

MONTANA CLIMATE OFFICE

Who are we and what is our mission?

State Climatologist

Dr. Kelsey Jencso

Assistant Professor, Watershed Hydrologist

Assistant State Climatologist

Dr. Ashley Ballantyne

Assistant Professor, Bioclimatology

Climate Science

[Dr.] Jared Oyler

Ecological Climatologist and

Software Engineer

Research Scientist

Dr. Nick Silverman

Hydroclimatologist

Research and Information Services

Michael Sweet

Information Technologies and GIS

MSDI Steward for Climate

<http://climate.umt.edu/>



History of the Montana Climate Office

Period of Promise

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2006: Governor Schweitzer designated the Montana Climate Office as the official State of Montana Climate Office. Schweitzer asked that the Montana Climate Office continue their working relationship with the Drought Advisory Committee (DNRC), Climate Change Advisory Group (DEQ -2007), and Montana State University.

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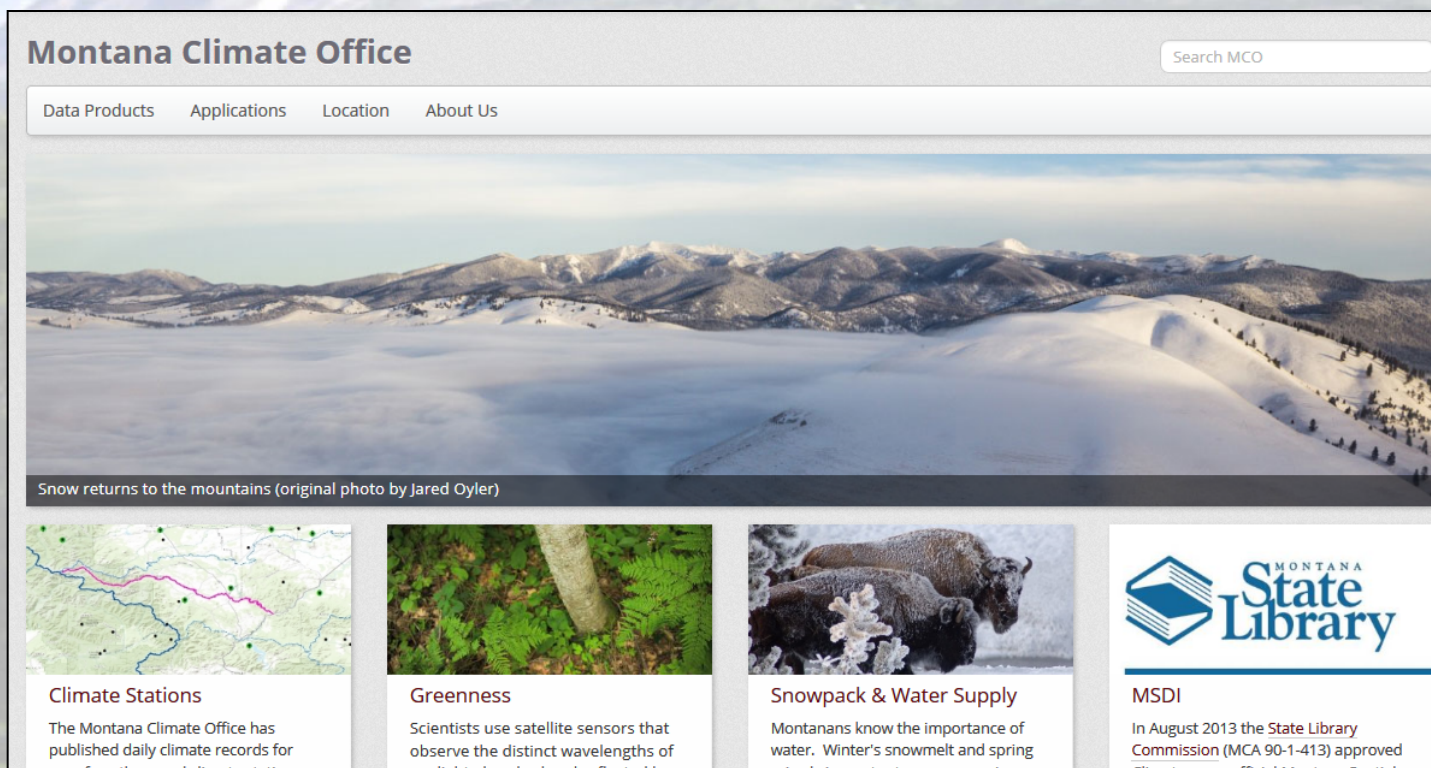
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Period of Renewal

2012: University of Montana College of Forestry and Conservation hired two new faculty members. Dr. Kelsey Jencso was designated as the State Climatologist and Dr. Ashley Ballantyne as the Assistant State Climatologist.

The Montana Climate Office is an independent state-designated body that provides Montanans with high-quality, timely, relevant, and scientifically-based climate information and services.



<http://climate.umt.edu/>

Ensuring that the ever-expanding volumes of data are easily and freely available to enable new scientific research, and making sure these data and the results that depend on them are useful to and understandable by a broad interdisciplinary audience.

A new paradigm that joins traditional climate research with research on climate adaptation, services, assessment, and applications will require strengthened funding for the development and analysis of climate models, as well as for the broader climate data enterprise.

The optimal use of climate data requires a more effective interdisciplinary communication of data limitations with regard to, for example, spatial and temporal sampling uncertainties; instrument changes; quality-control procedures; and, in particular, what model-based climate predictions or projections do well and not so well.

Increasingly, climate scientists and other types of scientists who work effectively at the interface between research and applications are working closely together, and even “coproducing” knowledge with stakeholders.

What drought planning tools, information, etc. do you provide?

The Montana Climate Office is the official steward of climate information for Montana

June 2013: The Montana Land Information Advisory Council (MCA 90-1-404) accepted Climate as Montana's 15th statewide spatial data theme and forwarded that recommendation onto the State Library Commission.

August 2013: The State Library Commission (MCA 90-1-413) approved Climate as an official Montana Spatial Data Infrastructure (MSDI) layer and identified the Montana Climate Office as the official state steward

First state in the nation to make this designation!

"A Montana Framework Data Layer is a State recognized, commonly needed and digitally formatted representation of land information features, natural and cultural that are coordinated, developed, integrated, maintained, and distributed through a community based effort over the geographic area of Montana and are, in the determination of the Montana Land Information Advisory Council and the Geographic Information Officer, significant to a broad variety of users within Montana and the Nation."

<http://geoinfo.msl.mt.gov/Home/msdi>

Current distribution of datasets

- Observations from climate stations
- Gridded precipitation
- Gridded temperature (min, mean, max)
- Normalized Difference Vegetation Index (NDVI)
- Enhanced Vegetation Index (EVI)
- Evapotranspiration (ET)
- Potential evapotranspiration (PET)
- Drought Severity Index (DSI)
- Source datasets for all of the above and additional Montana Climate Office resources

Distribution protocols

- Distributed in Montana State Plane NAD83 for ease of integration
- Published ISO metadata with the Montana State Library's data list
- Available in both an open-source and Esri geodatabase format
- A thematic GeoTIFF is provided as a browse graphic
- Updates occur on either a daily, weekly, monthly, or yearly schedule depending on the source data
- Source dataset is available for all published products

What current planning efforts do you have that are relevant to the region?

Fortunate to be co-located with Numerical Terradynamic Simulation Group (NTSG)



The screenshot shows the NTSG website with a blue header and navigation bar. The header includes the University of Montana logo, the NTSG logo, and the group's name: "Numerical Terradynamic Simulation Group" with the tagline "Modeling and Monitoring Ecosystem Function at Multiple Scales". Navigation links include "Search UM", "A-Z Index", "UM Home", "CFC Home", "DECS", and "NTSG login". The main navigation bar lists "Projects", "Data", "Publications", "People", "Teaching", "Media", "Event", "Contact", and "Climate Grief". A search bar is on the right. The "Highlighted Projects" section lists "MODIS" projects: "MODIS GPP/INPP Project (MOD17)", "MODIS Global Evapotranspiration Project (MOD16)", "MODIS Global Disturbance Index (MGDI)", and "MODIS Global Terrestrial Drought Severity Index". A "Hydrology" link is also present. The main content area describes the NTSG as a research laboratory at the University of Montana, focusing on landscape ecological and hydrological analyses. It mentions research scales from individual landscape units to global domains and the use of computational process modeling, satellite remote sensing, and GIS. It also states that NTSG is a NASA Earth Science Information Partner (ESIP) and is involved with the NASA Earth Observing System as a repository for global land data products, including MODIS (MOD17) vegetation productivity. The "NTSG News" section features a satellite image of Earth and a post dated January 26, 2015, mentioning Professor John Kimball's involvement in the NASA SMAP project.

The primary focus of NTSG is to understand how terrestrial vegetation responds to climate variability and influences energy, water and carbon cycles. NTSG conducts research over a broad range of spatial scales from individual landscape units to basin, continental and global domains. NTSG has strong emphasis in the application of ecological theory and environmental analysis using computational process modeling, satellite remote sensing and GIS. NTSG is a NASA Earth Science Information Partner (ESIP) and is involved with the NASA Earth Observing System as a repository for a variety of global land data products, including MODIS MOD16 (evapotranspiration) and MOD17 (vegetation productivity).

Drought Severity Index (DSI)

The DSI incorporates NDVI and the ratio of ET to PET into a single index theoretically ranging from unlimited negative values (drier than normal) to unlimited positive values (wetter than normal).

A Remotely Sensed Global Terrestrial Drought Severity Index

Mu, Q., M. Zhao, J. S. Kimball, N. McDowell and S. W. Running

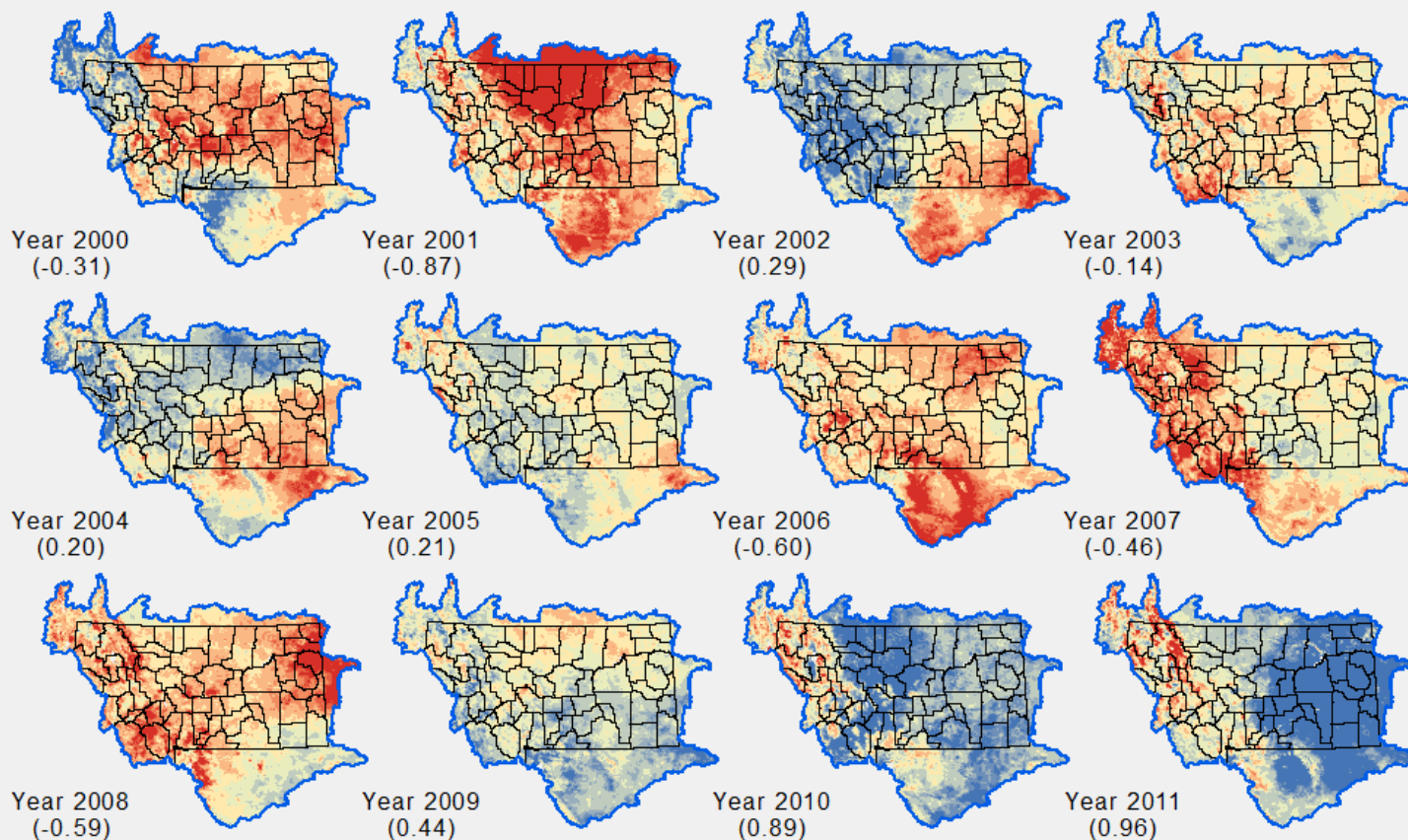
Bulletin of the American Meteorological Society, Volume 94, Number 1, page 83--98 - jan 2013 (doi: 10.1175/BAMS-D-11-00213.1)



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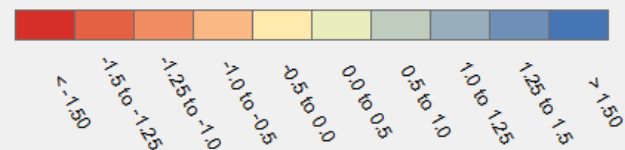
Annual Drought Severity Index

Montana Climate Office (climate.umt.edu) - 2015



MAP 35: Annual Drought Severity Index (DSI) for the years 2000-2011. The DSI is a single index ranging from negative (drier than normal) to positive (wetter than normal). The statewide mean allows for year to year comparisons. DSI was developed at the University of Montana as part of the MODIS global terrestrial evapotranspiration project.

Drought Severity Index (DSI)



The quest for regionalized or localized application of global climate models is driving near-term research efforts (next 2-3 years):

In Progress

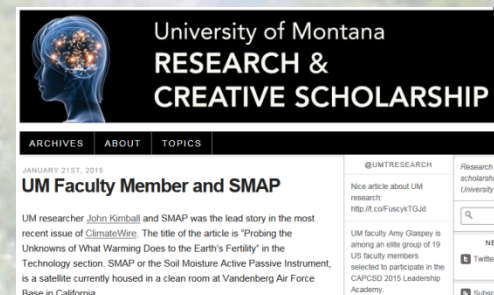
- Develop improved historic gridded temperature model (national)
- Develop Improved historic gridded dew point model (national)
- Develop Improved historic gridded precipitation model (regional, perhaps national)
- Develop Improved evapotranspiration (MODIS MOD16) product (regional)

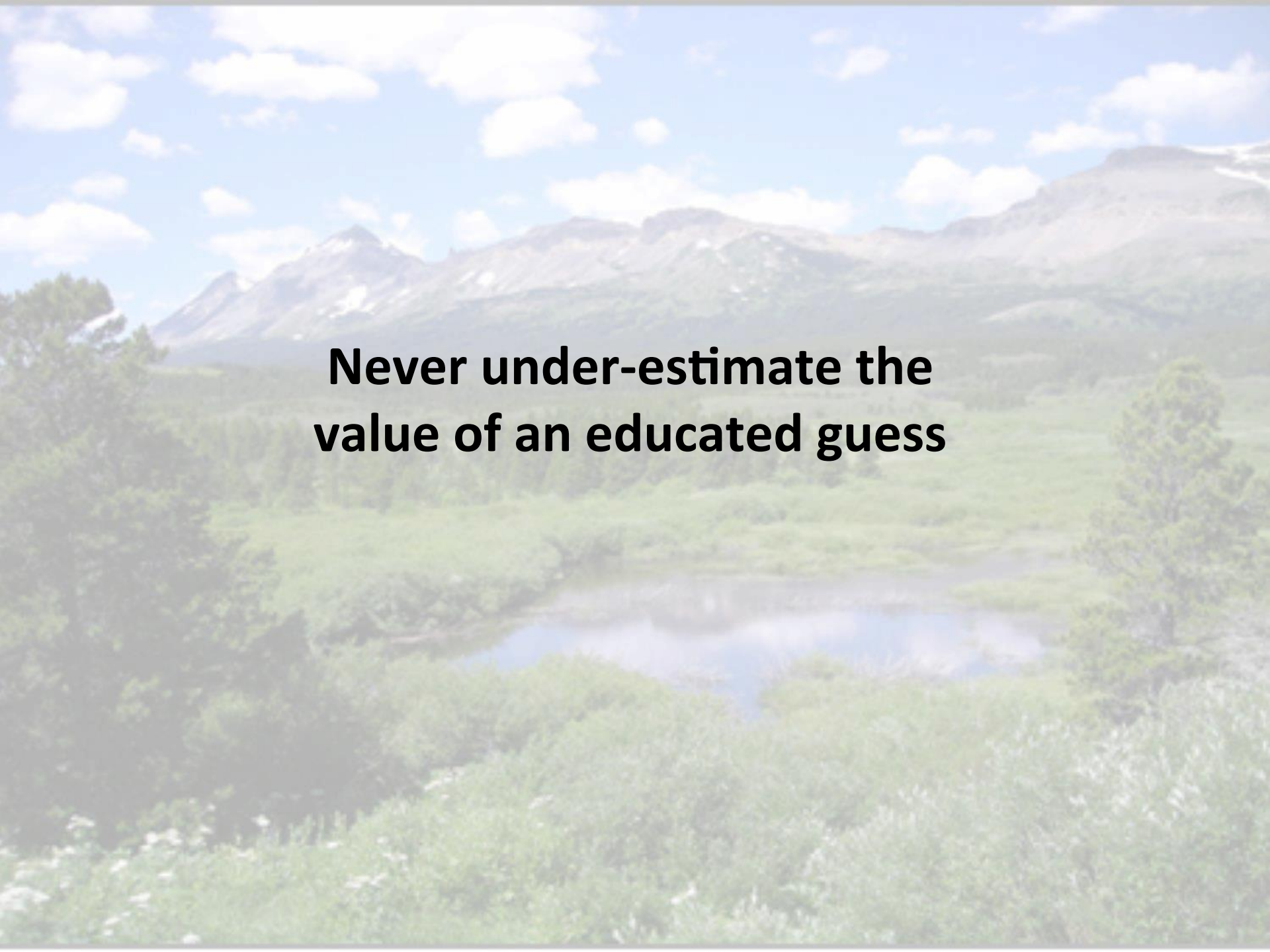
2015 and first-half of 2016

- Evaluate the influence of snowpack on interpretations
- Evaluate available climate projection datasets for their spatial and temporal viability in application to Montana's hydrologic basins
- Conduct trend analyses of climate products

2016

- Incorporation of soil moisture from SMAP
- Integrate ground sensors with regional climate models (validation)



A scenic landscape featuring a calm lake in the middle ground, surrounded by dense green forests. In the background, a range of rugged mountains with patches of snow is visible under a bright blue sky with scattered white clouds. The text "Never under-estimate the value of an educated guess" is overlaid in the center in a bold, black, sans-serif font.

**Never under-estimate the
value of an educated guess**