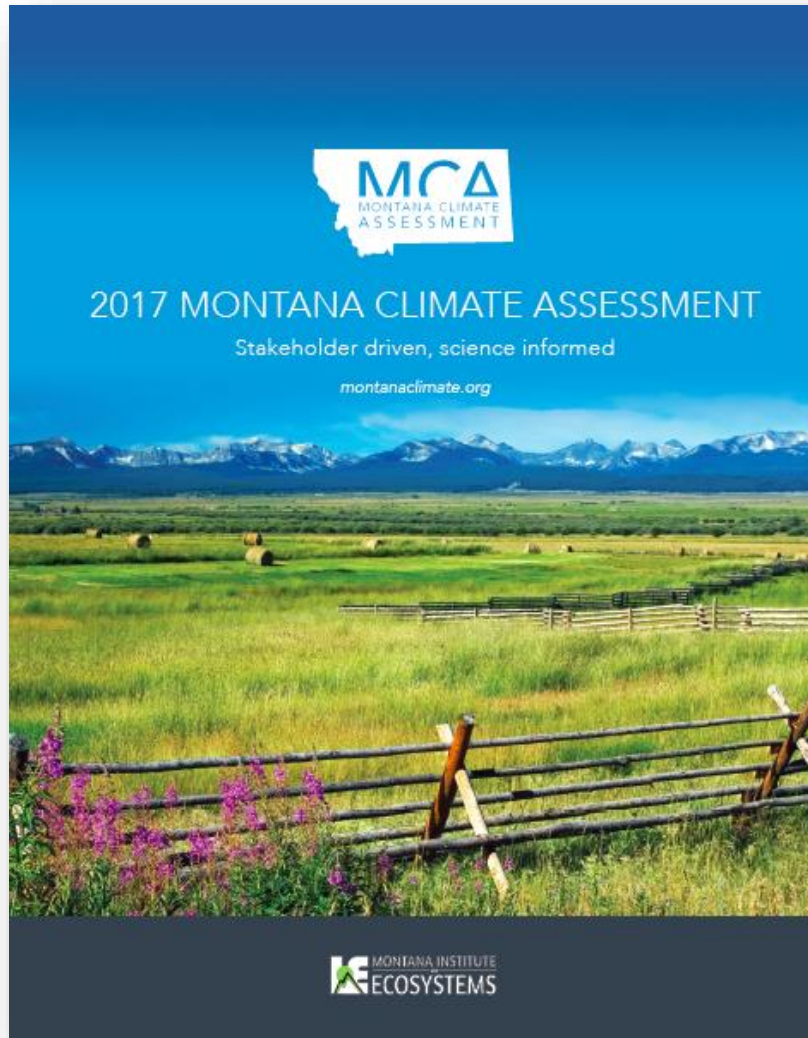


MONTANA CLIMATE ASSESSMENT

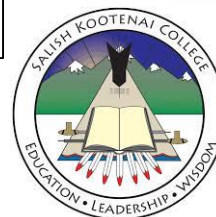
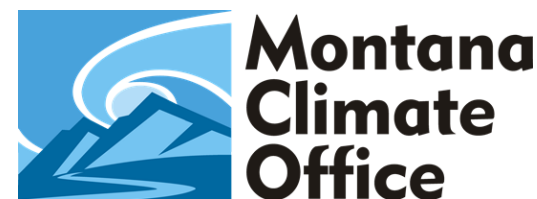
Cathy Whitlock
Montana State University



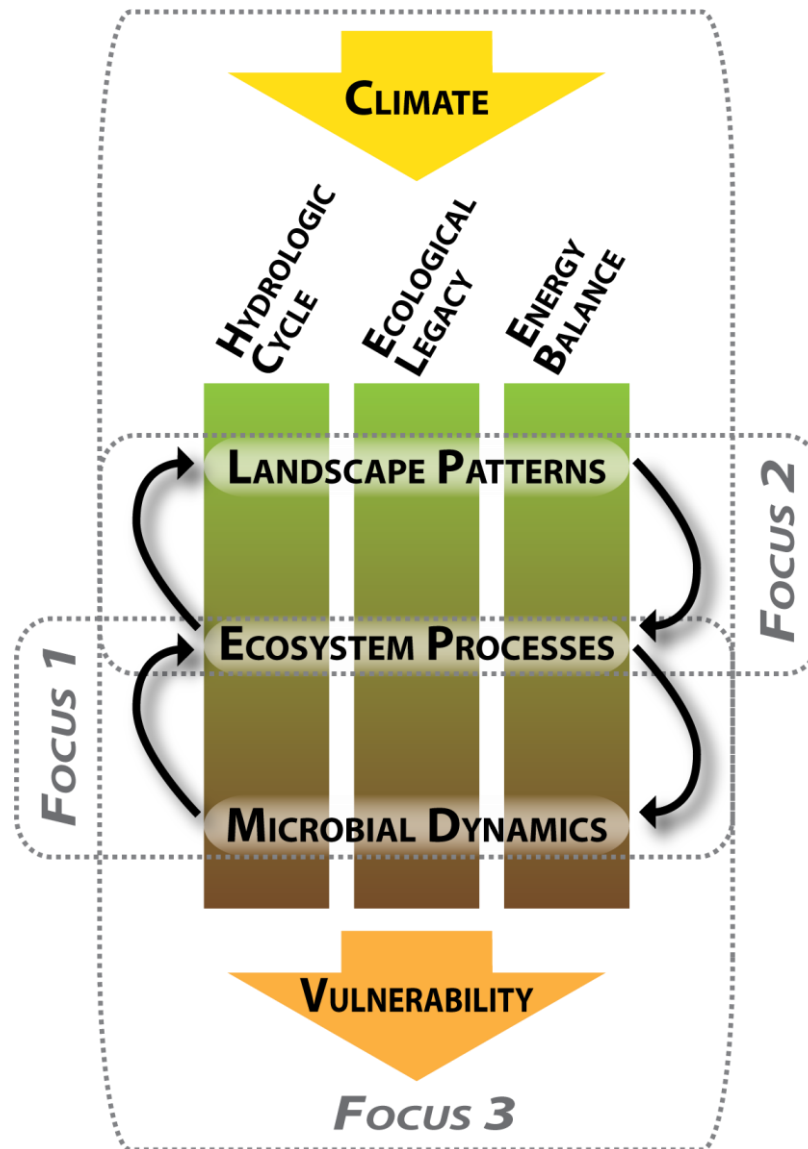
<http://montanaclimate.org>



MCA PARTNERS



MOTIVATION: NSF EPSCoR TRACK 1 GRANT



MOTIVATION: "THE RIGHT TO A CLEAN & HEALTHFUL ENVIRONMENT"

The CONSTITUTION of the STATE OF MONTANA

PREAMBLE

We the people of Montana grateful to God for the quiet beauty of our state, the grandeur of our mountains, the vastness of our rolling plains, and desiring to improve the quality of life, equality of opportunity and to secure the blessings of liberty for this and future generations do ordain and establish this constitution.

ARTICLE I COMPACT WITH THE UNITED STATES

All provisions of the enabling act of Congress (approved February 22, 1889, 25 Stat. 676), as amended and of Ordinance No. 1, appended to the Constitution of the state of Montana and approved February 22, 1889, including the agreement and declaration that all lands owned or held by any Indian or Indian tribes shall remain under the absolute jurisdiction and control of the congress of the United States, continue in full force and effect until revoked by the consent of the United States and the people of Montana.

ARTICLE II DECLARATION OF RIGHTS

Section 1. **POPULAR SOVEREIGNTY.** All political power is vested in and derived from the people. All government of right originates with the people, is founded upon their will only, and is instituted solely for the good of the whole.

Section 2. **SELF-GOVERNMENT.** The people have the exclusiveright of governing themselves as a free, sovereign, and independent state. They may alter or abolish the constitution and form of government whenever they deem it necessary.

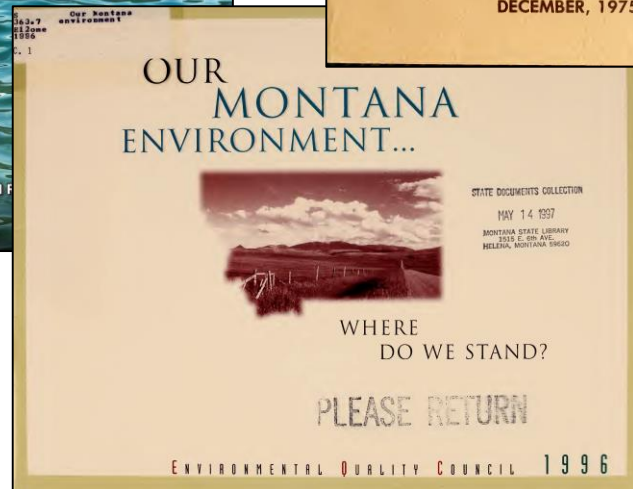
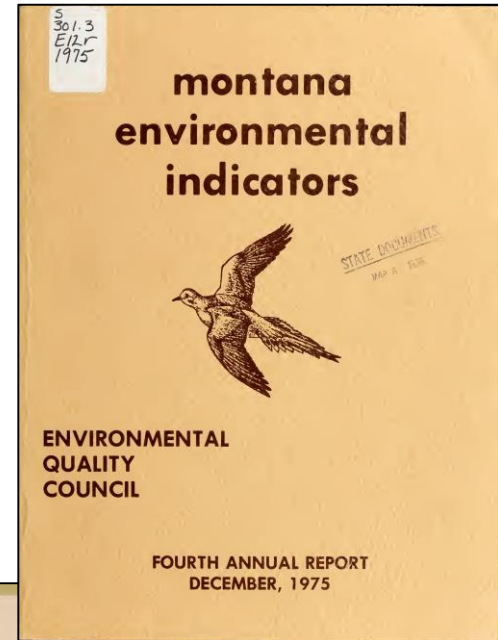
Section 3. **INALIENABLE RIGHTS.** All persons are born free and have certain inalienable rights. They include the right to a clean and healthful environment and the rights of pursuing life's basic necessities, enjoying their lives and liberties, acquiring, possessing and protecting property, and seeking their safety, health and happiness in all lawful ways. In enjoying these

Section 4. **IND**
No person shall be denied corporation, or institutio political rights on accou religious ideas.

Section 5. **FRE**
establishment of religion

Section 6. **FRE**
to assemble, petition for

Section 7. **FRE**
shall be passed impairing or publish whatever he v suits and prosecutions for under the direction of th



MOTIVATION: CLIMATE DRIVES THREE ECONOMIES

- Fast-growing 'micropolitan' and amenity sector that attract businesses & populations based on recreation & wildlands
- Resource-dependent agricultural, timber & energy sectors vulnerable to commodity price trends and regulatory & management decisions
- Persistently poor rural communities where isolation & historical factors contribute to human health & development challenges





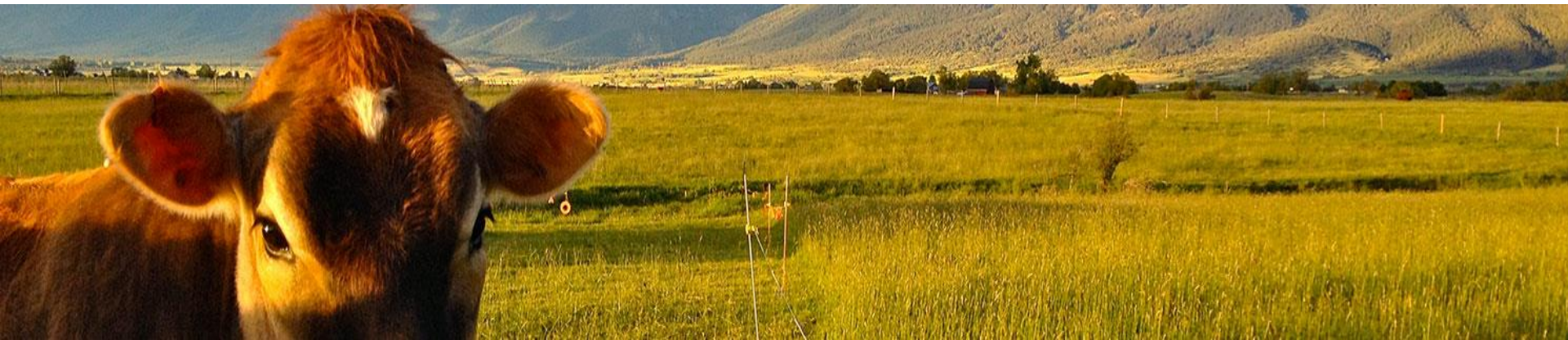
MCA STRATEGY

STAKEHOLDER DRIVEN, SCIENCE INFORMED

Listening sessions and questionnaires

Stakeholder responses informed the MCA strategy

- Critical decisions and issues impacted by climate
- What type of information they need
- How to disseminate useful information





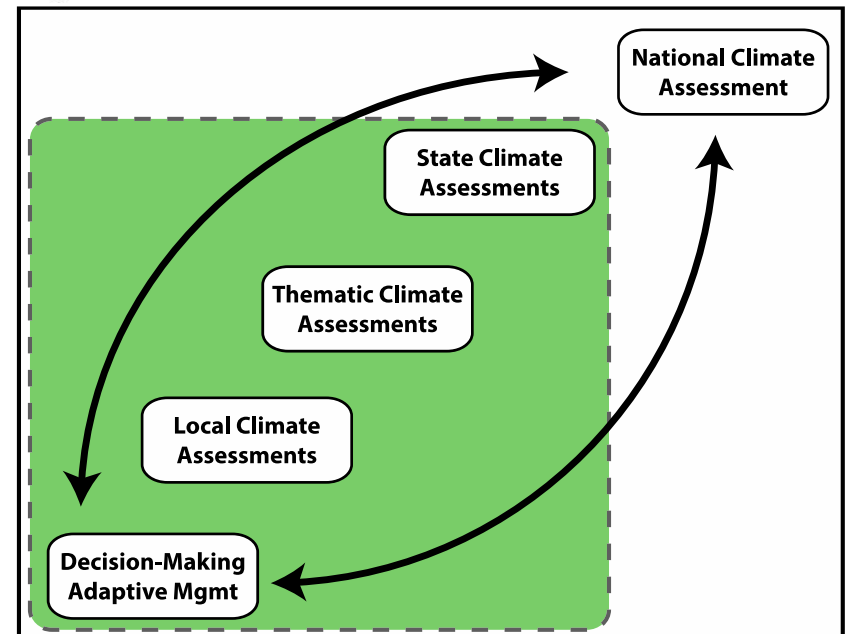
MCA STRATEGY

- Build on national efforts
- Build on university science, engagement & partnerships
- Cover relevant sectors
- Useful, updatable products
- Sustainable enterprise



U.S. Global Change Research Program

National Climate Assessment



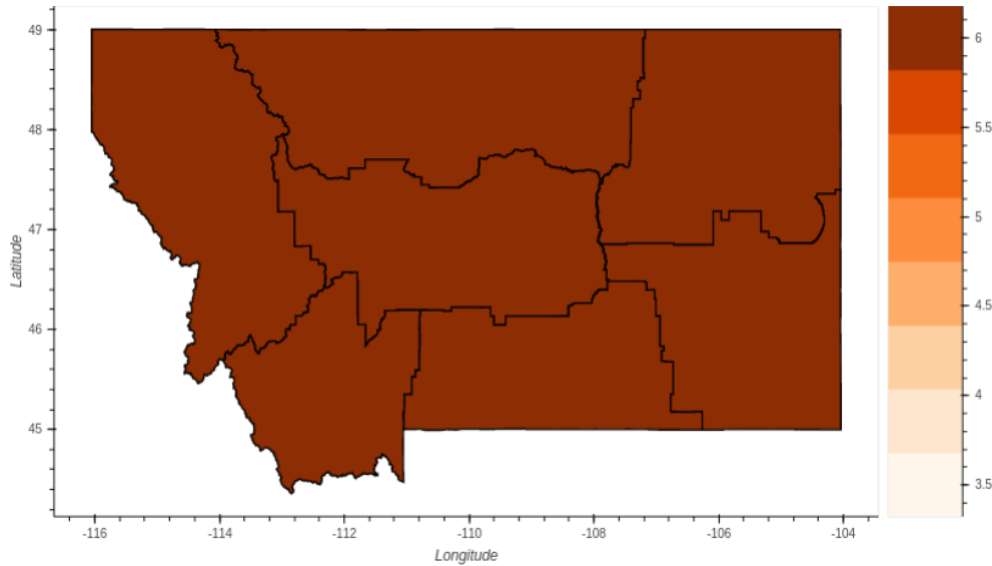
HOW IS MONTANA'S CLIMATE CHANGING?



photo credit: Rick & Susie Graetz, Univ. MT

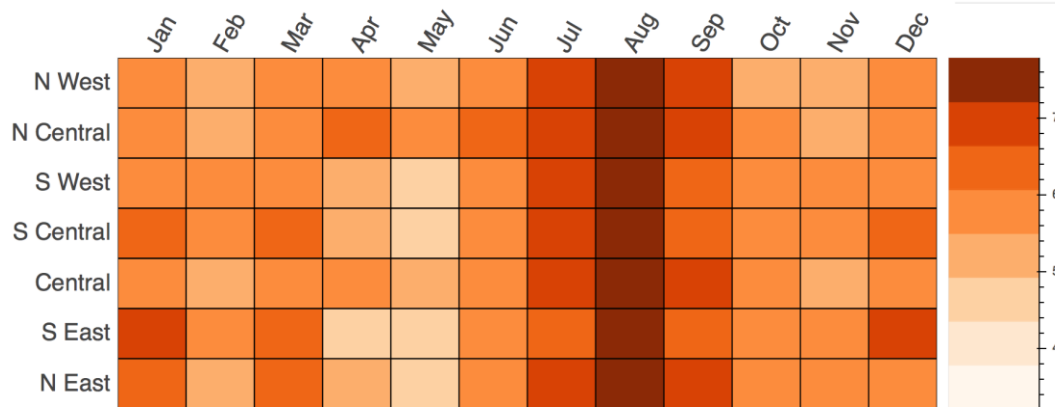
PROJECTED TEMPERATURES

RCP 8.5 (2040-2060)



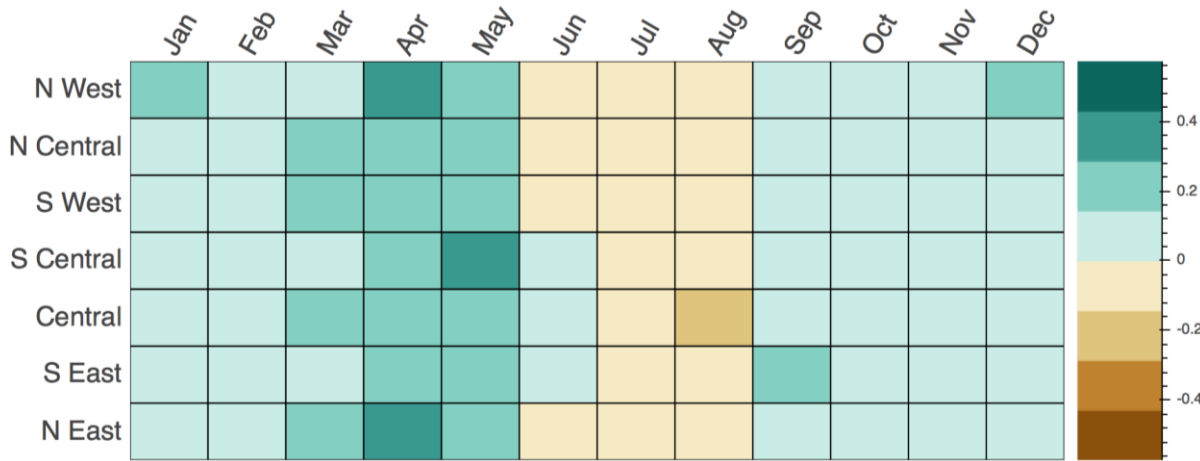
- Winter: 5 to 7°F
- Summer: 6 to 7.5°F

(100% model agreement)



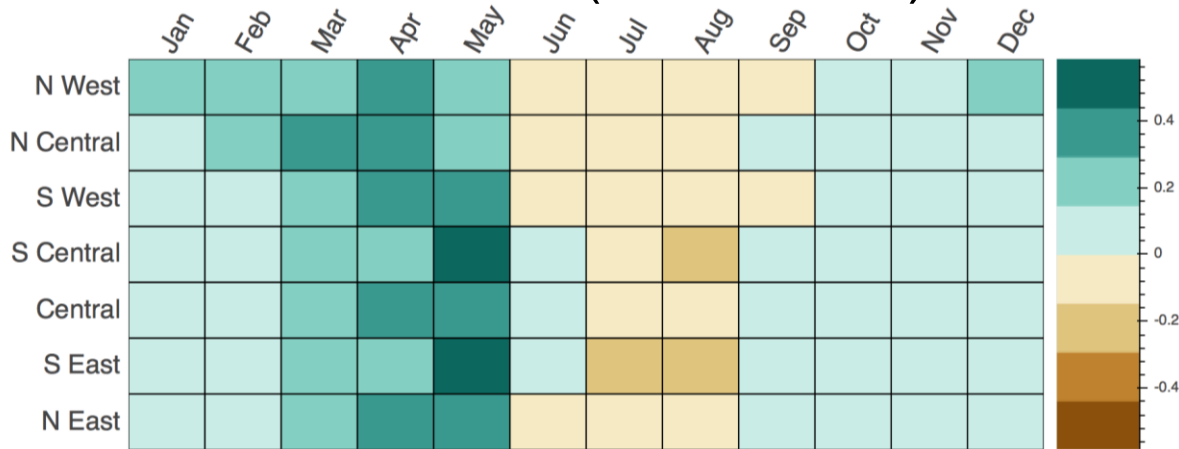
MONTHLY PRECIPITATION

RCP 4.5 (2040-2060)



Increases in winter, spring, and fall (>85% model agreement)

RCP 8.5 (2040-2060)



Decreases in summer (65% model agreement)

MONTANA'S CHANGING CLIMATE

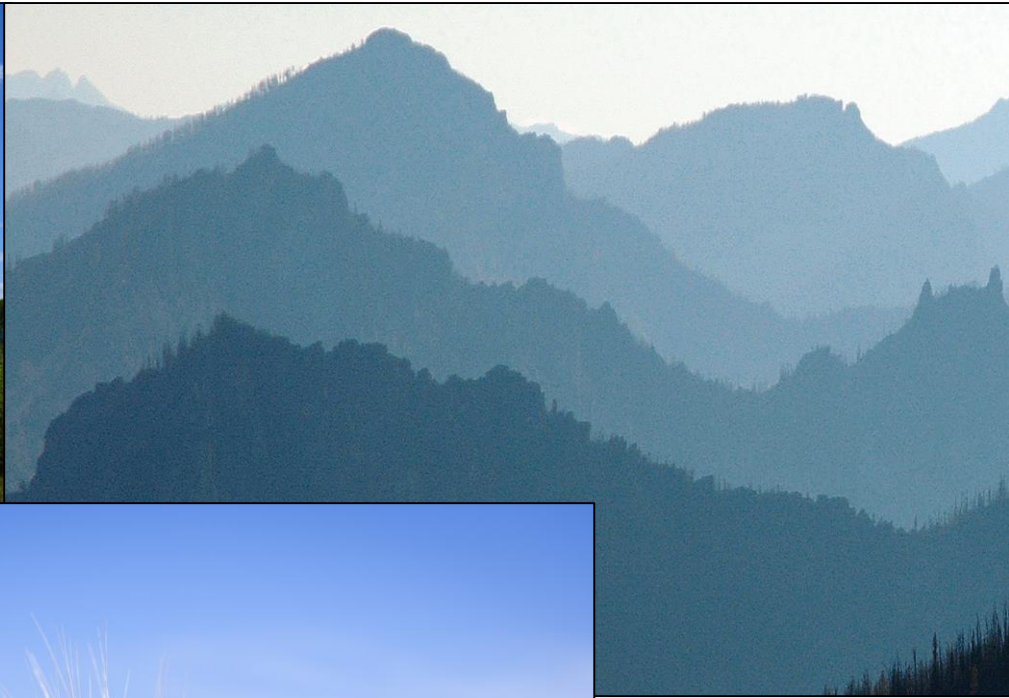
Between 1950-2015:

- Average temperatures have risen 2-3°F. Winter and springs have warmed the most.
- Montana's growing seasons are 12 days longer.
- No changes in annual or seasonal precipitation.

Future (mid century):

- Additional warming of 4-6°F by 2050, 9.8°F by 2100.
- 30-35 additional days over 90°F
- Precipitation increases slightly in winter, spring and fall, and decrease in summer.

WHAT DOES IT MEAN FOR WATER, FORESTS & AG?



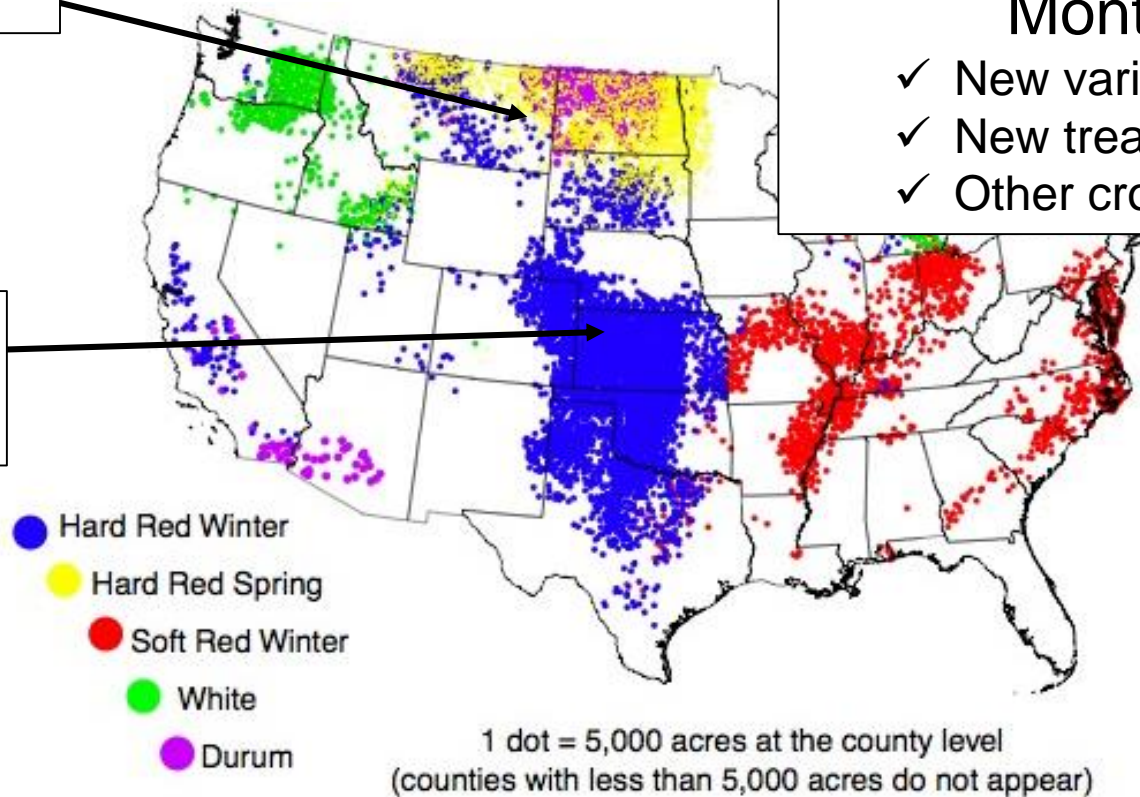
DRYLAND AGRICULTURE

Summers too hot for spring wheat

Winters too warm for winter wheat

Future of Wheat in Montana?

- ✓ New varieties
- ✓ New treatments
- ✓ Other crops



Source: Economic Research Service, USDA.

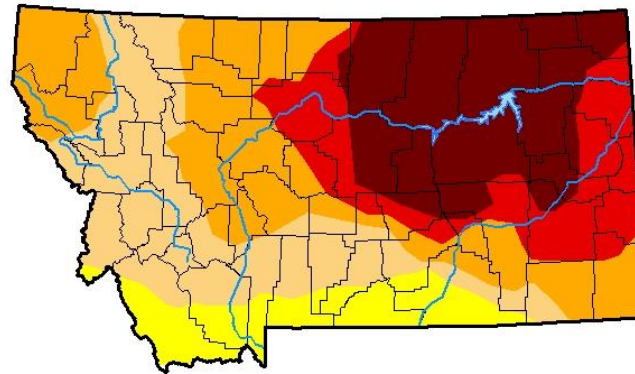
MONTANA AGRICULTURE PROJECTIONS

- Decreasing snowpack will reduce late-season irrigation capacity (affect hay, sugar beet, malt barley, garden/potato production).
- Longer growing season could enable crop diversity but with greater vulnerability.
- Increase number of days $>90^{\circ}\text{F}$ will impact wheat & stress livestock.
- Winter annual weeds will increase.

2017 DROUGHT



U.S. Drought Monitor Montana



August 29, 2017

(Released Thursday, Aug. 31, 2017)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.03	99.97	90.20	66.01	39.42	24.55
Last Week 08-22-2017	2.77	97.23	90.20	59.55	34.34	11.87
3 Months Ago 05-30-2017	67.50	32.50	0.00	0.00	0.00	0.00
Start of Calendar Year 01-03-2017	74.25	25.75	4.87	0.00	0.00	0.00
Start of Water Year 09-27-2016	55.14	44.86	25.49	5.86	0.33	0.00
One Year Ago 08-30-2016	43.00	57.00	24.93	7.60	0.35	0.00

Intensity:

■ D0 Abnormally Dry ■ D3 Extreme Drought
■ D1 Moderate Drought ■ D4 Exceptional Drought
■ D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Chris Fenimore
NCEI/NESDIS/NOAA



<http://droughtmonitor.unl.edu/>

MT: \$378 million in federal & state funds
1.26 million acres burned

MCA: WHERE ARE WE NOW?



MCA "ROAD SHOW"

HOW WILL A
CHANGING CLIMATE
IMPACT **MONTANA?**



MCA
MONTANA CLIMATE
ASSESSMENT
MontanaClimate.org



MCA CONVERSATIONS

- Water & water storage
- Floods & droughts
- Wildfire response, before & after
- Livestock & crop decisions
- Economic implications
- Health considerations



MAKE MONTANA ADAPTATION KNOWLEDGE EXCHANGE WIAKE

- Partnership of the state's universities, extension service, state and federal agencies, businesses & non-profits.
- Collaborative exchange of knowledge between scientists & practitioners (science → knowledge → action → science).
- Priority is climate-change adaptation and building on Montana Climate Assessment.



THE MONTANA CLIMATE ASSESSMENT

WWW.MONTANACLIMATE.ORG

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