

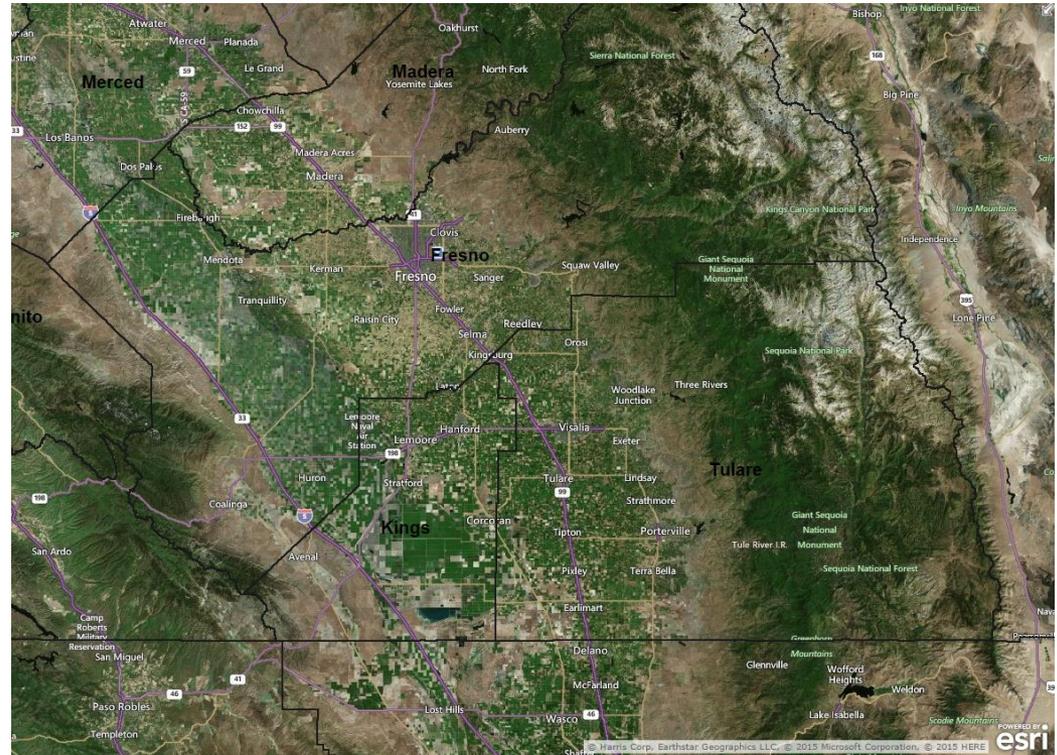
E&J. Gallo Winery

Satellite-based ET Applications in Wine Production: Maintaining Quality and Quantity in the Face of Drought,



Southern side of the Central Valley

- Intensive agricultural area within the Central Valley
- High use of water / high yielding fields
- Multiple crops – trees/vines/annuals

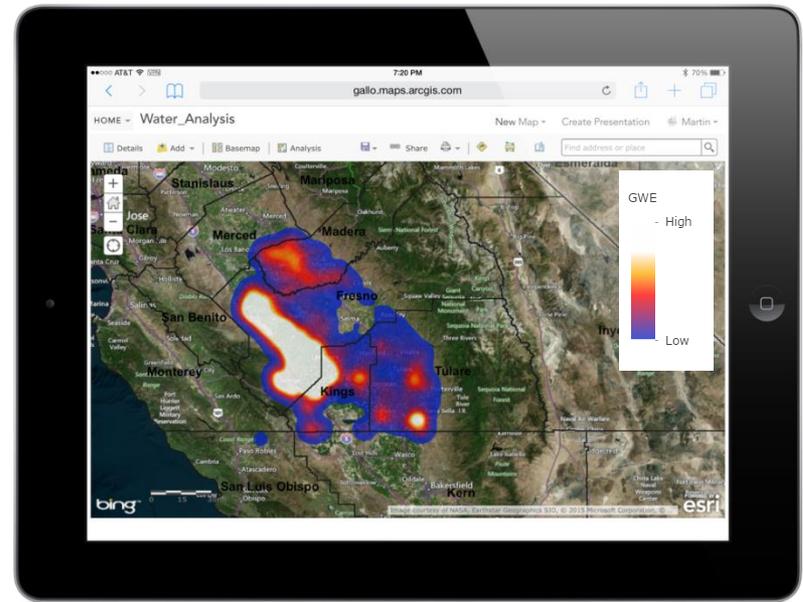
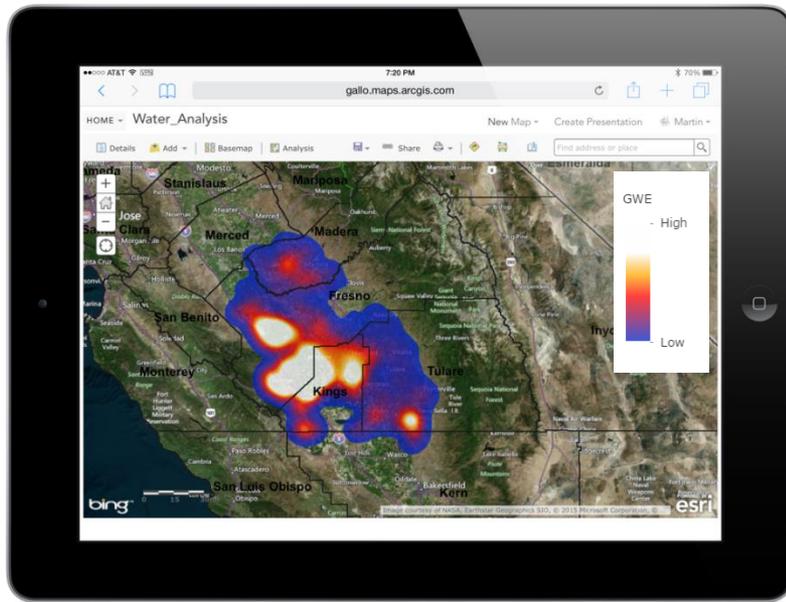


Ground Water Levels

2012

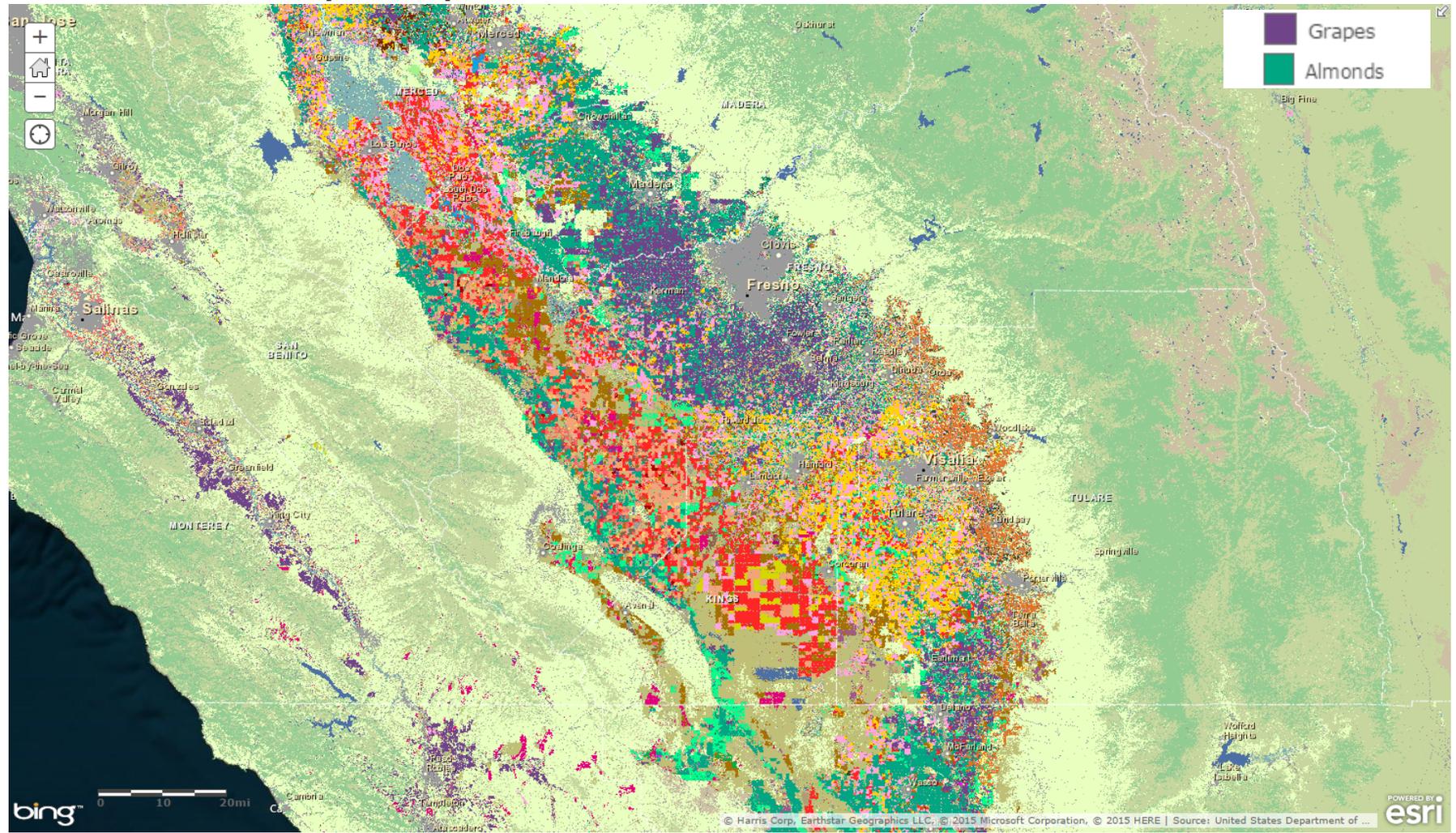
2014

DWR well data – distance from ground to water



Land Use

- NASS CropScope CDL



Applications of Remote Sensing

- Strategic Partnerships have allowed E&J Gallo to deliver value in commercial scale operations (Research to Practice)
- Management of natural resources is critical:
 - Water
 - Land
 - Others
- Management requires real time information deployed to growers via mobile applications

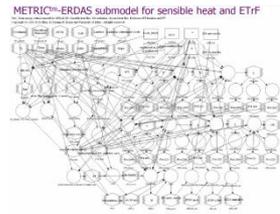
Satellite Based ET Applications

- Currently, Gallo works with every available Landsat image during the grape growing season. Irrigation generally starts in March in the warmer areas and continues through the month of October
- Gallo's goals with using Landsat imagery include:
 - Estimating the potential water use for vineyards by region and varietal
 - Estimating actual water use for irrigation and water stress index
 - Scanning every vineyard owned or purchased (approximately 150,000 acres) to develop area specific water budgets
 - Supporting land acquisition based on water availability and quality



PAST use of Satellite Data at E&J Gallo

- Desktop-based only / limited commercial application



A screenshot of a spreadsheet application. A red arrow points to cell A1. The spreadsheet has columns labeled A through F and rows numbered 1 through 20. Cell A1 is highlighted in blue.



PRESENT Model for deployment of Satellite-Based applications

- Desktop and mobile based – information delivered to growers real time via mobile applications
- Use of ‘Landsat web services’ and cloud computing systems via:
 - Amazon S3
 - Google Earth Engine
- Custom mobile applications for:
 - Viewing
 - Editing
 - Collection
- 24-HOUR DELIVERY

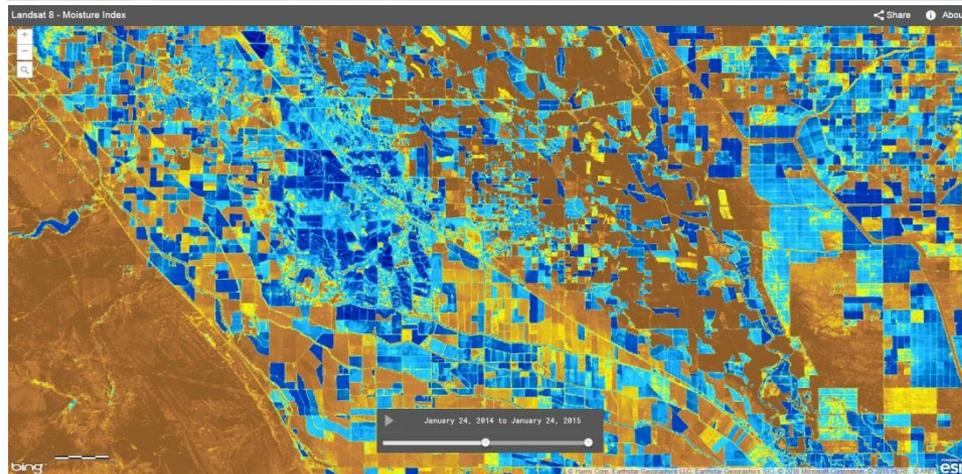
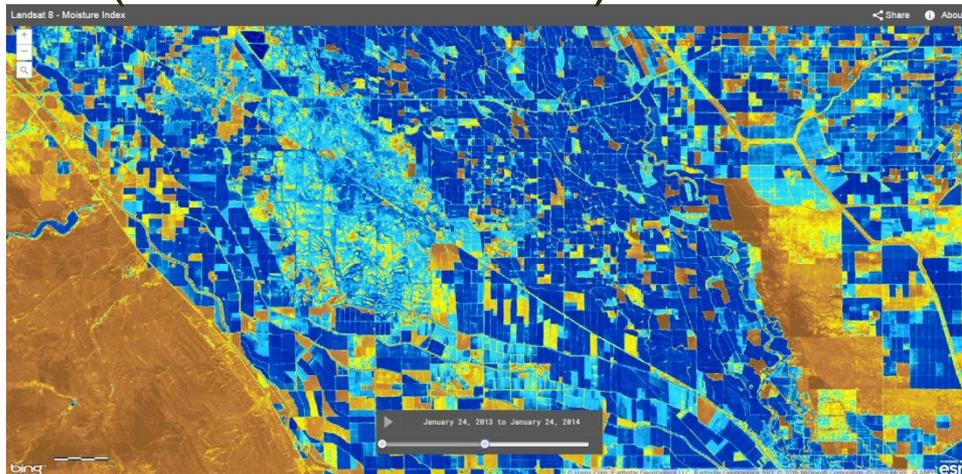


EXAMPLES OF CURRENT APPLICATIONS



Adapting to Changing Conditions

- Mobile application (Amazon S3 and ESRI)
- Normal and Dry Seasons (Landsat 8 NDMI)



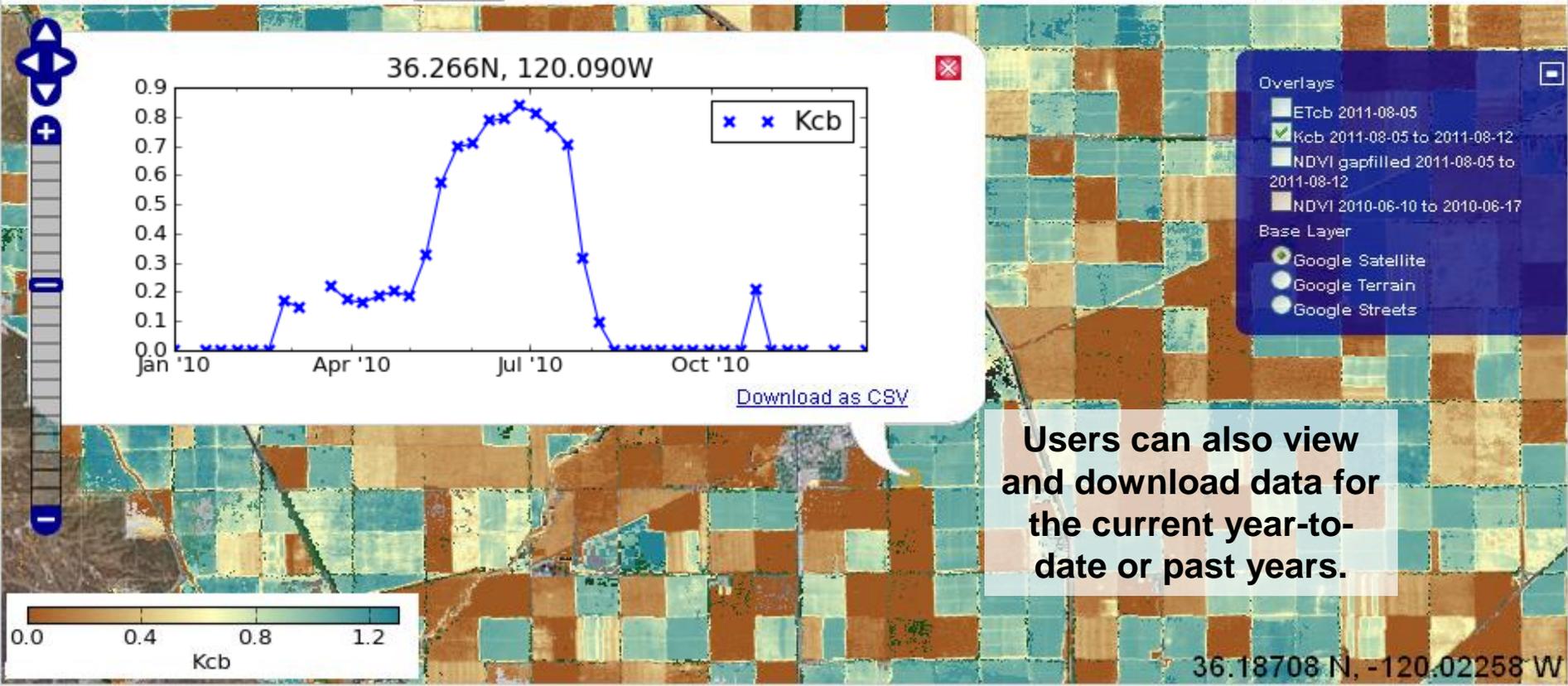


TOPS Satellite Irrigation Management Support

Go to: Search

[About](#) [Help](#)

Select Date:



Users can also view and download data for the current year-to-date or past years.

Disclaimer: This data is for research and evaluation purposes only.

NASA Official: Ramakrishna R. Nemani

Curator: Forrest Melton

[Privacy Statement](#)

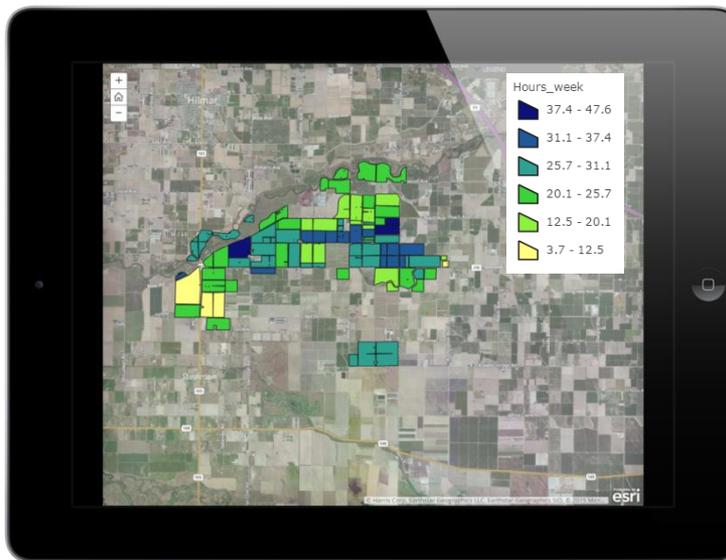
Custom Irrigation Schedules

- Growers get access to authoritative content (Maps/Apps – real time information)
- Mobile-based
- Farming to tier & specific stress index

GVI Irrigation Schedules
Week starting on 8/21/15

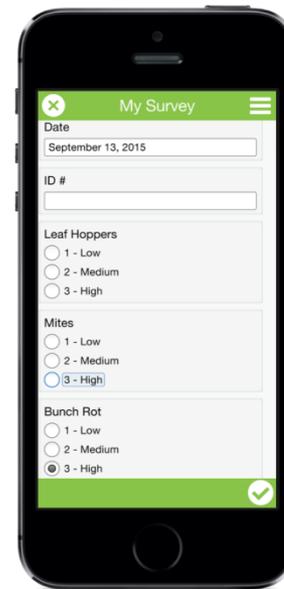
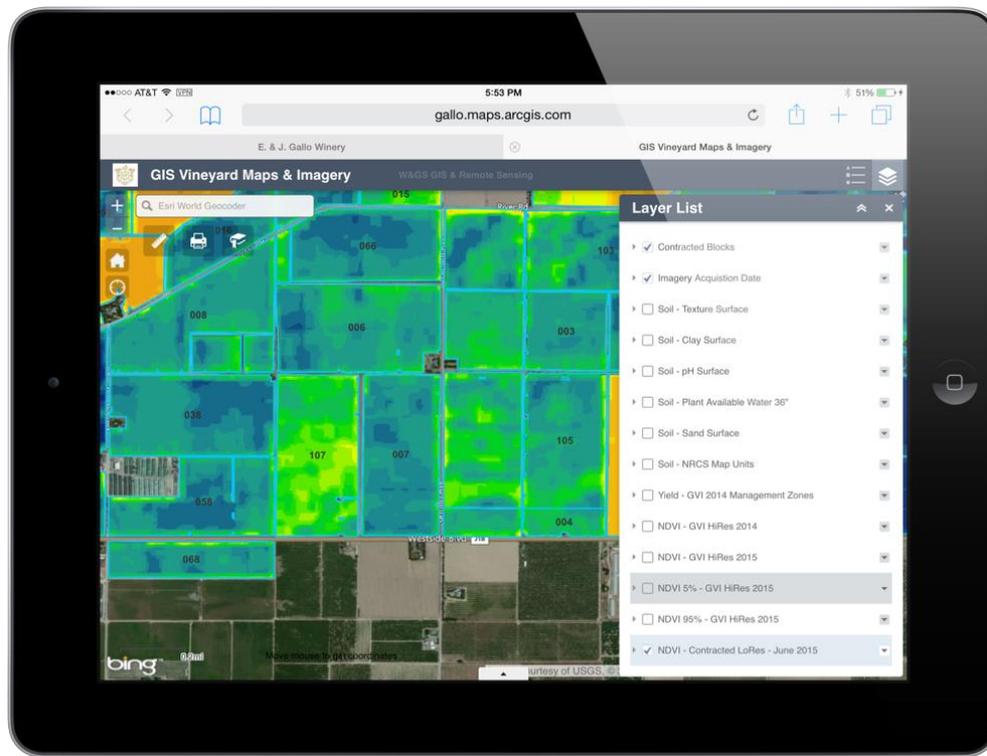
Ranch	Block ID	Name	Cultivar	Emitters/vine	GPH	Vines/acre	Mgmg. F.	Vigor	Hours/week	Gallons/week
Borden Hills	451	BH 1	Cab S	2	0.52	792	70	0.29	12.3	12.8
Borden Hills	453	BH 3	Cab S	2	0.52	990	70	0.57	19.2	20.0
Borden Hills	454	BH 4	Cab S	2	0.52	807	70	0.54	22.4	23.3
Borden Hills	455	BH 5	Cab S	2	0.52	728	70	0.50	22.8	23.7
Borden Hills	456	BH 6B	Cab S	2	0.52	792	70	0.26	11.0	11.5
Borden Hills	458	BH 6A	Cab S	2	0.52	792	70	0.30	12.9	13.4
Borden Hills	464	BH 12	Cab S	1	1.00	660	70	0.48	25.3	25.3
Borden Hills	466	BH 14	CH	2	0.52	660	70	0.41	20.7	21.5
Borden Hills	452	BH 2A	Merlot	2	0.52	622	70	0.47	25.1	26.1
Borden Hills	457	BH 2D	Merlot	2	1.00	728	70	0.47	11.2	22.3
Borden Hills	459	BH 2C	Merlot	2	0.52	622	70	0.48	25.9	26.9
Borden Hills	460	BH 2B	Merlot	2	0.52	622	70	0.48	25.9	26.9
Borden Hills	465	BH 13	Merlot	1	1.00	660	70	0.39	20.7	20.7
Borden Hills	467	BH 15	Syrah	2	0.52	728	70	0.45	20.8	21.6
Borden Hills	461	BH 9	Tendrego	2	0.52	792	70	0.55	23.4	24.3
Borden Hills	462	BH 10	Tendrego	2	0.52	792	70	0.38	16.0	16.6

Ranch	Block ID	Name	Cultivar	Emitters/vine	GPH	Vines/acre	Mgmg. F.	Vigor	Hours/week	Gallons/week
Valley Oak	952	952	Cab S	2	0.44	622	70	0.51	32.4	28.5
Valley Oak	953	953	Cab S	2	0.49	622	70	0.57	34.6	31.8
Valley Oak	959	959	Cab S	2	0.57	792	70	0.48	18.5	21.1
Valley Oak	963	963	CH	2	0.52	778	70	0.48	20.7	21.5
Valley Oak	955	955	Malbec	2.29	0.52	792	70	0.52	19.4	23.1
Valley Oak	957	957	Merlot	1.77	0.52	622	70	0.48	29.2	26.9
Valley Oak	958	958	Merlot	2.33	0.44	908	70	0.51	19.1	19.5
Valley Oak	962	962	Merlot	2	0.52	622	70	0.48	25.8	26.9
Valley Oak	956	956	Petit Syrah	2	0.41	908	70	0.45	21.1	17.3



Other Applications

- Spot Analysis - identification of problem areas and correction via management practices
 - i.e. high vigor areas due to overwatering may lead to bunch rot



The need for more Landsat...

1 (180 km path) Landsat Satellite (each 16 days)
 Probability of a Cloud-free Pixel at least every 32 days

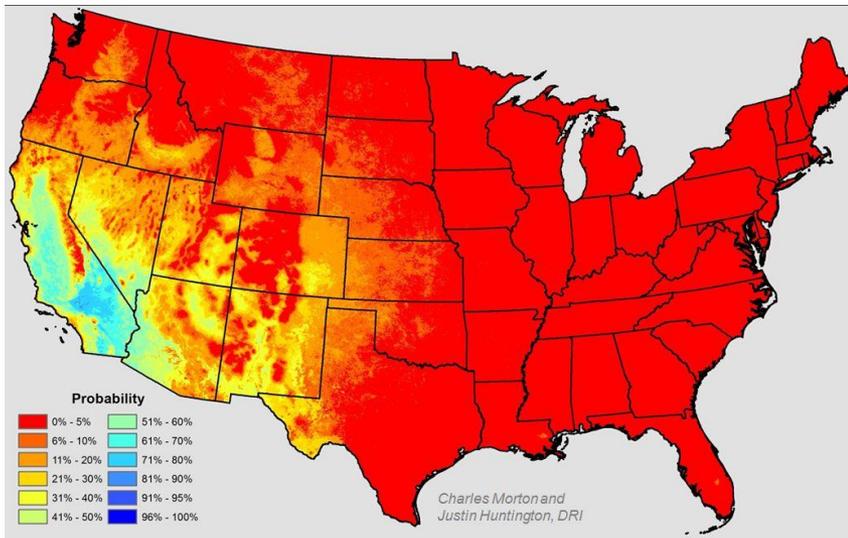
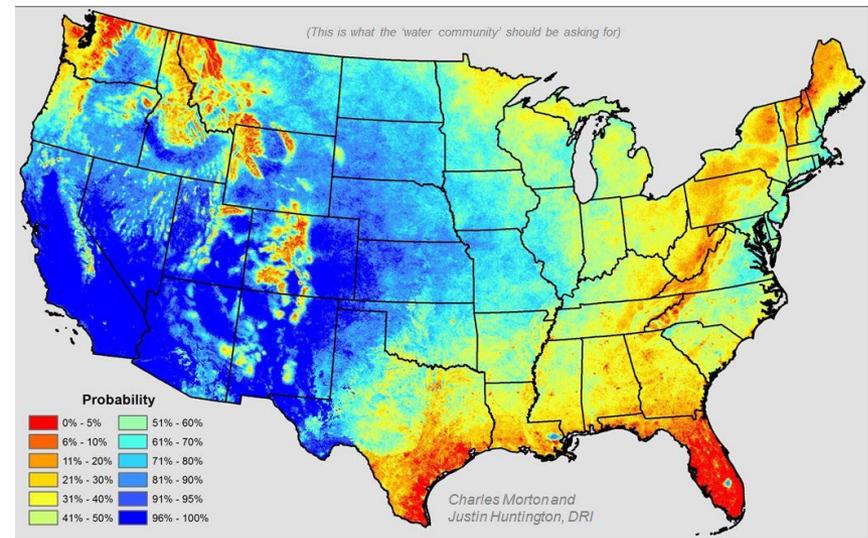


Image each 4 days -- Four 180 km Landsat Satellites
 or Two 360 km Landsat Satellites
 Probability of a Cloud-free Pixel at least every 32 days



Summary

1. GIS Corporate Initiative at E&J Gallo gives Growers access to products that leverage satellite-based data sets (and others)
2. Use of existing options (SIMS-NASA/CSU)
3. Need more frequent Landsat imagery
4. Use of cloud systems and web services instead of local/desktop based analytics allows for rapid delivery of information to growers
5. Two-tier applications:
 - i. Regional (temporal analysis)
 - ii. Vineyard:
 - 1) Actual water use
 - 2) Stress index
 - 3) Water balance
 - 4) Integration into scouting and irrigation platform for management decisions

