St. Louis Urban Heat Island

Thoughts by Aaron Young – Sustainability Planning Manager
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East-West Gateway Council of Governments

NEWS

Our Cities Are Getting Hotter—And it's Killing People

19

Heat waves are causing more deaths in U.S. cities than all other disasters combined

By **Alissa Walker** | **@awalkerinLA** | Updated Jun 21, 2019, 1:15pm EDT

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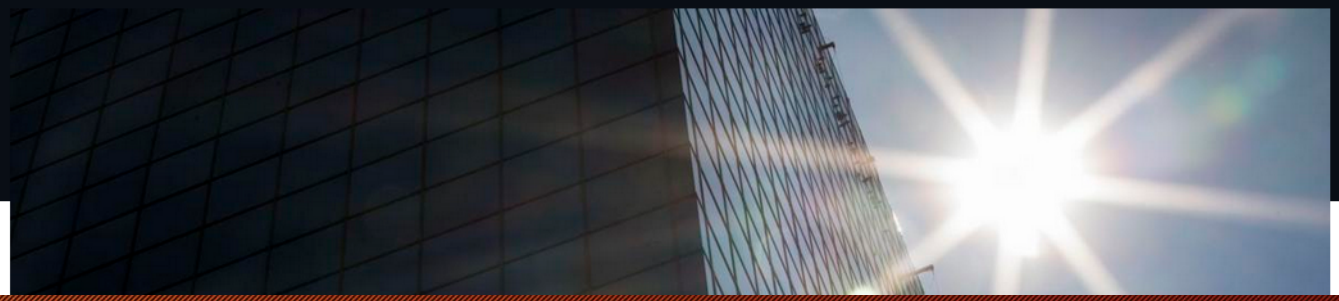
STL WINDOWS DIRECT & Doors
DESIGN & BUILD

As cities gather data on unequal urban heat, experts ask St. Louis to join

Bryce Gray Sep 7, 2021 0



Health, Science, Environment

Extreme heat is coming. What is St. Louis doing about 'the silent killer' of climate change?

St. Louis Public Radio | By Kelly Smits
Published June 21, 2023 at 6:00 AM CDT

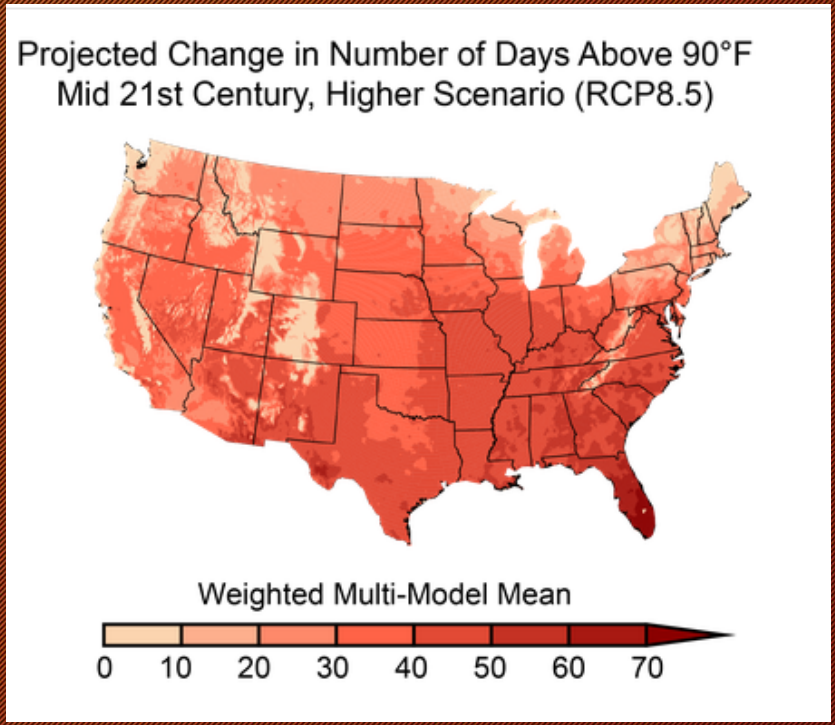
East-West Gateway Regional Analysis

Besides energy burden, why study UHI:

- Increased air pollution, such ground level ozone and PM2.5
- Cause heat stroke, heat exhaustion, heat cramps
- Trigger health issues such as asthma and depression
- Limit time spent safely recreating and working outdoors
- Increase crime
- Impacts on emergency response
- Rail buckling, increasing frequency of pavement maintenance, and stress on bridge expansion joints
- Decrease water quality from algae blooms, fish die-offs
- Raise hazards of using alternative transportation modes including bicycle, pedestrian, and Transit

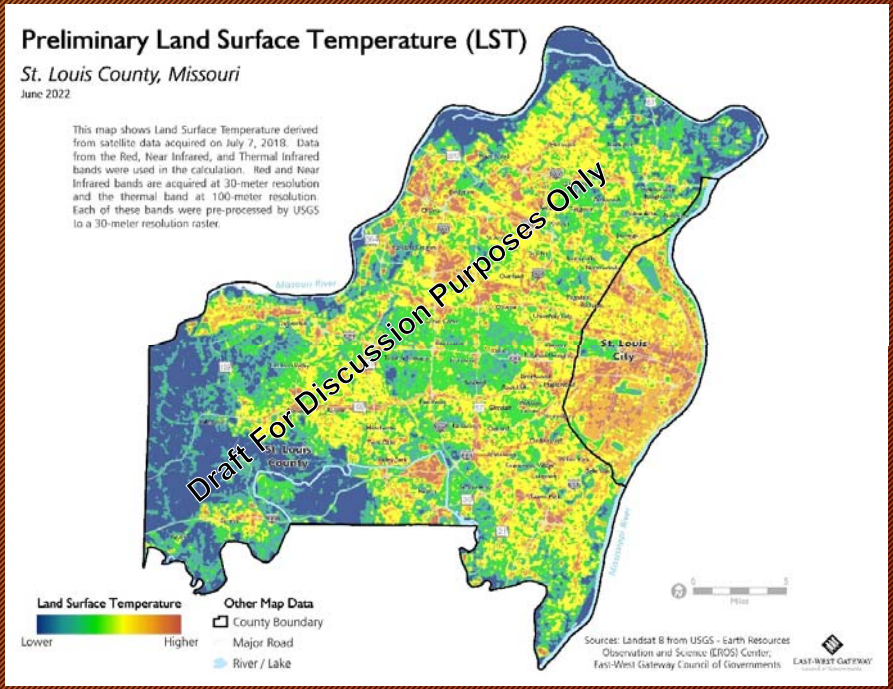
East-West Gateway Regional Analysis

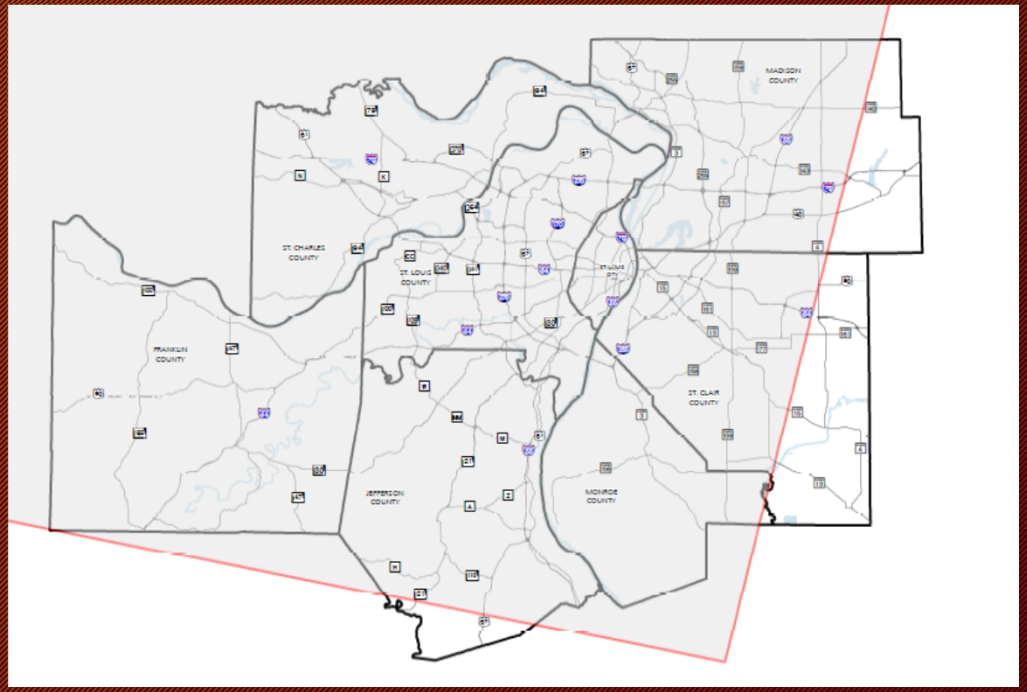
Climate Science Special Report– National Climate Assessment 4



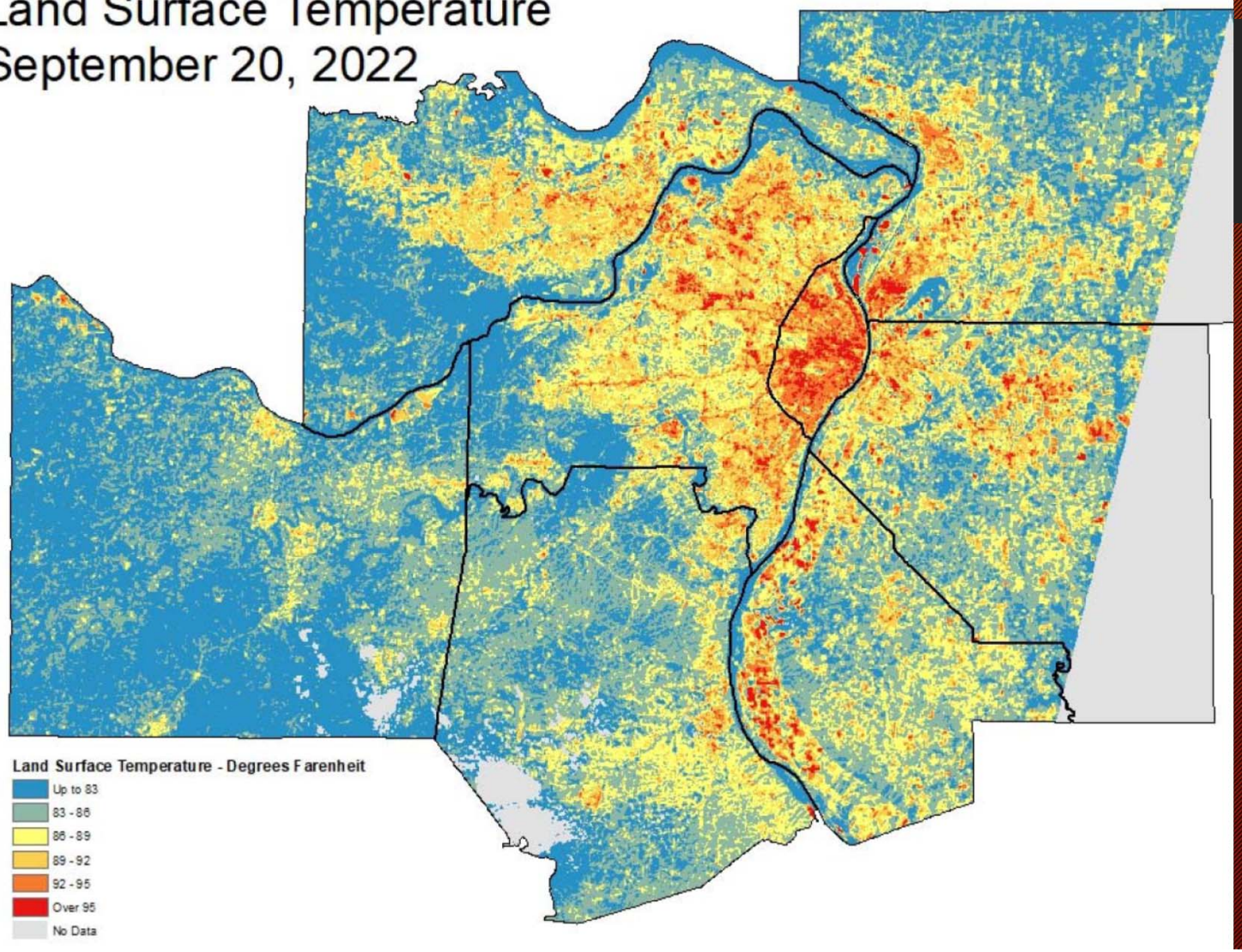
East-West Gateway Regional Analysis

- Developed and tested a methodology with Landsat 8

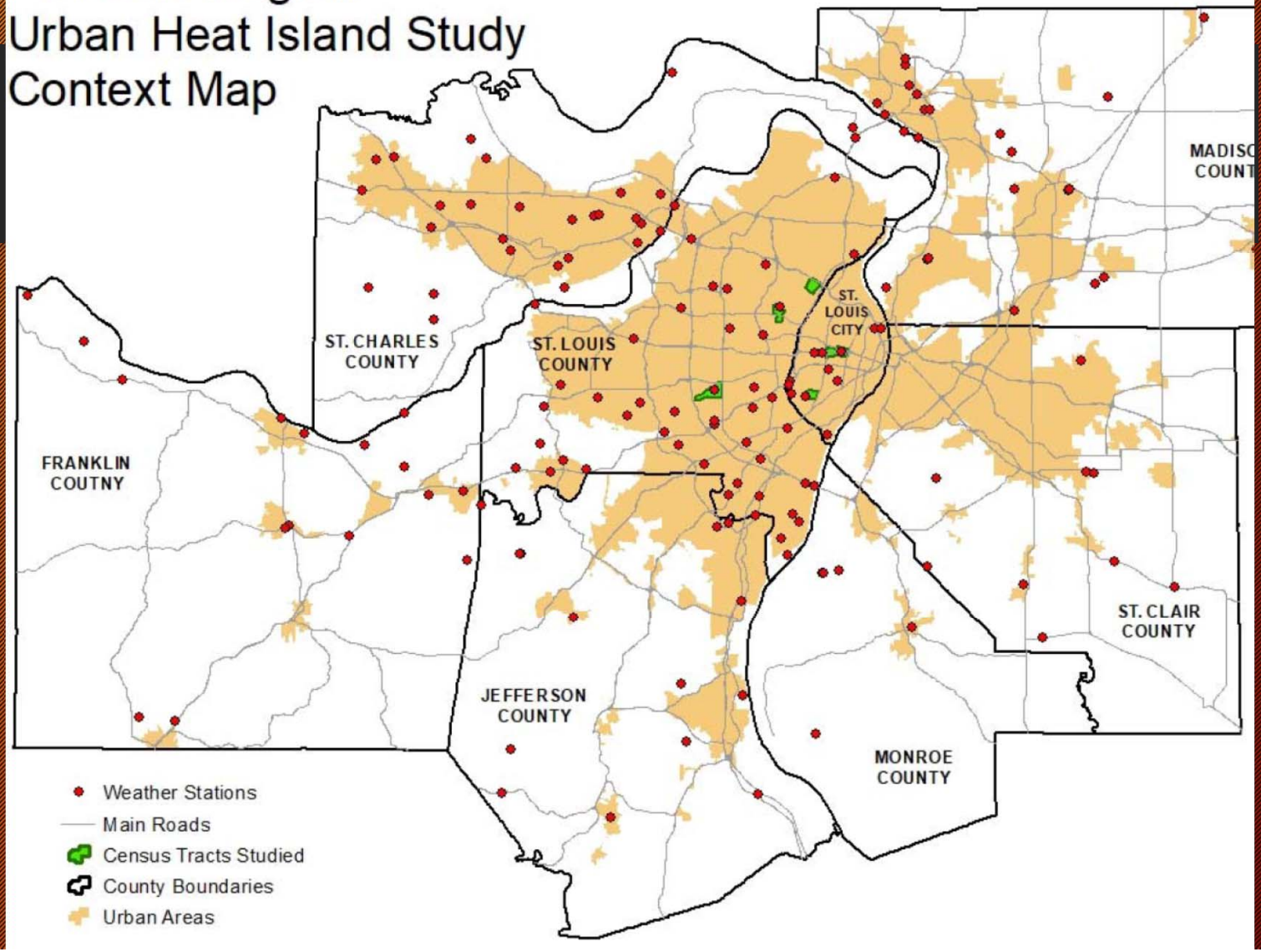


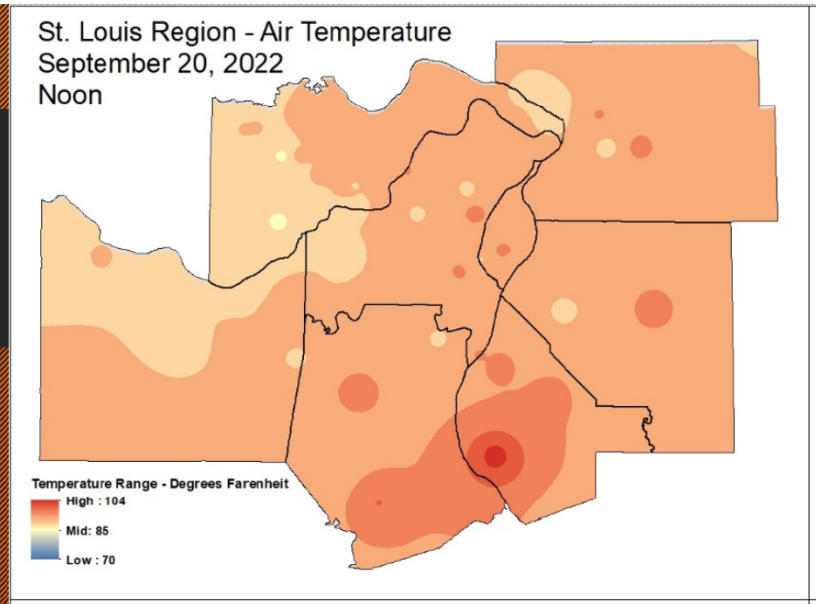


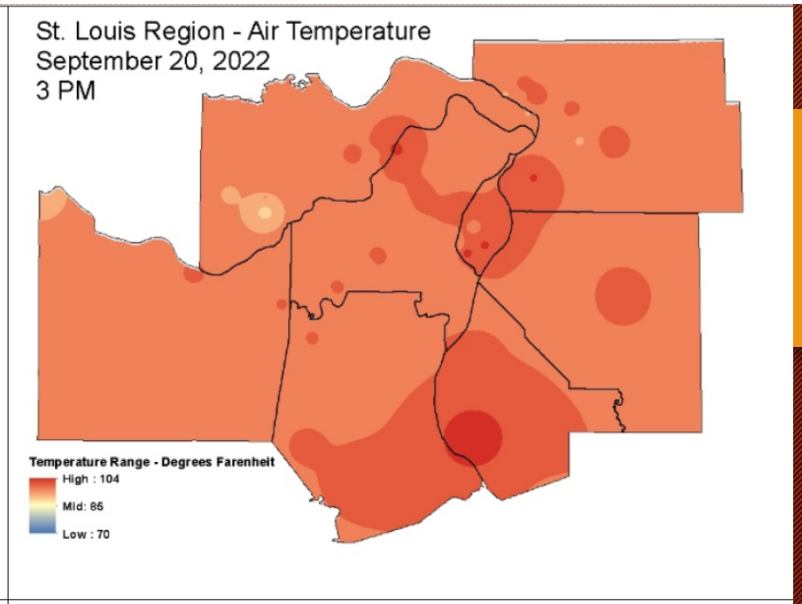
St. Louis Region
Land Surface Temperature
September 20, 2022



St. Louis Region - Urban Heat Island Study Context Map




St. Louis Region - Air Temperature
September 20, 2022
Noon
Temperature Range - Degrees Farenheit
High : 104
Mid: 85
Low : 70


St. Louis Region - Air Temperature
September 20, 2022
3 PM
Temperature Range - Degrees Farenheit
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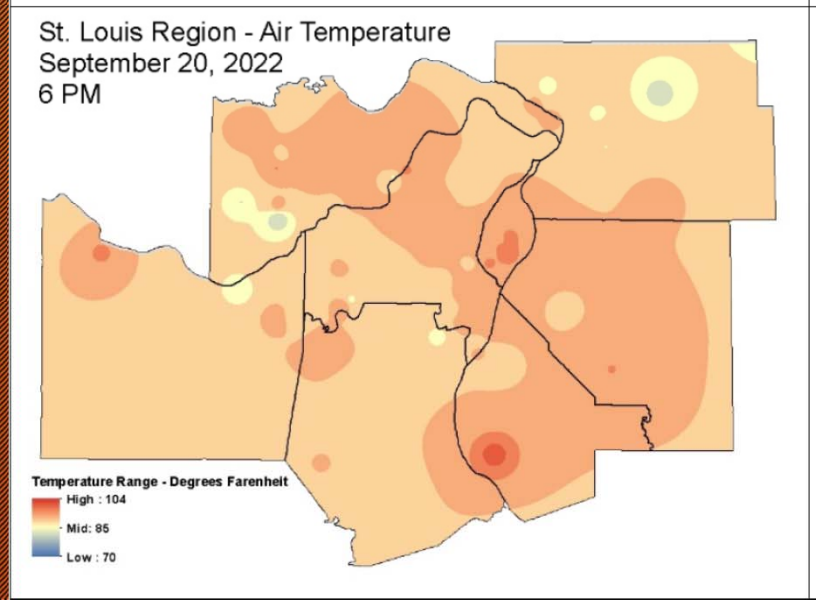
St. Louis Region - Air Temperature
September 20, 2022
6 PM
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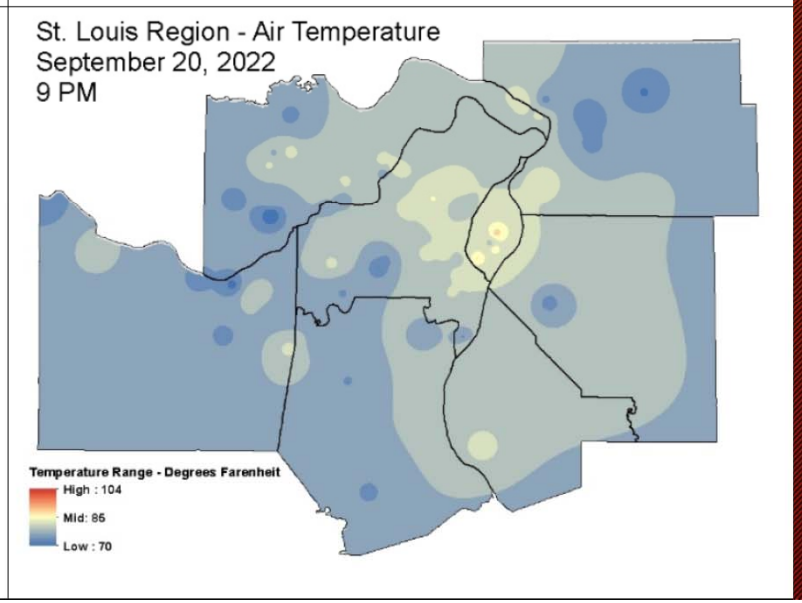

St. Louis Region - Air Temperature
September 20, 2022
9 PM
Temperature Range - Degrees Farenheit
High : 104
Mid: 85
Low : 70

Average Temperature by Land Cover - September 20, 2022

Hour	Barren / Sparsely Vegetated	Cold Deciduous Forest and Woodland	Grassland	High Intensity Urban	Low Intensity Urban	Mixed Cold Deciduous / Evergreen Forest and Woodland	Open Water	Row Crops	Woody-dominated Wetland
0	78.06008	75.09408	75.2356	79.18781	76.76605	73.37686	77.93626	75.02535	82.23484
1	76.68466	74.66401	74.16266	77.6334	75.50488	72.4391	77.50386	73.93266	82.32994
2	75.92814	73.64187	73.00378	76.60701	74.21997	71.54249	76.57616	73.27928	80.79665
3	74.63108	72.78401	72.27732	75.61667	73.33935	70.76788	75.82937	72.24558	79.50137
4	74.41972	71.8882	71.31615	74.56615	72.51986	70.396	75.44031	71.55273	78.53055
5	73.45437	71.03842	70.43425	73.48384	71.8179	69.96364	74.84874	70.98722	77.45806
6	72.28401	70.28177	69.79063	73.3835	71.18902	69.03961	74.74203	70.48518	76.62742
7	73.26999	70.57669	70.25184	74.08899	71.64425	69.80989	74.28406	70.62508	77.58092
8	76.62044	74.13766	74.81082	77.41117	75.84587	73.1401	76.73952	76.39	80.62451
9	81.55343	80.25927	80.08908	82.09763	81.65637	80.0817	80.631	82.52407	84.58231
10	85.80531	85.18981	85.12368	87.00244	86.38207	85.60404	85.2922	87.34568	88.69118
11	88.27	88.53167	88.93178	90.1282	89.7859	89.07958	87.44282	91.10251	91.97384
12	90.65883	91.29818	91.96367	93.21694	92.60914	91.97479	89.51438	93.87308	95.02289
13	92.76999	93.80524	94.14586	95.23245	94.60424	94.35585	91.13731	96.06984	97.51776
14	95.32093	95.46642	95.70283	96.63179	96.06417	96.12751	94.38572	96.8512	98.90748
15	96.12031	96.18182	96.51141	97.37049	96.74358	96.80727	96.08819	97.62686	99.42392
16	96.68559	95.95381	96.53198	97.35286	96.41123	96.01869	95.11545	97.22861	99.27466
17	96.43377	94.01013	95.10548	96.42669	95.12569	93.31123	94.39892	95.89117	98.30404
18	94.30532	89.34972	90.55575	93.31316	91.33791	87.80697	92.25678	91.58432	95.60477
19	87.2708	83.227	83.26033	89.35719	85.87768	81.62074	86.85007	83.96795	90.96353
20	85.16502	79.62829	79.55801	86.96307	82.67836	78.27465	83.48073	80.67718	87.181
21	82.9866	77.66361	77.52013	84.43884	80.70487	76.7498	81.72851	78.53057	85.40417
22	81.62047	76.3455	75.91851	82.42499	79.22826	76.08572	80.56466	77.7052	81.78766
23	79.68471	75.43215	75.14051	80.95276	78.2222	75.5998	80.22876	76.19955	81.52993

Energy Usage By Tract

	Hour	29189212201 - Northwoods	29189215901 - U City	29189218402 - Kirkwood	29510114300 - St. Louis Hills	29510118600 - Midtown
(Electricity kWh/Household)	0	1.70073043	1.62500936	2.31180000	1.82676919	1.19542708
	1	1.56441471	1.50611901	1.75672500	1.67765931	1.07987433
	2	1.44923571	1.36476033	1.50832500	1.56063460	0.96955922
	3	1.35367114	1.25882260	1.57365000	1.45210478	0.92272507
	4	1.26464571	1.17907298	1.41112500	1.38036993	0.87389340
	5	1.22016900	1.10733039	1.48230000	1.31042372	0.86373657
	6	1.18432886	1.08338091	1.45522500	1.30117389	0.88242103
	7	1.21840286	1.14649109	1.25025000	1.27895239	0.97276799
	8	1.28873143	1.17374004	1.04025000	1.26901532	1.04271554
	9	1.42766229	1.32418540	0.98550000	1.41367216	1.10089068
	10	1.61889129	1.56583630	0.84442500	1.65042010	1.20078101
	11	1.85371971	1.78173413	1.16917500	1.87108048	1.30234457
	12	2.08172829	2.01424820	1.35885000	2.09194063	1.40768293
	13	2.25512271	2.24283877	2.71402500	2.30182034	1.48865875
	14	2.40798771	2.45075711	3.55267500	2.46200552	1.57528906
	15	2.49844200	2.49773488	3.63345000	2.50169469	1.58151307
	16	2.60882400	2.61538870	4.30612500	2.63430235	1.68174023
	17	2.65824429	2.69011362	3.65482500	2.78128678	1.76950490
	18	2.58962743	2.61299603	3.12600000	2.74611182	1.78251579
	19	2.48727471	2.49074723	3.10815000	2.67437563	1.73850285
	20	2.43065143	2.41569903	3.31365000	2.62485031	1.70823644
	21	2.31001757	2.30820127	3.12855000	2.49568456	1.71023423
	22	2.17230386	2.10280082	3.08002500	2.31496896	1.58535930
	23	2.01487843	1.93176332	2.66520000	2.10217695	1.43482486

East-West Gateway Regional Analysis

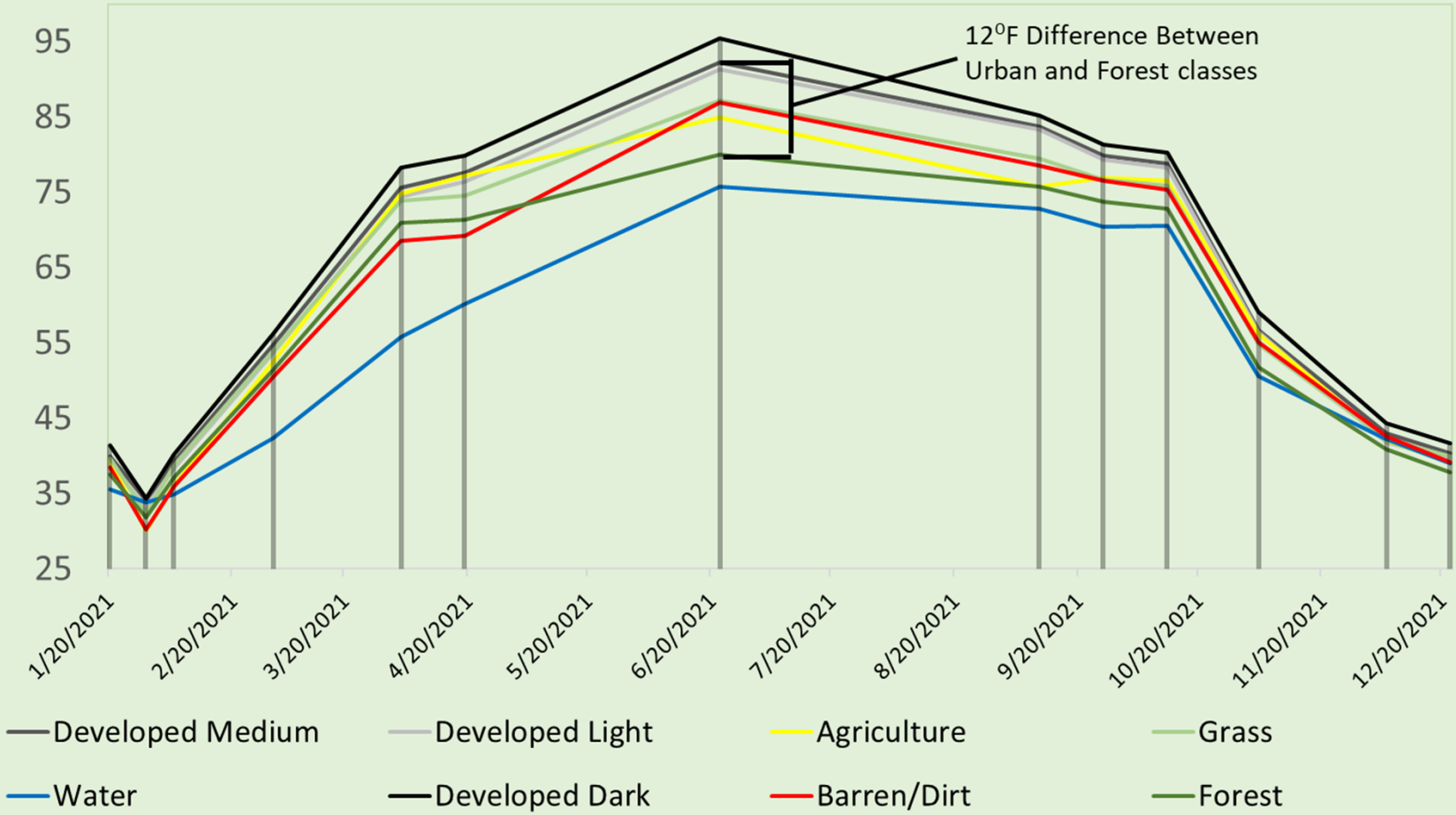
- Findings
  - Urban, suburban, *and pockets of rural areas* experience the urban heat island effect
  - Areas that experience higher temperatures also heat up earlier in the day and stay hotter longer into the evening
  - When comparing air temperatures to land cover, trends were visible that showed warmer temperatures in urban areas and cooler temperatures in more rural/vegetated areas.

  - Expected higher energy usage in urban areas did not emerge
  - Need to study a larger sample of data to draw a more statistically confident conclusion on whether the UHI effect increases energy use.

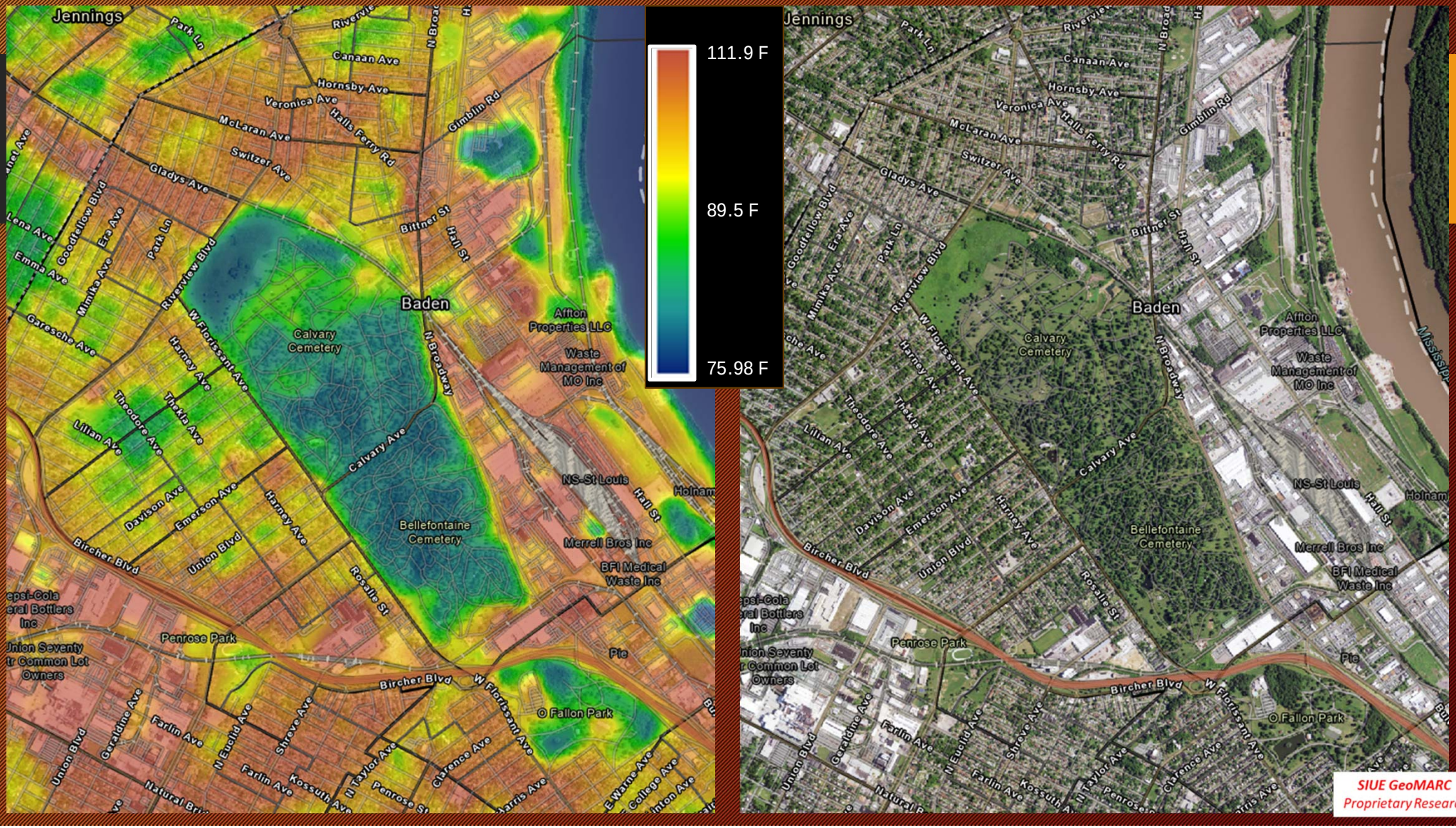
East-West Gateway Regional Analysis

- Recommendations:
  - Research and apply a correlation between surface temperature and air temperature to St. Louis
  - Compare data from multiple days to reveal temperature variation
  - Begin collecting additional data sets that can be used in producing Local Climate Zones such, detailed land cover, LiDAR, and tree canopy.
  - Compile existing studies on the impacts and mitigation of UHI.
  - Analyze additional data for energy use using various days and geographies
  - Include more variables into energy use analysis such as building square footage and number of units.

Landcover Temperatures Throughout the Year (F^{o})



SIUE GeoMARC
Proprietary Research


111.9 F
89.5 F
75.98 F
Jennings
Baden
Calvary Cemetery
Bellefontaine Cemetery
Affton Properties LLC
Waste Management of MO Inc
NS-St Louis
Merrell Bros Inc
BFI Medical Waste Inc
Penrose Park
O Fallon Park
Pie
Canaan Ave
Hornsby Ave
Veronica Ave
McLaran Ave
Halls Ferry Rd
Gimblin Rd
Switzer Ave
Gladys Ave
Bittner St
Hall St
N Broadway
Calvary Ave
Riverview Blvd
W Florissant Ave
Harney Ave
Theodore Ave
Lilian Ave
Davison Ave
Emerson Ave
Union Blvd
Bircher Blvd
Rosalie St
Geraldine Ave
Farlin Ave
N Euclid Ave
Shreve Ave
N Taylor Ave
Clarence Ave
Kossuth Ave
Penrose St
Harris Ave
E Warne Ave
College Ave
Goodfellow Blvd
Era Ave
Mimika Ave
Park Ln
Emma Ave
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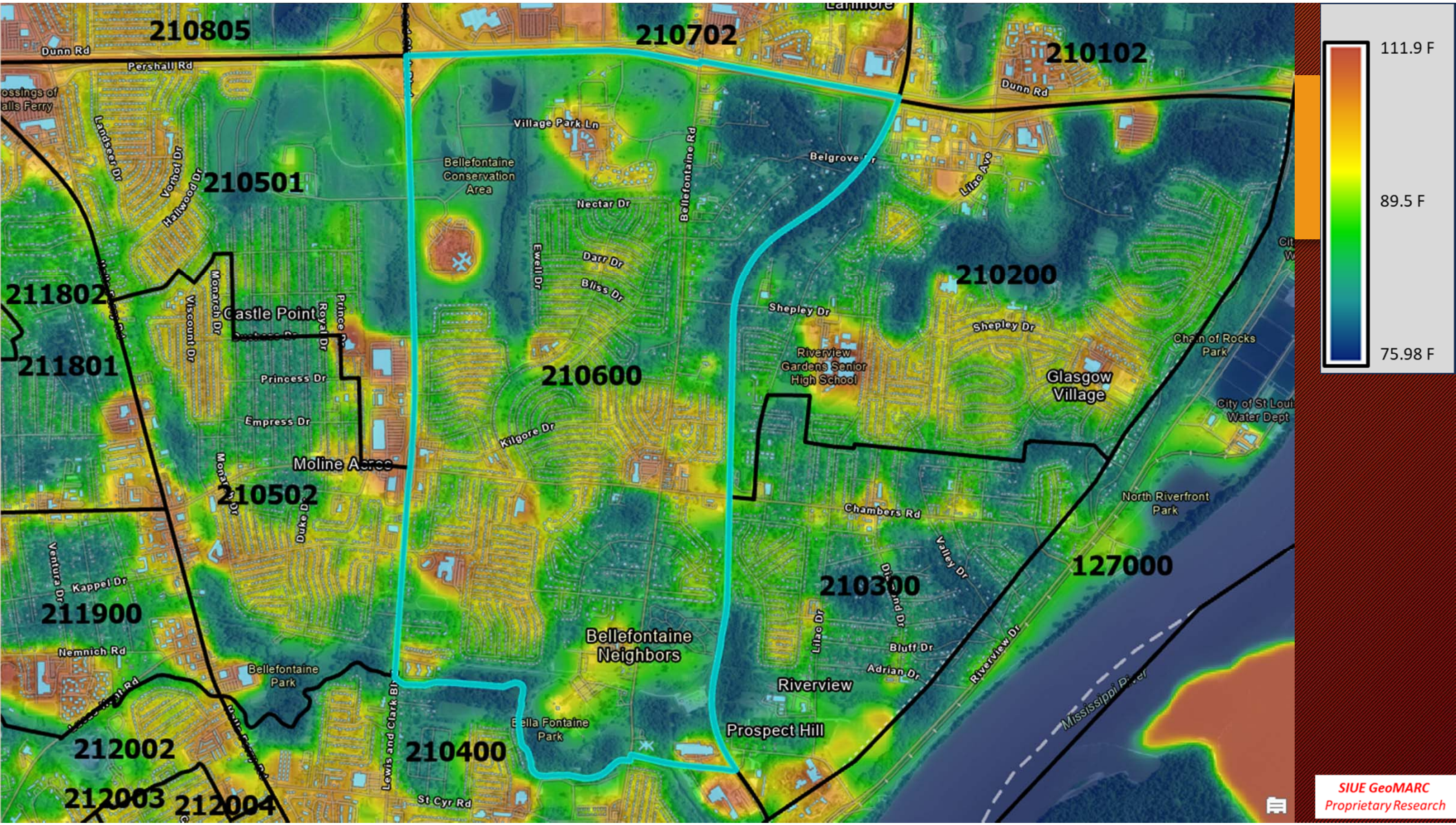
Garesche Ave
Union Seventy Tr Common Lot Owners
Pepsi-Cola General Bottlers Inc
Natural Br
Mississippi
SIUE GeoMARC
Proprietary Research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212003
212004
210400
111.9 F
89.5 F
75.98 F
Dunn Rd
Pershall Rd
Village Park Ln
Bellefontaine Conservation Area
Bellefontaine Rd
Belgrove Dr
Lilac Ave
Nectar Dr
Darr Dr
Bliss Dr
Ewell Dr
Shepley Dr
Riverview Gardens Senior High School
Glasgow Village
Chain of Rocks Park
City of St Louis Water Dept
Castle Point
Princess Dr
Empress Dr
Kilgore Dr
Moline Acres
Chambers Rd
North Riverfront Park
Valley Dr
Diamond Dr
Bluff Dr
Adrian Dr
Riverview Dr
Lilac Dr
Bellefontaine Neighbors
Riverview
Prospect Hill
Mississippi River
Kappel Dr
Nemnich Rd
Bellefontaine Park
Bella Fontaine Park
St Cyr Rd
Lewis and Clark Blvd
Landseer Dr
Vorhof Dr
Hallwood Dr
Viscount Dr
Monarch Dr
Royal Dr
Prince Dr
Duke Dr
Ventura Dr
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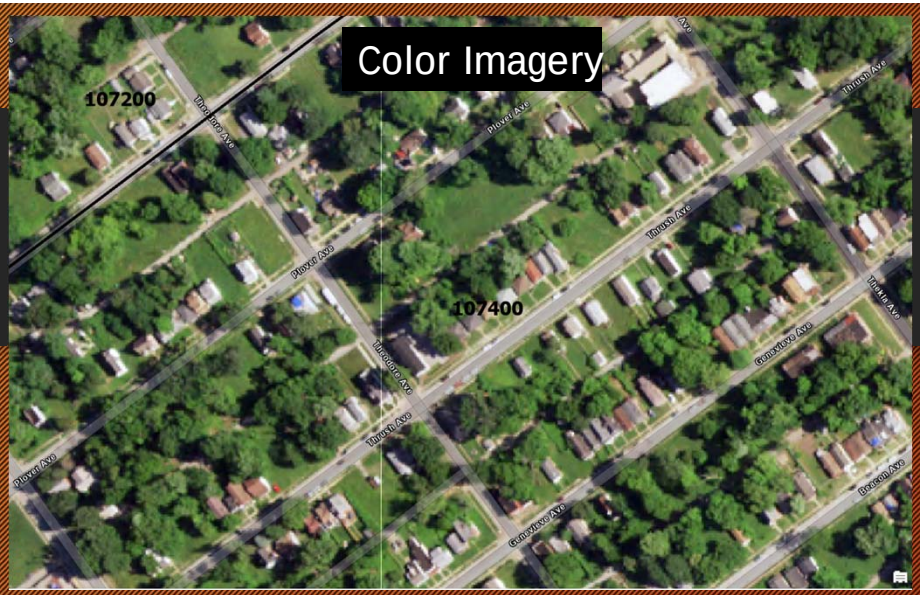

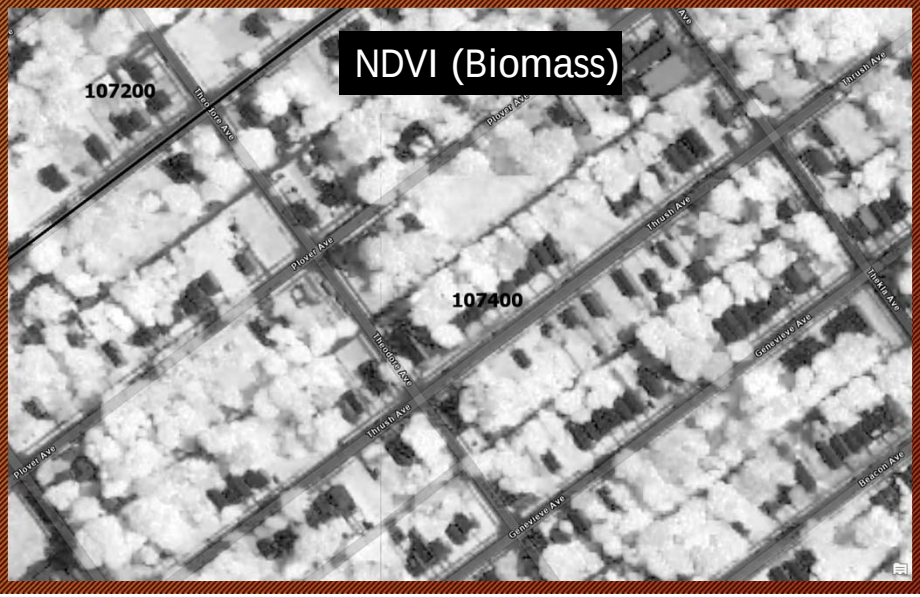

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