Southeast ClimateConsortium

Florida Water & Climate Alliance

Projects of the Florida Water and Climate Alliance

Community Building to Create Actionable Science

Chris Martinez
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UF University of Florida IFAS Extension

The Florida Water and Climate Alliance

- Partnership of:
  - Water utilities
  - State agencies
  - Researchers
  - Local governments
- Science we can use!

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The Florida Water and Climate Alliance

www.FloridaWCA.org

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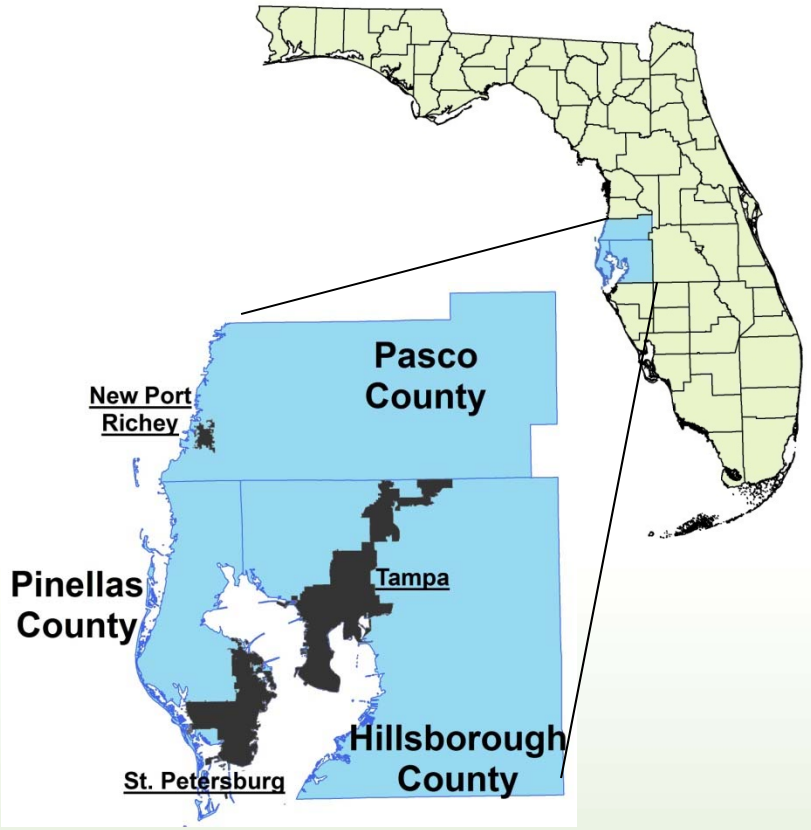
Tampa Bay Water

- Regional wholesale water supply authority
- Non-profit, special district created by interlocal agreement
- 6 member governments
- Serving 2+ million people



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Tampa Bay Water

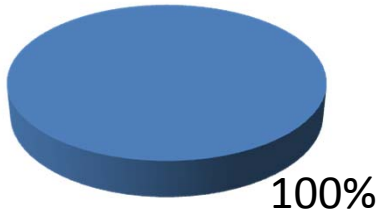
- Created in 1998 to end the region's "water wars"

- Current sources:
  - Groundwater (13 Wellfields)
  - Hillsborough and Alafia Rivers
  - C.W. Bill Young Reservoir
  - Desalination Plant

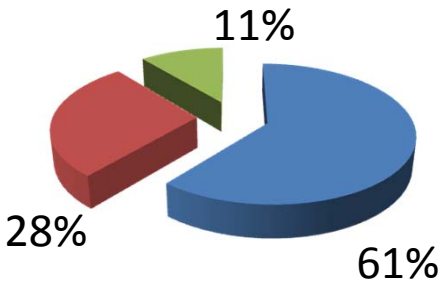
Groundwater Permit		
pre 1998	192 MGD	
1998	158 MGD	(12-month moving average)
2002	121 MGD	
2008	90 MGD	

Percentage of Water by Source

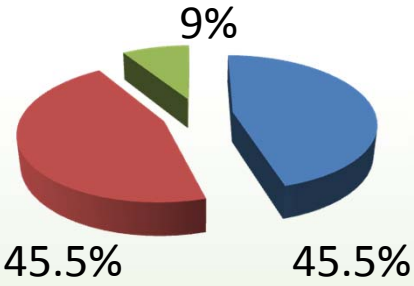
1998

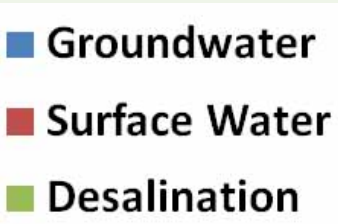


2008



2012





Links Between Information and Decisions

Decision	Time-Scale	Required Information
Operational Allocations	Weekly, out to 4 weeks	Precipitation, Streamflow and Demand forecasts
Update water-year Allocations	Monthly, out to 12 months	Precipitation and Streamflow forecasts
Infrastructure	Decades	Precipitation, Temperature, Streamflow, and Demand Projections

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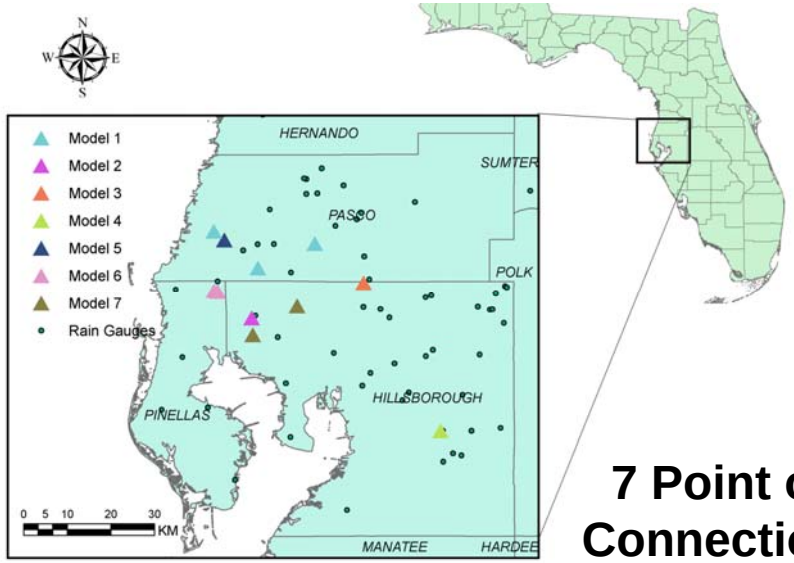
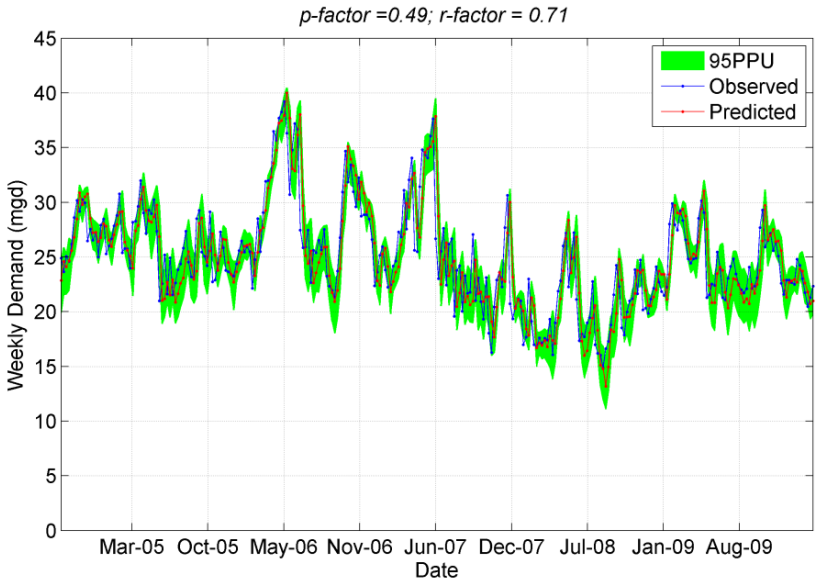
Weekly Municipal Demand

- Forecast Analogs
- Global Ensemble Forecast System (GEFS)
- ARIMAX models
  - Total Rainfall
  - Number of Wet Days
  - Consecutive Wet Days
  - Number of Hot Days

- **<u>Uncertainty Reduced</u>**



7 Point of Connections



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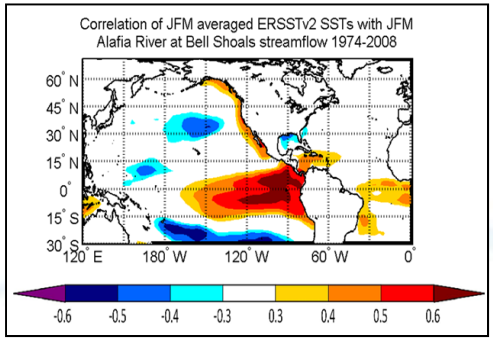
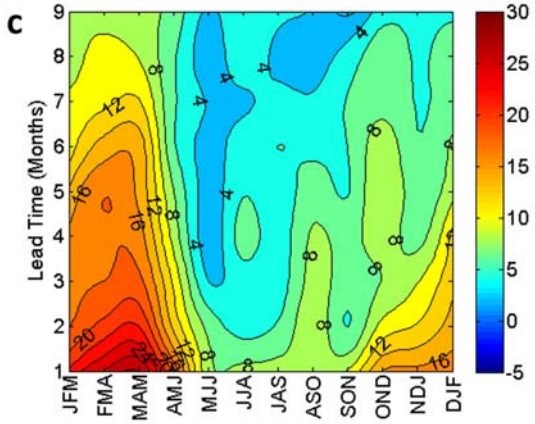
Seasonal Streamflow

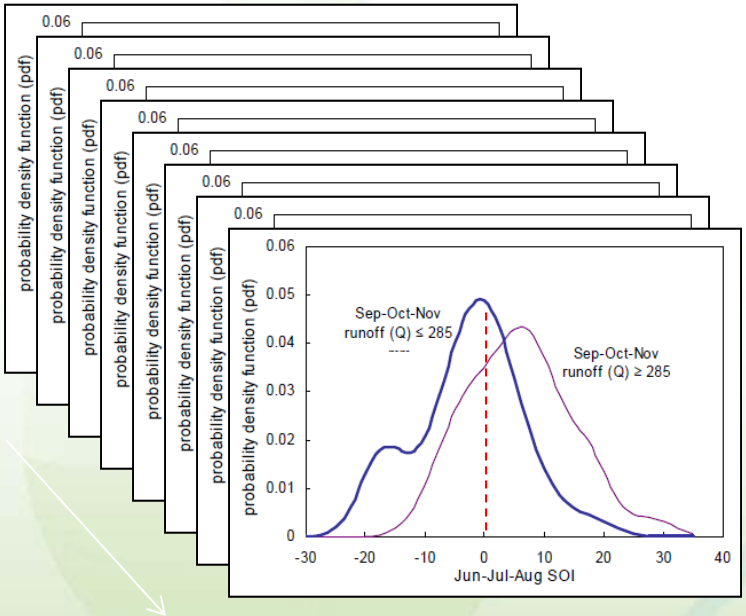
Exploratory Analysis



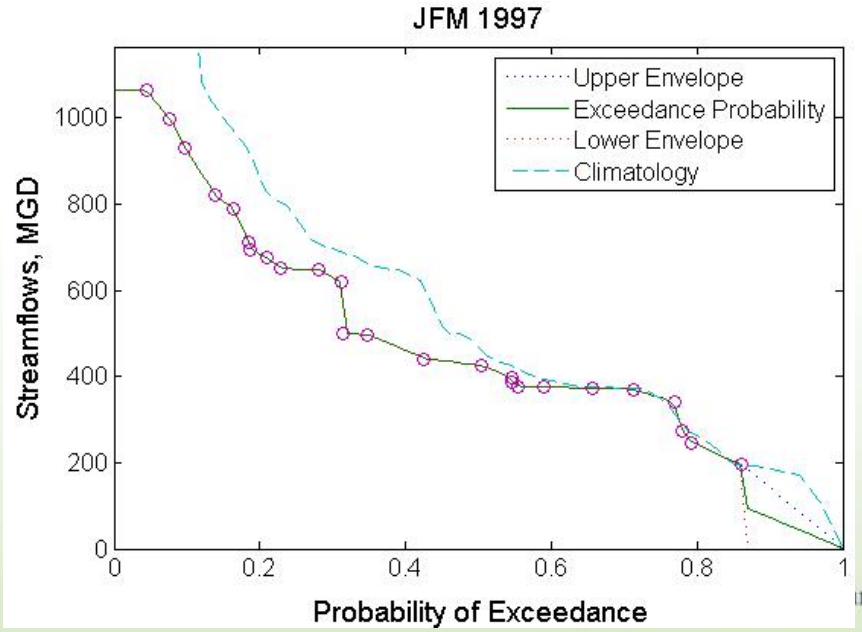
LEPS Skill Score



Stratify Flow by Niño3.4

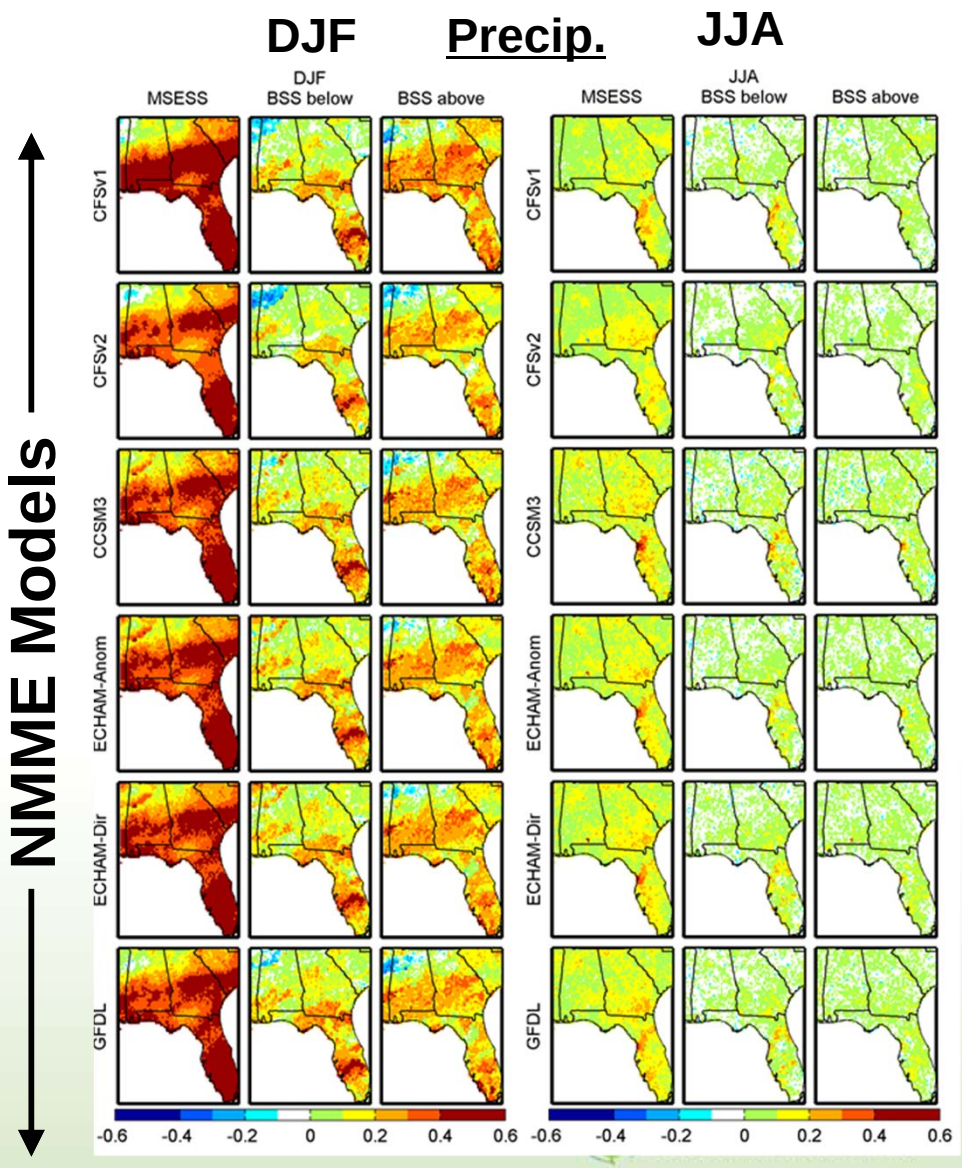


Alafia River at Bell Shoals



National Multi-Model Ensemble (NMME)

- 6 GCM reforecasts
- Downscaled to 12 km
- Multiple downscaling methods
- Ensemble performed as well as best single model



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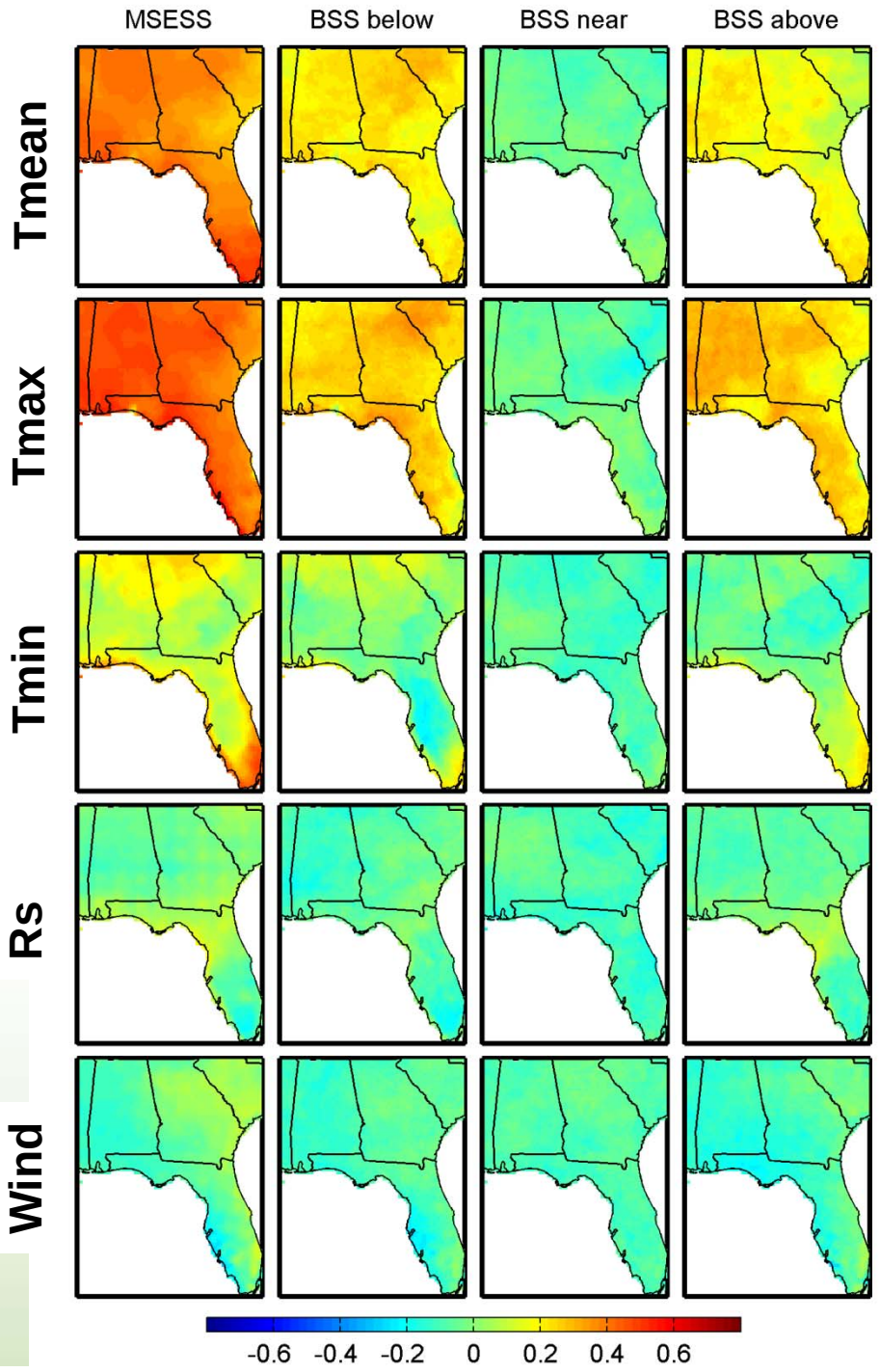
Seasonal Reference Evapotranspiration

- Climate Forecast System v2 (CFSv2)
- Downscaled to 12 km
- Quantile mapping
- Penman Monteith

- **<u>Skill highest in winter & during ENSO events</u>**



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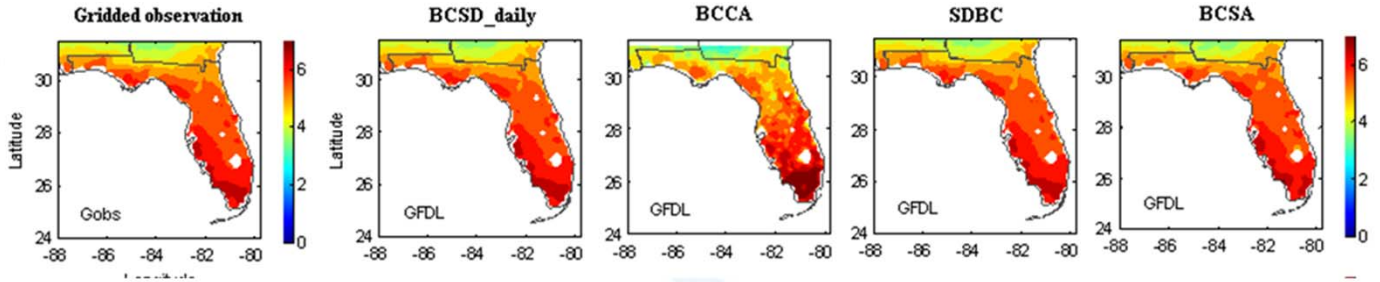
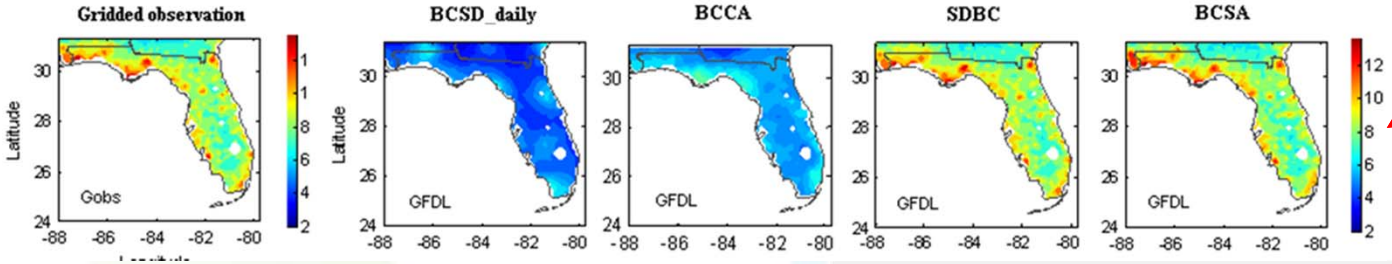
Statistical Downscaling Methods

Wet season average daily rainfall

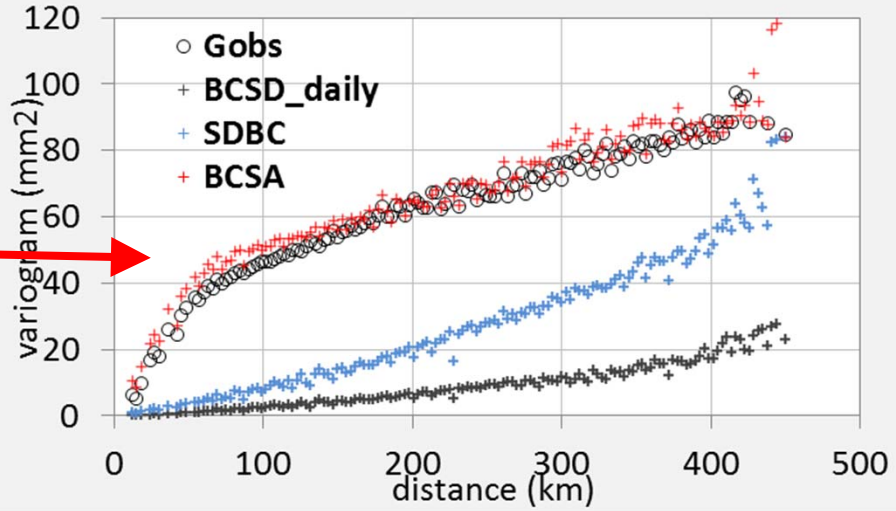


Wet season standard deviation of daily rainfall



UF Method

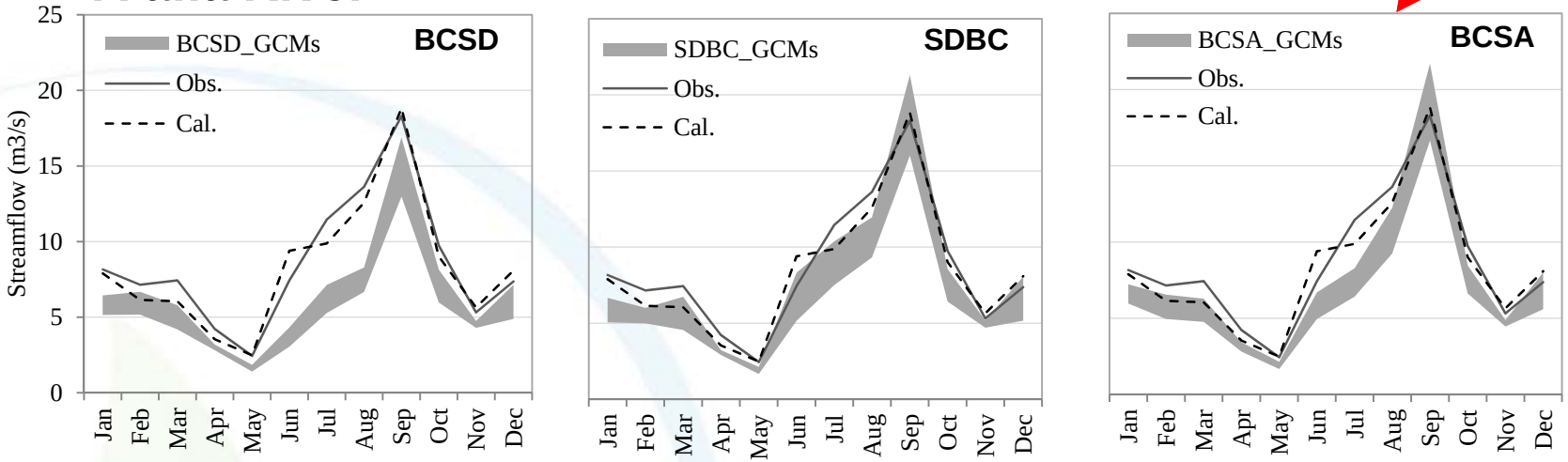
UF Downscaling Method Works Best!



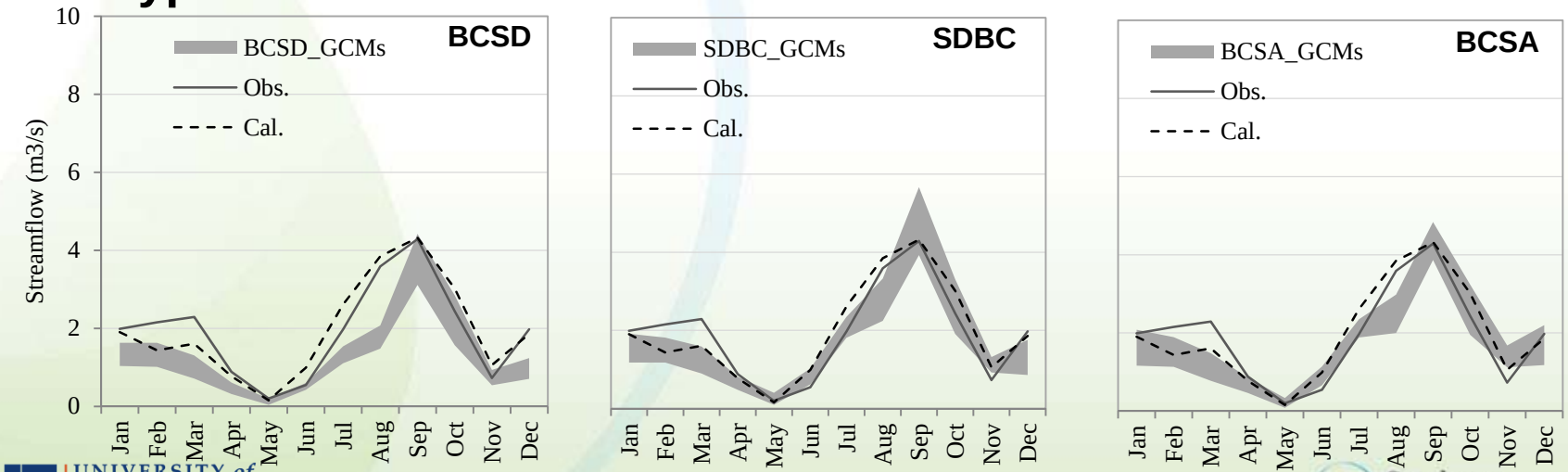
Hydrologic Implications

UF Method

Alafia River



Cypress Creek



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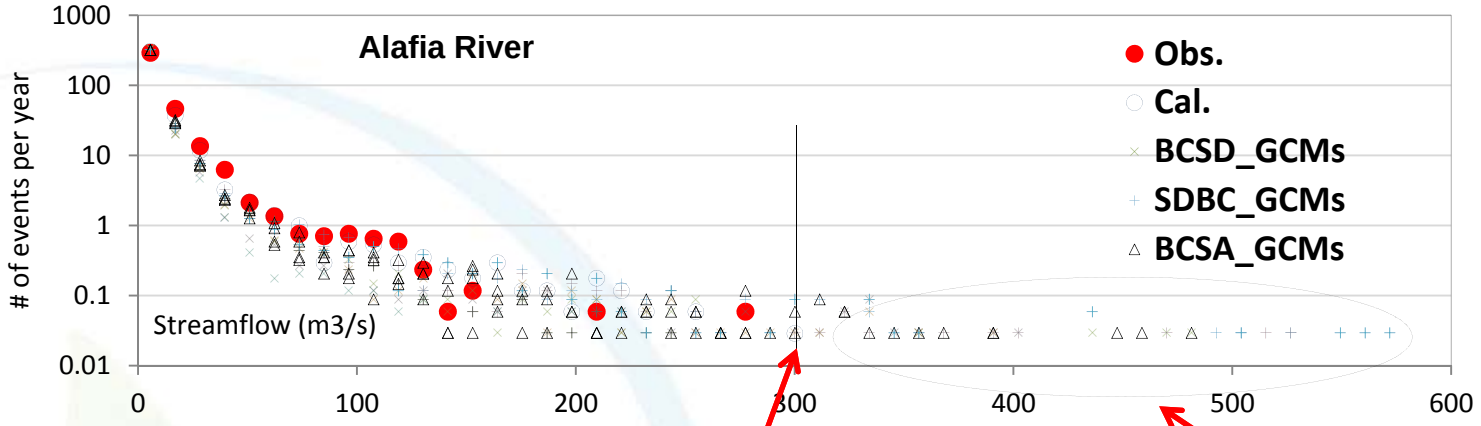
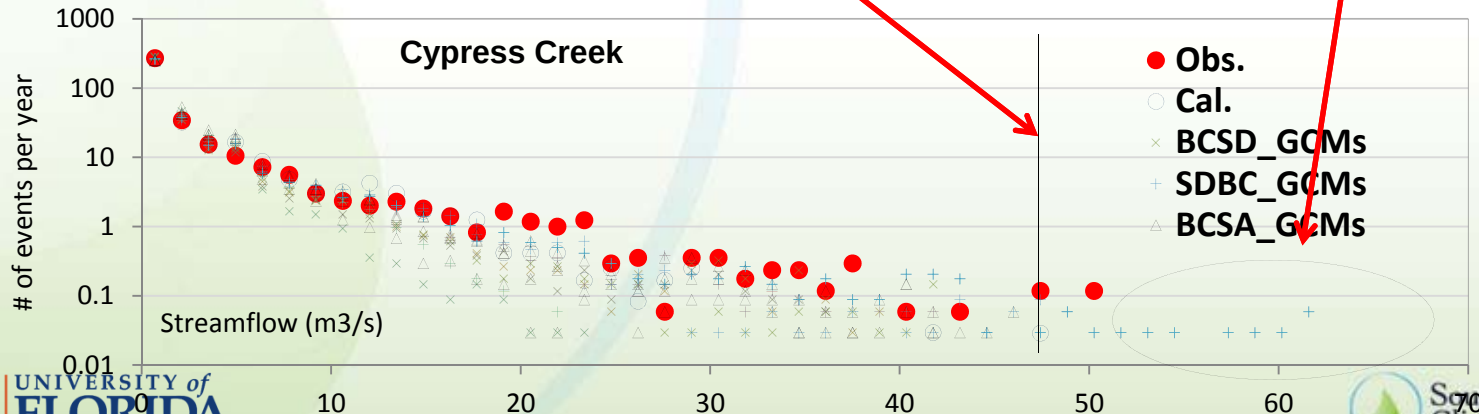
Frequency of daily streamflow events



Max Observed

Over-prediction of peaks



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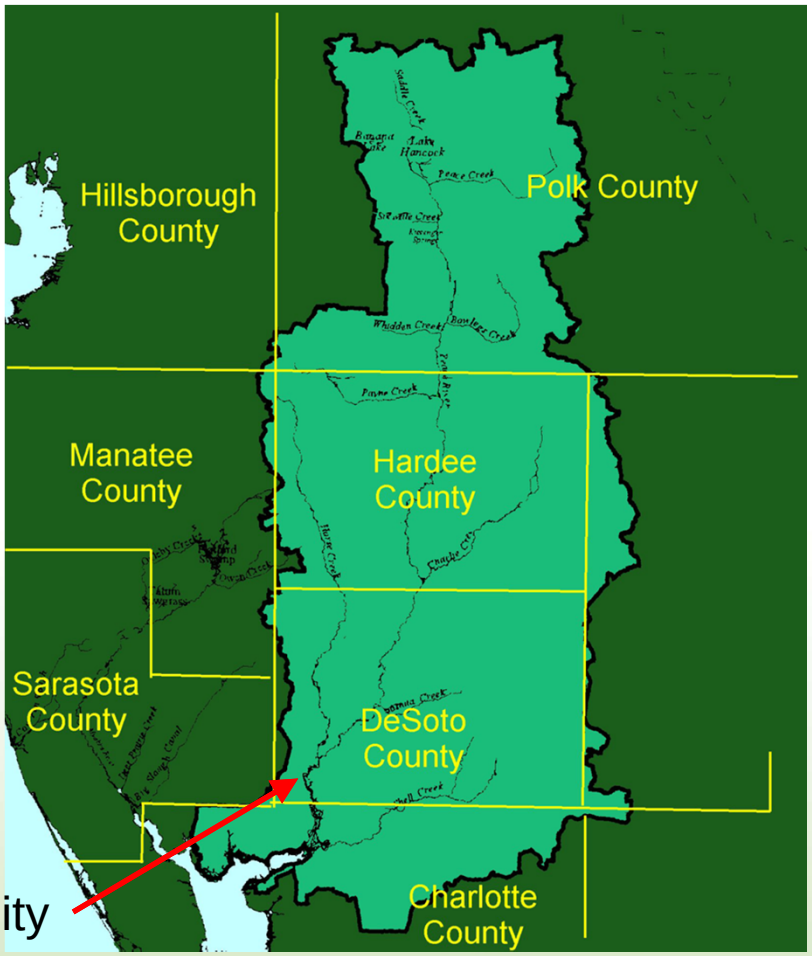
Peace River Manasota Regional Water Supply Authority

- Regional wholesale water supply authority
- 300,000 customers
- ***Peace River is the single source***



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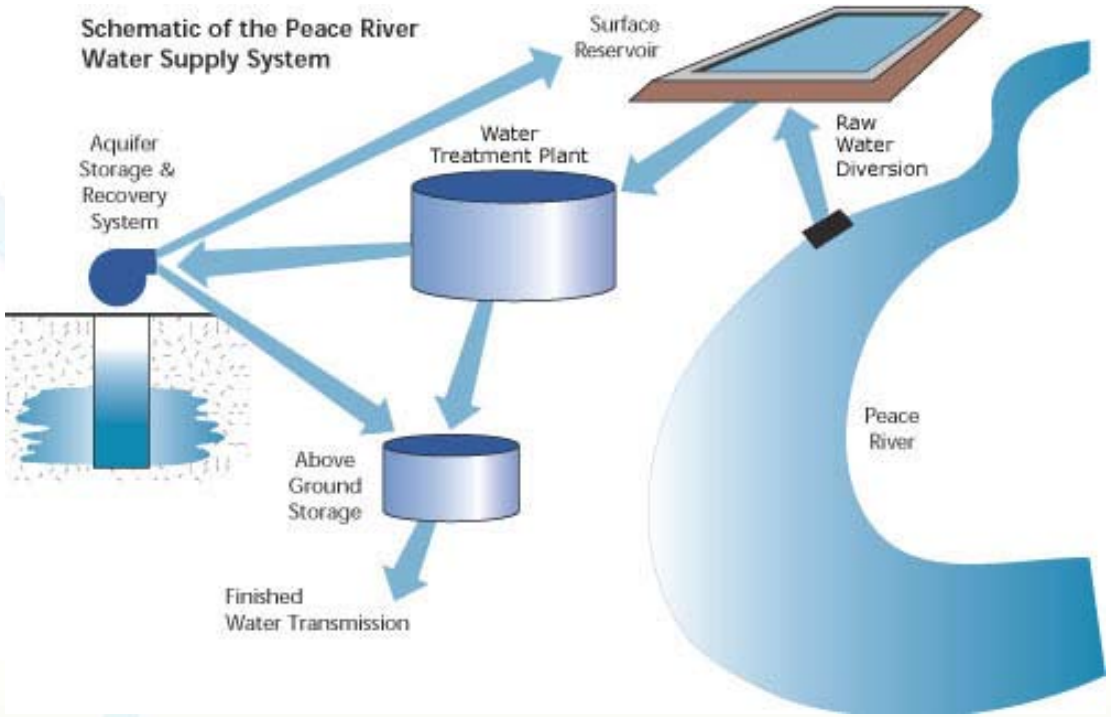
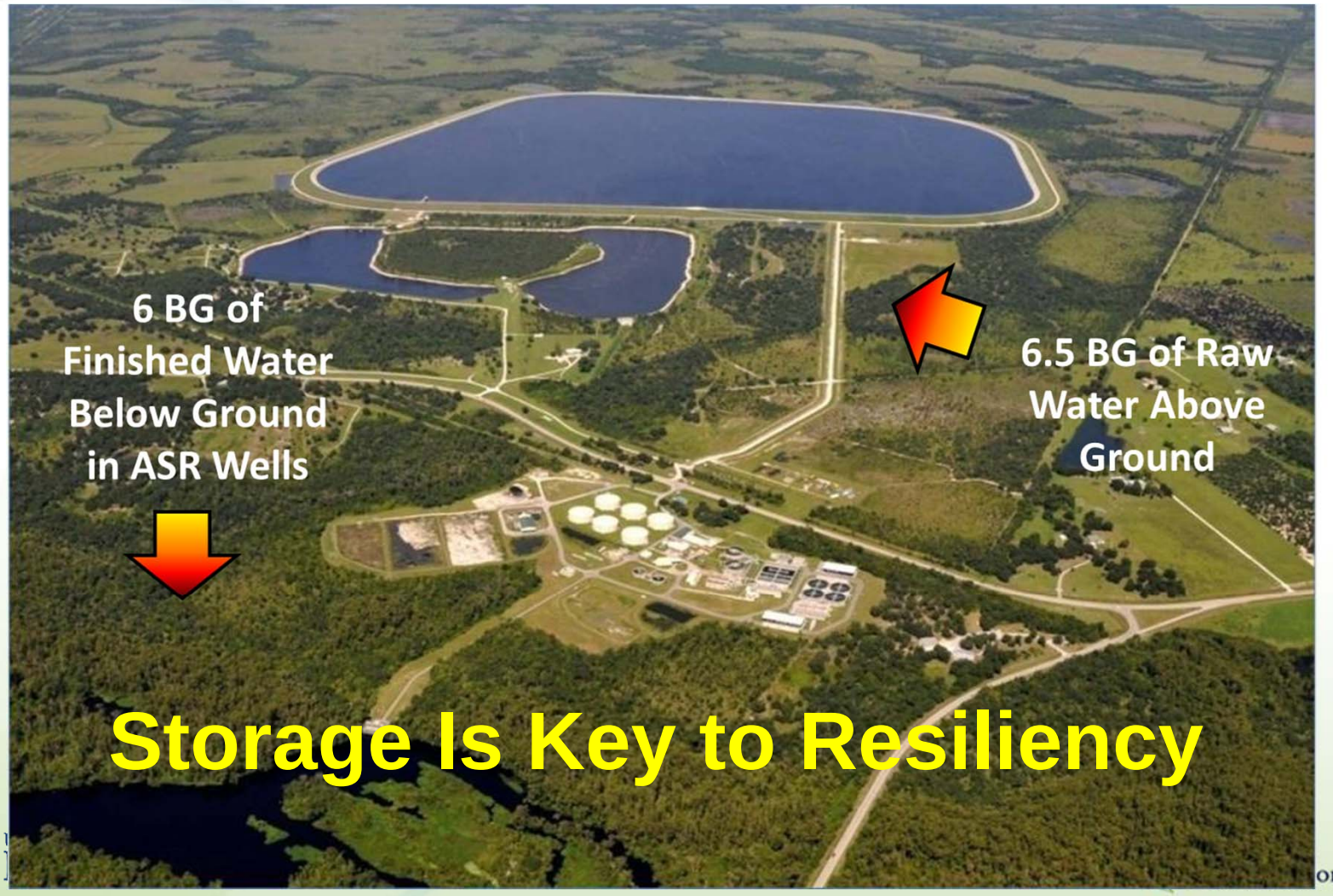
Peace River Supply System

- Highly Seasonal River Flows
- Reservoir
- Largest ***Aquifer Storage and Recovery (ASR)*** East of the Mississippi



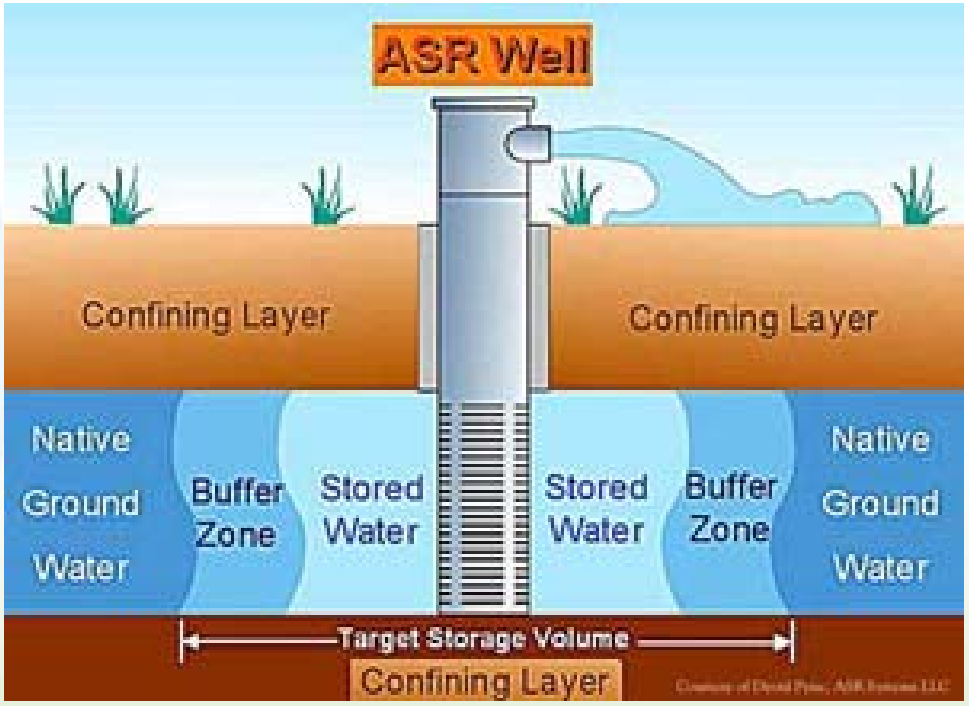
Peace River Supply System



Aquifer Storage and Recovery (ASR)

- When to start ASR recovery?

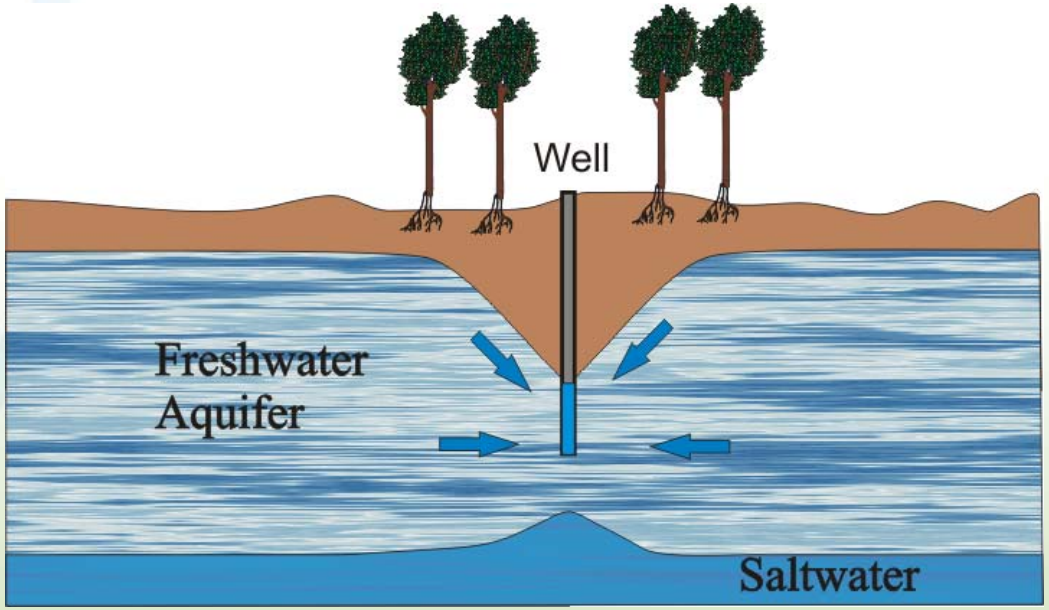
- **<u>Too Soon</u>**:
  - Costs rise (ASR Water treated twice!)
  - Higher TDS (blended water quality issue)



Aquifer Storage and Recovery (ASR)

- When to start ASR recovery?

- **<u>Too Late</u>**:
  - Less reservoir water to dilute TDS of ASR water
  - Water restrictions
  - Pull hard on wells potential salt water upconing



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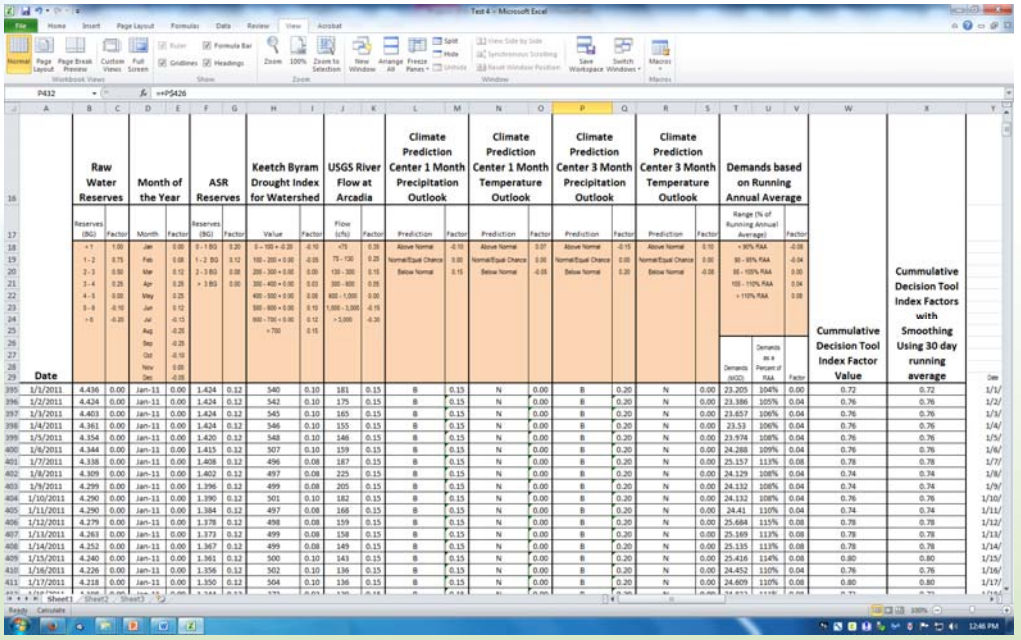
Aquifer Storage and Recovery (ASR)

- **<u>Decision Support Tool</u>**:
  - Keetch Byram Drought Index (KBDI)
  - CPC 1 Month Outlooks
  - CPC 3 Month Outlooks
  - Raw water reserves
  - ASR reserves
  - River flow

- ***Different Weights***



Date	Raw Water Reserves		Month of the Year		ASR Reserves		Keetch Byram Drought Index for Watershed		USGS River Flow at Arcadia		Climate Prediction Center 1 Month Precipitation Outlook		Climate Prediction Center 1 Month Temperature Outlook		Climate Prediction Center 3 Month Precipitation Outlook		Climate Prediction Center 3 Month Temperature Outlook		Demands based on Running Annual Average			Cummulative Decision Tool Index Factor Value	Cummulative Decision Tool Index Factors with Smoothing Using 30 day running average	
	Reserves (BG)	Factor	Month	Factor	Reserves (BG)	Factor	Value	Factor	Flow (cfs)	Factor	Prediction	Factor	Prediction	Factor	Prediction	Factor	Prediction	Factor	Range (% of Running Annual Average)	Factor				
395	1/3/2011	4.436	0.00	Jan-11	0.00	1.424	0.12	540	0.10	181	0.15	B	0.15	N	0.00	B	0.20	N	0.00	23,205	104%	0.04	0.72	0.72	1/1/
396	1/2/2011	4.424	0.00	Jan-11	0.00	1.424	0.12	542	0.10	175	0.15	B	0.15	N	0.00	B	0.20	N	0.00	23,386	105%	0.04	0.76	0.76	1/2/
397	1/3/2011	4.403	0.00	Jan-11	0.00	1.424	0.12	545	0.10	165	0.15	B	0.15	N	0.00	B	0.20	N	0.00	23,657	106%	0.04	0.76	0.76	1/3/
398	1/4/2011	4.361	0.00	Jan-11	0.00	1.424	0.12	546	0.10	155	0.15	B	0.15	N	0.00	B	0.20	N	0.00	23,53	106%	0.04	0.76	0.76	1/4/
399	1/5/2011	4.354	0.00	Jan-11	0.00	1.420	0.12	548	0.10	146	0.15	B	0.15	N	0.00	B	0.20	N	0.00	23,974	108%	0.04	0.76	0.76	1/5/
400	1/6/2011	4.344	0.00	Jan-11	0.00	1.415	0.12	507	0.10	159	0.15	B	0.15	N	0.00	B	0.20	N	0.00	24,288	109%	0.04	0.76	0.76	1/6/
401	1/7/2011	4.338	0.00	Jan-11	0.00	1.408	0.12	496	0.08	187	0.15	B	0.15	N	0.00	B	0.20	N	0.00	25,157	113%	0.08	0.78	0.78	1/7/
402	1/8/2011	4.309	0.00	Jan-11	0.00	1.402	0.12	497	0.08	225	0.15	B	0.15	N	0.00	B	0.20	N	0.00	24,129	108%	0.04	0.74	0.74	1/8/
403	1/9/2011	4.299	0.00	Jan-11	0.00	1.396	0.12	499	0.08	205	0.15	B	0.15	N	0.00	B	0.20	N	0.00	24,132	108%	0.04	0.74	0.74	1/9/
404	1/10/2011	4.290	0.00	Jan-11	0.00	1.390	0.12	501	0.10	182	0.15	B	0.15	N	0.00	B	0.20	N	0.00	24,132	108%	0.04	0.76	0.76	1/10/
405	1/11/2011	4.290	0.00	Jan-11	0.00	1.384	0.12	497	0.08	168	0.15	B	0.15	N	0.00	B	0.20	N	0.00	24,41	110%	0.04	0.74	0.74	1/11/
406	1/12/2011	4.279	0.00	Jan-11	0.00	1.378	0.12	498	0.08	159	0.15	B	0.15	N	0.00	B	0.20	N	0.00	25,684	115%	0.08	0.78	0.78	1/12/
407	1/13/2011	4.263	0.00	Jan-11	0.00	1.373	0.12	499	0.08	158	0.15	B	0.15	N	0.00	B	0.20	N	0.00	25,169	113%	0.08	0.78	0.78	1/13/
408	1/14/2011	4.252	0.00	Jan-11	0.00	1.367	0.12	499	0.08	149	0.15	B	0.15	N	0.00	B	0.20	N	0.00	25,135	113%	0.08	0.78	0.78	1/14/
409	1/15/2011	4.240	0.00	Jan-11	0.00	1.361	0.12	500	0.10	143	0.15	B	0.15	N	0.00	B	0.20	N	0.00	25,416	114%	0.08	0.80	0.80	1/15/
410	1/16/2011	4.226	0.00	Jan-11	0.00	1.356	0.12	502	0.10	136	0.15	B	0.15	N	0.00	B	0.20	N	0.00	24,452	110%	0.04	0.76	0.76	1/16/
411	1/17/2011	4.218	0.00	Jan-11	0.00	1.350	0.12	504	0.10	136	0.15	B	0.15	N	0.00	B	0.20	N	0.00	24,609	110%	0.08	0.80	0.80	1/17/

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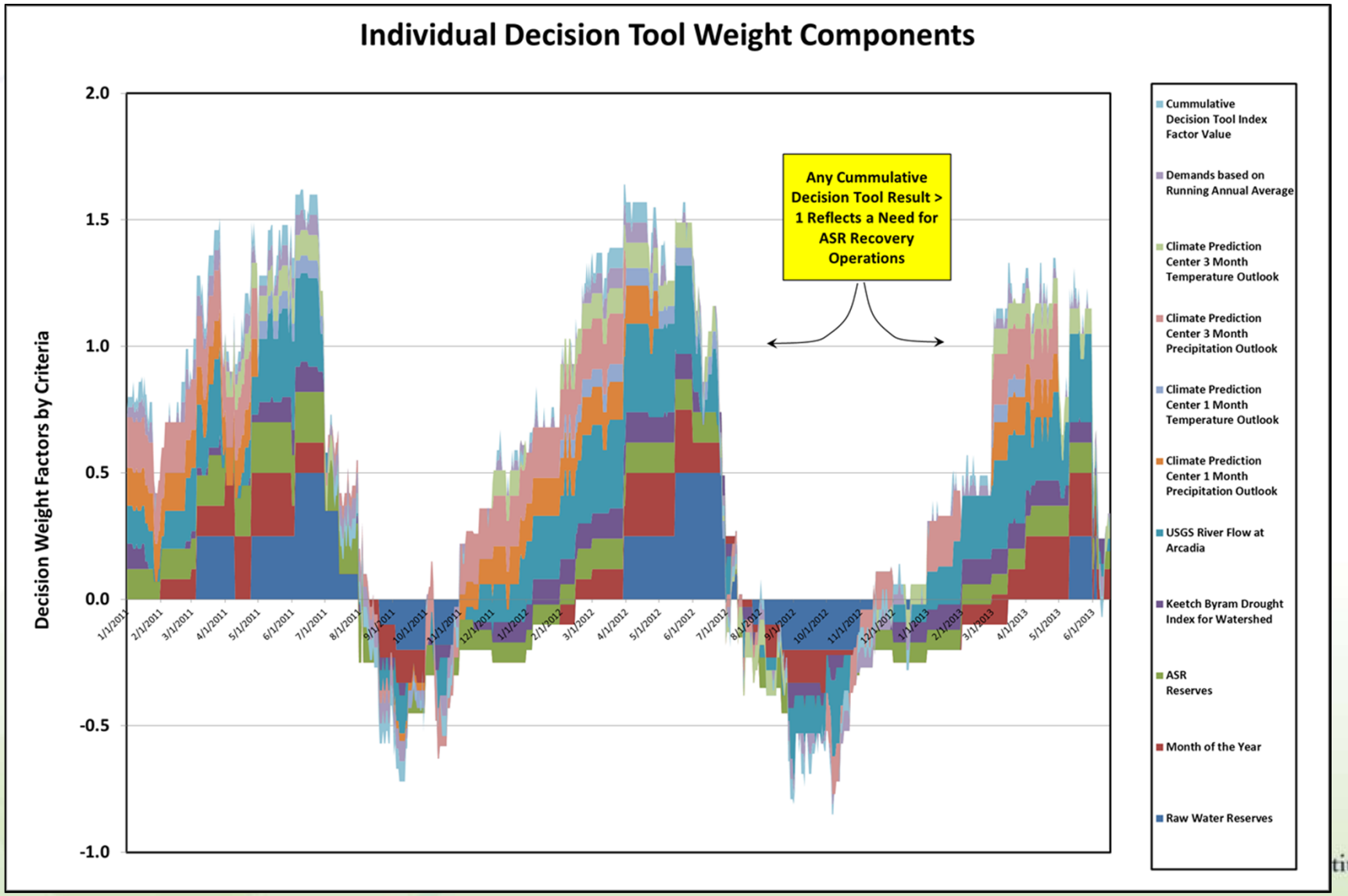
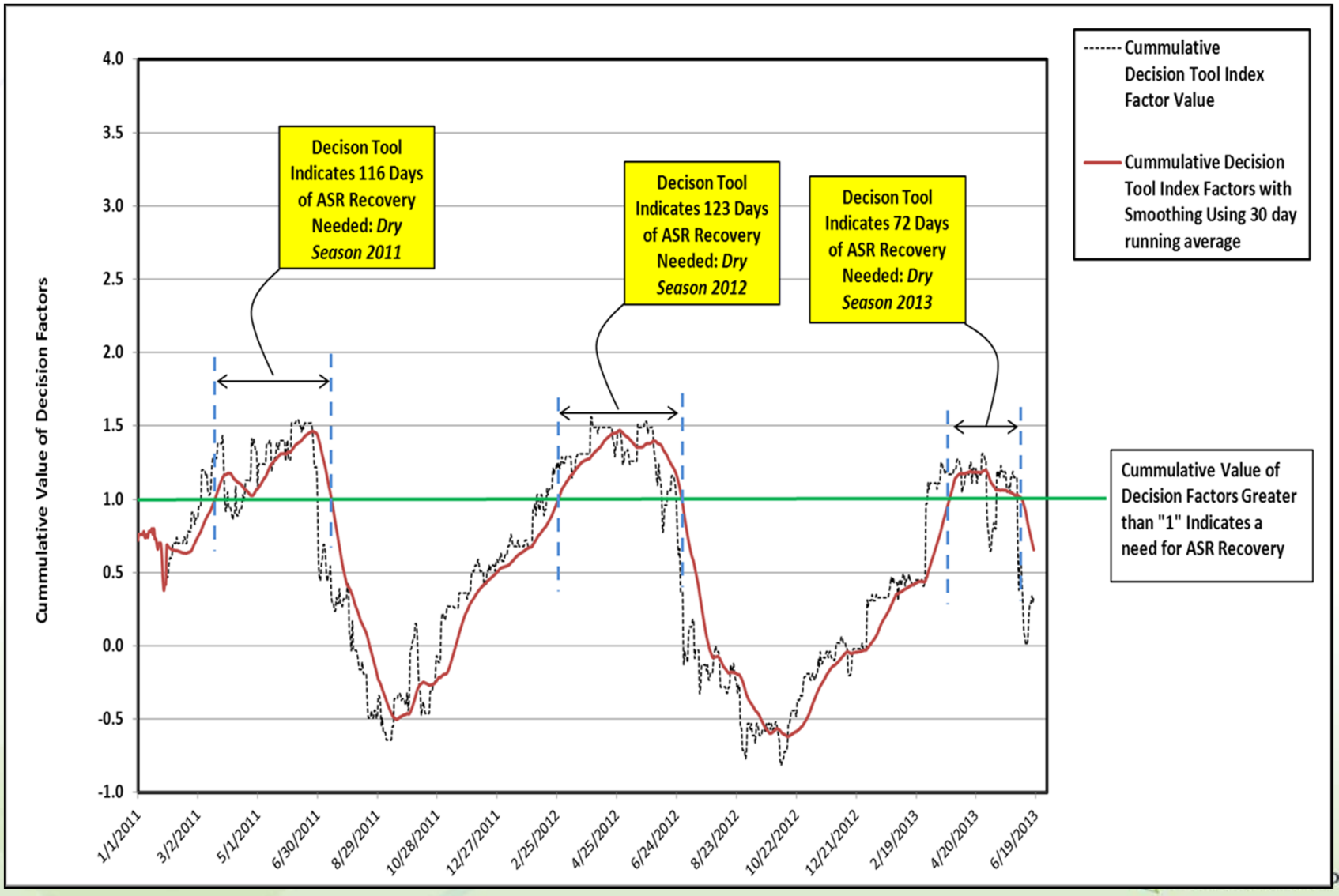
Aquifer Storage and Recovery (ASR)

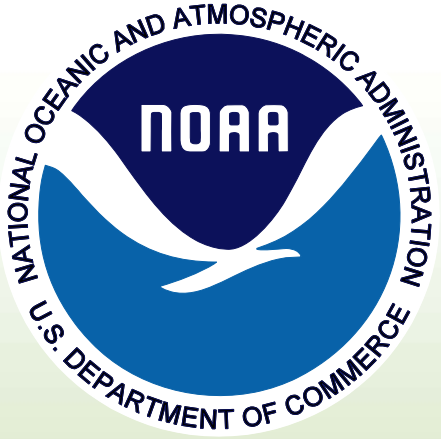


Aquifer Storage and Recovery (ASR)



Questions?

- NOAA Sectoral Applications Research Program (SARP)
- NOAA Regional Integrated Science and Assessments Program (RISA)
- Tampa Bay Water



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