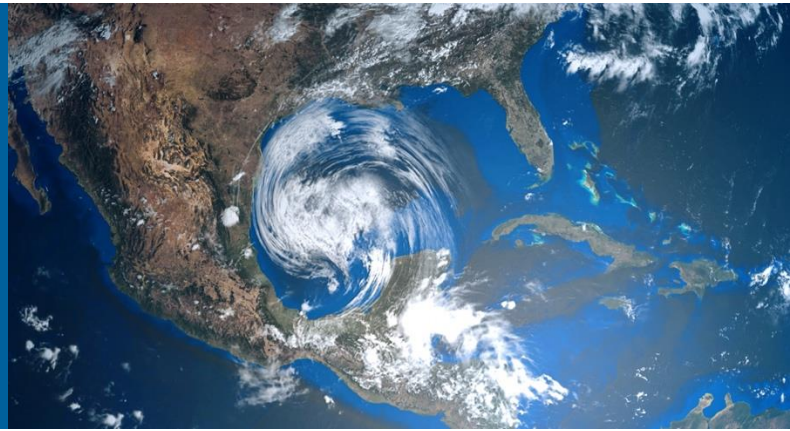
CENTER FOR
CLIMATE RESILIENCE
AND DECISION SCIENCE
Argonne National Laboratory

CLIMATE RISK AND RESILIENCE PORTAL (CLIMRR)



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U.S. DEPARTMENT OF ENERGY
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Argonne NATIONAL LABORATORY

ClimRR: GOALS

- ClimRR is the outgrowth of a public-private collaboration between Argonne National Laboratory, FEMA, DOE, and AT&T.
- Provides free and equitable access to leading, peer-reviewed climate datasets.
- Contextualize how climate risks interact with community-level characteristics to inform resilience planning, such as extending ClimRR data with FEMA's RAPT.
- Empower individuals, organizations, planners and officials at state, local, tribal, and territorial governments to analyze climate risk to support decision-making.

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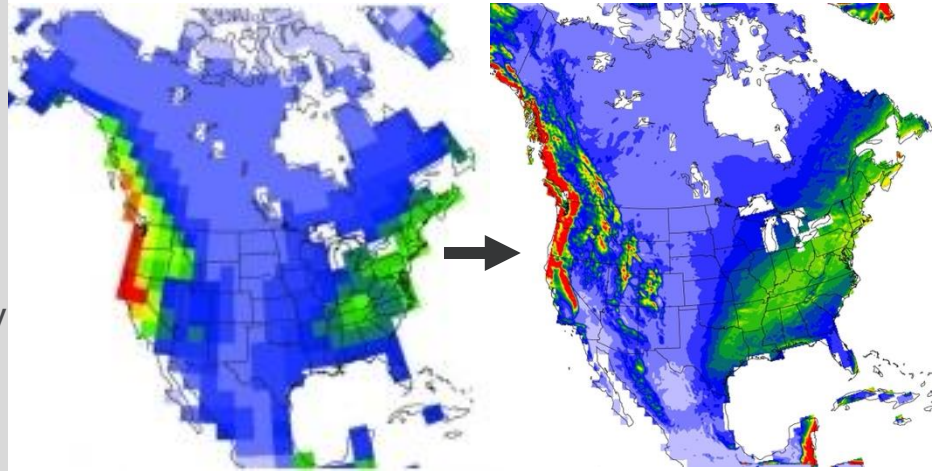
FEMA

GDO
GRID DEPLOYMENT OFFICE

AT&T

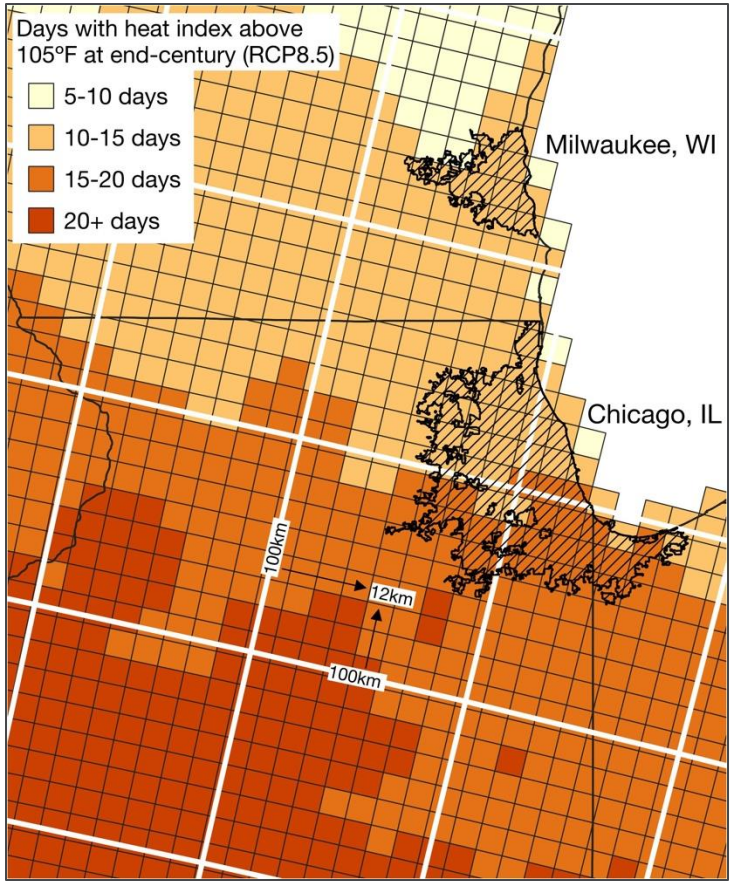
LOCAL CLIMATE PROJECTIONS THROUGH DYNAMICAL DOWNSCALING

- From coarse resolution (100-200km) to high resolution, community-level data (12km)
- Physics-based models that incorporate local geography & features (e.g., mountains, waterbodies)
- Downscaled data from three different global climate models
- Three timeframes: historical (1995-2004), mid-century (2045-2054), and end-of-century (2085-2094)
- Two scenarios: RCP8.5 (high emissions) + RCP4.5 (moderate emissions)
- Scientific transparency: widely published and peer reviewed modeling and outcomes



DYNAMICAL DOWNSCALING

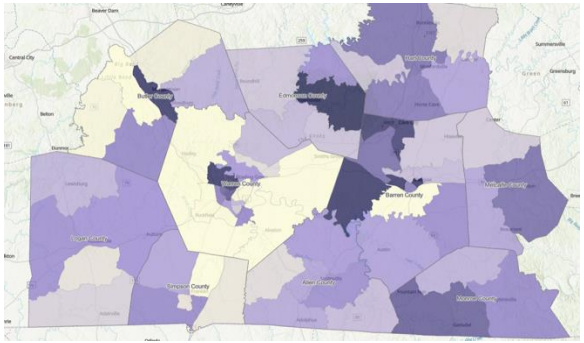
- From coarse resolution (100-200km) to high resolution, community-level data (12km)
- Physics-based models that incorporate local geography & features (e.g., mountains, waterbodies)
- Downscaled data from three different global climate models
- Three timeframes: historical (1995-2004), mid-century (2045-2054), and end-of-century (2085-2094)
- Two scenarios: RCP8.5 (high emissions) + RCP4.5 (moderate emissions)
- Scientific transparency: widely published and peer reviewed modeling and outcomes



HIGHLIGHTED FINDINGS – BRADD

Importance of Monitoring Heat Index

Classification	Heat Index	Effect on the Body
Caution	80°F - 90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F - 103°F	Heat stroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F - 124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely



+1 Week

over a heat-index of 105 degrees by mid-century.

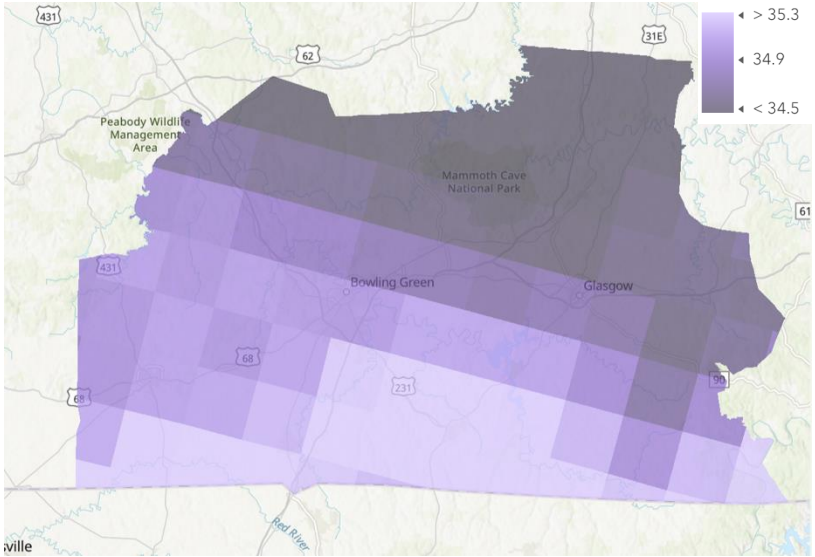
5 inches

of additional rainfall are expected in some regions of BRADD.

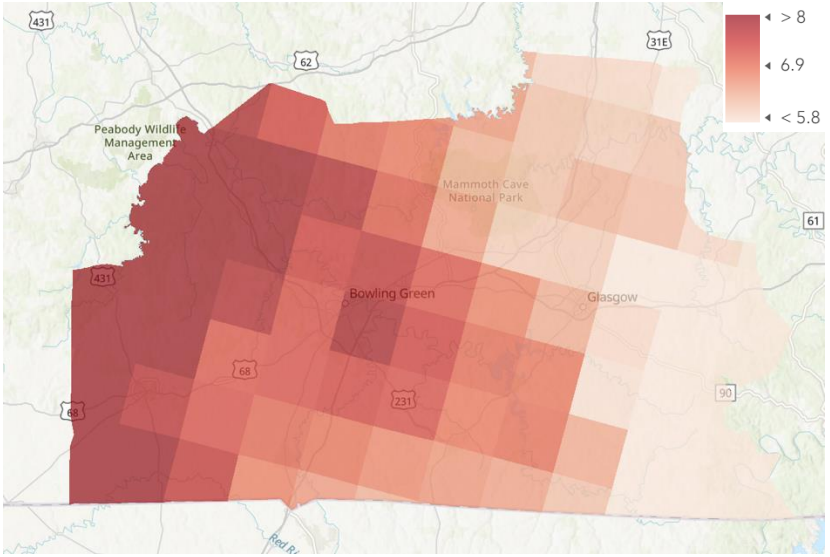
19%

of BRADD falls below poverty level, with some areas eclipsing 35%.

PROJECTING WARMER WINTERS AND SCORCHING SUMMERS



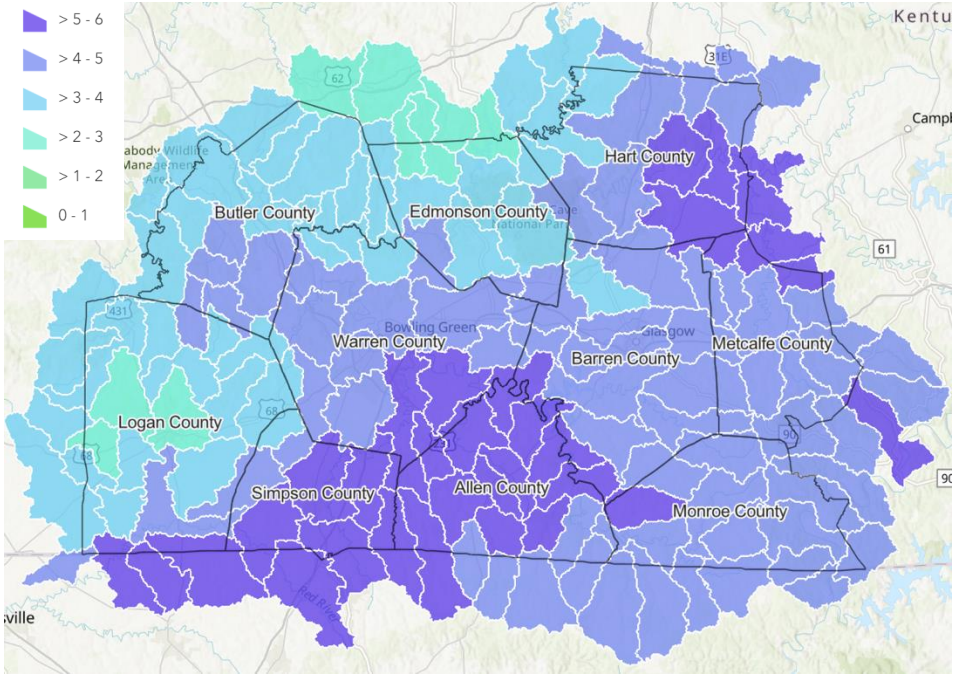
Winter Average Low Temperature: RCP8.5 Mid-Century



Change in Days with Heat Index over 105: Mid-Century vs. Historical

Key Takeaway: ClimRR shows that the BRADD may need to deal with an additional two to three weeks of these potentially dangerous heat index values compared to the historical model.

PLANNING FOR POTENTIAL CHANGES IN WATERSHED VOLUME ACROSS THE REGION



Change in Precipitation by HUC12s: RCP8.5 Mid-Century vs. Historical

Key Takeaway:

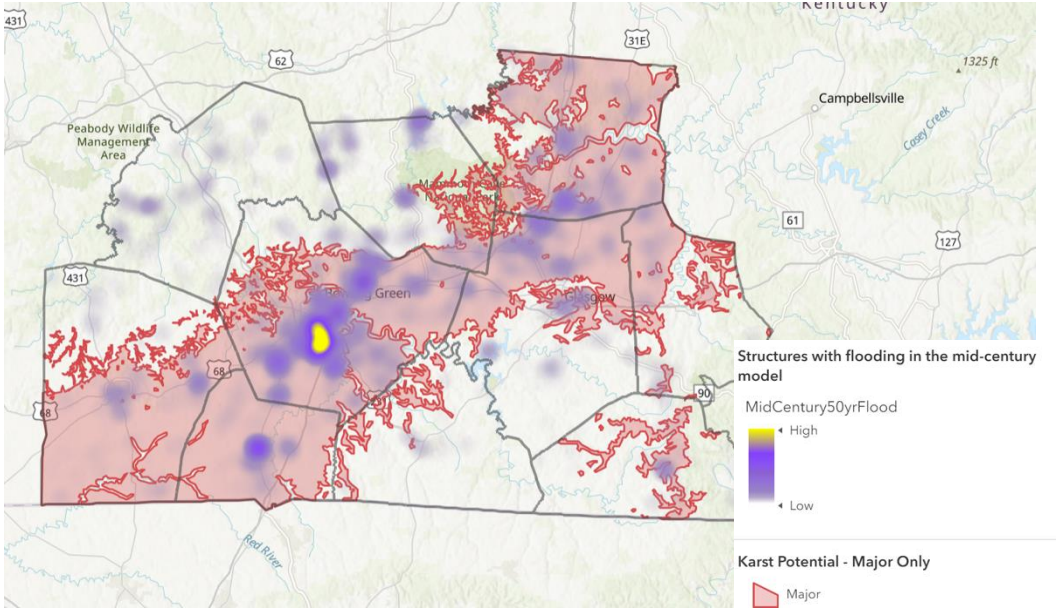
Comparing the historical period (2000) to midcentury (2050), ClimRR projects that these counties will see the greatest change in precipitation (5-6"): Allen, Simpson, Warren, and Hart

This has capacity implications for:

- Water treatment facilities
- River/stream systems
- City stormwater management

SINKHOLES, FLOODING, AND CLIMATE CHANGE

- As precipitation increases so to does the probability of sinkholes in a karst landscape.
- This precipitation will also cause more pluvial flooding.
- These hazards do not require new mitigation strategies but rather expansion of already established strategies in areas of compounding exposure.

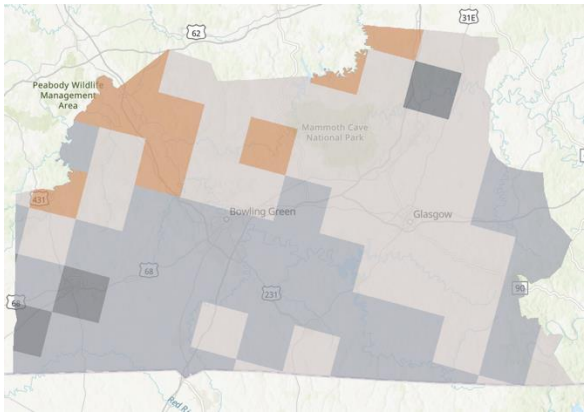


MANAGING WATER UNDER DIFFERENT CLIMATE SCENARIOS

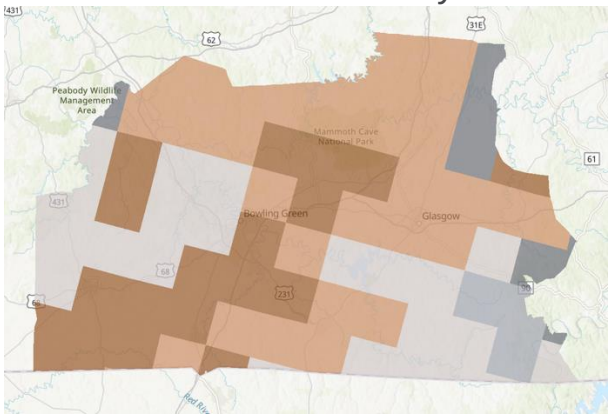
Consecutive Days with No Precipitation

> 30 - 35
> 28 - 30
> 26 - 28
> 24 - 26
22 - 24

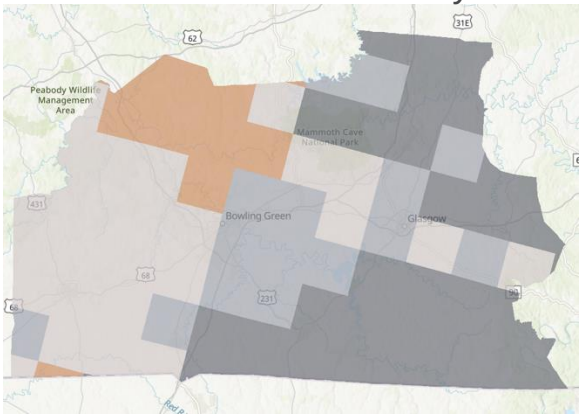
Historical



RCP4.5 Mid-Century

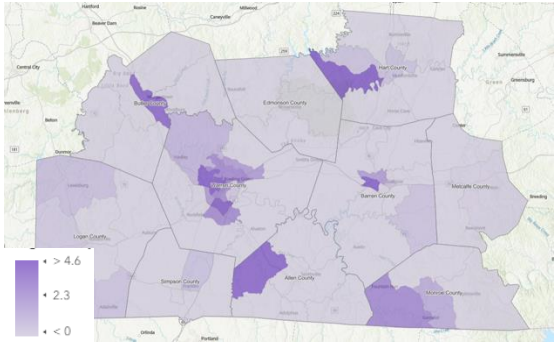


RCP8.5 Mid-Century

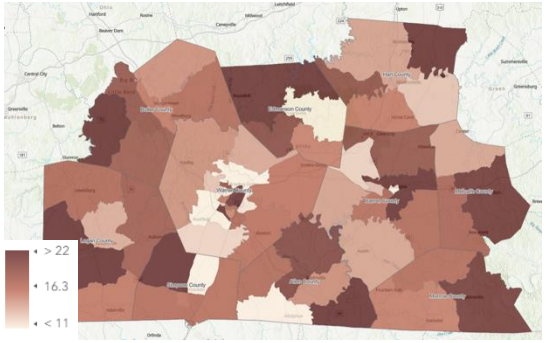


Key Takeaway: ClimRR shows that the lower emissions scenario projects see more drought-like conditions, while the higher emissions scenario sees less, requiring flexibility in future water management projects

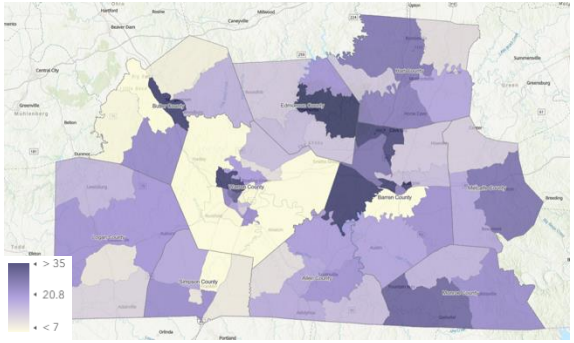
CLIMATE IMPACTS AND EQUITY



Households with Limited English: Percentage of households in which no one over 14 speaks English "very well"



Population Age 65 and Older: Percentage of the population age 65 and older



Population Below Poverty Level: Percentage of the population below the U.S. Census poverty level in past 12 months

LESSONS LEARNED

- We are currently distilling our learnings from the Climate Resilient Communities research and implementations into a DIY guide for integrating climate data into similar plans.

- ClimRR data aides in the consideration of future conditions, but it does not account for all future conditions.

- Incorporating climate data into HMPs provides necessary context for mitigation planning to ensure that proposed strategies are not maladaptive.

CLIMATE RISK AND RESILIENCE PORTAL (CLIMRR)

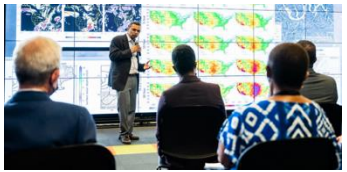
CLIMRR

Data offerings

- Temperature & heat index
- Precipitation
- Wildfire weather index
- Wind speeds
- Days with no precipitation
- Degree Days
- Future integration of:
  - Inland flooding
  - Storm surge / coastal flooding
  - Heat waves

Multiple ways to explore data

Local Climate Projections



National Map Explorers

Data Catalog

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QUESTIONS?
FEEDBACK?

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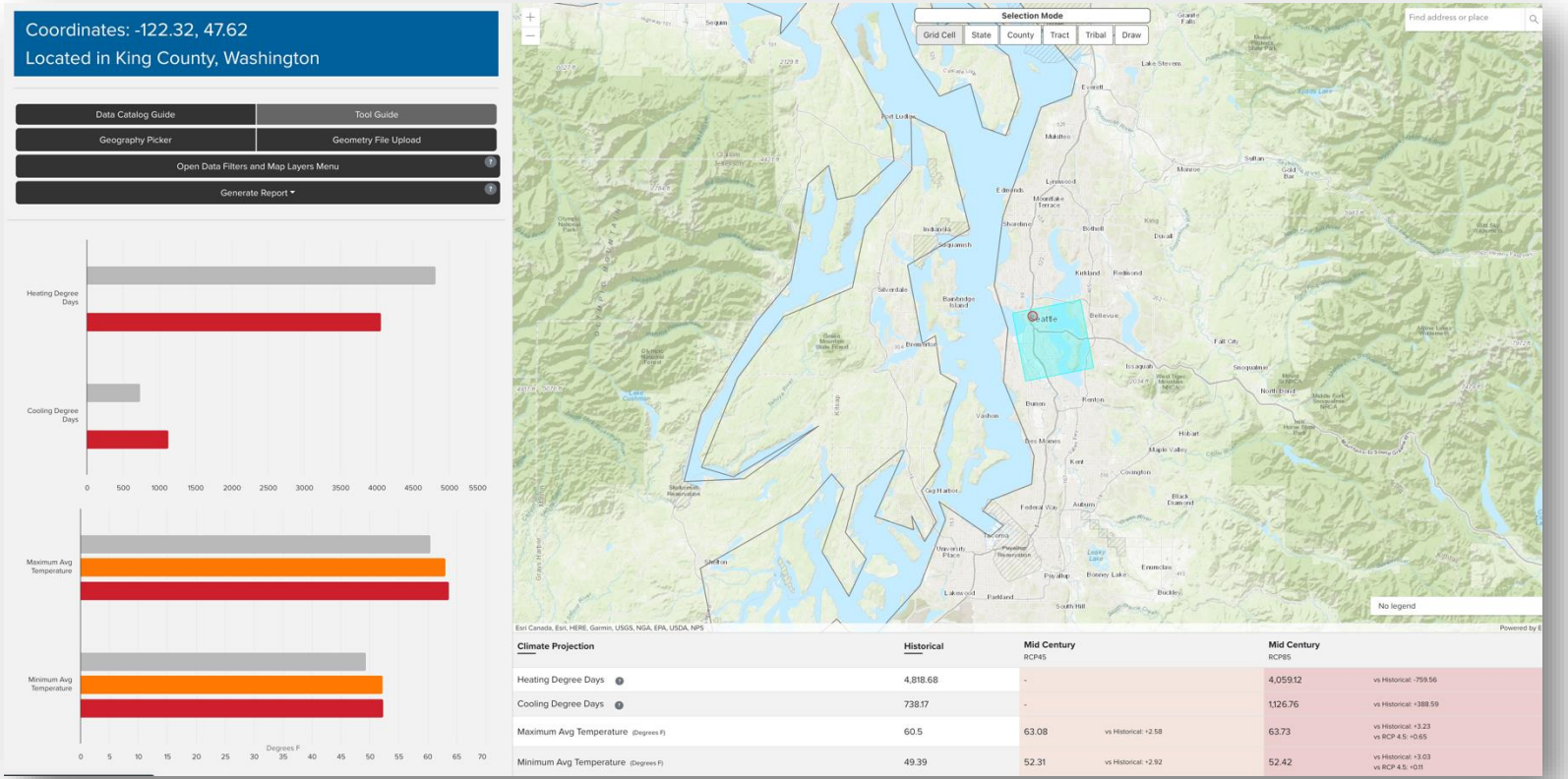
climrr.anl.gov

Link to ClimRR:

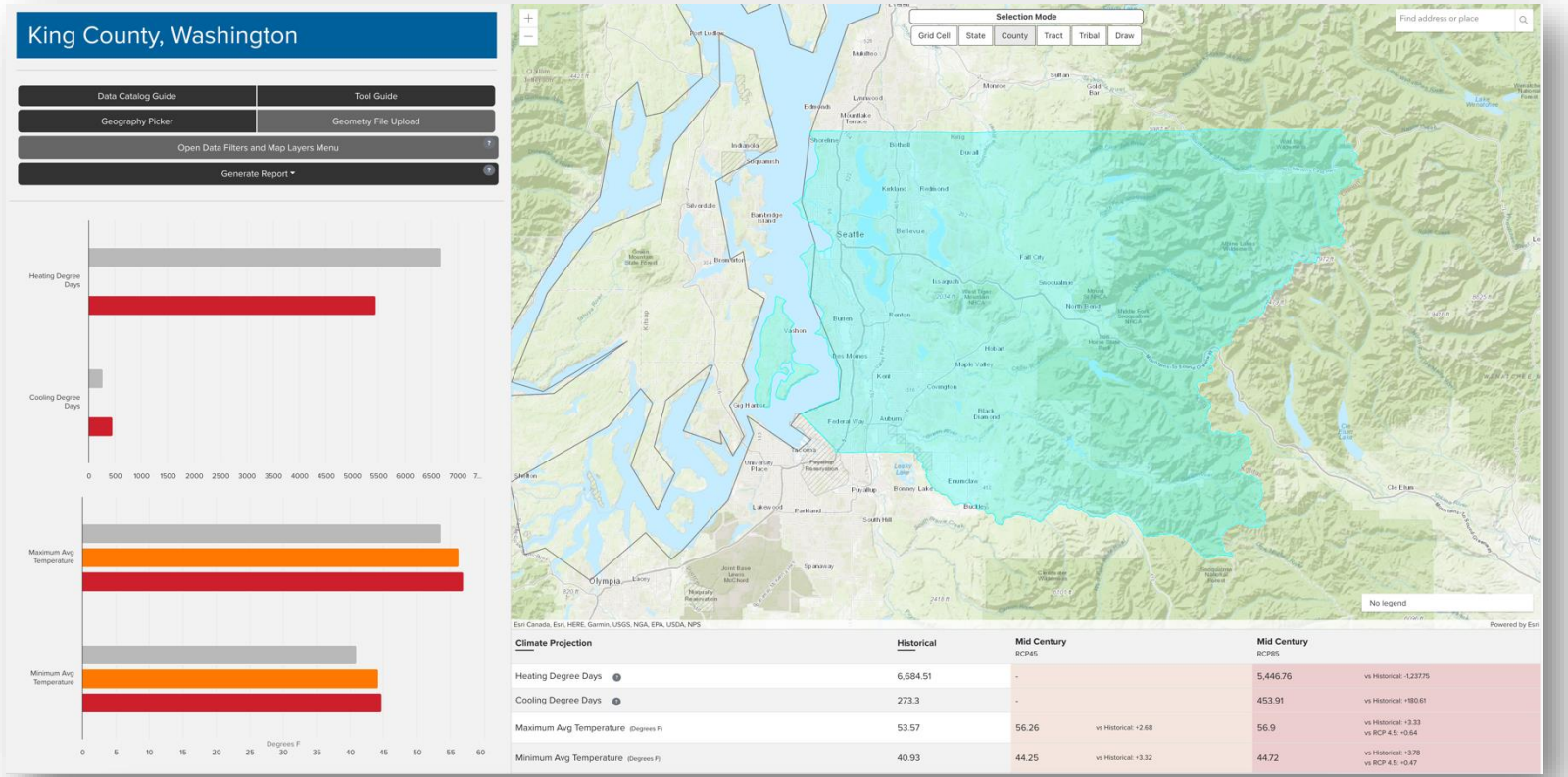
LOCAL CLIMATE PROJECTIONS

Grid-level data



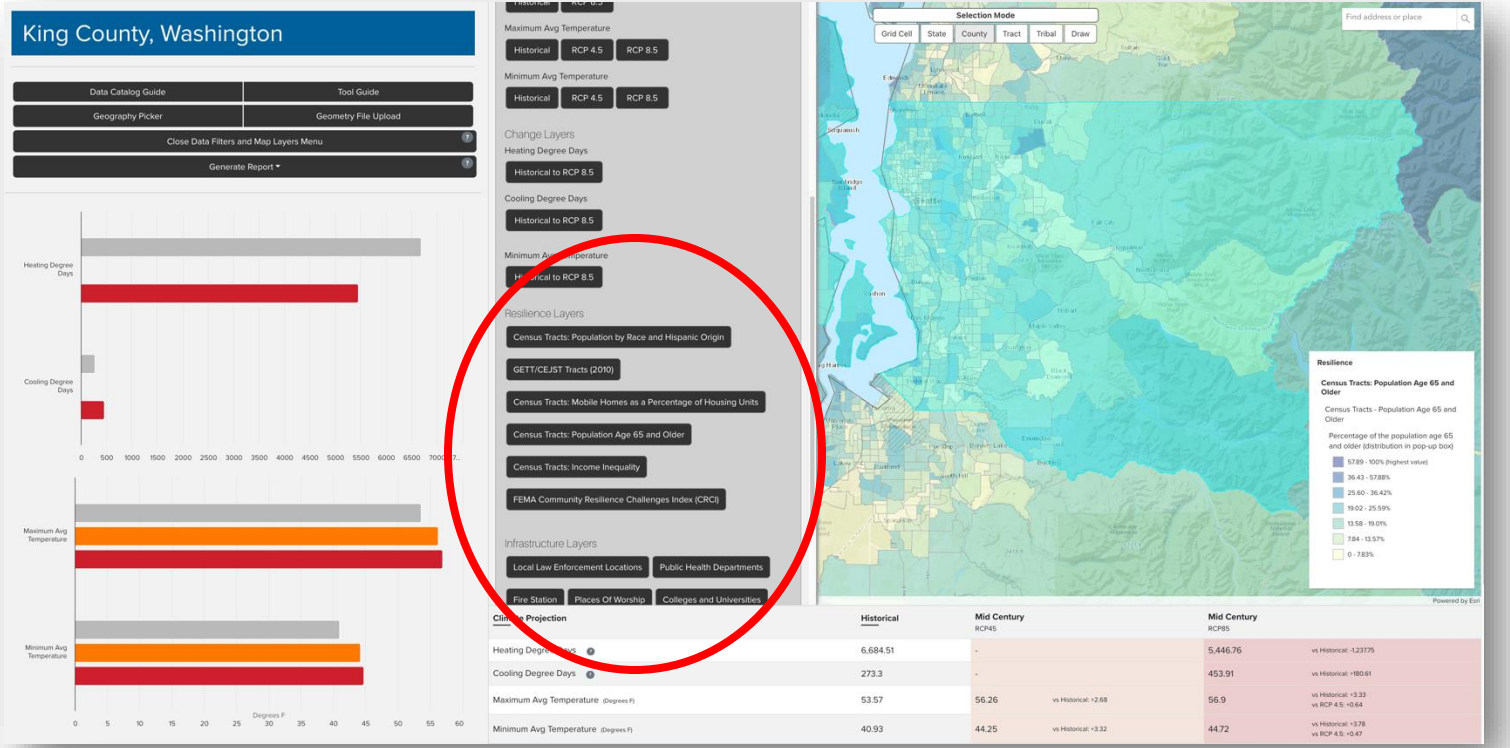
LOCAL CLIMATE PROJECTIONS

County-level summaries



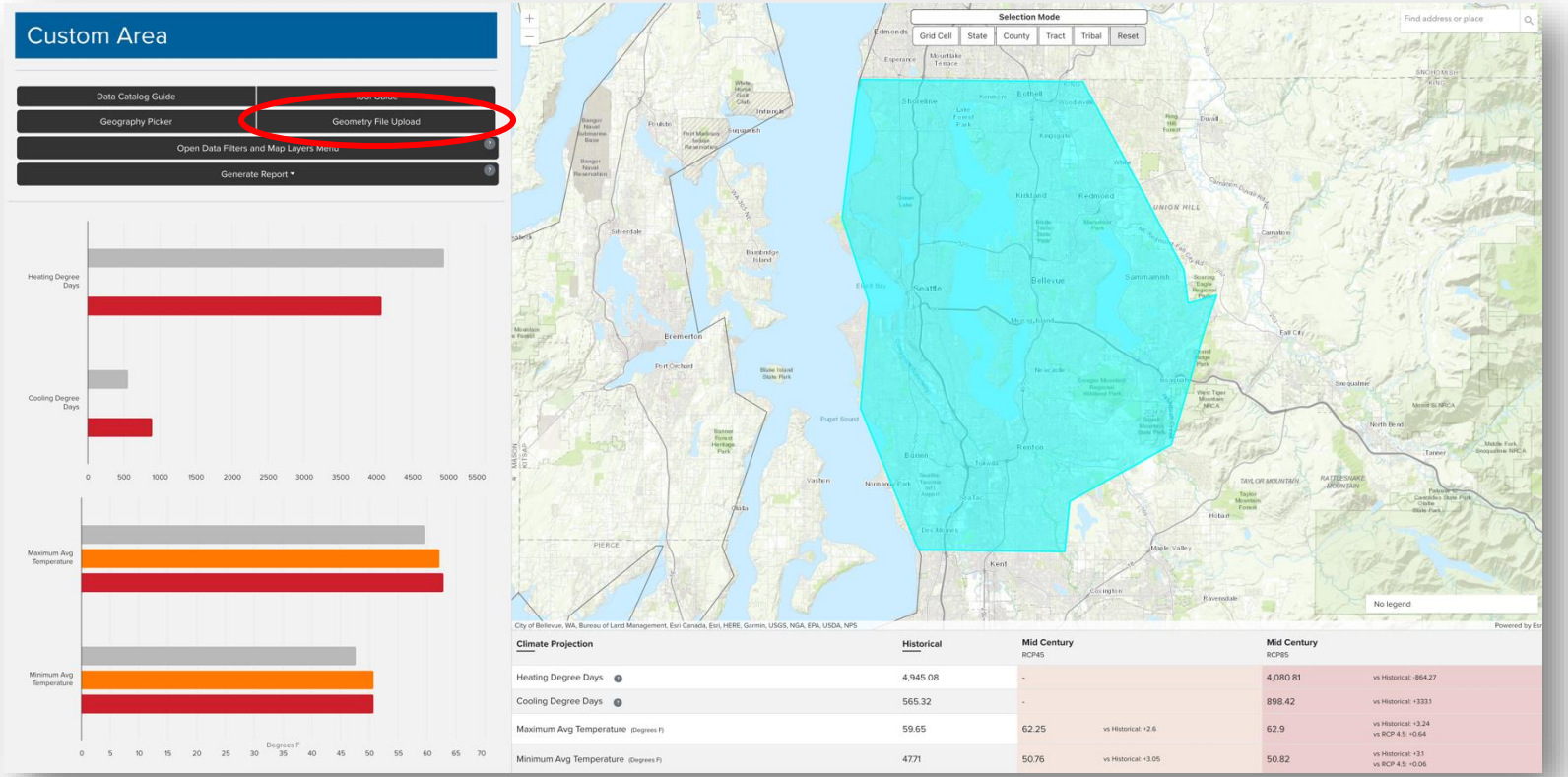
LOCAL CLIMATE PROJECTIONS

County-level summaries – community layers



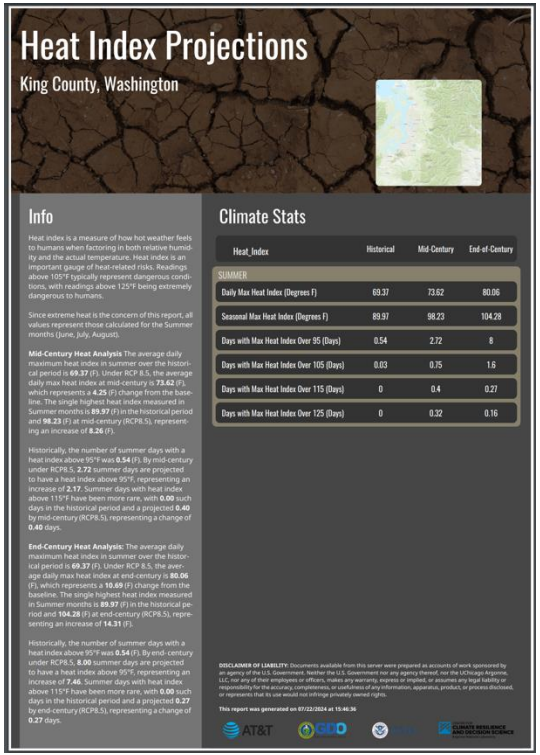
LOCAL CLIMATE PROJECTIONS

Draw your own area of interest



LOCAL CLIMATE PROJECTIONS

Current Variable Reports



Heat Index Projections

King County, Washington

Info

Heat index is a measure of how hot weather feels to humans when factoring in both relative humidity and the actual temperature. Heat index is an important gauge of heat-related risks. Readings above 105°F typically represent dangerous conditions, with readings above 125°F being extremely dangerous to humans.

Since extreme heat is the concern of this report, all values represent those calculated for the Summer months (June, July, August).

Mid-Century Heat Analysis The average daily maximum heat index in summer over the historical period is **69.37** (F). Under RCP 8.5, the average daily max heat index at mid-century is **73.62** (F), which represents a **4.25** (F) change from the baseline. The single highest heat index measured in Summer months is **89.97** (F) in the historical period and **98.23** (F) at mid-century (RCP8.5), representing an increase of **8.26** (F).

Historically, the number of summer days with a heat index above 95°F was **0.54** (F). By mid-century under RCP8.5, **2.72** summer days are projected to have a heat index above 95°F, representing an increase of **2.17**. Summer days with heat index above 115°F have been more rare, with **0.00** such days in the historical period and a projected **0.40** by mid-century (RCP8.5), representing a change of **0.40** days.

End-Century Heat Analysis: The average daily maximum heat index in summer over the historical period is **69.37** (F). Under RCP 8.5, the average daily max heat index at end-century is **80.06** (F), which represents a **10.69** (F) change from the baseline. The single highest heat index measured in Summer months is **89.97** (F) in the historical period and **104.28** (F) at end-century (RCP8.5), representing an increase of **14.31** (F).

Historically, the number of summer days with a heat index above 95°F was **0.54** (F). By end-century under RCP8.5, **8.00** summer days are projected to have a heat index above 95°F, representing an increase of **7.46**. Summer days with heat index above 115°F have been more rare, with **0.00** such days in the historical period and a projected **0.27** by end-century (RCP8.5), representing a change of **0.27** days.

Climate Stats

Heat_Index	Historical	Mid-Century	End-of-Century
SUMMER			
Daily Max Heat Index (Degrees F)	69.37	73.62	80.06
Seasonal Max Heat Index (Degrees F)	89.97	98.23	104.28
Days with Max Heat Index Over 95 (Days)	0.54	2.72	8
Days with Max Heat Index Over 105 (Days)	0.03	0.75	1.6
Days with Max Heat Index Over 115 (Days)	0	0.4	0.27
Days with Max Heat Index Over 125 (Days)	0	0.32	0.16

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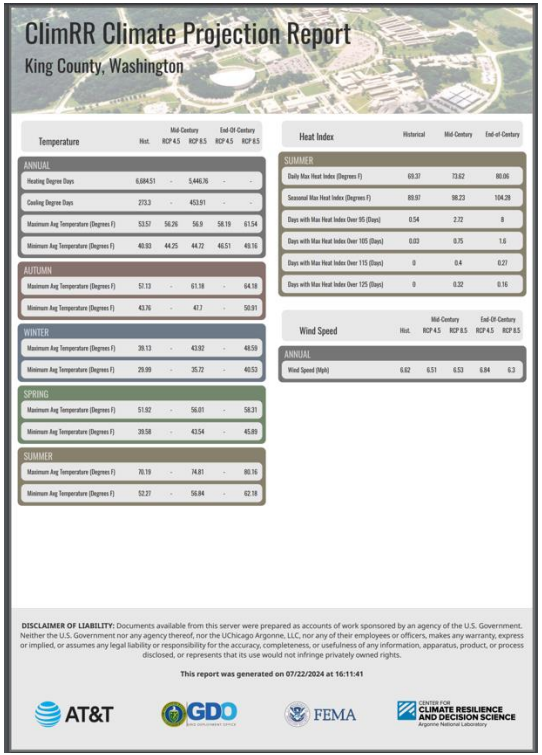
All Variables Reports (1 of 2 pages)



ClimRR Climate Projection Report

King County, Washington

Temperature	Hist.	Mid-Century RCP 4.5	Mid-Century RCP 8.5	End-Of-Century RCP 4.5	End-Of-Century RCP 8.5
ANNUAL					
Heating Degree Days	6,684.51	-	5,446.76	-	-
Cooling Degree Days	273.3	-	453.91	-	-
Maximum Avg Temperature (Degrees F)	53.57	56.26	56.9	58.18	61.54
Minimum Avg Temperature (Degrees F)	40.93	44.25	44.72	46.51	49.16
AUTUMN					
Maximum Avg Temperature (Degrees F)	57.13	-	61.18	-	64.18
Minimum Avg Temperature (Degrees F)	43.76	-	47.7	-	50.91
WINTER					
Maximum Avg Temperature (Degrees F)	39.13	-	43.92	-	48.59
Minimum Avg Temperature (Degrees F)	29.99	-	35.72	-	40.53
SPRING					
Maximum Avg Temperature (Degrees F)	51.92	-	56.01	-	58.31
Minimum Avg Temperature (Degrees F)	39.58	-	43.54	-	45.89
SUMMER					
Maximum Avg Temperature (Degrees F)	70.19	-	74.81	-	80.16
Minimum Avg Temperature (Degrees F)	52.27	-	56.94	-	62.18

Heat Index	Historical	Mid-Century	End-of-Century
SUMMER			
Daily Max Heat Index (Degrees F)	69.37	73.62	80.06
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Days with Max Heat Index Over 115 (Days)	0	0.4	0.27
Days with Max Heat Index Over 125 (Days)	0	0.32	0.16

Wind Speed	Hist.	Mid-Century RCP 4.5	Mid-Century RCP 8.5	End-Of-Century RCP 4.5	End-Of-Century RCP 8.5
ANNUAL					
Wind Speed (Mph)	6.02	6.51	6.53	6.84	6.3

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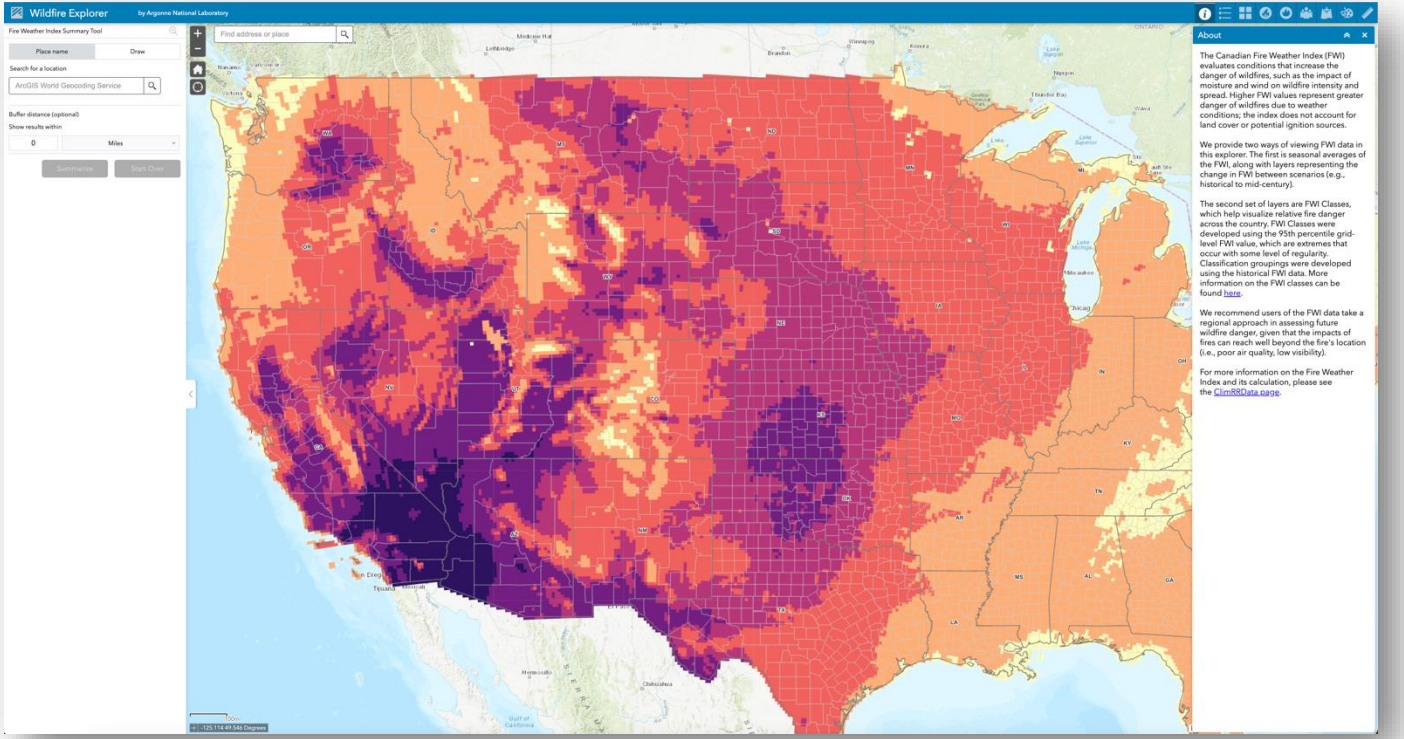
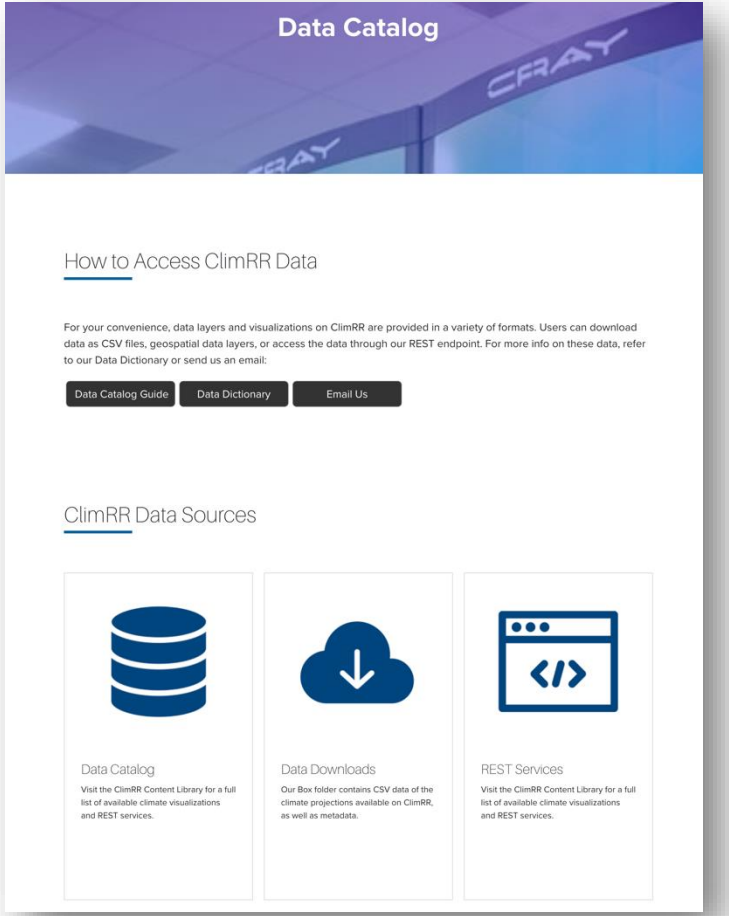
NATIONAL MAP EXPLORERS

- Mapping interface
- Analytical tools
- No GIS expertise required
- Community and infrastructure data



DATA CATALOG

- Data download (spatial and tabular)
- Data catalog (linking to other Arc Online environments)
- REST API services



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