Climate Summary
for the
Intermountain Adaptation Partnership

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outline

- General overview of climate modeling
- Historical and projected climate for the IAP region
- Sub-region specific climate information
Historical data

- Long term (paleo-climate)
- Observations from weather stations
- Gridded observations
- Historical modeled

Projections for future scenarios

- Global Climate Models
- Statistically Downscaled Global Climate Models
- Regional Climate Models
Model physics
Downscaling

Image courtesy of John Stamm, USGS
Modeled human (anthropogenic) forcings

RCP = representative concentration pathways

Energy sources by sector (van Vuuren et al. 2011)
Historical Climate Data come from:
- Maurer et al. dataset
- PRISM
- TopoWx

Modeled climate data come from:
- CMIP5 - Coupled Model Inter-comparison Project Data
- Representative Concentration Pathways (RCP): 4.5 and 8.5
- with Bias Correction and Spatial Disaggregation (BCSD) statistical downscaling algorithm (Wood et al., 2004)
- Looking at “normal” (~30 year averages) for 1979-2009, 2030-2059, and 2070-2099.
Not all historical gridded climate data are equal...

Temperature and precipitation changes for RCP 8.5 are warmer and wetter than for RCP 4.5. Variation across climate models.

CMIP5 changes in temperature similar to CMIP3 results; CMIP5 projections are slightly wetter.

Change is over periods 1979-2009 and 2040-2060. CMIP5 (RCP 4.5 and 8.5 projections) are numbers; CMIP3 models (A1B scenario) are labels.
IAP Region and subregions

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Average temperature in degrees F
1979 to 2009
IAP Region/subregion projections for 2030-2059 under RCP 4.5

Average temperature in degrees F
2030 to 2059 under RCP 4.5

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Average temperature in degrees F
2070 to 2099 under RCP 4.5

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Average precipitation in inches/year
2030 to 2059 under RCP 4.5

Intermountain Adaptation Partnership
Average precipitation in inches/year
2070 to 2099 under RCP 4.5
IAP Region and subregions

Uinta and Wasatch Front Subregion

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Three historical gridded data sets. Minimum temperature shows the most warming over this period. Large variability in precipitation.

Uintas and Wasatch Front subregion

Data Set
- PRISM
- Maurer
- TopoWx

Min daily temp (°F)

1960 1980 2000

25.0 30.0 32.5

Max daily temp (°F)

1960 1980 2000

53 55 57

Total precip (in/yr)

1960 1980 2000

15 20 35

Uinta and Wasatch Front Subregion

4km PRISM data
Continued warming of maximum daily temperatures, with emissions a major uncertainty. +5-11 °F by 2100, as compared to 1950-2012.
Continued warming of minimum daily temperatures, with emissions a major uncertainty. +5-11 °F by 2100, as compared to 1950-2012.

Model Projections for Uintas and Wasatch Front subregion

- RCP 8.5
- RCP 4.5
- All
- Maurer

Uinta and Wasatch Front Subregion

CMIP5 model ensemble
Projections for precipitation are less certain.

Model Projections for Uintas and Wasatch Front subregion

CMIP5 model ensemble
Seasonal maximum temperature. Warming in all seasons, with winter means rising above freezing, greatest RCP differences in summer and autumn.
Seasonal minimum temperature. Warming in all seasons, spring and autumn means rise above freezing, greatest RCP differences in summer and autumn, under RCP 8.5.
Seasonal Precipitation. Great variation in projections.

Total Precip (Inches/Season)

- Winter
- Spring
- Summer
- Autumn

Emissions
- RCP 8.5
- RCP 4.5
- Modeled Historic

Uinta and Wasatch Front Subregion
All subregions: Maximum/minimum temperatures increase by 10 °F by 2100. Precipitation projections are highly variable with no clear trend.

Great Basin/Semi-Desert: Projected minimum temperature rises above freezing (historical levels) in both scenarios; spring minimum temperatures rise above freezing, autumn warms more, especially for RCP 8.5.

Middle Rockies: Projected winter maximum temperatures rise above freezing; summer maximum temperatures in the upper 80s for RCP 8.5.

Southern Greater Yellowstone: Projected winter maximum temperatures rise above freezing; summer maximum temperatures could be in the middle 80s for RCP 8.5.

Plateaus: Winter minimum temperatures warm but remain below freezing; summer maximum temperatures rise to the lower to mid 90s for RCP 4.5 and for RCP 8.5.

Uintas and Wasatch Front: Winter maximum temperatures rise above freezing as do spring and autumn minimum temperatures, under RCP 8.5.
Intergovernmental Panel on Climate Change (IPCC) Assessment Reports (AR)
   FAR (first AR), second (SAR), third (TAR), AR4, AR5,...
CMIP5 - Coupled Model Inter-comparison Project
   (CMIP5 = most current & goes with Assessment Report 5)
GCM: Global Climate Models
RCM: Regional Climate Models
Representative Concentration Pathways (RCP) (which is the CMIP5 term for emissions scenarios, in CMIP3 they were referred to as SRES, special report on Emissions Scenarios)
Downscaling: statistical or dynamical