

## The Future of Soil Information

The Soil Information System (SIS)

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Founder  
Soil & Topography Information (STI)

### 5 Minute Video from SoilInfo.com



### Brief Background of SIS

- Dan Rooney background as a soil physicist combined with several years developing geotechnical sensors led to PhD (in remote sensing)
- Development began in early 2000's, founded STI in 2002
- Over \$10M spent on developing software, algorithms, databases, and sensors (thank you John Deere)
- Over 15 full-time scientists and engineers for 6+ years
- Full-throttle commercial in 2006
- Used all over USA, Europe, China, N. Africa

### Customers - Agriculture

4 continents - 300+ customers

#### In California

- Over 400 projects
- Repeat customers (includes two of largest grape growers in world; Gallo & WCGF)
- Activity increasing in other crops

#### US

- 12 states
- Variety of crops
- Activity increasing in multiple crops

#### International

- 200+ sites in Europe (mostly wine grapes)
- Multiple sites in Morocco (olives/citrus)
- Multiple sites in China (wine grapes)
- Inquiries from South America/Australia



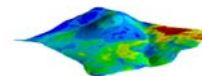
### Some Non-Ag STI Customers

US Department of Homeland Security (DHS): WI, MS, CA  
US Department of Defense (DOD): AZ, OK, VA  
SNCF (French Railroad): France  
Nexen Oil Company: Canada

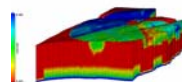
### Soil Information System (SIS)



The SIS consists of hardware, software, algorithms, patents, and licenses



The SIS creates soil information products that optimize inputs, timing, monitoring, and scouting for agriculture.



When combined with STI's dynamic decision support system crops can be managed throughout the growing season as conditions and the crop change.



SIS deployed at over 1000 sites on 4 continents with hundreds of customers

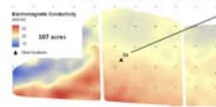
### SIS Genesis — Early Academic Research (1997-1999)



### EC/EM is NOT a Soil Property

#### Same EC ≠ Same Soil

EC = 42 mS/m at all 3 locations...



...but these are very different soils



The fact is that there are over a dozen soil properties that determine how fast an electromagnetic current travels through the soil. The EC is a bulk average raw sensor measurement that is best used as a step towards characterizing soils. Assuming that the same reading is the same soil is not accurate.

### SIS Hardware



### SIS Penetrometer Evolution

Gen2  
In use

Gen3  
Prototype

Gen4  
Development



Volumetric  
Moisture  
Resistivity  
Color  
Texture &  
Compaction

US Navy Patent: 5,316,950

"Method for quantitative calibration of in-situ optical chemical measurements in soils using soil class characteristics"

- STI has exclusive license: 3/2008
- Gen3 plus infra-red for chemistry



First prototype pictured and field-tested Nov. 2008

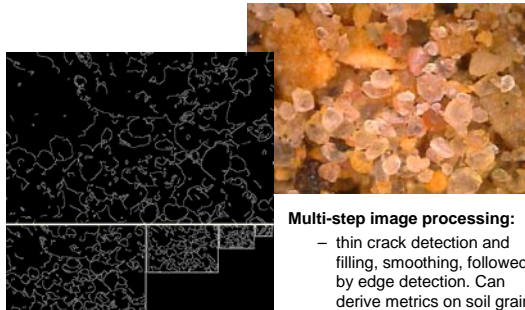
### Soil Imaging Property (SIP)



### SIP Images

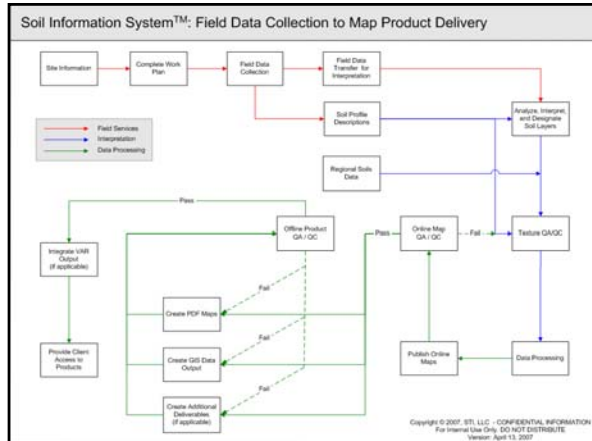
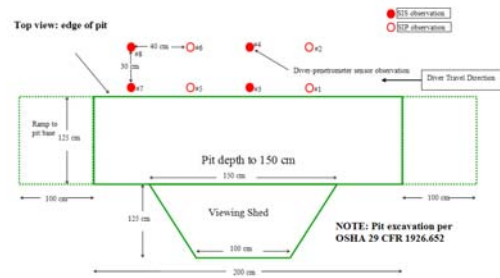


### Example Imaging Algorithm – Edge Detection

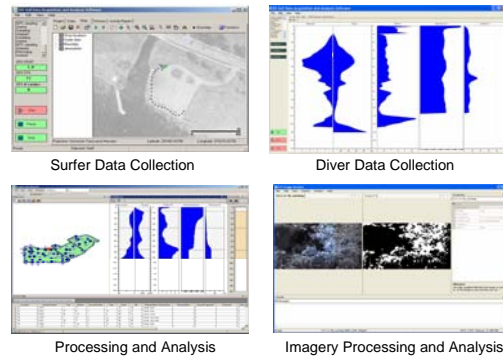


**Multi-step image processing:**  
 – thin crack detection and filling, smoothing, followed by edge detection. Can derive metrics on soil grains; number, size, shape, etc.

### Micro Correlations



### Software

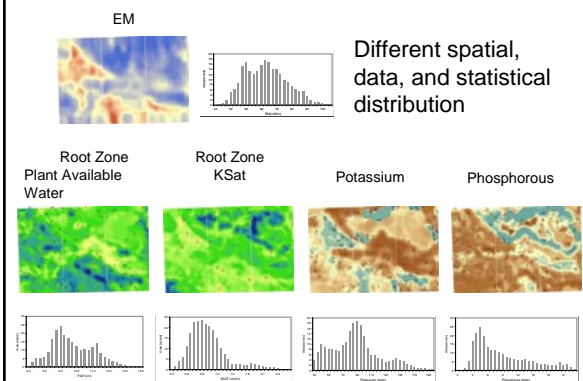


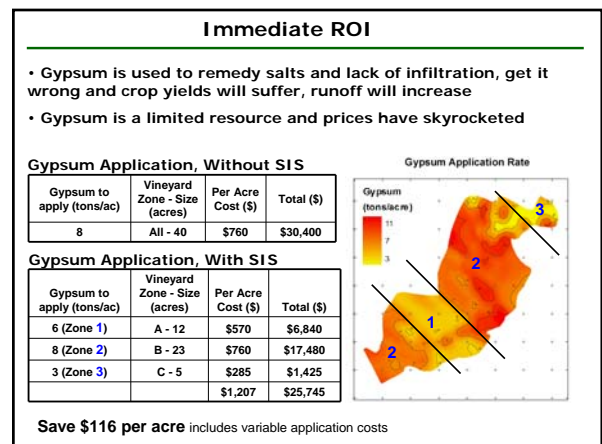
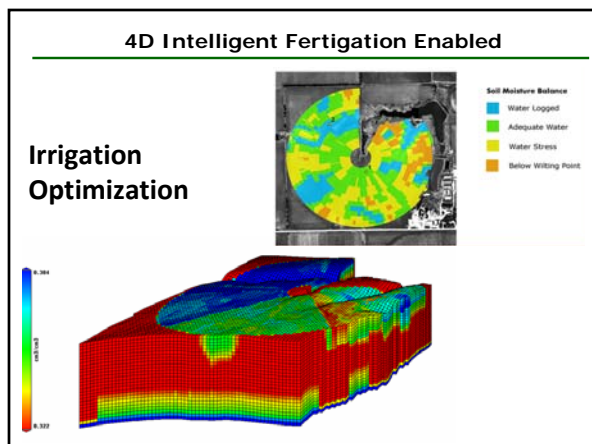
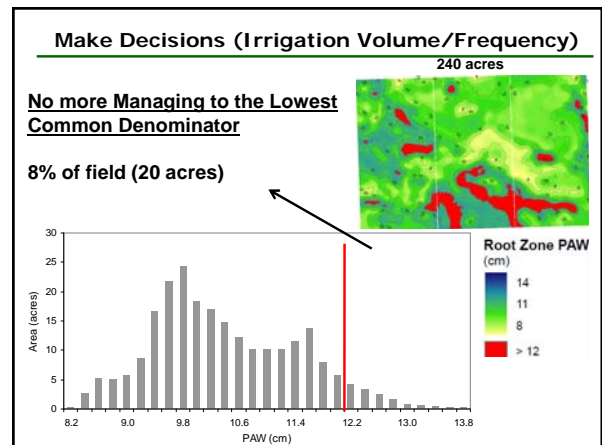
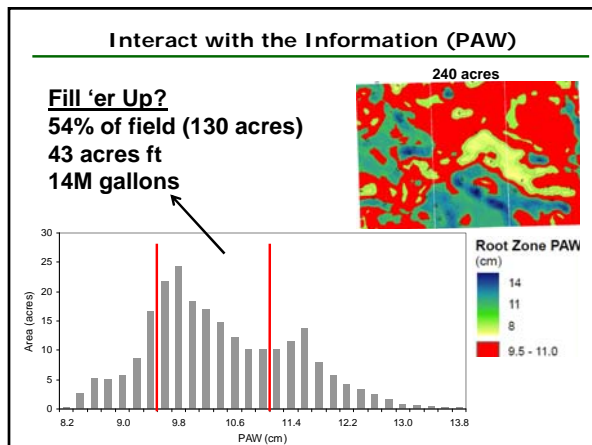
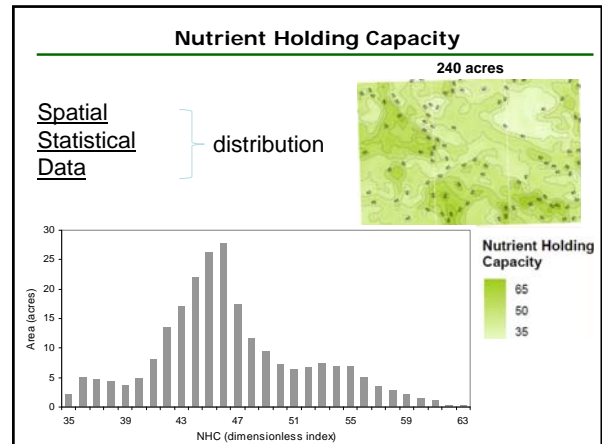
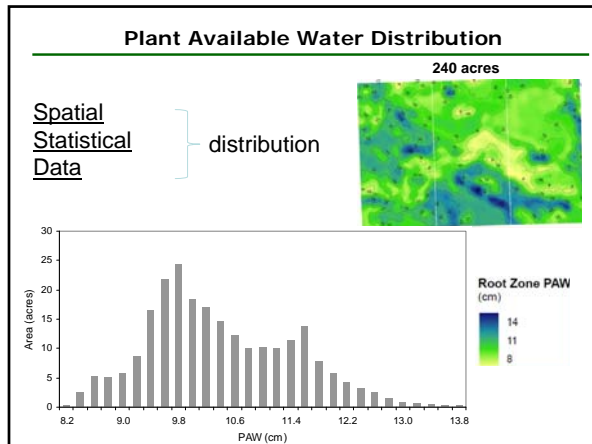
### Don't Judge a Book by it's Cover

**Why aren't EM/EC/NDVI alone a good way to 'map' soil?**

**Only 'scratch the surface' AND They each only have one spatial, data, and statistical distribution, unlike the way soil really is...**

### Super Giga Mega Ultra Dimensional



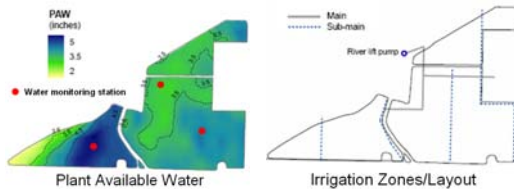


## Agriculture – Quantifying Soil Pays

Customer was going to apply irrigation uniformly

### Instead with the SIS they:

- Designed the irrigation to fit each unique field
- Irrigate based on soil water holding capacity and its unique 3D pattern
- Can intelligently target soil moisture monitoring
- Will save 5.5M gallons of water per year (220,000 gallons/acre/year)  
(In CA water costs vary so this ROI ranges from \$50-\$750 per acre annually)
- Will save over 37 hours of electrical pumping costs

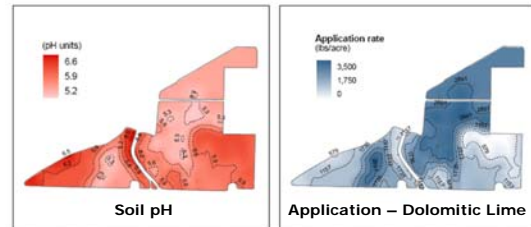


## Agriculture – Quantifying Soil Pays

Customer was going to apply chemicals uniformly

### Instead with the SIS they:

- Apply chemicals only where needed and at the correct rate
- Don't over apply chemicals and will not harm the environment or waste money
- Get a return of \$170 per acre immediately from applying chemicals intelligently



....now you know

[www.soilinfo.com](http://www.soilinfo.com)