammonia**  **47%**

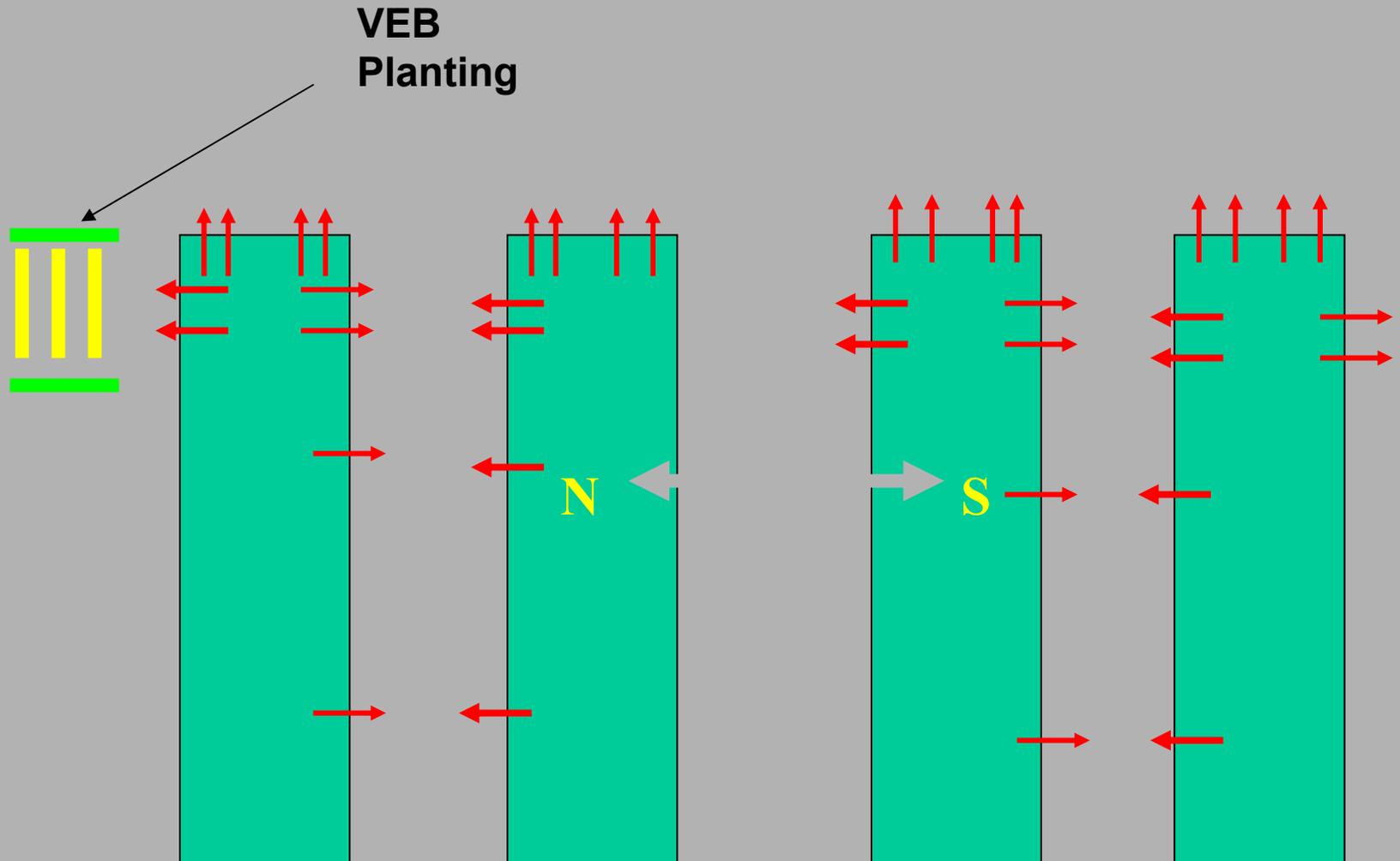
- **Total dust**  **51%**

- **Odor**  **13%**

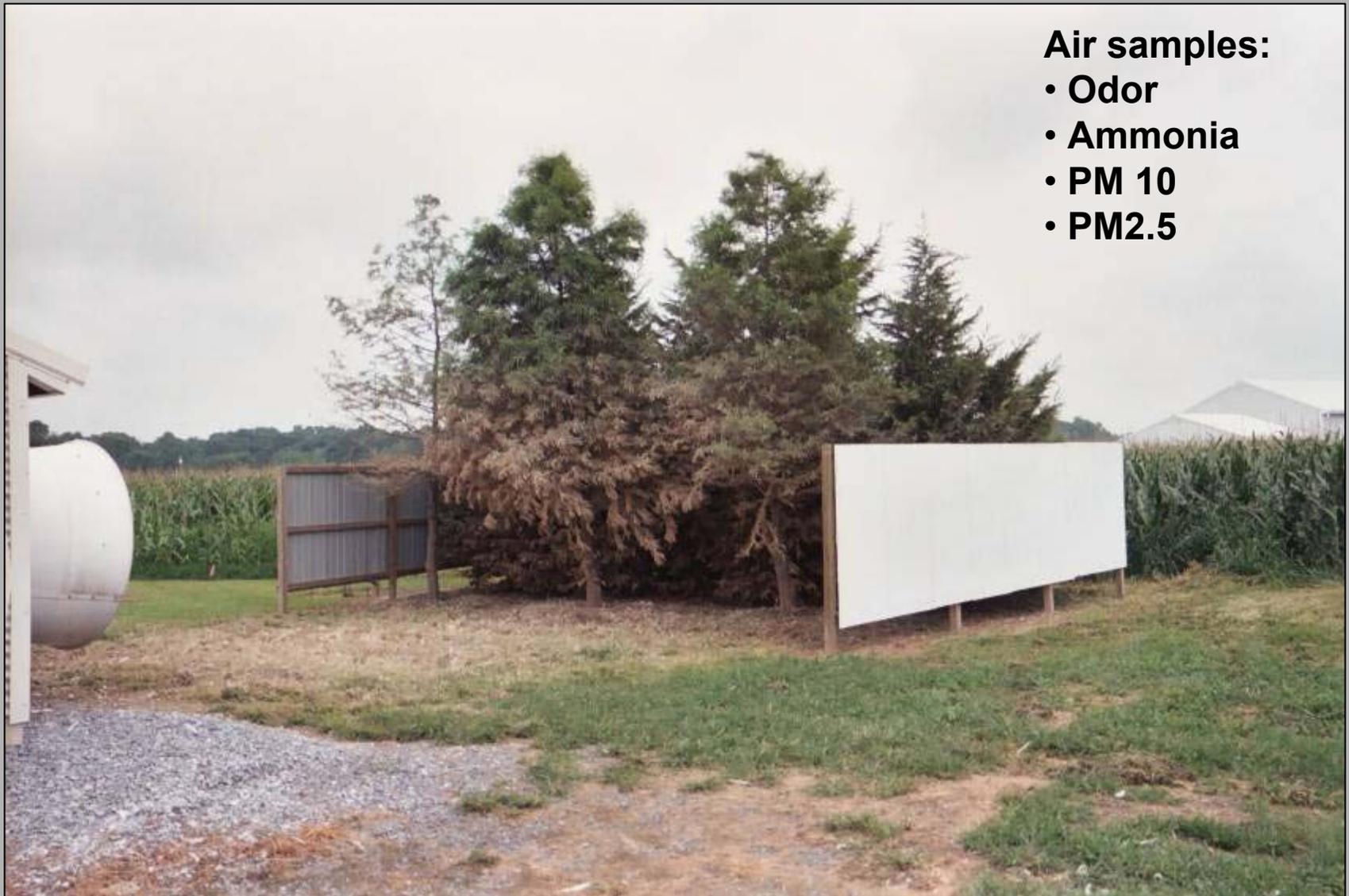


# Delaware Farm Layout & Sample Location

## Study Site 2002- present



# U of Delaware Test Site – Working Broiler Farm - 2003



## **Air samples:**

- **Odor**
- **Ammonia**
- **PM 10**
- **PM2.5**

Photo: J. Tyndall, ISU

# Weed Control Demo



# **Progress Made - Pennsylvania**

- **Established 12 new VEBs**
- **Field day in June**
- **Monitored microclimate & potential stressors**
- **Lab – Greenhouse studies of trees & dust/ammonia interactions (Pot-in-Pot)**
  - **Poplar damaged by ammonia**

# PSU – Experimental Pot-in-Pot



# **PSU- Environmental Chamber – ammonia, tree growth & tissue damage**



# **Progress Made - Iowa**

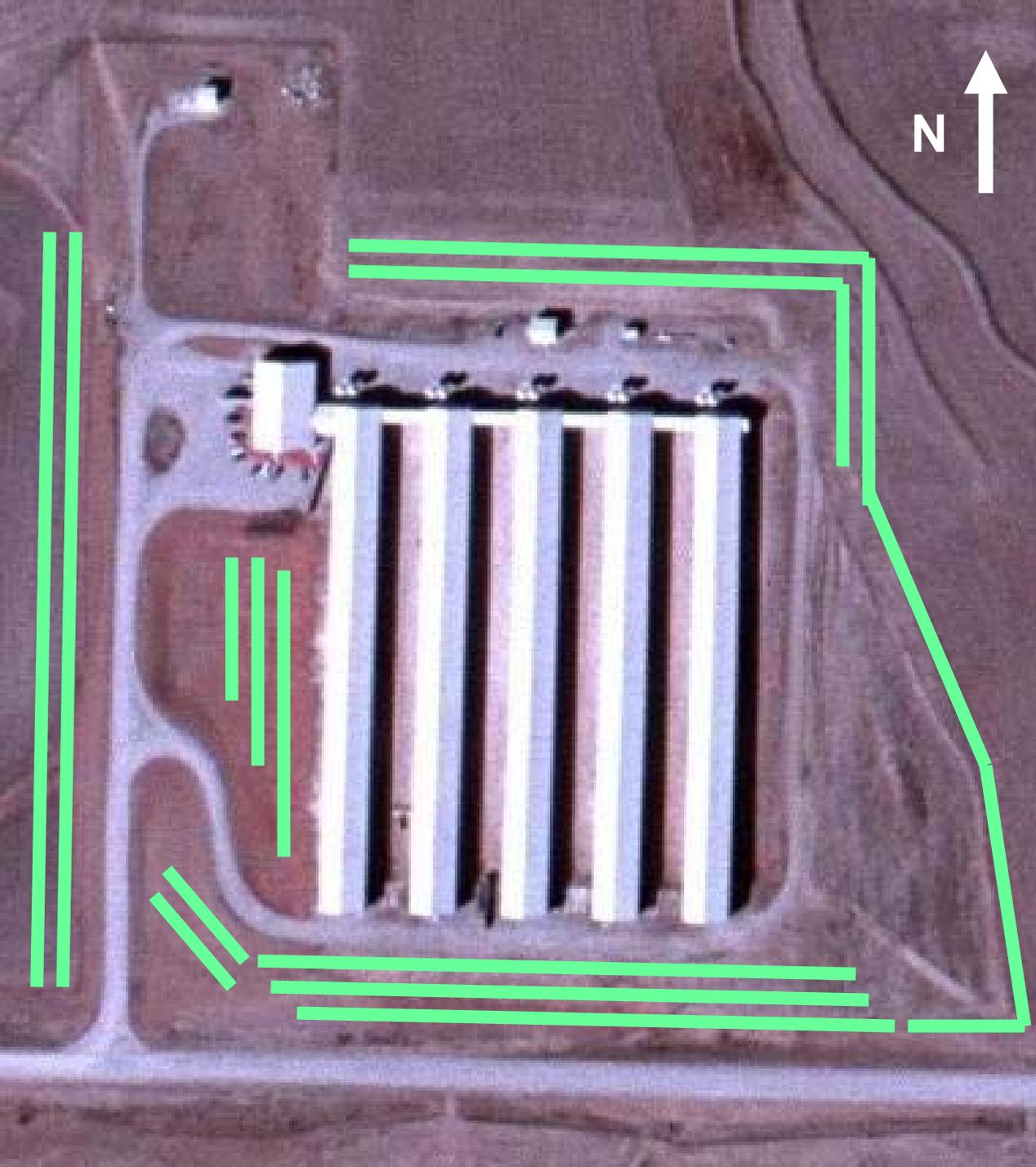
- **Planted VEB on private pullet operation**
- **Developed protocols**
- **Setup & calibration of Mobile Emission Lab (MEL)**
- **Sampled VEB**

# October, 2004 Sparboe Pullet Operation Eagle Grove, IA



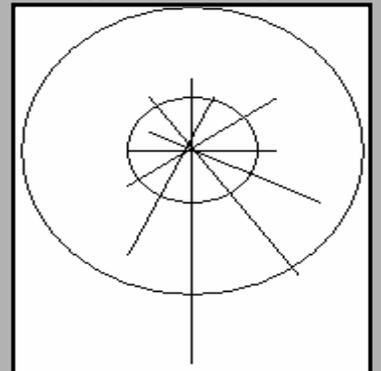
# **Outcomes & Impacts**

- **Poultry producers very interested**
- **Other interest groups interested**
- **Efficacy seems to exist for VEBs**
- **Neighbor to neighbor diffusion**
- **Many contacts with researchers by producers**



**Planting  
scheduled for  
spring 2005**

**May – August**



**Iowa's summer  
winds :  
south, southeast,  
and southwest**

# Shelterbelts & Landscape Aesthetics



Potential look of NE Iowa livestock facility

# NRCS CanVis Software



**Poultry Farm Site**



**Houses + 1 Yr Trees**



**Houses + 5 Yr Trees**



**Houses + 10 Yr Trees**