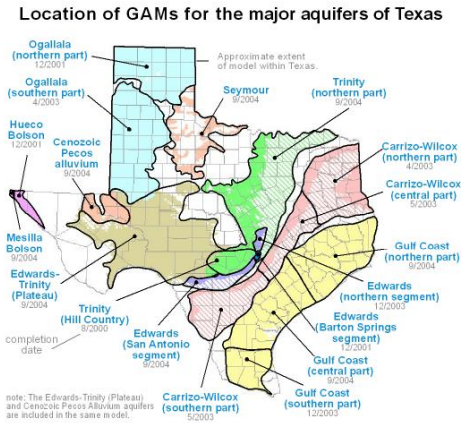
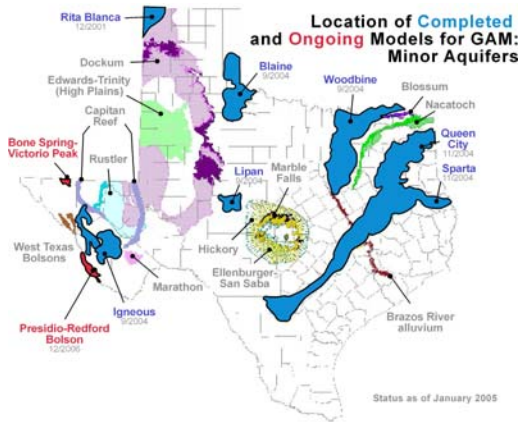
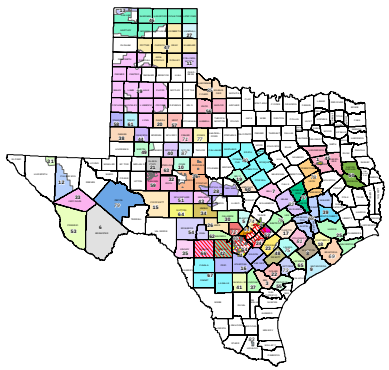
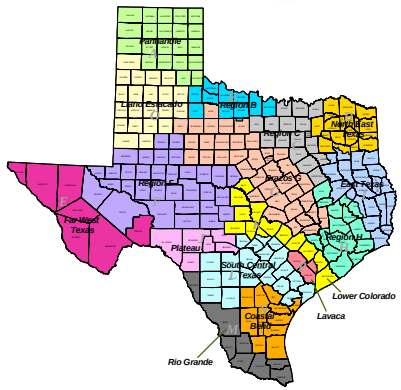
Groundwater Availability Modeling

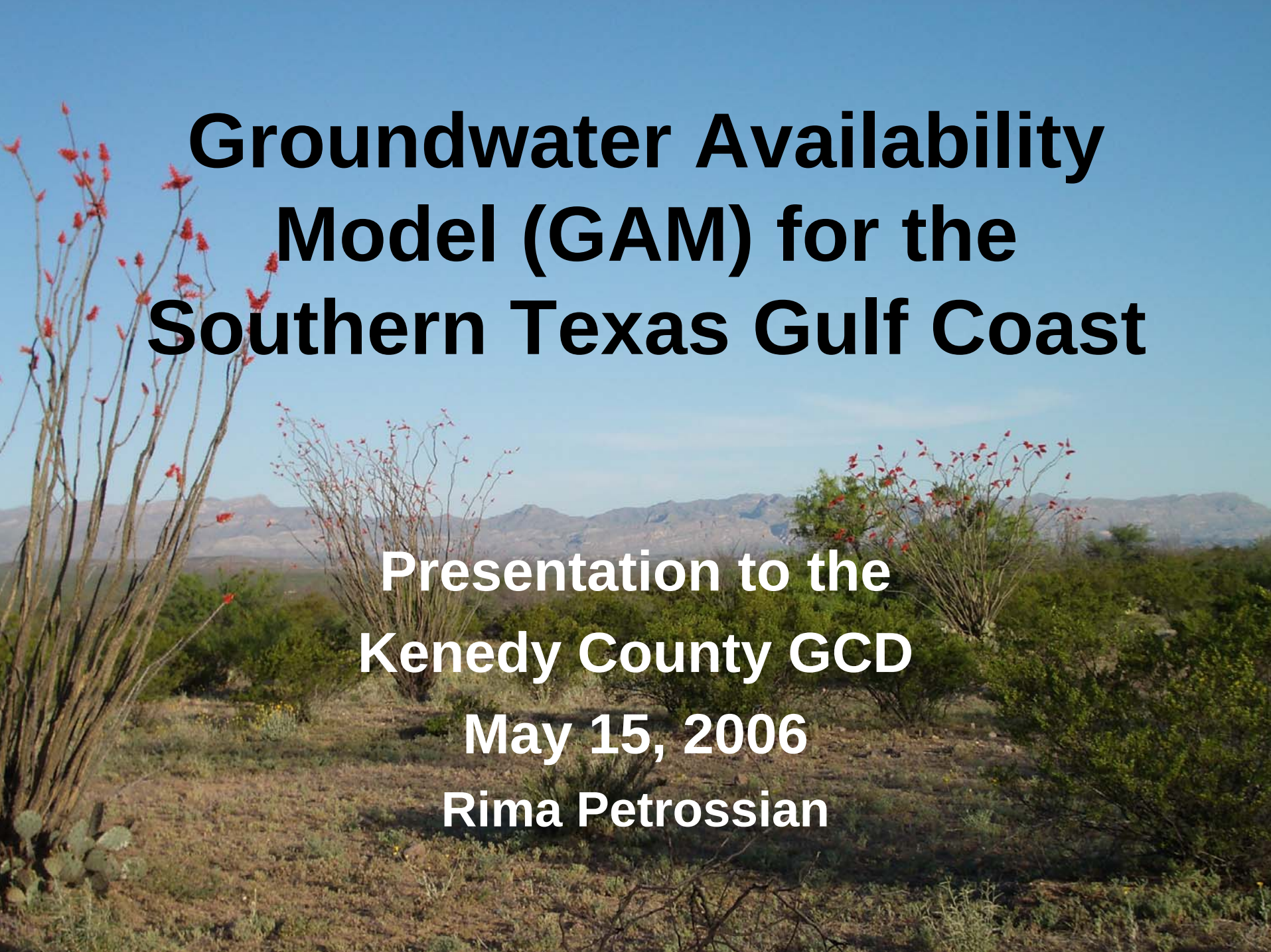








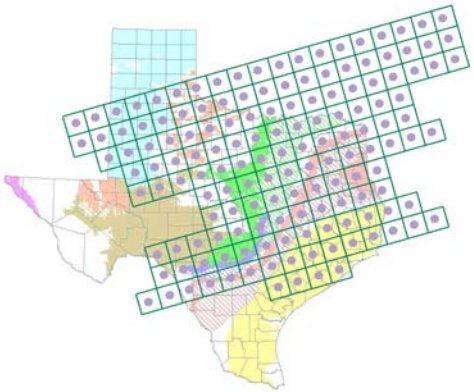
Texas Water Development Board



Groundwater Availability Model (GAM) for the Southern Texas Gulf Coast

Presentation to the
Kenedy County GCD
May 15, 2006

Rima Petrossian



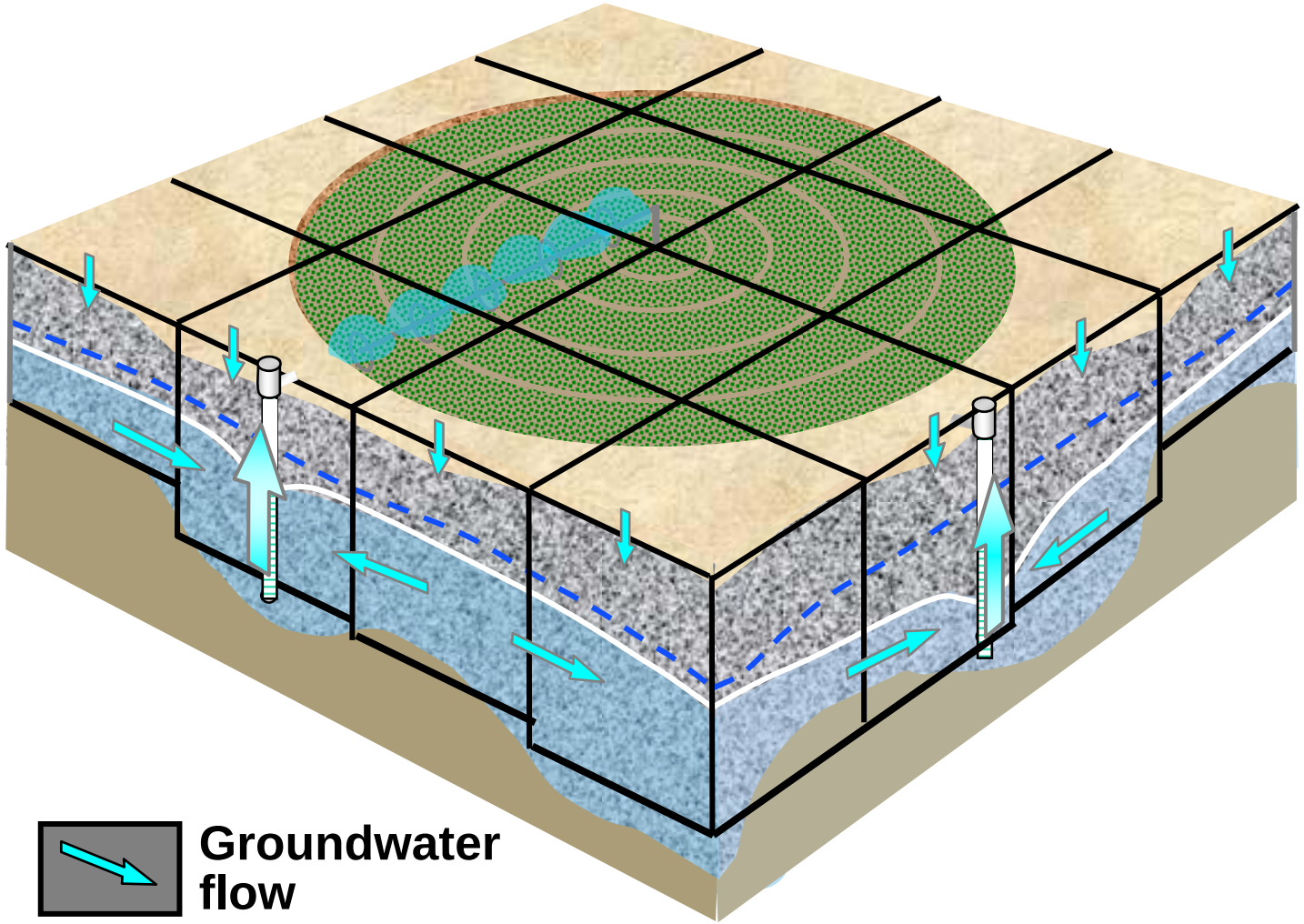
How do we use GAM?

- **The model**
  - **predict water levels and flows in response to pumping and drought**
  - **effects of well fields**
- **Data Storehouse**
  - **water in storage**
  - **recharge estimates**
  - **hydraulic properties**
  - **geologic structure**

Groundwater Modeling

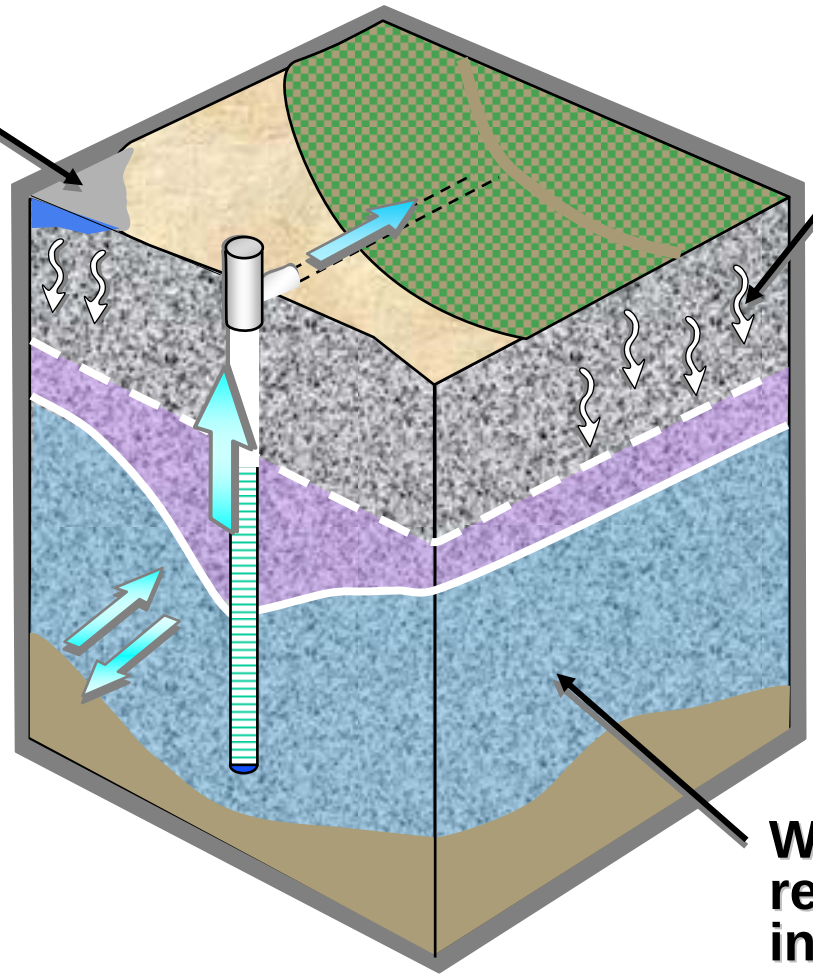
- **We model the aquifer by dissecting or dividing it into blocks.**
- **Each block is called a “grid cell”.**
- **Water flowing in and out of each grid cell is calculated and balanced by the computer.**
- **Inflows and outflows can include:**
  - **cross formational flow (up and down flows),**
  - **lateral inflow and outflow (side to side),**
  - **pumping (water taken out of aquifer),**
  - **recharge (water being added to aquifer),**
  - **evapotranspiration, and**
  - **stream inflows and outflows.**

Cutout of aquifer dissected into grid cells



From, Daniel B. Stephens & Associates, Inc.

Flow in one grid cell



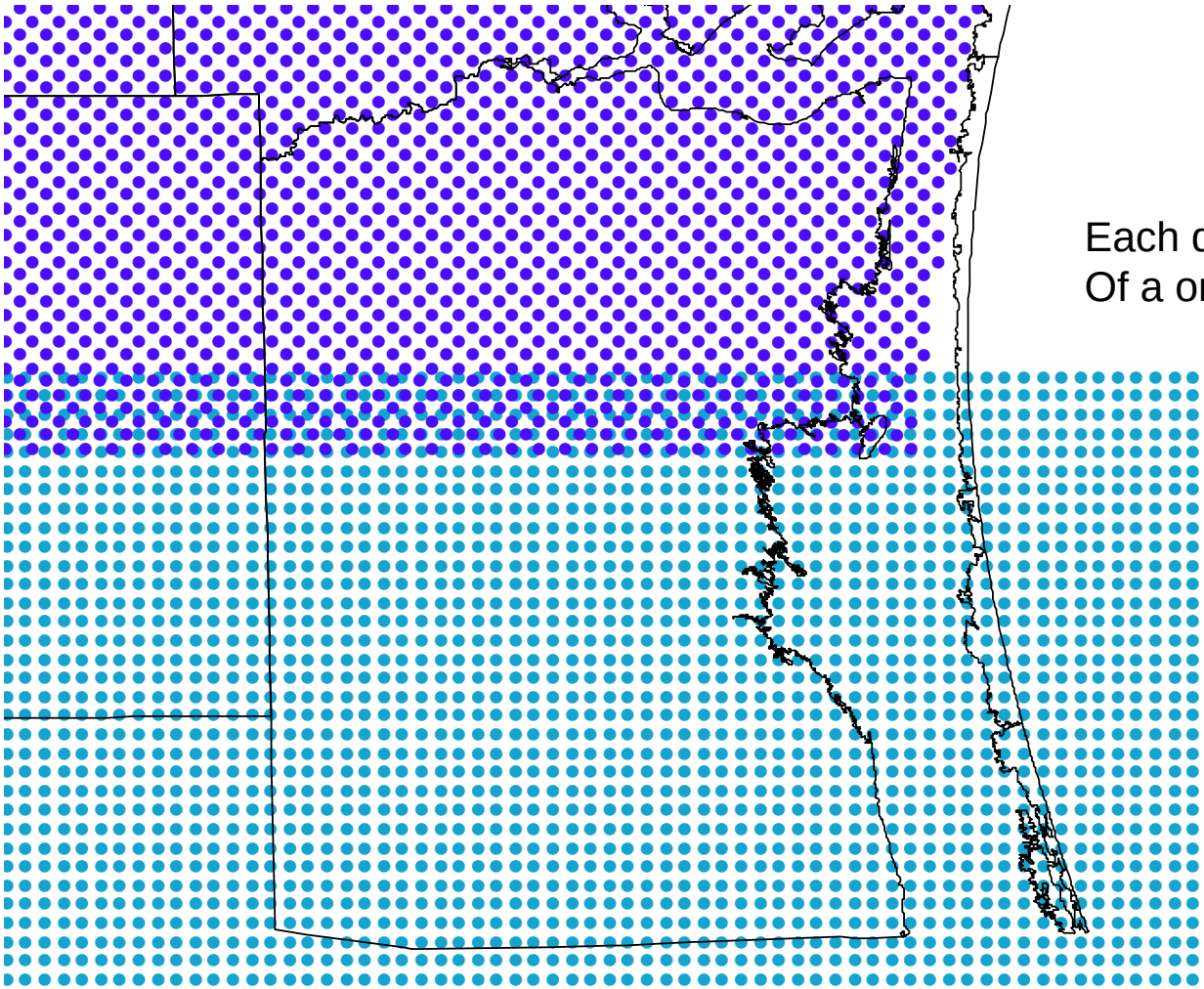
- Permeability
- Storage
- Thickness

From, Daniel B. Stephens & Associates, Inc.

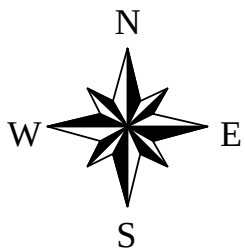
Problem Statement

The Central Gulf Coast GAM and the Lower Rio Grande Valley GAM have an overlap of ~5 miles creating a double accounting in the water budgets

Map of Kenedy County with GAM Overlap Area



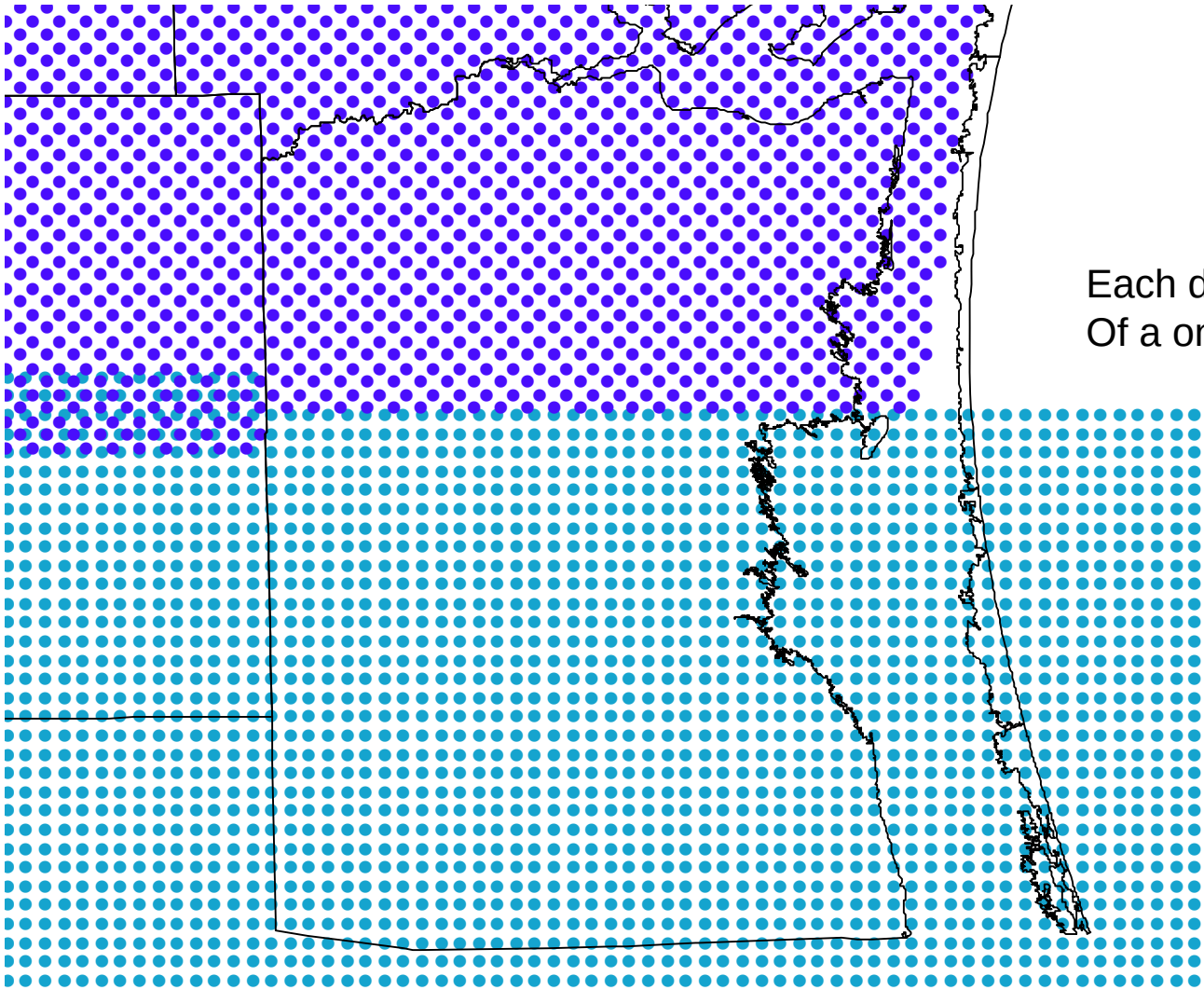
Each dot is the center
Of a one square mile grid cell



Modeling Solution

- Evaluate the overlap and determine the distance
- Divide the distance by two
- Run each model without ½ of the grid cells in the overlap zone for the 1980-1999 period
- Compute the average value for the twenty year period

Map of Kenedy County with Overlap Removed



Each dot is the center
Of a one square mile grid cell

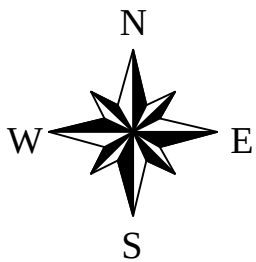


Table Showing Change in the Water Budget in the Central Gulf Coast GAM without the Overlap Cells

GCD	GCD Number	Model Zone	Model	Aquifer	RWPG Letter	Precipitation Recharge (acft/yr)	Av. Surface Water Inflow (1980-99) (acft/yr)	Av. Surface Water Outflow (1980-99) (acft/yr)	Av. Inflow into district (acft/yr)	Av. Outflow from district (acft/yr)	Av. Net Inter-aquifer flow (upper) (acft/yr)	Av. Net Inter-aquifer flow (lower) (acft/yr)
Old Values Using the Overlap												
Kenedy County	37	10	Gulf Coast-Central	Chicot aquifer	N	26,496	13,228	44,422	20,127	17,310	0	-217
Kenedy County	37	10	Gulf Coast-Central	Evangeline aquif	N	0	0	0	6,213	5,702	217	846
Kenedy County	37	10	Gulf Coast-Central	Burkeville CU	N	0	0	0	444	164	-846	391
Kenedy County	37	10	Gulf Coast-Central	Jasper aquifer	N	0	0	0	444	164	-391	0
New Values without the Ovelap												
Kenedy County	37	10	Gulf Coast-Central	Chicot aquifer	N	23,945	13,228	42,570	18,122	14,277	0	-235
Kenedy County	37	10	Gulf Coast-Central	Evangeline aquif	N	0	0	0	6,006	5,451	235	842
Kenedy County	37	10	Gulf Coast-Central	Burkeville CU	N	0	0	0	439	160	-842	391
Kenedy County	37	10	Gulf Coast-Central	Jasper aquifer	N	0	0	0	444	164	-391	0

Table Showing Change in the Water Budget in the Lower Rio Grande GAM without the Overlap Cells

GCD	GCD Number	Model Zone	Model	Aquifer	RWPG Letter	Precipitation Recharge (acft/yr)	Av. Surface Water Inflow (1980-99) (acft/yr)	Av. Surface Water Outflow (1980-99) (acft/yr)	Av. Inflow into district (acft/yr)	Av. Outflow from district (acft/yr)	Av. Net Inter-aquifer flow (upper) (acft/yr)	Av. Net Inter-aquifer flow (lower) (acft/yr)
Old Values with the Overlap												
Kenedy County GCD	37	1	Gulf Coast-South	Chicot aquifer	N	11,504	3,398	1,324	9,904	1,752	0	6,242
Kenedy County GCD	37	1	Gulf Coast-South	Evangeline aquifer	N	824	0	0	7,223	1,815	-6,242	218
Kenedy County GCD	37	1	Gulf Coast-South	Burkeville CU	N	0	0	0	12	2	-218	207
Kenedy County GCD	37	1	Gulf Coast-South	Jasper aquifer	N	0	0	0	1,192	287	-207	0
New Values without the Overlap												
Kenedy County GCD	37	1	Gulf Coast-South	Chicot aquifer	N	10,922	3,398	1,324	9,060	1,646	0	5,922
Kenedy County GCD	37	1	Gulf Coast-South	Evangeline aquifer	N	668	0	0	6,866	1,641	-5,921	208
Kenedy County GCD	37	1	Gulf Coast-South	Burkeville CU	N	0	0	0	12	1	-208	199
Kenedy County GCD	37	1	Gulf Coast-South	Jasper aquifer	N	0	0	0	1,129	262	-199	0

Comments:

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