Florida Statewide Agricultural Irrigation Demand (FSAID)

Modelling future irrigation demand from the ground-up (2015-2035): lessons from Florida USA

Valerie Seidel, Paul Yacobellis, John Fountain

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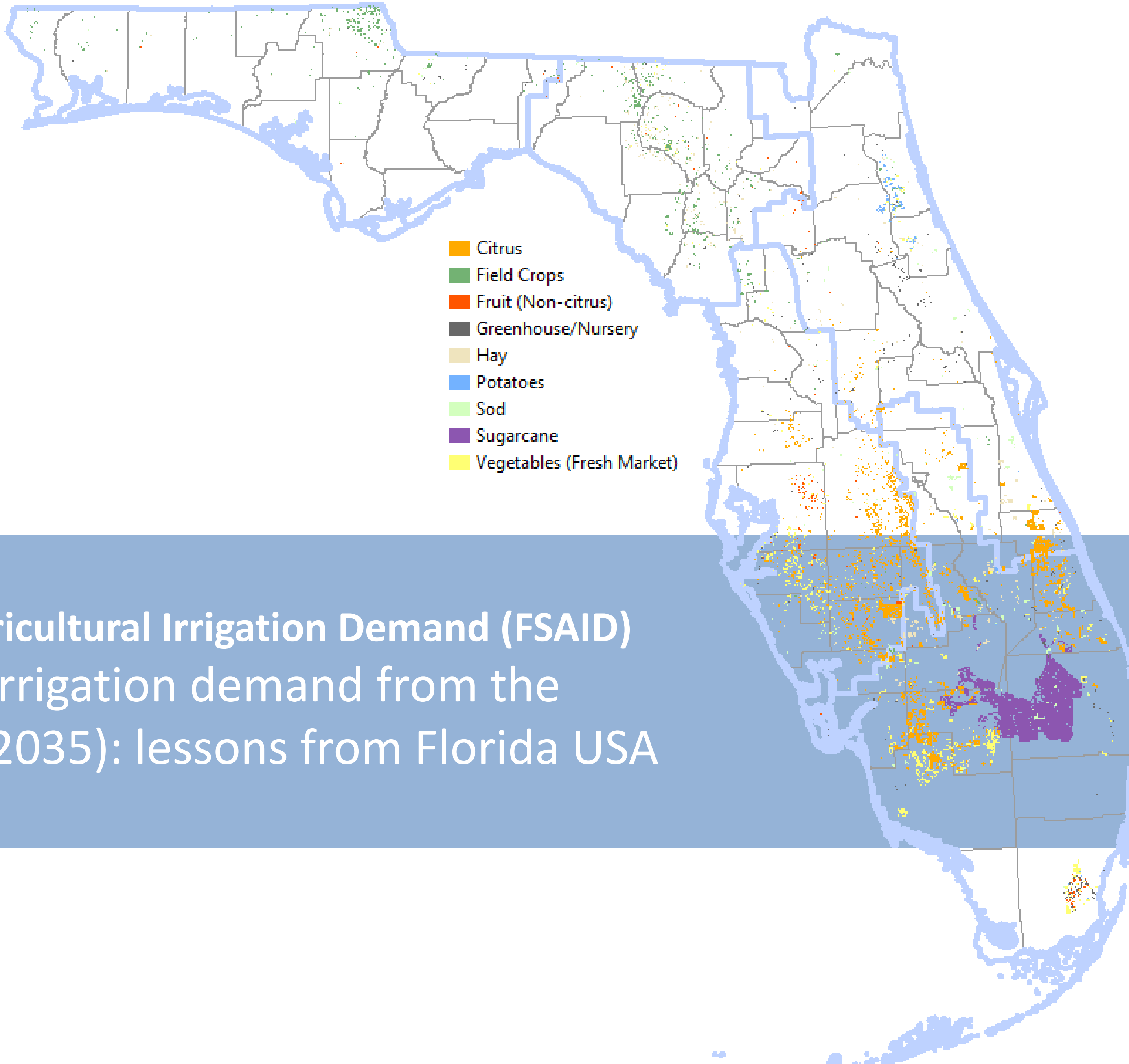

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Study area

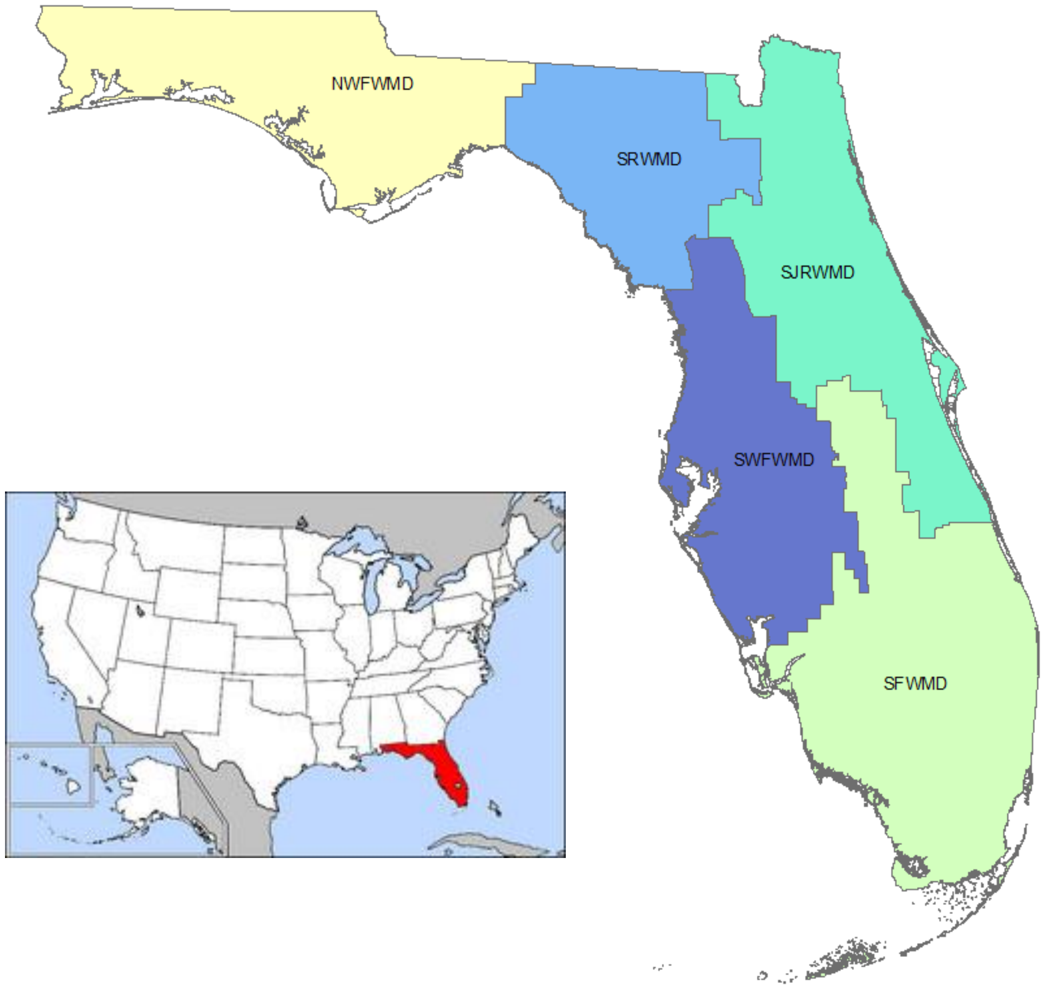
Florida USA (think: Miami, Orlando, Gatorade, NASA)

Goal

Improve planning, reduce risk of litigation

Project

Develop statewide estimates of agricultural water use at the property level, and forecast to 2035



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Obvious differences: Florida and Australia

- Size: less than 1/5 of NSW
- Pop: more than 2 x NSW
- Gross Value of Irrigated Ag Production: 1/10 of NSW

Approximate scale	Florida	NSW	Australia
Population (million)	19.8	7.52	23.5
Area (million ha)	13.8	80.9	769.2
Agricultural land (million ha)	3.8	58.3	406.2
Irrigated Agricultural land (million ha)	0.693	0.674	~ 2
GVIAP ($b)	0.4	3.5	14.6
Ag Water use (GL)	3,484	4,506	11,561
Average annual rainfall (mm)	1,518	919*	443

** average annual rainfall for Orange*

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Problem

- Water supply conflicts: authorities getting caught in litigation among themselves and with other states

Charge

- Florida Department of Agriculture and Consumer Services legislated requirement to project water supply for its 5 Water Management Districts over next 20 years, and to locate irrigated Ag spatially (GIS)

Problem

- Each District used its own methodology (same crop 1km away using 70% more water/acre), plus inconsistent data (content, coverage, missing years, spatial gaps)

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Approach

- Collated existing data and GIS layers: landuse, soil type, irrigation type, rainfall, evapotranspiration
  $\Rightarrow$ consistent statewide map of irrigated agriculture (1st FL)
- Fed water meter data (2,300 farms) into an bio-economic to model water demand for each farm given crop price, soil type, rainfall, evapotranspiration, chemical costs, location …
  $\Rightarrow$ base-year estimates of agricultural water demand
- Forecast crop prices, chemical costs, combined with long-term average rainfall & ET
  $\Rightarrow$ future changes in Ag water demand and landuse

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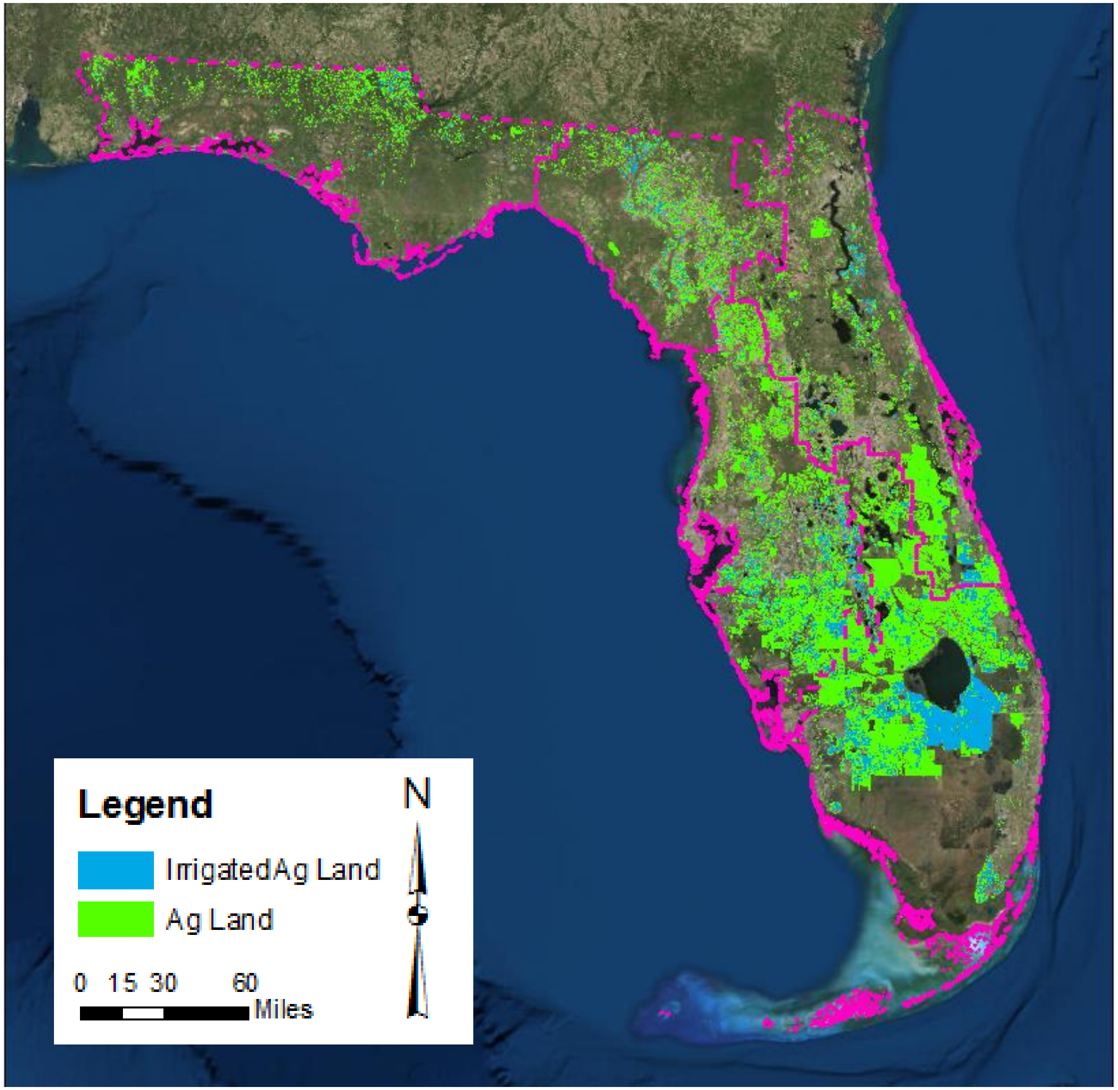
Outputs

1) Irrigated Lands Geodatabase (spatial dataset, 2015-2035)
2) Agricultural water use: by crop, by irrigation type, by county (irrigation, livestock, cold protection)
3) Water use projections
4) Soils Geodatabase
5) Conservation potential



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Irrigated Acreage Comparison by County, RWSP, and Crop Category

COUNTY	Citrus	Sugar Cane	Vegetables /Melons /Berries	Pasture	…
SFWMD – Lower West Coast RWSP					
Broward	0	0	1,006	1,187	…
Collier	0	0	0	0	…
Hendry	12,457	43,572	22,362	511	…
MiamiDade	657	0	20,172	118	…
PalmBeach	1,031	387,012	5,230	432	…
Monroe	0	0	0	0	…
SFWMD -LEC Total	*14,145*	*430,585*	*48,770*	*2,248*	…
SFWMD – Lower East Coast RWSP					
Charlotte	4,330	0	4,843	2,708	…
Collier	33,077	0	43,939	553	…
Glades	7,985	14,874	465	0	…
Hendry	49,248	56,007	7,806	740	…
Lee	11,710	0	7,701	566	…
SFWMD -LWC Total	*106,350*	*70,881*	*64,754*	*4,567*	…
…	…	…	…	…	…

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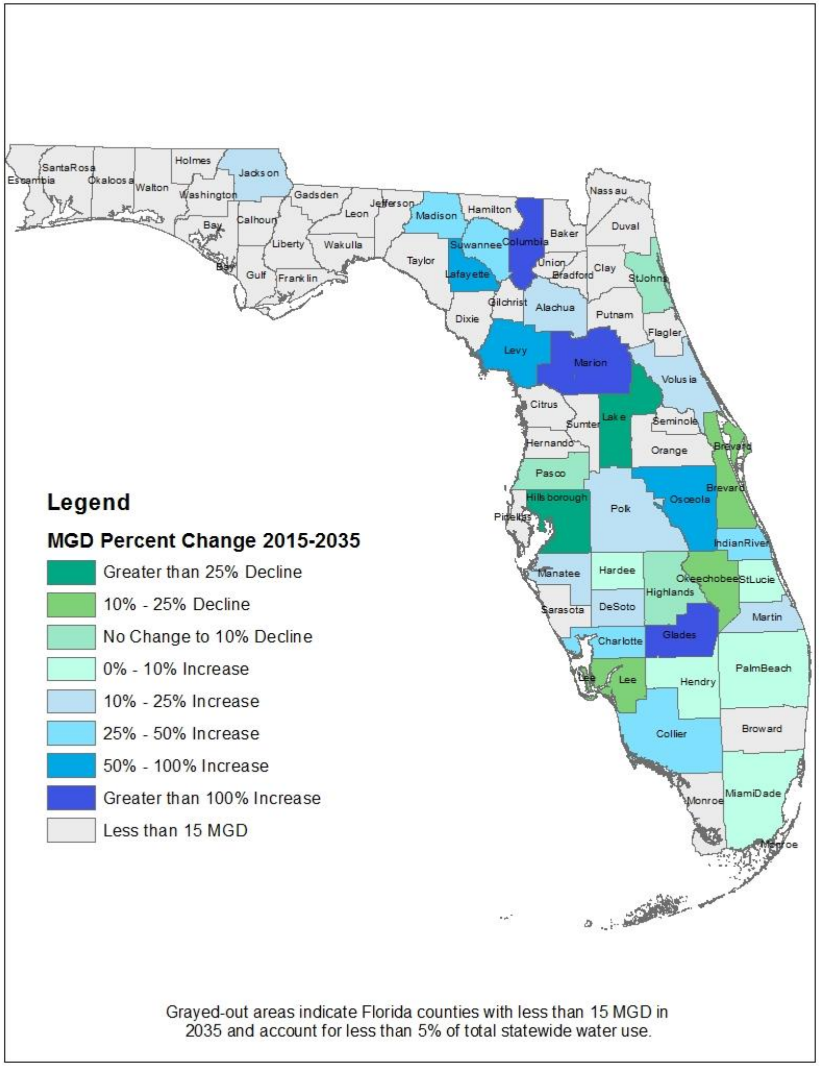

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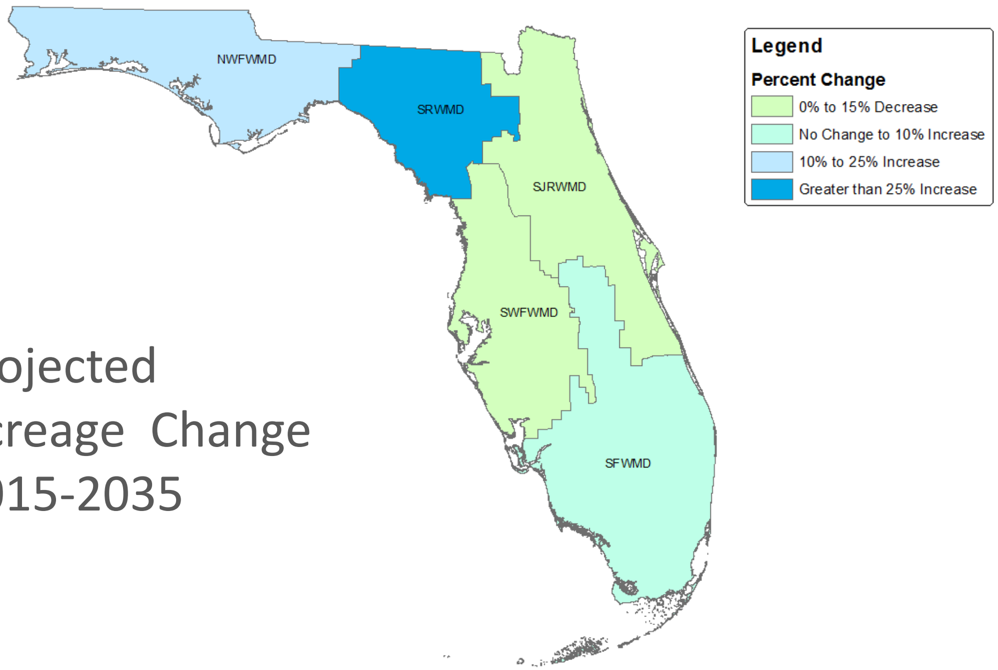
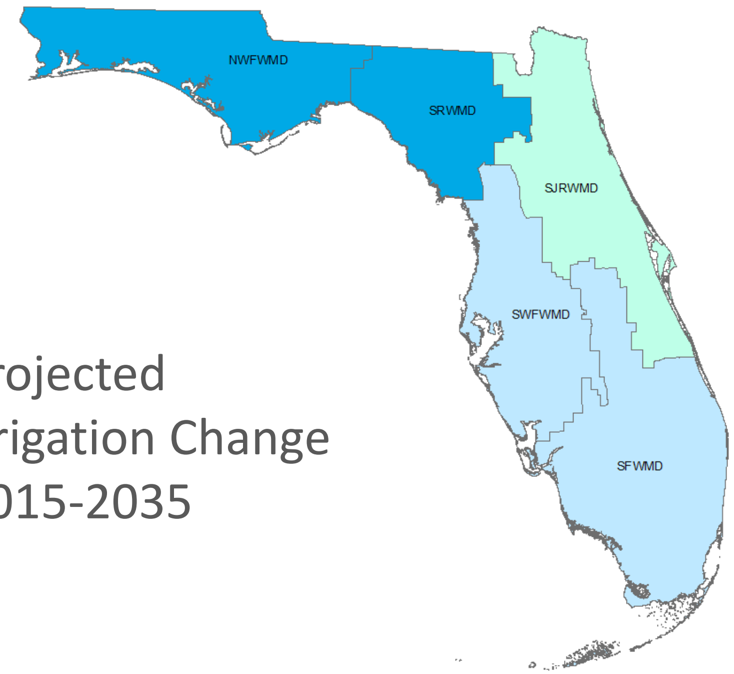


Projected
Acreage Change
2015-2035



Projected
irrigation Change
2015-2035

Projections:

5% increase in irrigated acreage, but 17% increase in water use

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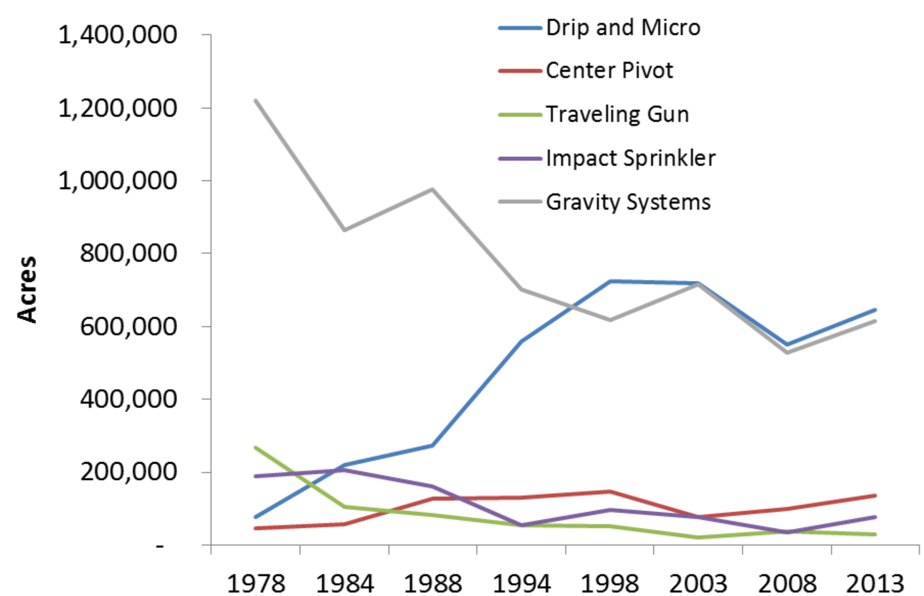
USDA FRIS, acreage trends for selected irrigation systems



Costs of irrigation water conservation

Data source	Total project cost	Water savings (MGD)	$/kgal (5 years)	$/kgal (10 years)	$/kgal (15 years)
FRIS data, Florida; 2003,2008,2013	$7,901,227	20.1	0.23	0.13	0.09
FRIS data, U.S.; 2003,2008,2013	$339,027,408	400.0	0.51	0.27	0.20

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Improvements

- User interface: FSAID2.com

Setup Table

Columns

Irrigated Acreages

Rows

County

Filter Results

Filter By

Water Management District (WMD)

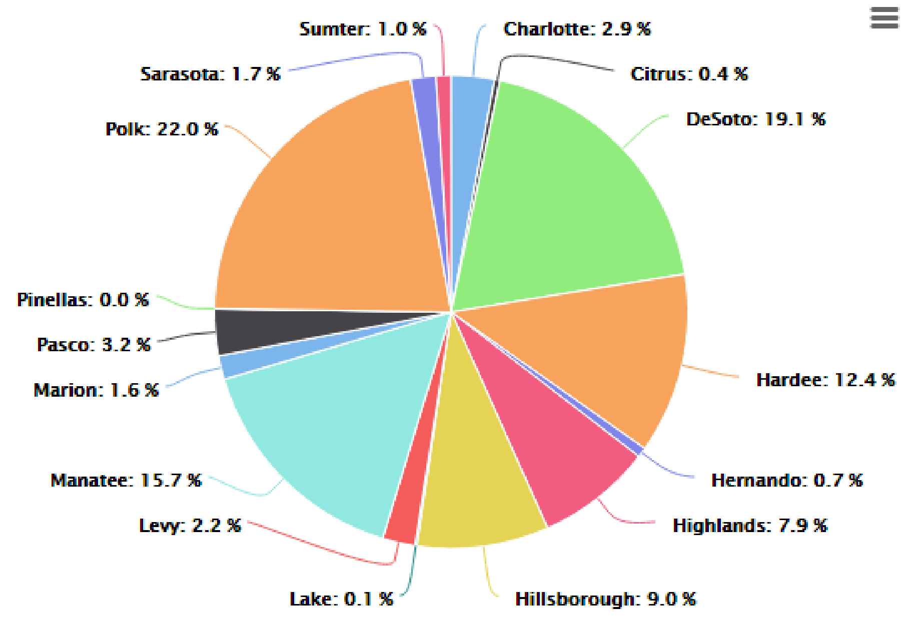
Filter Categories

× SWFWMD

Chart

Year

2015



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Differences in Australia

- Physical: less rainfall, fewer lakes, dryer rivers
- Drought: no crops sown in a bad year
- Data: property-level landuse data
- Institutional: water trading, response to world prices

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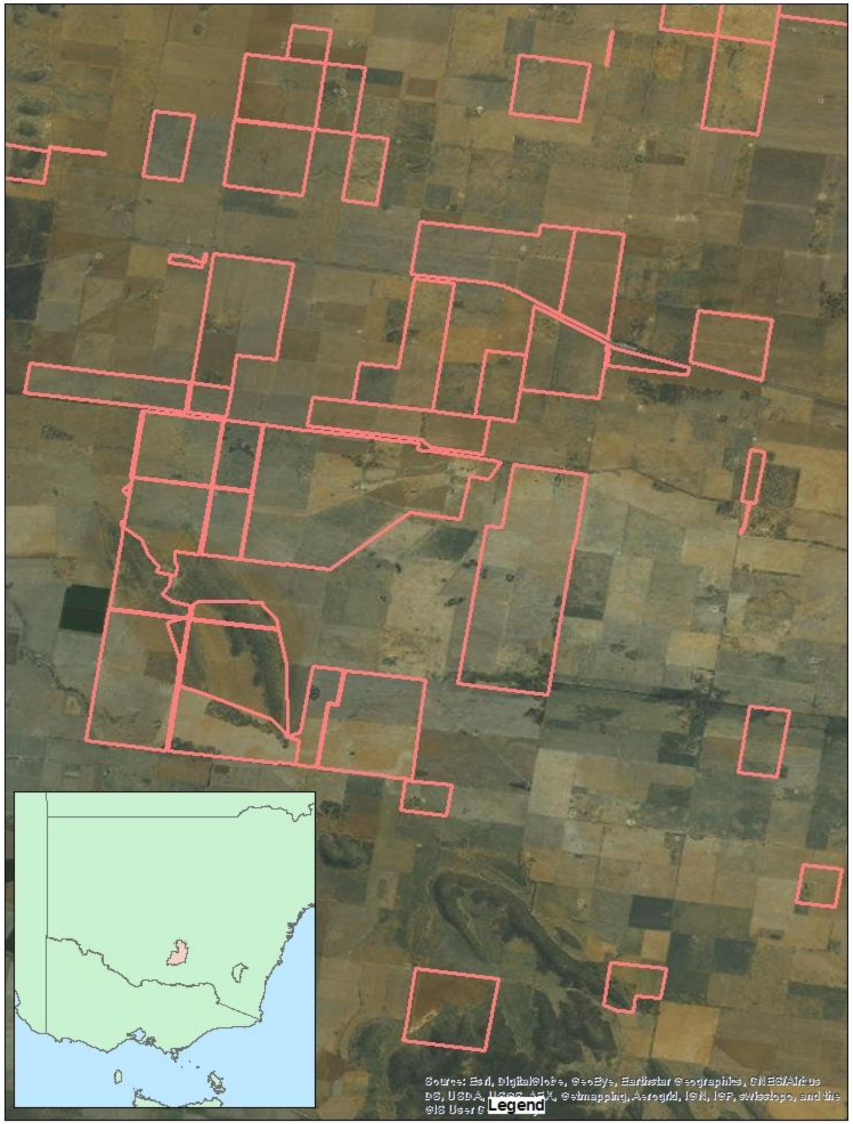
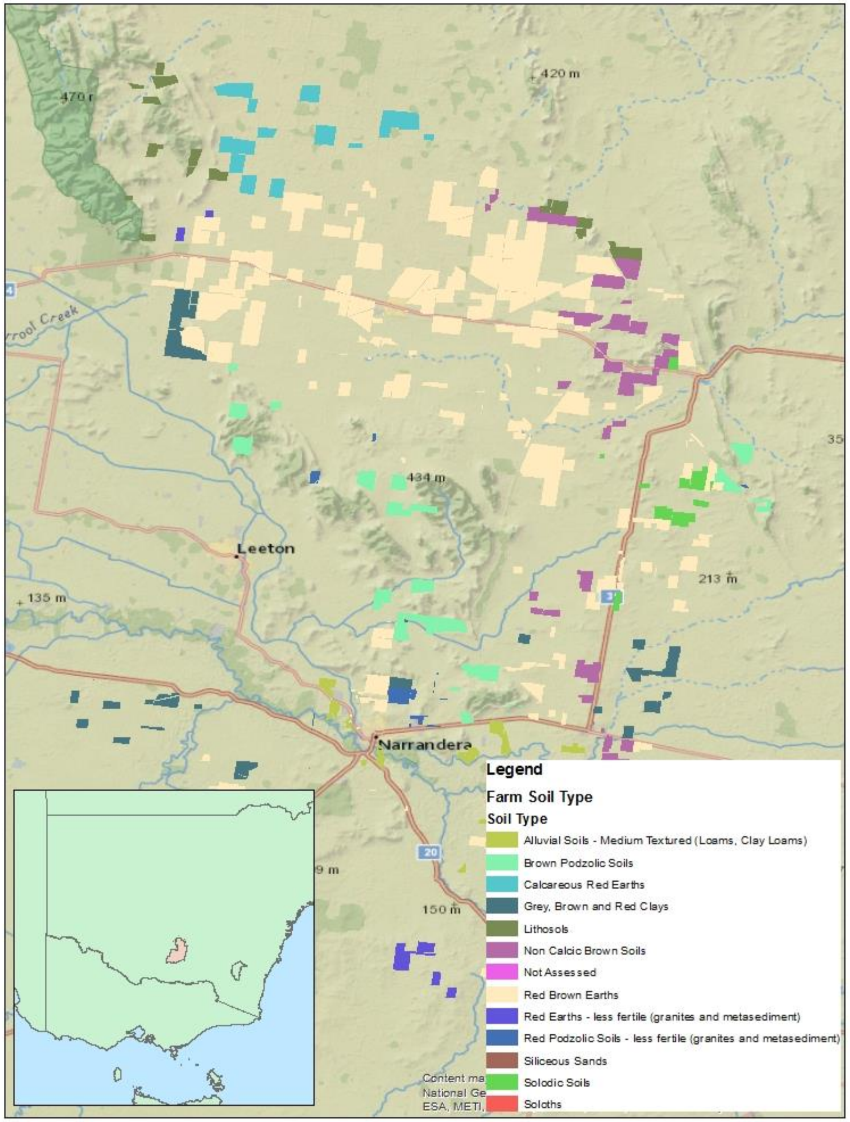
Potential outcomes

- Potential scale of future Ag water demand
- Identify supply constraints
- Identify landuse conflicts
- Geodatabase: landuse, Irr Ag, soil
- Values: GVIAP, opp. cost of water (MDBP)
- Conservation: water quality, excess runoff vs. recharge vs. re-use

AID


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus
DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the
GIS User C
Legend


420 m
470 m
434 m
Leeton
135 m
213 m
Narrandera
150 m
Legend
Farm Soil Type
Soil Type
Alluvial Soils - Medium Textured (Loams, Clay Loams)
Brown Podzolic Soils
Calcareous Red Earths
Grey, Brown and Red Clays
Lithosols
Non Calcic Brown Soils
Not Assessed
Red Brown Earths
Red Earths - less fertile (granites and metasediment)
Red Podzolic Soils - less fertile (granites and metasediment)
Siliceous Sands
Solodic Soils
Soloths

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Questions…