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AIR FORCE WEATHER AGENCY

QDR CLIMATE CHANGE:
PROJECTED CLIMATOLOGY 2030/2050 PART II

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Director of Operations
14th Weather Squadron

Original Task / Intent

Results are derived directly from the IPCC/NCAR CCSM3 climate forecast model and are NOT a product of AF models or long-range forecast procedures

- **23 Dec 09: SAF/IEE requested support for climate change information/date via HAF/A3O-W**
- **Task: Utilize QDR-directed Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report future climate projections to create *proof-of-concept* projected climatology**
  - **Utilized CCSM3 climate model output**
  - **Moderate emissions scenario A1B**
  - **Recently added scenarios A2 and B1**
- **Intent: *Create OCDS-like forecast summaries (decadal average) for select DoD locations valid at 2030 and 2050**

*

Projected Climatology

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Current OCDS-II Report

Forecast 2020-2029 (2030) OCDS-II Report*

Forecast 2040-2049 (2050) OCDS-II Report*

Offutt AFB, NE

Parameter	Jan			Feb			Mar			Apr			May			Jun		
Avg Max Temp (°F)	37	38	40	40	42	43	53	55	57	66	68	70	76	77	79	83	85	87
Mean Temp (°F)	25	27	29	28	30	32	40	42	44	52	54	56	63	65	67	72	74	76
Avg Min Temp (°F)	18	20	22	21	22	24	31	33	35	44	45	47	54	56	58	63	65	67
Days > 90°F	0	0	0	0	0	0	0	0	0	0	1	1	2	3	4	6	8	11
Days < 32°F	30	27	25	25	22	20	18	14	12	5	3	1	0	0	0	0	0	0
Days < 0°F	3	3	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Mean Dewpoint (°F)	19	21	22	22	23	25	31	32	34	41	42	44	52	53	55	61	63	64
Mean Precip (in)	0.7	0.8	0.8	1.3	1.3	1.3	2.0	2.0	2.0	3.8	3.8	3.8	6.0	6.1	6.1	3.6	3.6	3.6

Parameter	Jul			Aug			Sep			Oct			Nov			Dec			Ann		
Avg Max Temp (°F)	89	91	93	86	88	90	79	81	83	66	68	70	53	54	56	38	40	42	64	66	68
Mean Temp (°F)	77	79	81	74	76	78	65	67	69	54	55	57	41	43	44	26	28	30	51	53	55
Avg Min Temp (°F)	69	70	72	66	68	70	56	58	60	45	47	48	32	34	36	20	22	24	43	45	47
Days > 90°F	14	17	20	8	12	15	4	5	7	0	1	2	0	0	0	0	0	0	34	45	58
Days < 32°F	0	0	0	0	0	0	0	0	0	5	2	2	17	13	12	28	26	24	129	109	96
Days < 0°F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	1	9	6	4
Mean Dewpoint (°F)	67	69	71	66	67	69	55	56	58	44	45	47	32	33	35	21	22	24	42	43	45
Mean Precip (in)	3.1	3.1	3.1	4.1	4.1	4.1	1.9	2.0	2.0	2.3	2.3	2.3	1.4	1.4	1.5	1.0	0.9	0.9	30.3	30.5	30.8

Current Task / Intent

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- **May - Aug 10: Presented initial results to A3O-W & SAF/IEE**
- **New Task: Exploit newly created Projected Climatology**
  - **Utilize existing 14 WS projections**
  - **Provide "useable" graphics (SAF/IEE and planner focused)**
  - **Apply sound statistical and meteorological methodologies**
- **Method: Focused on annual days ≥90F and ≤32F in 2030/50**
  - **CONUS only (+ applicable border sites for boundaries)**
    - **10+ year sites added to fill in previously data sparse regions**
  - **Graphic generation utilized inverse distance weighting interpolation**
    - **Reflects a weighted average of all data points (next slide)**
    - **Location is most/less influenced by nearby/distant points**

Data Points

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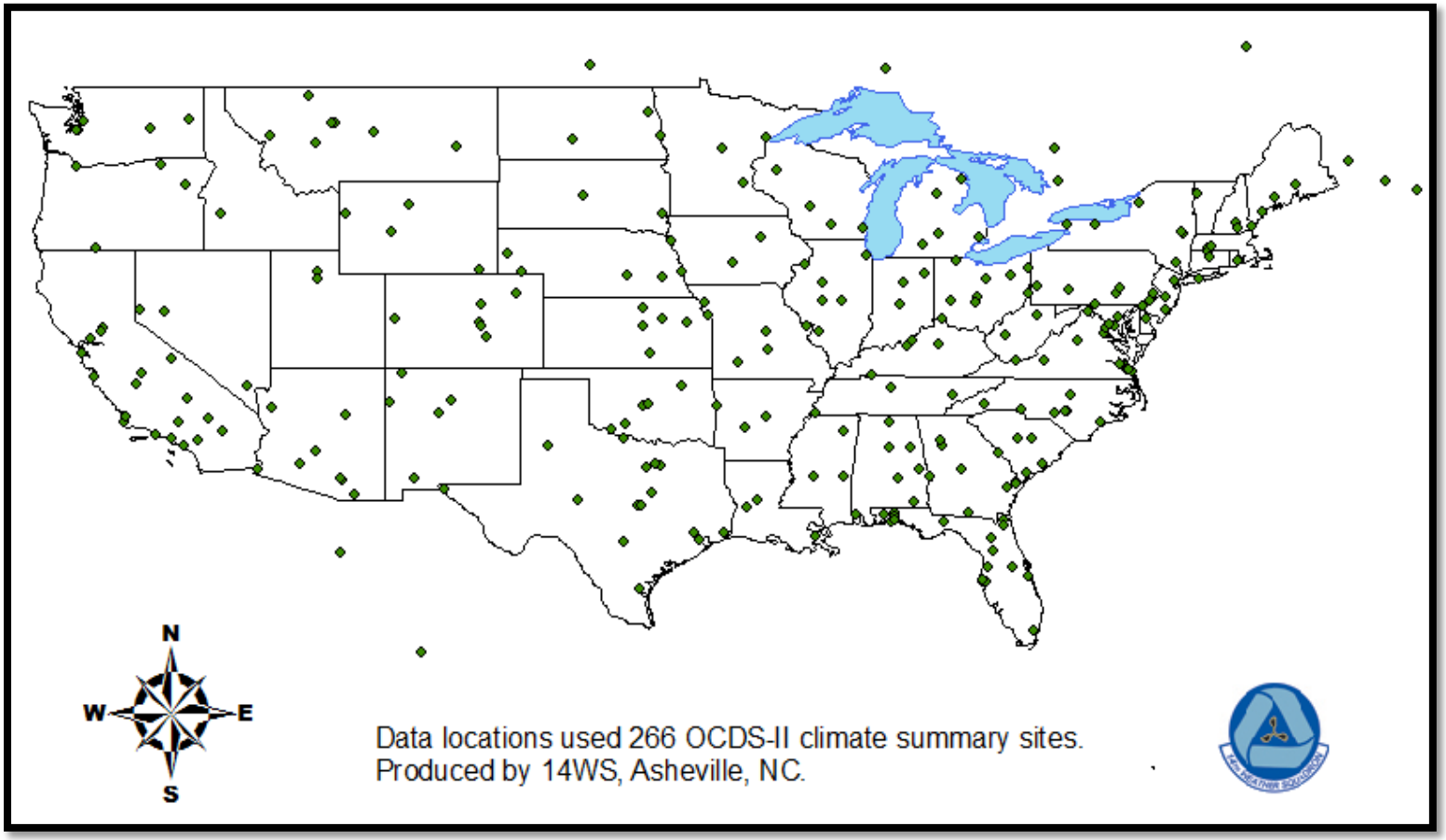

≤32F Days Decrease (2030)

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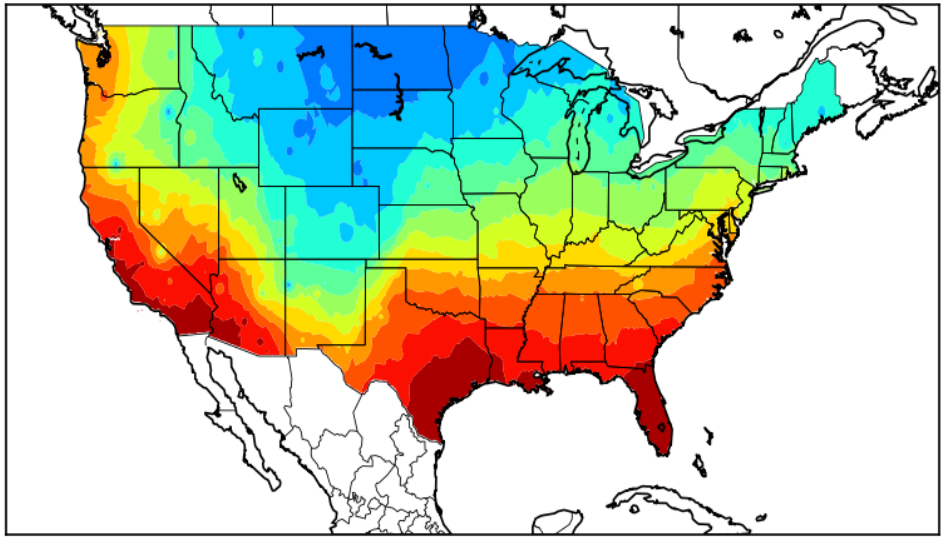
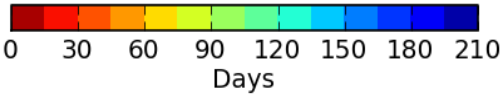
Climate Change Projection
Days ≤ 32°F: 2030 Projection



Projections derived from CCSM3-A1B 2010-2050 trend applied to replicated 1999-2008 data.
Inverse distance weighting interporlation used to create the map

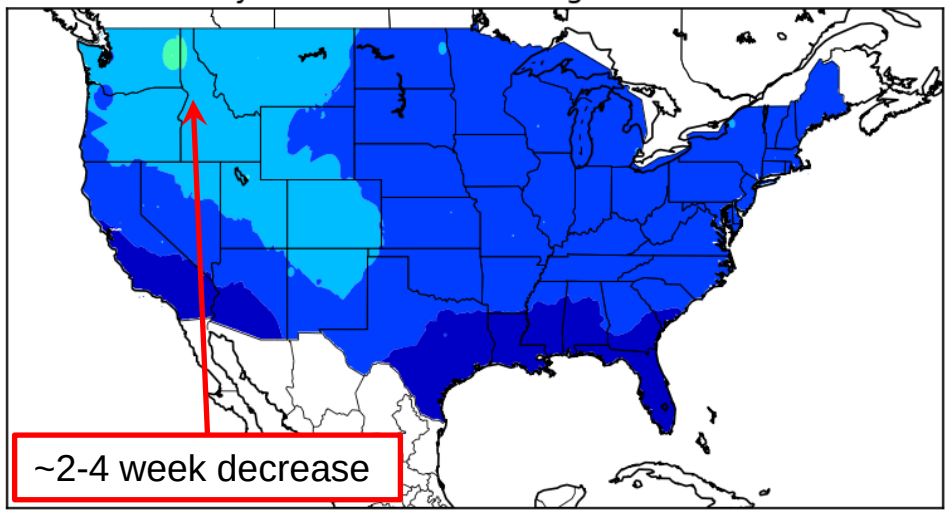


Produced by:
14WS: Asheville, NC

Summary

- CONUS-wide: 0 to 28 days decrease in days ≤ 32F
- NW CONUS: 14 to 28 days decrease in days ≤ 32F
  - -- Potentially reduce/alter mountain snowpack
  - -- Disrupt "normal" river flow to reservoirs/cities

Climate Change Projection
Days ≤ 32°F: 2030 Change from 2010



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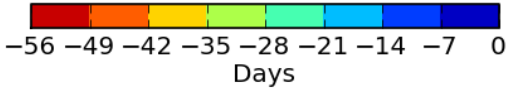

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≤32F Days Decrease (2050)

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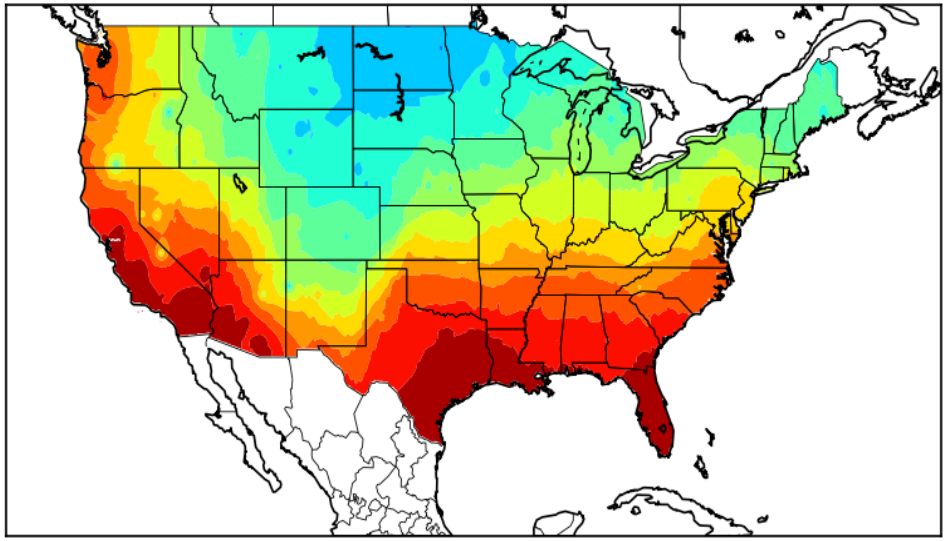
Days ≤ 32°F: 2050 Projection



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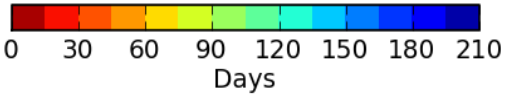

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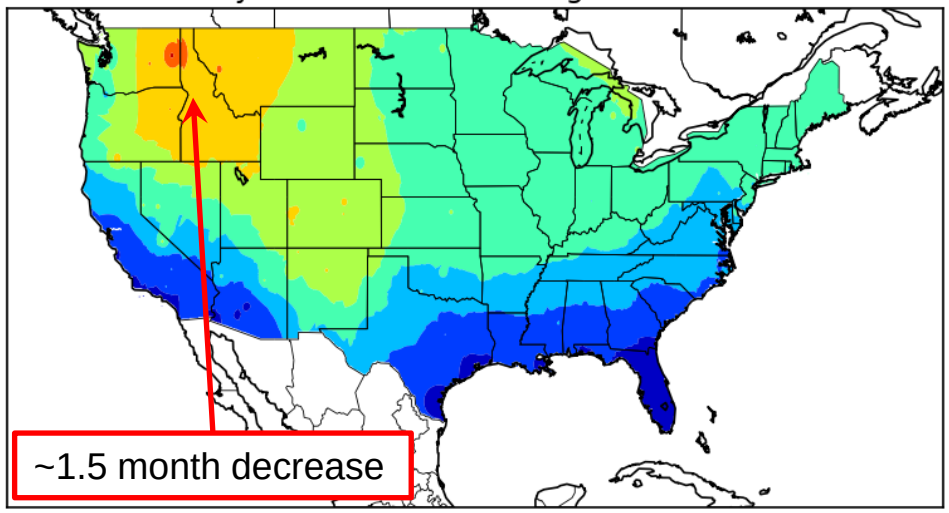
Summary

- CONUS-wide: 0 to 49 days decrease in days ≤ 32F
- NW CONUS: 28 to 49 days decrease in days ≤ 32F
  - -- Potentially reduce/alter mountain snowpack
  - -- Disrupt "normal" river flow to reservoirs/cities

Climate Change Projection
Days ≤ 32°F: 2050 Change from 2010



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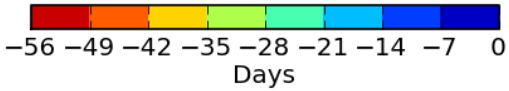

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≥90F Days Increase (2030)

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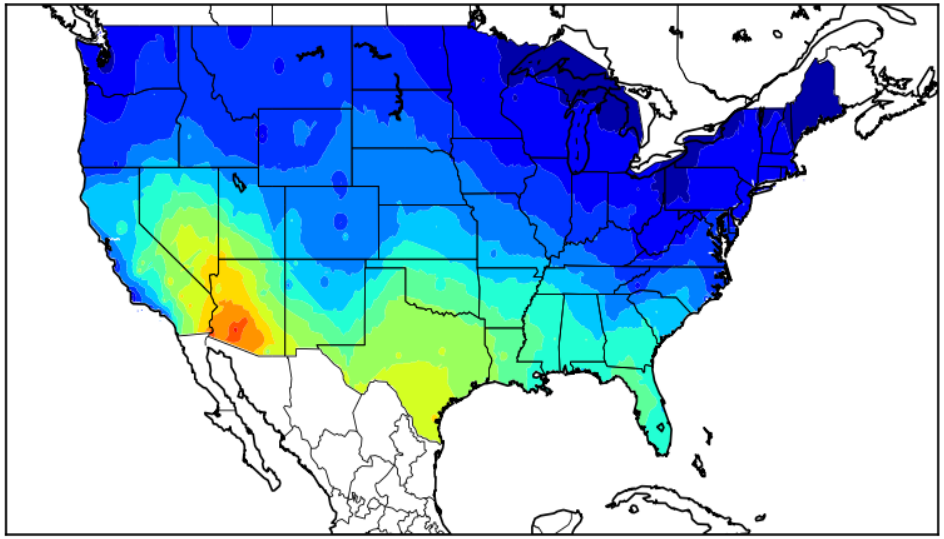
Climate Change Projection
Days ≥ 90°F: 2030 Projection



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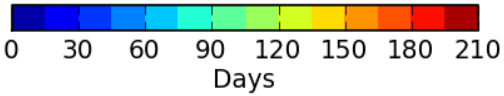

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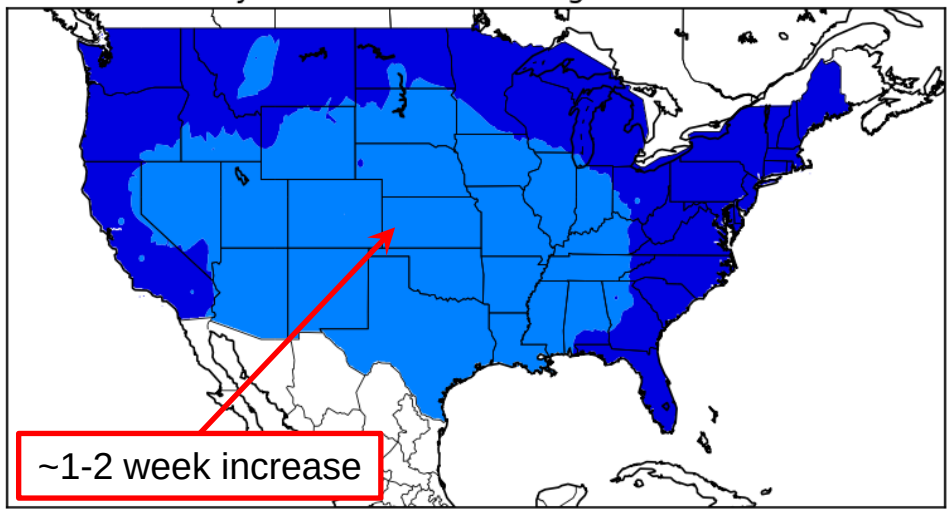
Summary

- CONUS-wide: 0 to 14 days increase in days ≥ 90F
- Cent CONUS: 7 to 14 days increase in days ≥ 90F
  - -- Increased "Black Flag" conditions
  - -- More extreme heat → power needs (a/c)

Climate Change Projection
Days ≥ 90°F: 2030 Change from 2010



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≥90F Days Increase (2050)

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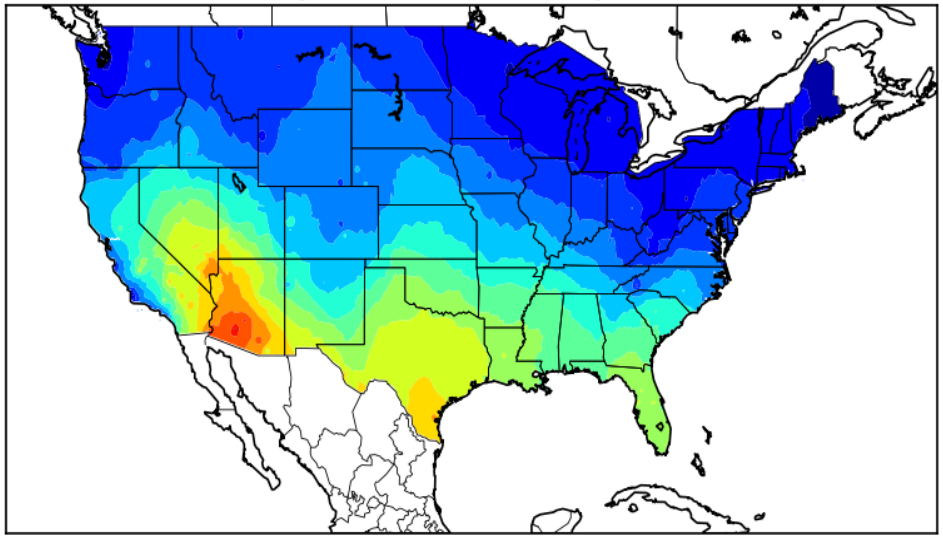
Climate Change Projection
Days ≥ 90°F: 2050 Projection



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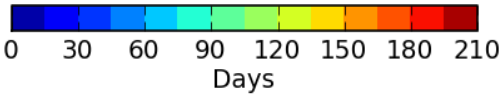

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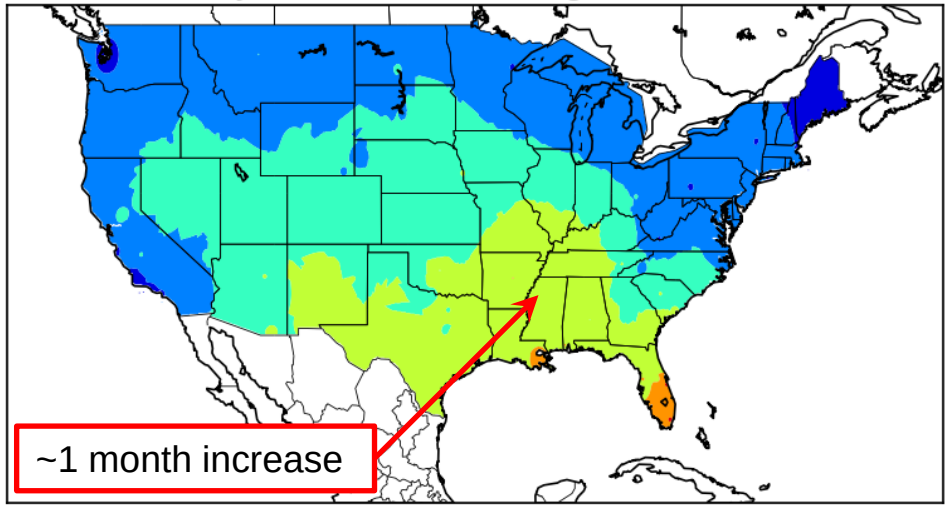
Summary

- CONUS-wide: 0 to 35 days increase in days ≥ 90F
- S CONUS: 21 to 35 days increase in days ≥ 90F
  - -- Increased "Black Flag" conditions
  - -- More extreme heat → power needs (a/c)

Climate Change Projection
Days ≥ 90°F: 2050 Change from 2010



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- **Decreased days ≤ 32F**
  - **Most visible in NW CONUS; up to ~1½ mo ('50) fewer freezing days**
  - **Impact mountain snowpack, availability/duration of fresh water**
- **Increased days ≥ 90F**
  - **Most visible in southern/southeastern states; up to ~1¼ mo ('50) more days above 90F**
  - **Impact due to increased Black Flag (ops) conditions, urban areas (e.g. heat stress, HVAC power demands) and seasonal crops**
- **A robust and expandable method**
  - **Geographically: Data-rich regions like Europe, ROK, Japan, etc**
  - **Temperature-related parameters: degree days, thresholds, etc**
  - **Other CCSM3 scenarios: A2, B1 extremes**

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Contact Information

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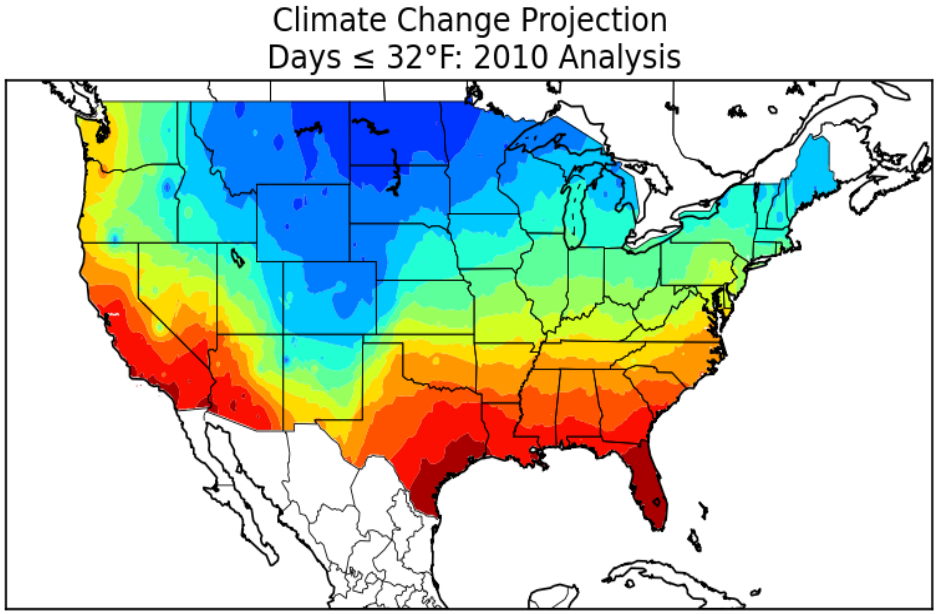
https://www.afccc.af.mil

Days <32F and >90F Current Analysis (2010)



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