

Geothermal Resources for the Eastern United States

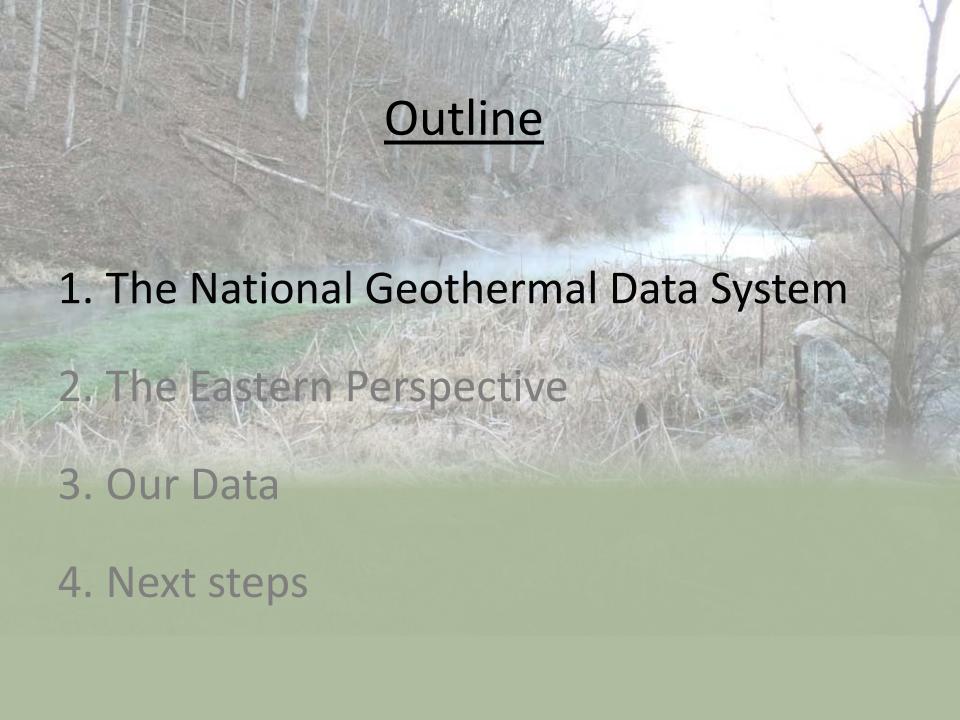
Wendy Kelly, Division of Geology and Mineral Resources September 11th 2013

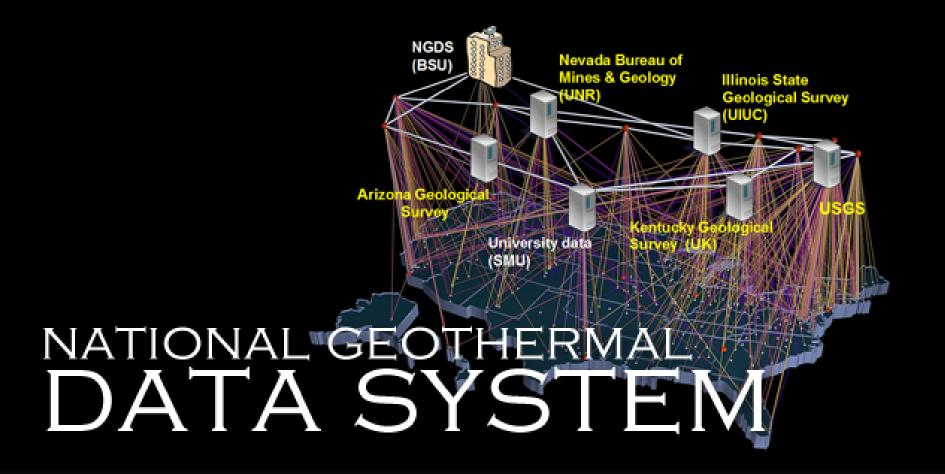




Outline

- 1. The National Geothermal Data System
- 2. The Eastern Perspective
- 3. Our Data
- 4. Next steps

















Virginia Division of Geology and Mineral Resources





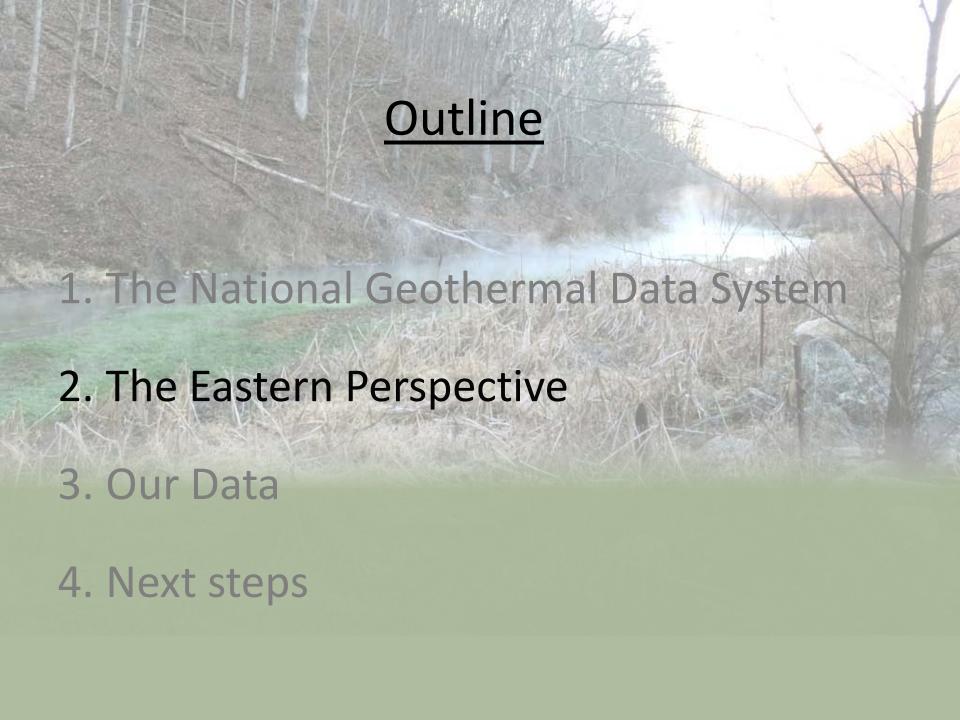


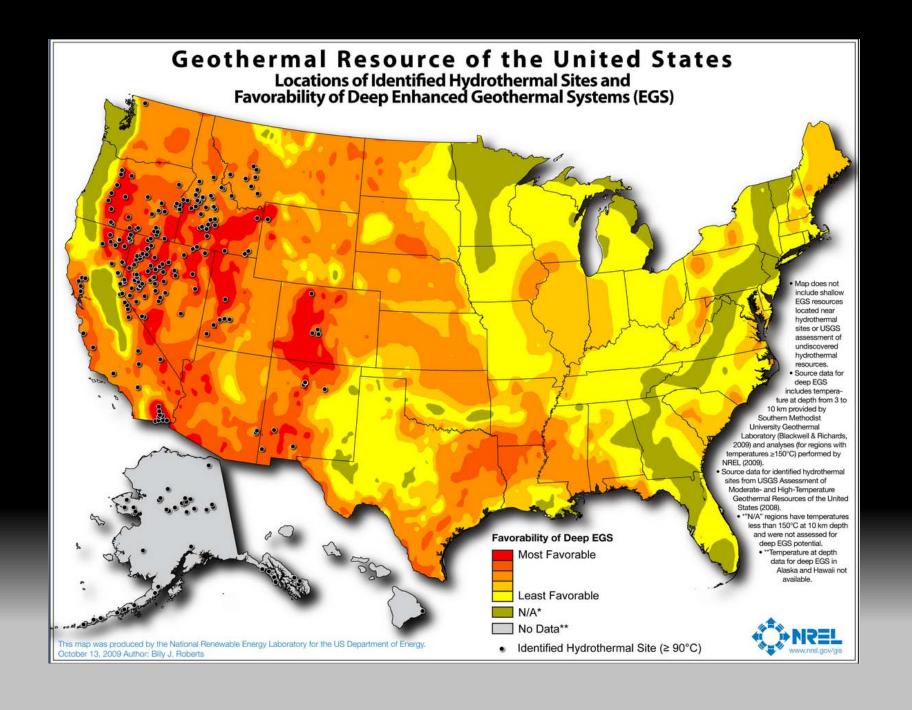


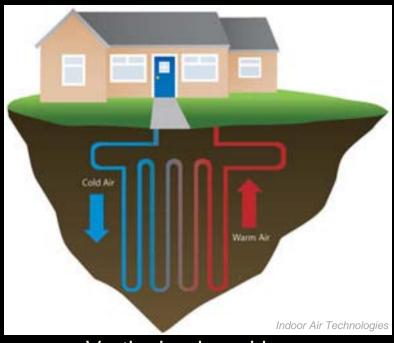












Vertical - closed loop



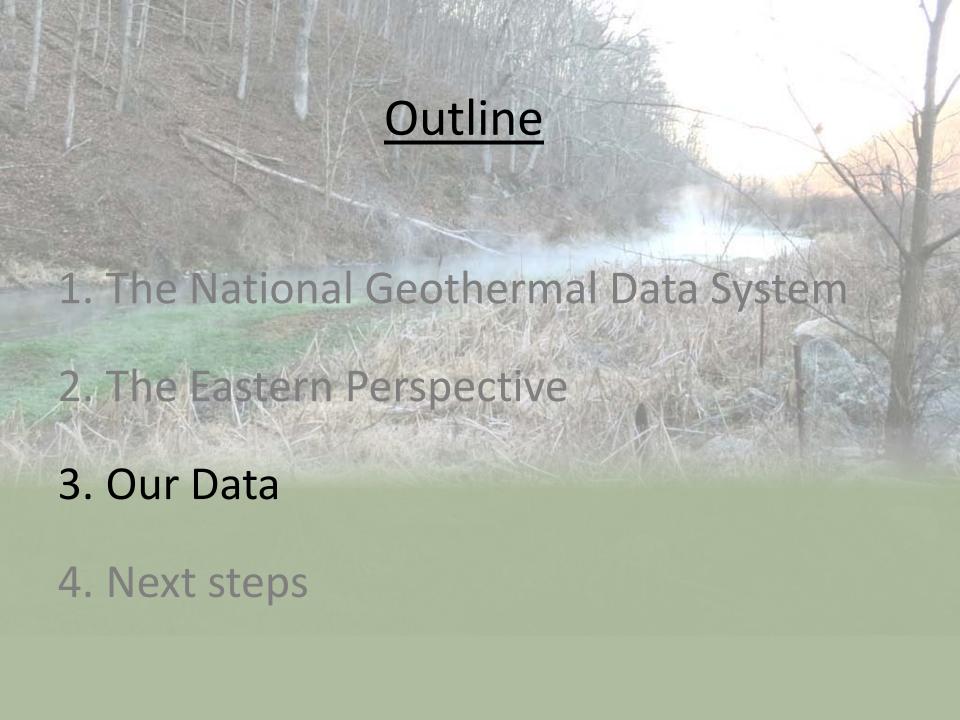
Horizontal Trench - closed loop

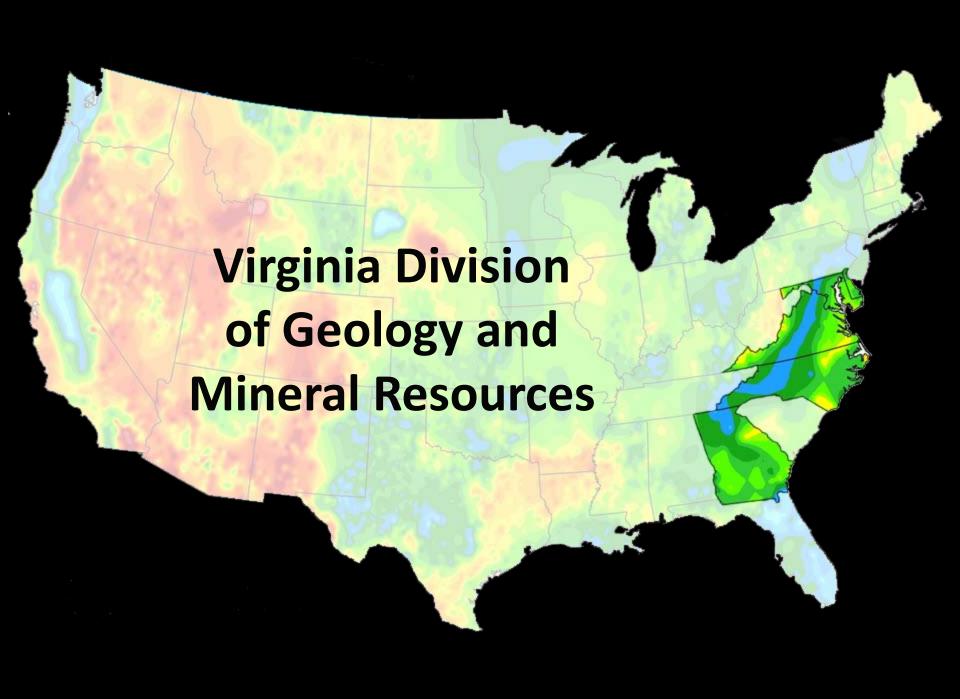


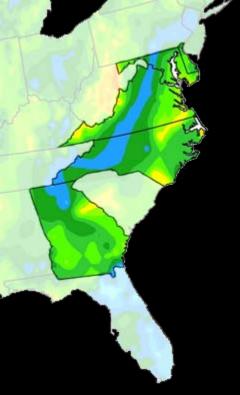
Pond - closed loop



Vertical – open loop







Data for the NGDS

Geologic Maps

Geothermal Publications

Geologic Units - descriptions and geochemistry

Thermal Springs - descriptions and aqueous chemistry

Heat Pump Installations

Gravity Data – station measurements and maps

Bottom Hole Temperatures

Heat Flow measurements

Thermal Conductivity

Borehole Data – Lithologic and Geophysical logs from Geothermal, Water, and Oil/Gas Wells

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								727 727 727	ACCOMACK	COUNTY	A SHARE STEEL	1000		THE STATE OF THE S	307	7.50		335	
- 95				1			-		TOODWACK	COOKITY				_	200			087	M.O
WWC	OWNER	DRILLER	LOCATION (nearest lown)	TD	SWL	Y'ld (ppm)	D'd	HOLE SIZE	CASING SIZE (dis. x length)	SCREEN SIZE (die, and depths)	AQUIFERS (depths)	Bed- rock	G PAL D.I.	Com- pleted	RIG	Source of info.	USE	Торо. Ехр.	REMARKS*
	Thonaton, Richard	Scott, John			12				2"4	1000		-		1950	J	usgs	Dom	Hat	Soft Water, El. 27
	Thounton, Richard	Scott, John		64				E TO SETTING SEE	2"x			-	173 138	5/49	2	usgs	Dem.	Hat	Fl. 25' Sout Water, 1
	Long, Pat		Tempranceville			18	3.4	3	2°X		198	-	18 18	4/50	5	usgs	Dom.	Flat	FLZT, Sopt Water, A.
	Lecato Conquest		Chiacoteague						24		238 28 ES	-	100	1000	12	usgs	De ut.	Plat	BLS' SORT Water FI
55	Hall, Frederick	Scott, John				14			2"x		1000	-	450	4/49	2	usgs	Don.	Hat	61.30' A-55 soct and
	gladden, Kai					25	3-4		D"x84"	Service The service		-	350	4/48	2	0.595	Dan	Flat	EL 25'
	Roberts, Anna	Scott, John		232					D"X	60 mesh	THE SECTION AND ADDRESS OF THE SECTION ADDRESS OF THE SECTION ADDRESS OF THE SECTION AND ADDRESS OF THE SECTION ADDRESS	-	350	5/48	2	usgs	Dom	Phat	E1.25 A-57
58	Dewey MARShall						4 3		2'X	758		-	350	1950	2	14595	Die	21.1	E1.25 A-58
59	Davis, Henry Hall, James A.	Scott, John				16\$	8		2"x	7678	70,300-6,	-	163	7/51	2	usgs	Don	Hat	El.30, A-59
60	Hall, James A.	Clark, I.B.		186			-		13°x		10'-30', 110'-150'	-	1 30 00	1903	1200	usgs	Dillion	3235	E1.10 . D. 60
61	Toppin, Melvin	Scott, John		231					2"x	and mesh	10000	-	175 150	3/48	2	usgs	Ind.	Hat	E1.25, A-61
						16	4 .		2"x	60 mesh	S 3 7 700 00	-		1950	2	4595	Dem.	302	E1.25'
	Seaside Fish Ca		Assateague Is.			100	-		6"X			18		1935		usgs	18	Hat	F, Ab., well ander me
64	gondy, John B.		Mappaville	130			-94				A SERVICE AND A	-	78 6	22	2:	usgs			E1.40, A-64
65	Adkins, May			190		2			ıi x			-	1	1936	2	usgs	Dom.	Hat	A-65 FI.9'F
66	Taylor, George E.	Scott, John		25%		0.0		7 2-905	2"x ,11 x			-	100		2	usgs			El. 81', A-66
67	groton, Samuel B.		Hallwood	199		-31			2°x		30	-		1946		asgs	Dom	Flat	E1.25', A-67
	Bloxom Auto	Scoll, John		255		- 1	15		2"x			-	161	11/51			Don	Flat	El.25', A-68
		Ewell, W.		21	4		- 1		2"x			-		7/48	DIV	usgs	Dan	Hat	FL 25', 4-69
	Natl. Adv. Comm. Acrossus		Wallops Island		25	30			6'X 133'	42 (132-147') 16 slot	134-147		100	0.00		usas	Doza.	100 P	E1.9, A-70
71	Linwood, D. Lewis	Scoll John	Mappsville	225	32				3°x		777	-	165	11/50	2	usgs	DOM.	FLAT	EL 25', A - 71, SOFT
		Jenking L.M.		23					ıi'x			400	12	7/45	D.V.	usgs	Dom.	FLEET	EL. 16' , A. 72
		Scott, John		220	14				2°x			-	100	1945	2	usgs	DOM.		A-73
	Custis, John	millburn, F.	Gloxom	183	8.7		4 8		2° X		100000000000000000000000000000000000000	-	100		Dug	usgs	DOM.	MILLY	FC. 19, A. 74, Shirt we
	Langroad, PRESTON	Scott, John	WIO KOY	245		100	4 0		3"x		CONTRACTOR OF THE		163	1/51	2	usgs	DOM.	FLAT	EL. 25, A - 75, 50 FT WA
		Scott, John		240					3°x				800	9/50	2		D014	FLAT	CU. 33', A. 76, Seri w.
		Scott, John.				15	6		2°x	The state of the s			900	11/48		4595	DOM.	FLAT	EL-25 A. TTHARD WE
		Scott, J.		255		2	-		2.X				163	9/52		usgs	Dose	FLKT	EL. 25' SEFT WE
	Mason, Short					163	9 "		3°x			-	75	11/48		USGS	D094.	FLAT	BL. 18 A-79 WARD W
80	Means, C.	Scott, J.		230.		-			2"X			-		1951	2	usgs	Doba.	FLAT	BL. 25 A - 80, SOFT WO
81		Scott, J.	Nelsonia	230		-			3°x		And the second	-	15	9/51		usgs	DOM.	FLAT	EL. 25, A. 8, 5041 W
52	Tayloa, g.R.	Taylon, G.R.		34		50	-		1#"X		Commence of the second	-	10	11/48		usgs	DOM.	FLAT	EL. IIX
83	Annis, Forest	Taylor, Wm.	Control of the Contro	138		-	-		It'x	13"(138")		-	100	1935		usgs	DOM.	FLAT	EL. K , A-83
84	Pickers, Barnett	Scott, John	Mappaville	338	30	163	6 3		2"X	CAS CONTRACTOR	7/2 1/08/1-22	-	163	10/50	2	4595	Dom	FLAT	EL 25' SEET WATE

15"X

2"X

15 X

2"x

2"X

2"X

2"X

15"X

2"x

*REMARKS: E Becric cal/or garron my logs contable

- W - Well script coll-corroga contable

14 871

85 Paulson, Milton R.

89 Watkinson, BRantley

94 Richardson, Henry J.

95 GROSVENOR, Walter

99 Marsh, David W.

100 Russell, milton

WWCR - Water Well Completion Report

TD -- Total Depth NW1. -- Socie Water Level

96 Pulley W.F.

98 Edwards, W.

wett +

W.N. = 1

90 Duncan, Linespool

86 Means, Wm. S.

87 Costin, H.R.

88 Copper, J.h.

91 Dicks

92 Town

93 Town

97 Black

Hopeton

Ganzatha

Pankaley

Chesconessex

Hopkins

Hopkins

Pankaley

Parksley

GREENbush

OMANGOCK

D'd - Drawlown

18 4

123

65

FRanklin City 75 0 20

Chaseonessex 160 8 30

Chesconessex 150 6 15 4

160 5

123 12 138

PT — Pemp Tex DI — Depth of Intake

220 16 15 5

2

30.

150

100 \$ 12

165 17 200

50 10 13 12

Means, Wm.S.

Scott John

Porter, W.

Porter, W. Parksley

Scott, John GREENbush

Watson, W. ONancock

Parter, W.

Sydnon

PORTER_

Scott, J.

Scott, J.

20-75 USGS DOM FLOT ECEN 3 A 96 18, 150-160 1951 USGS DOW FLAT PLEV. 7, D.97 US\$5 DOM FLAT BLEY, 4' 4. 98 7/49 USGS DOM FLAT ELEV. 6 , 4.99 2/48 J USGS DOM FLAT ELEV. 25' A - Wester enalysis available F - Artesisis flow (in gpm) D -- Drillen log available P .- Plang the day available Ab Abrahasl 50

20,60-63,163-165

DOM. SLAT ELSE! MUSTY OUR

DOM. FLAT EL. 20 , SEET WATE

DOM. FLAT ELIZS

USGS DOM FLAT ELEV. 3', A.94

DOM. FLAT EL 7', A. 88

DOM FLAT EL 3 A S

DOM: FLAT EL. 3 , 8-90

DOM. FLAY EL 25 D.91

DOM FLAT FLEV. 25, A. 95

EL 30,0-92

4595

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11/52 5

9/47 D

7/43

1951



Geothermaldata.org

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Use Data

Publish Data

Developers

Events

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Welcome to NGDS, information for discovery, evaluation, and development of geothermal resources.

NGDS is your source for access to information resources on geothermal energy from a national network of data providers. Data are contributed by academic researchers, private sector participants, and state and federal agencies, primarily the Department of Energy. Access, view, and download data with this free and easy online search tool.



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NGDS Featured in September 2013 EARTH article:

Digitizing Earth: Developing a cyberinfrastructure for the geosciences



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Becoming a data provider to the NGDS is simple. To learn more about contributing your project's data to the DOE Geothermal Data Repository, data interchange formats, and data services

PARTICIPANTS



State Geologists

Association of American

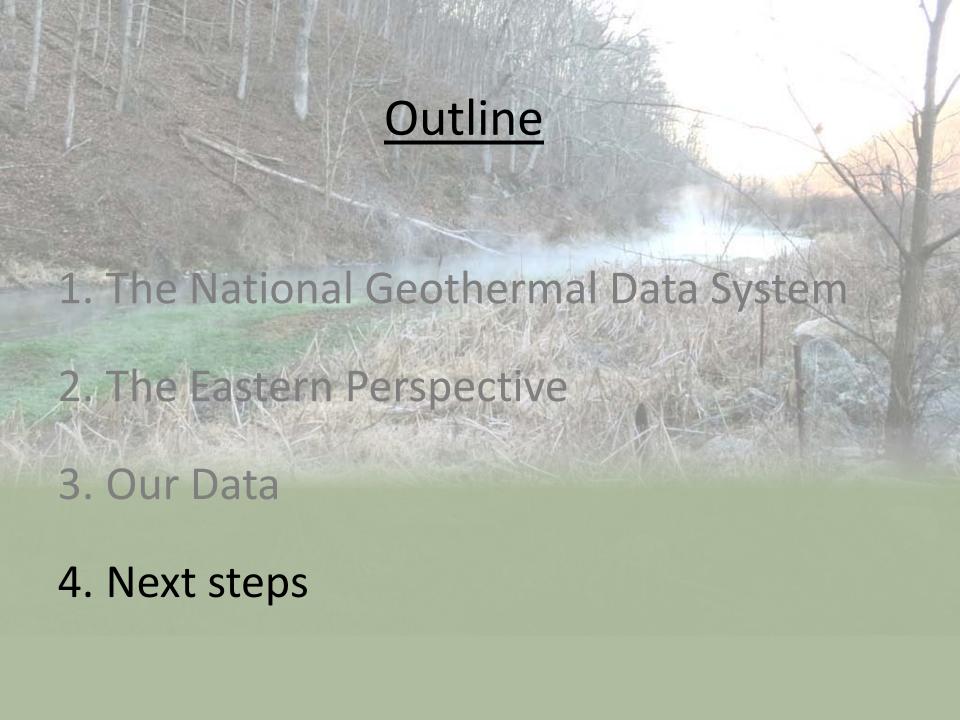


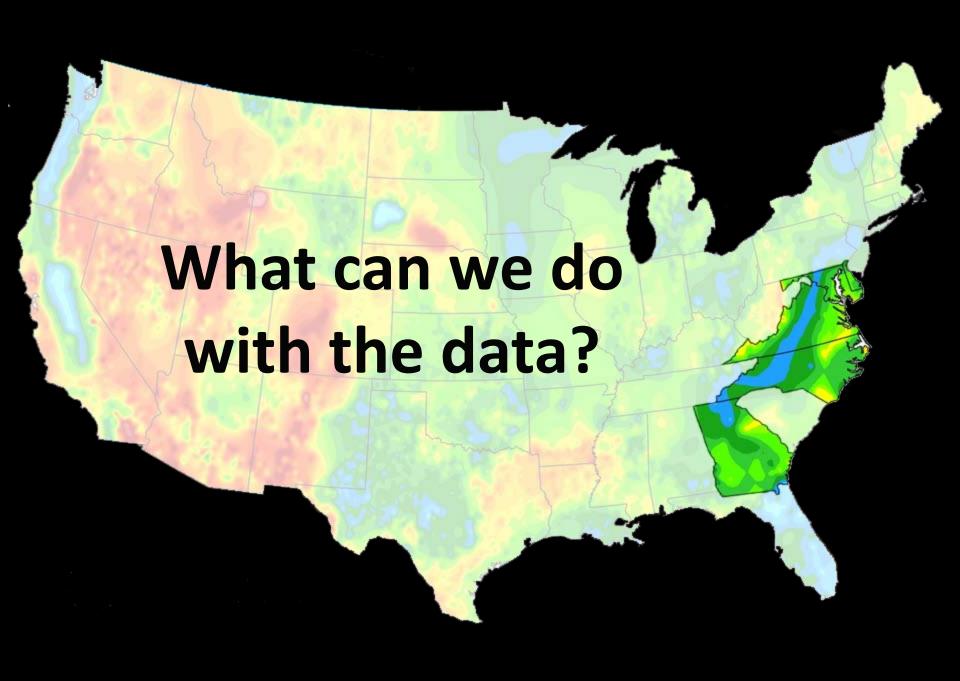


Southern Methodist University

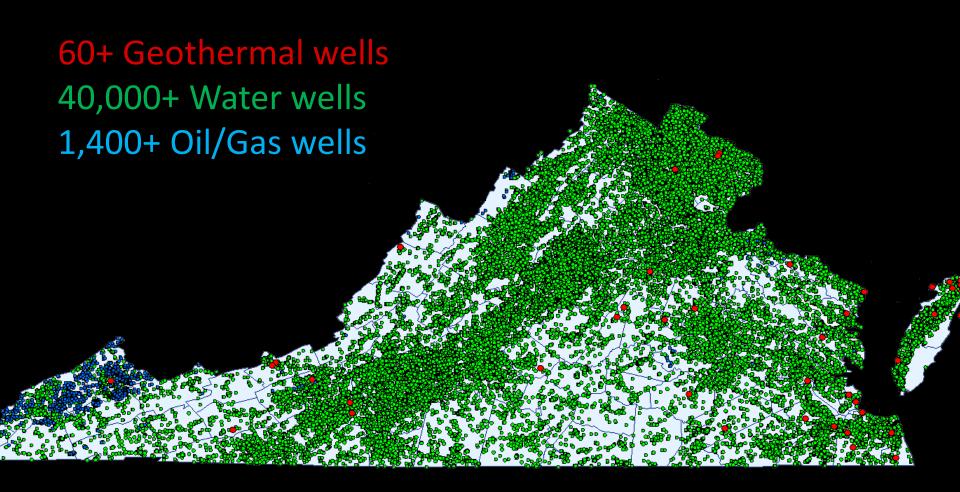


U. S. Geological Survey

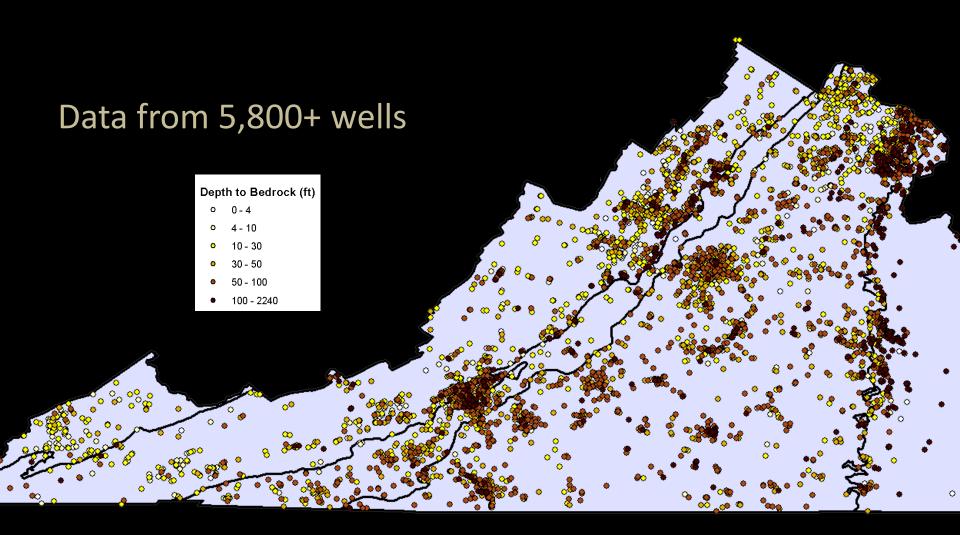




Virginia Well Database

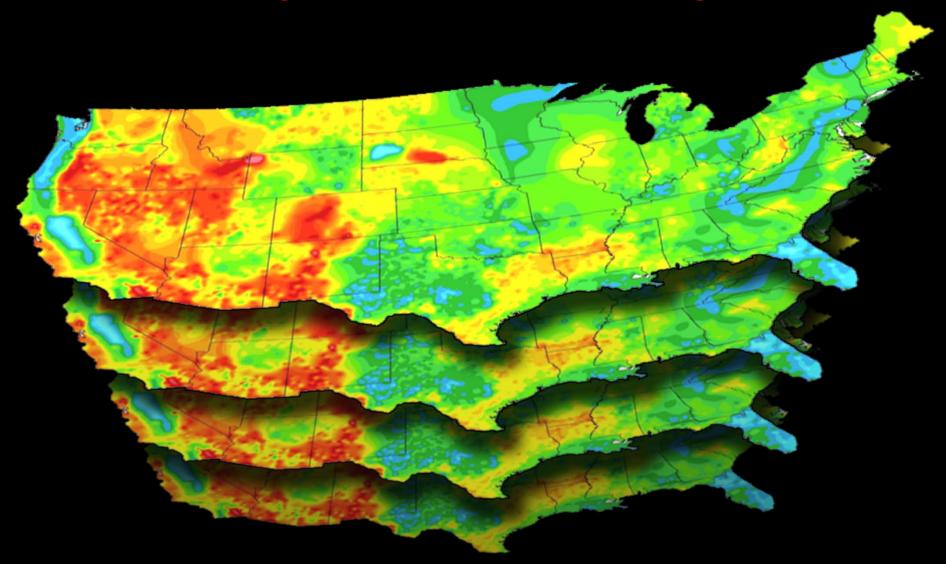


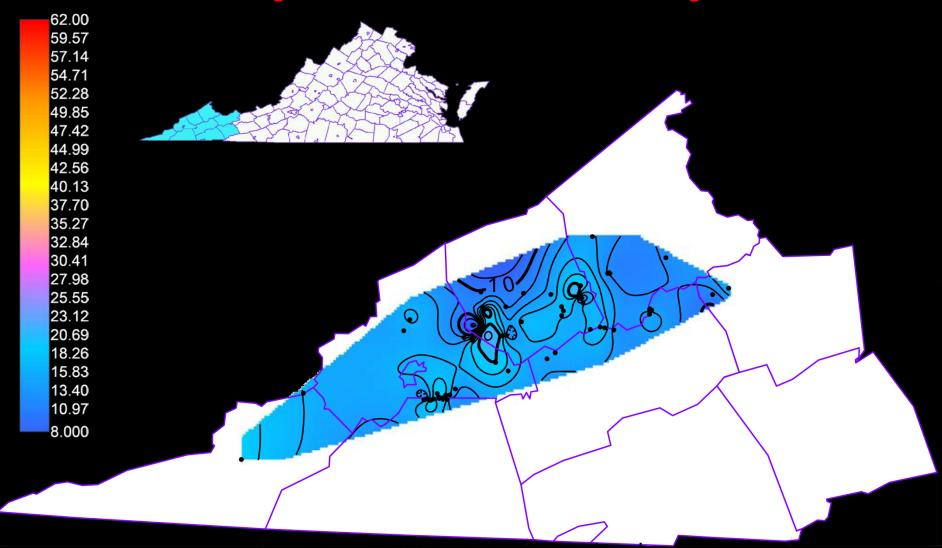
Depth to Bedrock

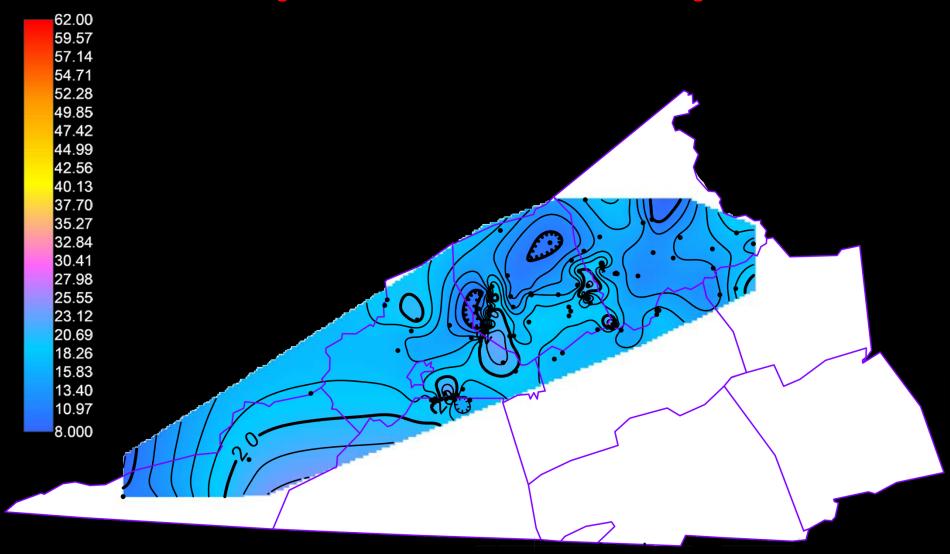


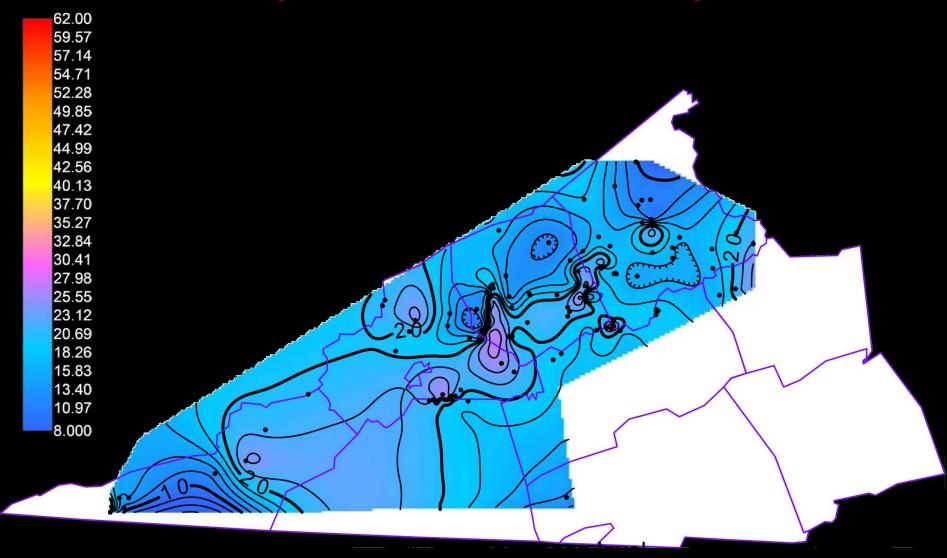
Ground Source Heat Pumps

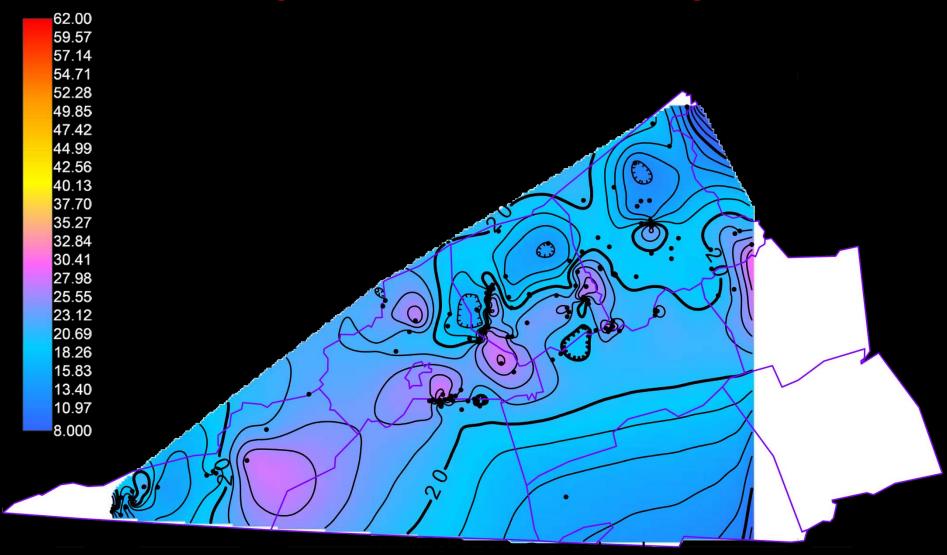
700 installations from VA Division of Energy rebates, school systems, installation companies Installation Density 3

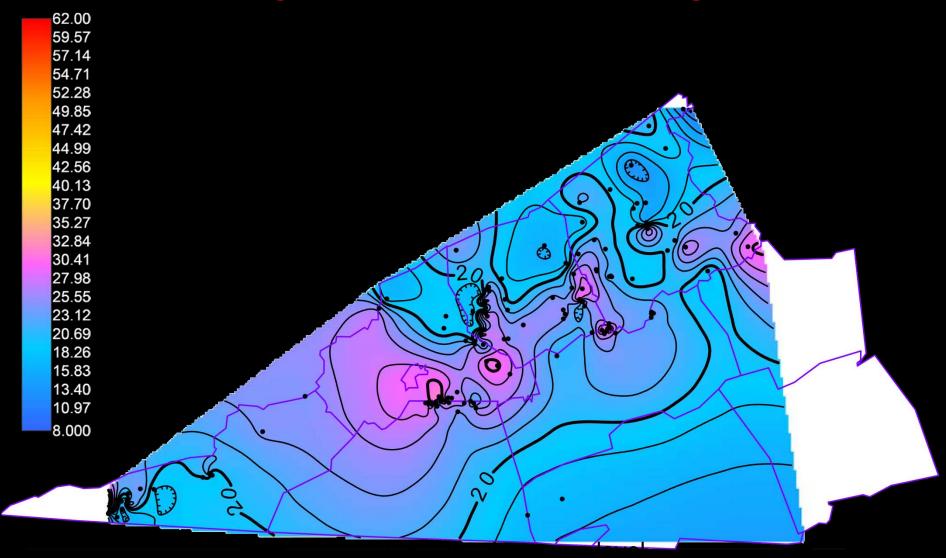




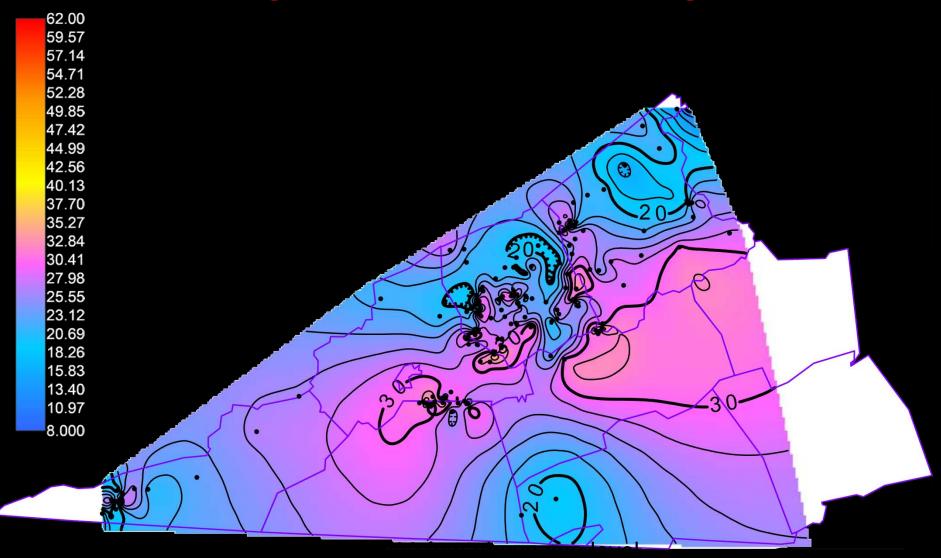


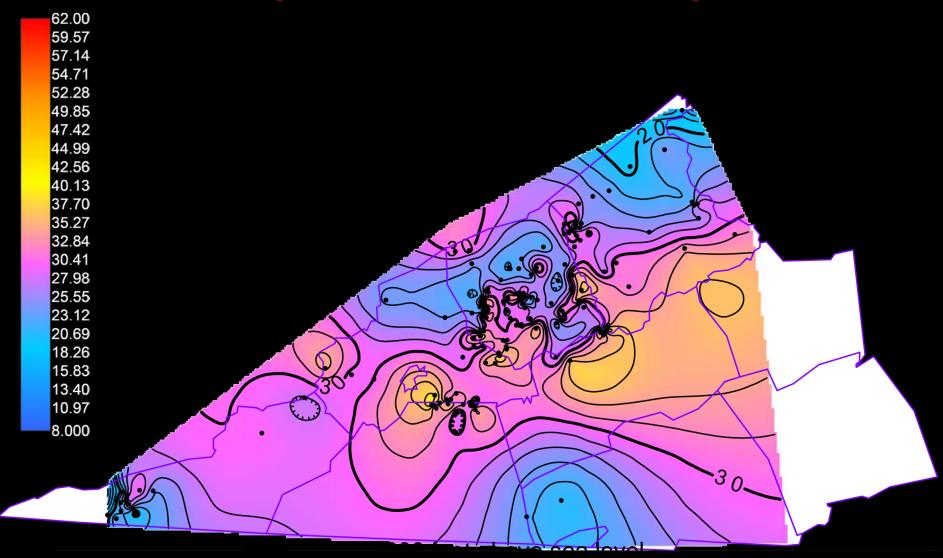


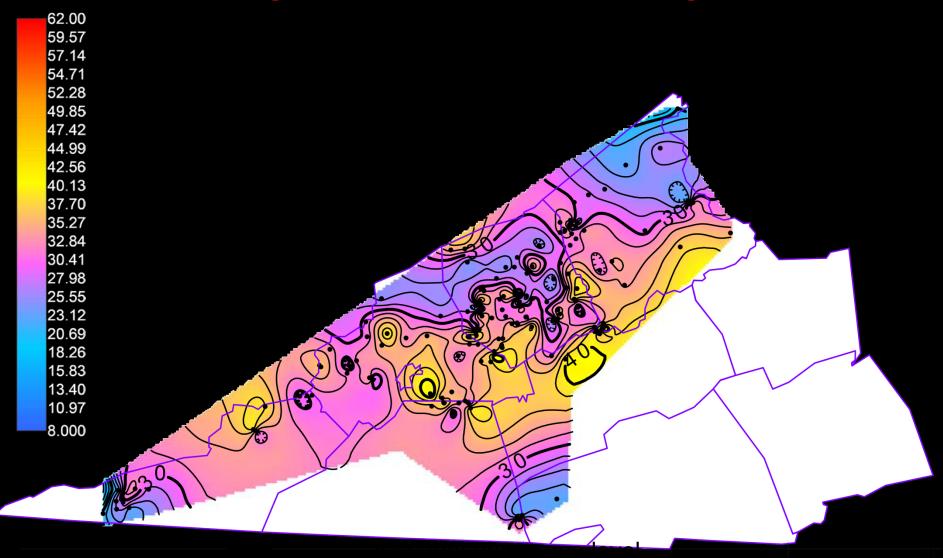


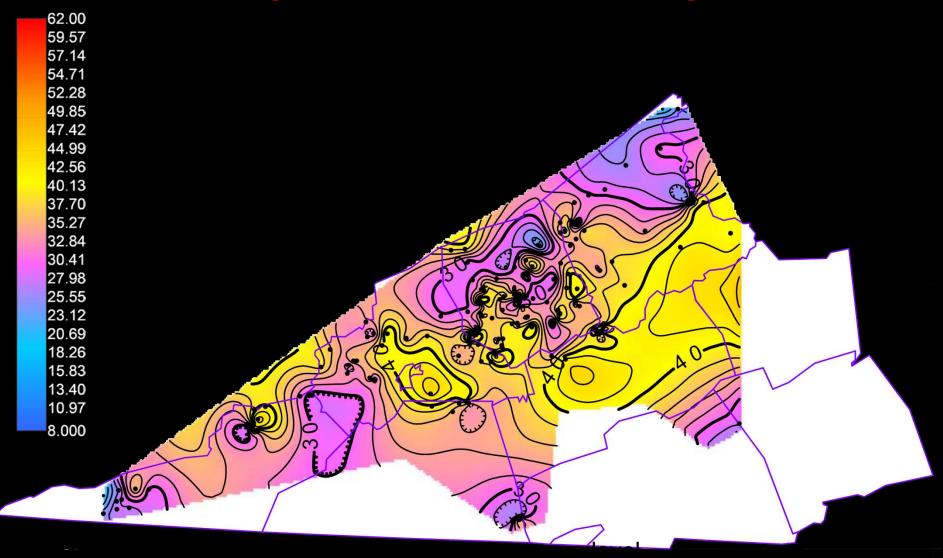


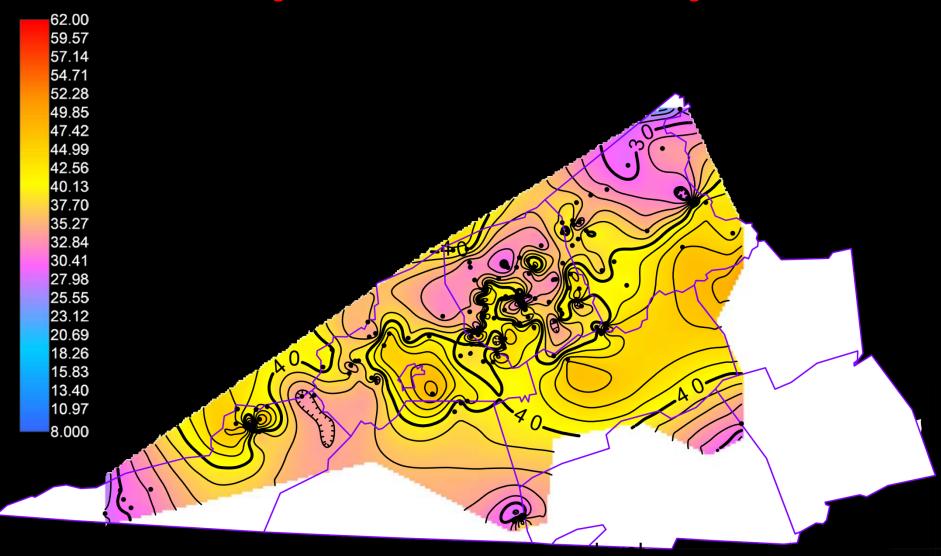
Sea Level

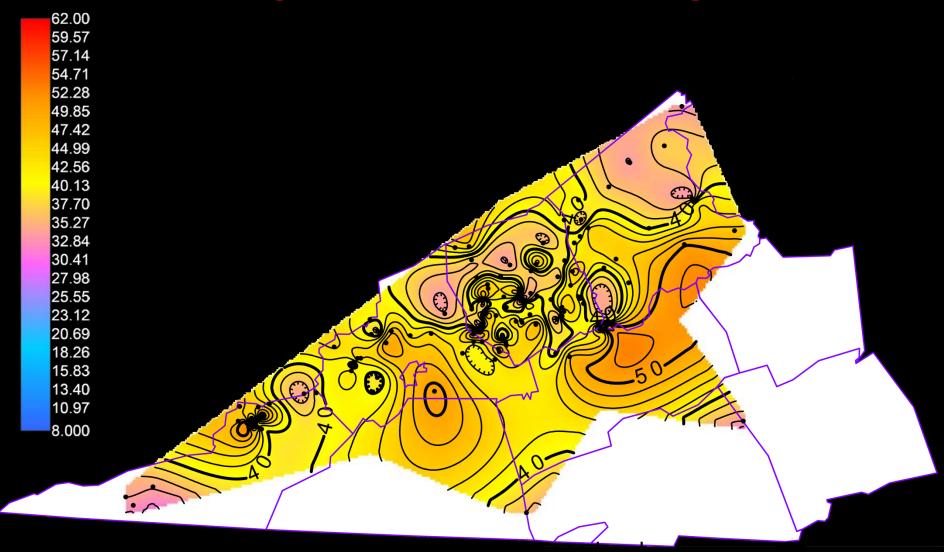


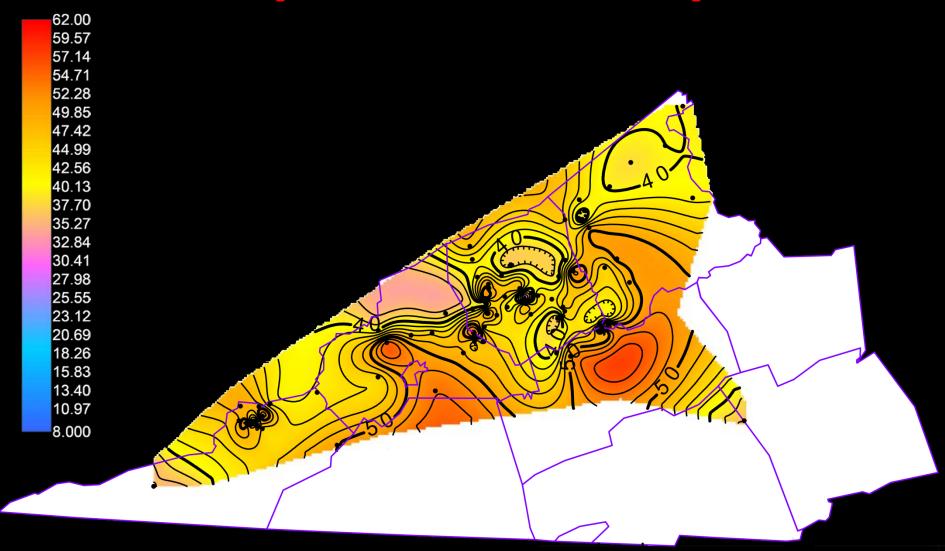


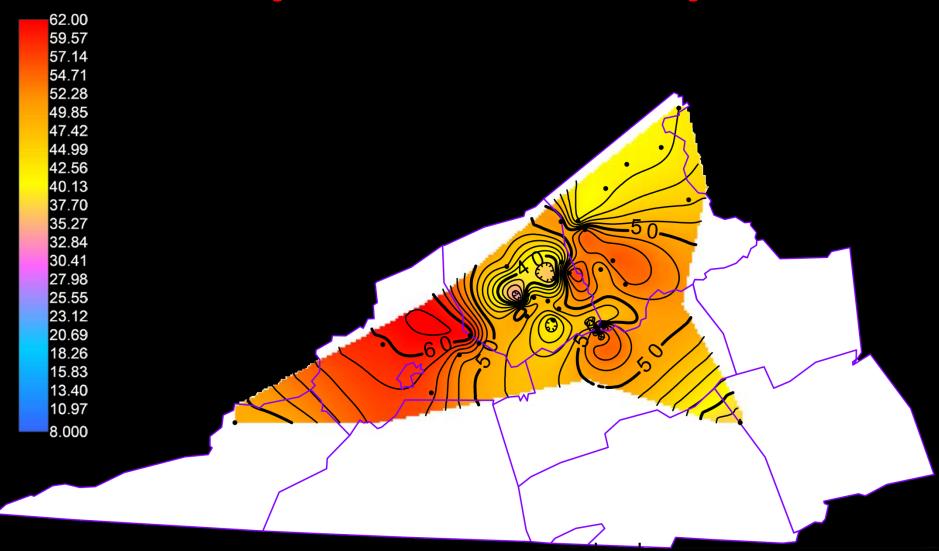


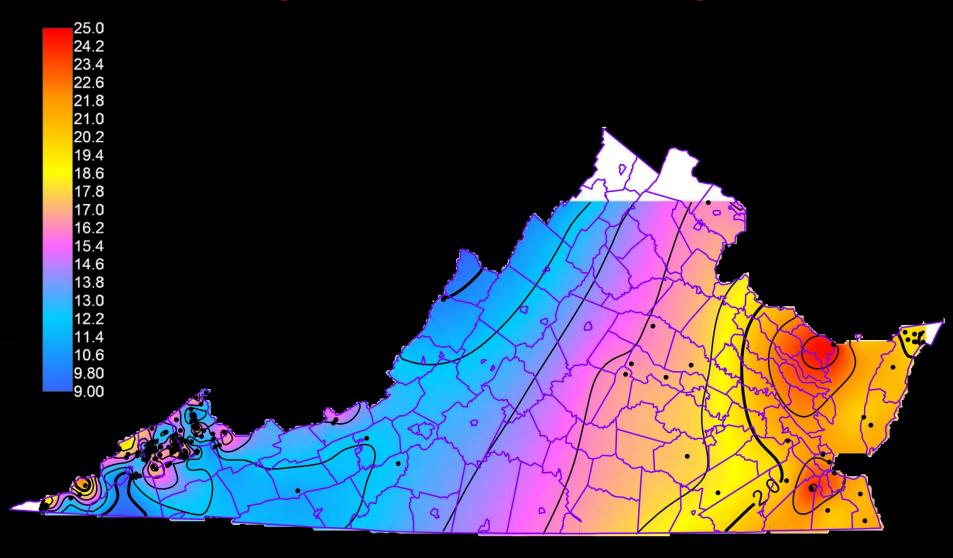






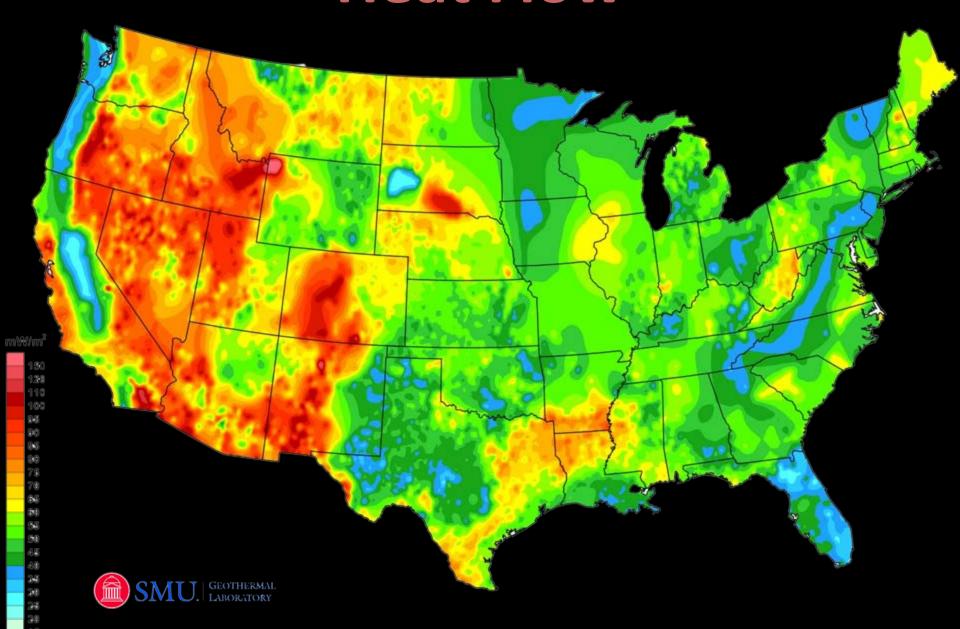






200m below ground surface

Heat Flow



Heat flow (mW/m2)

$$Q = K \frac{dT}{dz}$$

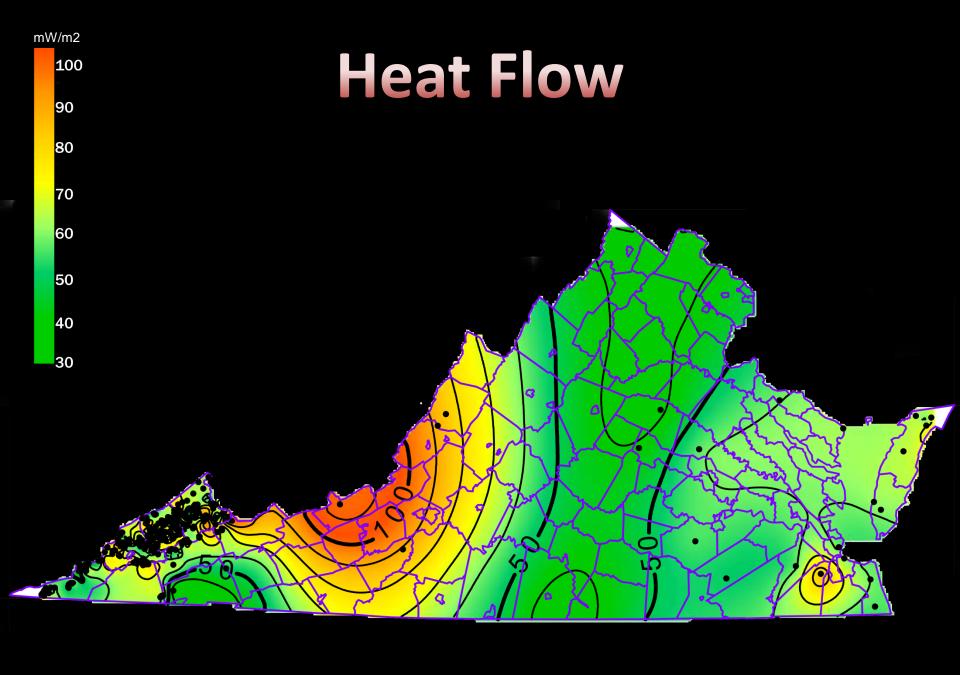
Thermal Conductivity (ability to conduct heat)

- 1. Identify down-hole stratigraphy
- 2. Assign generalized thermal conductivity per unit
- 3. Calculate weighted mean thermal conductivity per well

Thermal Gradient

(△°/△ depth)

- 1. Calculate gradient per well
- 2. Use a geothermal well equilibrium temperature log as a control
- 3. Use regional mean annual air temperature as anchor





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Division of Geology and Mineral Resources

The Division of Geology and Mineral Resources (DGMR) serves as Virginia's geological survey. DGMR performs investigations aimed at reducing risk from geologic hazards and encouraging sustainable development through the wise use of mineral, land, water, and energy resources. In addition to publishing maps and reports, DGMR maintains repositories of geological and geophysical data, as well as rock, fossil, and core samples. With our staff of experienced geoscientists, we are uniquely positioned to provide expert assistance in matters pertaining to the geology and mineral resources of the Commonwealth.



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Falling Spring, Bath County