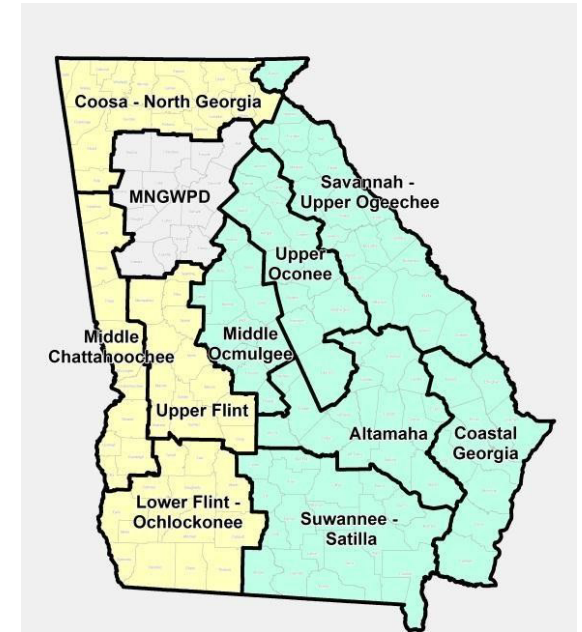


**Joint Council Meeting #1 – Eastern Councils
Thursday, June 23, 2016**

**Dubose Porter Center
Oconee Fall Line Technical College
560 Pinehill Road
Dublin, GA 31021**



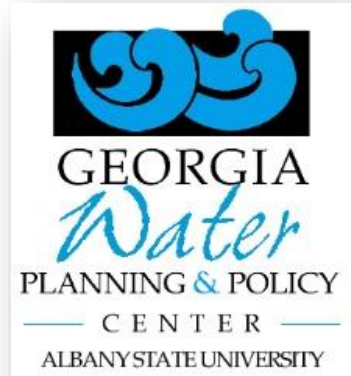
Agricultural Water Use Forecast Slides and Handouts – This package includes the following slides presented by Mark Masters and a handout with additional detail:

- Agricultural Water Use Forecast
- Agricultural Water Use Forecast – Handouts for the following water planning regions:
 - Pg. 39 – Altamaha
 - Pg. 52 – Coastal Georgia
 - Pg. 65 – Middle Ocmulgee
 - Pg. 78 – Savannah-Upper Ogeechee
 - Pg. 91 – Suwannee-Satilla
 - Pg. 104 – Upper Oconee

AGRICULTURAL WATER USE FORECAST

Joint Council Meeting #1 – Eastern Councils
June 23, 2016

Mark H. Masters
Georgia Water Planning & Policy Center
Albany State University



Project Team

- ▣ Albany State University – Georgia Water Planning and Policy Center
- ▣ University of Georgia Agricultural and Applied Economics



2015-2016 Ag Water Demand Update Components

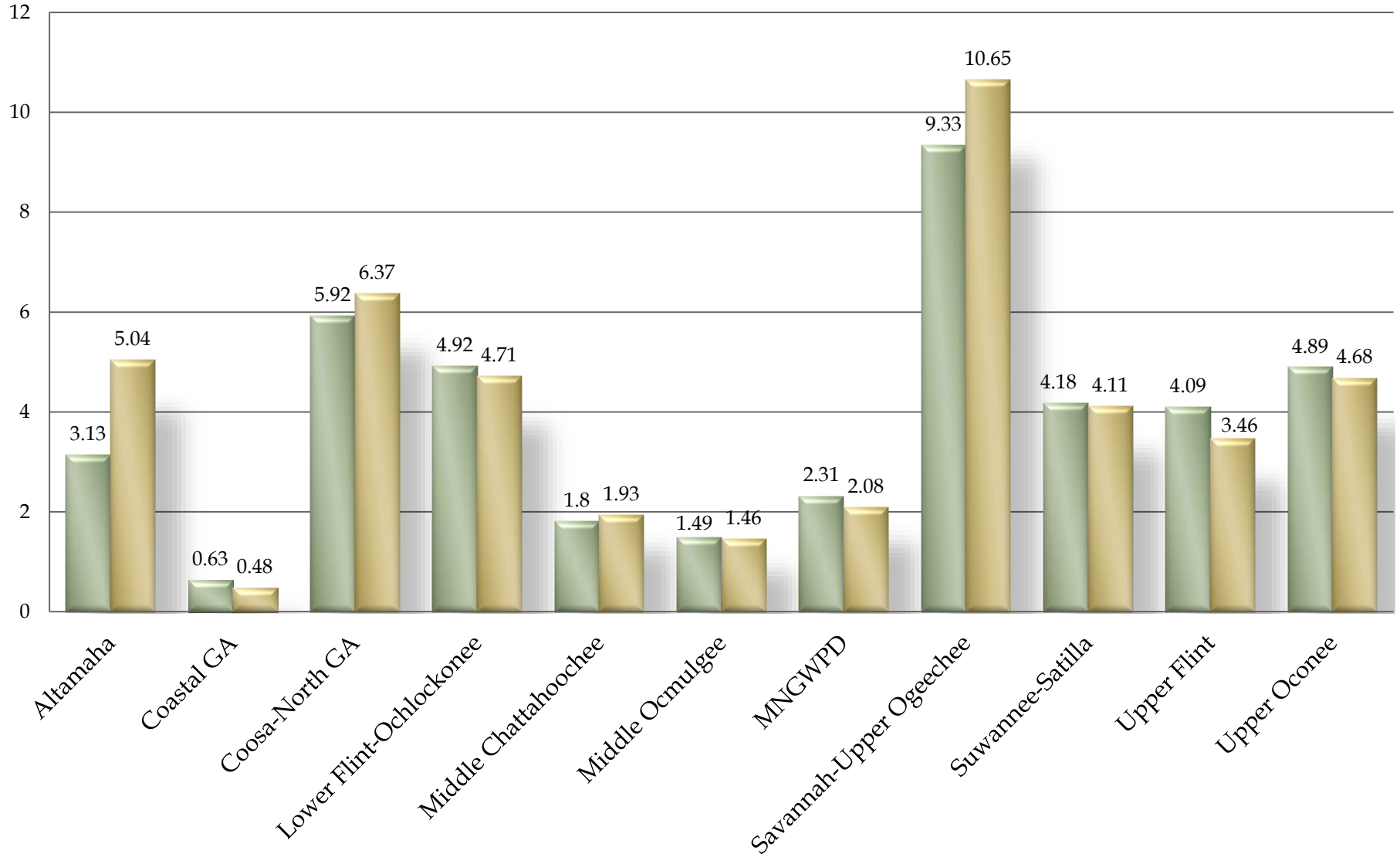
- ▣ Animal Agriculture and Horticultural Sector Water Use
- ▣ Current Agricultural Water Use Estimates
 - Meter Data
 - Modeled Data
- ▣ Agricultural Water Demand Forecasts
 - Modeled Data

2015-16 Animal Agriculture and Horticultural Sector Water Use - Methods

- ▣ **Update current water use estimates based same methods used for 2009-2010 estimates**
- ▣ **Animal Agriculture**
 - Head per county x Water needs per head
 - Data sources: GA Farm Gate Survey, USDA NASS
- ▣ **Horticultural Sector**
 - Area per county (nursery/ greenhouse) x Water needs per unit area
 - Data sources: GA Farm Gate Survey
- ▣ **Review by industry experts**

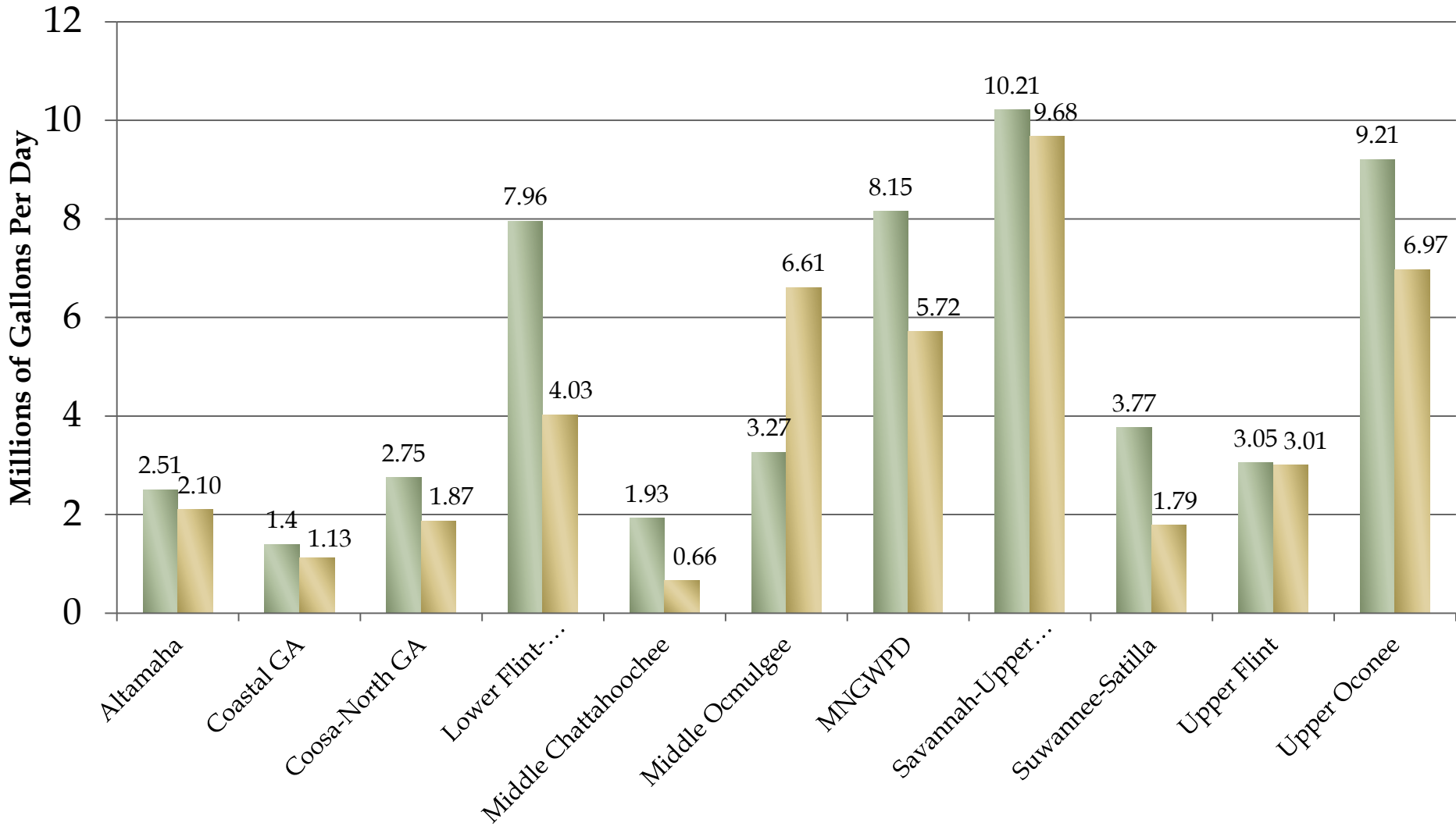
Animal Agriculture - Daily Water Use by Water Planning Region

Statewide Total: 45 MGD (*draft*)



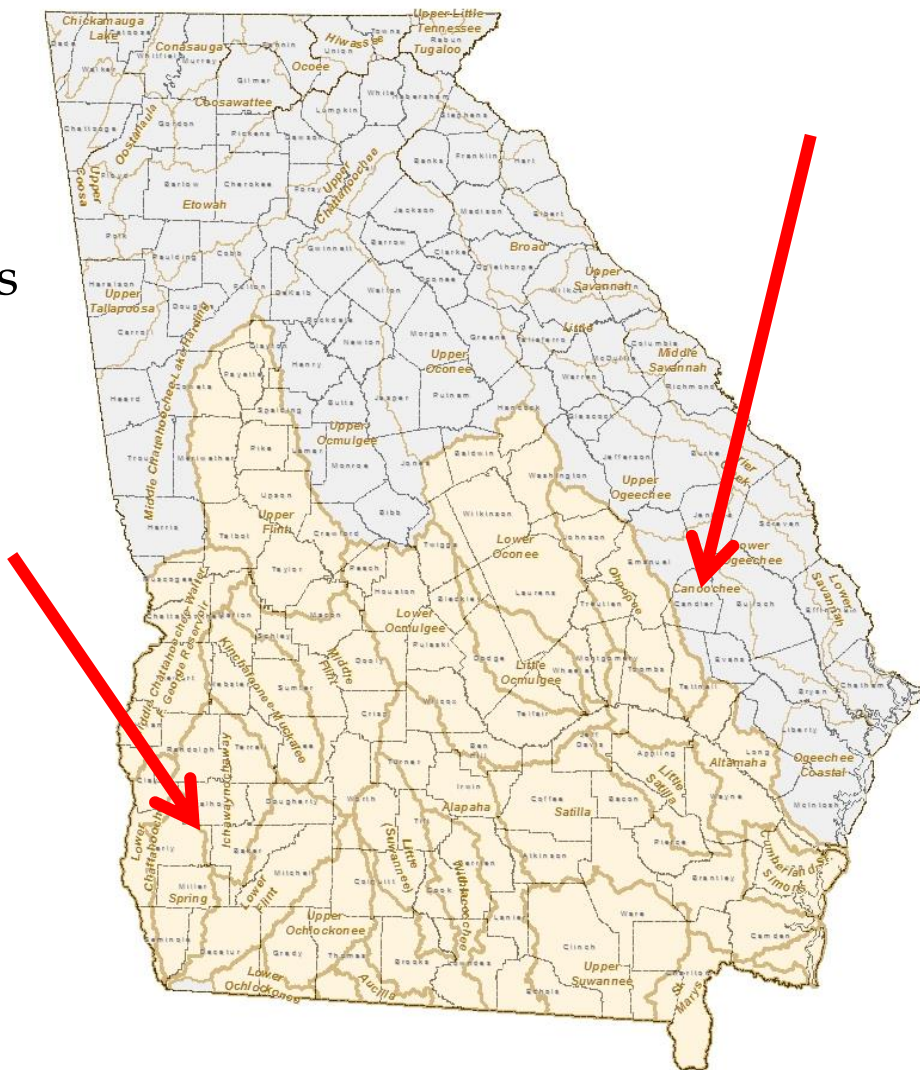
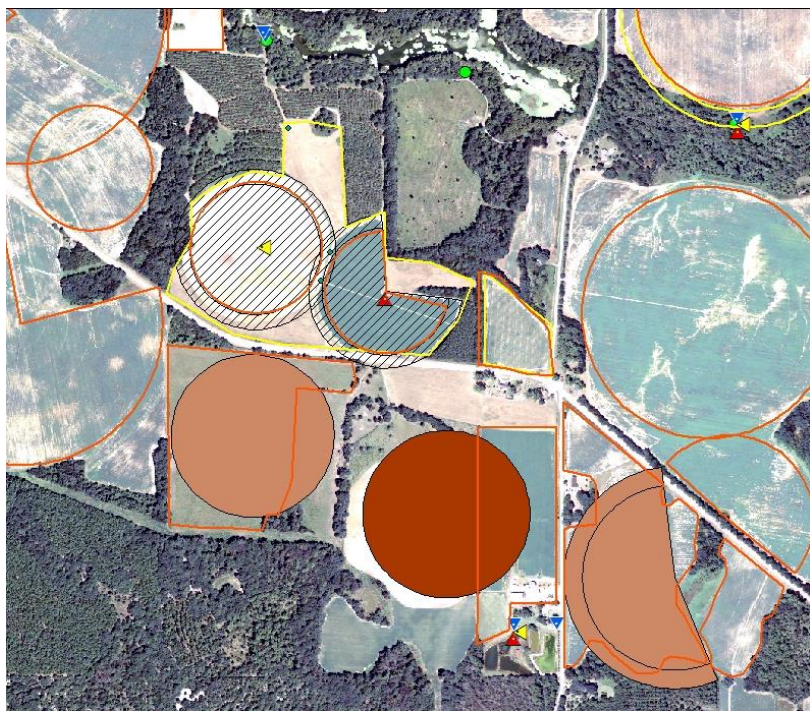
Daily Water Use by Horticultural Nurseries (Container, In-Ground, and Greenhouse), Millions of Gallons Per Day

Statewide Total: 43.56 MGD (*draft*)

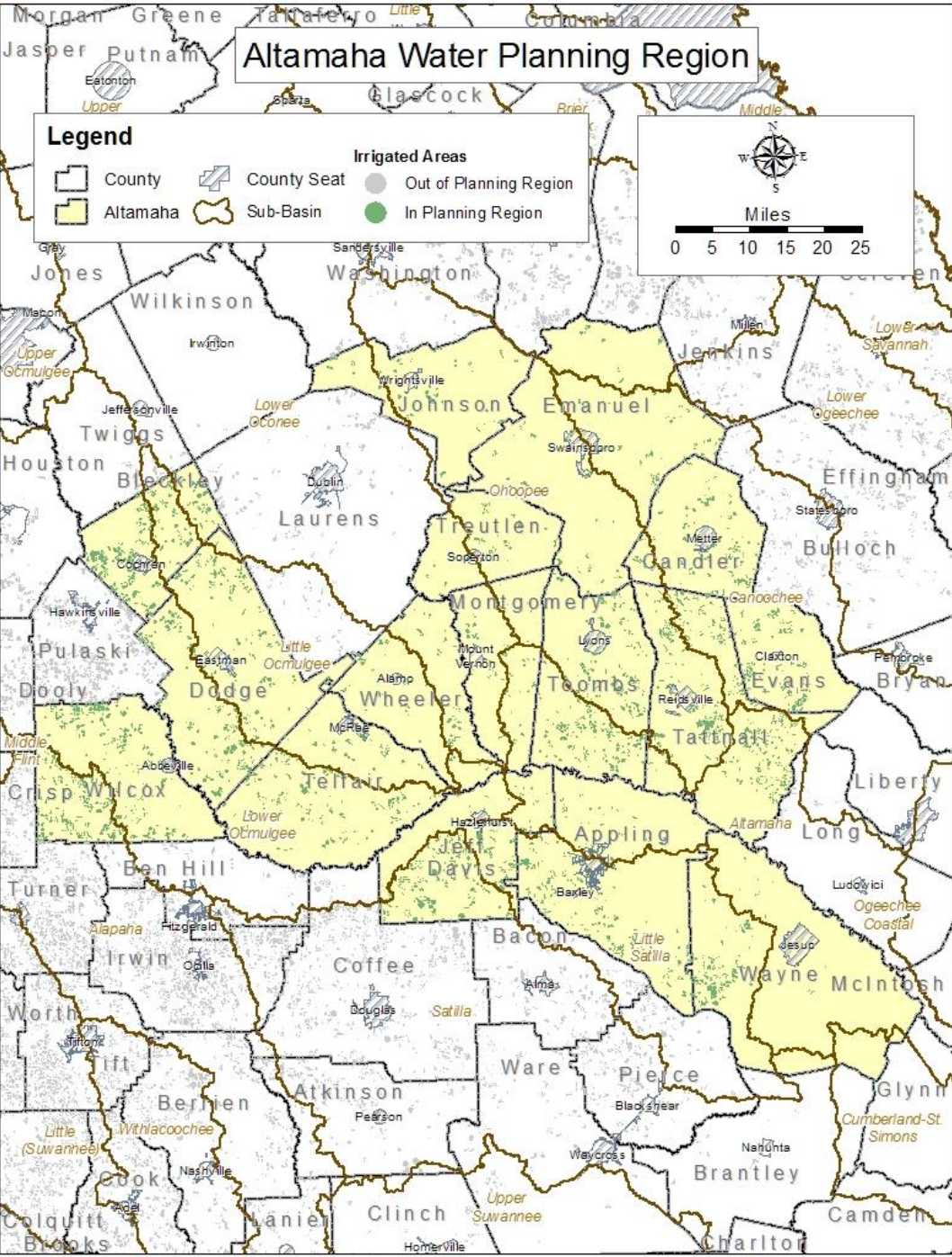


2015-16 Current Agricultural Water Use Estimates - Methods

- ▣ **Wetted Acreage Mapping**
 - ▣ Detailed mapping
 - ▣ Desktop survey
 - ▣ Review source assumptions



Altamaha Water Planning Region



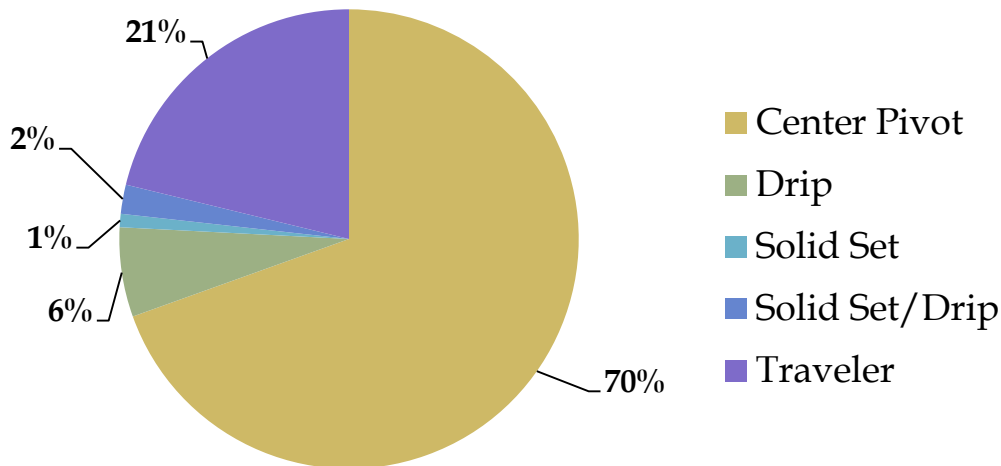
Irrigated Acres

County	2009	2015
Appling	7,901	11,233
Bleckley	13,434	16,160
Candler	6,048	7,045
Dodge	16,167	19,404
Emanuel	4,757	6,582
Evans	7,379	6,902
Jeff Davis	10,650	13,865
Johnson	1,993	3,850
Montgomery	2,134	3,826
Tattnall	19,238	20,235
Telfair	8,431	11,871
Toombs	12,521	15,651
Treutlen	1,426	2,427
Wayne	4,851	6,922
Wheeler	4,657	5,604
Wilcox	18,416	23,728

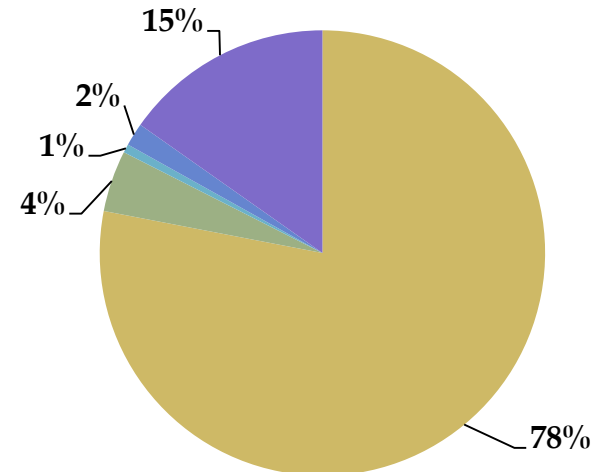
Altamaha River RWPC

	2009	2015	% Change
Total # of Fields	3,607	4,590	+ 27.3%
Total Acreage	140,003	175,302	+ 25.2%
Total GW Acreage	77,553	113,767	+ 46.7%
Total SW Acreage	62,450	61,535	- 1.5%
Total Center Pivots	2,057	3,190	+ 55.1%
Center Pivot Acreage	92,218	136,722	+ 48.3%

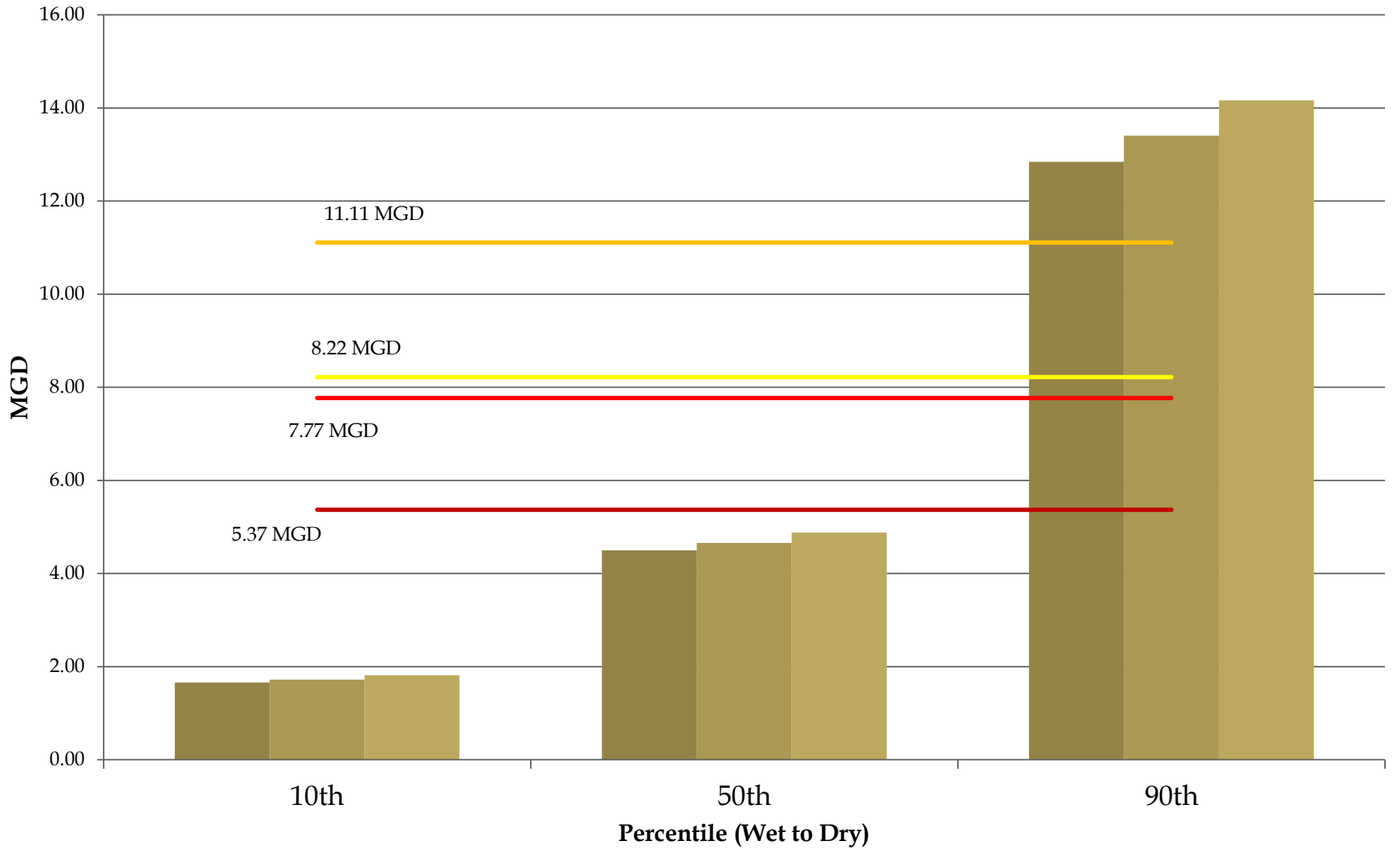
System Type - % of Systems



System Type - % of Acreage

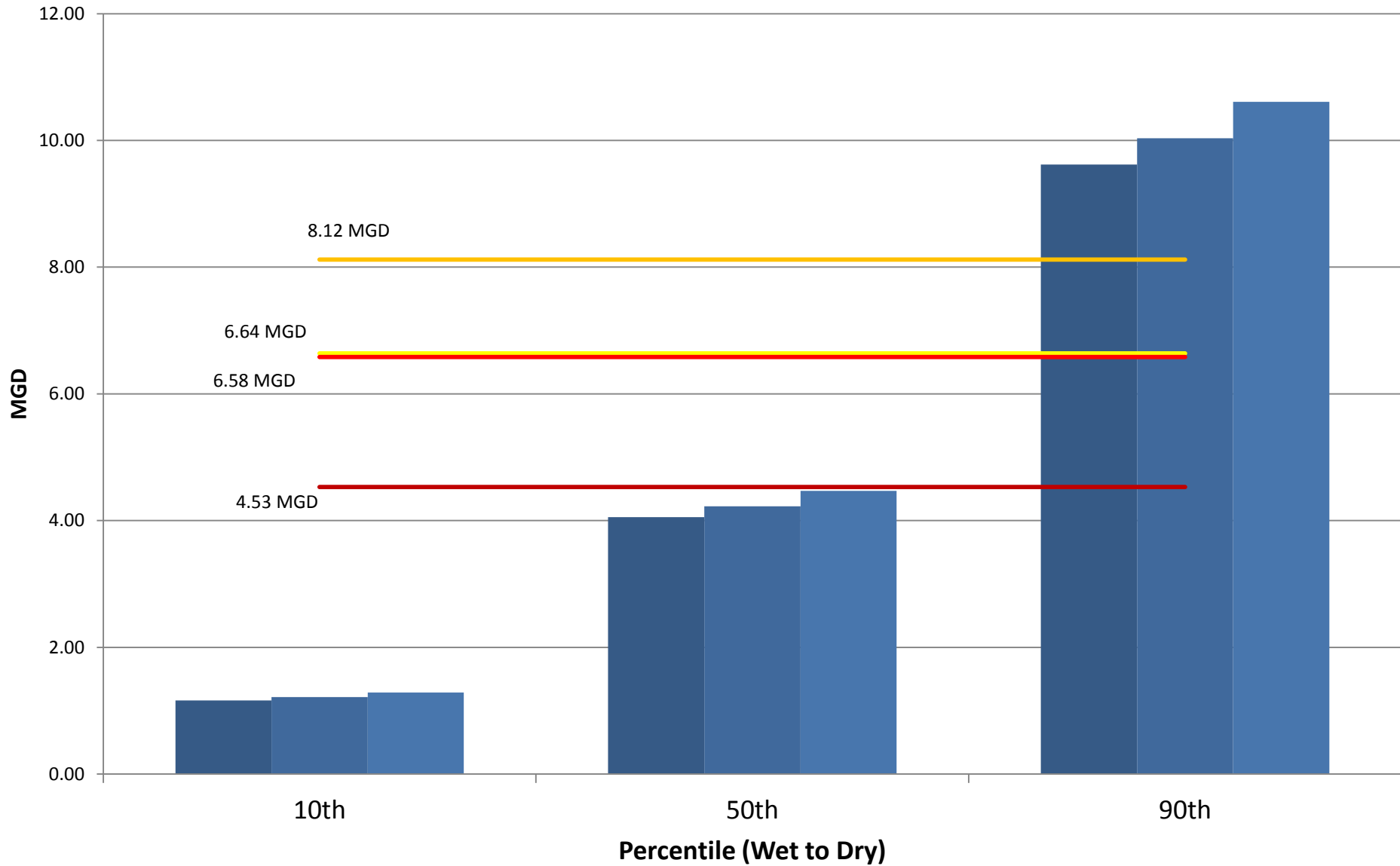


Coastal Georgia - Groundwater (Meter Data)



2011 Forecast
 2030 Forecast
 2050 Forecast
 2010 Meter
 2011 Meter
 2012 Meter
 2013 Meter

Coastal Georgia - Surface Water (Meter Data)

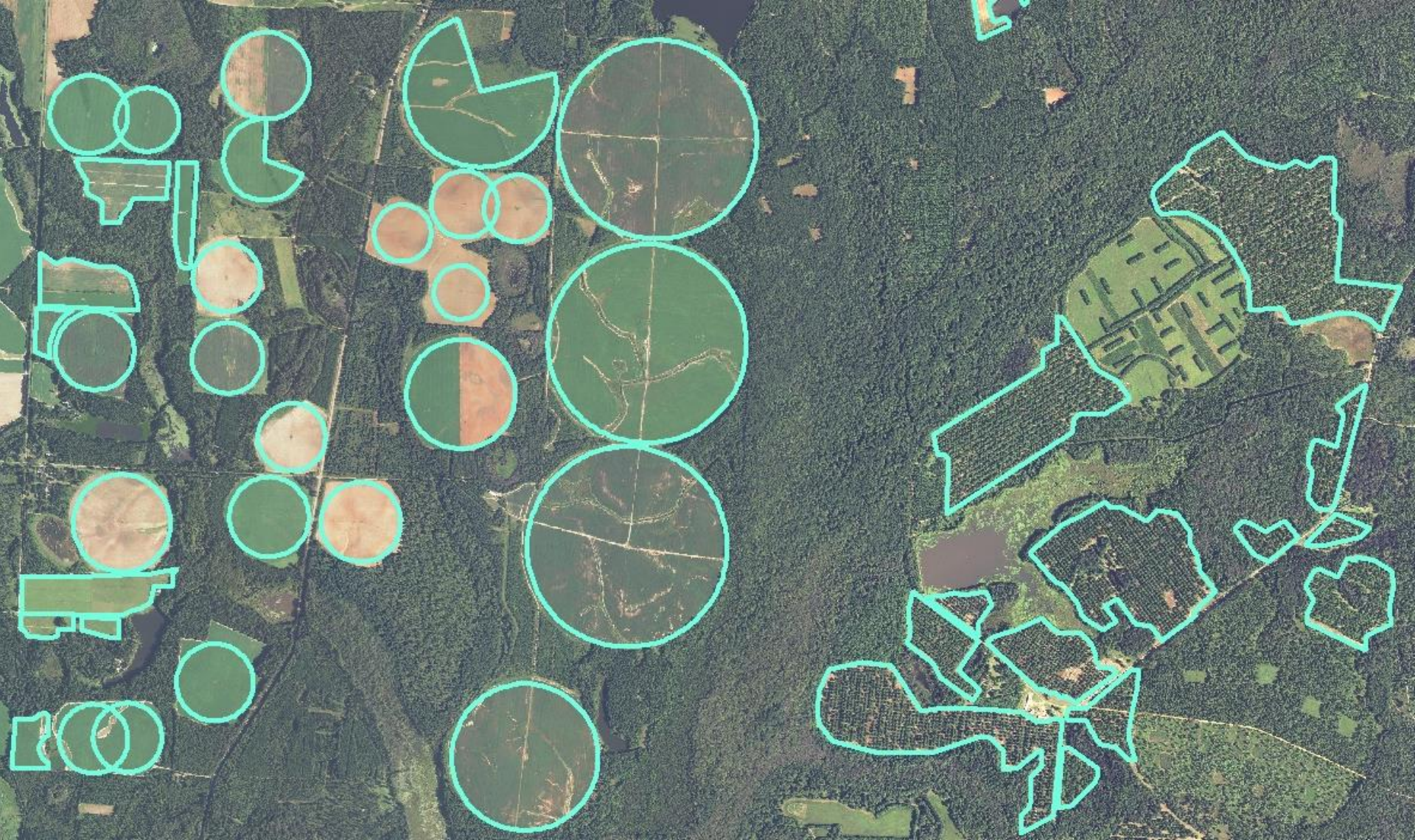


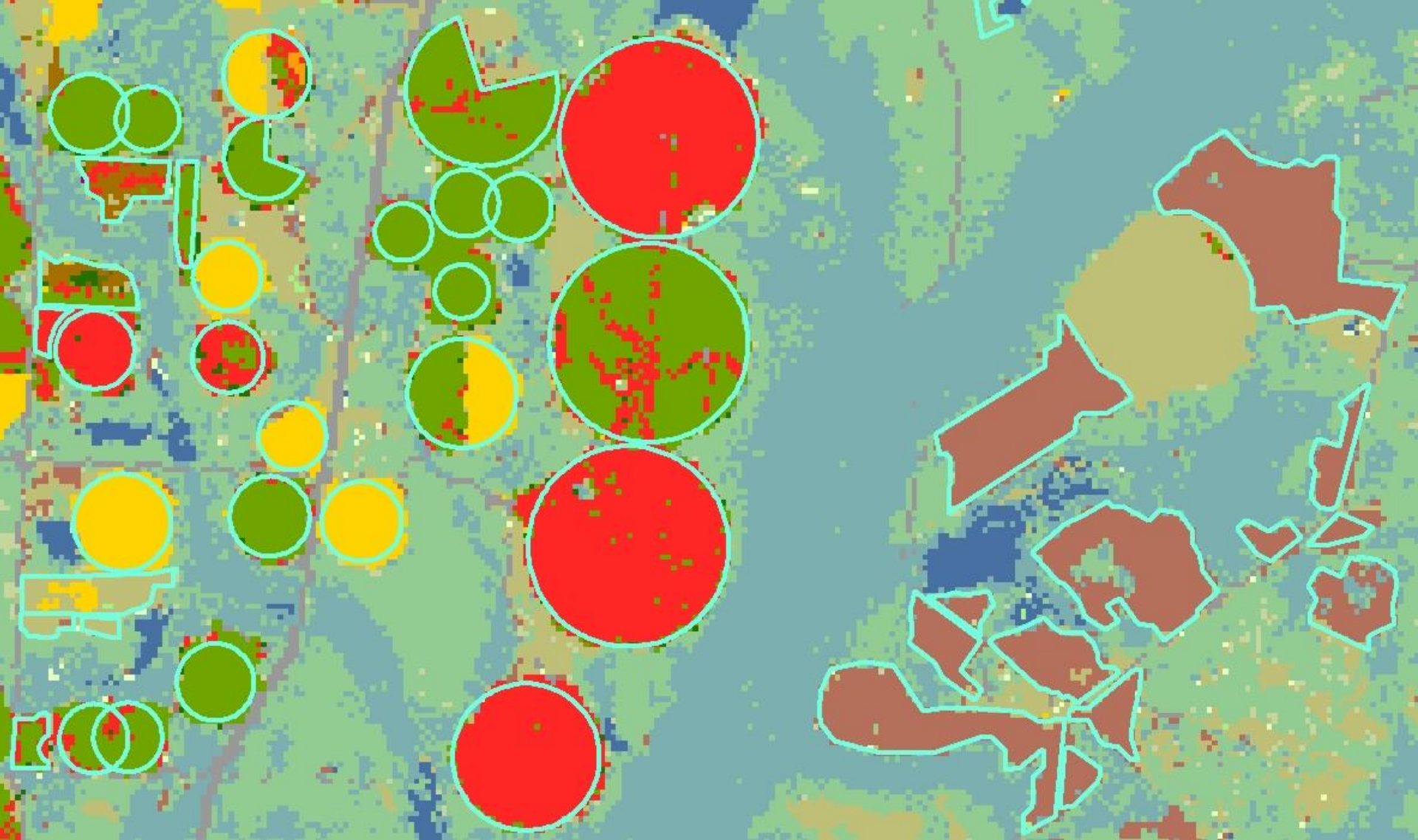
■ 2011 Forecast ■ 2030 Forecast ■ 2050 Forecast — 2010 Meter
— 2011 Meter — 2012 Meter — 2013 Meter

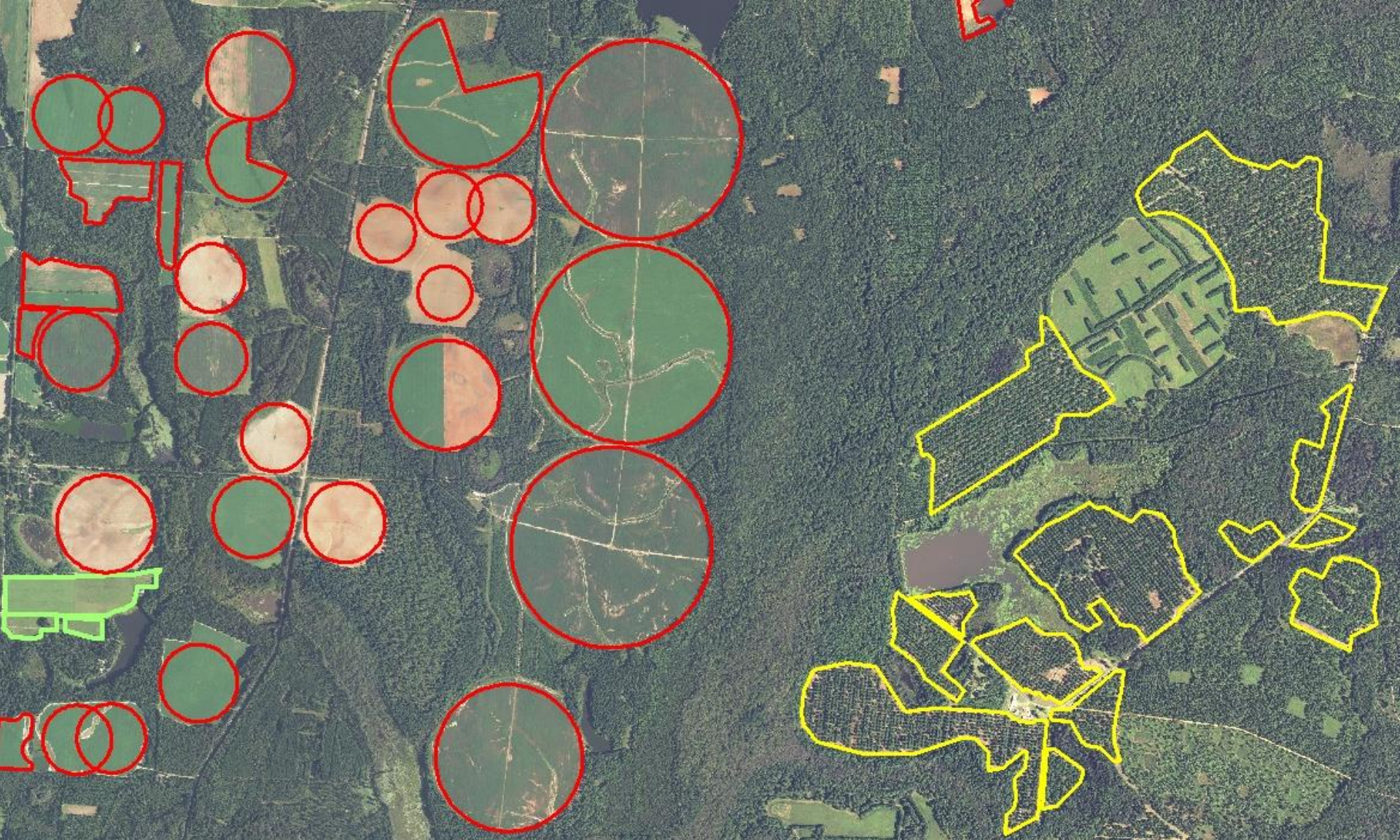
2015-16 Agricultural Water Demand Forecasts - Methods

- ▣ **Approach:** Look to past trends and consider foreseeable changes
- ▣ **Acreage**
 - Baseline – USDA Census of Agriculture (2012); linked to 2015 irrigated acres



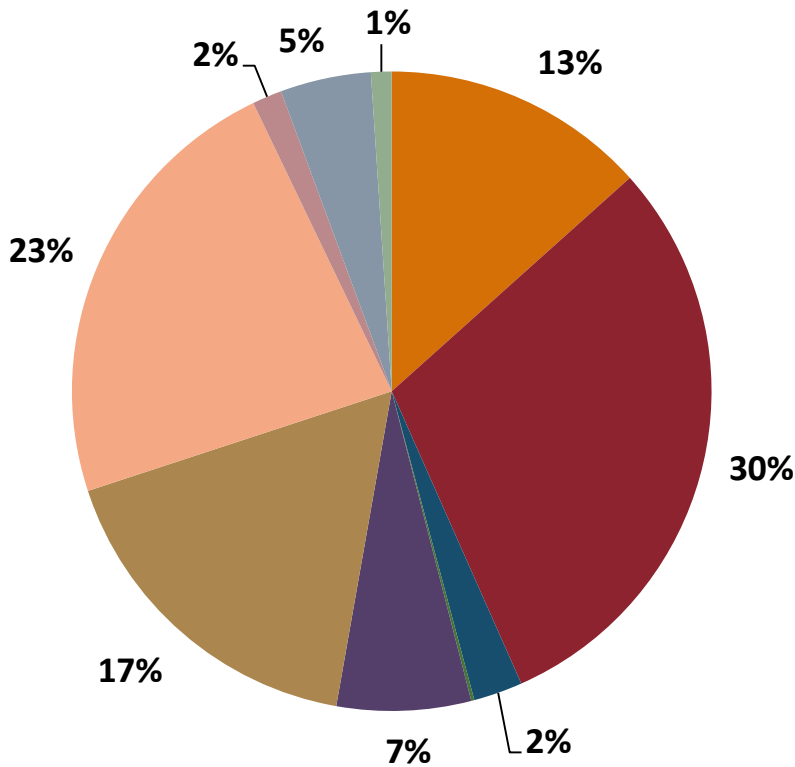




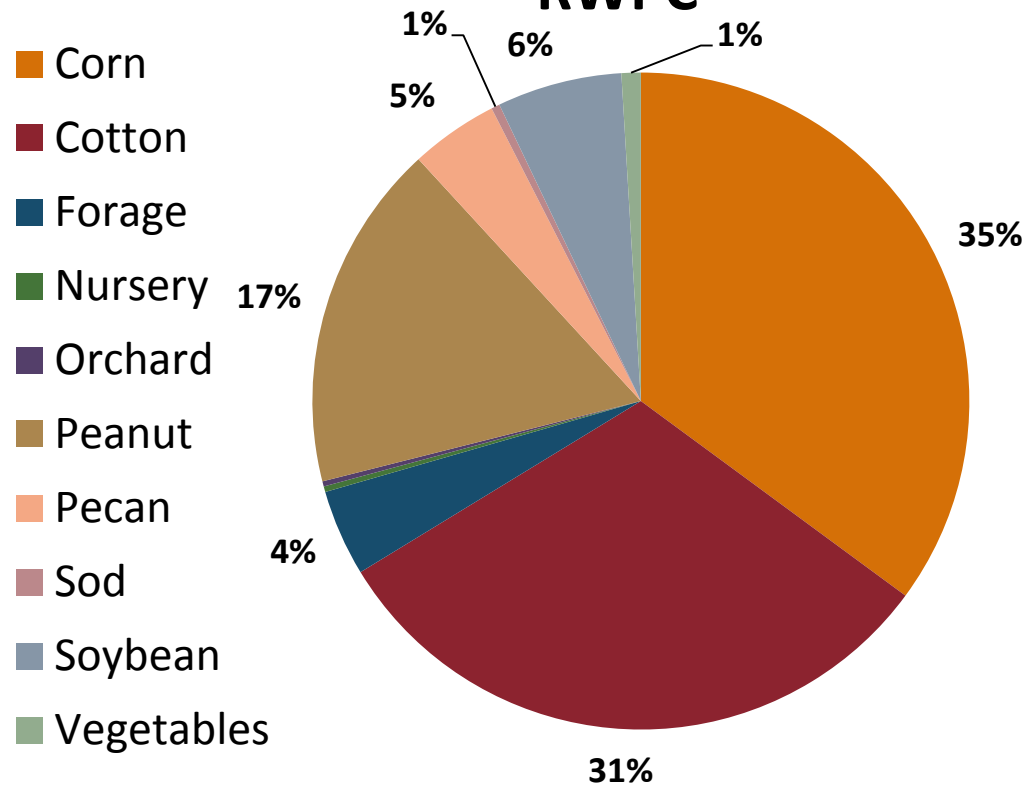


Baseline Crop Mix by RWPC

Middle Ocmulgee RWPC

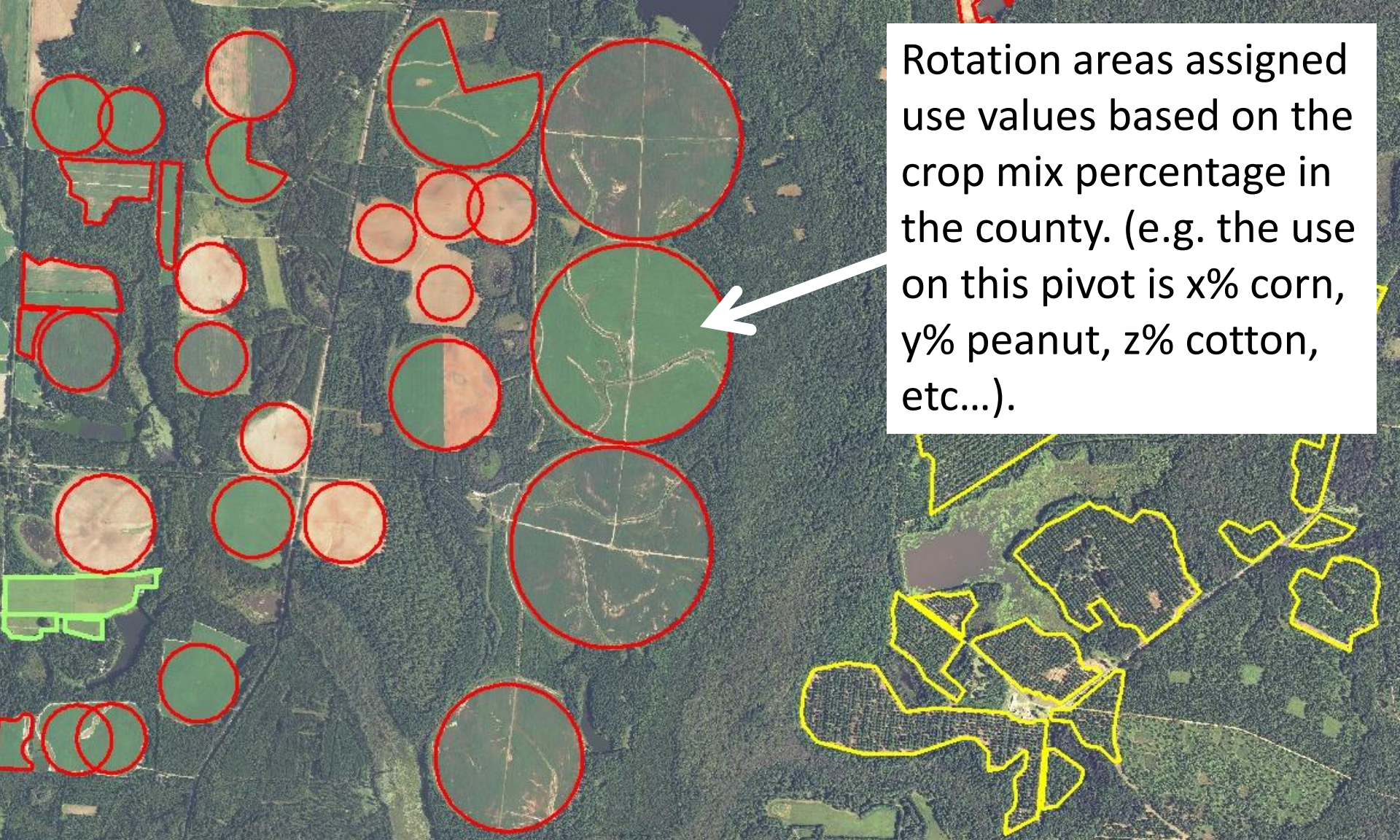


Savannah-Upper Ogeechee RWPC



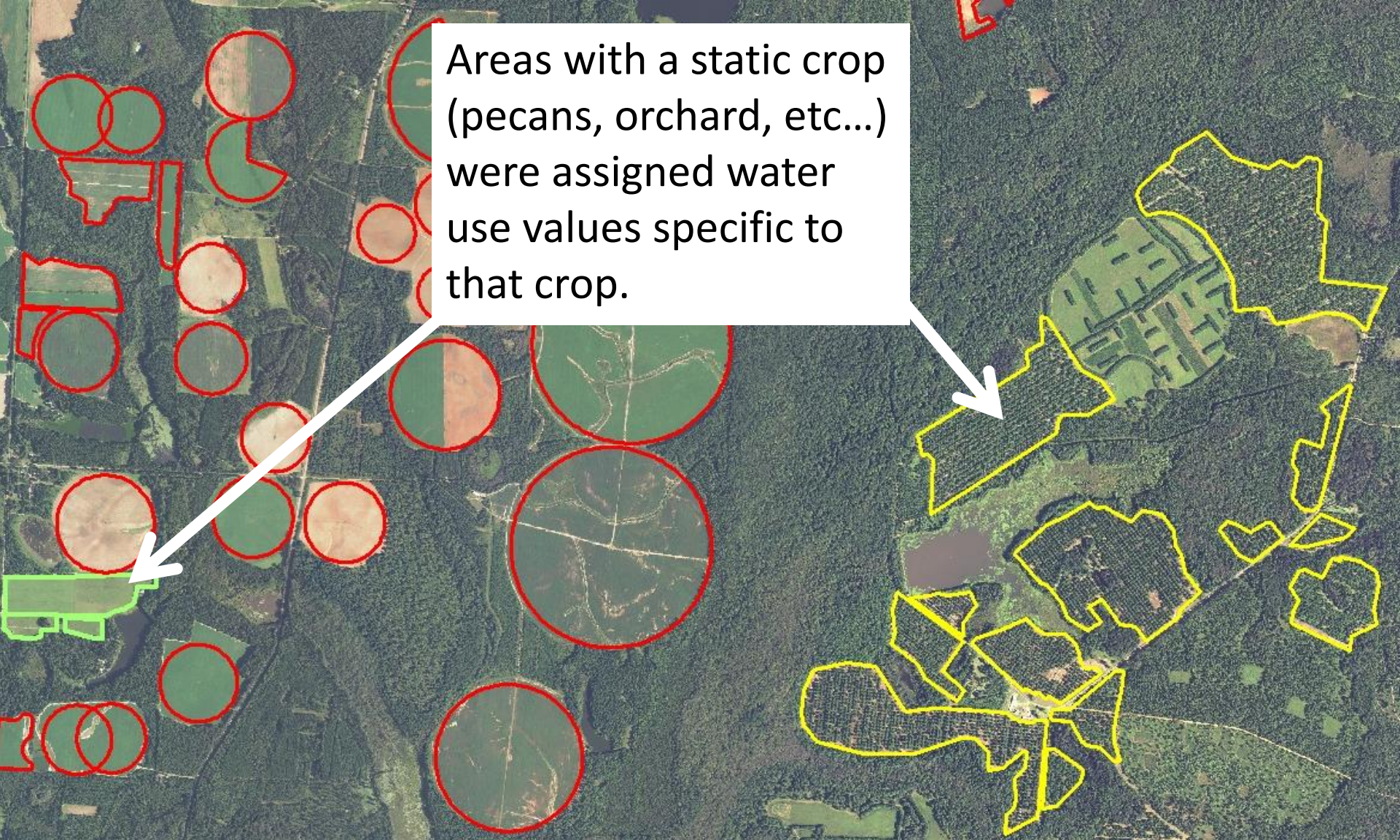
2015-16 Agricultural Water Demand Forecasts - Methods

- ▣ **Approach:** Look to past trends and consider foreseeable changes
- ▣ **Acreage**
 - Baseline – USDA Census of Agriculture (2012); linked to 2015 irrigated acres
- ▣ **Crop water needs**
 - Wet, normal and dry year estimates by crop/soil/county
 - Aggregated spatially to 2015 irrigated acreage



Rotation areas assigned use values based on the crop mix percentage in the county. (e.g. the use on this pivot is x% corn, y% peanut, z% cotton, etc...).

Areas with a static crop (pecans, orchard, etc...) were assigned water use values specific to that crop.



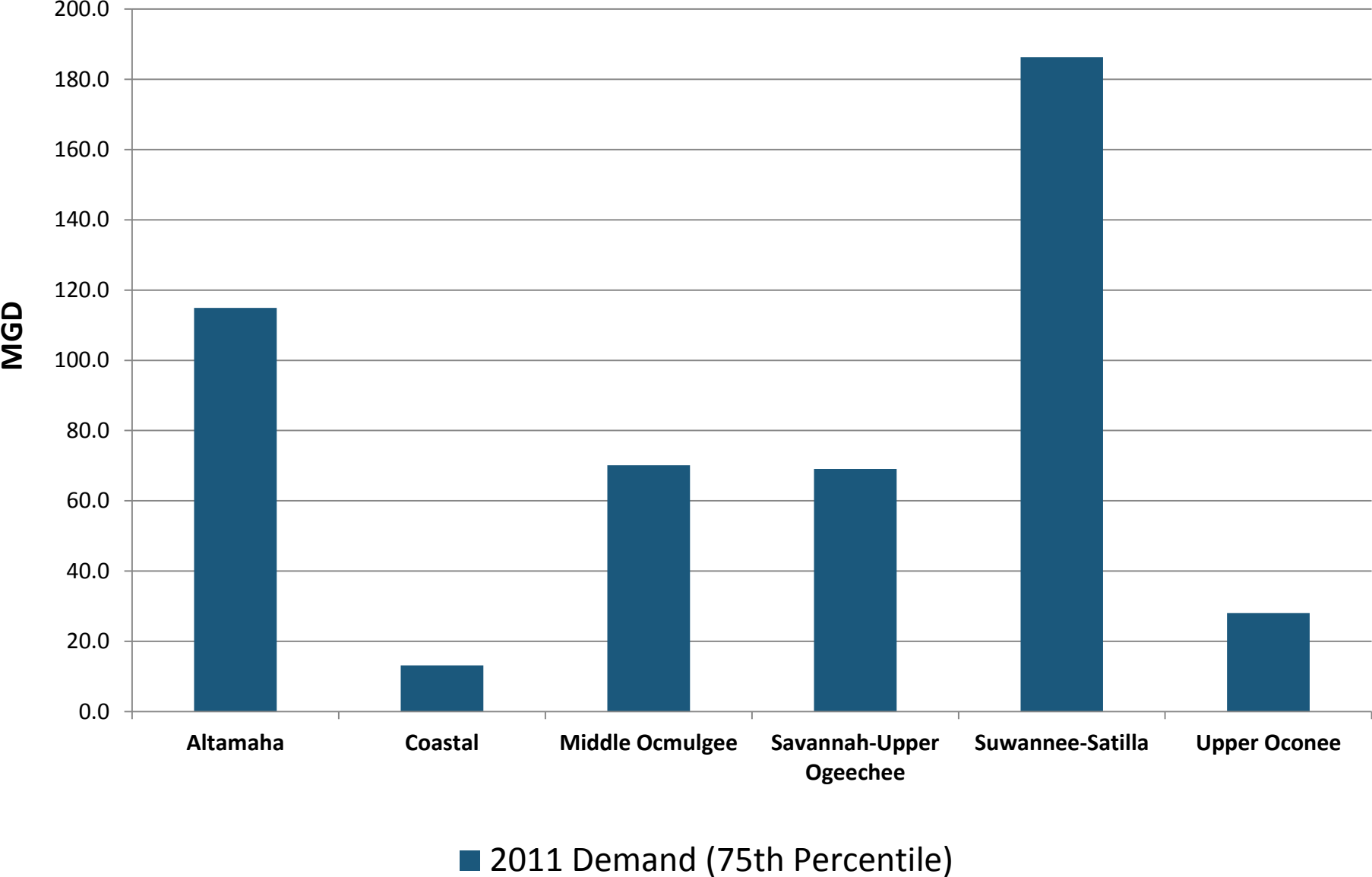
2015-16 Agricultural Water Demand Forecasts - Methods

- ▣ **Approach:** Look to past trends and consider foreseeable changes
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- ▣ **Crop water needs**
 - Wet, normal and dry year estimates by crop/soil/county
 - Aggregated spatially to 2015 irrigated acreage
- ▣ **Crop projections through 2050 - modeled based on multiple data sources:**
 - Average of: USDA Projections, Southeast Model, Georgia Model

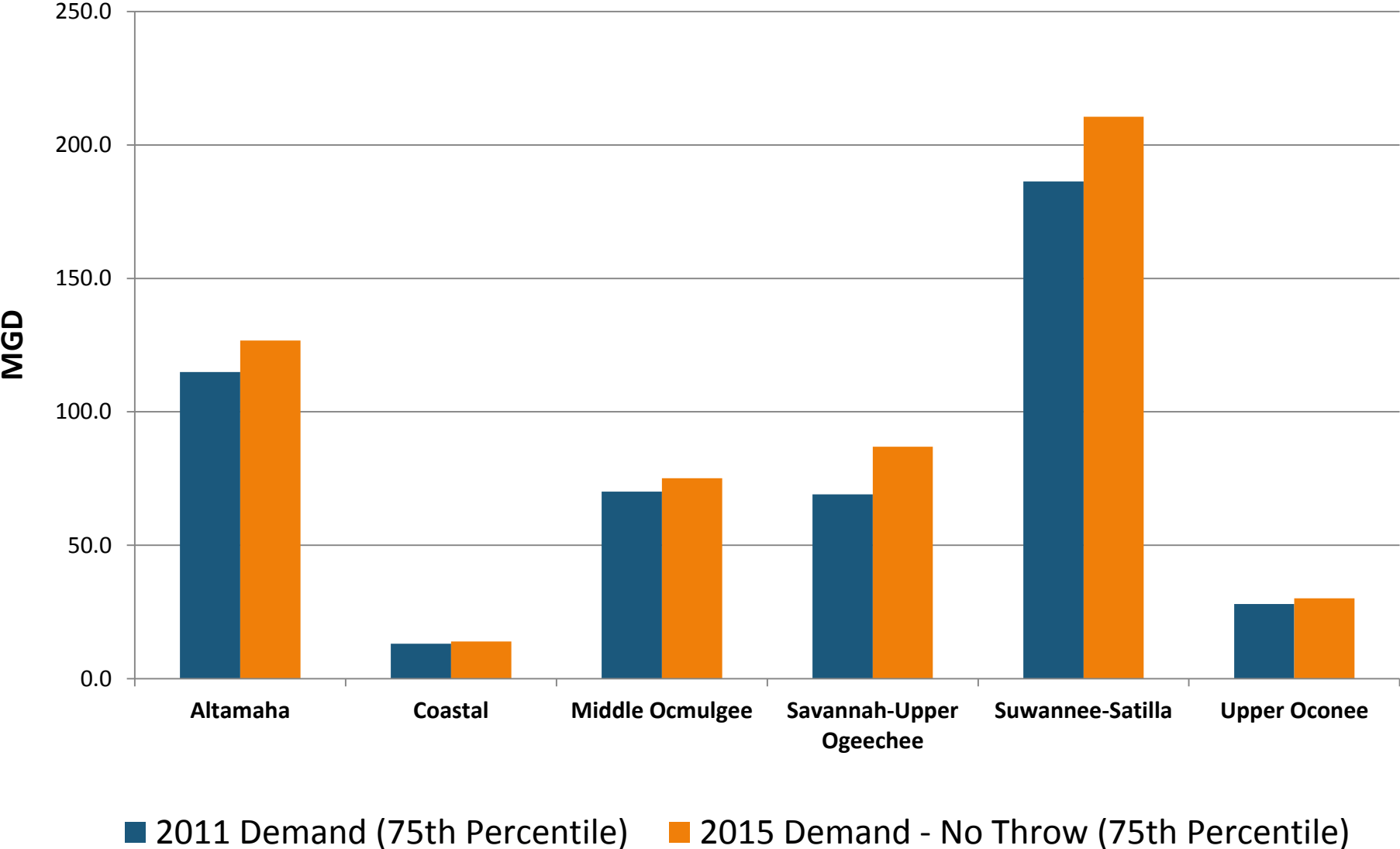
Results

Current Demand Estimates

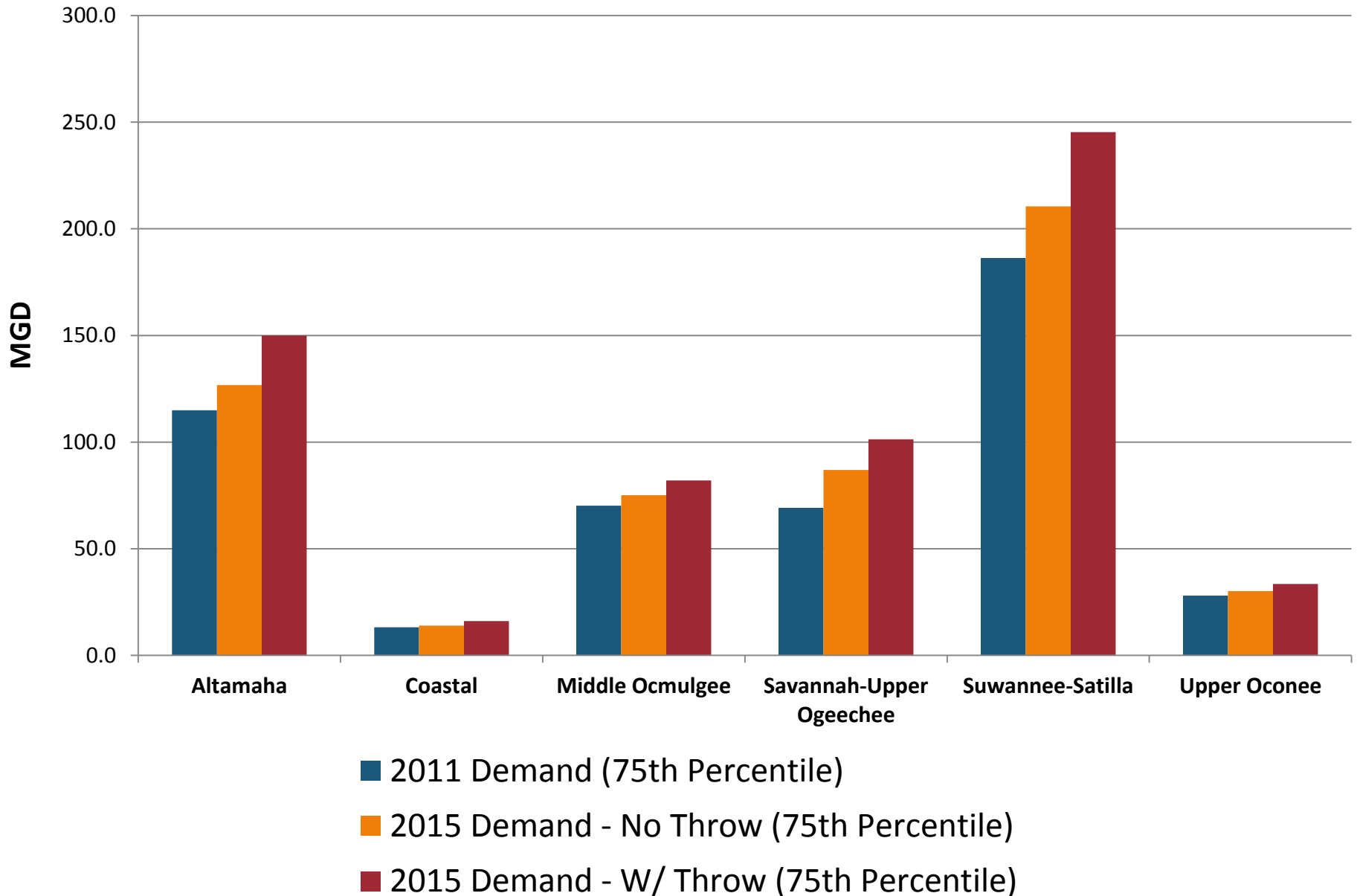
Ag Demand (2011 & 2015)



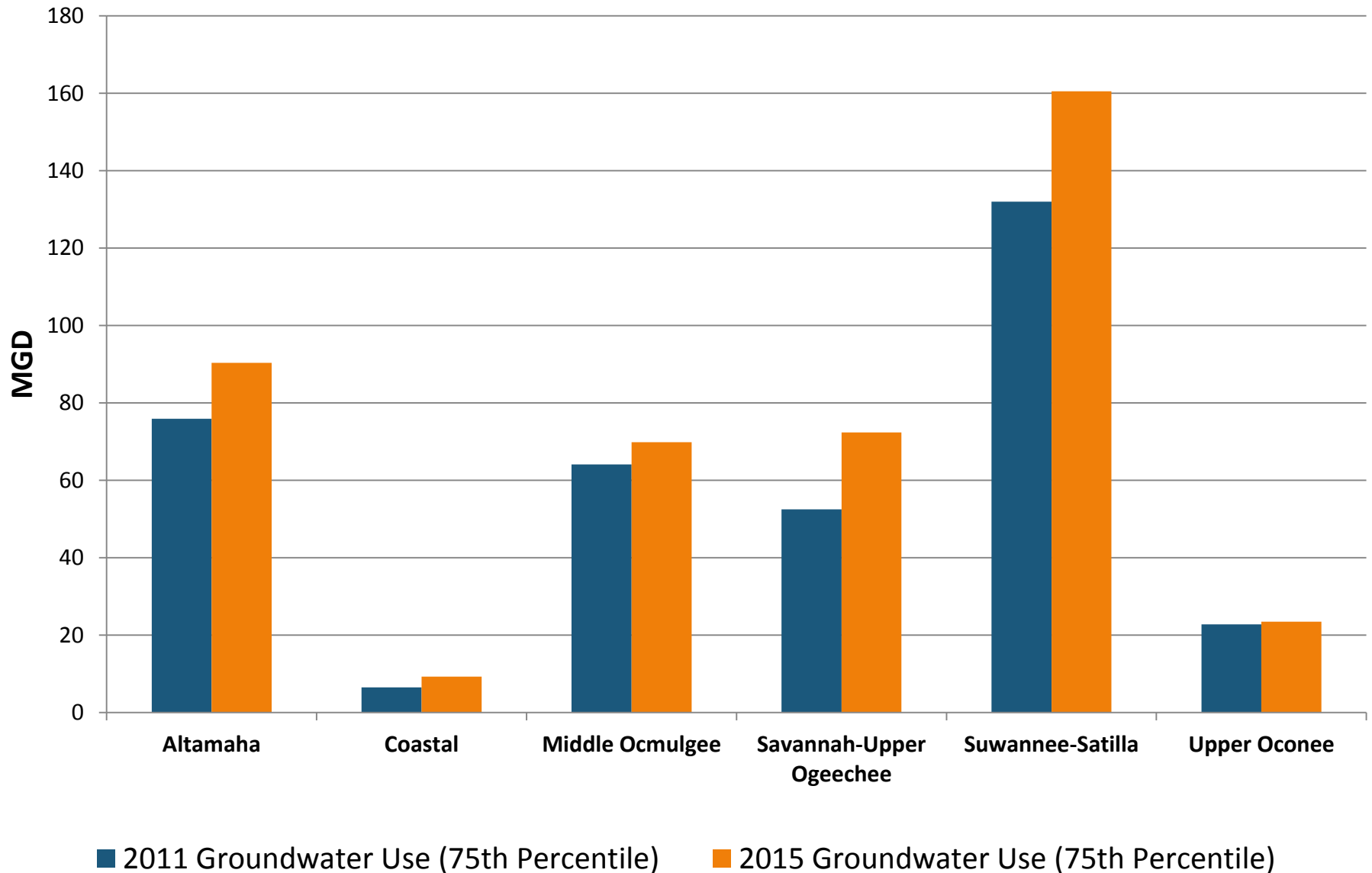
Ag Demand (2011 & 2015)



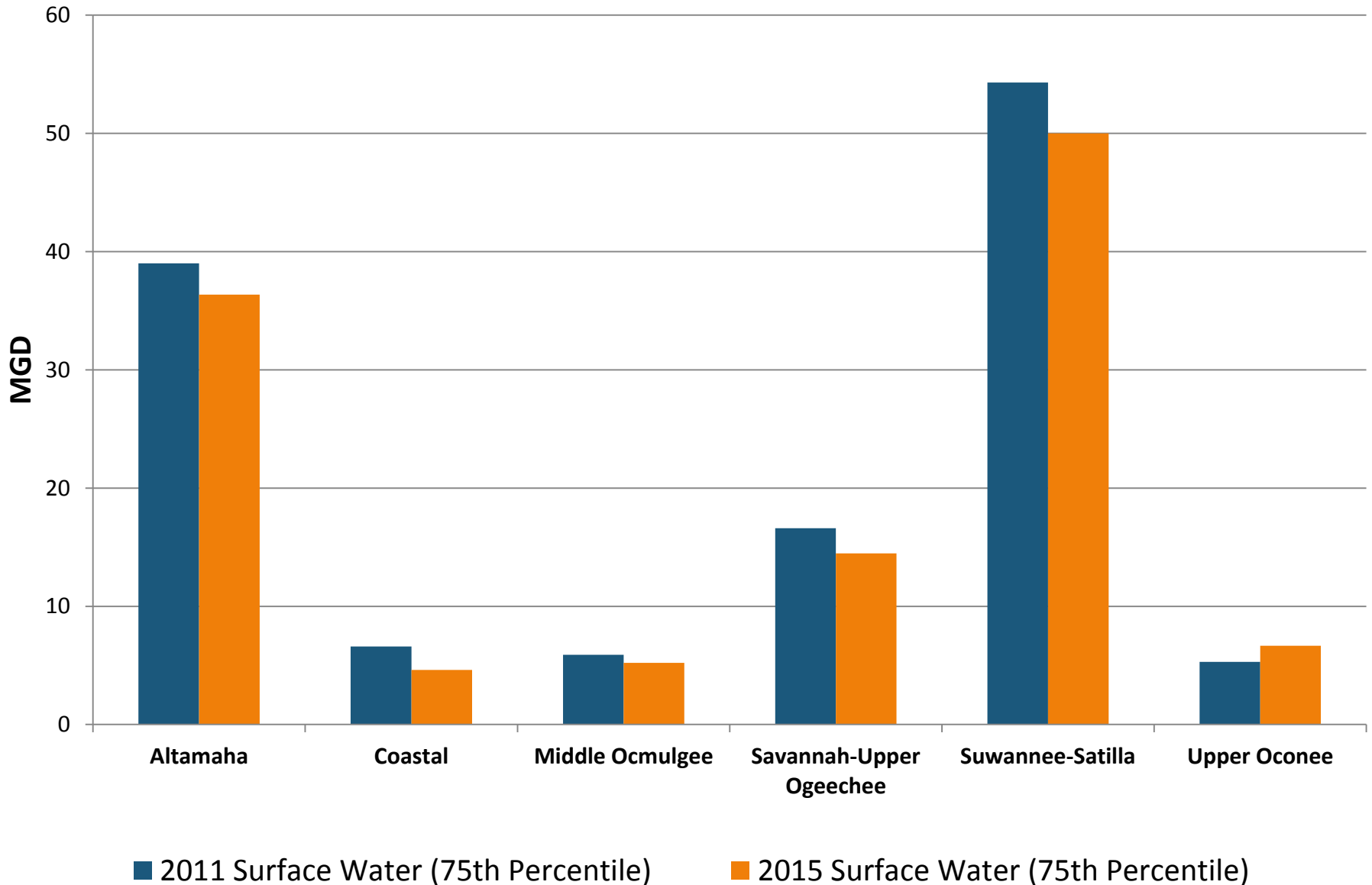
Ag Demand (2011 & 2015)



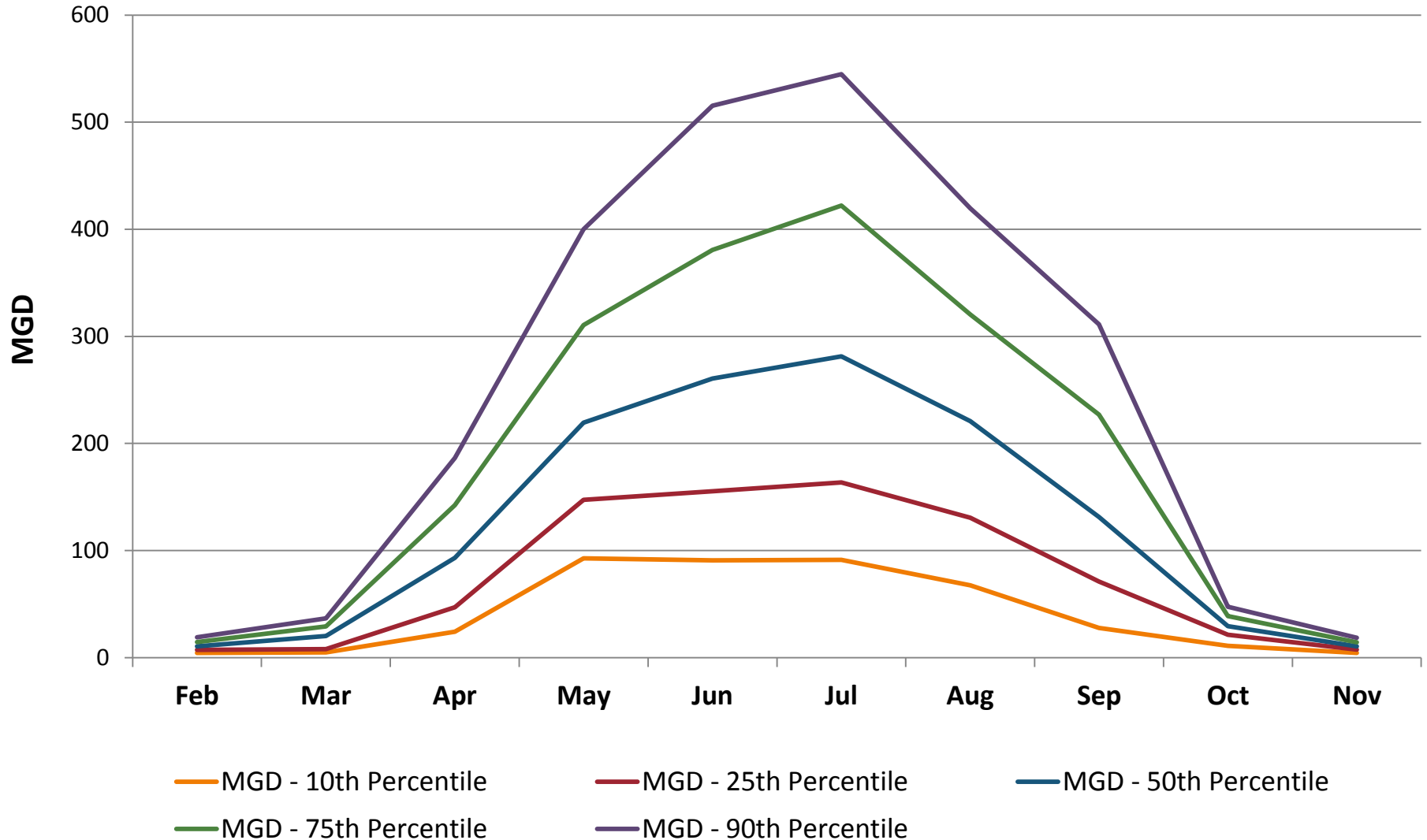
Groundwater Use (2011 & 2015)



Surface Water Use (2011 & 2015)



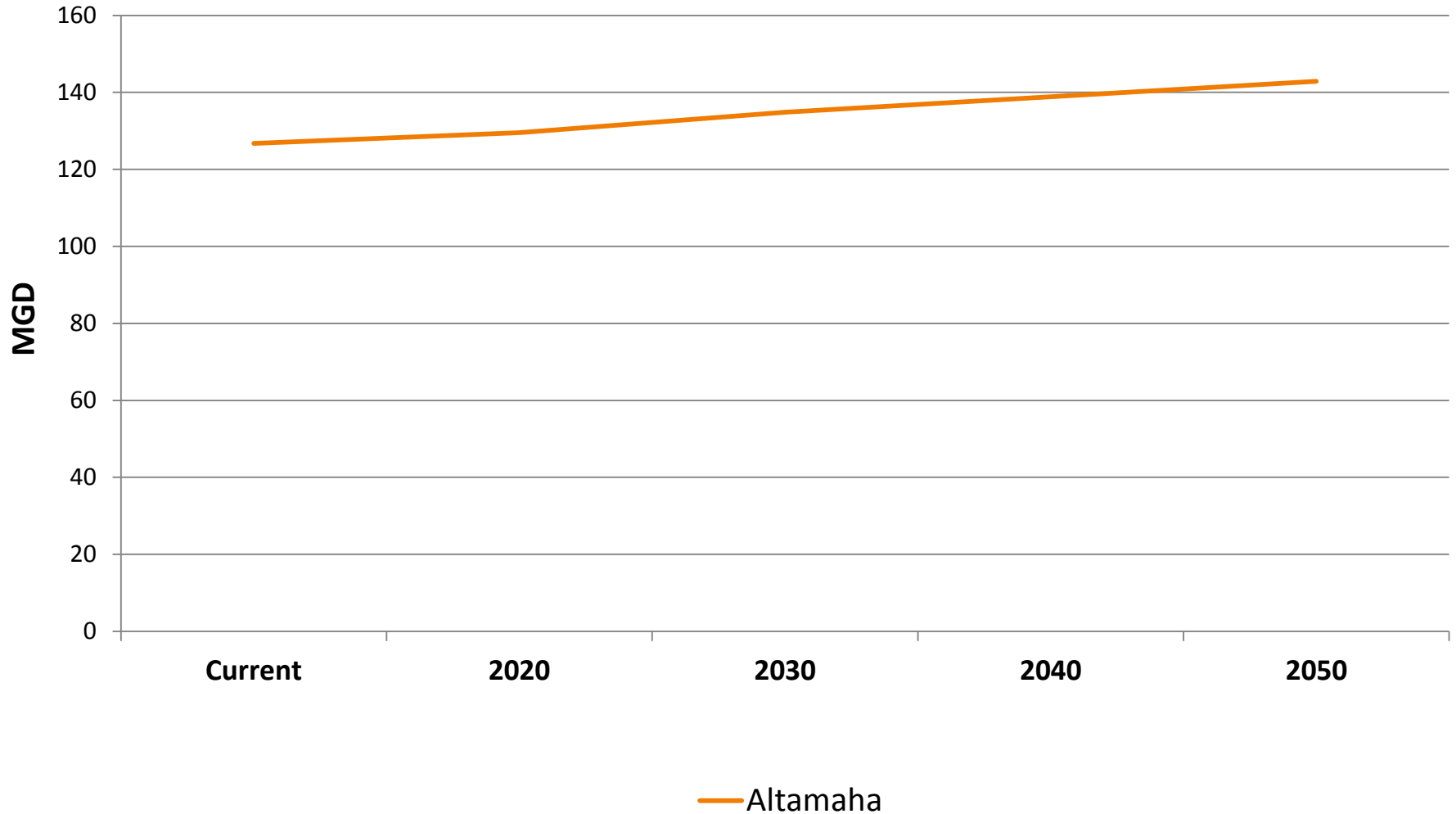
Suwannee-Satilla RWPC - Monthly



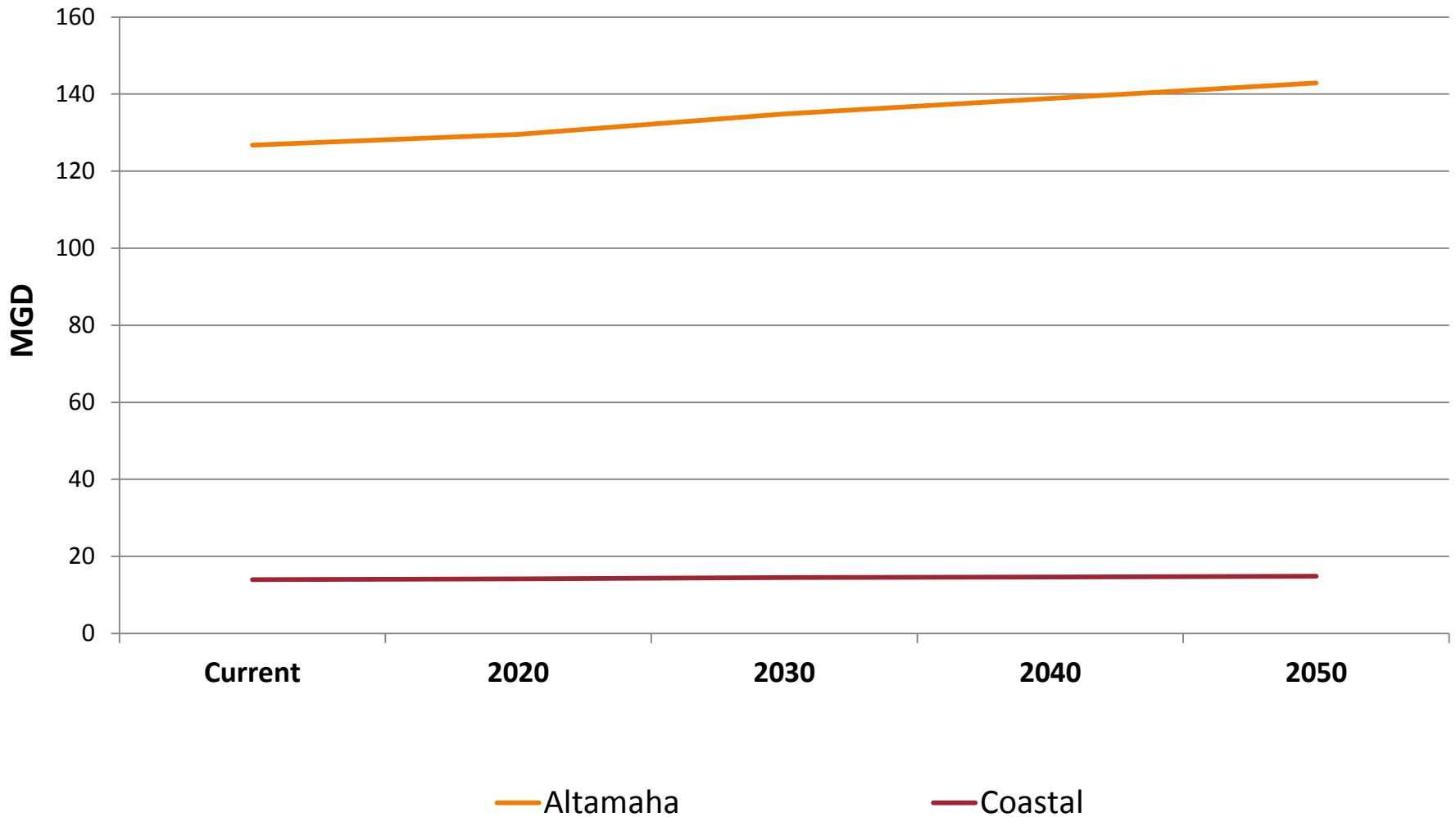
Results

Forecast Demand Estimates

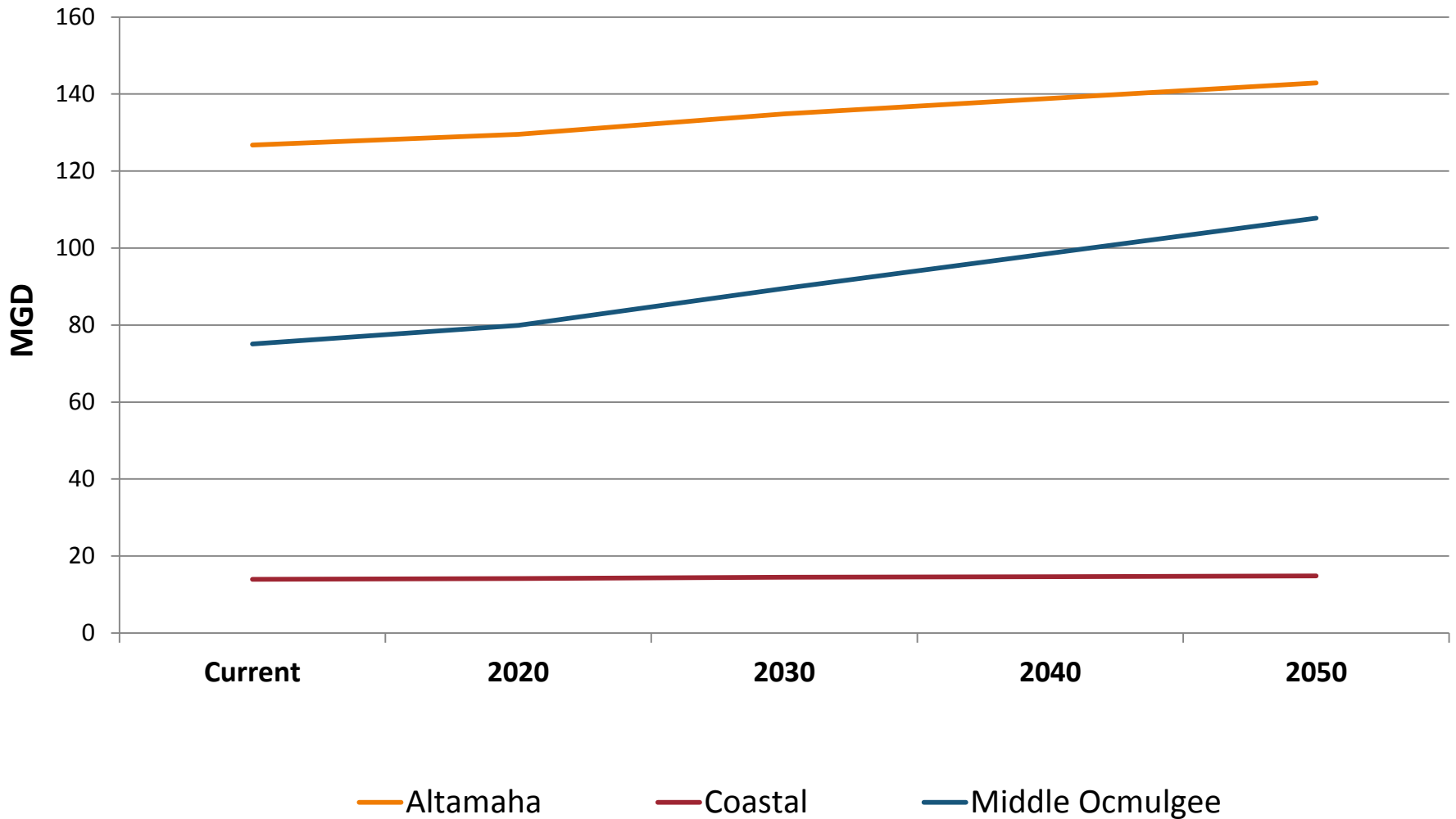
2015 - 2050 Forecast (75th Percentile)



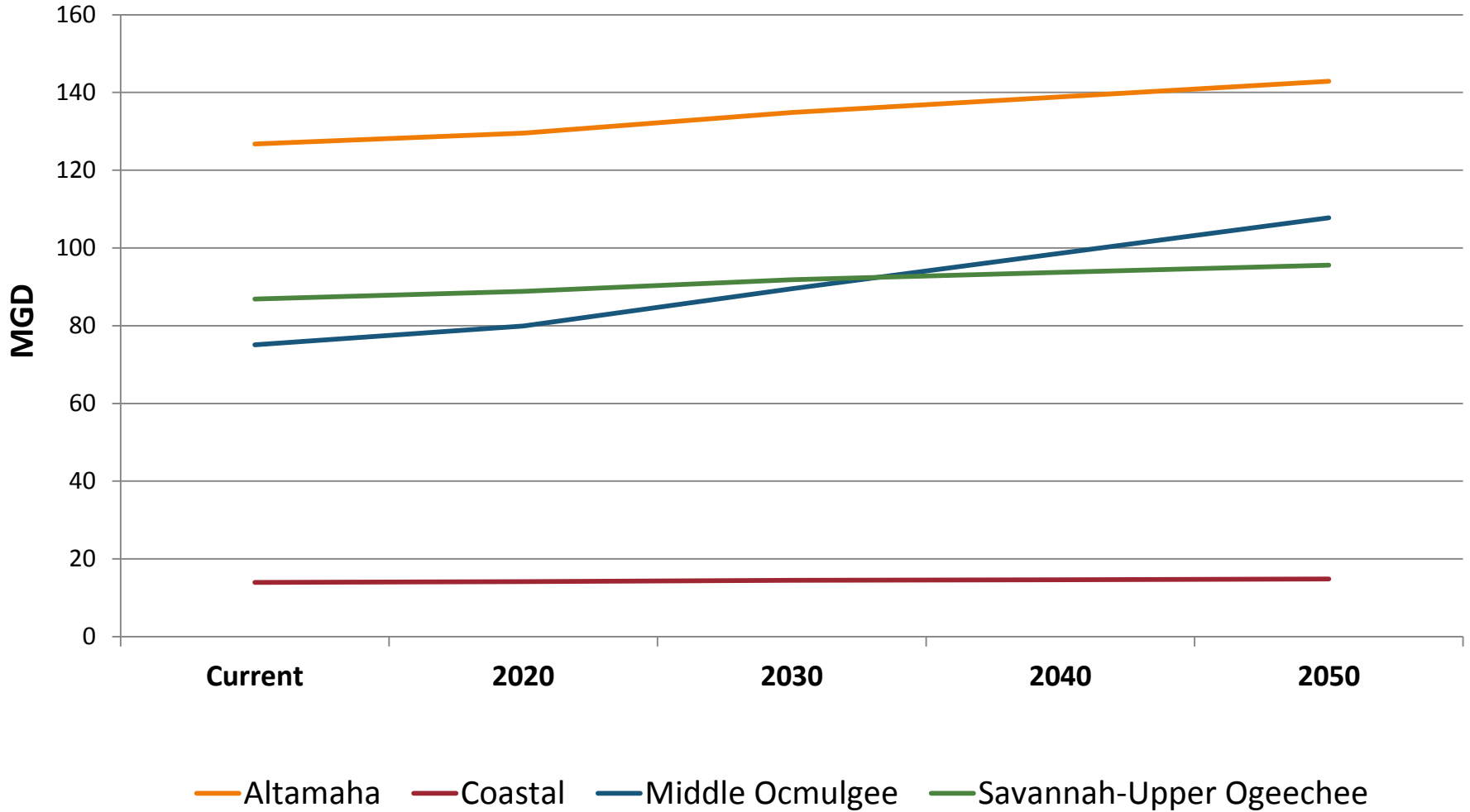
2015 - 2050 Forecast (75th Percentile)



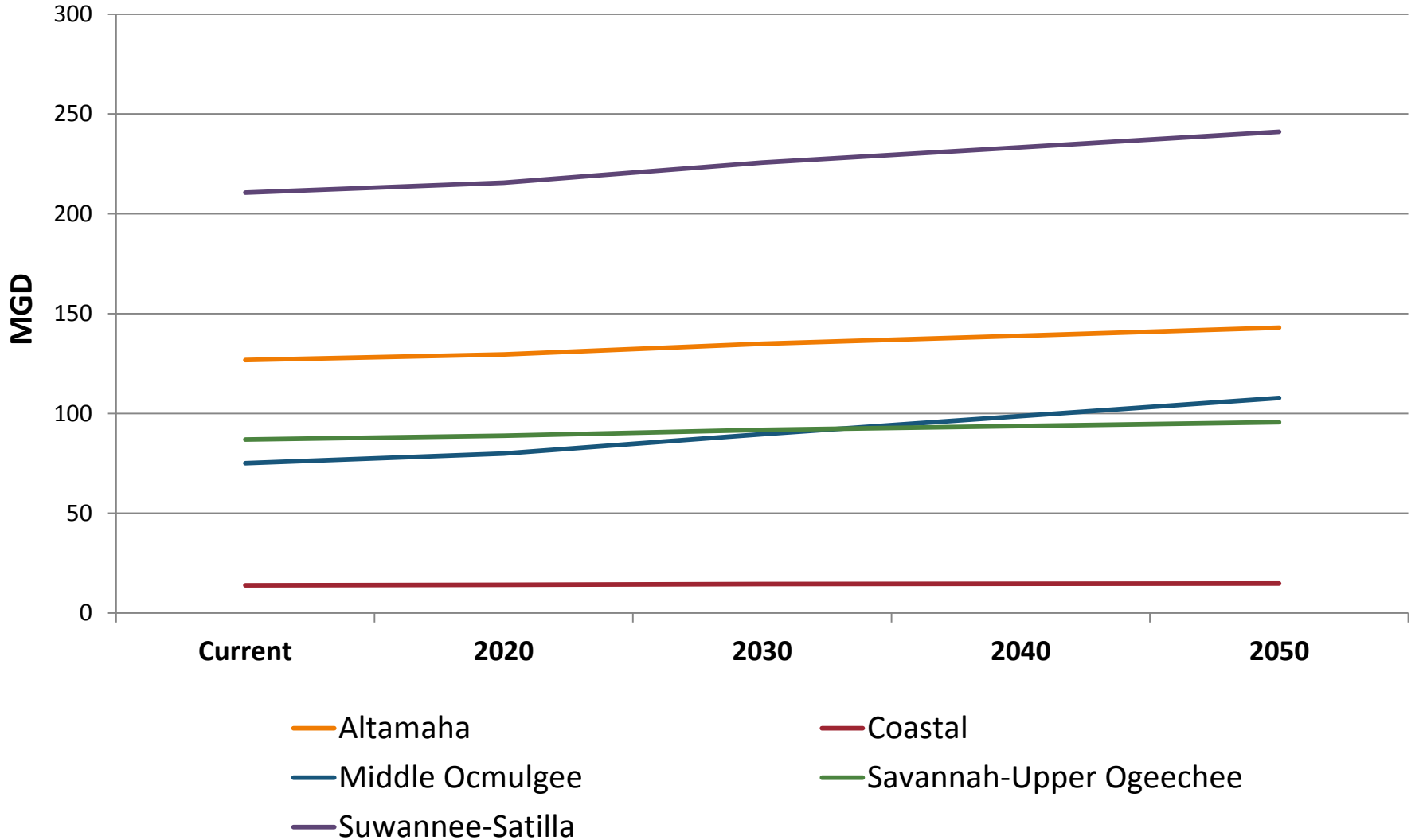
2015 - 2050 Forecast (75th Percentile)



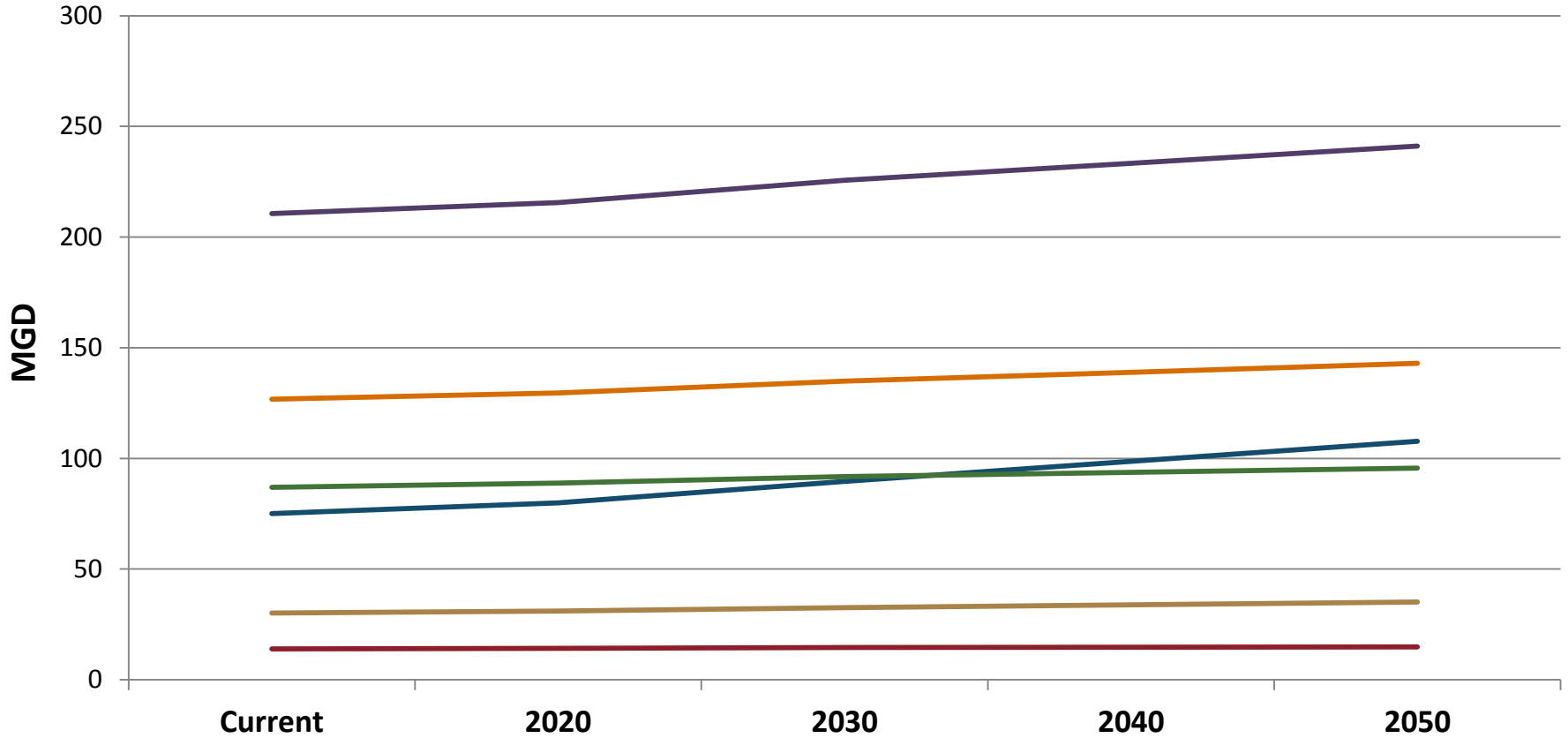
2015 - 2050 Forecast (75th Percentile)



2015 - 2050 Forecast (75th Percentile)



2015 - 2050 Forecast (75th Percentile)



— Altamaha

— Middle Ocmulgee

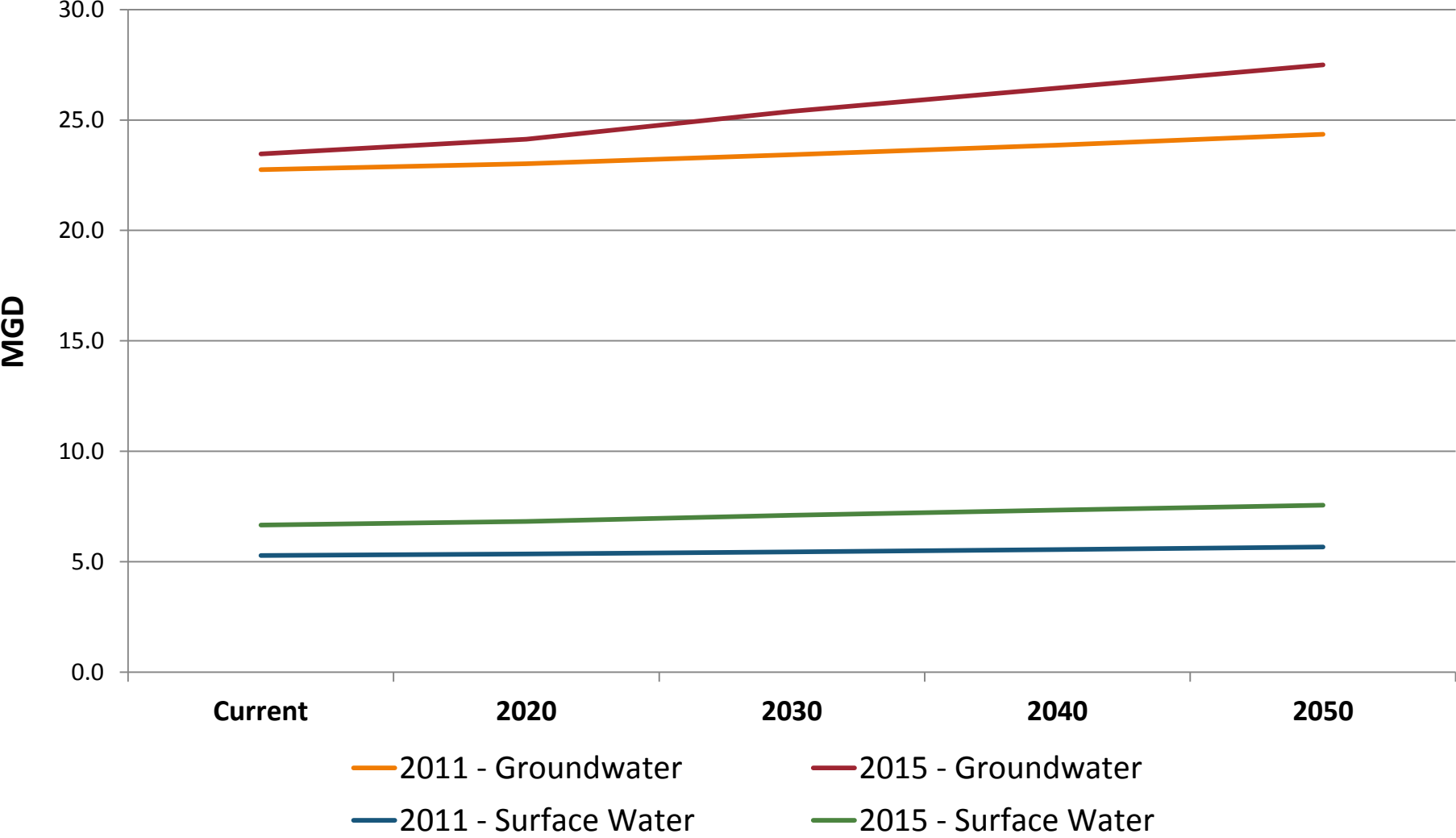
— Suwannee-Satilla

— Coastal

— Savannah-Upper Ogeechee

— Upper Oconee

Upper Oconee RWPC - Forecast (75th Percentile)



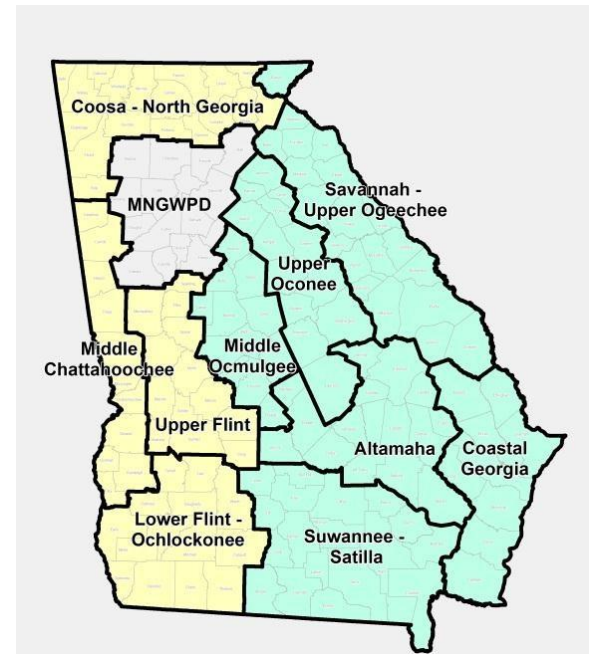
Summary

- ▣ Current and forecast use by basin, water planning region, drainage area (node), county and aquifer
- ▣ Use in dry, normal and wet years
- ▣ Used to support resource assessments and water planning council plan development
- ▣ Peer and stakeholder review forthcoming
- ▣ Questions?

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229-430-2900 x36

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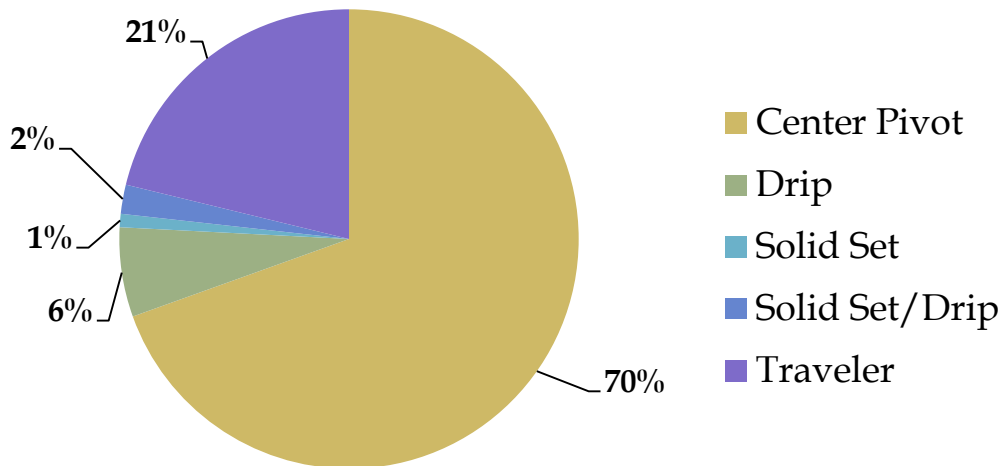


Agricultural Water Use Forecast – Handout for Altamaha Water Planning Region

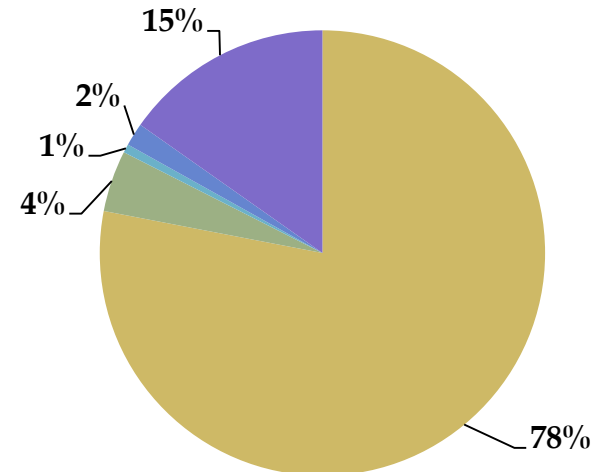
Altamaha River RWPC

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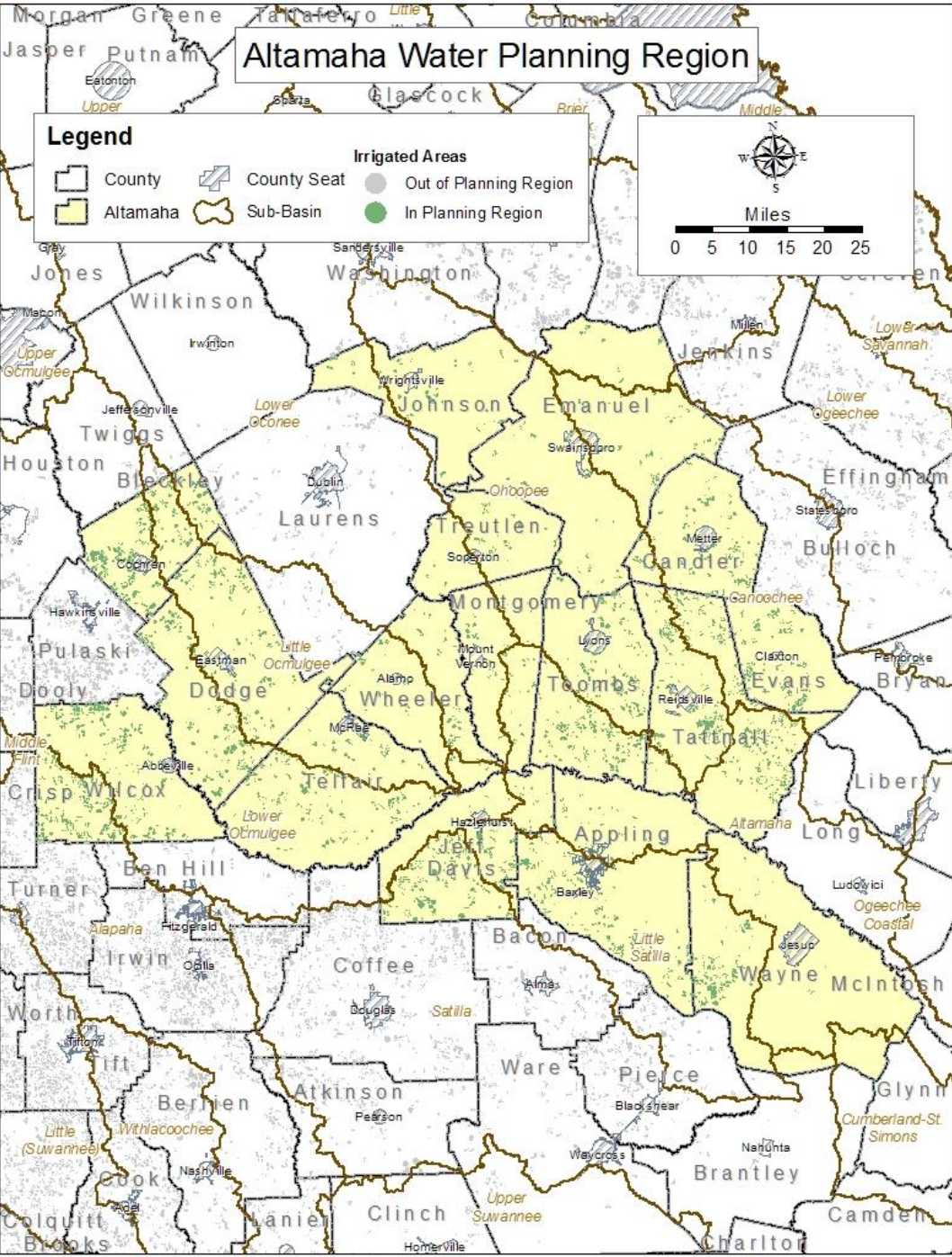
System Type - % of Systems



System Type - % of Acreage



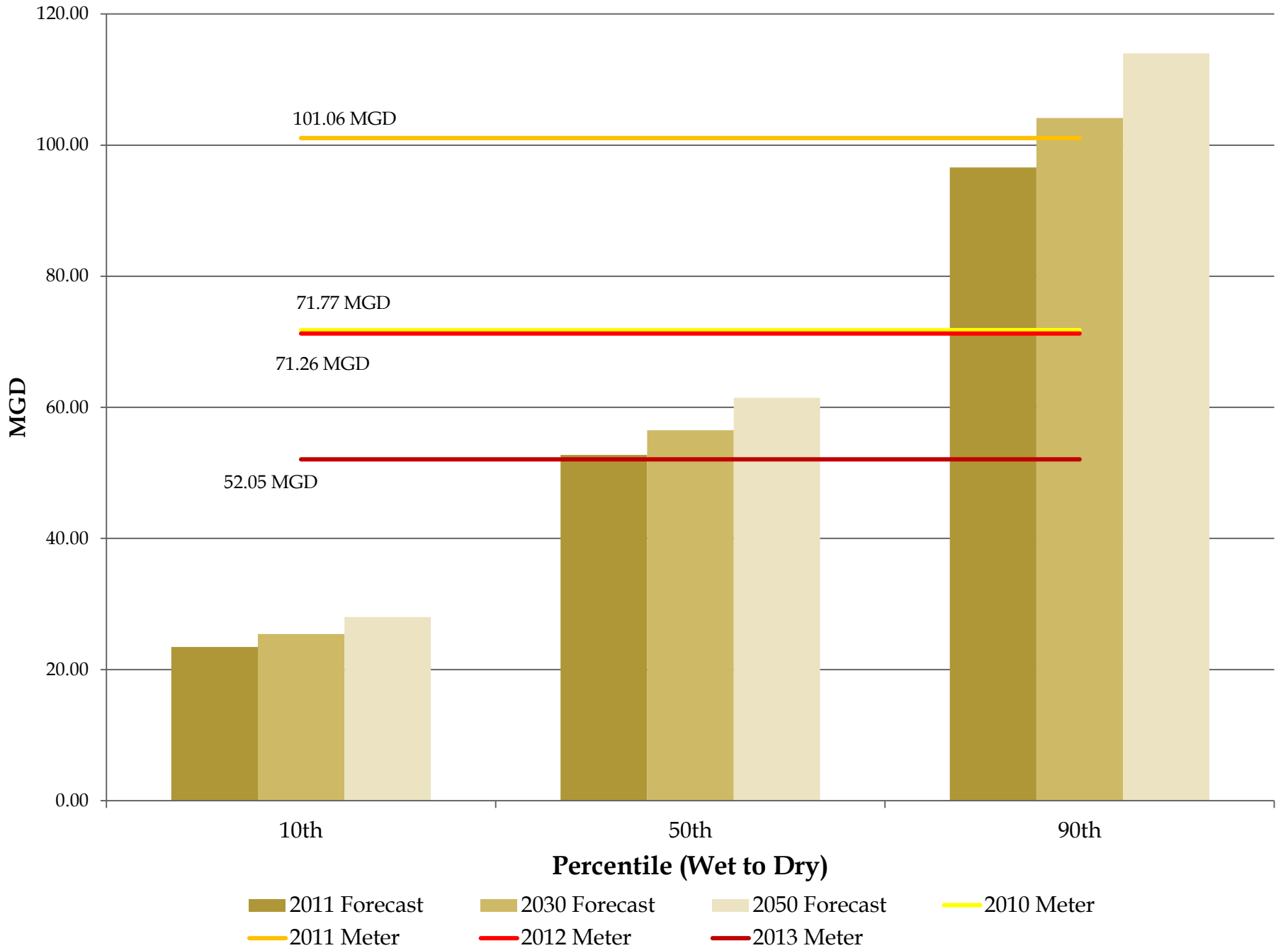
Altamaha Water Planning Region



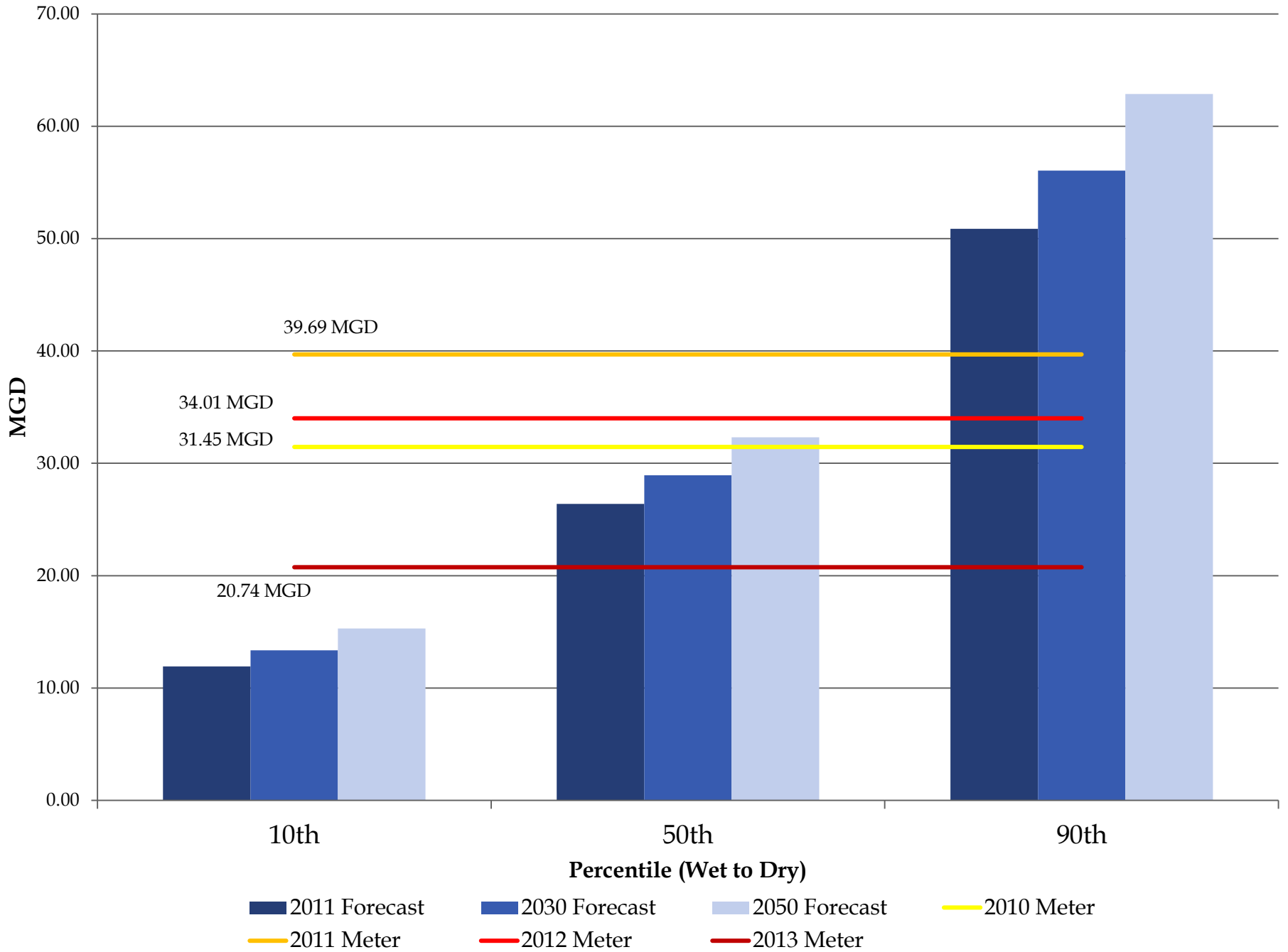
Irrigated Acres

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Candler	6,048	7,045
Dodge	16,167	19,404
Emanuel	4,757	6,582
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Jeff Davis	10,650	13,865
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Wheeler	4,657	5,604
Wilcox	18,416	23,728

Altamaha RWPC - Groundwater (Meter Data)



Altamaha RWPC - Surface Water (Meter Data)

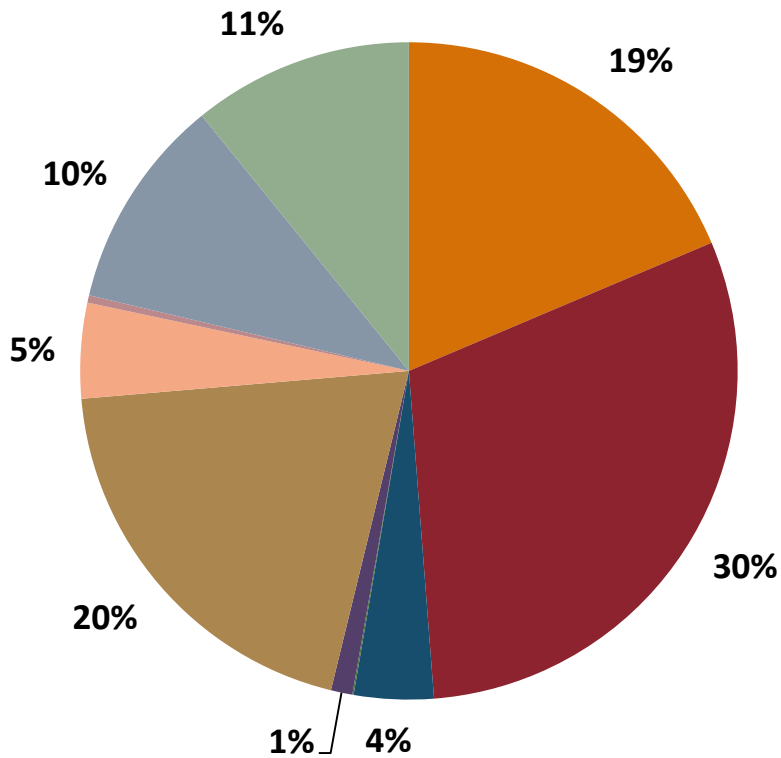


2015-16 Agricultural Water Demand Forecasts - Methods

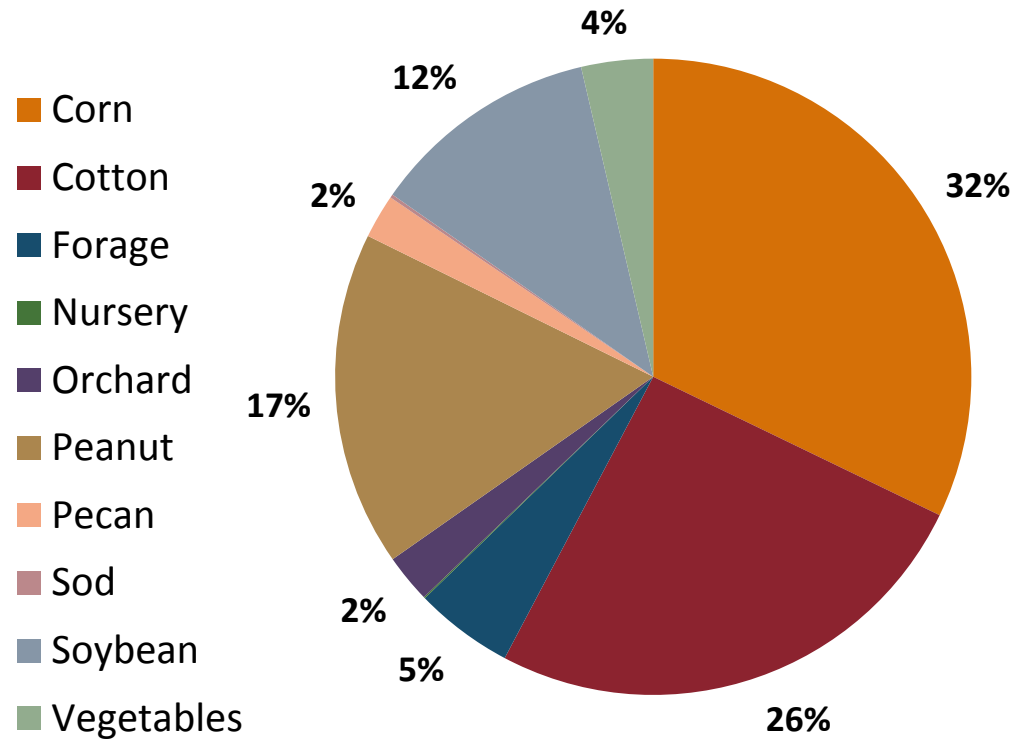
- ▣ **Approach: Look to past trends and consider foreseeable changes**
- ▣ **Acreage**
 - Baseline – USDA Census of Agriculture (2012); linked to 2015 irrigated acres
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 - Average of: USDA Projections, Southeast Model, Georgia Model

Baseline Crop Mix by RWPC

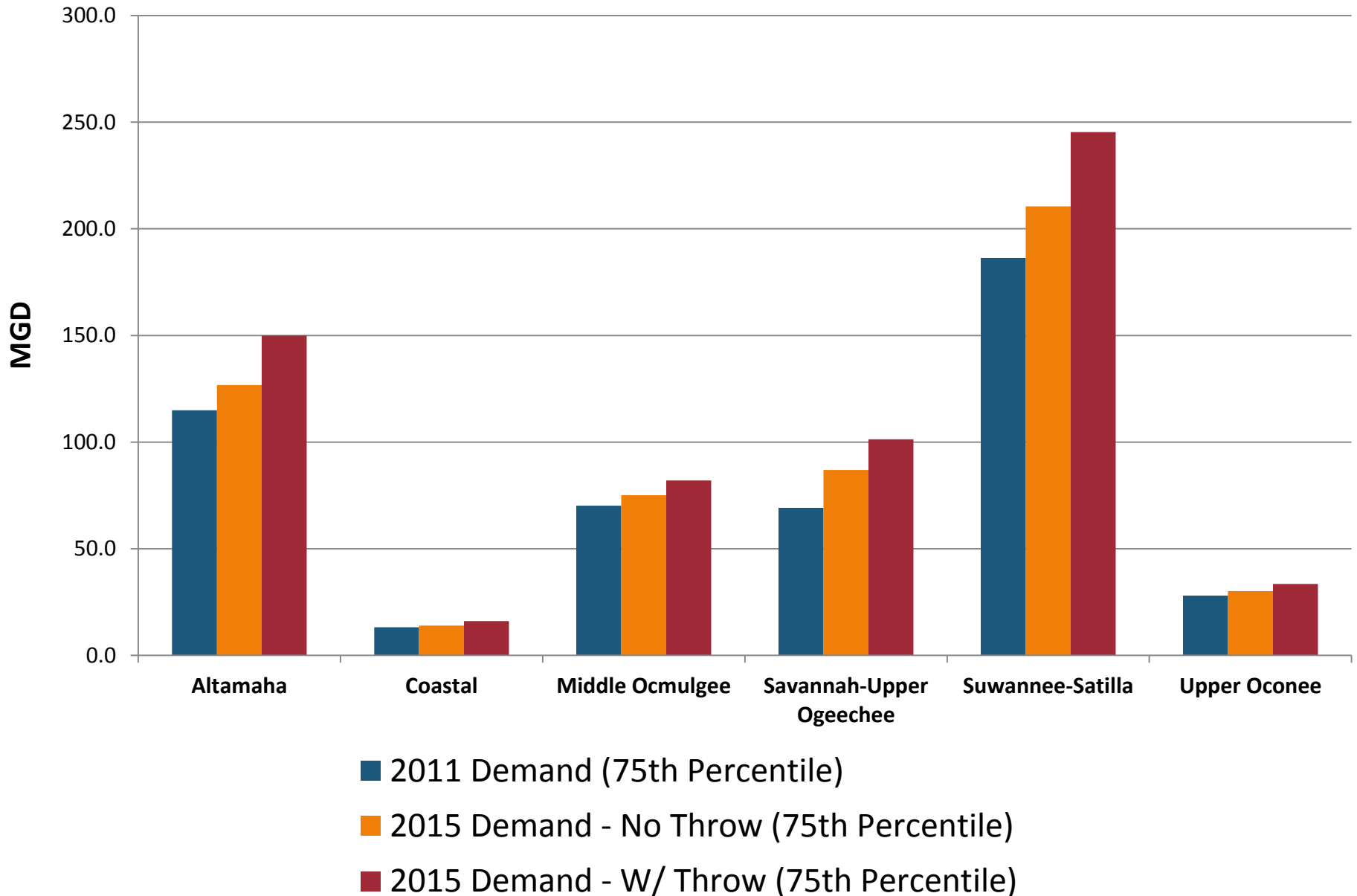
Altamaha RWPC



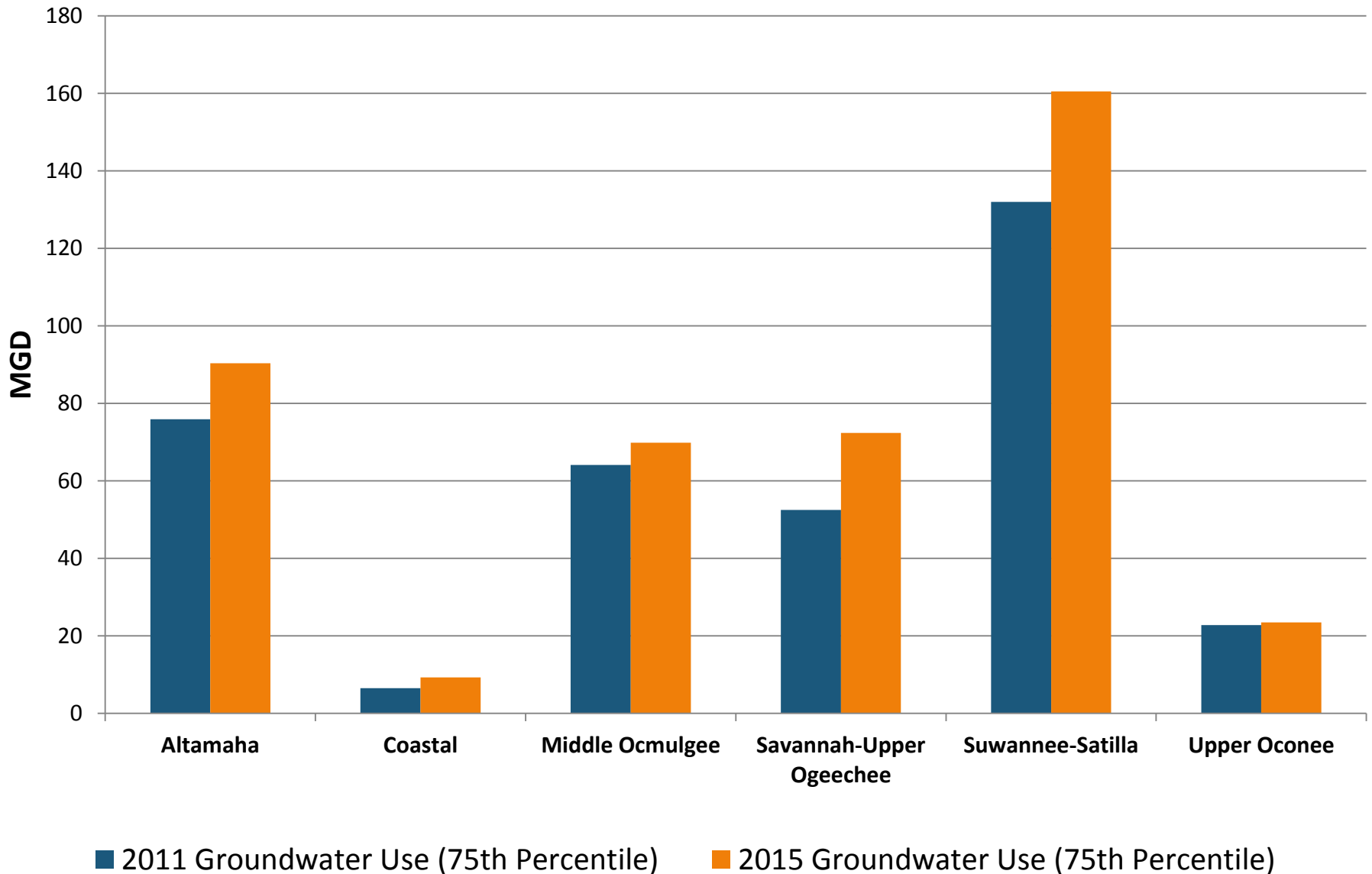
Coastal Georgia RWPC



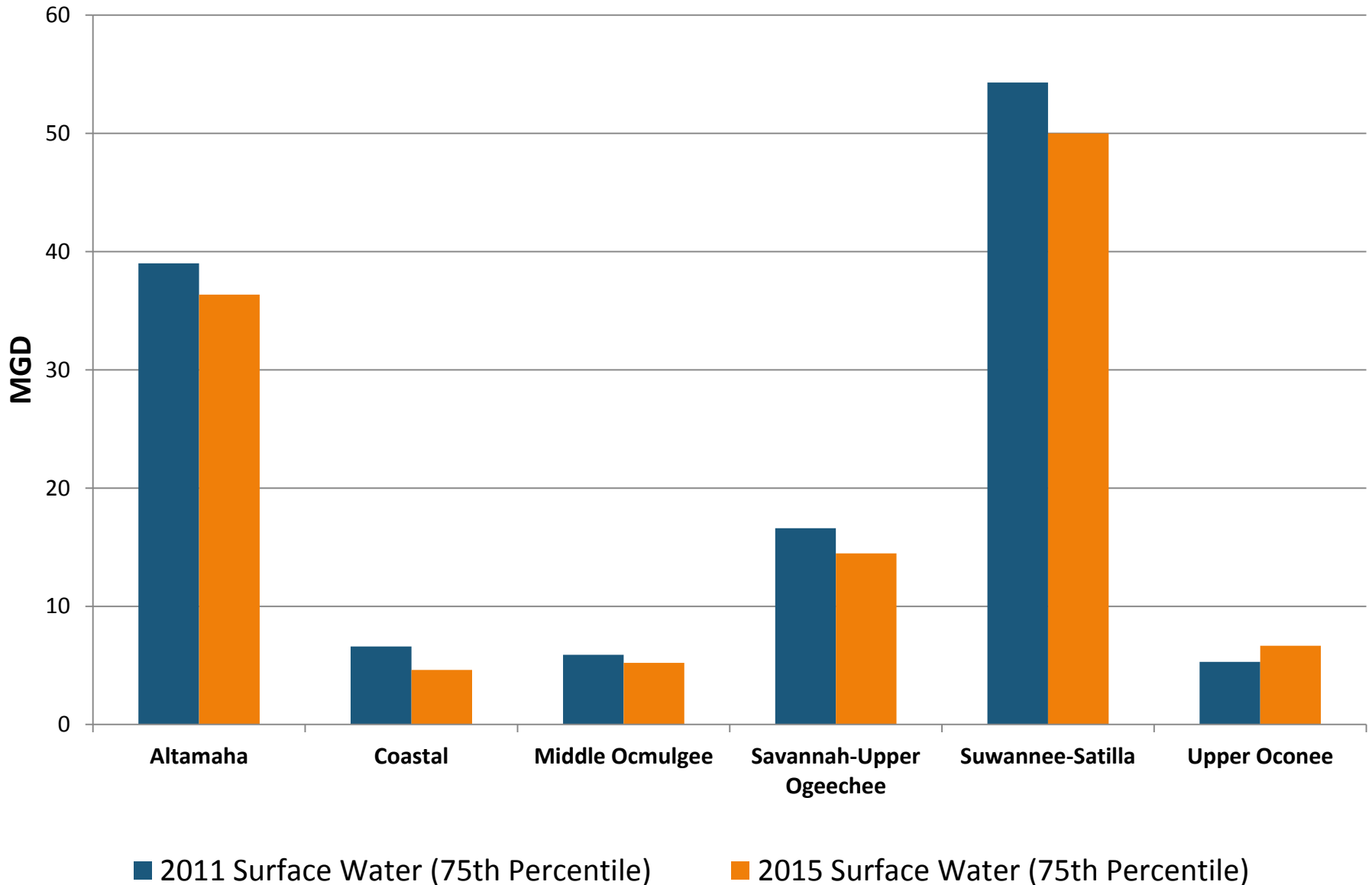
Ag Demand (2011 & 2015)



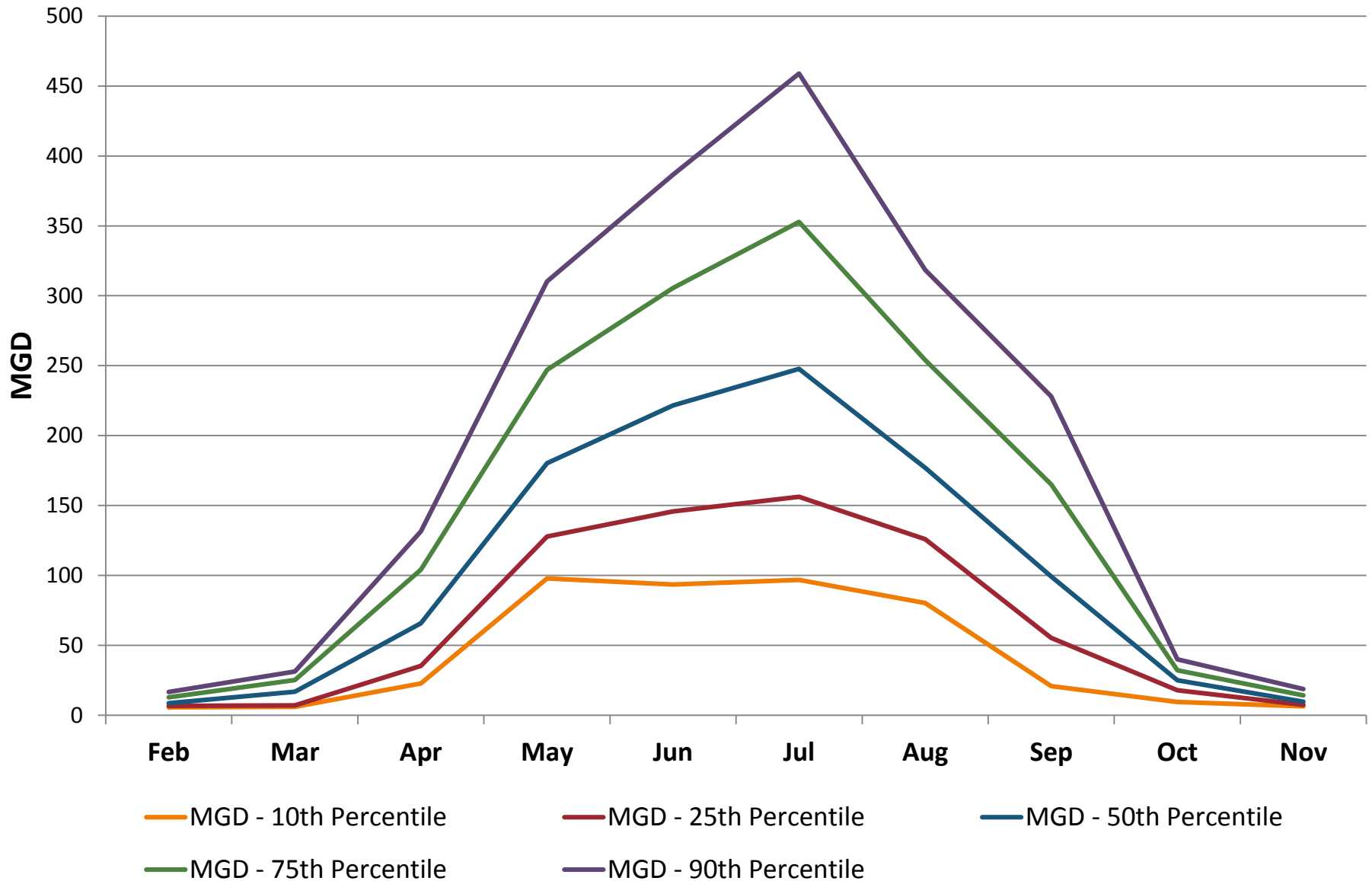
Groundwater Use (2011 & 2015)



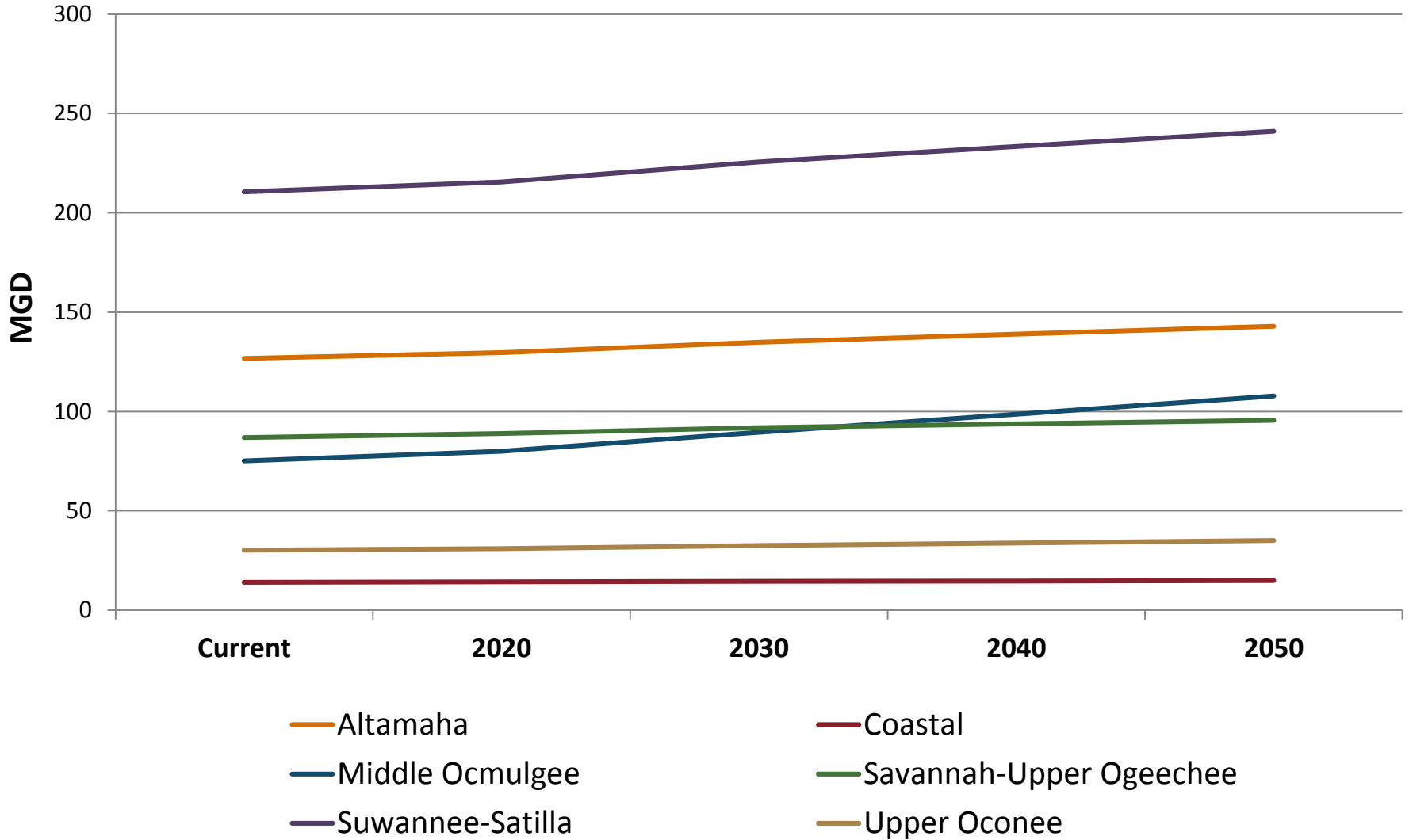
Surface Water Use (2011 & 2015)



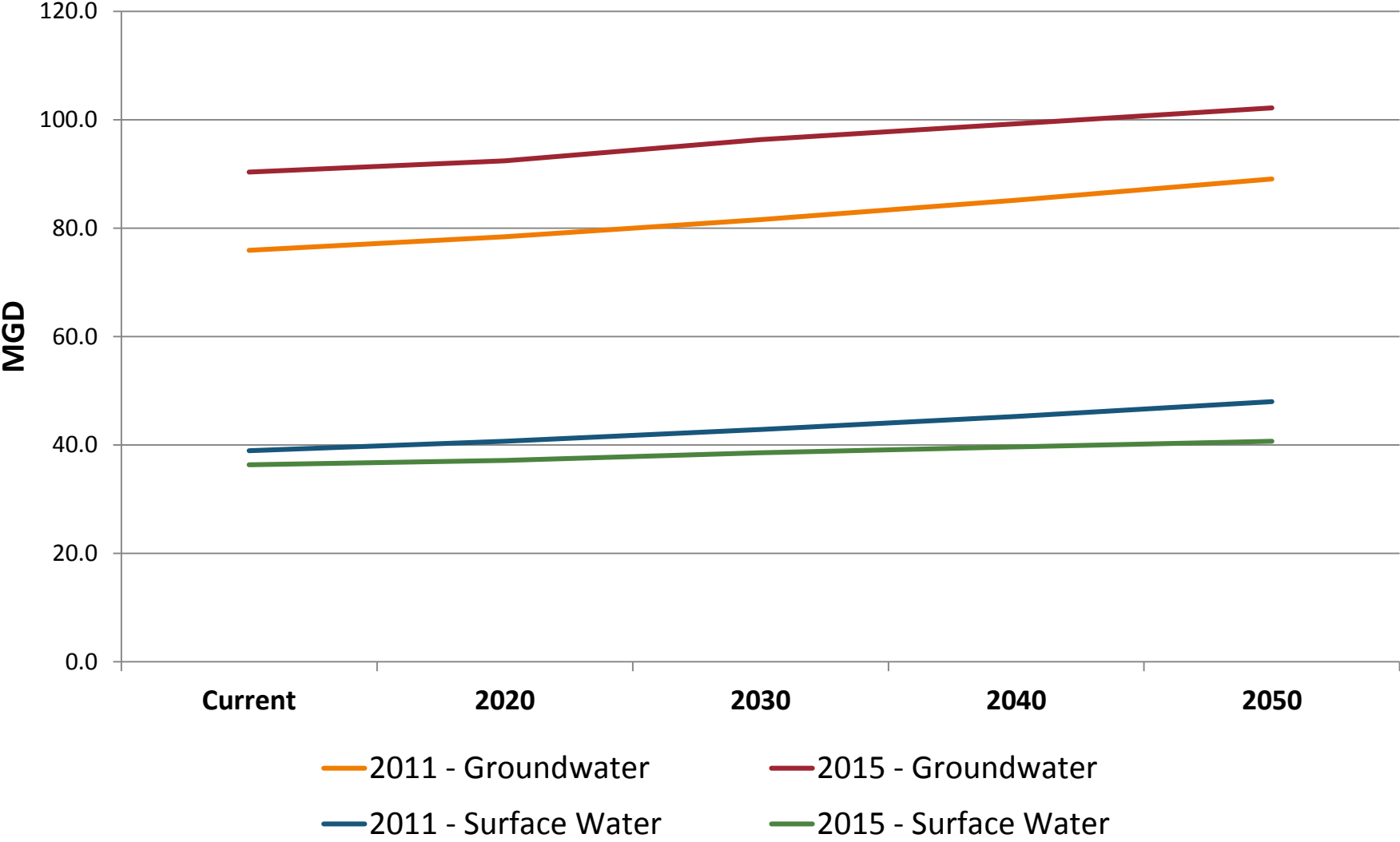
Altamaha RWPC - Monthly



2015 - 2050 Forecast (75th Percentile)



Altamaha RWPC - Forecast (75th Percentile)



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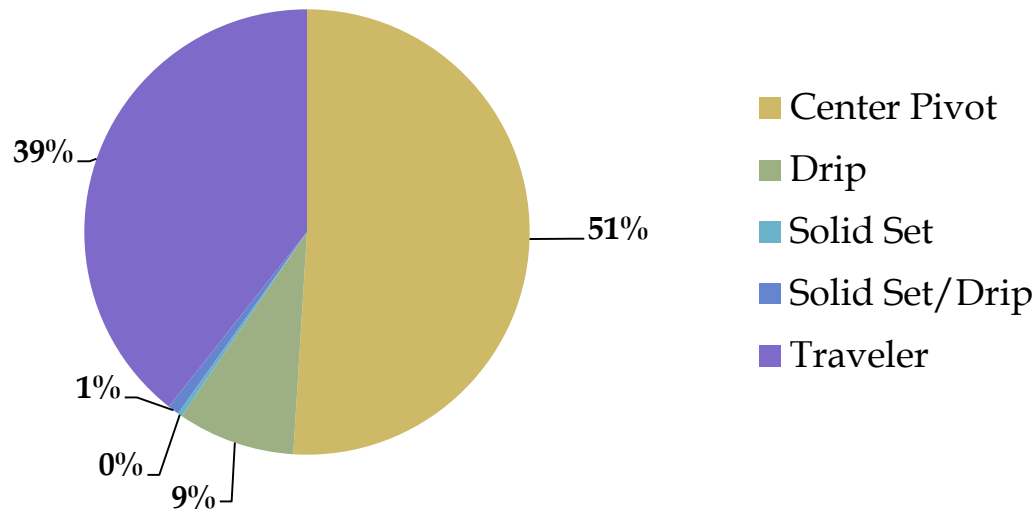


Agricultural Water Use Forecast – Handout for Coastal Georgia Water Planning Region

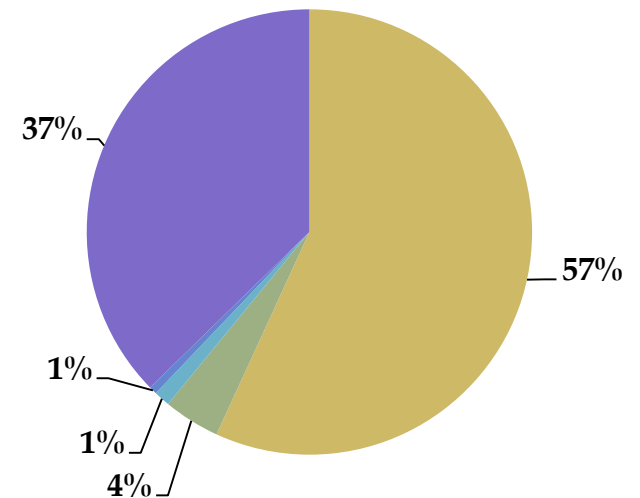
Coastal Georgia RWPC

	2009	2015	% Change
Total # of Fields	525	610	+ 16.2%
Total Acreage	20,391	22,468	+ 10.2%
Total GW Acreage	7,469	12,833	+ 72.5%
Total SW Acreage	12,922	9,635	- 21.6%
Total Center Pivots	175	311	+ 77.7%
Center Pivot Acreage	7,974	12,773	+ 60.2%

System Type - % of Systems







System Type - % of Acreage





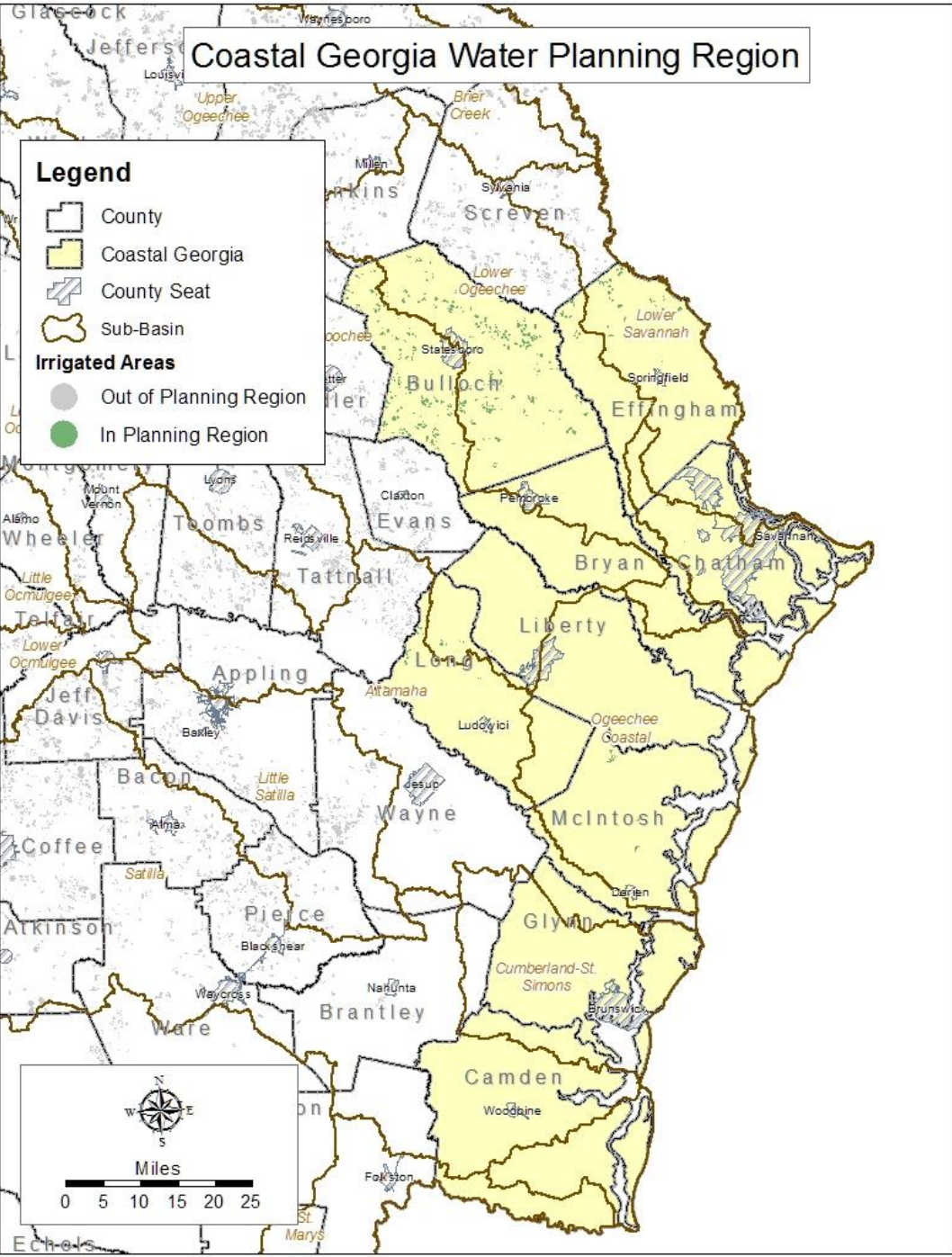
Coastal Georgia Water Planning Region

Legend

-  County
-  Coastal Georgia
-  County Seat
-  Sub-Basin

Irrigated Areas

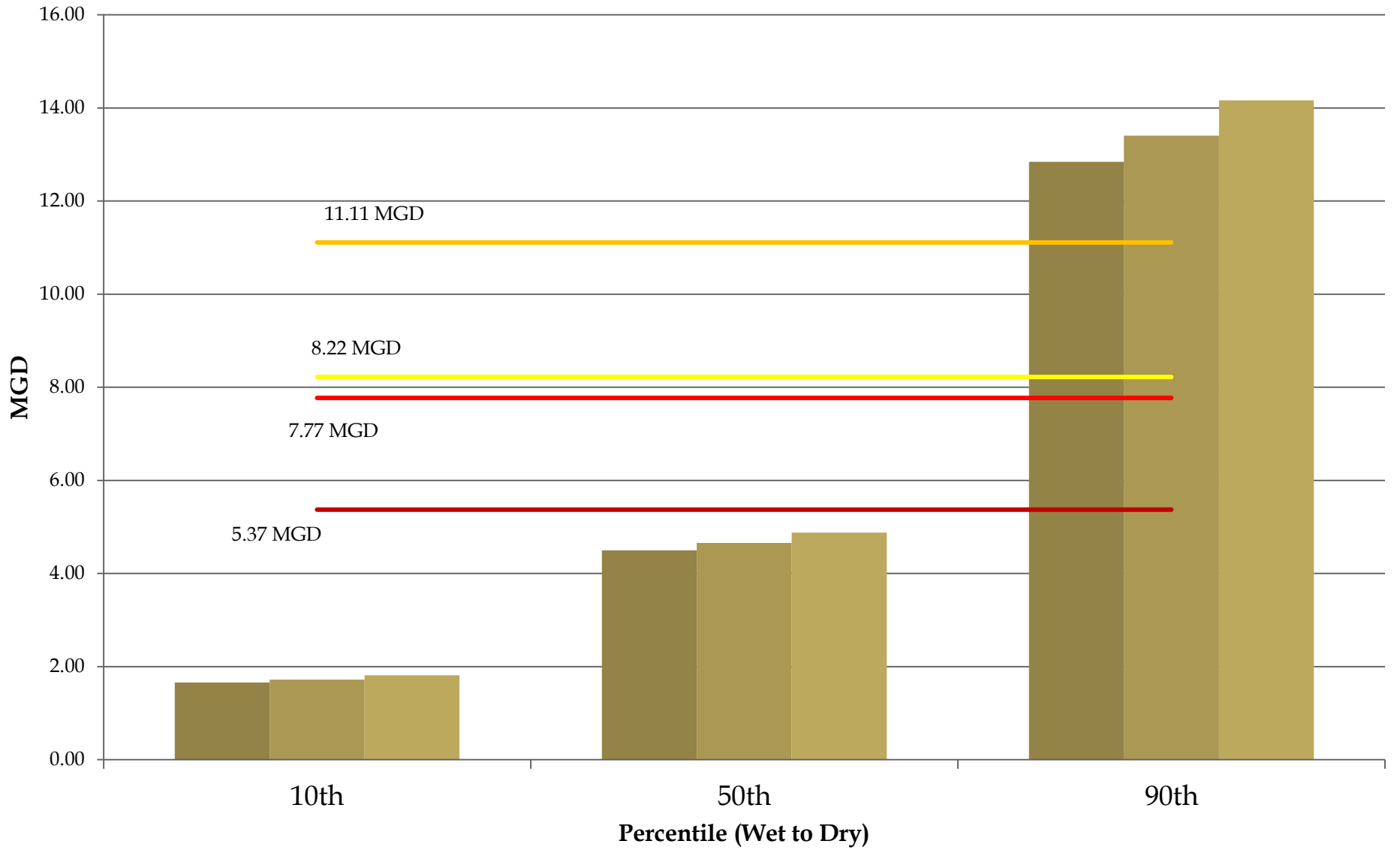
-  Out of Planning Region
-  In Planning Region



Irrigated Acres

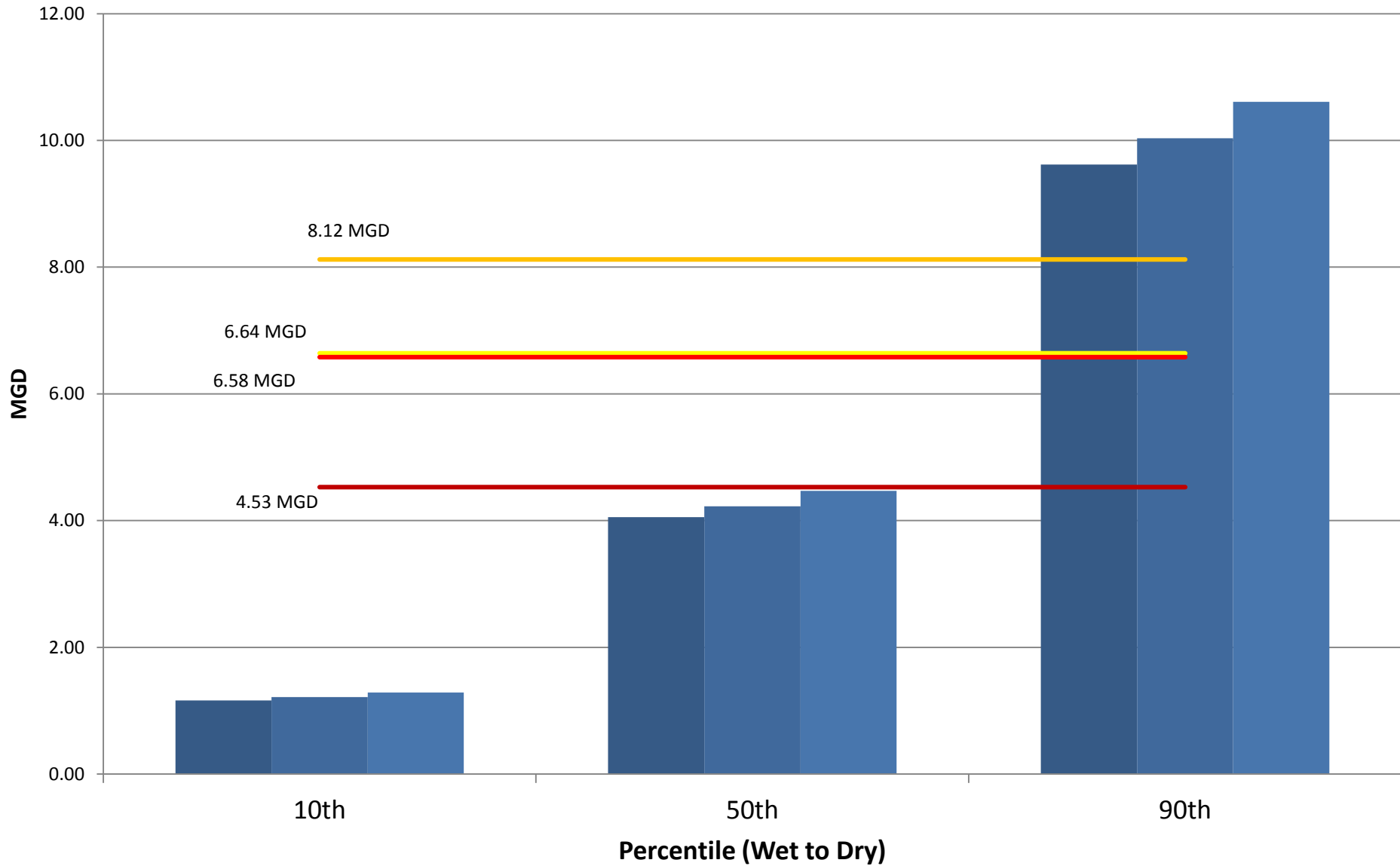
County	2009	2015
Bryan	156	34
Bulloch	17,954	17,885
Chatham	48	93
Effingham	1,238	2,827
Glynn	0	57
Liberty	32	31
Long	963	905
McIntosh	0	635

Coastal Georgia - Groundwater (Meter Data)



2011 Forecast
 2030 Forecast
 2050 Forecast
 2010 Meter
 2011 Meter
 2012 Meter
 2013 Meter

Coastal Georgia - Surface Water (Meter Data)



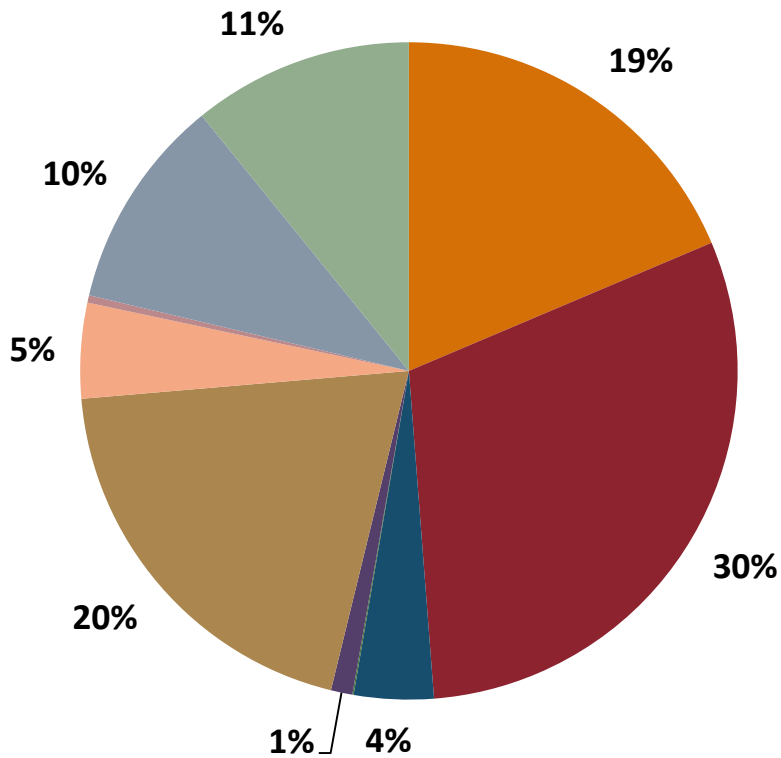
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2015-16 Agricultural Water Demand Forecasts - Methods

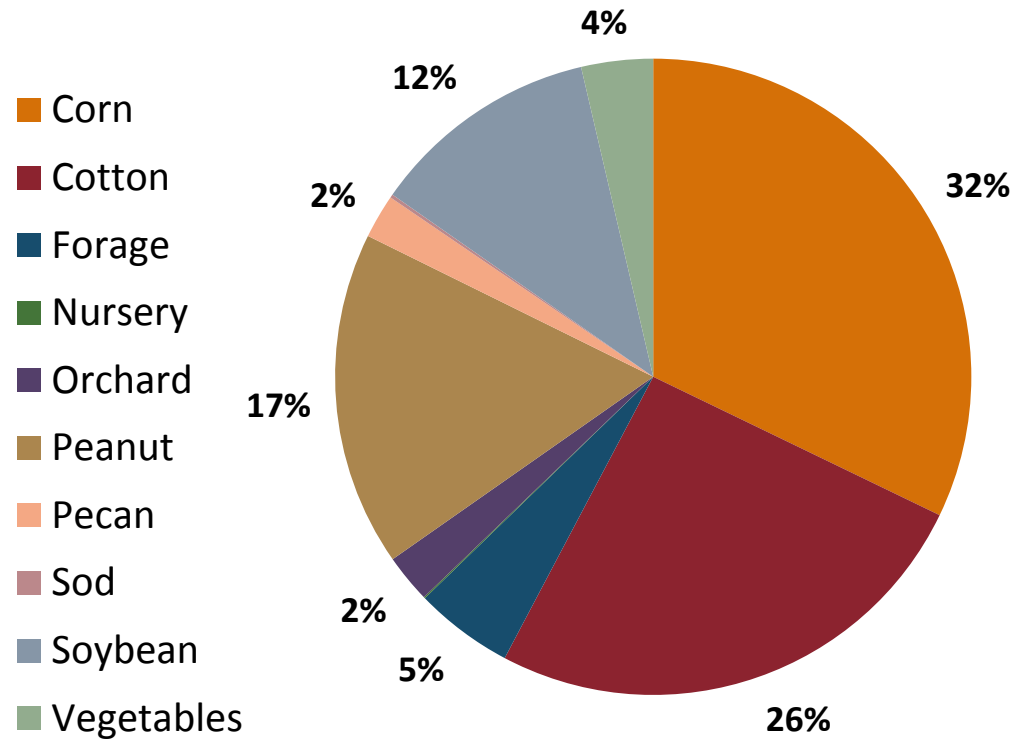
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- ▣ **Crop projections through 2050 - modeled based on multiple data sources:**
 - Average of: USDA Projections, Southeast Model, Georgia Model

Baseline Crop Mix by RWPC

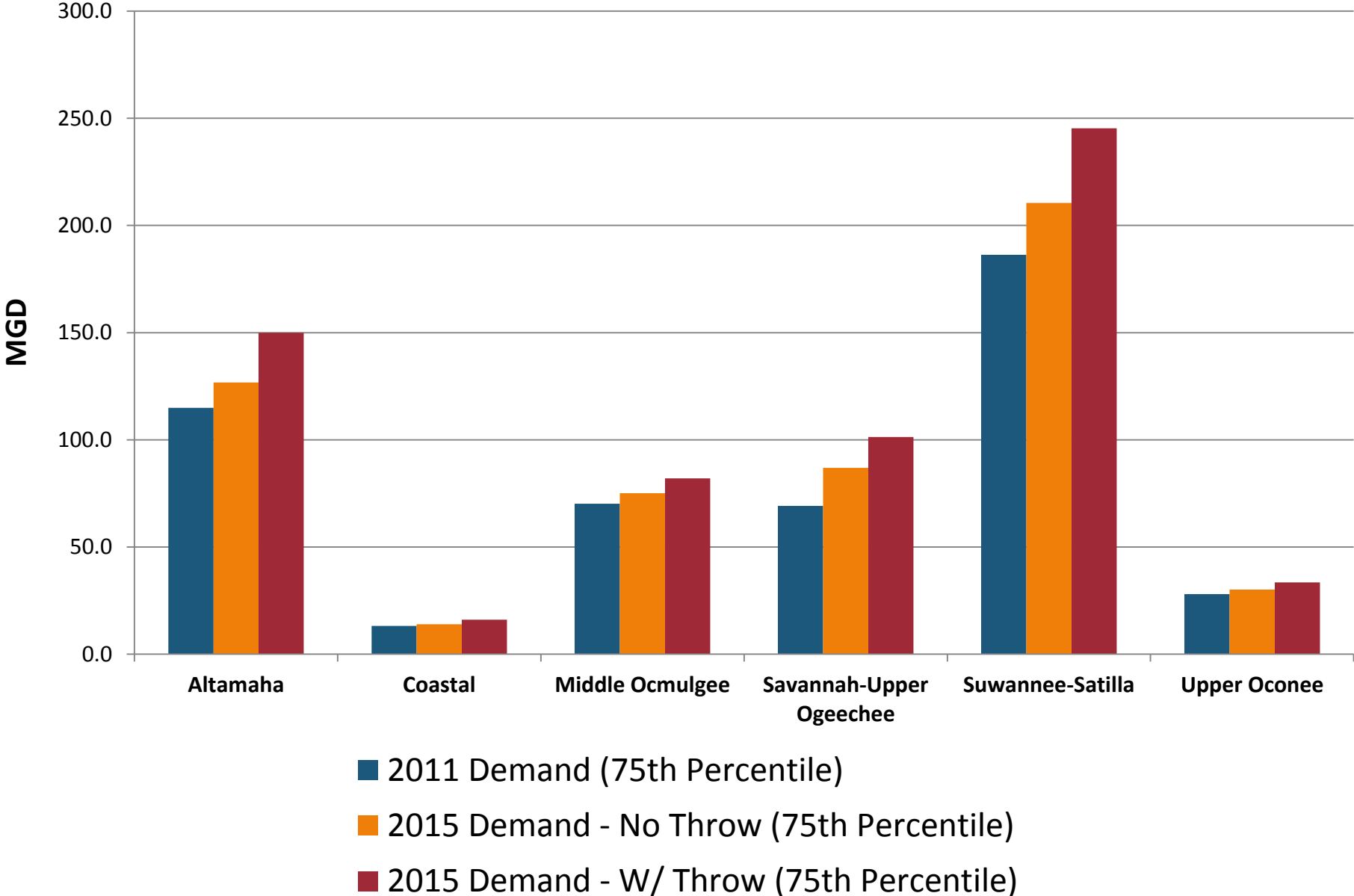
Altamaha RWPC



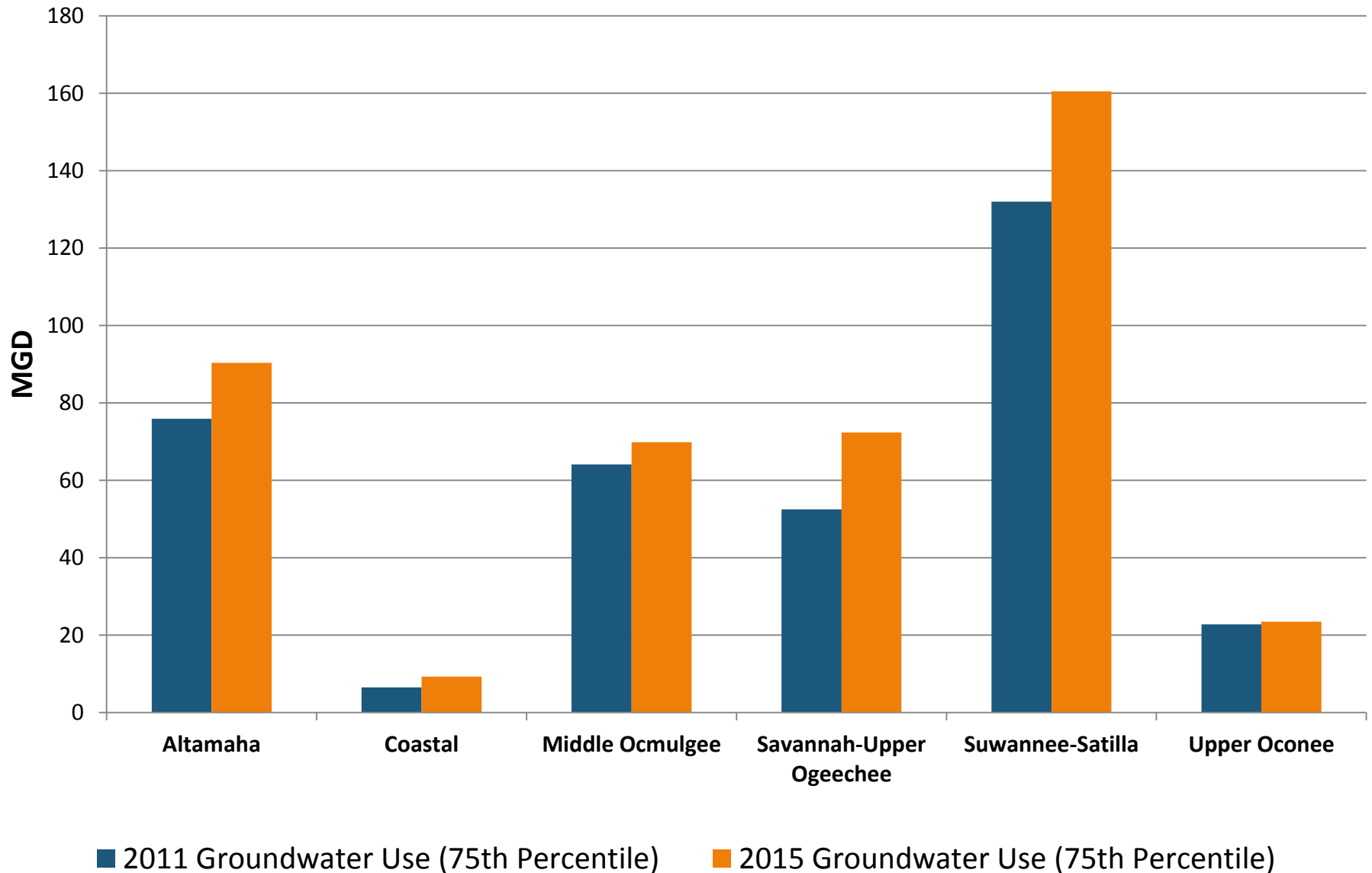
Coastal Georgia RWPC



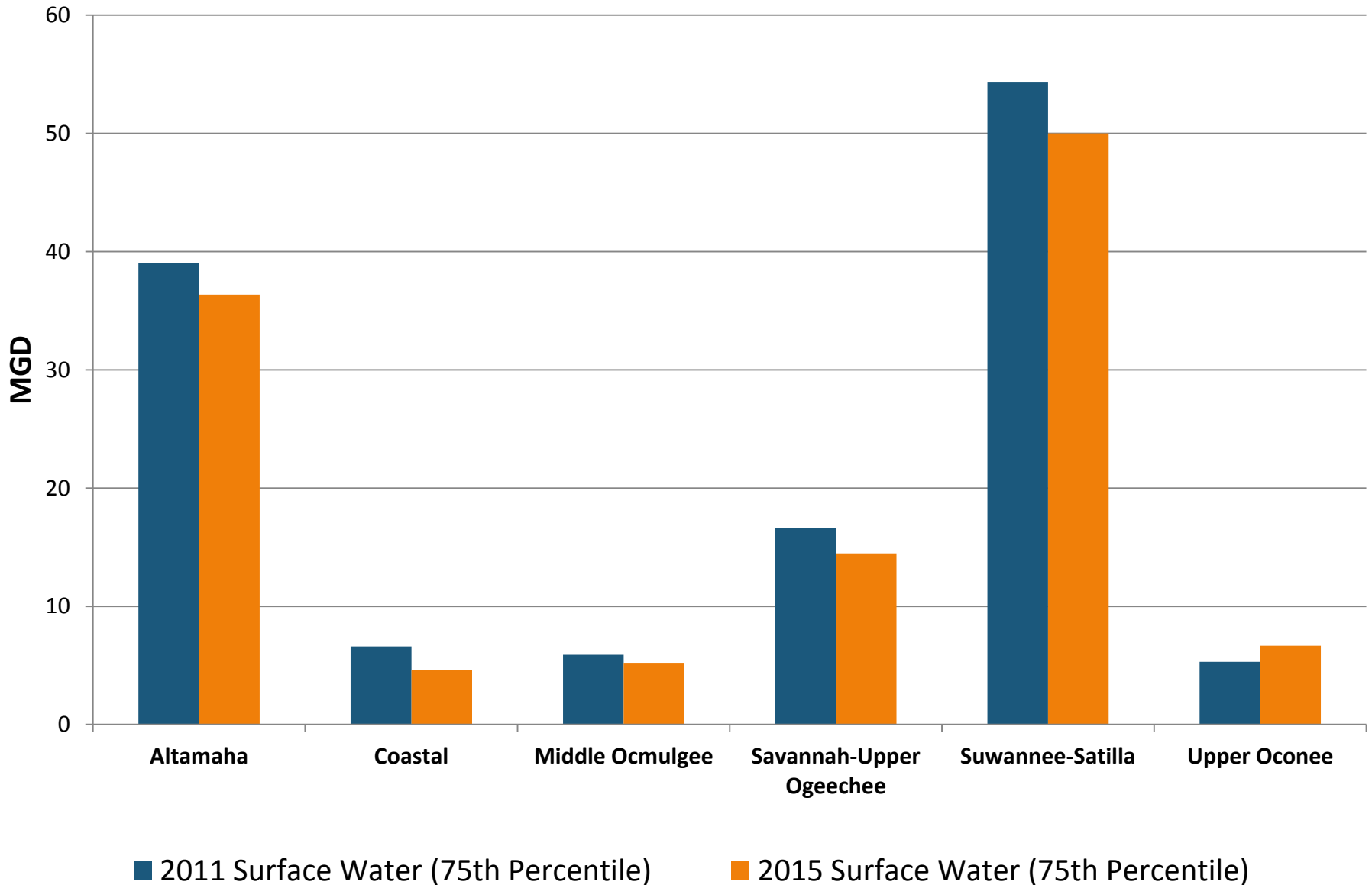
Ag Demand (2011 & 2015)



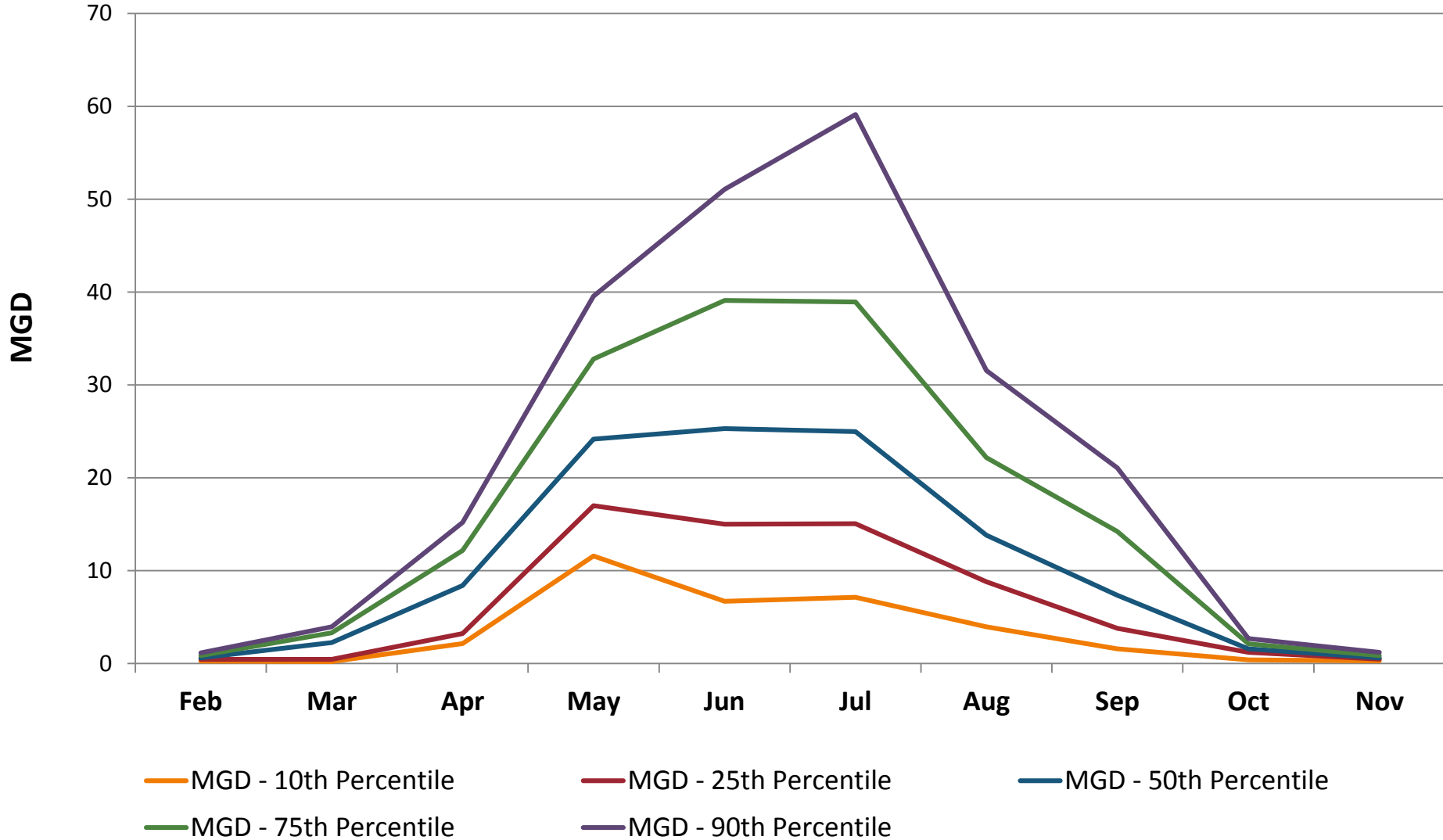
Groundwater Use (2011 & 2015)



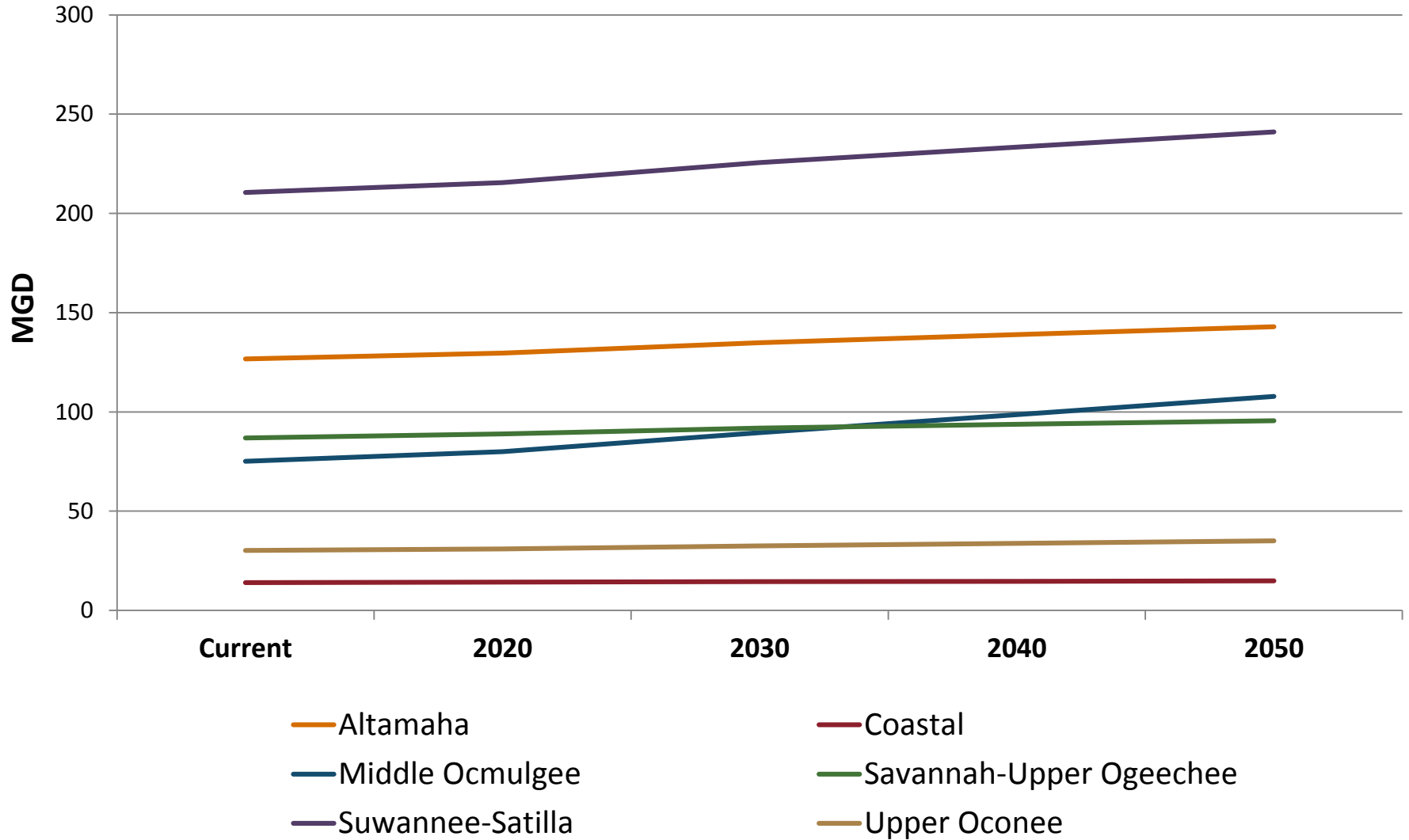
Surface Water Use (2011 & 2015)



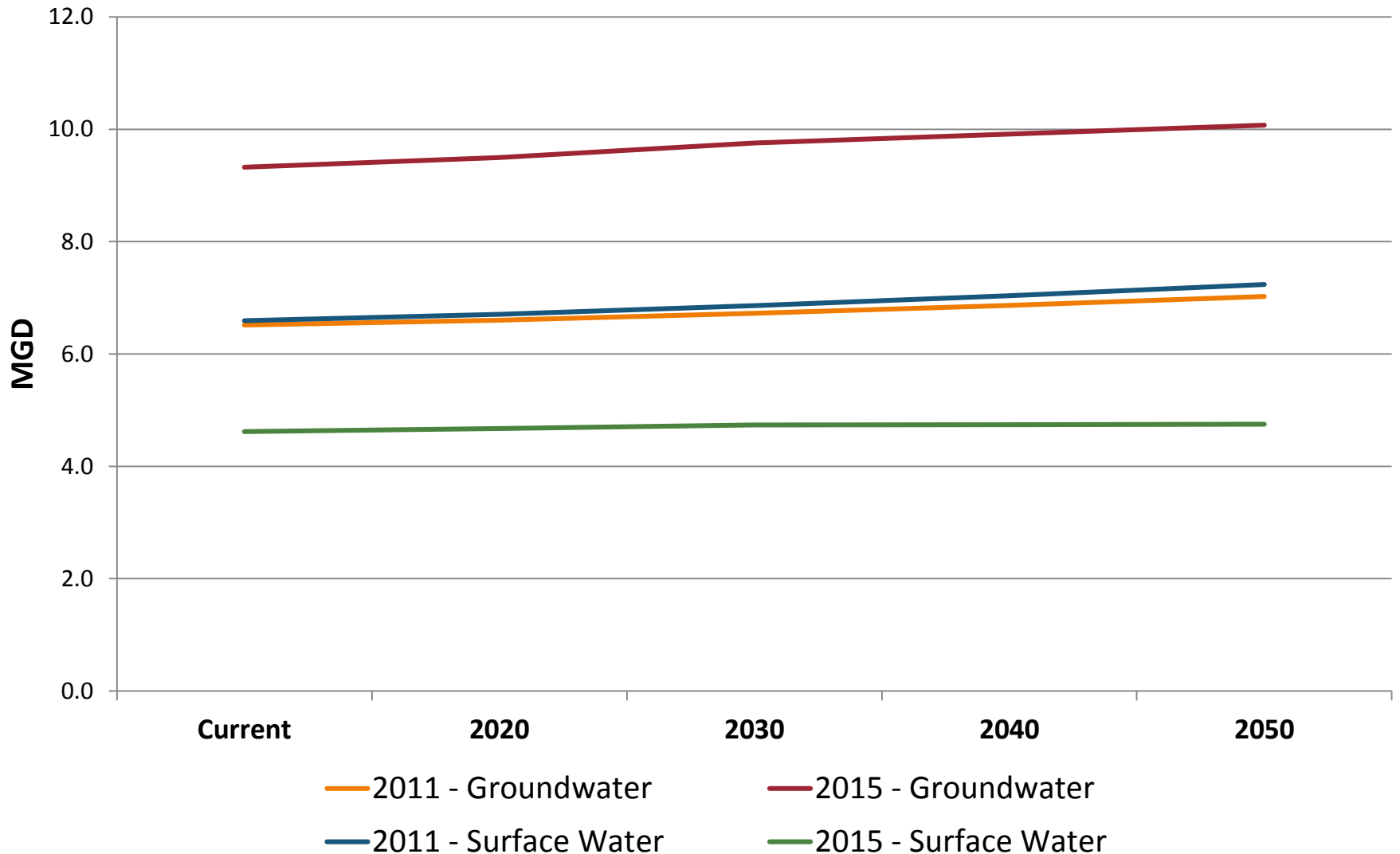
Coastal RWPC - Monthly



2015 - 2050 Forecast (75th Percentile)



Coastal RWPC - Forecast (75th Percentile)



**Joint Council Meeting #1 – Eastern Councils
Thursday, June 23, 2016**

**Dubose Porter Center
Oconee Fall Line Technical College
560 Pinehill Road
Dublin, GA 31021**

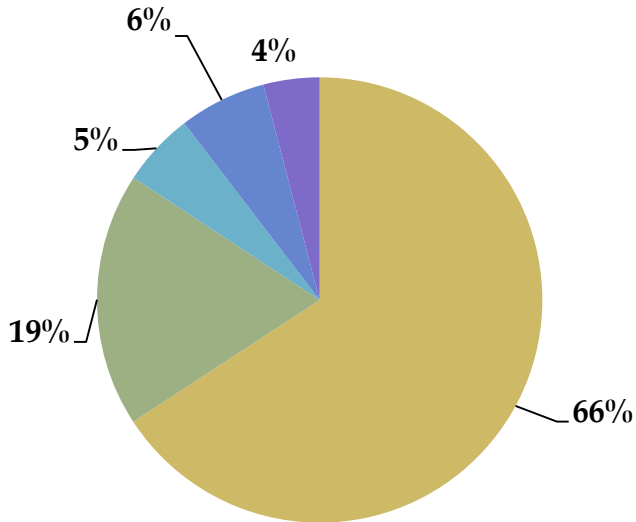


Agricultural Water Use Forecast – Handout for Middle Ocmulgee Water Planning Region

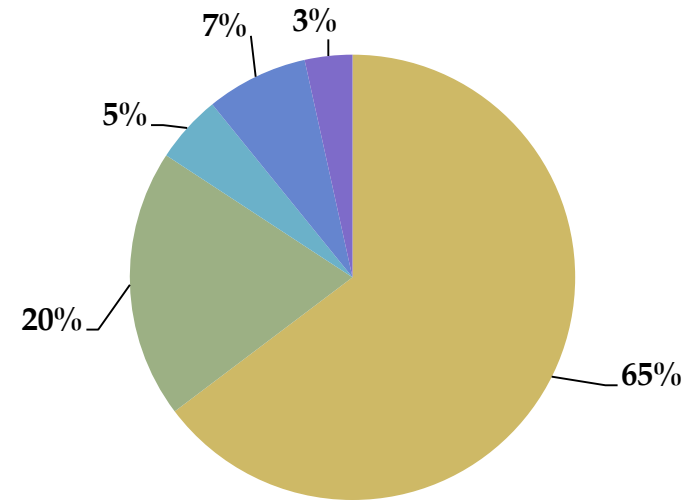
Middle Ocmulgee RWPC

	2009	2015	% Change
Total # of Fields	891	1,107	+ 24.2%
Total Acreage	53,972	64,437	+ 19.4%
Total GW Acreage	45,440	56,635	+ 24.6%
Total SW Acreage	8,532	7,802	- 8.6%
Total Center Pivots	509	727	+ 42.8%
Center Pivot Acreage	32,699	41,657	+ 27.4%

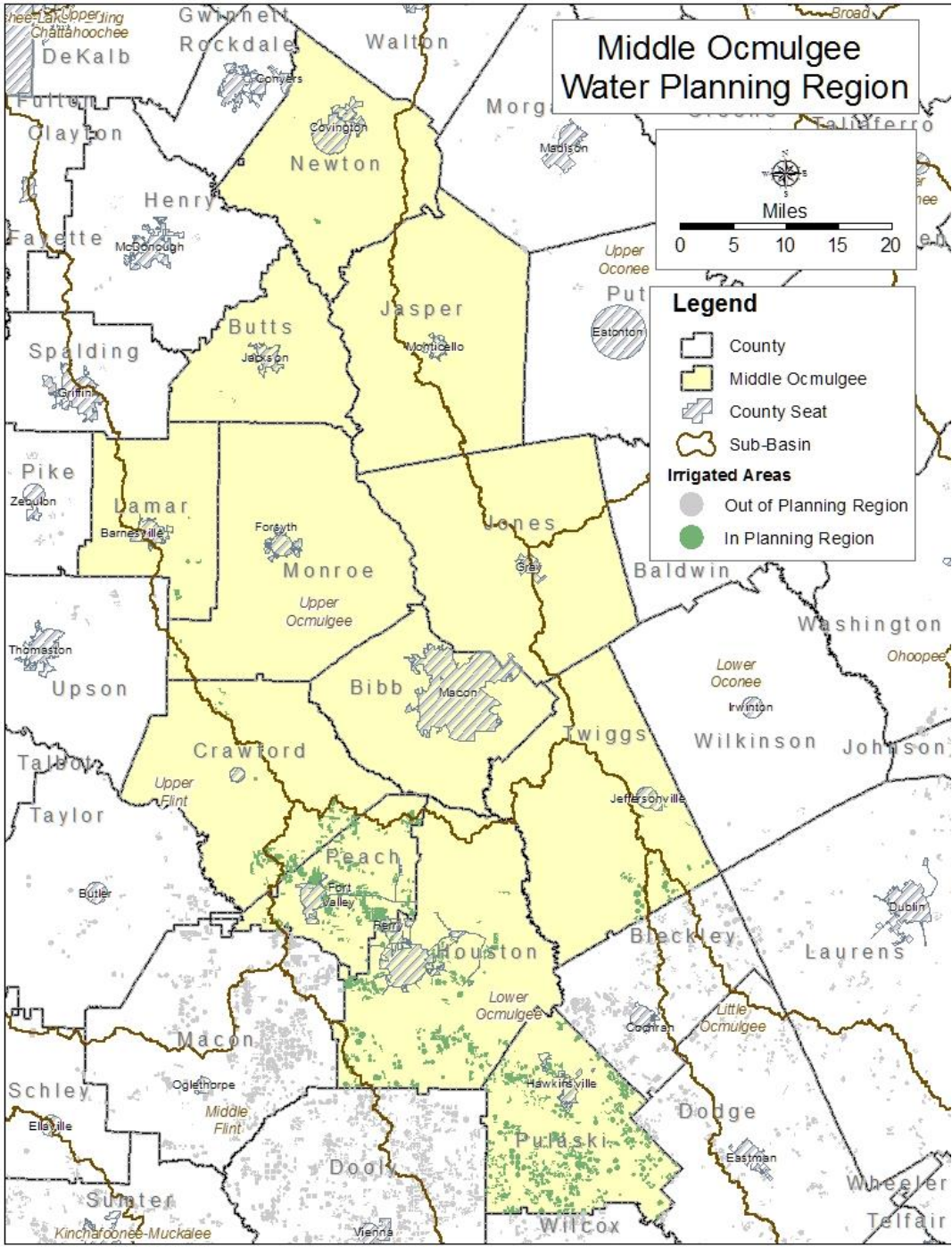
System Type - % of Systems



System Type - % of Acreage



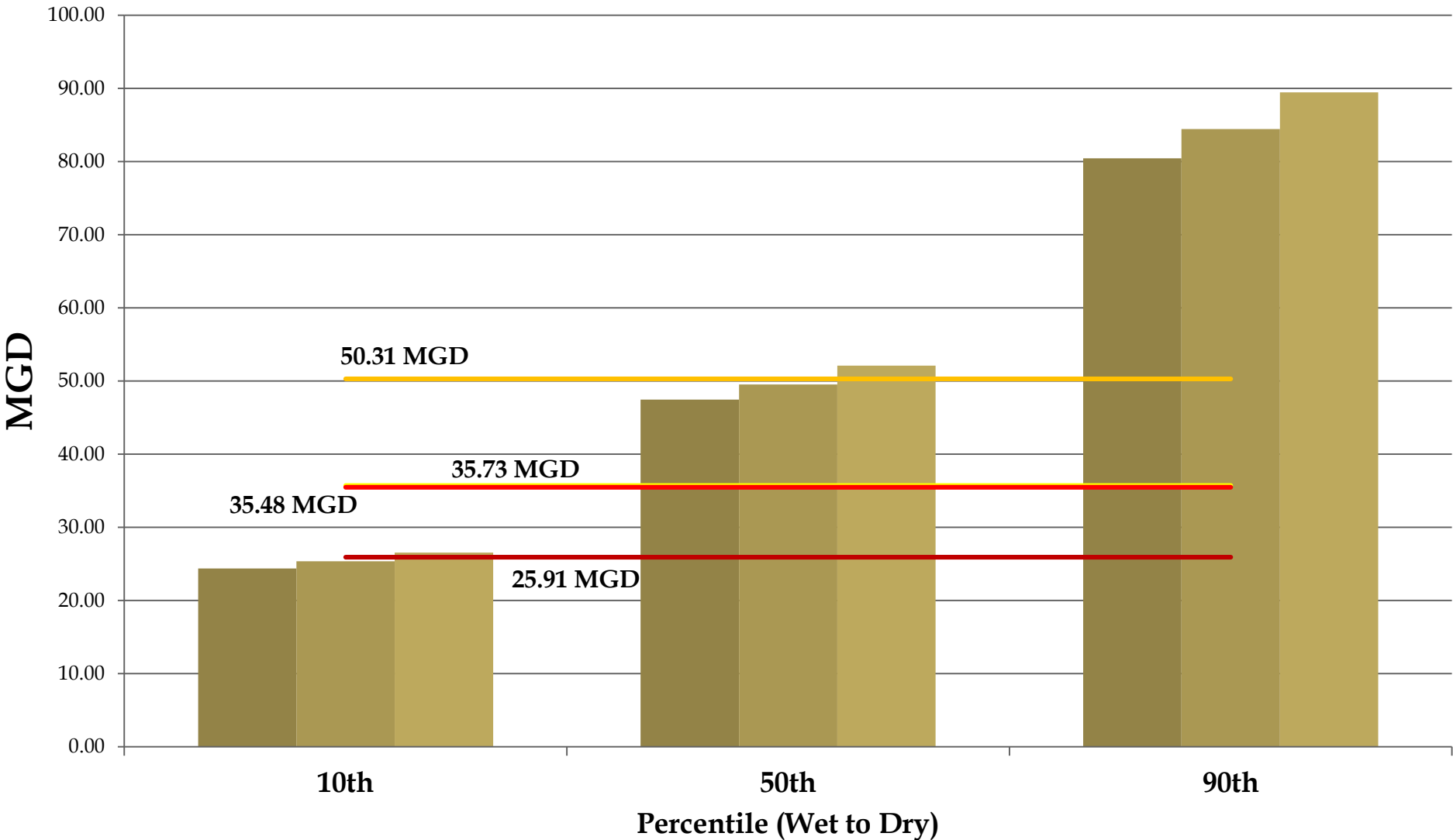
- Center Pivot
- Drip
- Solid Set
- Solid Set/Drip
- Traveler



Irrigated Acres

County	2009	2015
BIBB	167	0
BUTTS	47	47
CRAWFORD	4,922	5,386
HOUSTON	10,957	14,649
JASPER	165	0
JONES	73	0
LAMAR	577	486
MONROE	148	116
NEWTON	212	212
PEACH	12,921	13,657
PULASKI	21,608	27,118
TWIGGS	2,175	2,765

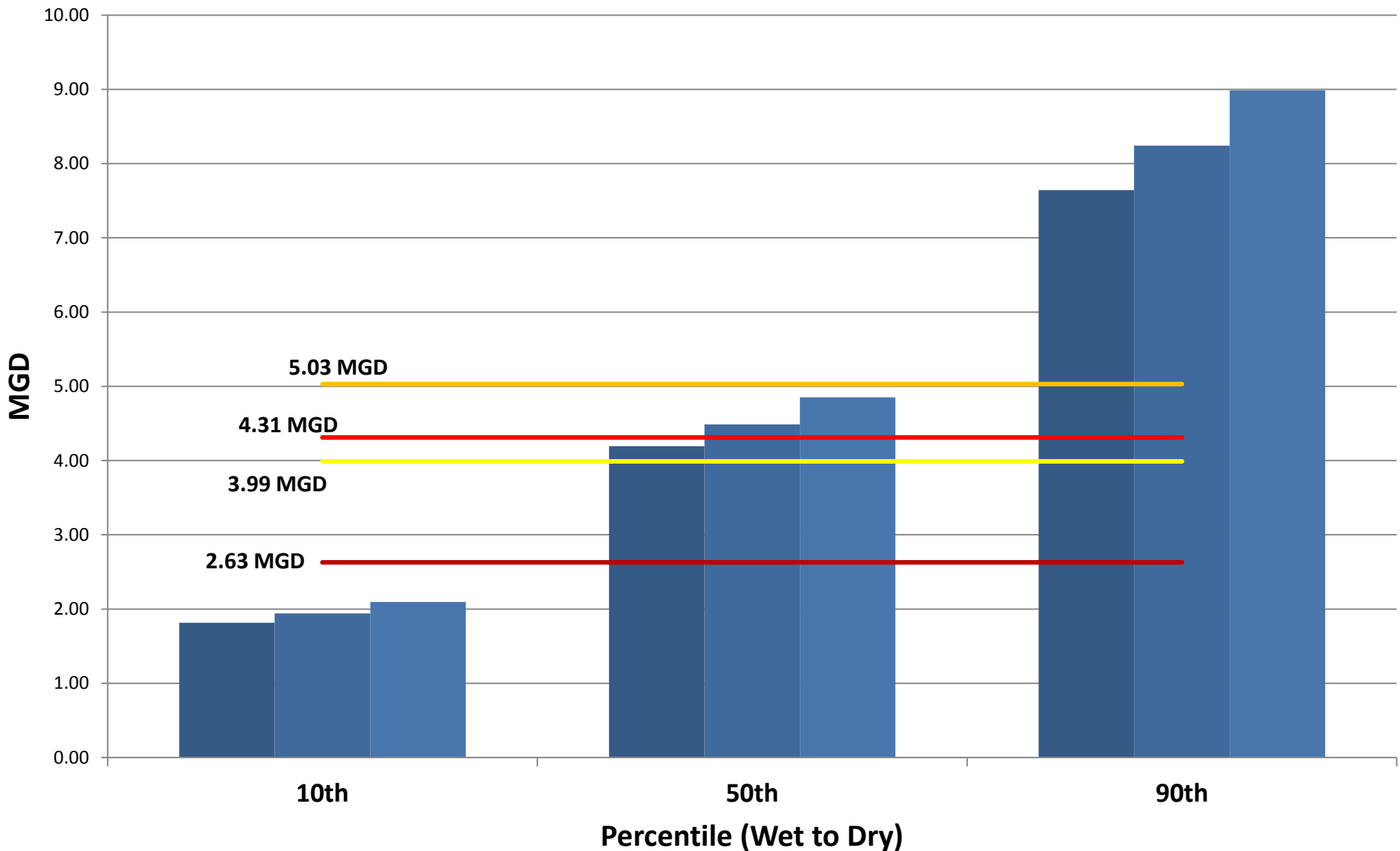
Middle Ocmulgee - Groundwater (Meter Data)



2011 Forecast
 2030 Forecast
 2050 Forecast
 2010 Meter

2011 Meter
 2012 Meter
 2013 Meter

Middle Ocmulgee - Surface Water (Meter Data)



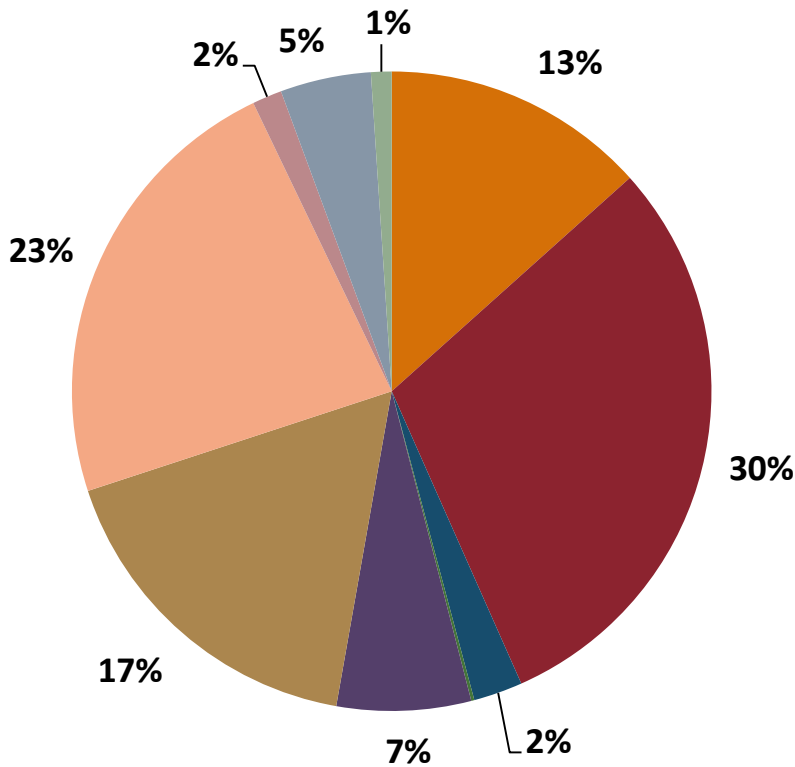
2011 Forecast
 2030 Forecast
 2050 Forecast
 2010 Meter
 2011 Meter
 2012 Meter
 2013 Meter

2015-16 Agricultural Water Demand Forecasts - Methods

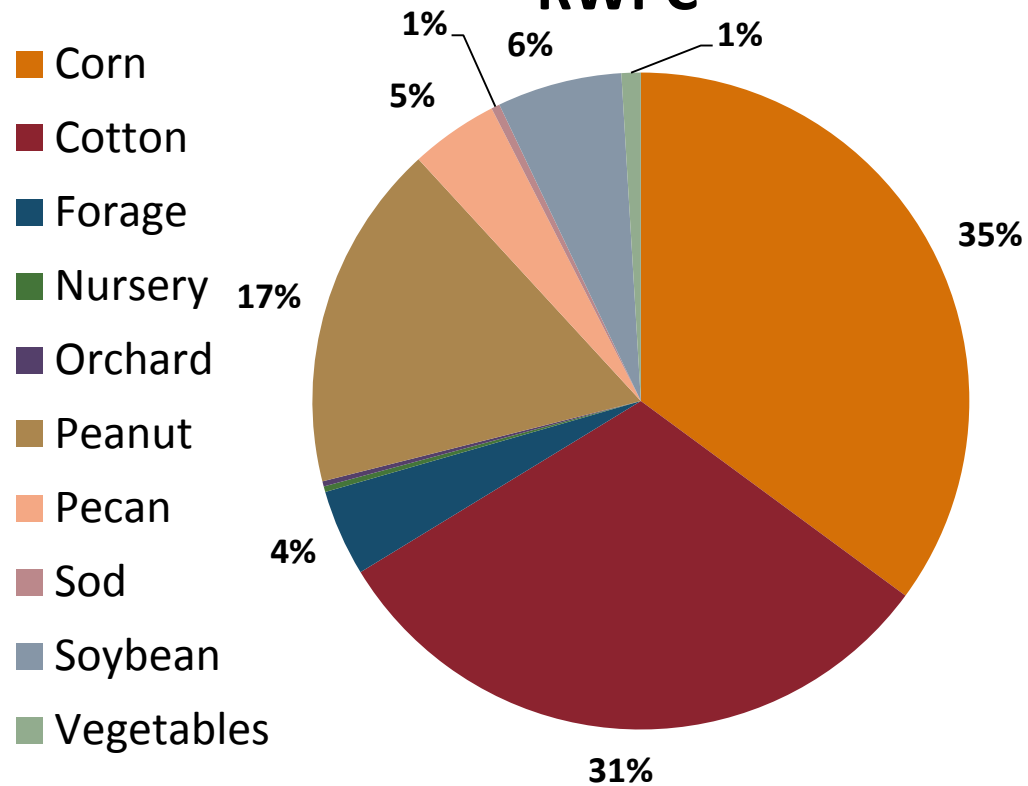
- ▣ **Approach: Look to past trends and consider foreseeable changes**
- ▣ **Acreage**
 - Baseline – USDA Census of Agriculture (2012); linked to 2015 irrigated acres
- ▣ **Crop water needs**
 - Wet, normal and dry year estimates by crop/soil/county
 - Aggregated spatially to 2015 irrigated acreage
- ▣ **Crop projections through 2050 - modeled based on multiple data sources:**
 - Average of: USDA Projections, Southeast Model, Georgia Model

Baseline Crop Mix by RWPC

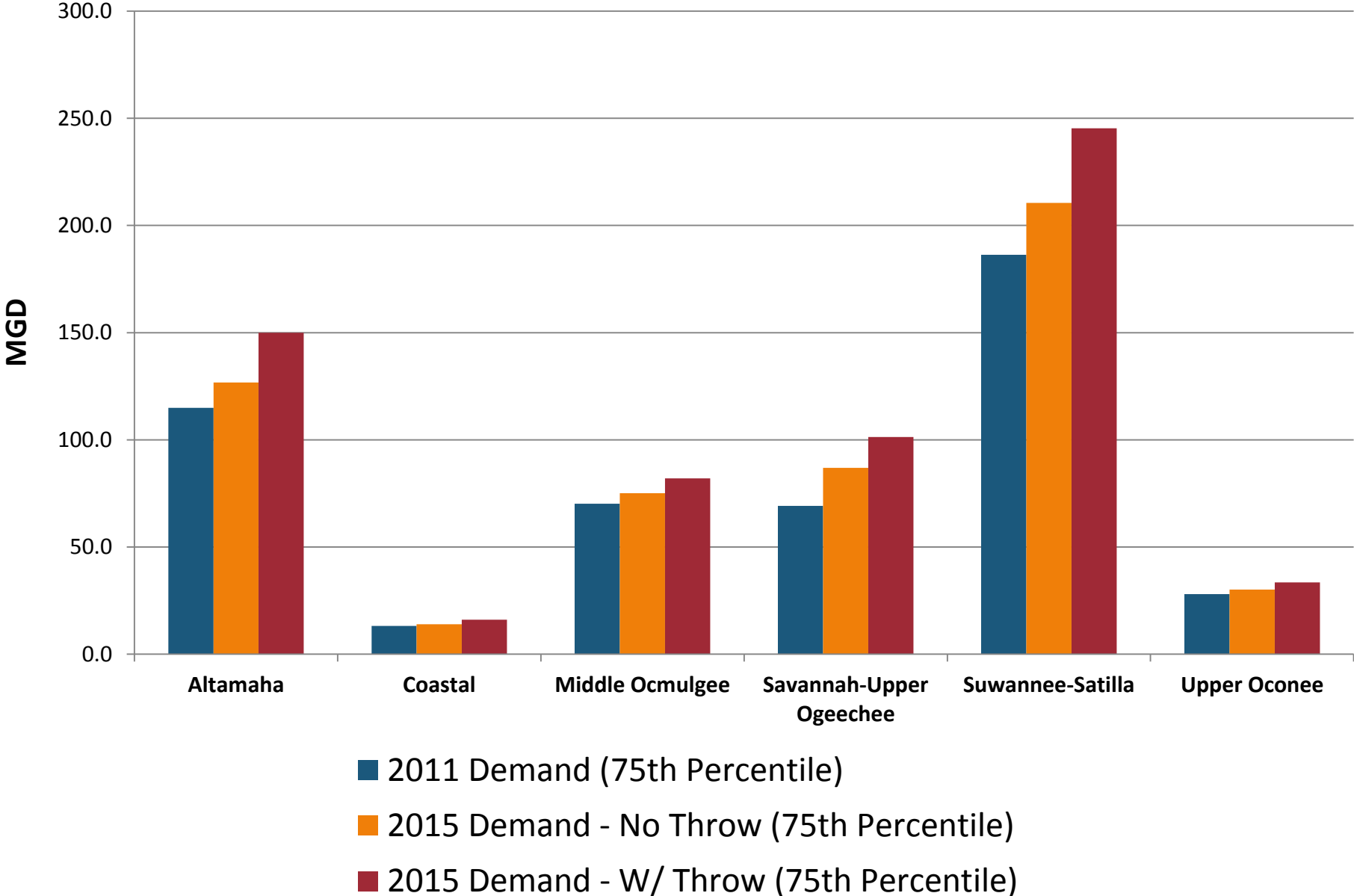
Middle Ocmulgee RWPC



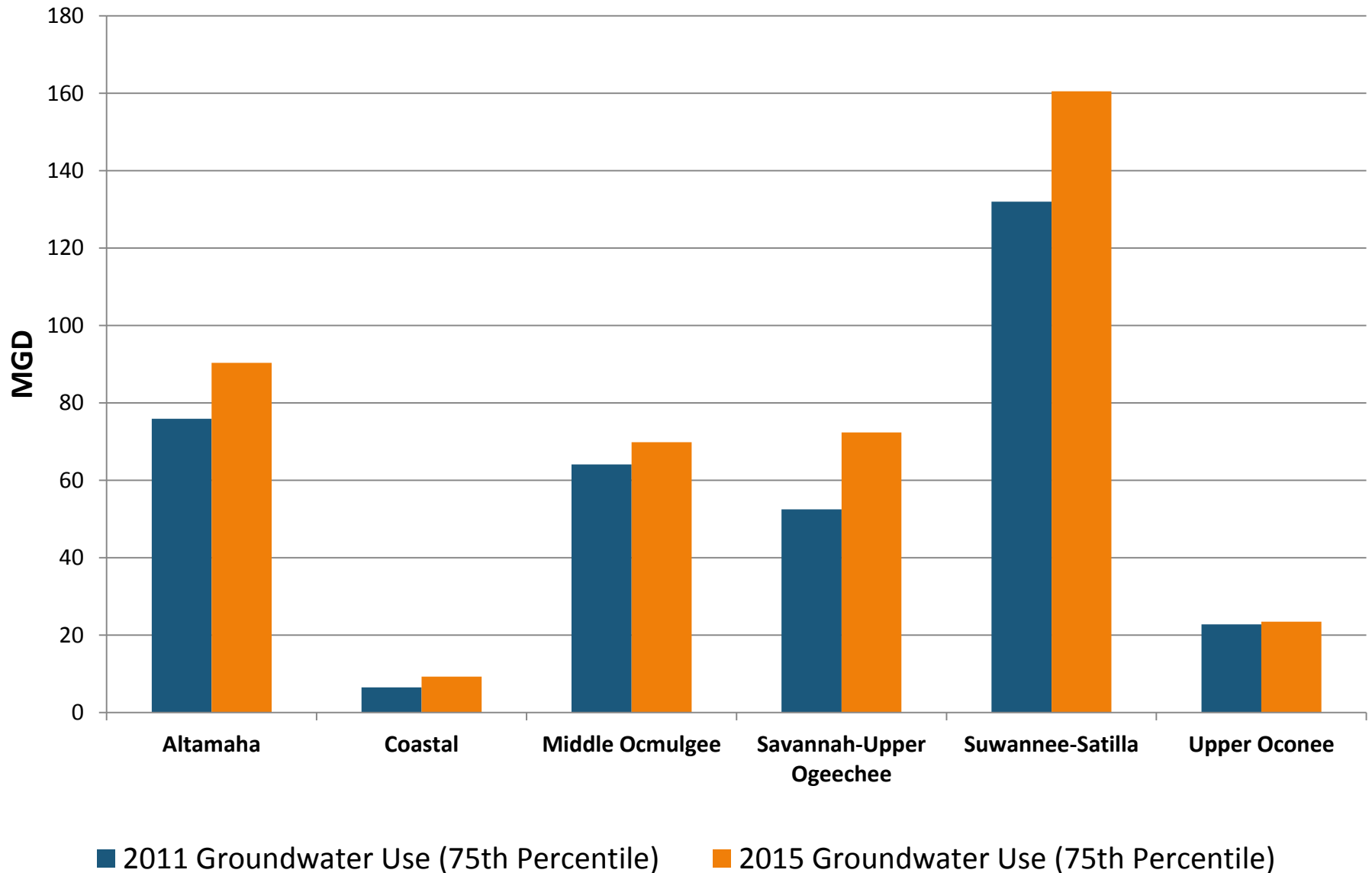
Savannah-Upper Ogeechee RWPC



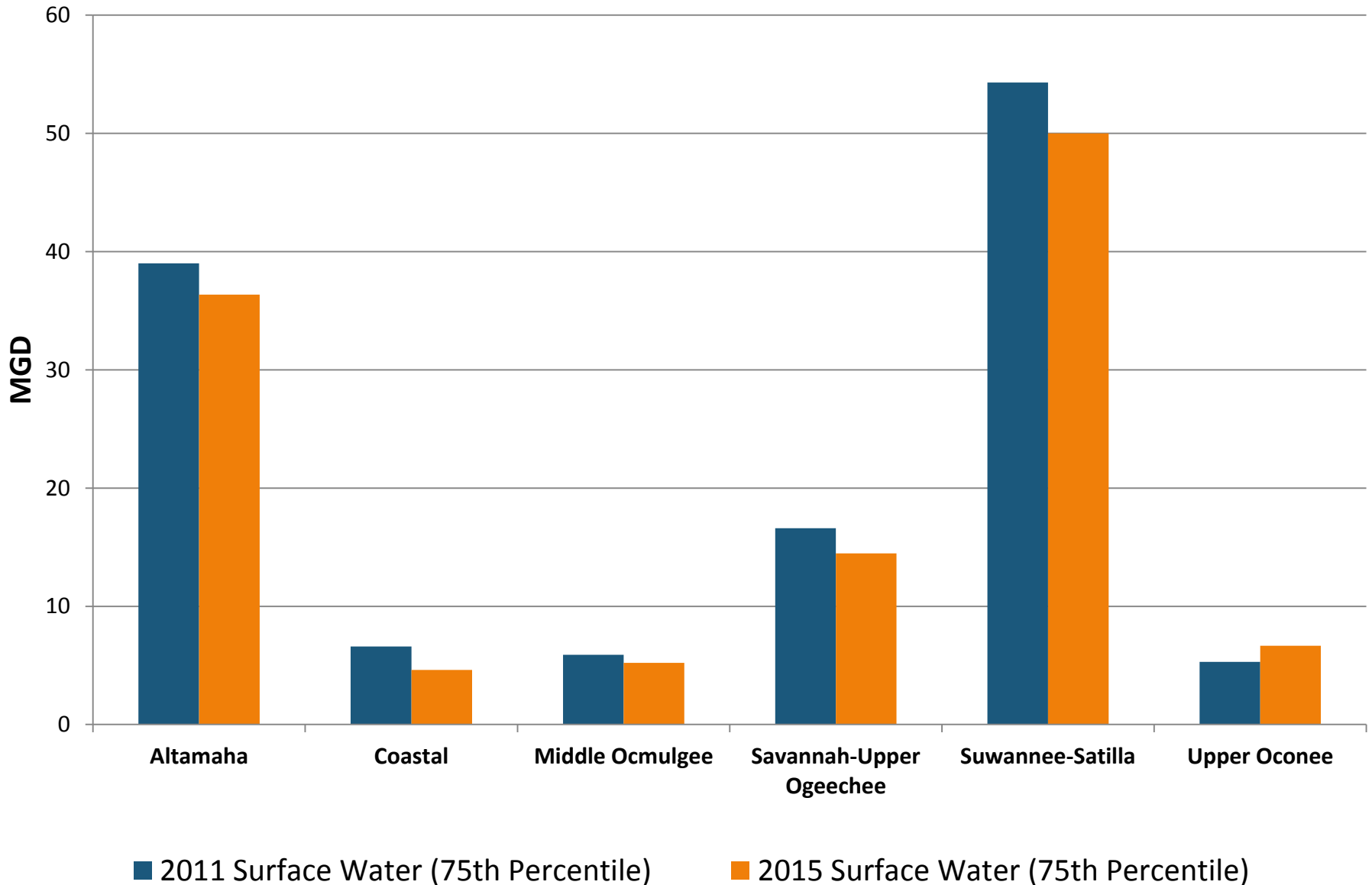
Ag Demand (2011 & 2015)



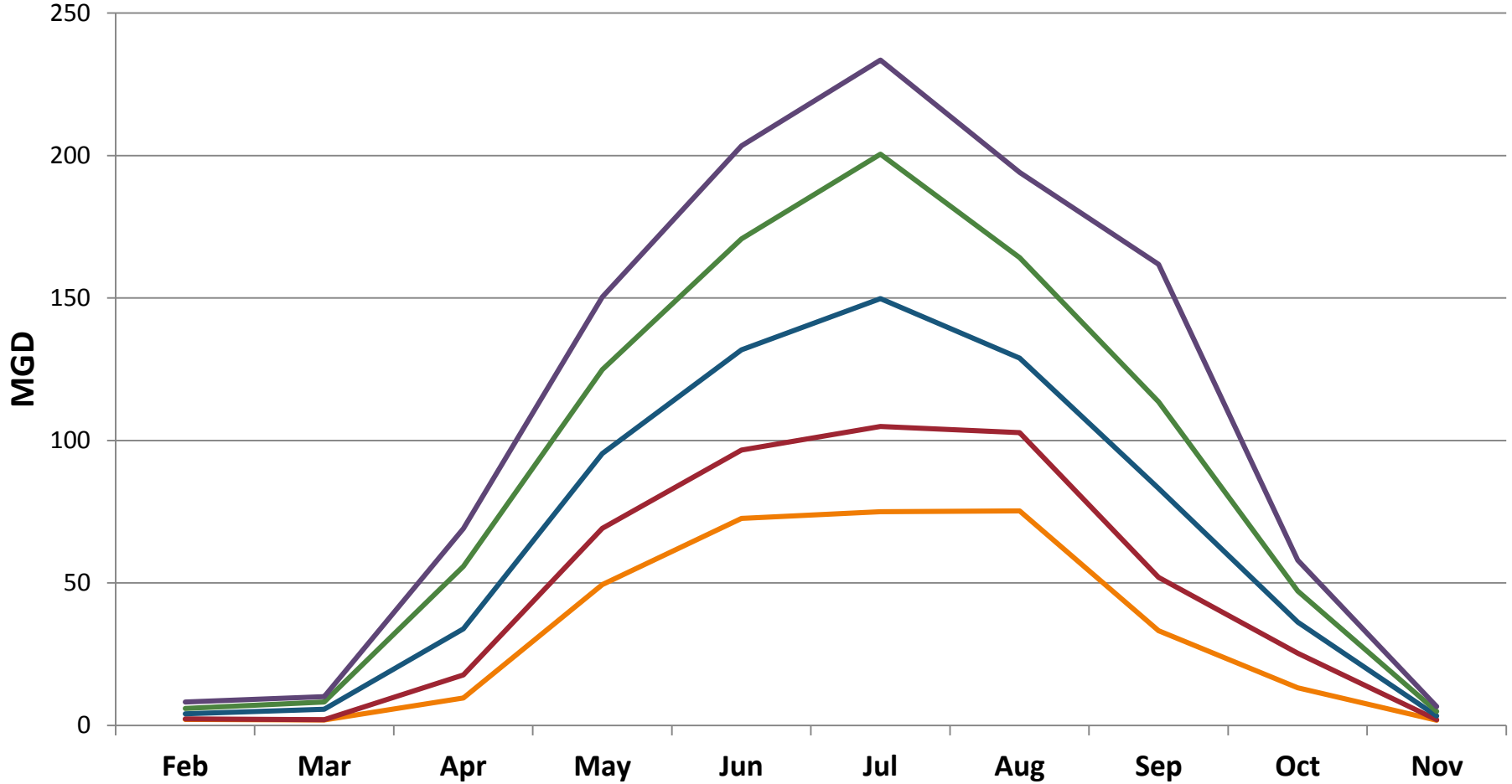
Groundwater Use (2011 & 2015)



Surface Water Use (2011 & 2015)



Middle Ocmulgee RWPC - Monthly



MGD - 10th Percentile

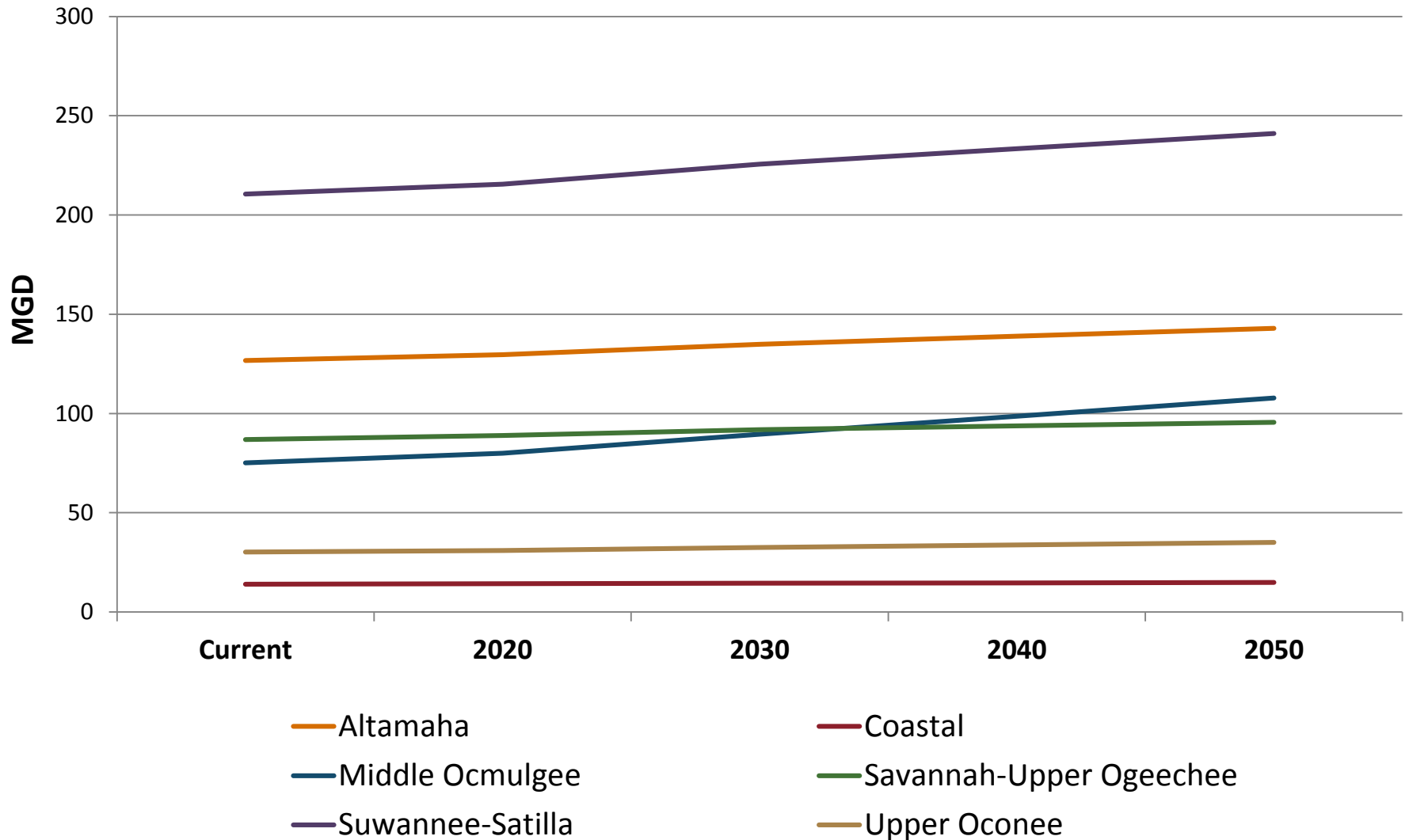
MGD - 25th Percentile

MGD - 50th Percentile

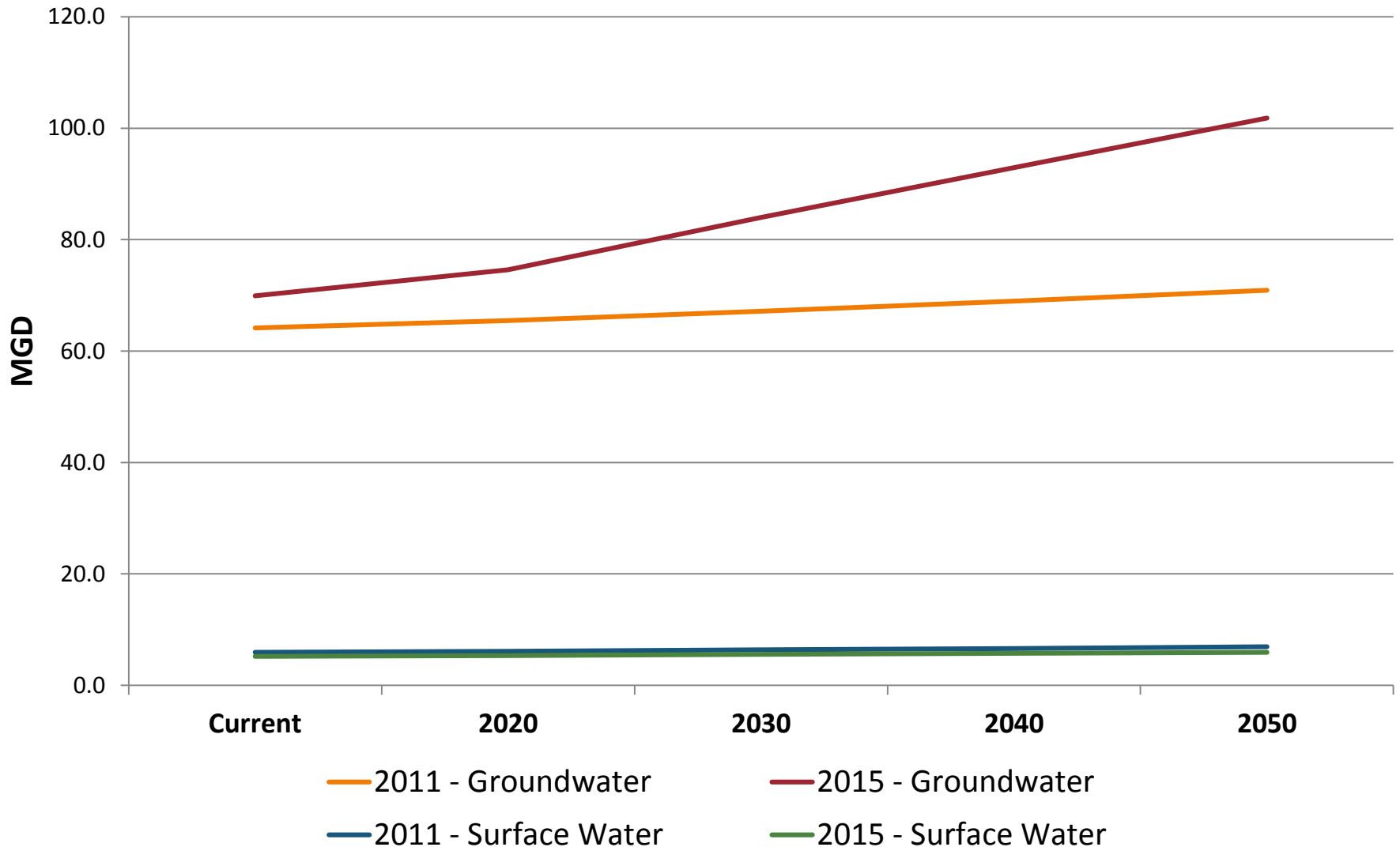
MGD - 75th Percentile

MGD - 90th Percentile

2015 - 2050 Forecast (75th Percentile)



Middle Ocmulgee RWPC - Forecast (75th Percentile)



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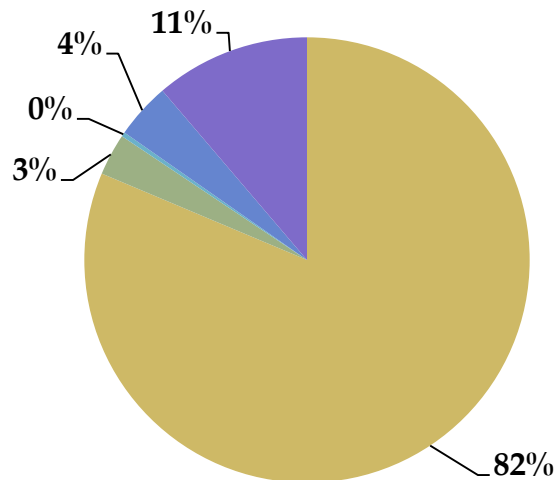


**Agricultural Water Use Forecast – Handout for Savannah-Upper Ogeechee Water
Planning Region**

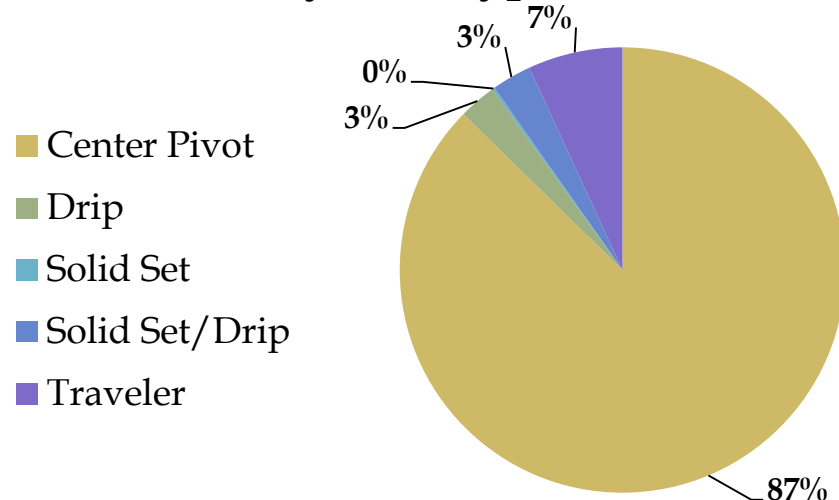
Savannah-Upper Ogeechee RWPC

	2009	2015	% Change
Total # of Fields	1,313	1,876	+ 42.9%
Total Acreage	78,361	111,075	+ 41.7%
Total GW Acreage	50,856	87,466	+ 72.0%
Total SW Acreage	27,505	23,609	- 14.2%
Total Center Pivots	922	1,525	+ 65.4%
Center Pivot Acreage	61,293	96,999	+ 58.3%

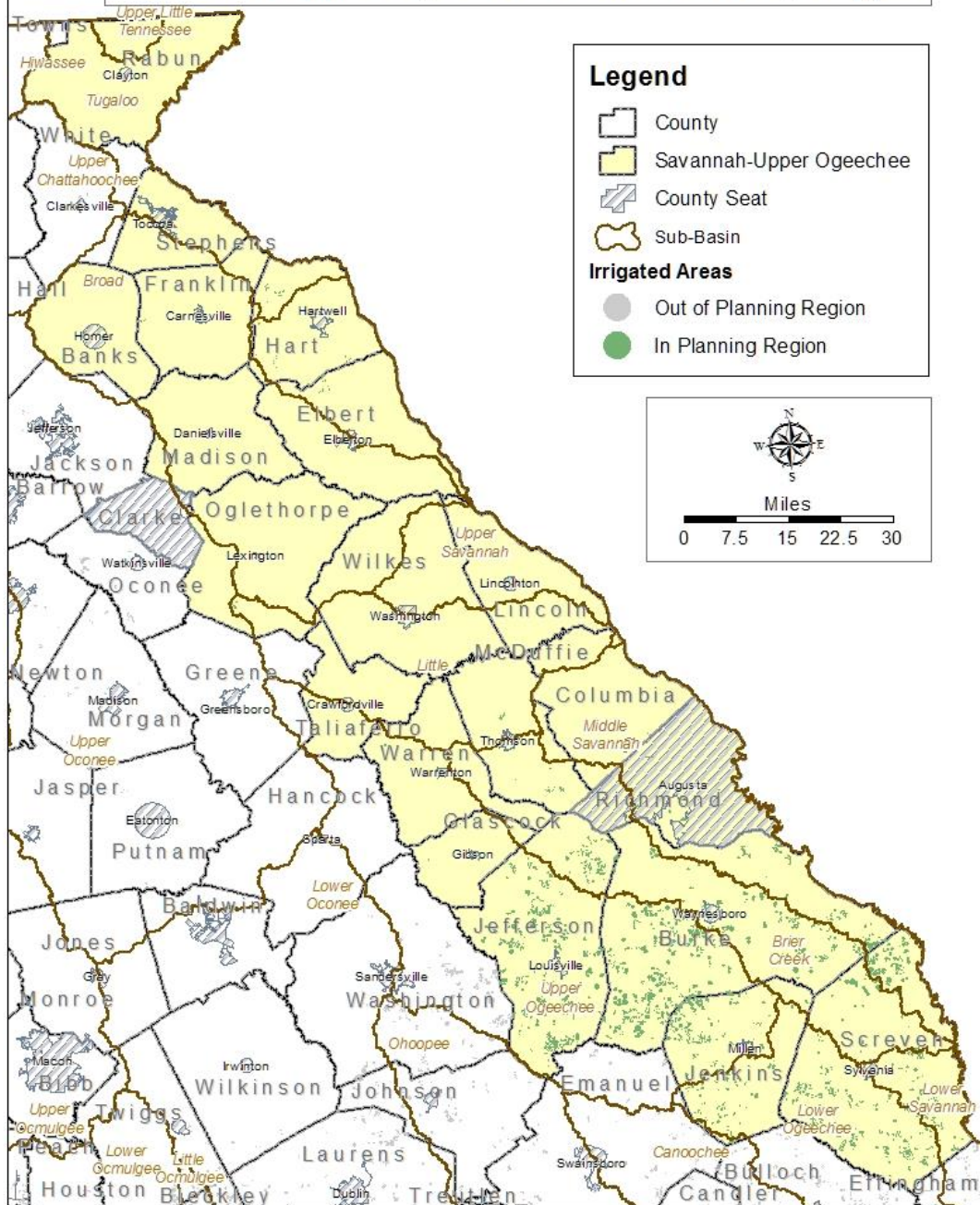
System Type - % of Systems



System Type - % of Acreage



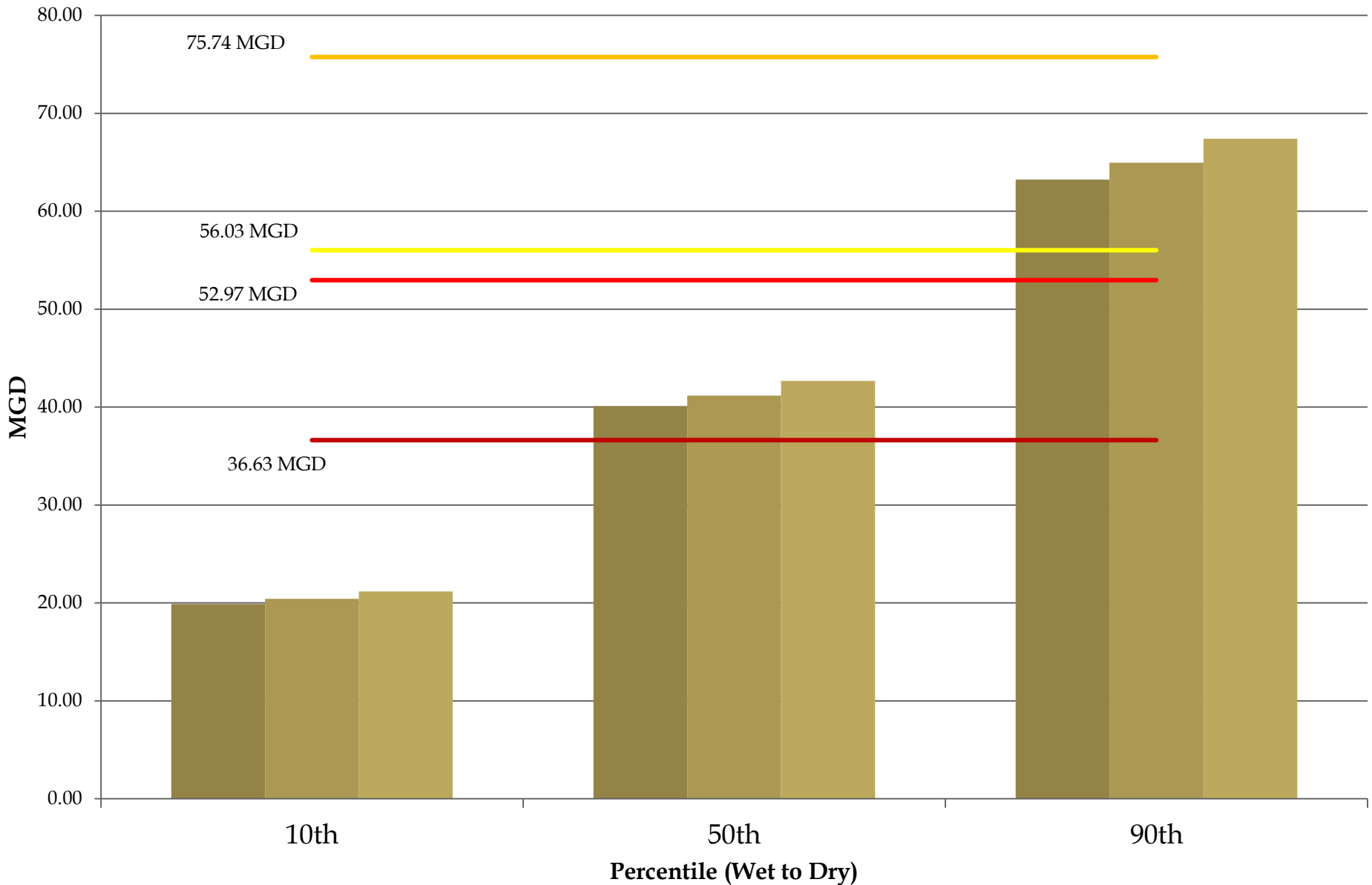
Savannah-Upper Ogeechee Water Planning Region



Irrigated Acres

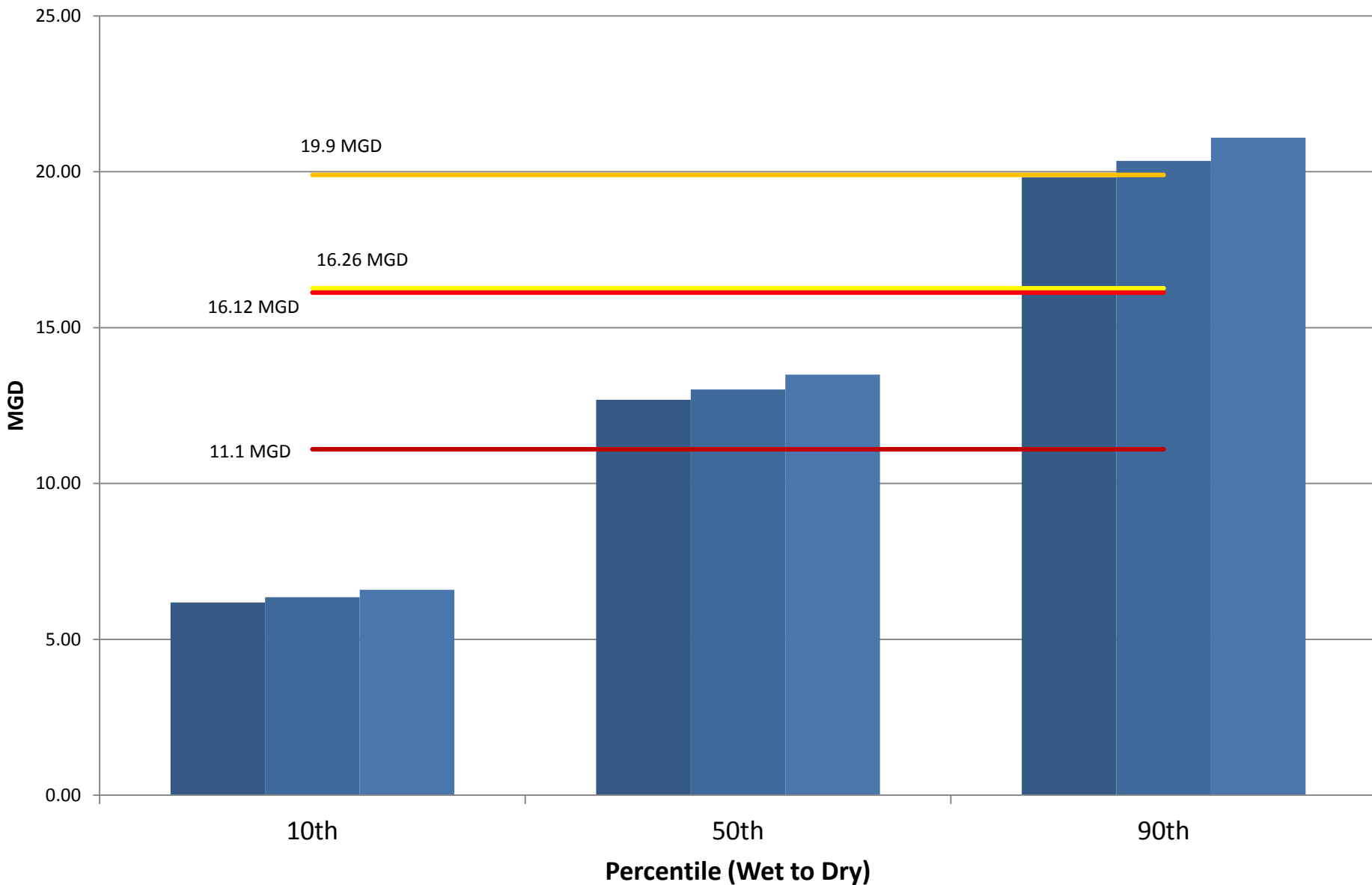
County	2009	2015
Banks	6	6
Burke	24,840	40,244
Columbia	45	141
Elbert	444	311
Franklin	161	161
Glascok	89	294
Hart	779	911
Jefferson	19,803	26,688
Jenkins	8,973	13,084
McDuffie	811	793
Oglethorpe	349	341
Rabun	21	0
Richmond	114	851
Screven	21,899	27,117
Taliaferro	0	33
Warren	0	99
Wilkes	27	0

Savannah-Upper Ogeechee RWPC - Groundwater (Meter Data)



2011 Forecast
 2030 Forecast
 2050 Forecast
 2010 Meter
 2011 Meter
 2012 Meter
 2013 Meter

Savannah-Upper Ogeechee - Surface Water (Meter Data)



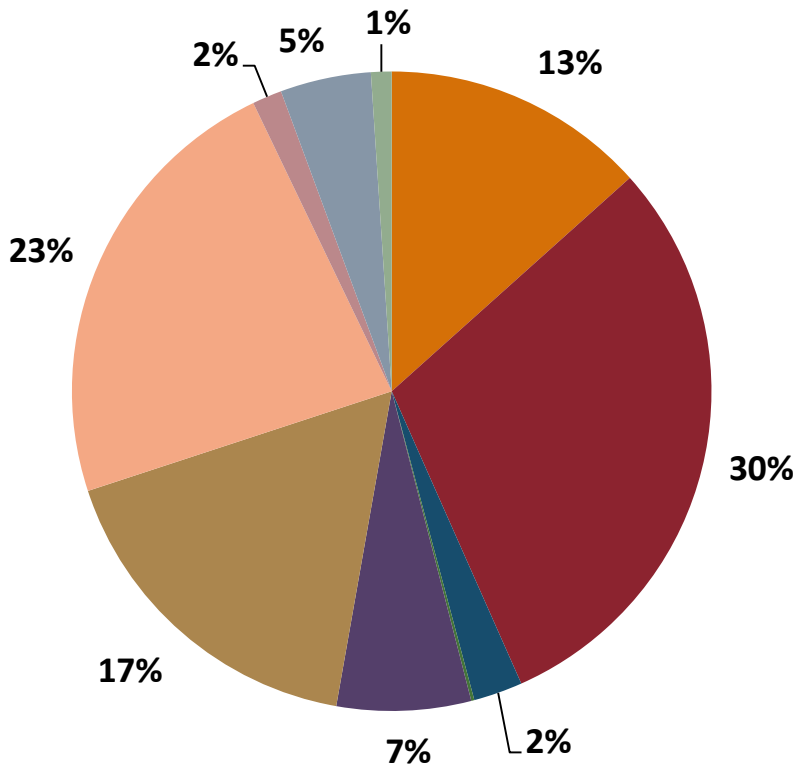
2011 Forecast 2030 Forecast 2050 Forecast 2010 Meter
2011 Meter 2012 Meter 2013 Meter

2015-16 Agricultural Water Demand Forecasts - Methods

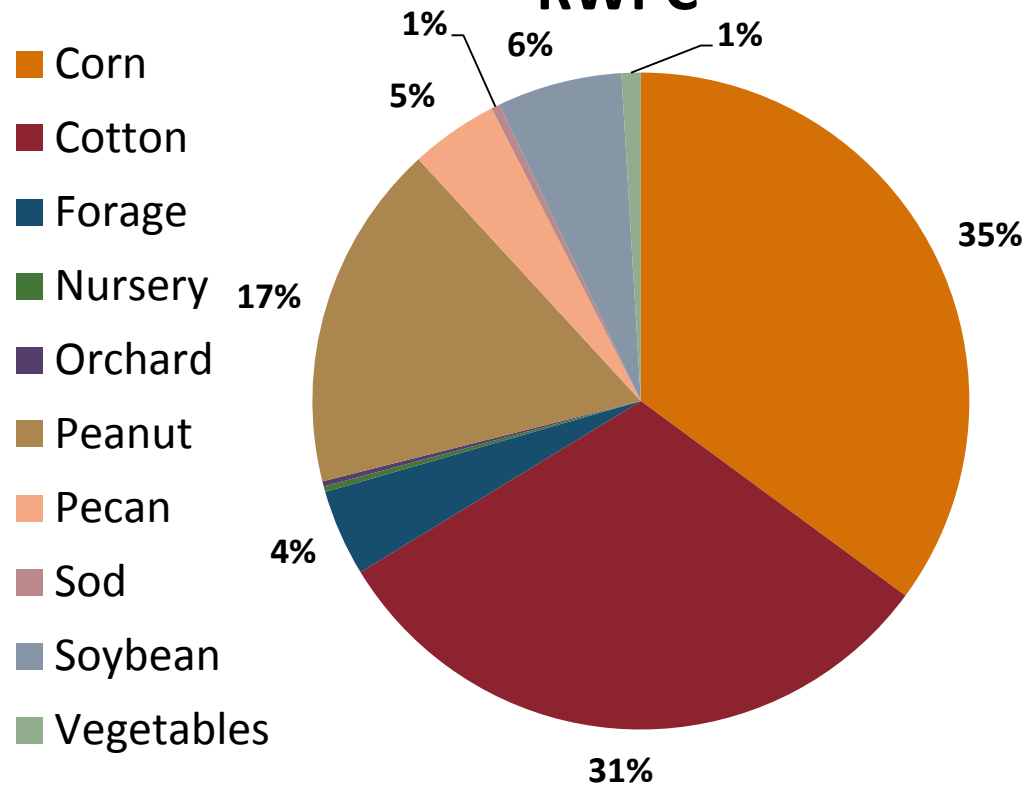
- ▣ **Approach: Look to past trends and consider foreseeable changes**
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 - Baseline – USDA Census of Agriculture (2012); linked to 2015 irrigated acres
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Baseline Crop Mix by RWPC

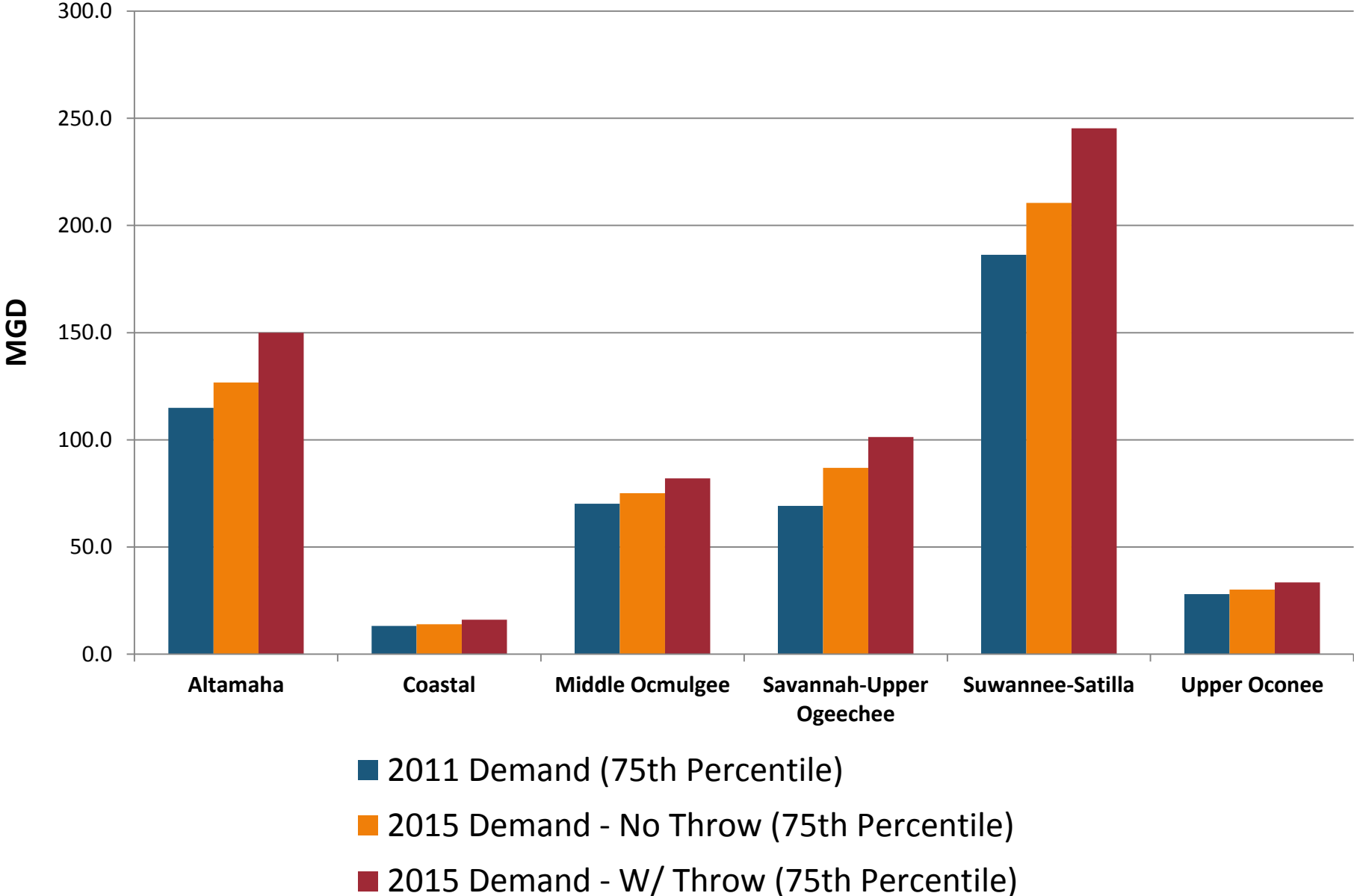
Middle Ocmulgee RWPC



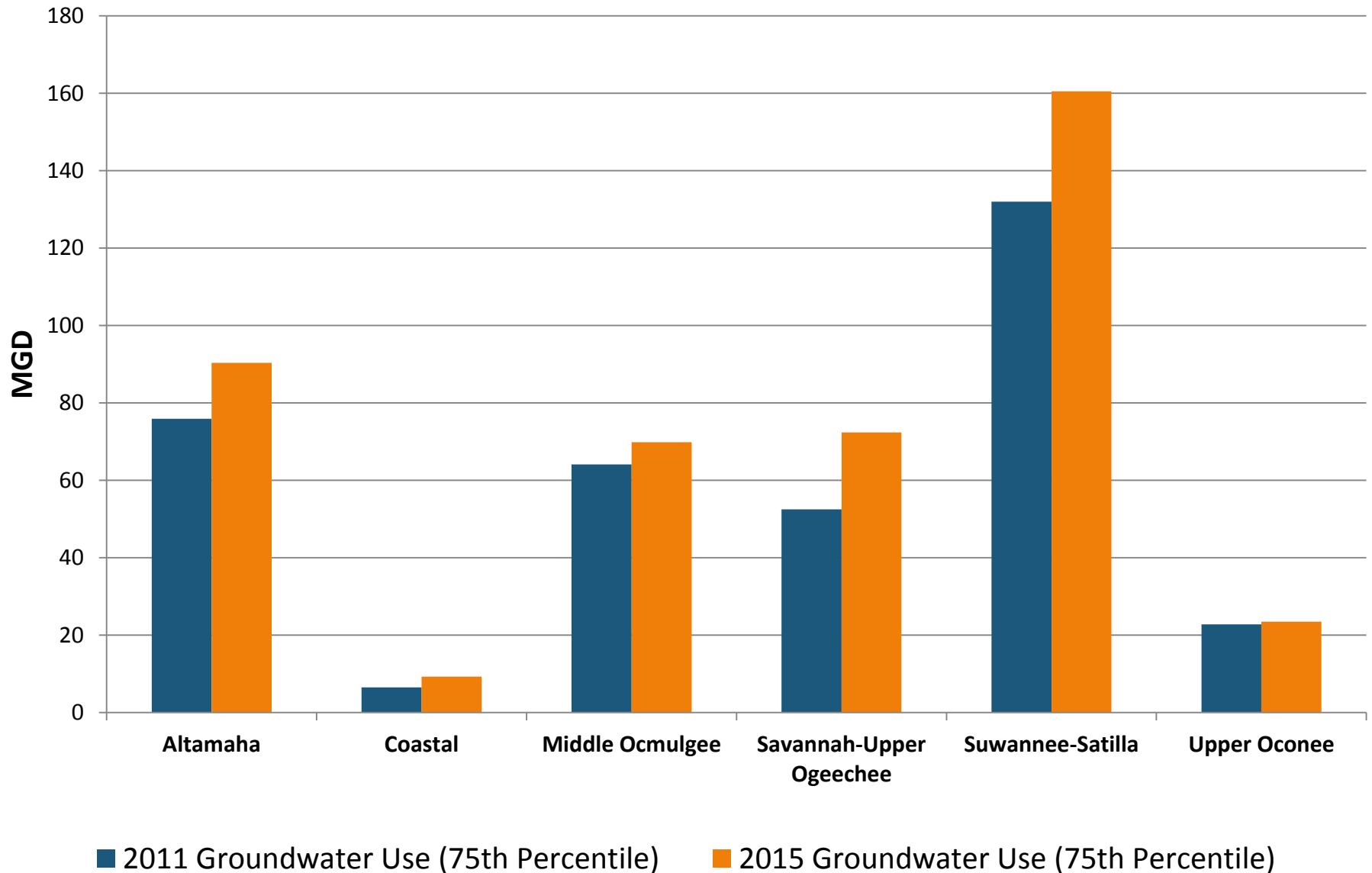
Savannah-Upper Ogeechee RWPC



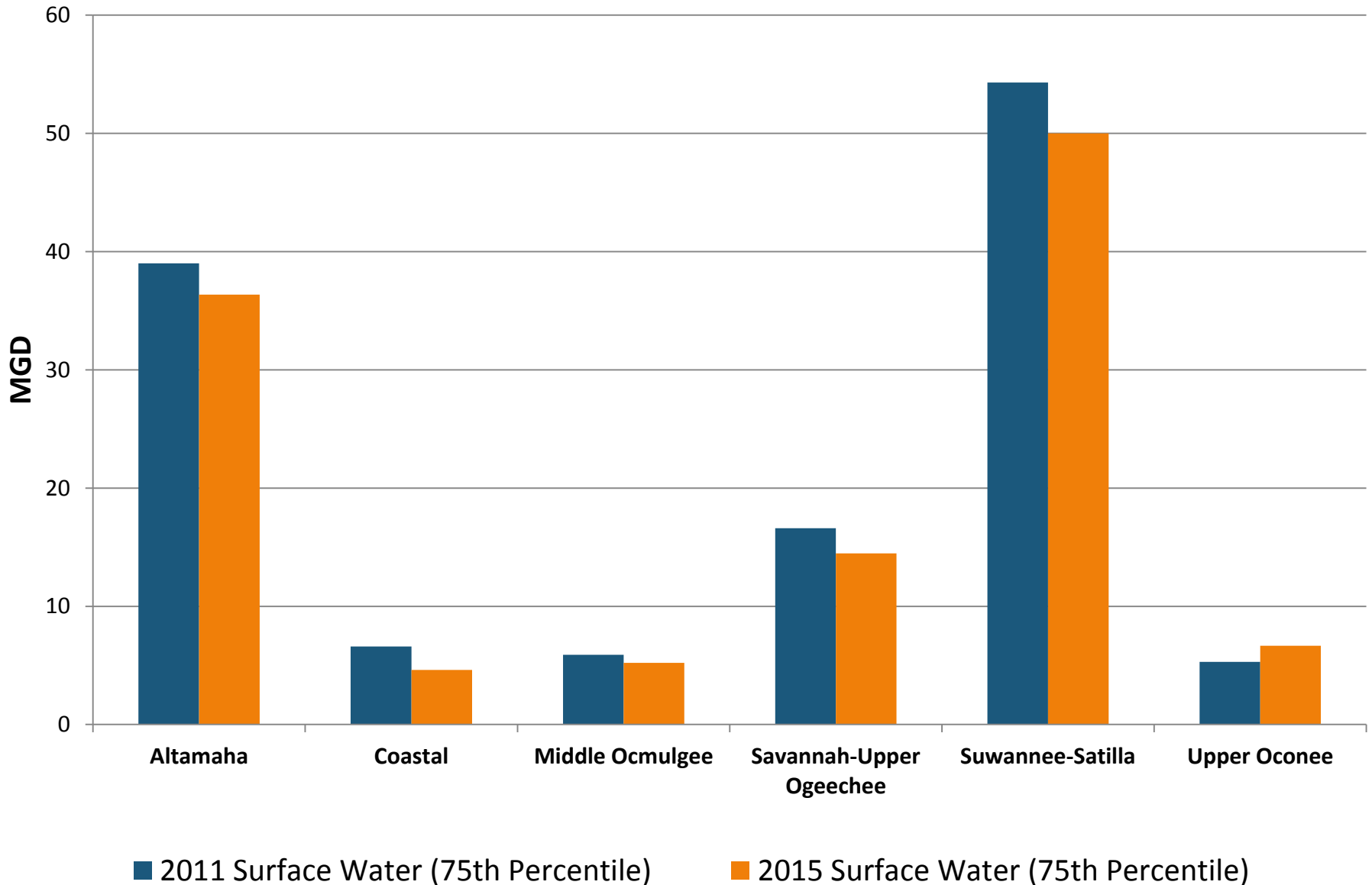
Ag Demand (2011 & 2015)



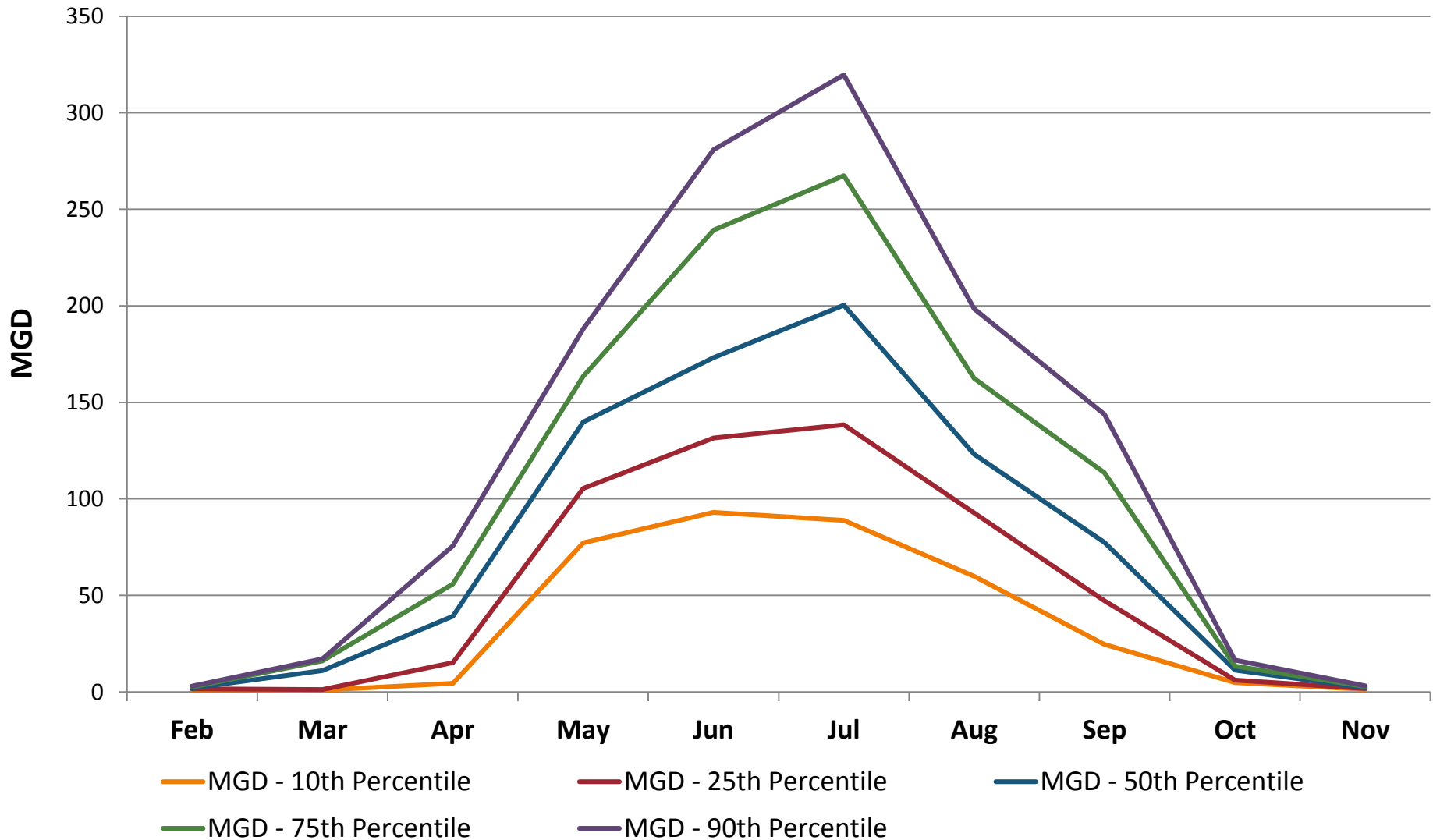
Groundwater Use (2011 & 2015)



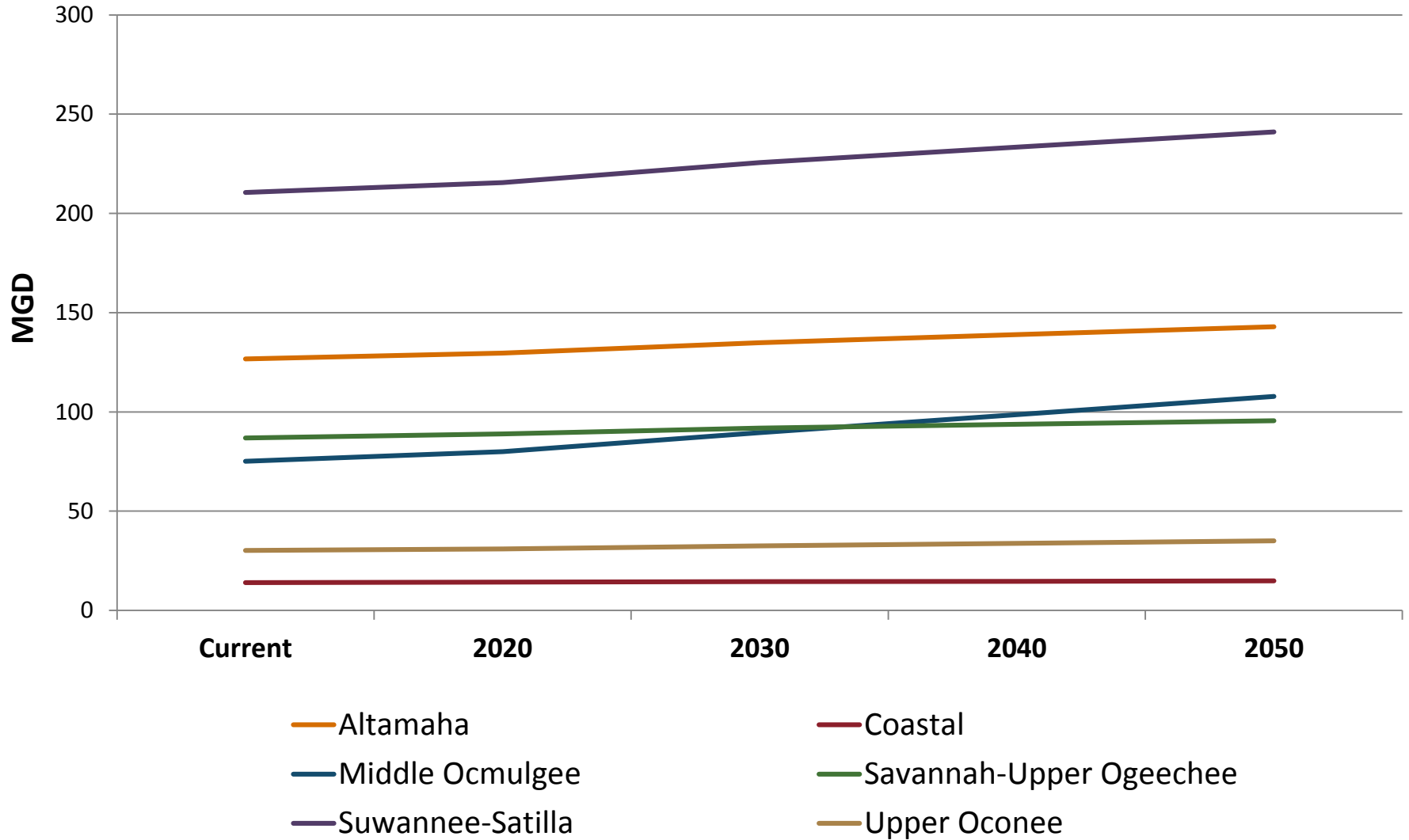
Surface Water Use (2011 & 2015)



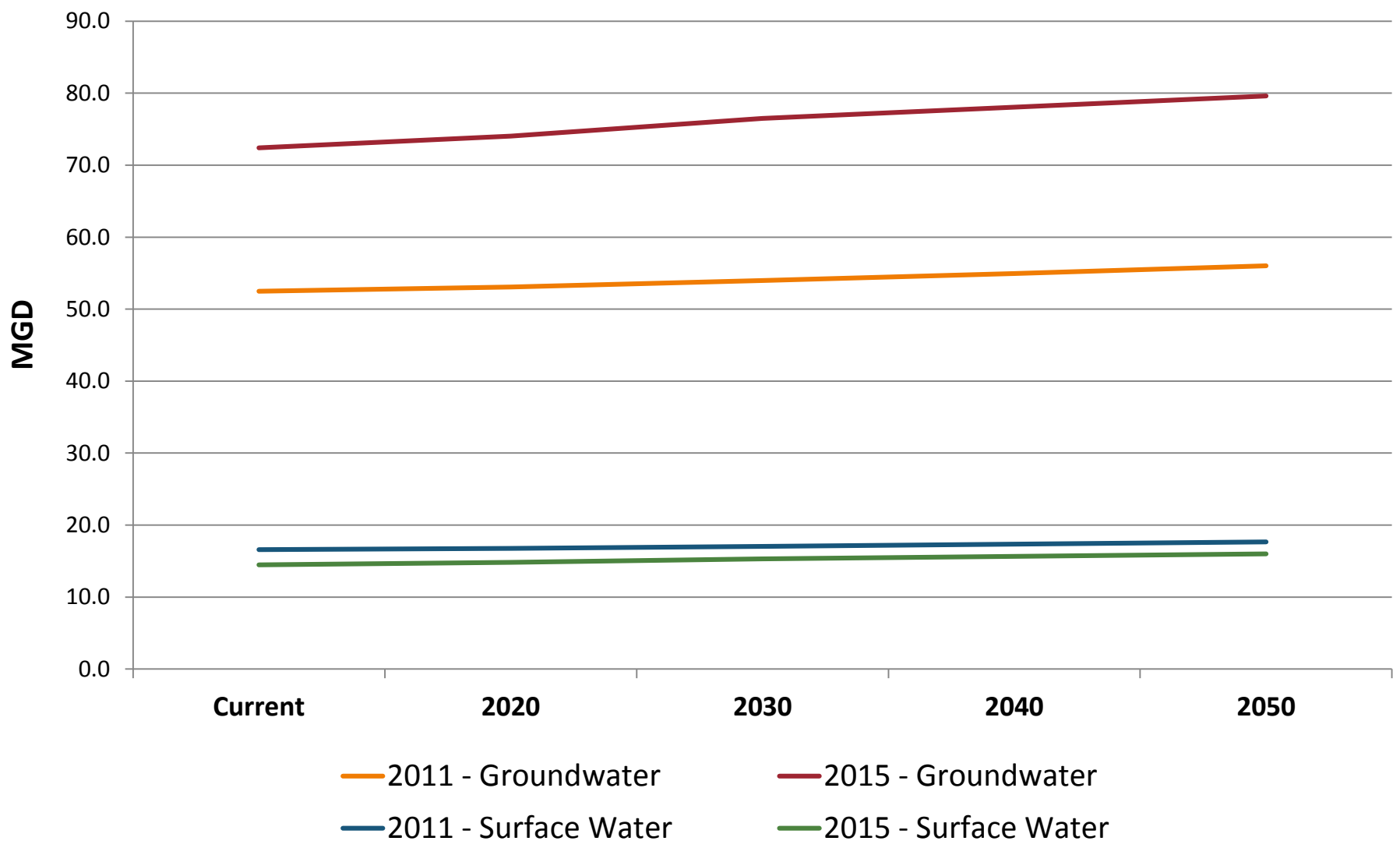
Savannah-Upper Ogeechee RWPC- Monthly



2015 - 2050 Forecast (75th Percentile)



Savannah-Upper Ogeechee - Forecast (75th Percentile)



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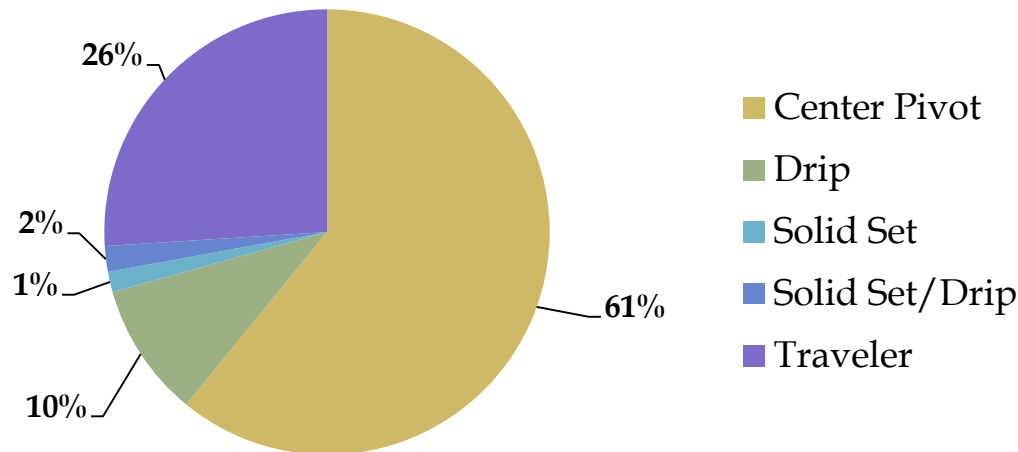


**Agricultural Water Use Forecast – Handout for Suwannee-Satilla Water Planning
Region**

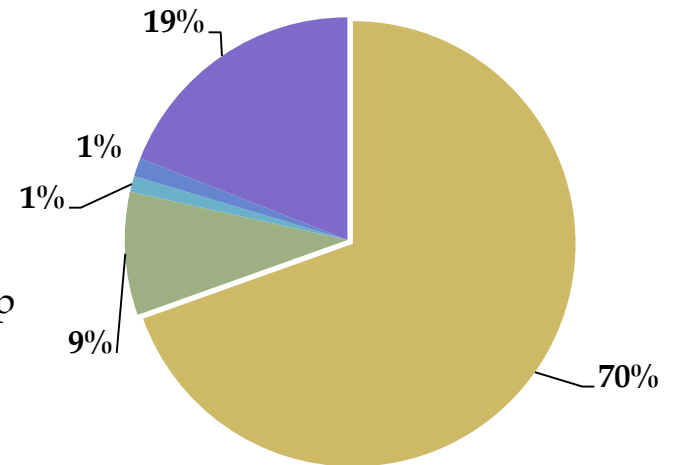
Suwannee-Satilla RWPC

	2009	2015	% Change
Total # of Fields	6,235	7,844	+ 25.8%
Total Acreage	234,365	286,131	+ 22.1%
Total GW Acreage	137,108	194,191	+ 41.6%
Total SW Acreage	97,257	91,939	- 5.5%
Total Center Pivots	2,910	4,771	+ 64.0%
Center Pivot Acreage	131,676	198,833	+ 51.0%

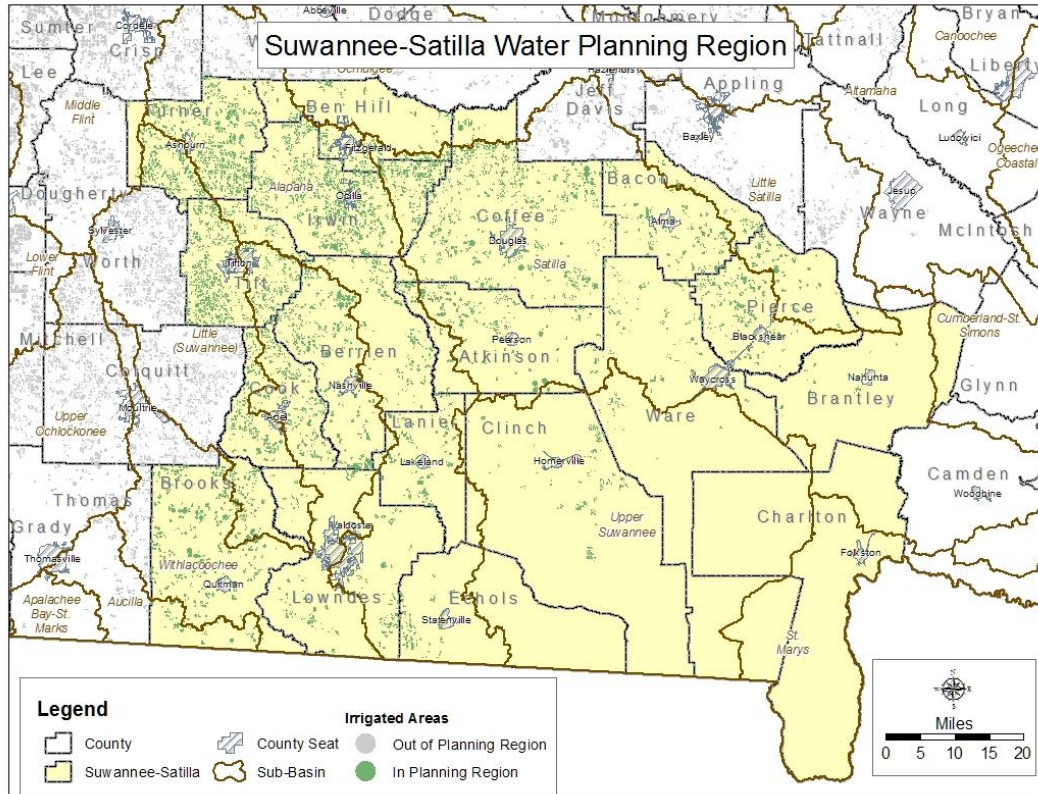
System Type - % of Systems



System Type - % of Acreage

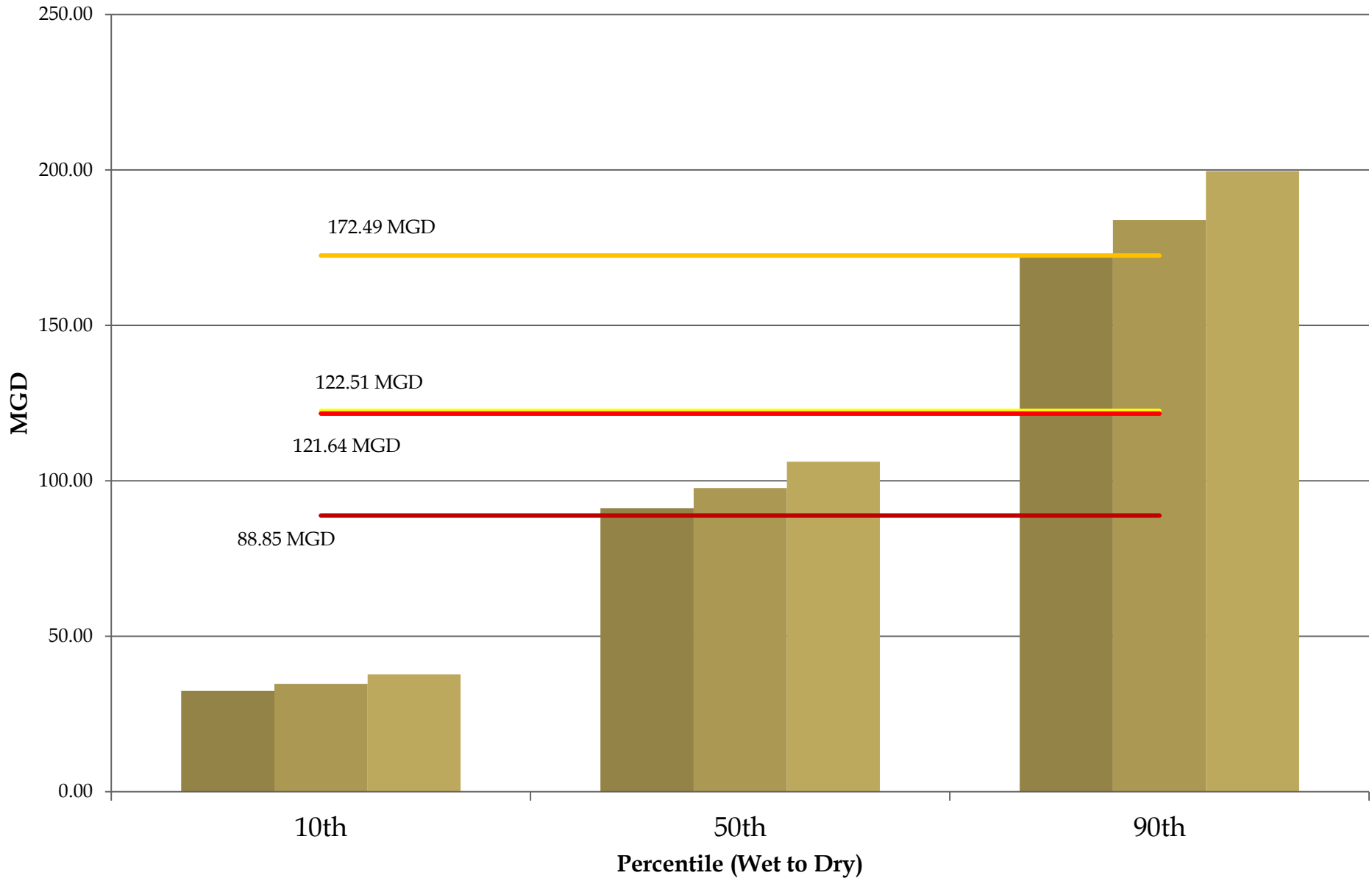


Irrigated Acres



County	2009	2015
Atkinson	7,671	13,458
Bacon	6,623	10,125
Ben Hill	8,476	10,853
Berrien	16,542	23,154
Brantley	727	1,086
Brooks	22,956	28,819
Clinch	3,280	4,857
Coffee	25,769	32,486
Cook	16,034	18,485
Echols	2,935	3,536
Irwin	34,310	41,799
Lanier	6,417	7,110
Lowndes	8,095	8,728
Pierce	11,524	13,299
Tift	25,514	27,703
Turner	33,267	34,468
Ware	4,225	6,098

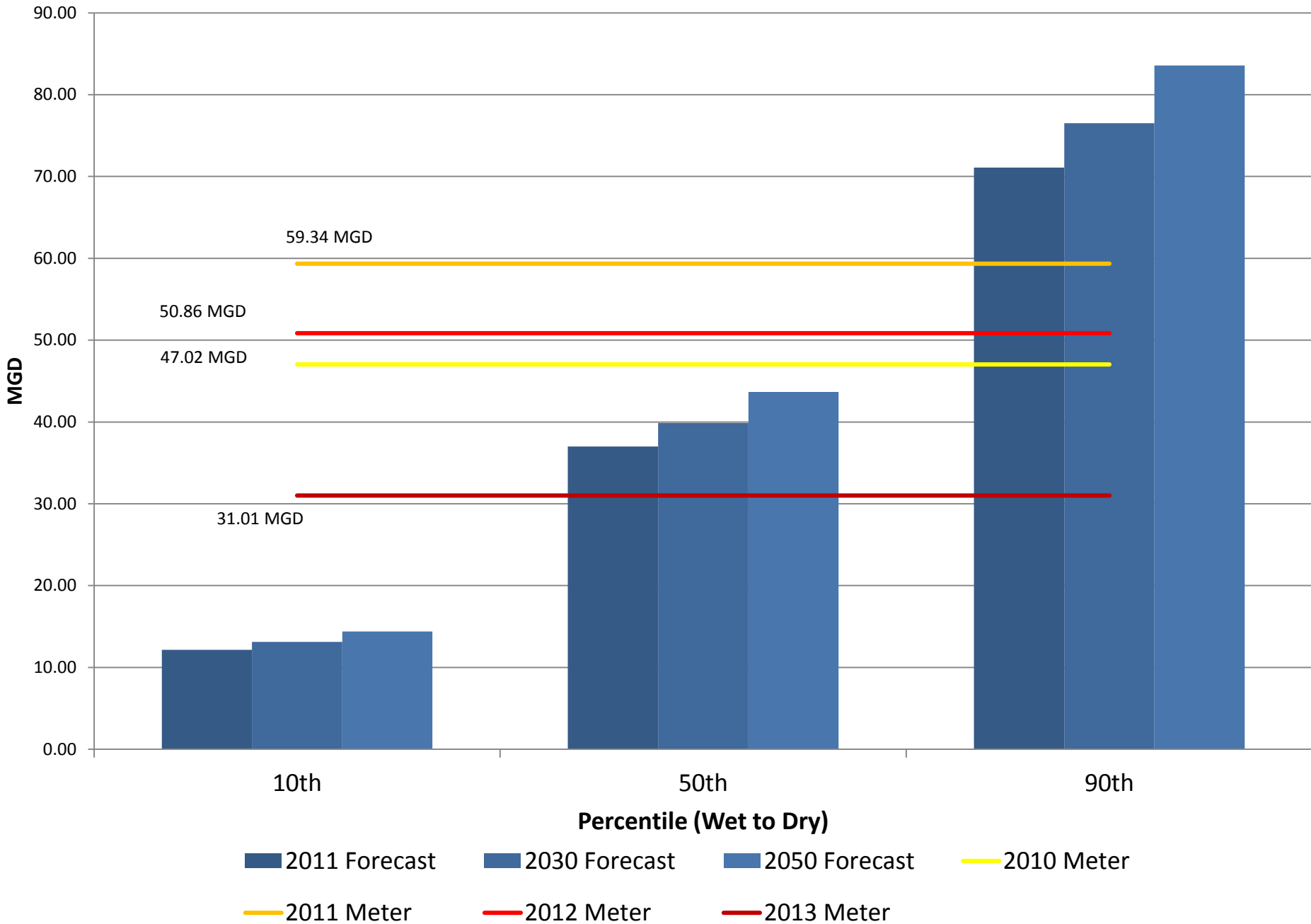
Suwannee-Satilla - Groundwater (Meter Data)



2011 Forecast
 2030 Forecast
 2050 Forecast
 2010 Meter

2011 Meter
 2012 Meter
 2013 Meter

Suwannee-Satilla - Surface Water (Meter Data)

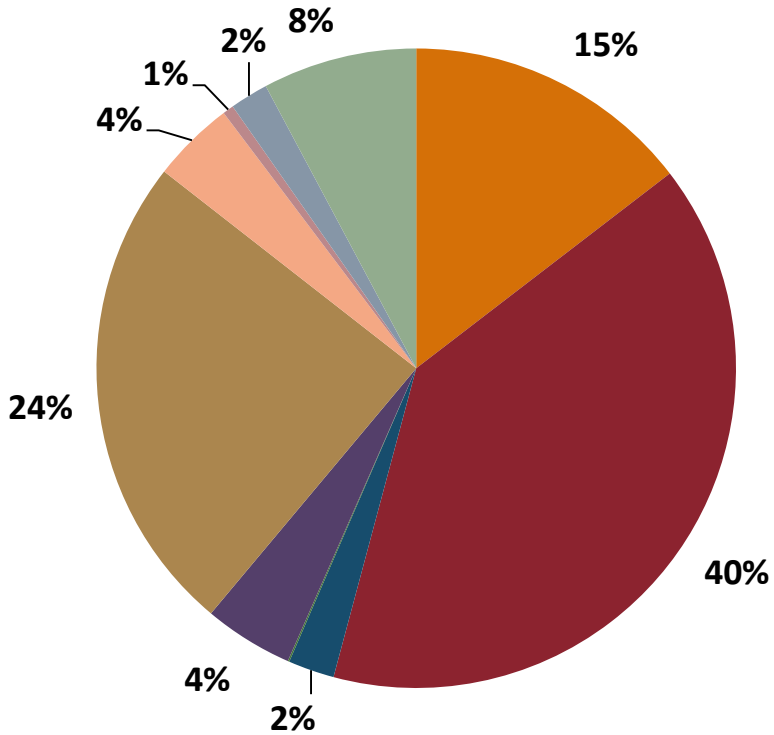


2015-16 Agricultural Water Demand Forecasts - Methods

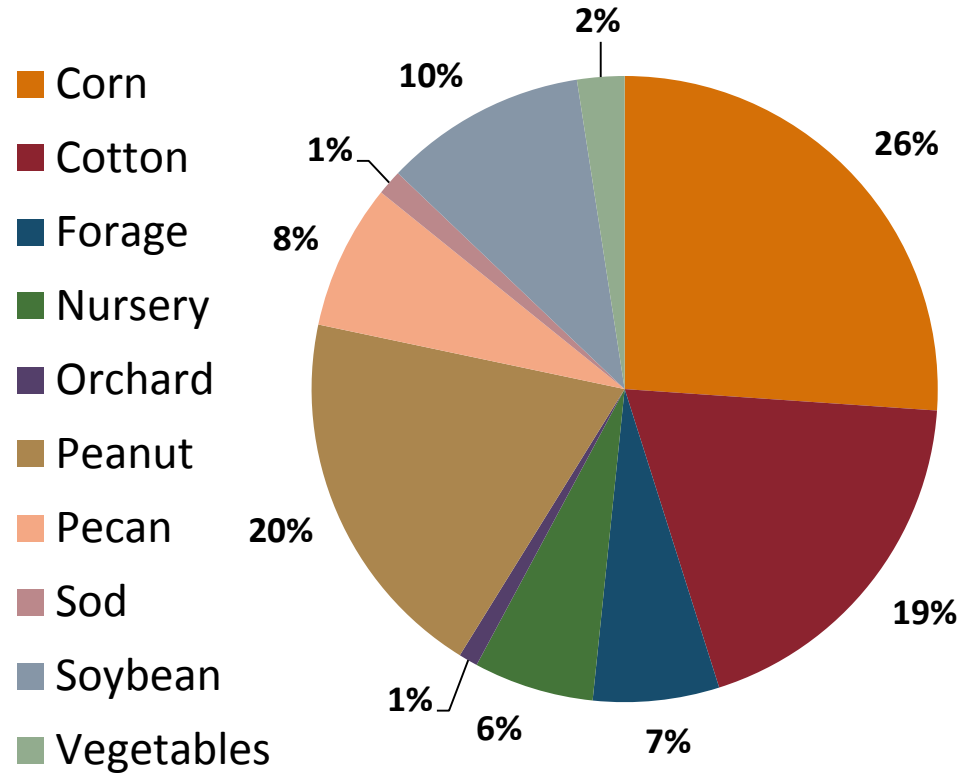
- ▣ **Approach: Look to past trends and consider foreseeable changes**
- ▣ **Acreage**
 - Baseline – USDA Census of Agriculture (2012); linked to 2015 irrigated acres
- ▣ **Crop water needs**
 - Wet, normal and dry year estimates by crop/soil/county
 - Aggregated spatially to 2015 irrigated acreage
- ▣ **Crop projections through 2050 - modeled based on multiple data sources:**
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Baseline Crop Mix by RWPC

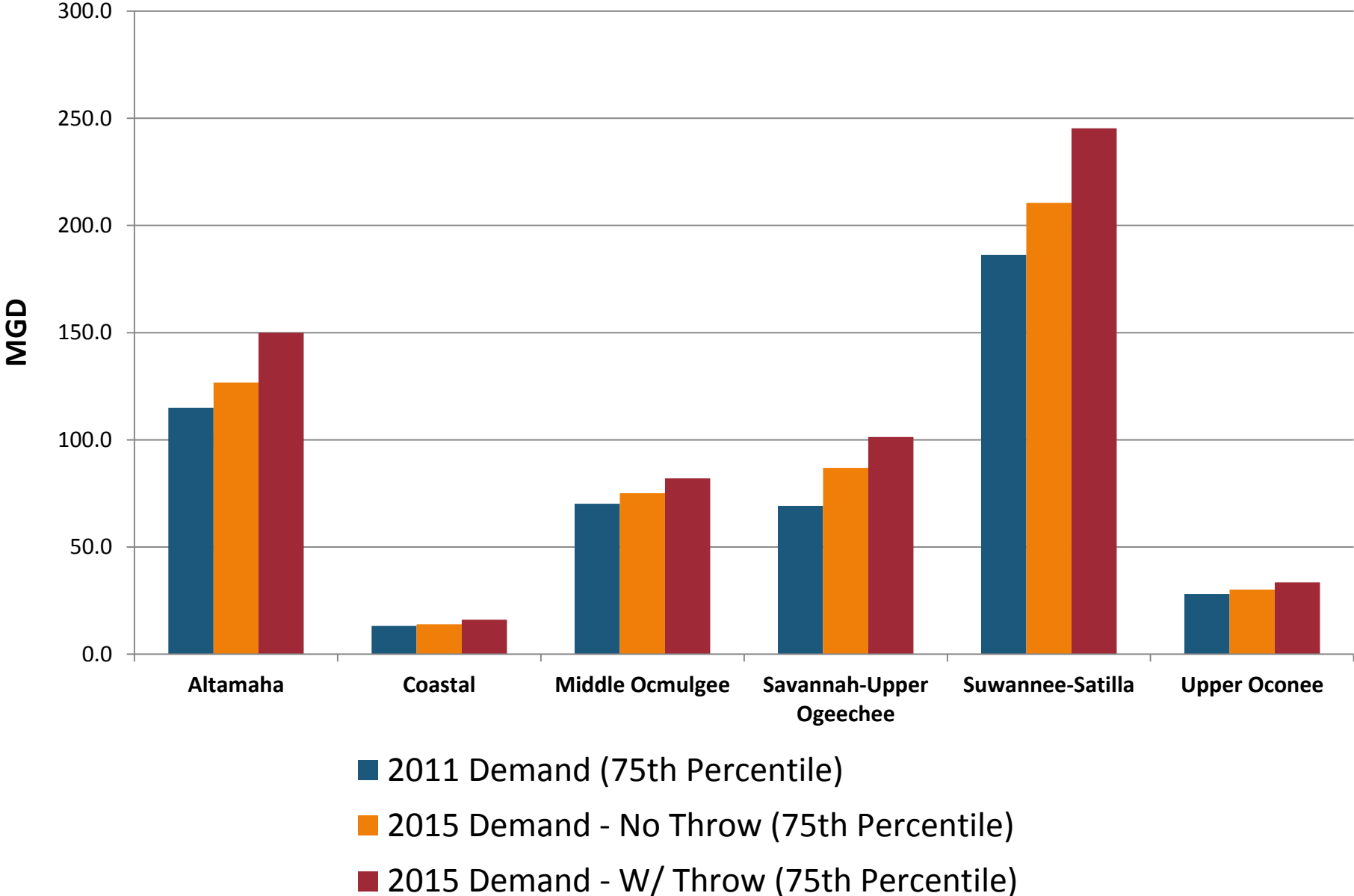
Suwannee-Satilla RWPC



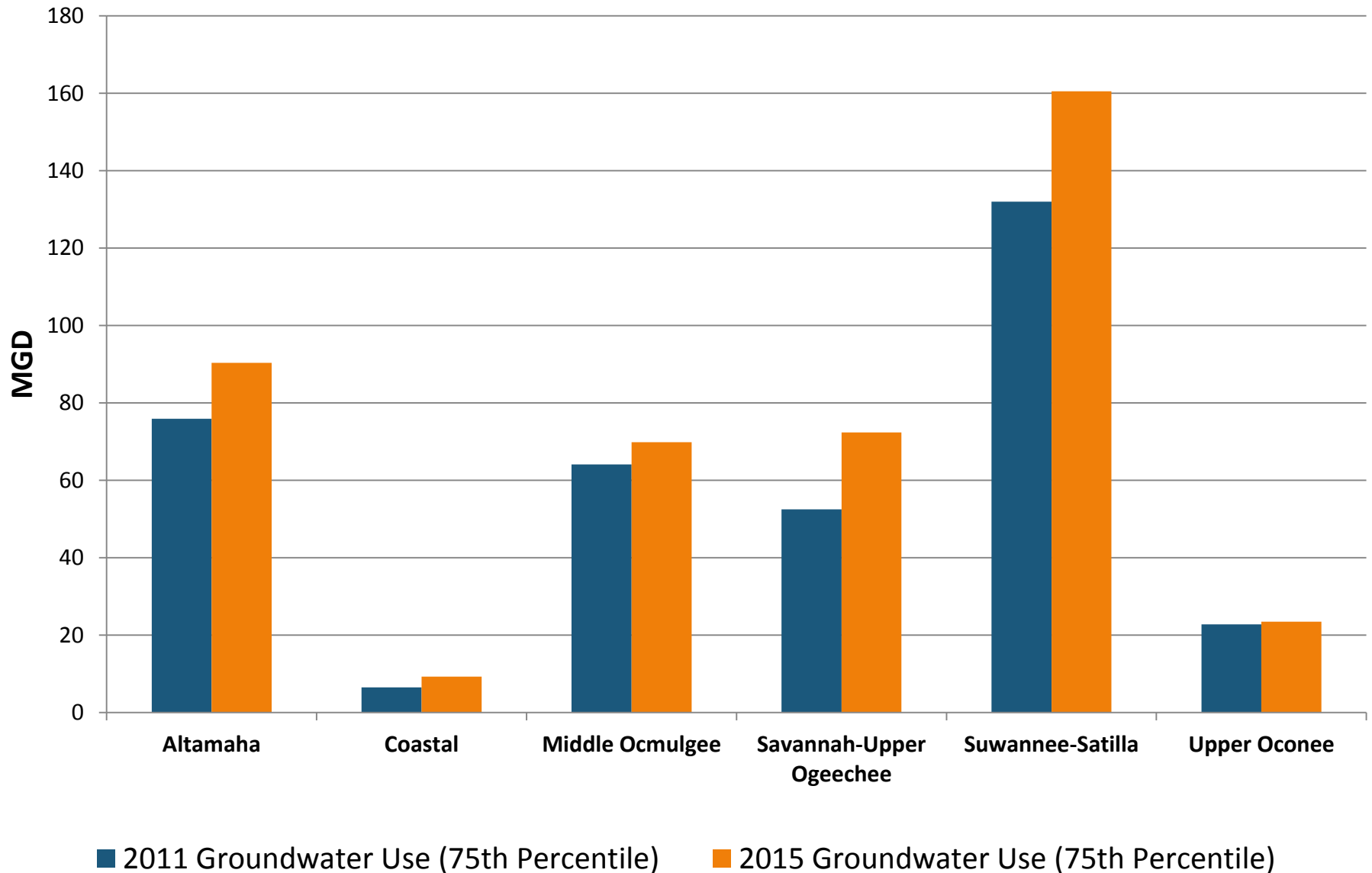
Upper Oconee RWPC



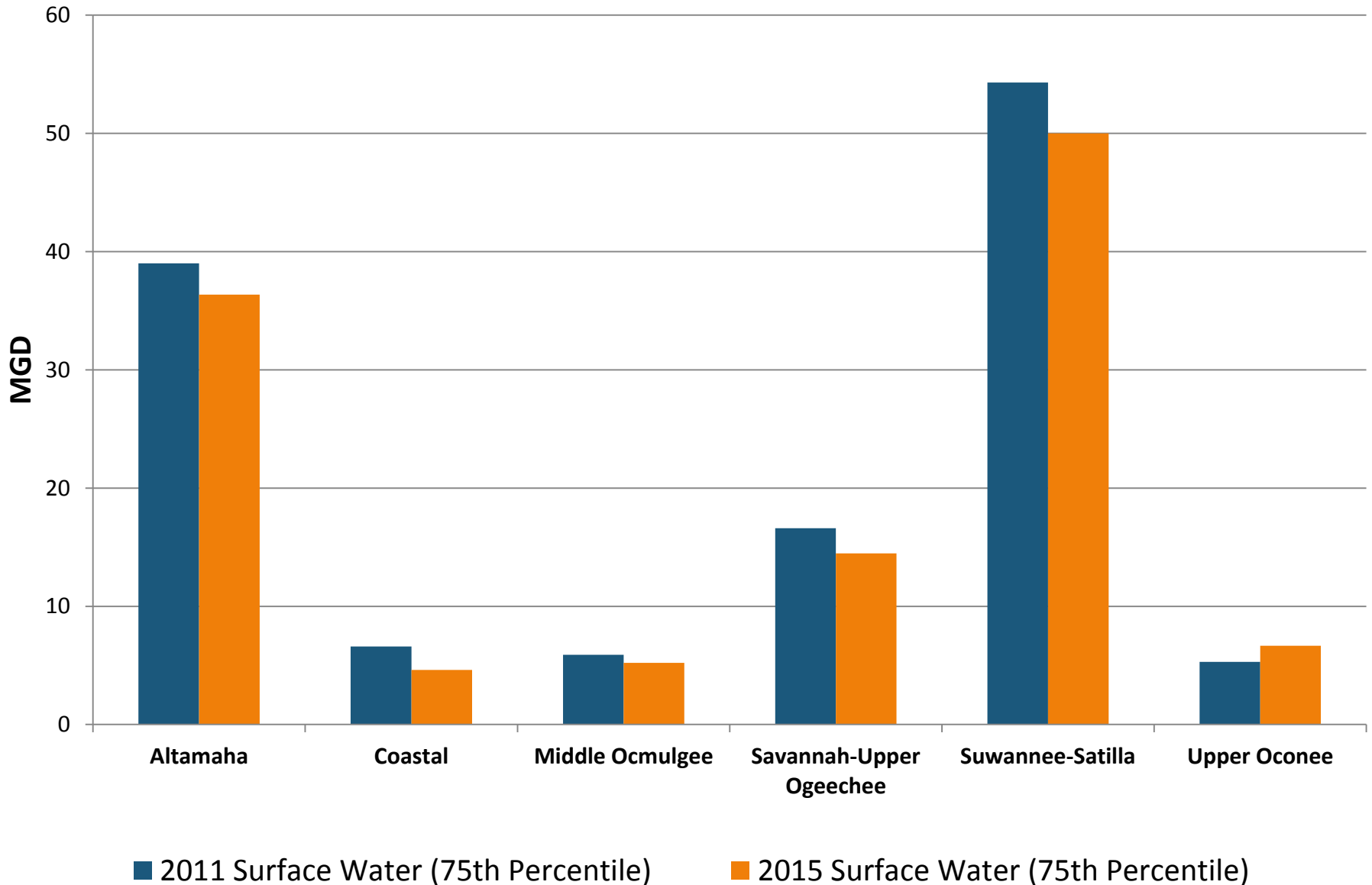
Ag Demand (2011 & 2015)



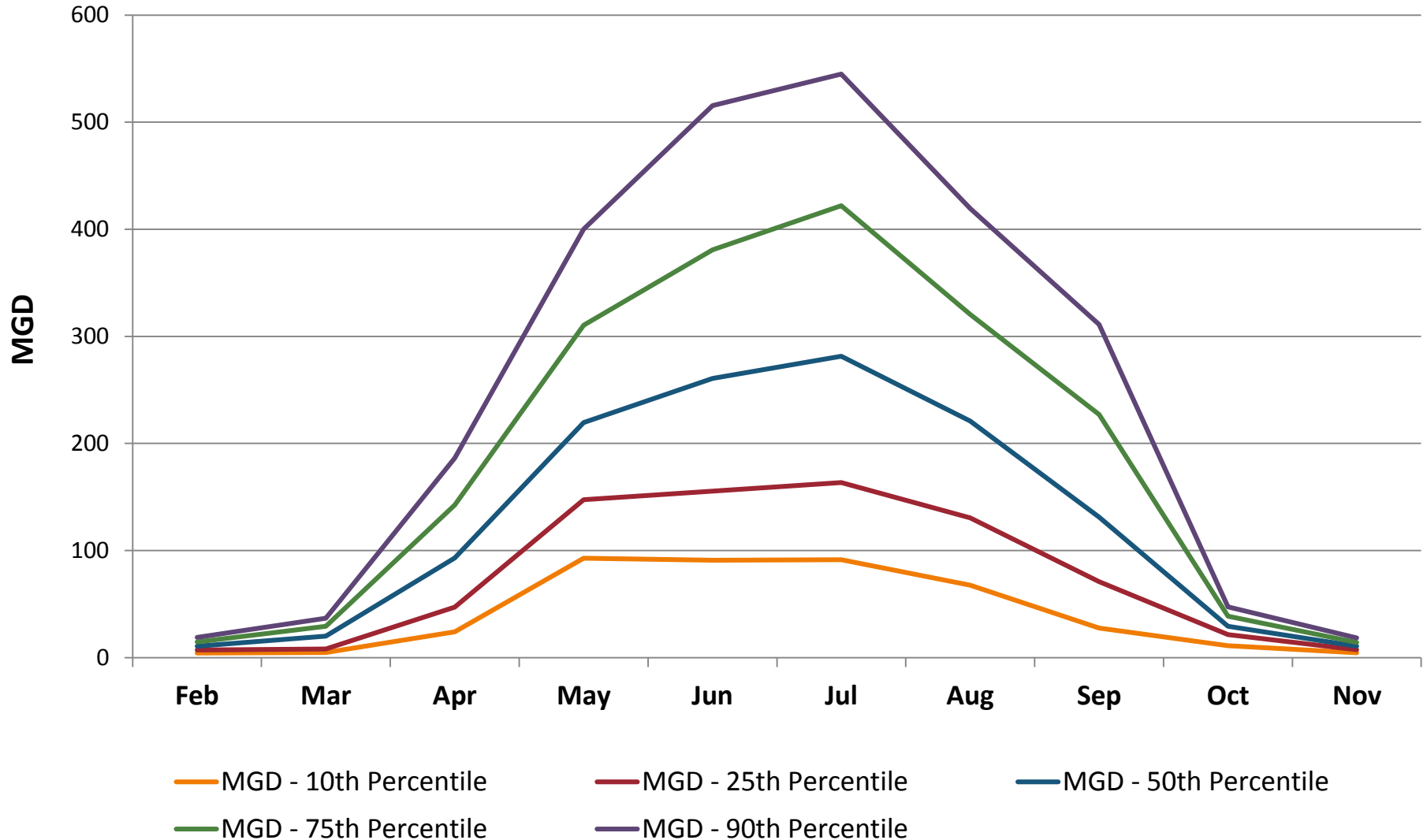
Groundwater Use (2011 & 2015)



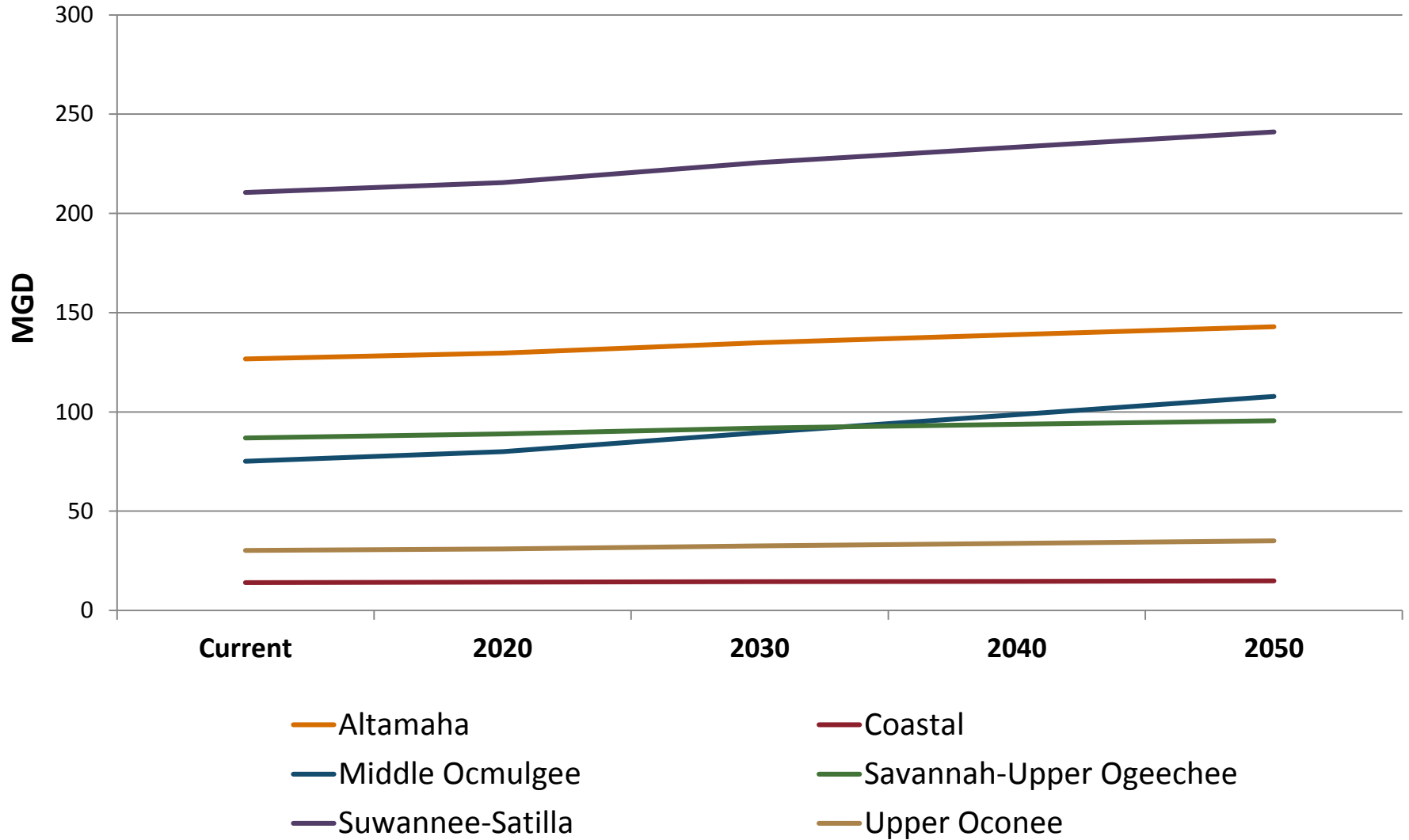
Surface Water Use (2011 & 2015)



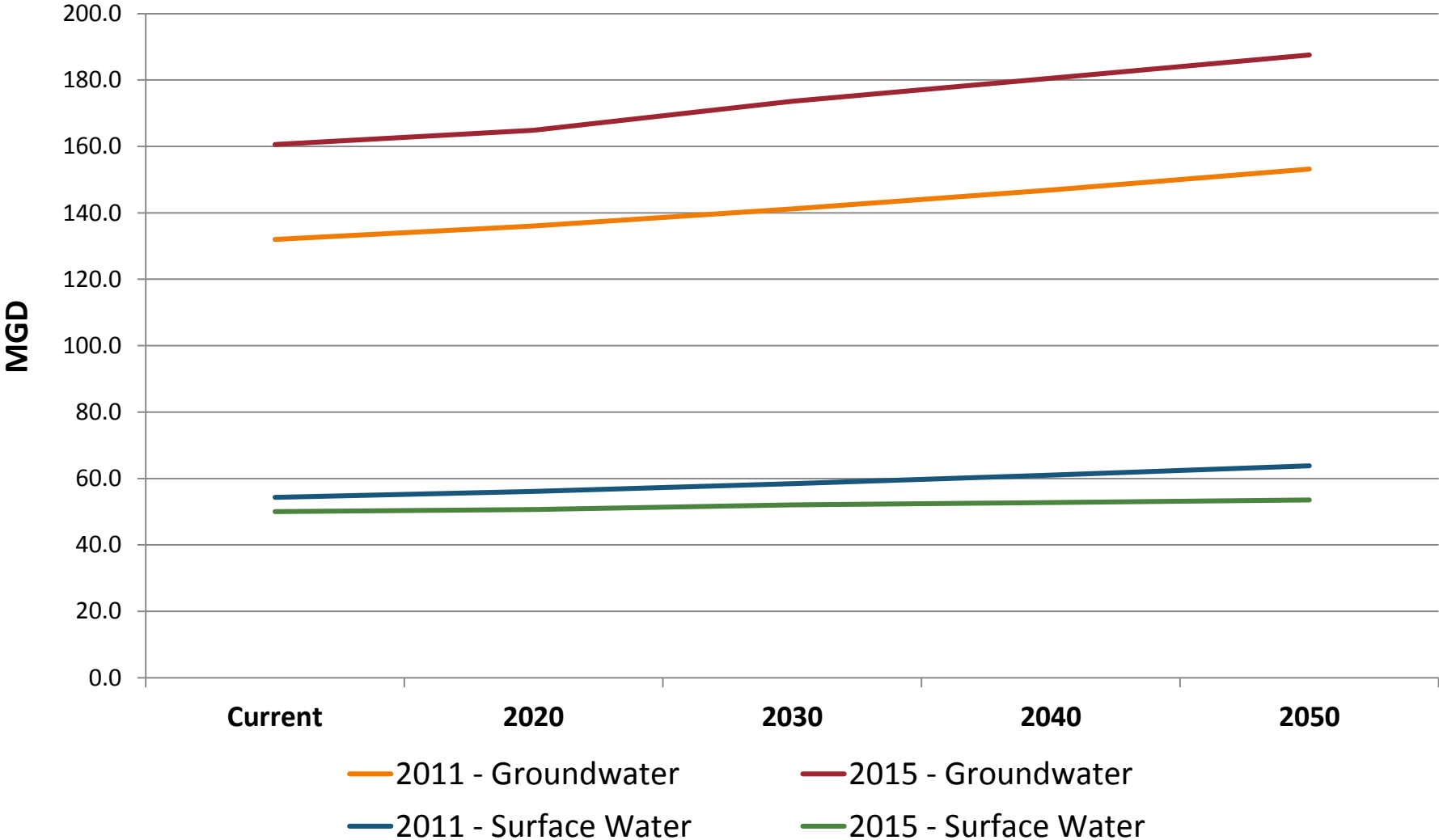
Suwannee-Satilla RWPC - Monthly



2015 - 2050 Forecast (75th Percentile)



Suwannee-Satilla RWPC - Forecast (75th Percentile)



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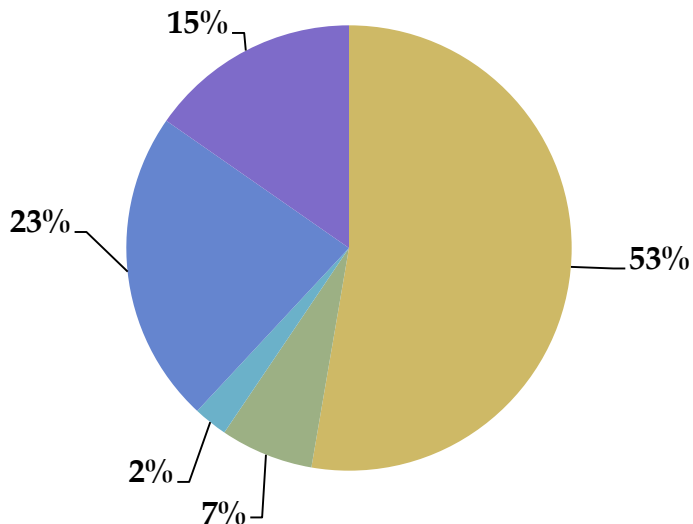


Agricultural Water Use Forecast – Handout for Upper Oconee Water Planning Region

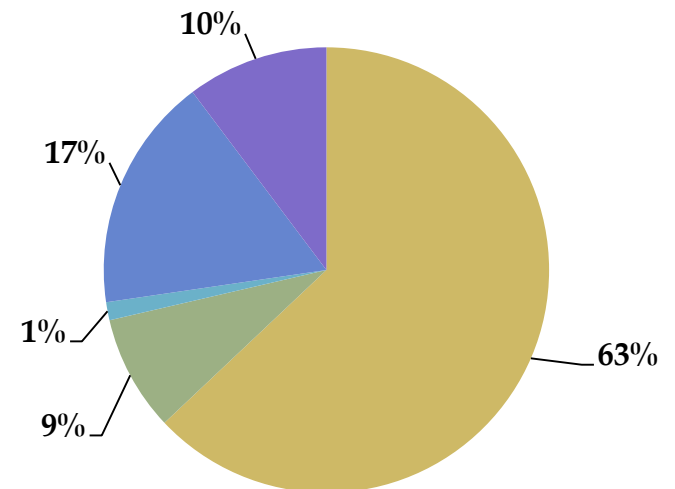
Upper Oconee RWPC

	2009	2015	% Change
Total # of Fields	444	542	+ 22.1%
Total Acreage	20,007	26,113	+ 30.5%
Total GW Acreage	12,548	19,624	+ 56.4%
Total SW Acreage	7,459	6,489	- 13.0%
Total Center Pivots	234	368	+ 57.3%
Center Pivot Acreage	12,597	19,307	+ 53.3%

System Type - % of Systems

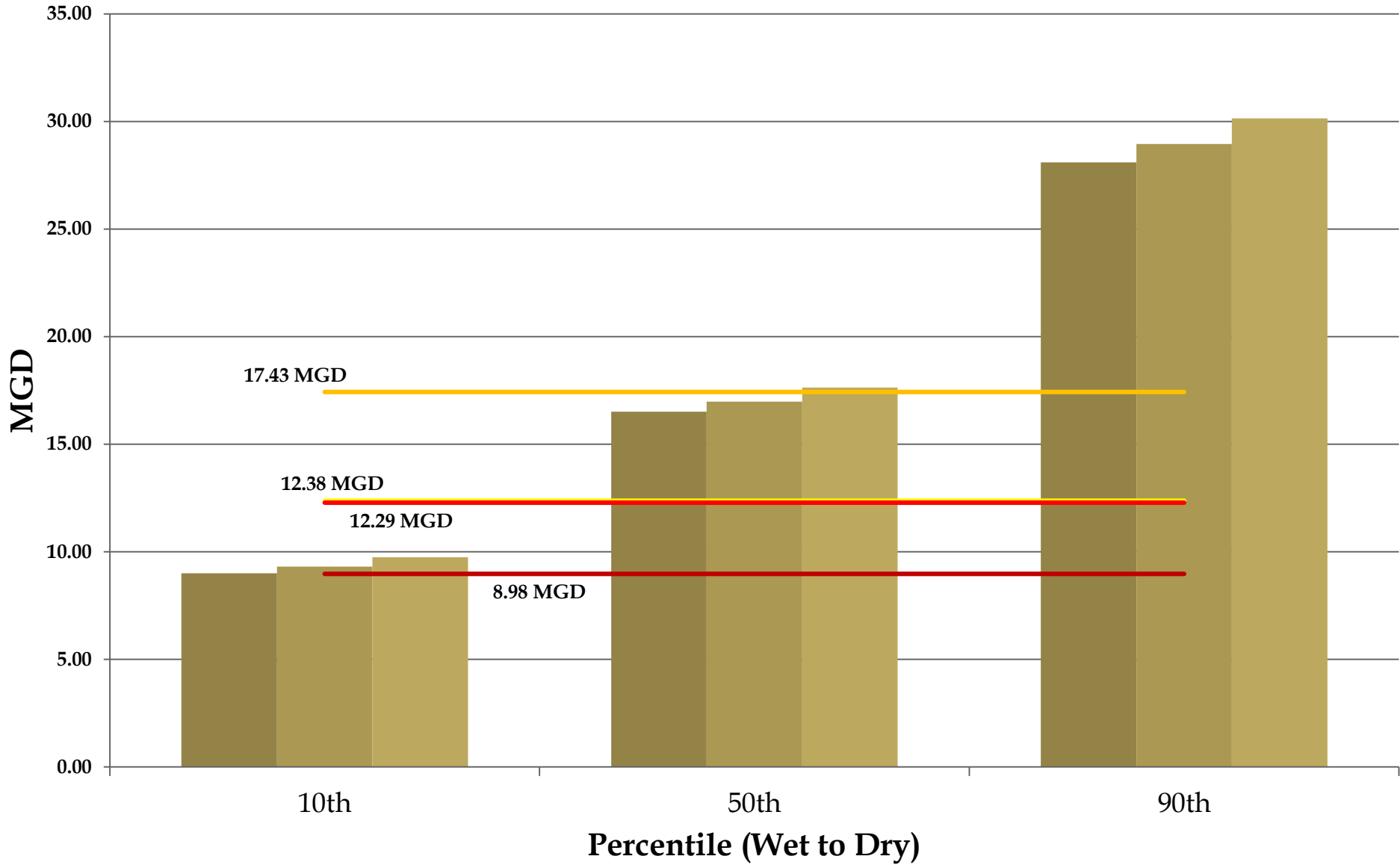


System Type - % of Acreage



- Center Pivot
- Drip
- Solid Set
- Solid Set/Drip
- Traveler

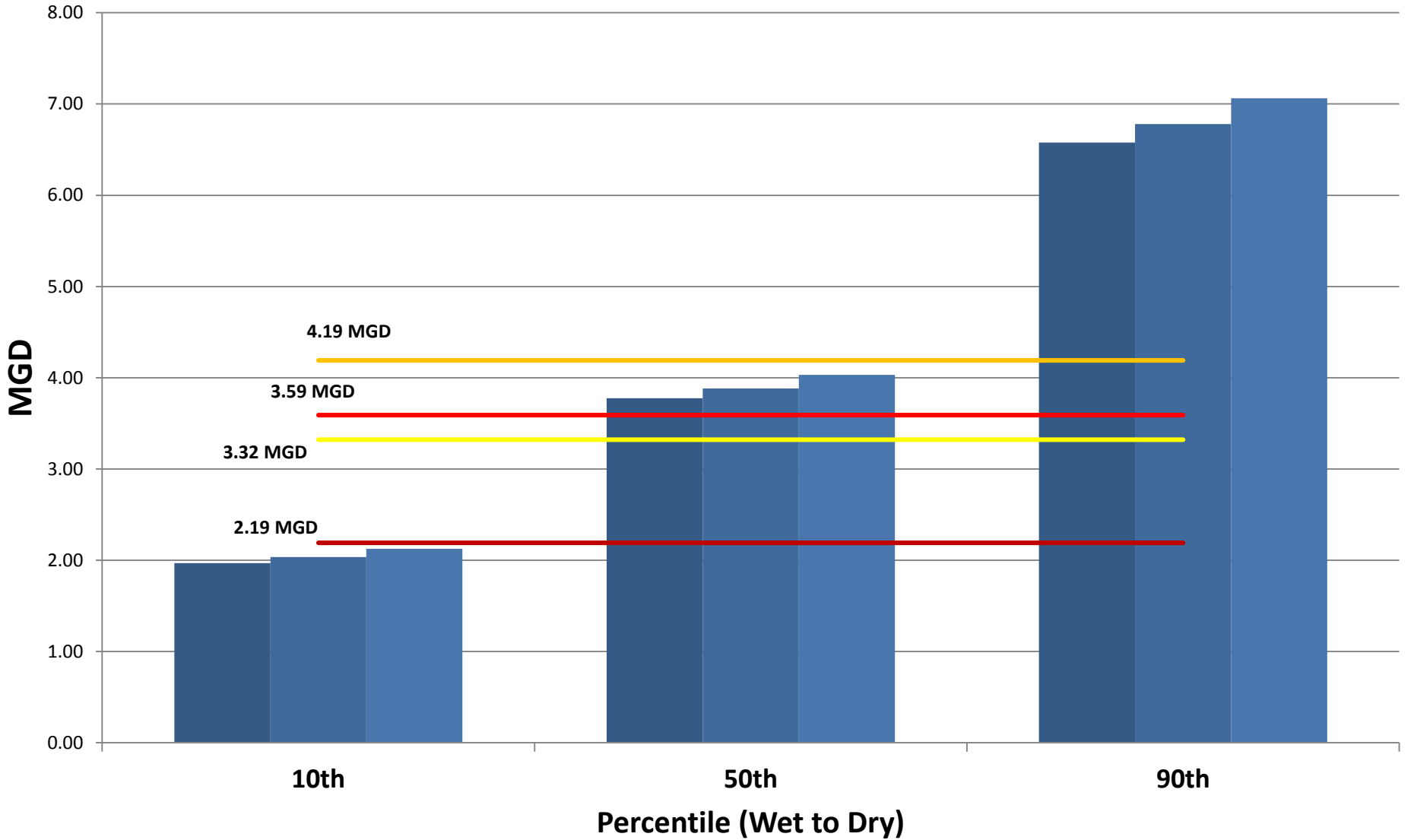
Upper Oconee - Groundwater (Meter Data)



2011 Forecast
 2030 Forecast
 2050 Forecast
 2010 Meter

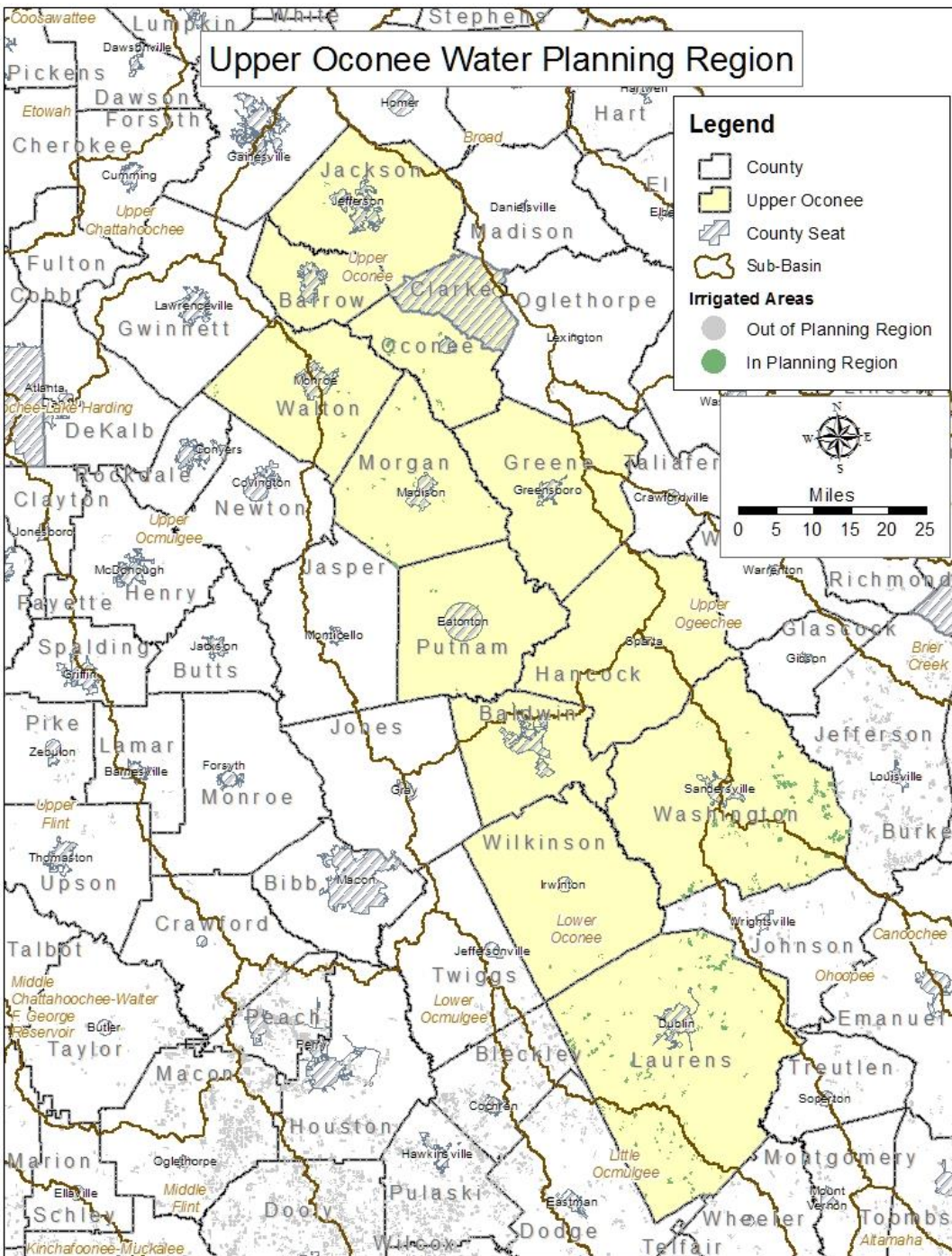
2011 Meter
 2012 Meter
 2013 Meter

Upper Oconee - Surface Water (Meter Data)



■ 2011 Forecast ■ 2030 Forecast ■ 2050 Forecast — 2010 Meter
— 2011 Meter — 2012 Meter — 2013 Meter

Upper Oconee Water Planning Region



Irrigated Acres

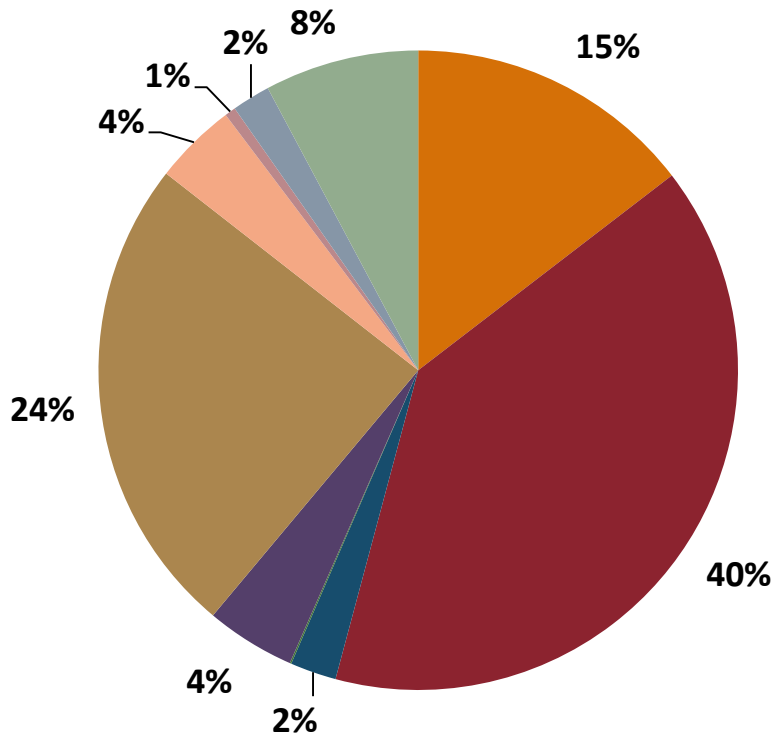
County	2009	2015
Clarke	106	114
Greene	55	0
Hancock	312	47
Jackson	114	113
Laurens	8,303	10,774
Morgan	953	1,272
Oconee	1,328	1,304
Putnam	399	391
Walton	974	930
Washington	7,388	10,924
Wilkinson	75	244

2015-16 Agricultural Water Demand Forecasts - Methods

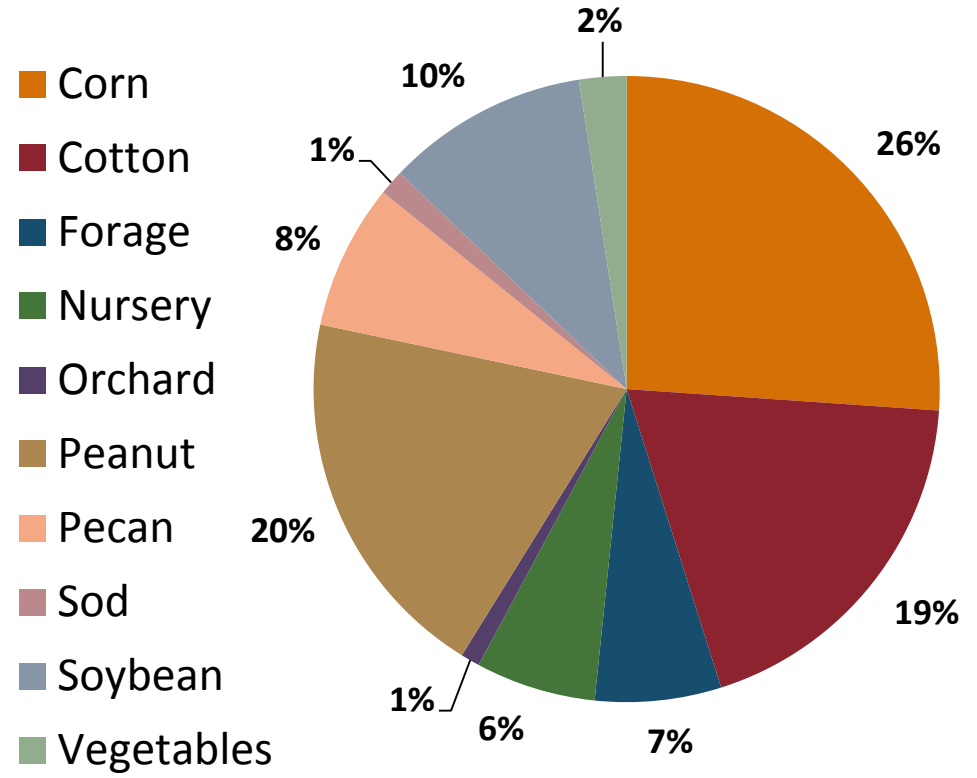
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Baseline Crop Mix by RWPC

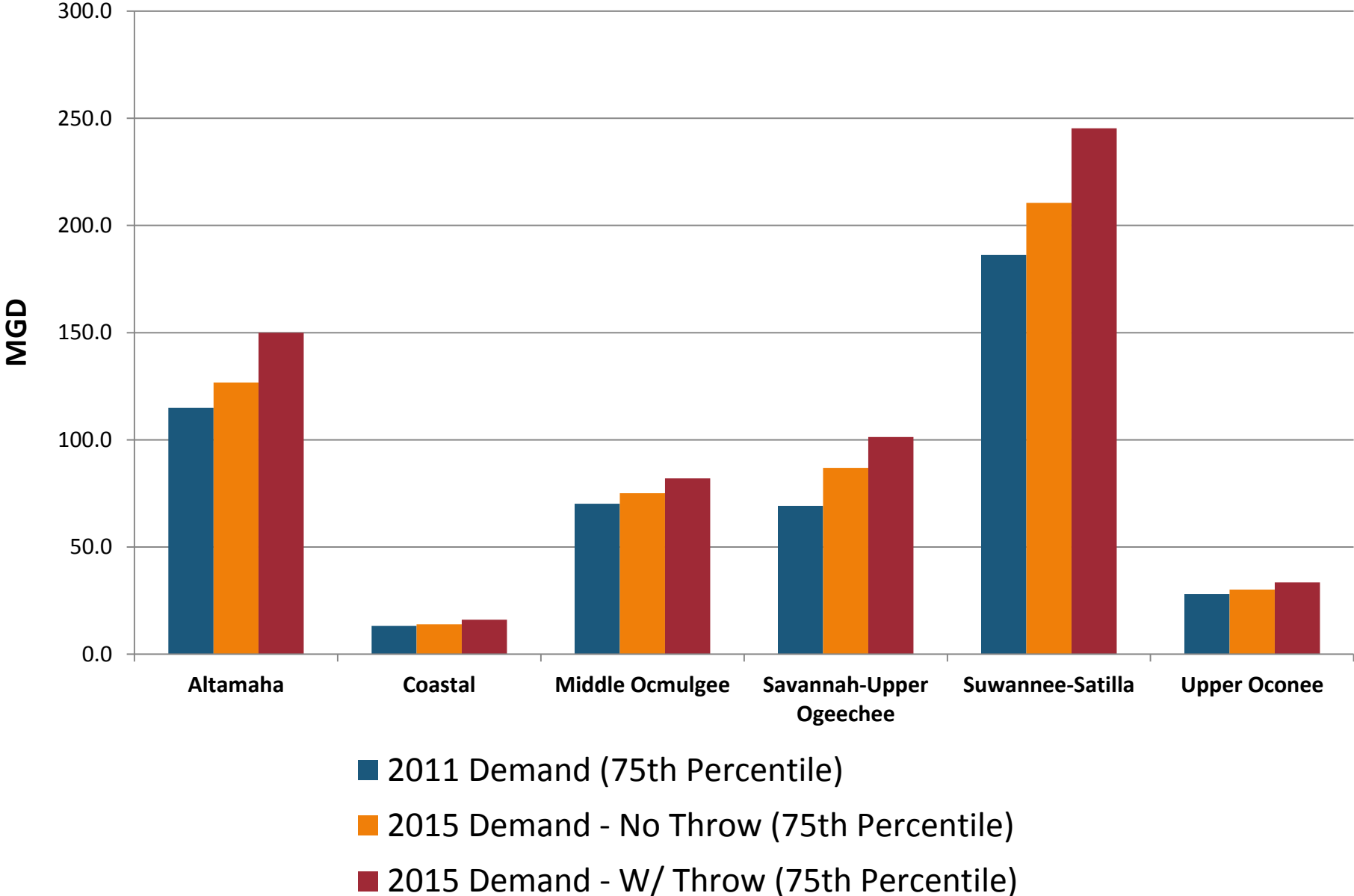
Suwannee-Satilla RWPC



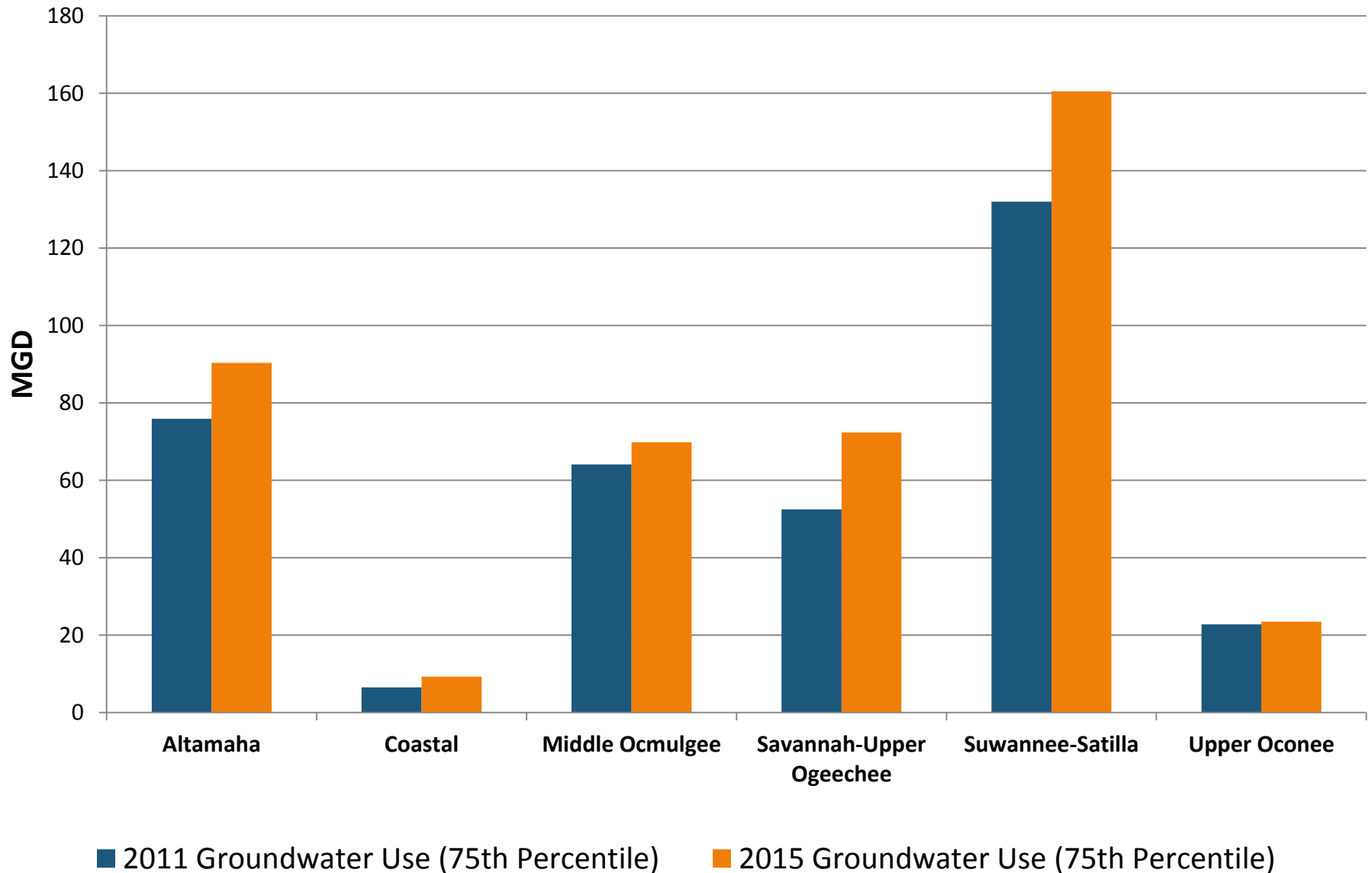
Upper Oconee RWPC



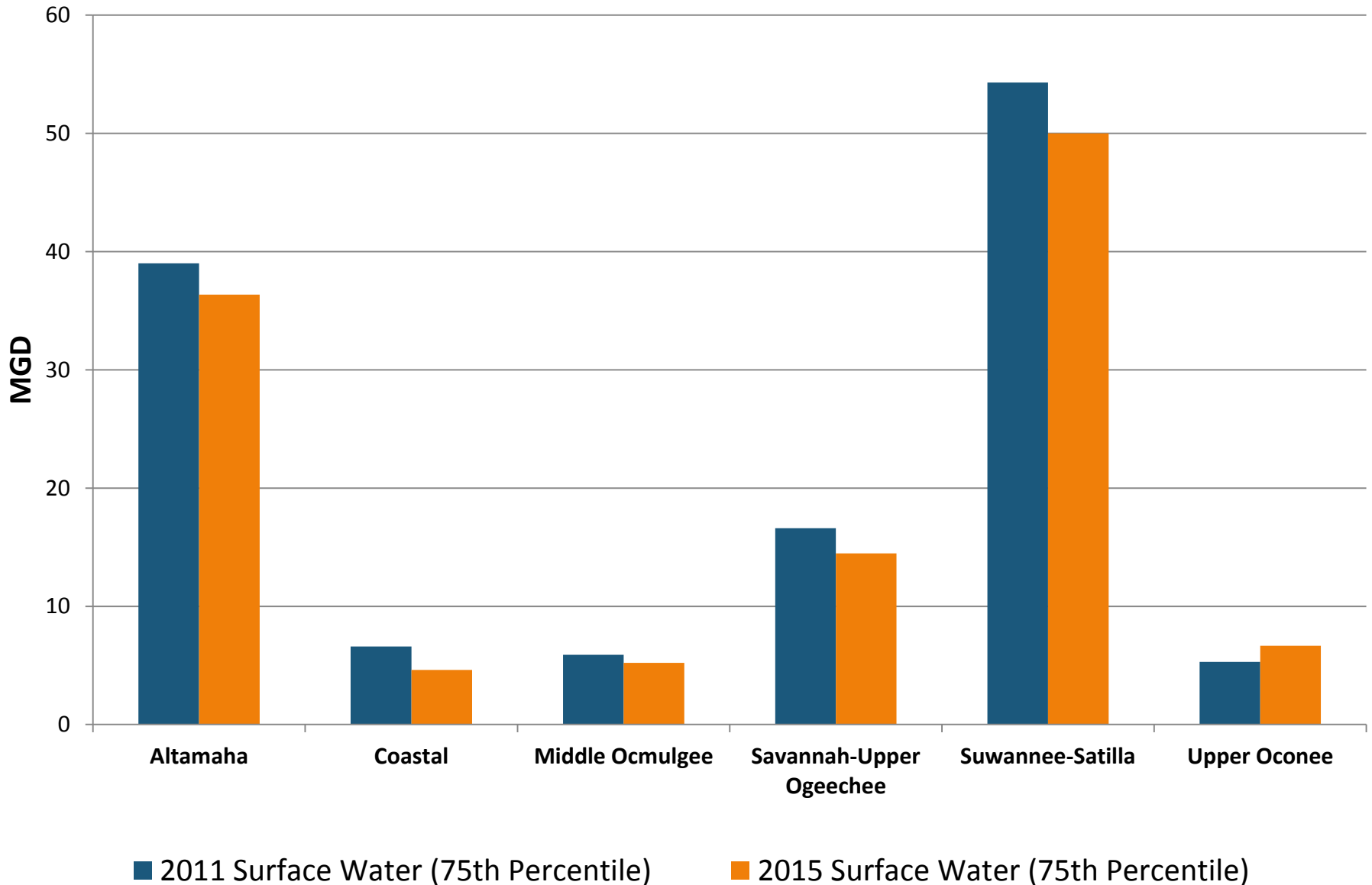
Ag Demand (2011 & 2015)



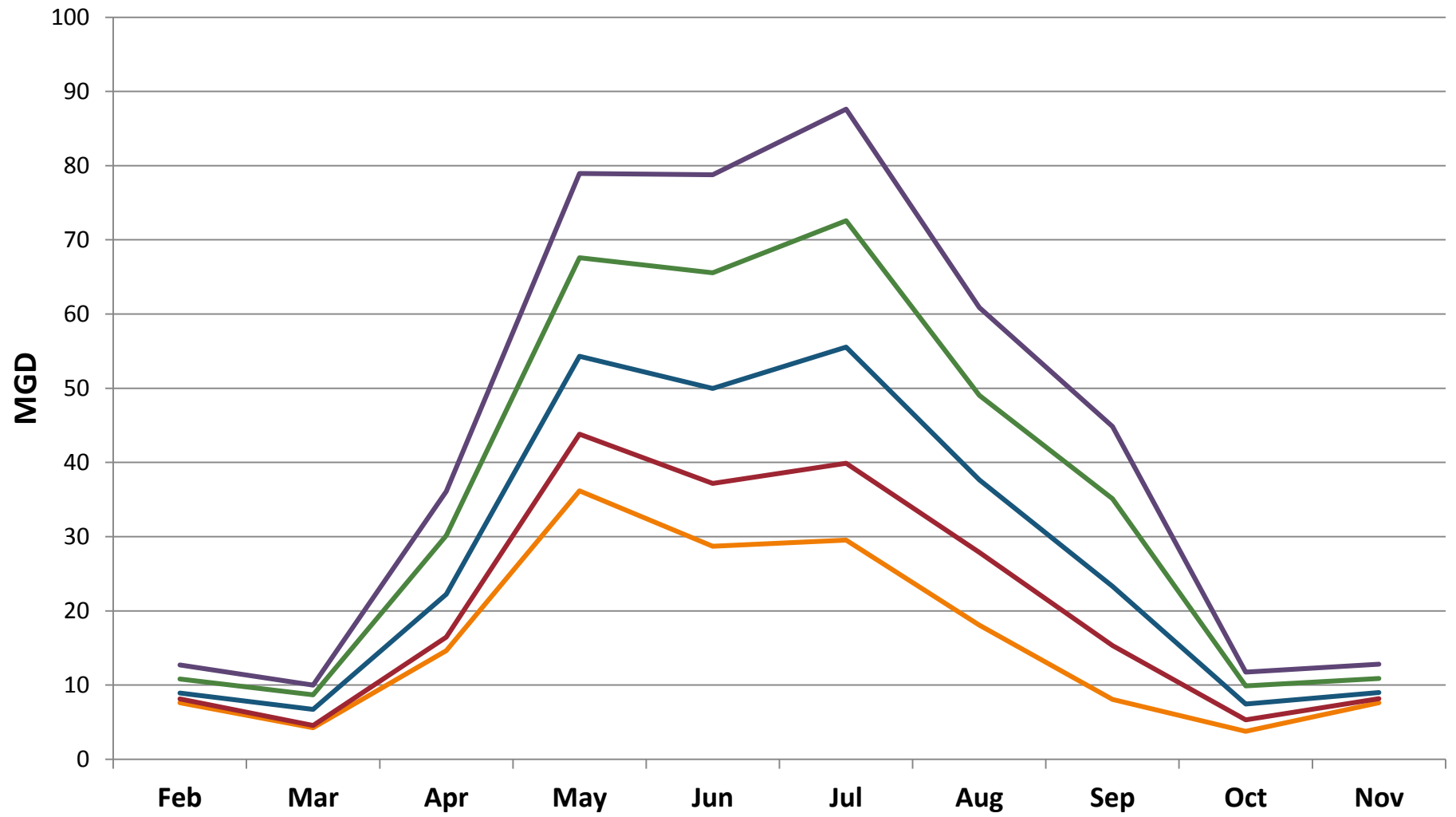
Groundwater Use (2011 & 2015)



Surface Water Use (2011 & 2015)

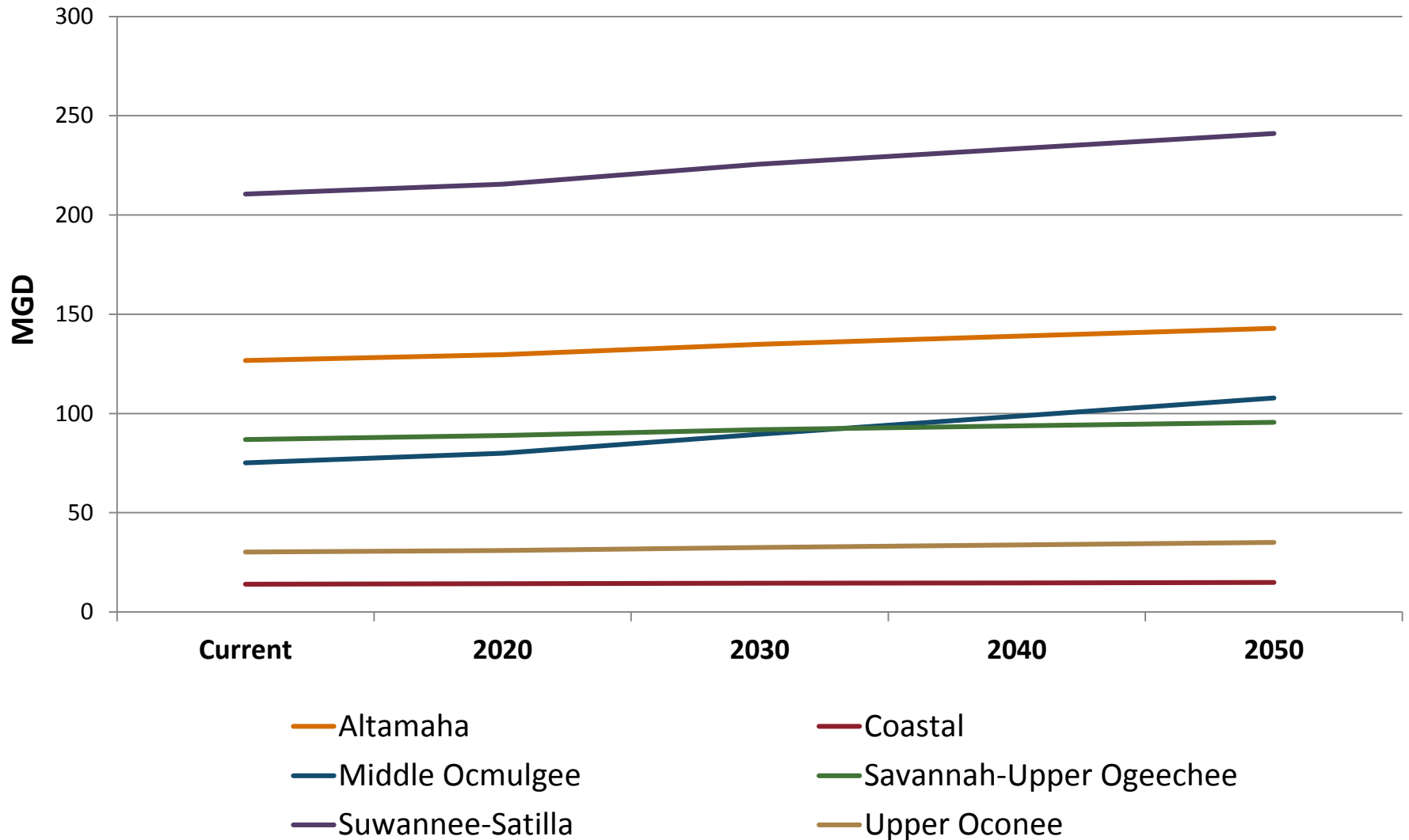


Upper Oconee RWPC - Monthly



- MGD - 10th Percentile
- MGD - 25th Percentile
- MGD - 50th Percentile
- MGD - 75th Percentile
- MGD - 90th Percentile

2015 - 2050 Forecast (75th Percentile)



Upper Oconee RWPC - Forecast (75th Percentile)

