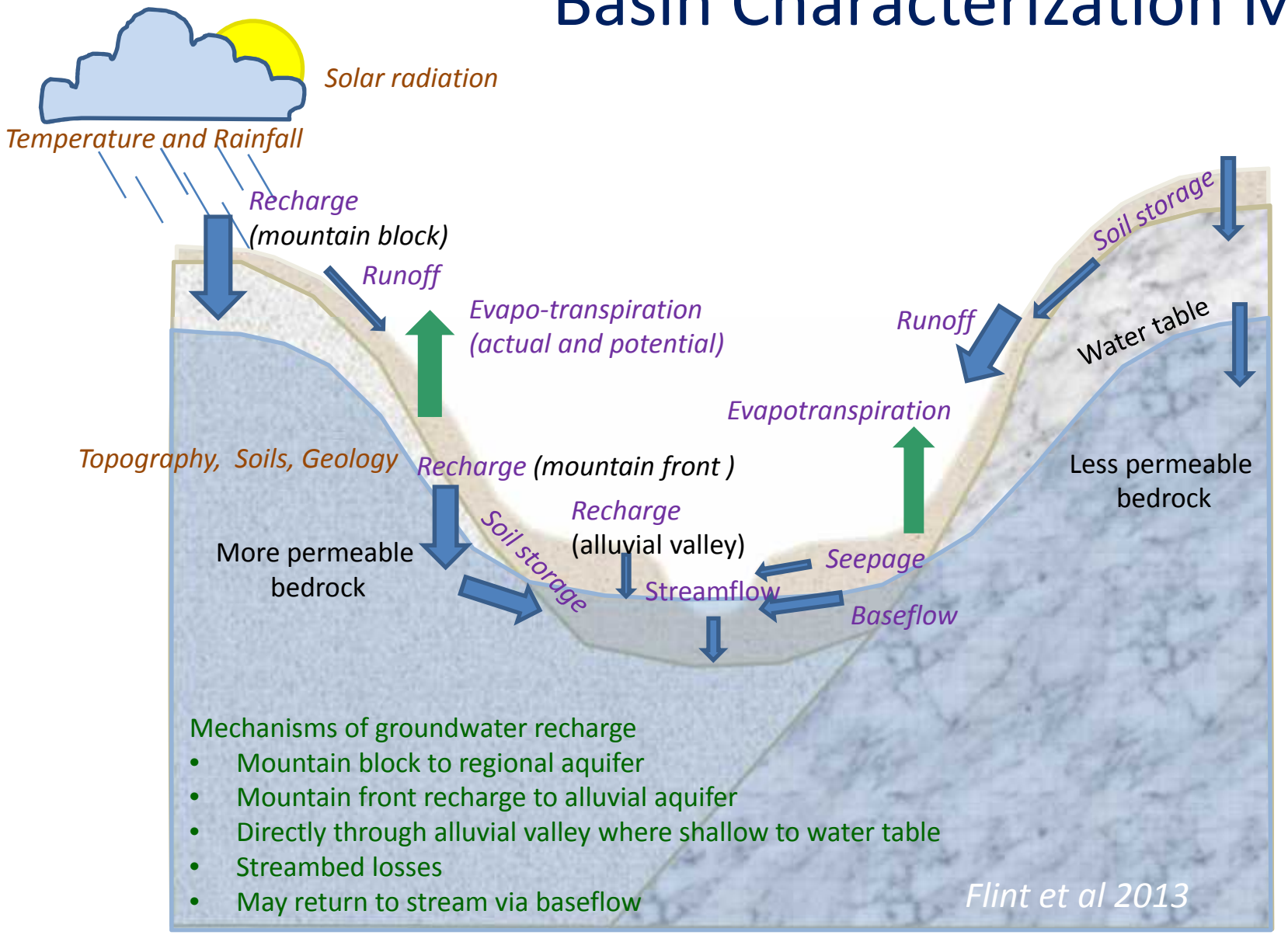
Intertribal Climate Adaptation Summit

November 10th, 2016

Hopland, Califorina

Lisa Micheli and Celeste Dodge

Basin Characterization Model



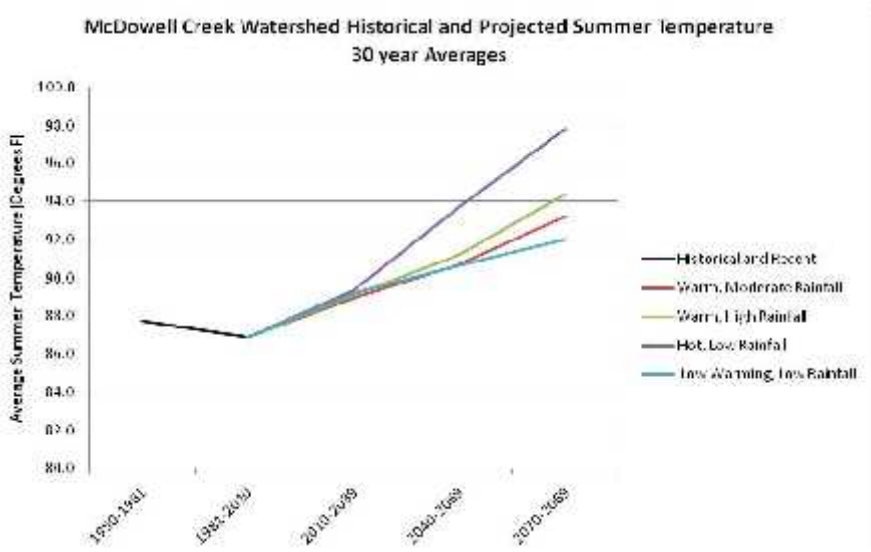
Size of arrows reflect relative magnitude of water flow

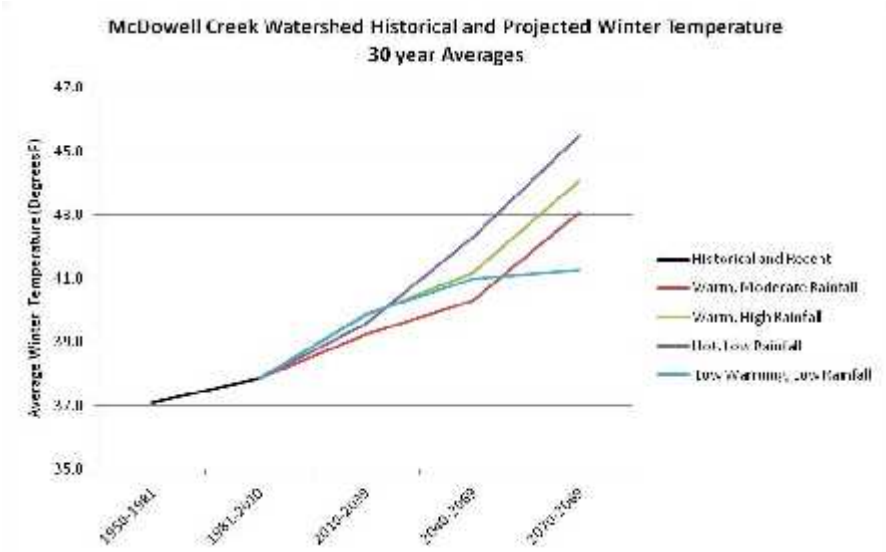
USGS science for a changing world

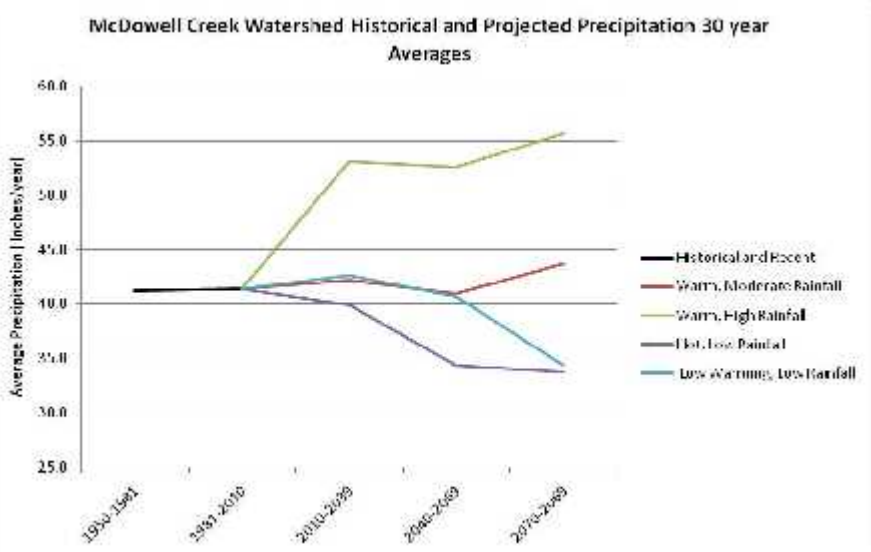
Brown text is BCM input, Purple text is BCM output

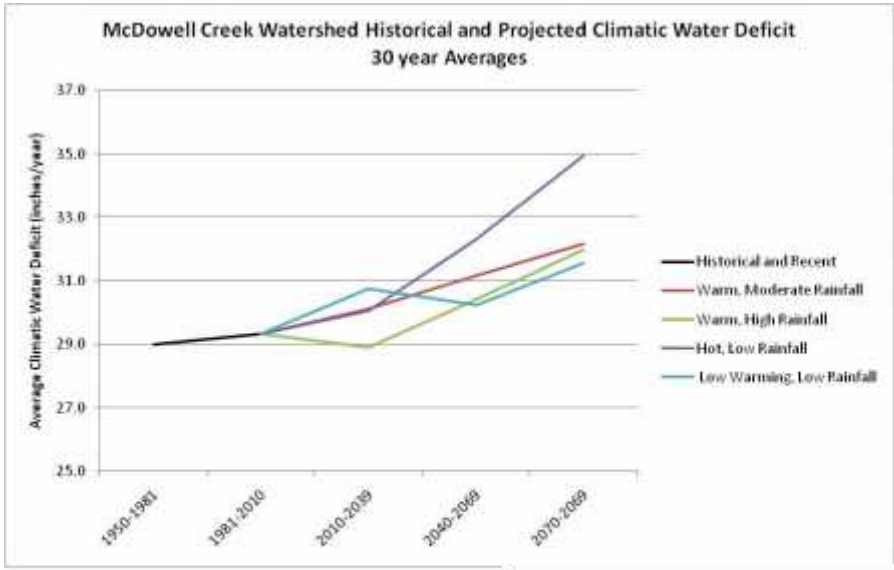
Pepperwood PRESERVE

30 year average trends in McDowell Creek Watershed

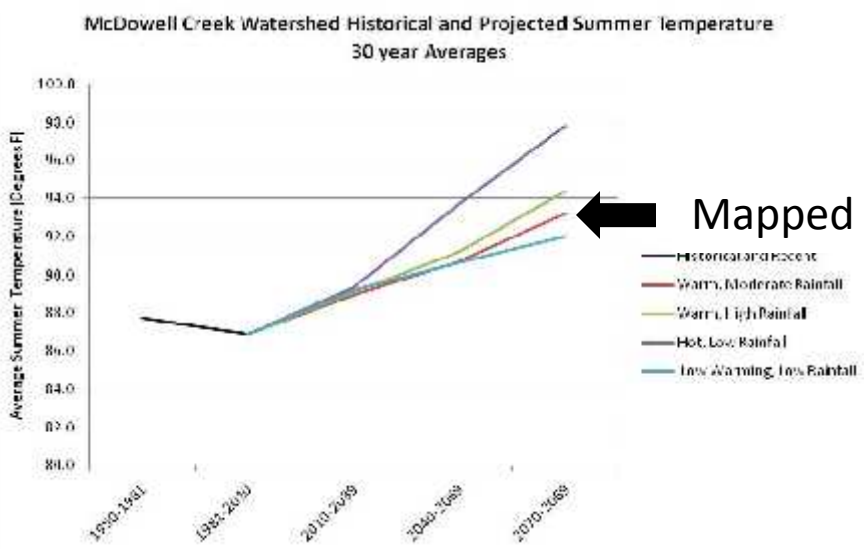




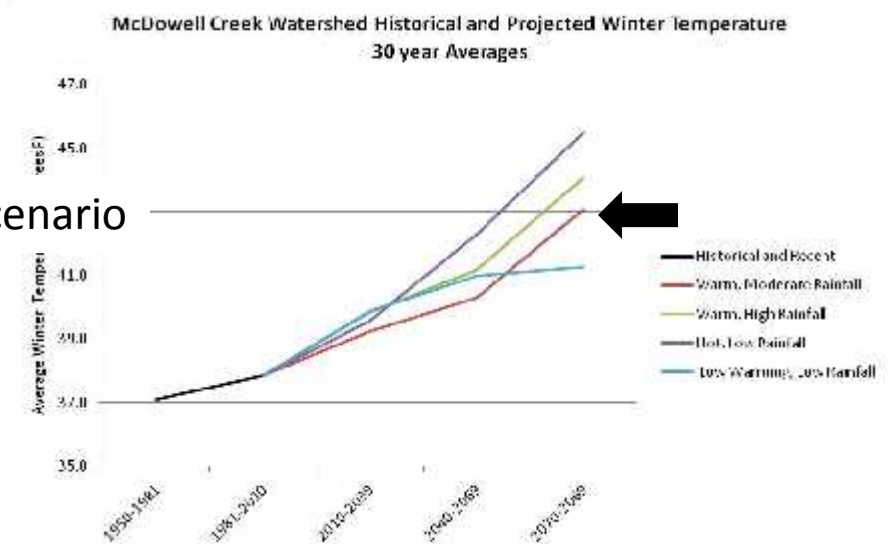


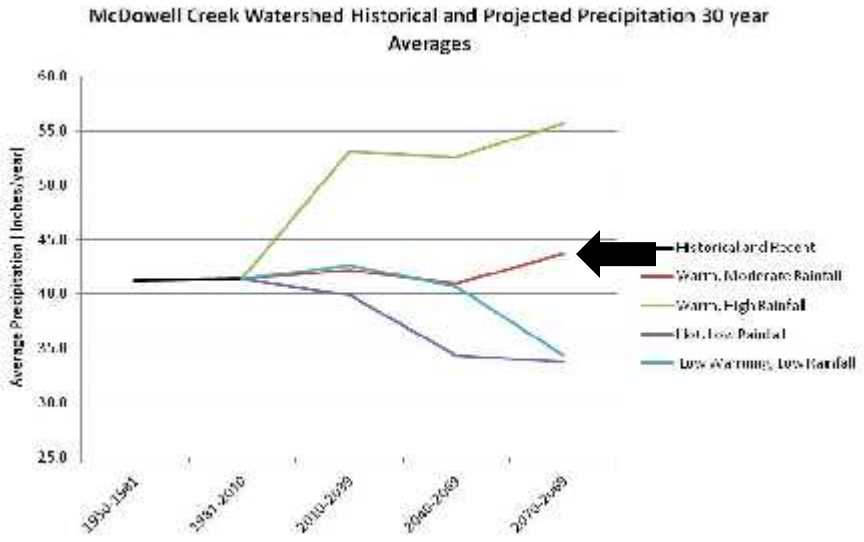


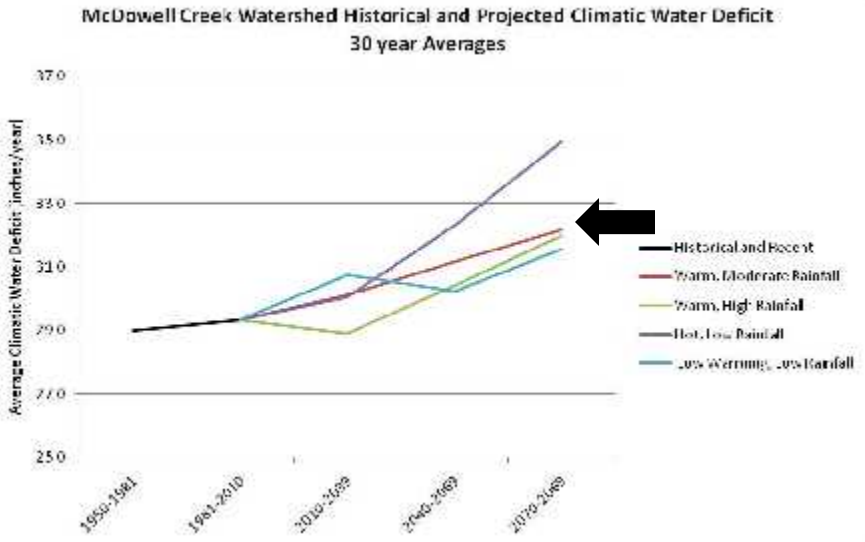
Pepperwood
PRESERVE



Mapped Scenario



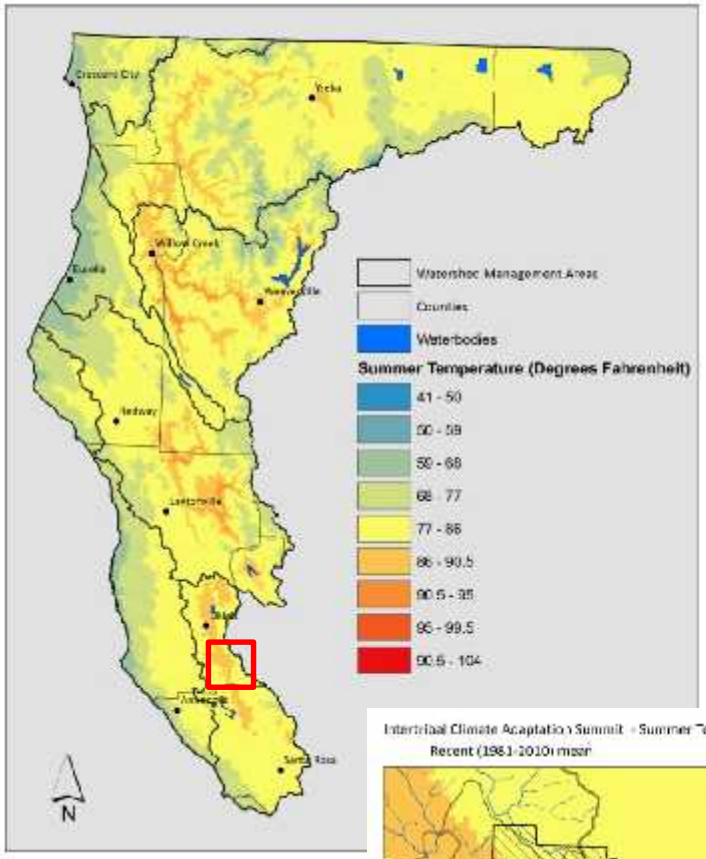




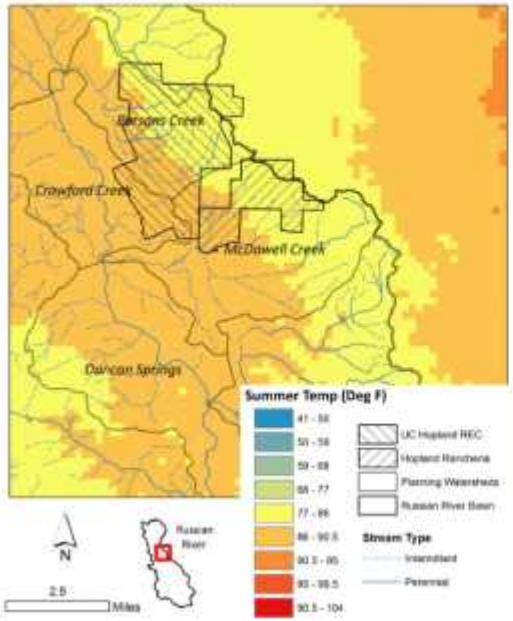
Pepperwood
PRESERVE

Summer Temperatures

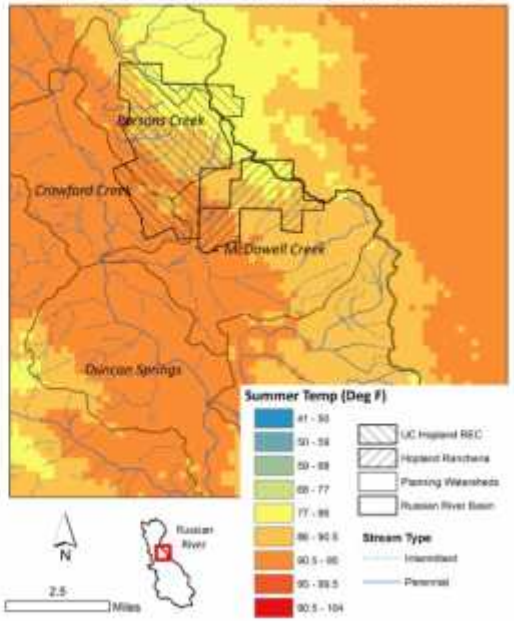
Recent (1981-2010) mean



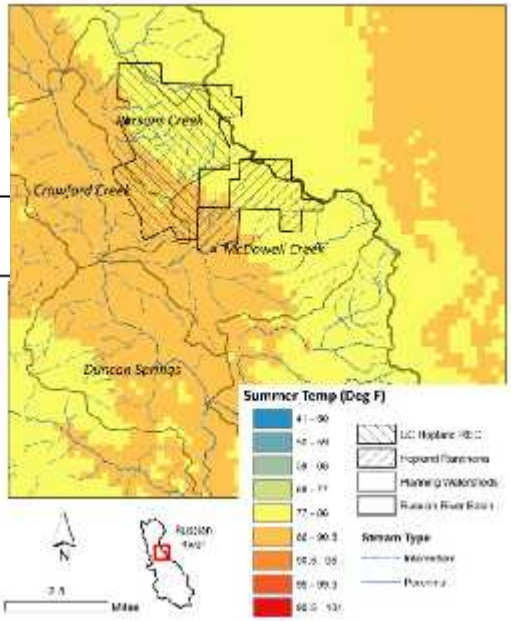
Intertribal Climate Adaptation Summit - Summer Temperatures (Jun/July/Aug)
Historical (1951-1980) mean



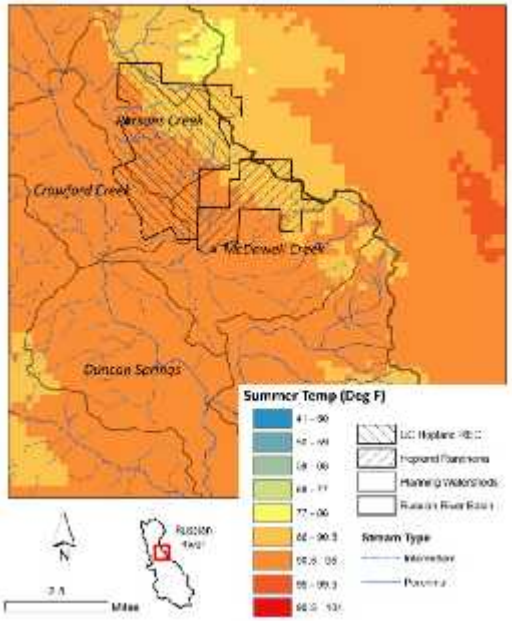
Intertribal Climate Adaptation Summit - Summer Temperatures (Jun/July/Aug)
Warm, Moderate Rainfall (CCSM4 rcp 8.5) Mid Century (2040-2069) mean



Intertribal Climate Acaptatio n Summit - Summer Temperatures (Jun/July/Aug)
Recent (1981-2010) mean



Intertribal Climate Acaptatio n Summit - Summer Temperatures (Jun/July/Aug)
Warm, Moderate Rainfall (CCSM4 rcp 8.5) End of Century (2070-2099) mean

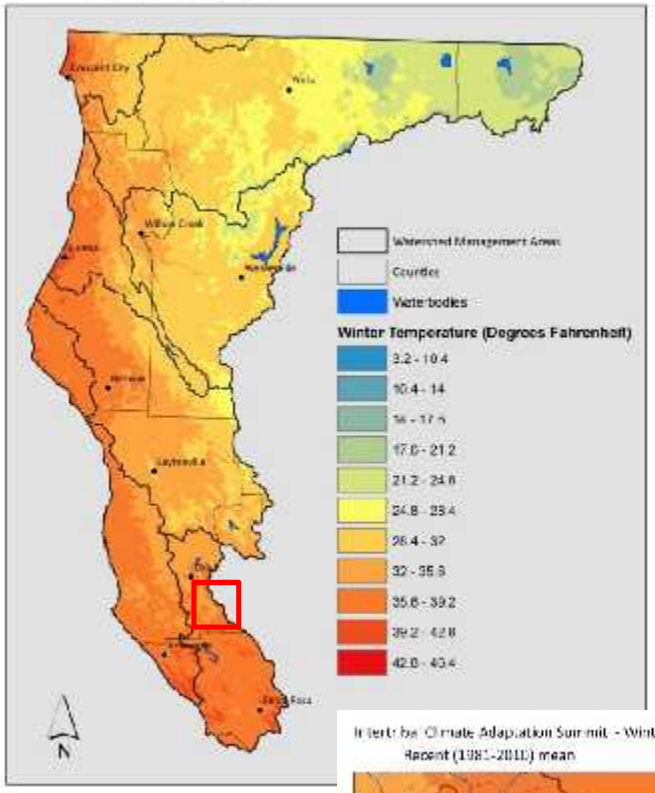


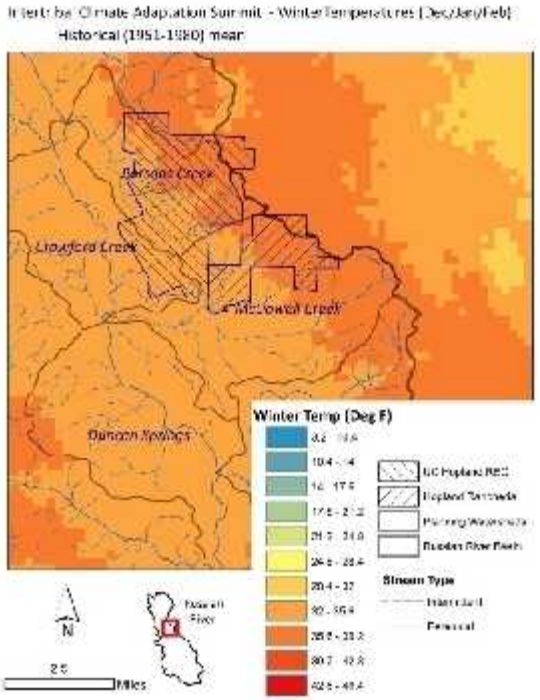
McDowell Creek		
	1950-1981	1981-2010

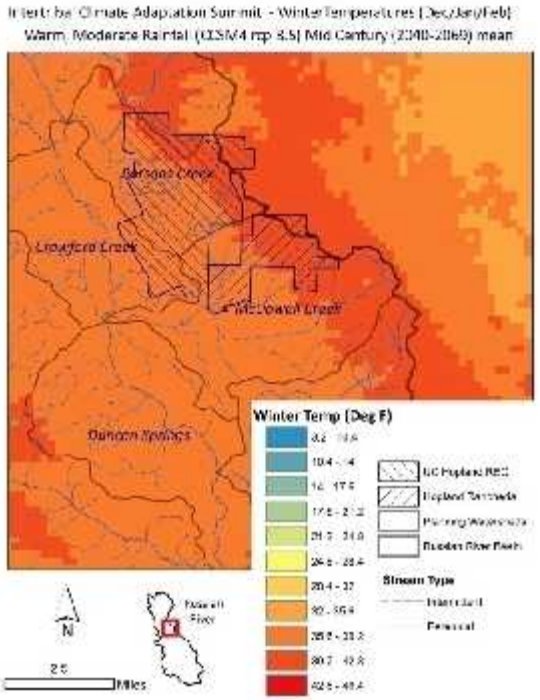
	Warm, Moderate Rainfall	
	2040 2069	2070 2069

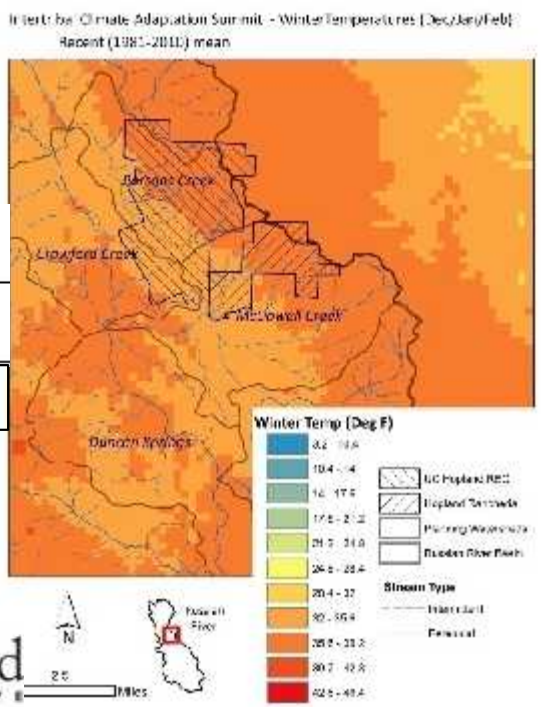
Pepperwood PRESERVE

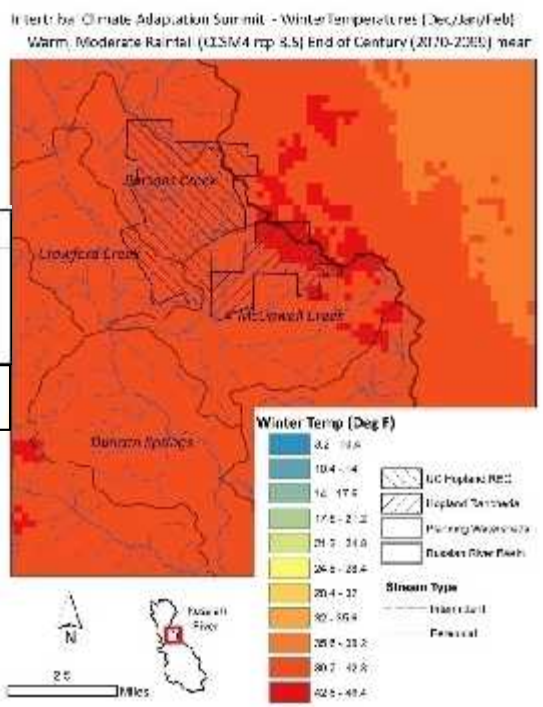
Winter Temperatures











McDowell Creek

	1950-1981	1981-2010
	87.7	86.9

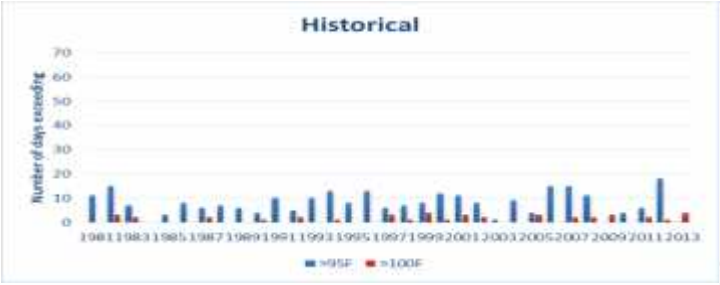
Warm, Moderate Rainfall		
	2040-2069	2070-2069
	90.7	93.2

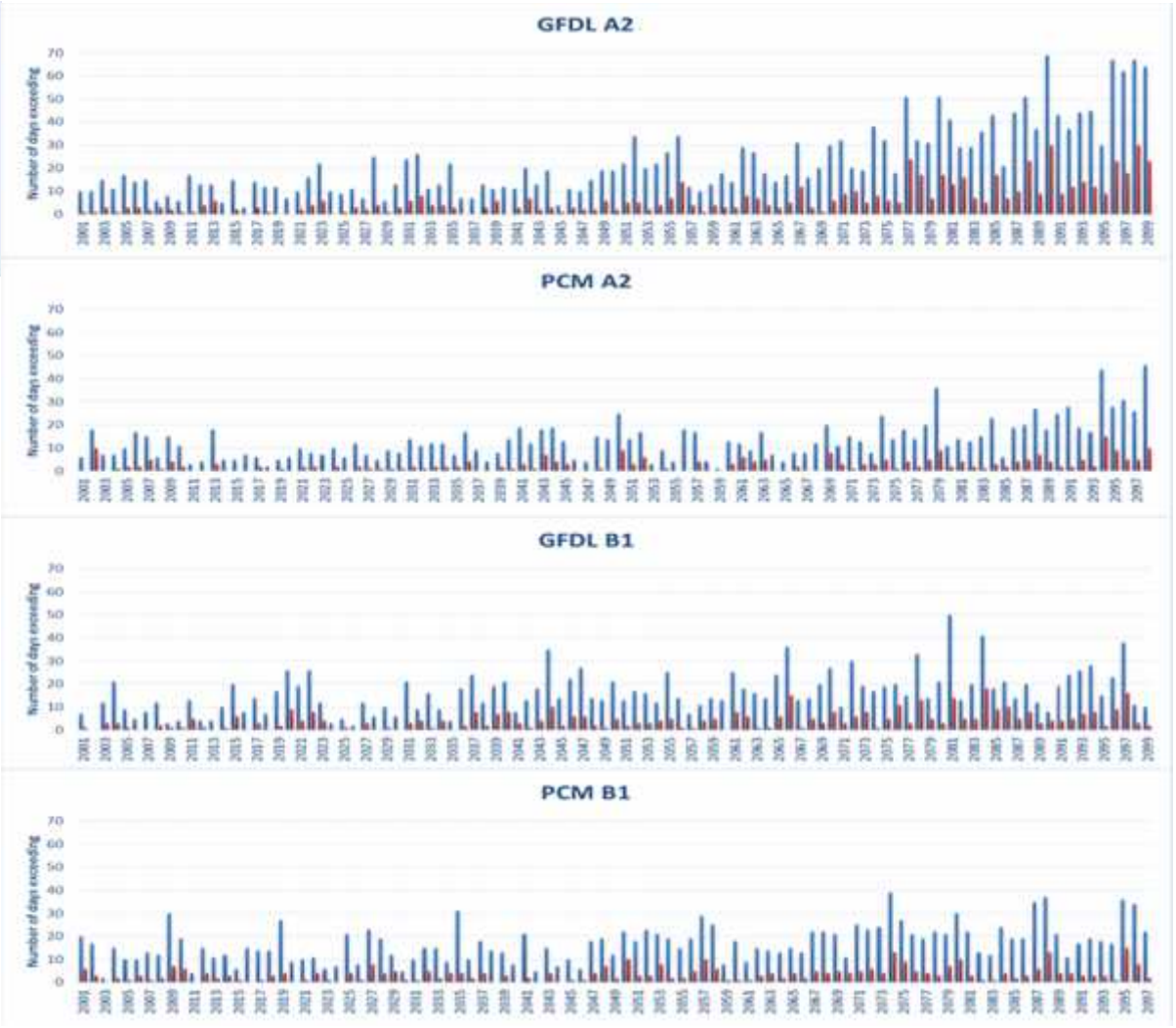
Pepperwood PRESERVE

Temperature Extremes

Pepperwood
PRESERVE
inspiring conservation through science

Three-day Heat Waves
Santa Rosa Plain





Number of events of 3 or more days in a row where Tmax exceeds 95F for the Santa Rosa Plain.

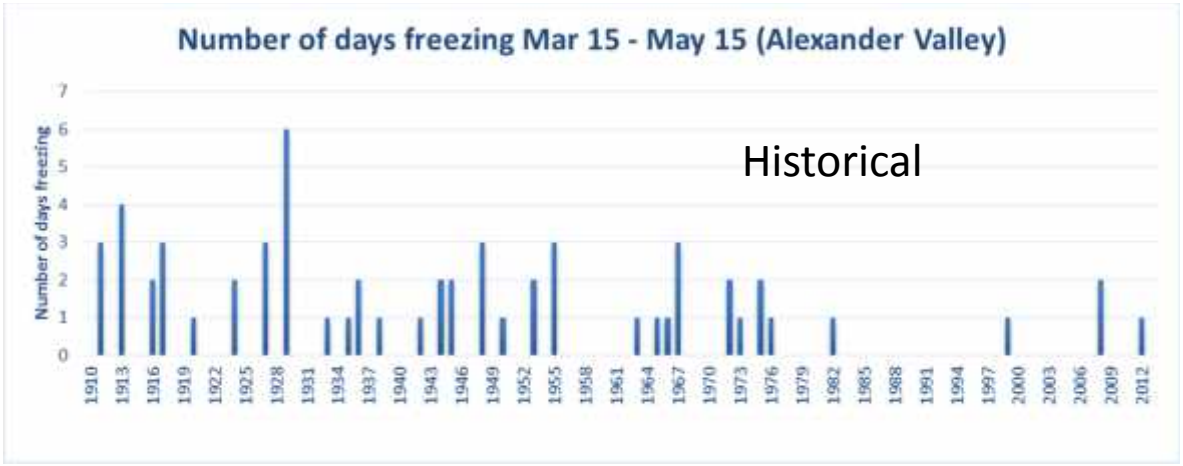
	# of events	Tmax	Tmin
1981-2010	26	95.7	93.4
2010-2039	39	96.5	93.3
2040-2069	55	96.4	93.5
2070-2099	148	97.3	93.5

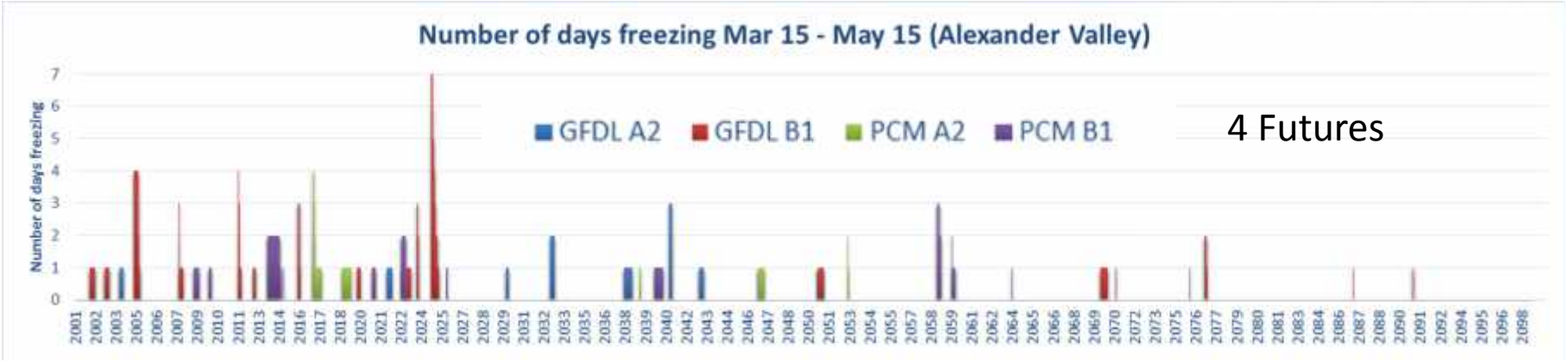
PCM wet model
GFDL dry model

Number of springtime days at or below freezing: Alexander Valley

(average for valley, does not account for cold air pools)

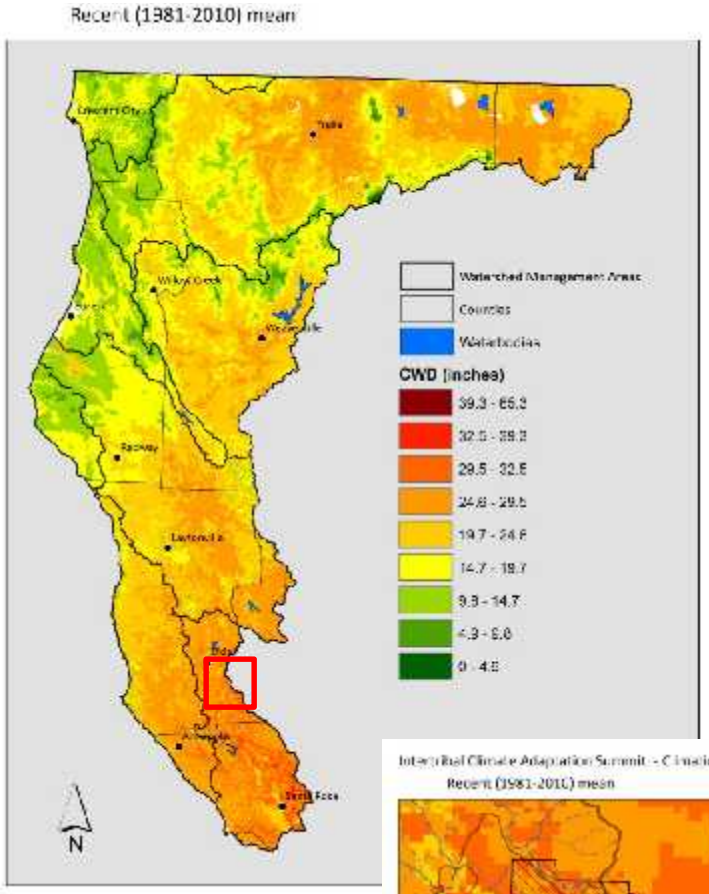
	Historical 1981-2010		
	February	March	April
	52	8	5
	Future 2040-2069		
	February	March	April
PCM A2	38	5	1
GFDL A2	25	5	1
PCM B1	87	11	1
GFDL B1	24	6	1
average	44	7	1
	Future 2070-2099		
	February	March	April
PCM A2	24	3	0
GFDL A2	18	4	0
PCM B1	34	7	0
GFDL B1	31	6	1
average	27	5	0

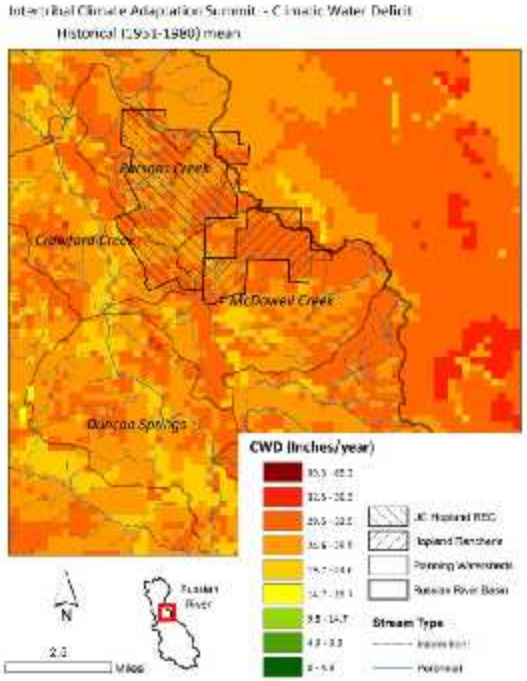


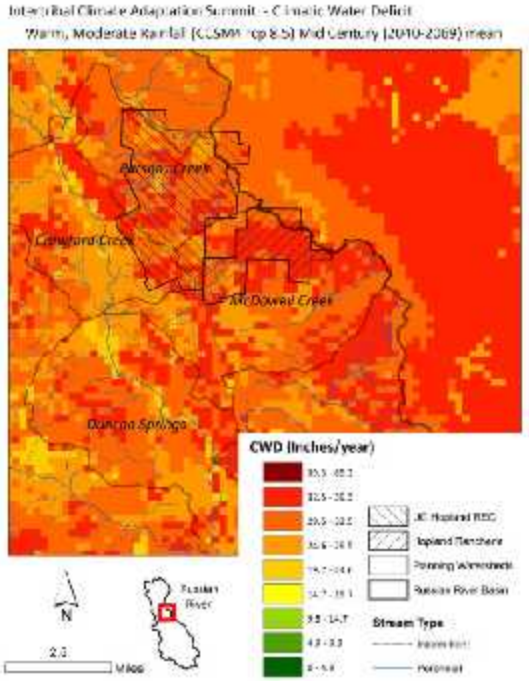


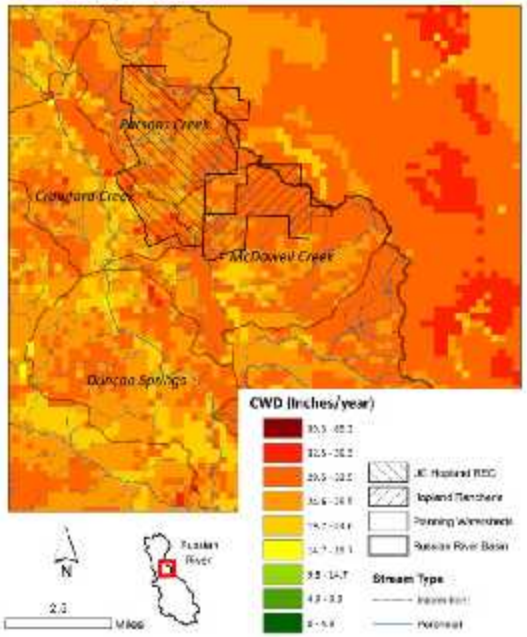
PCM wet model, GFDL dry model

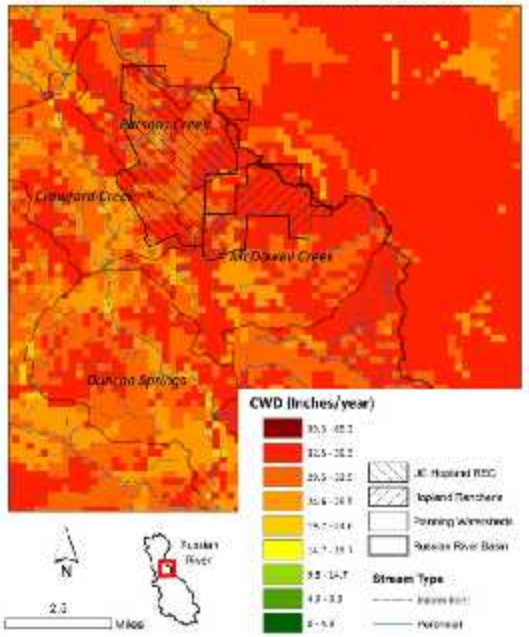
Climatic Water Deficit











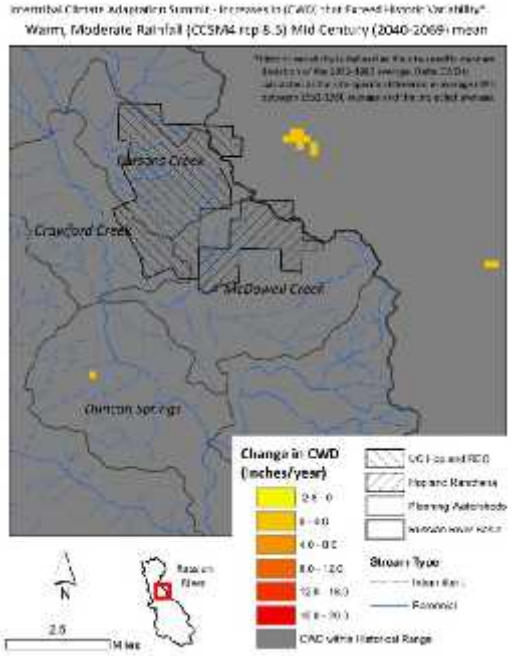
McDowell Creek

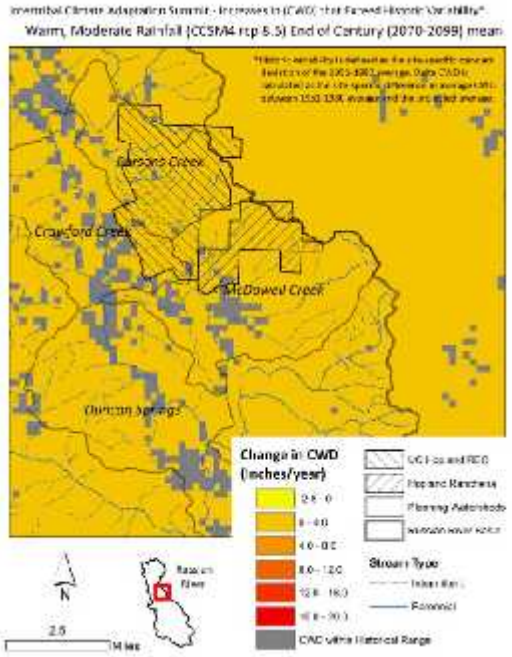
	1950-1981	1981-2010
	29.0	29.3

Warm, Moderate Rainfall		
	2040-2069	2070-2069
	31.2	32.2

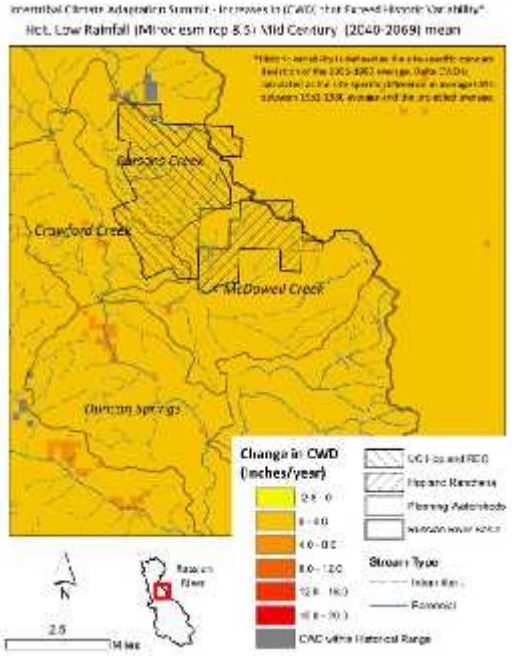
Pepperwood PRESERVE

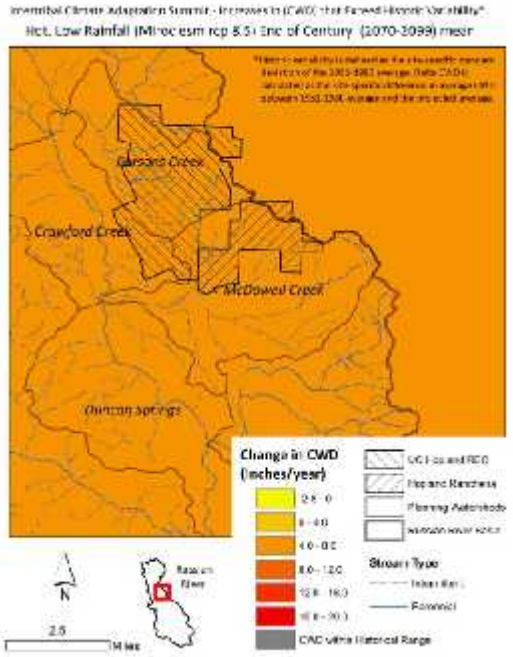
Warm, Moderate Rainfall





Hot, Low Rainfall





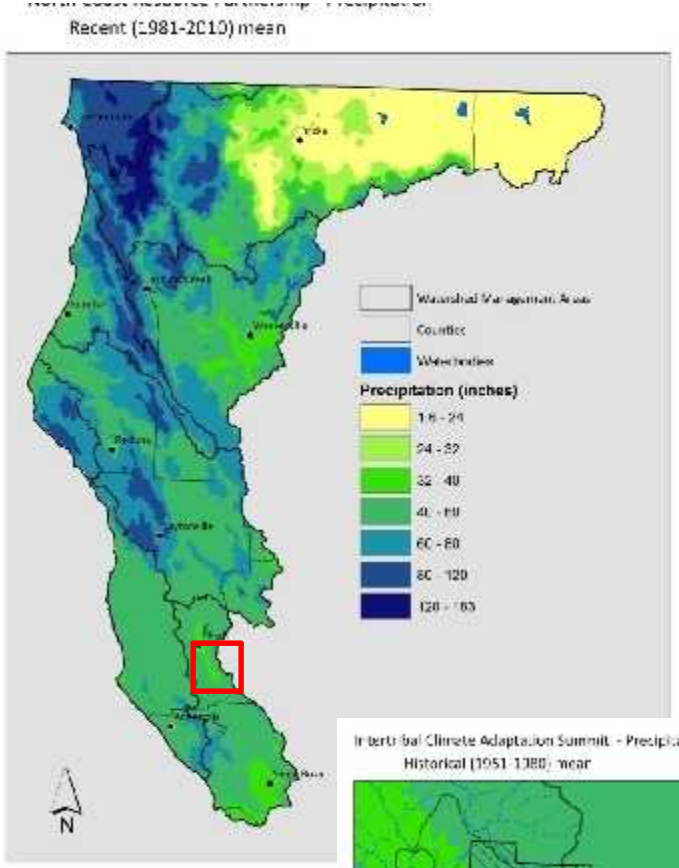
Mid Century

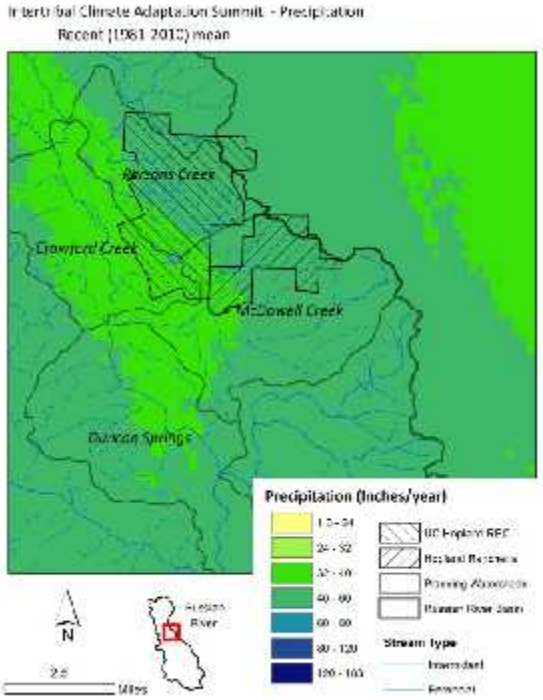
End of Century

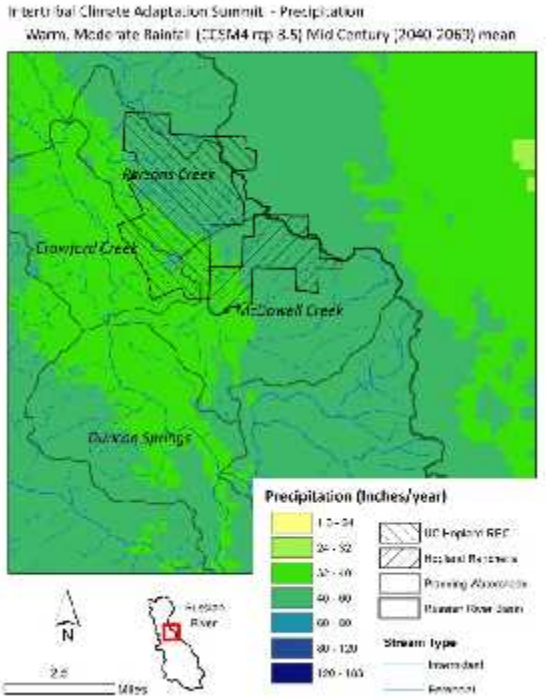
Average CWD Values, McDowell Creek:

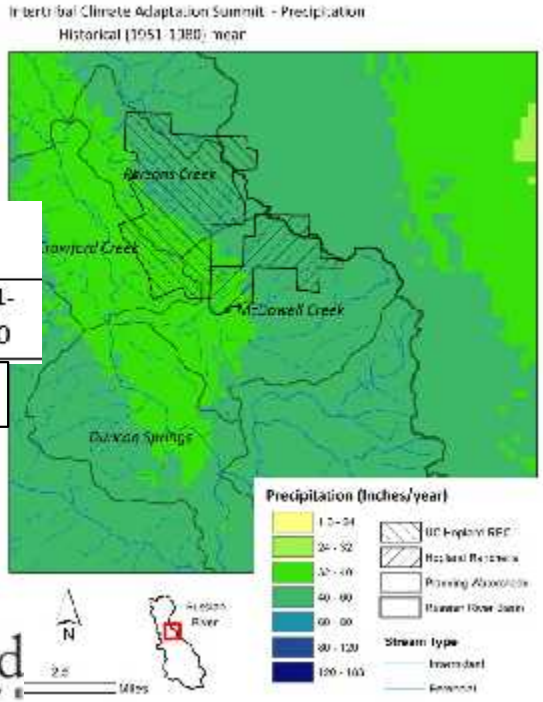
Warm, Moderate Rainfall		Hot, Low Rainfall	
2040 2069	2070 2069	2040 2069	2070 2069
31.2	32.2	32.3	35.0

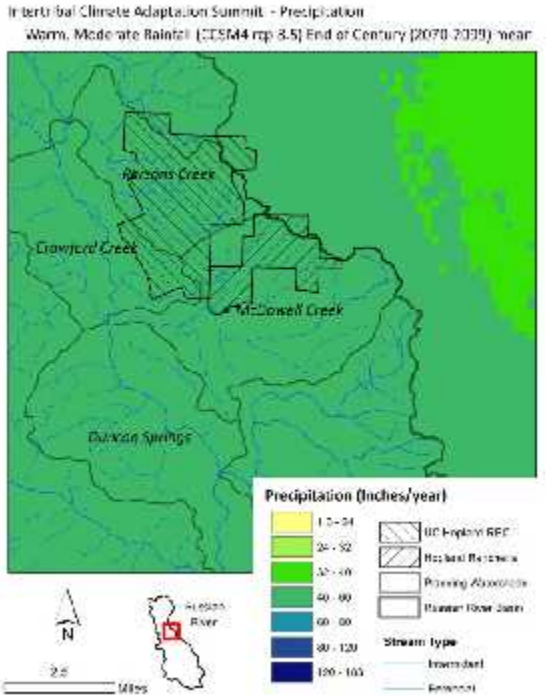
Precipitation
Moderate Rainfall Scenario











McDowell Creek		
	1950-1981	1981-2010
	41.2	41.5

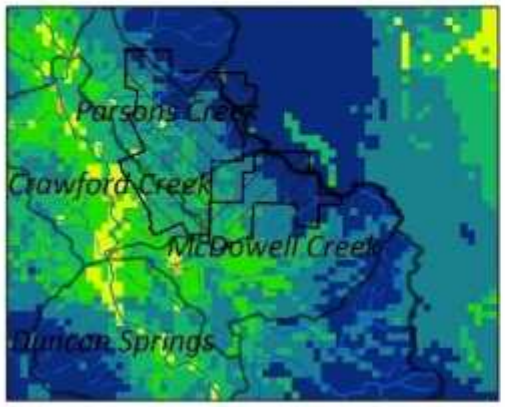
Warm, Moderate Rainfall	
2040-2069	2070-2069
40.9	43.7

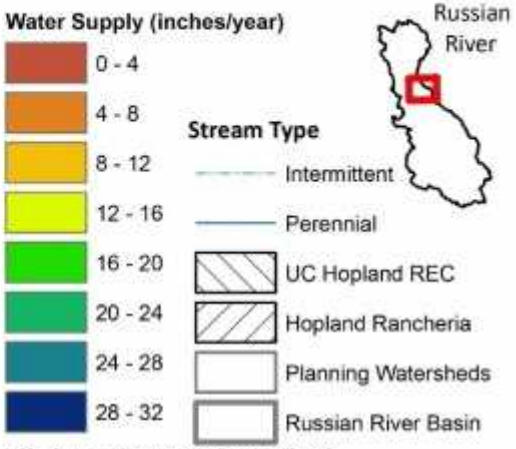
Pepperwood PRESERVE

Water Supply
(Runoff and Recharge)
Moderate and Low Rainfall Scenarios

Intertribal Climate Adaptation Summit - Water Supply Over 30-Year Time Steps

Historical (1951-1980) mean



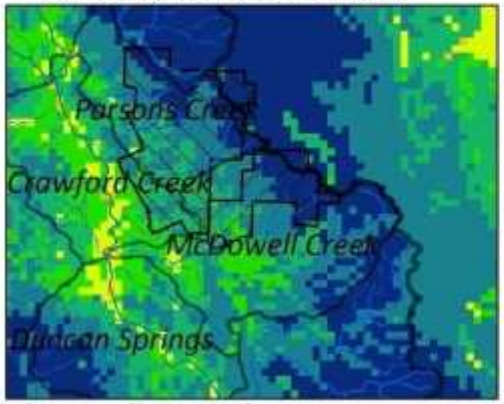


McDowell Creek

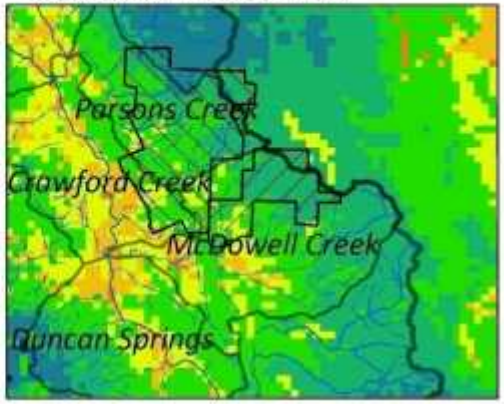
1950-1981	1981-2010
24.4	24.6

Mid Century (2040-2069) means

Warm, Moderate Rainfall (CCSM4 rcp 8.5)



Hot, Low Rainfall (Miroc-esm rcp 8.5)



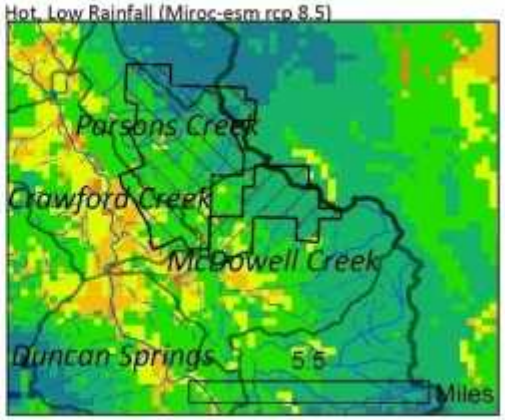
Warm, Moderate Rainfall 2040-2069	Warm, Moderate Rainfall 2070-2069
24.6	27.3

Hot, Low Rainfall 2040-2069	Hot, Low Rainfall 2070-2069
18.3	18.7

End Century (2070-2099) means

Warm, Moderate Rainfall (CCSM4 rcp 8.5)

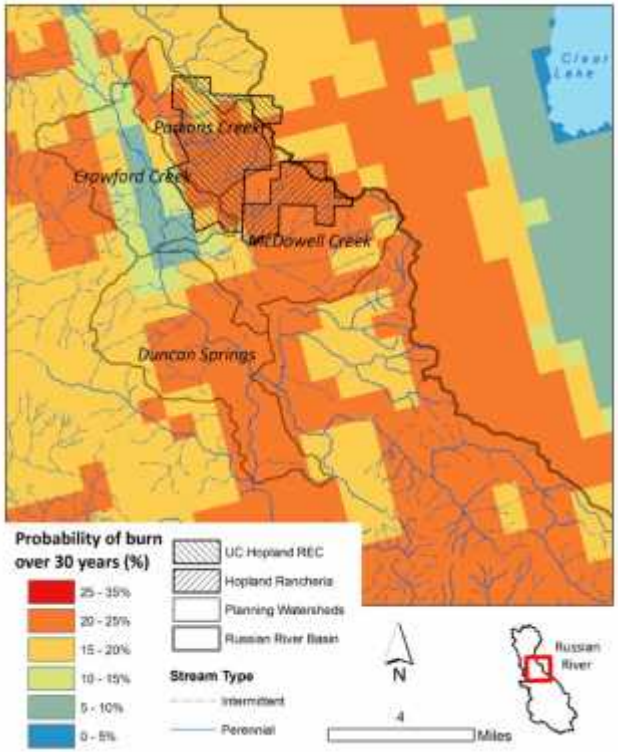
Hot, Low Rainfall (Miroc-esm rcp 8.5)



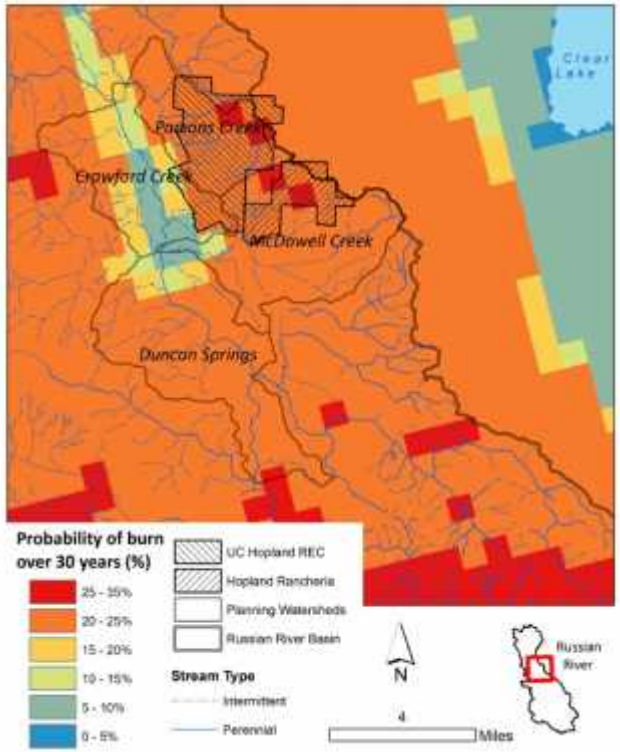
Pepperwood PRESERVE

Fire Probability

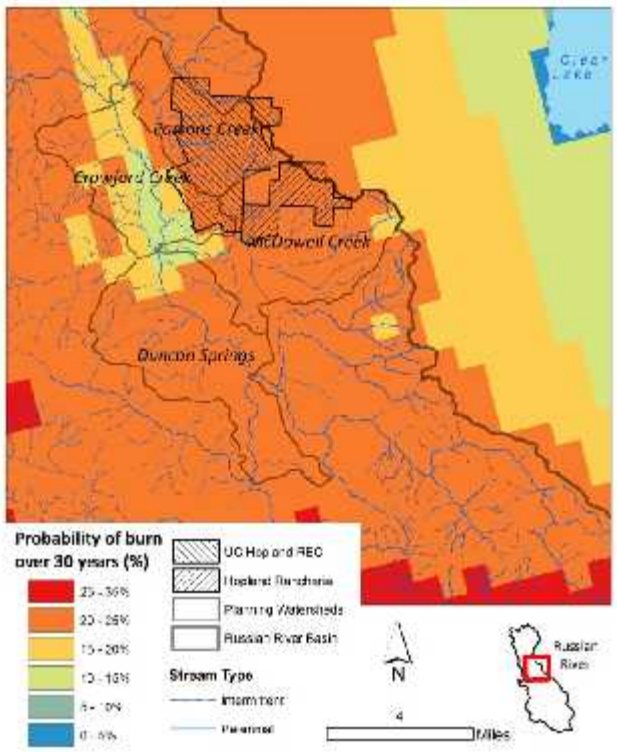
Intertribal Climate Adaptation Summit - Probability of Burning Over 30 Years
Historical (1971 - 2000) mean



Intertribal Climate Adaptation Summit - Probability of Burning Over 30 Years
Hot, Low Rainfall (GFDL sres A2) Mid Century (2040-2069) mean



Intertribal Climate Adaptation Summit - Probability of Burning Over 30 Years
Hot, Low Rainfall (GFDL sres A2) End of Century (2070-2099) mean

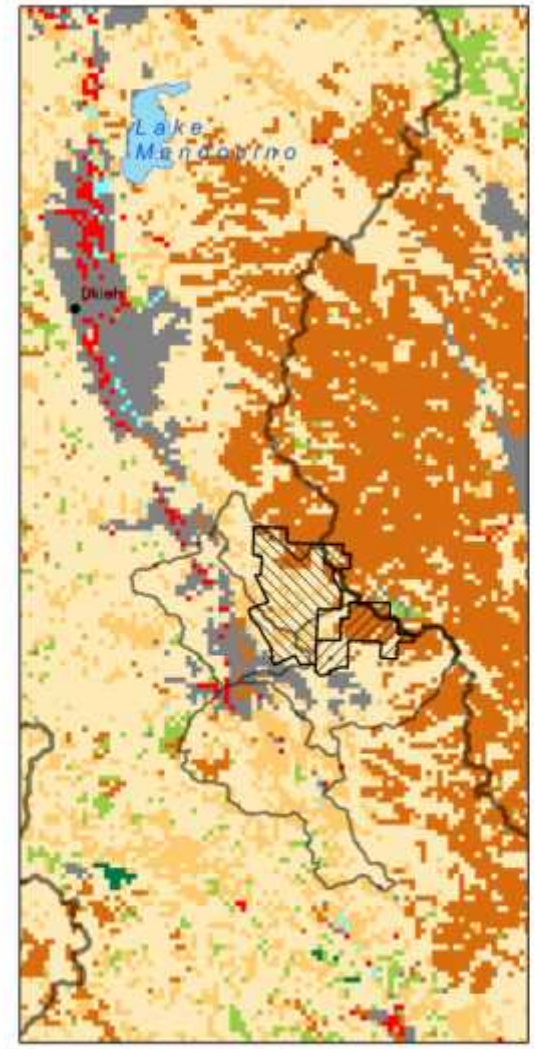


Pepperwood
PRESERVE

Vegetation Macrogroups and Climate Exposure of Vegetation

Intertribal Climate Adaptation Summit - Vegetation Cover

Vegetation Macrogroups



Waterbodies

Vegetation Macrogroup

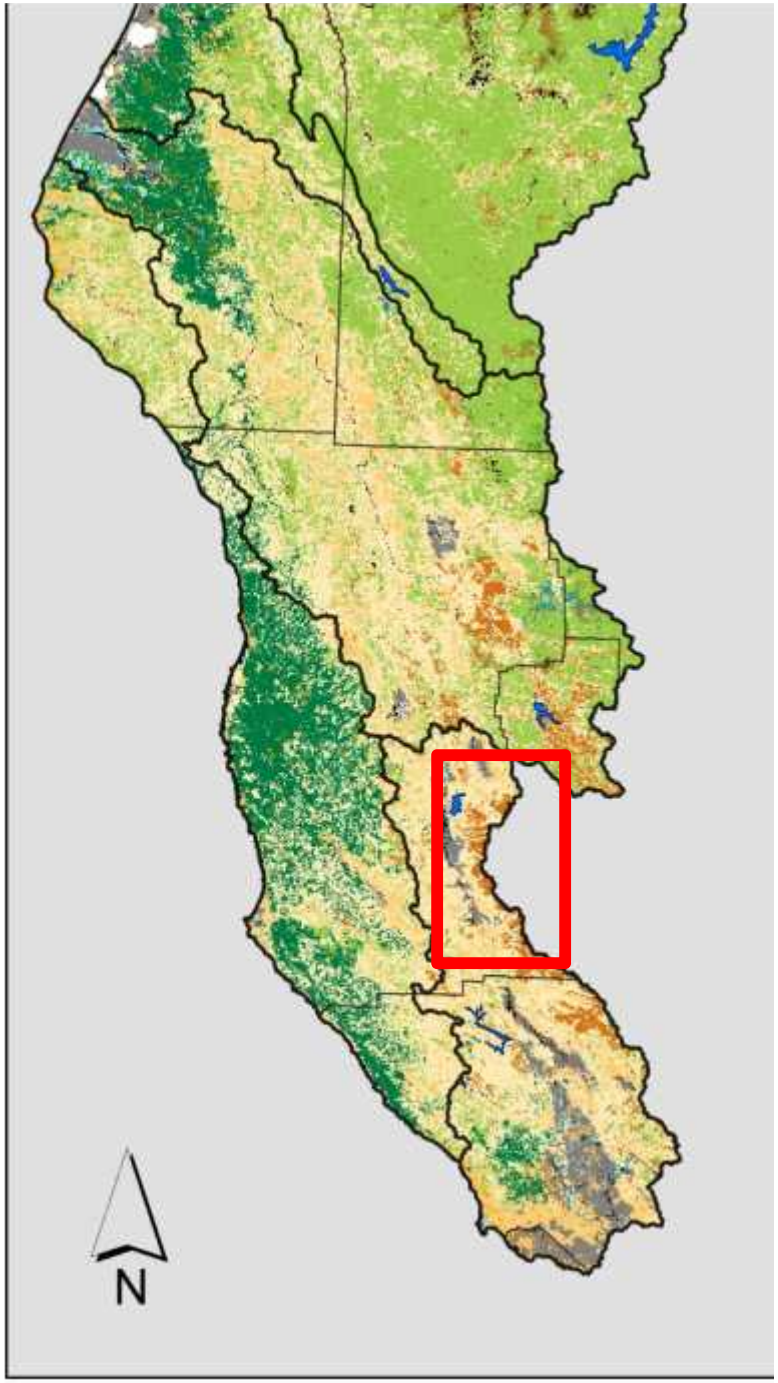
- 9 - California Foothill and Valley Forests and Woodlands
- 20 - Subalpine Aspen Forests & Pine Woodlands
- 23 - North Coastal mixed evergreen & montane conifer forests
- 24 - Pacific NW Conifer Forests
- 25 - Pacific Northwest Subalpine Forest
- 26 - Great Basin Pinyon-Juniper Woodland
- 34 - North Coastal and Montane Riparian Forest and Woodland
- 43 - Chaparral
- 45 - California Grassland and Flowerfields
- 47 - Mountain Riparian Scrub and wet meadow
- 48 - western upland grasslands
- 50 - North coast deciduous scrub and terrace prairie
- 52 - Montane Chaparral?
- 58 - Coastal Dune and Bluff Scrub
- 64 - Macro Group not analyzed
- 67 - Macro Group not analyzed
- 96 - Big Sagebrush Scrub
- 97 - Great Basin Dwarf Sagebrush Scrub
- 98 - Great Basin Upland Scrub
- 110 - California foothill and coastal rock outcrop vegetation
- 113 - Macro Group not analyzed
- 114 - Northwest Coast Cliff and Outcrop
- Urban and Ag Lands

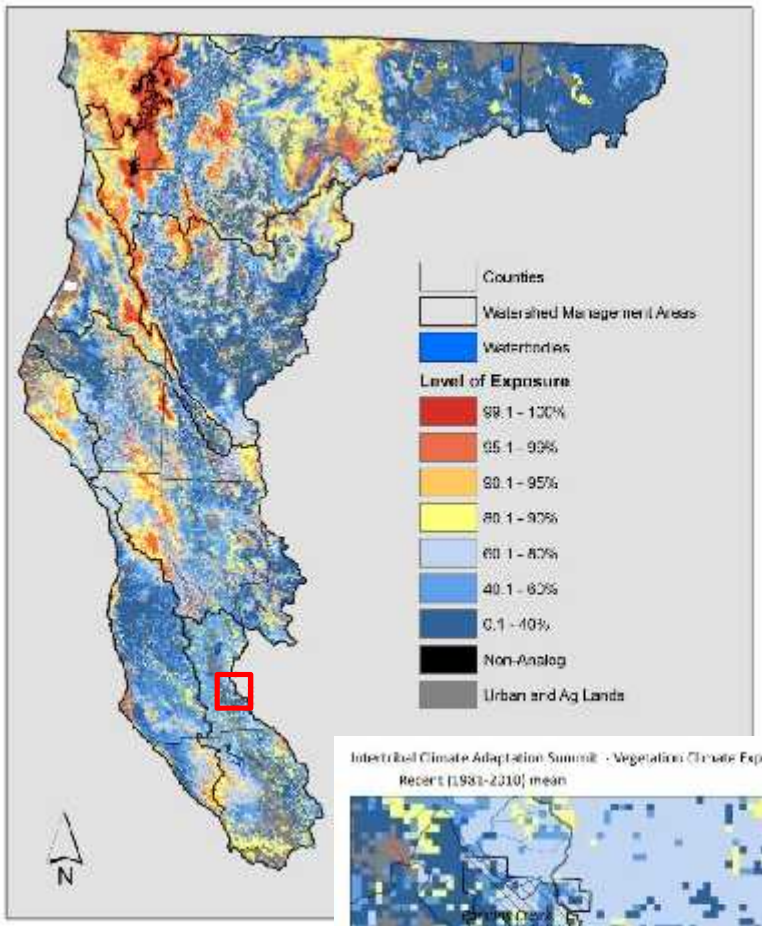
- UC Hopland REC
- Hopland Rancheria
- Planning Watersheds
- Russian River Basin

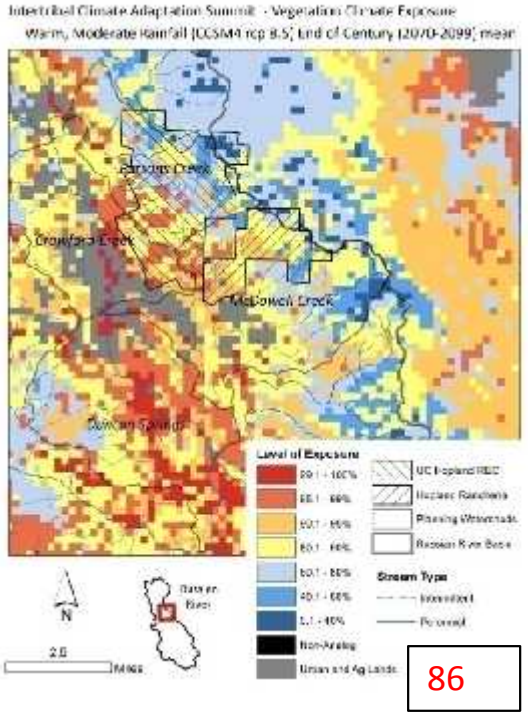
N

8.5

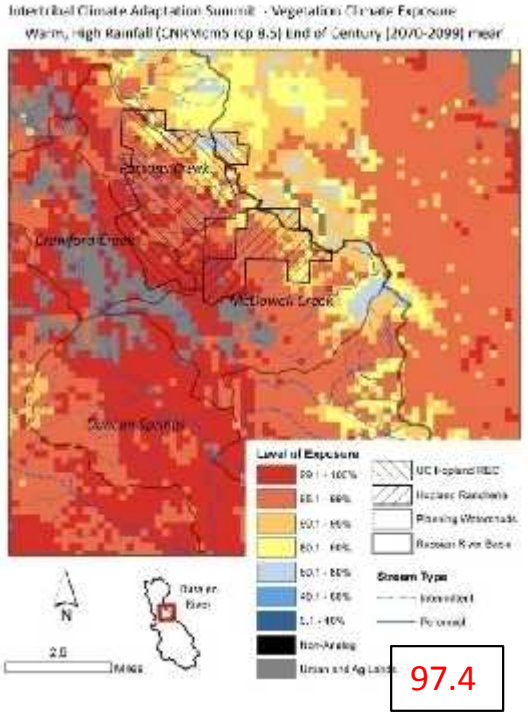
Miles







86



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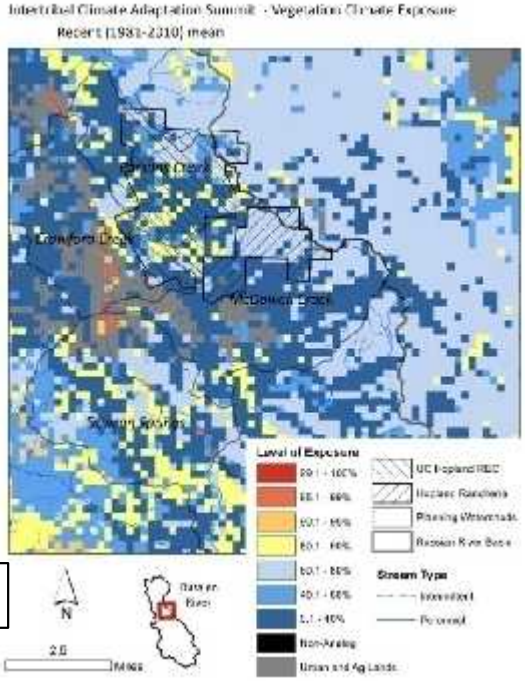

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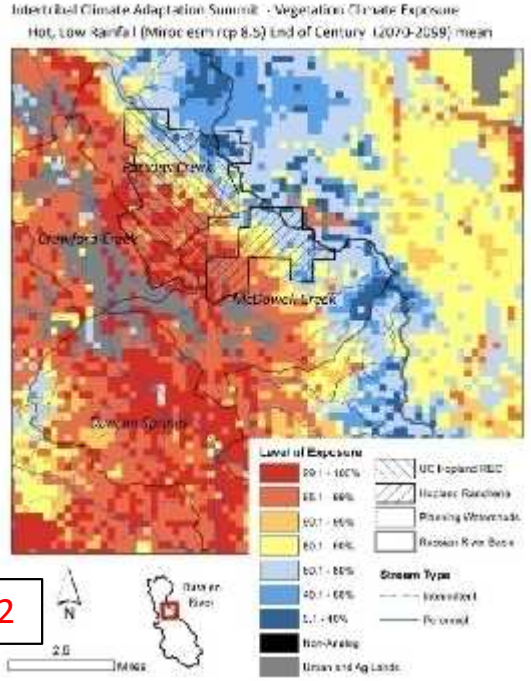

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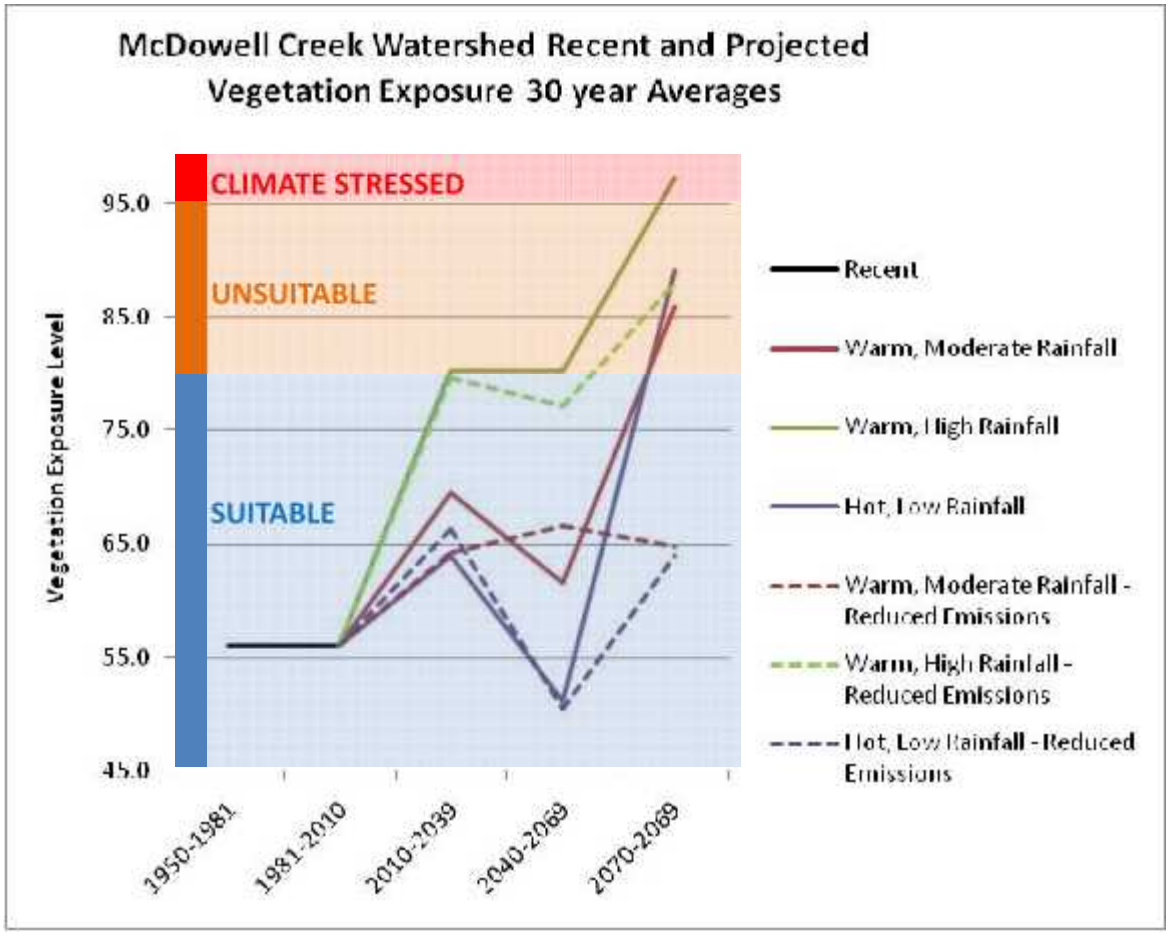
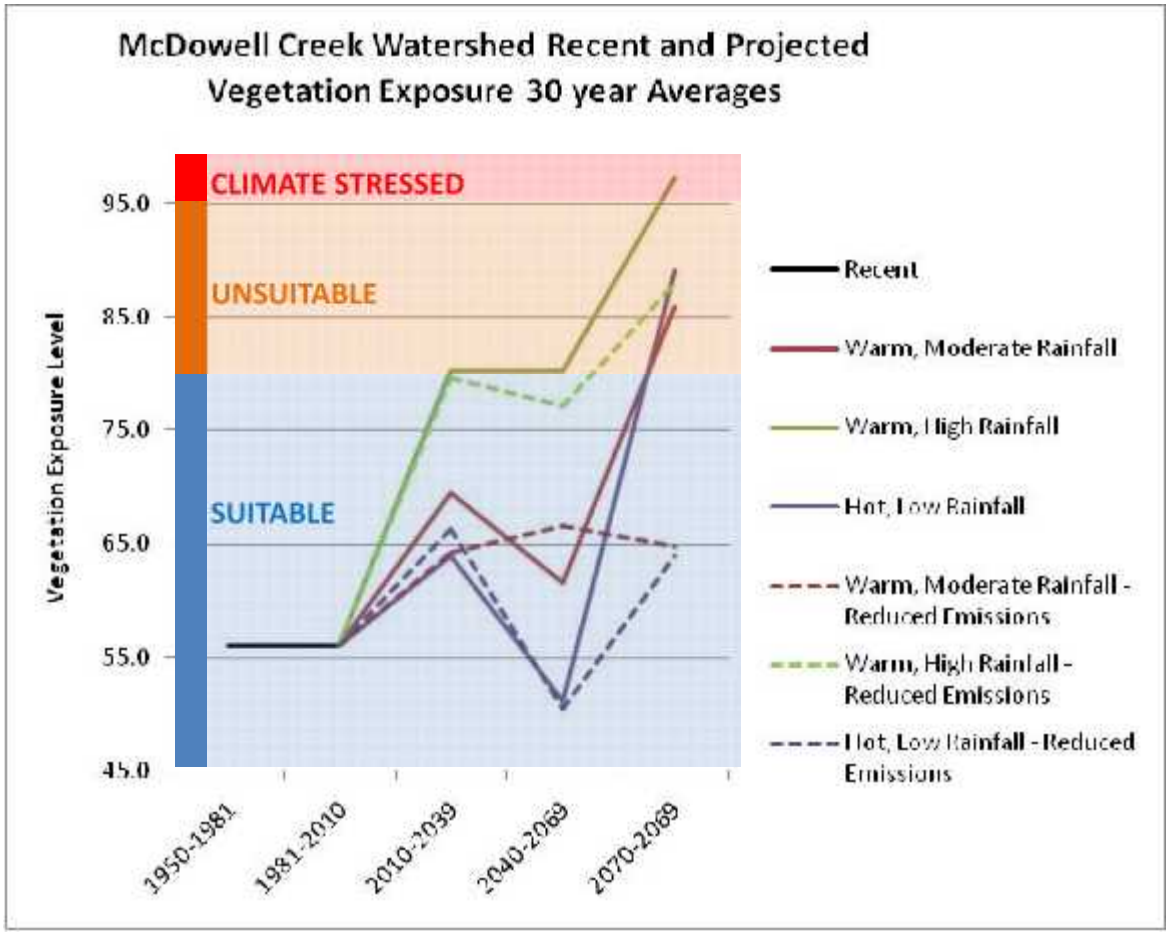

McDowell Creek Watershed Recent and Projected
Vegetation Exposure 30 year Averages
CLIMATE STRESSED
UNSUITABLE
SUITABLE
Vegetation Exposure Level
95.0
85.0
75.0
65.0
55.0
45.0
1950-1981
1981-2010
2010-2039
2040-2069
2070-2099
Recent
Warm, Moderate Rainfall
Warm, High Rainfall
Hot, Low Rainfall
Warm, Moderate Rainfall - Reduced Emissions
Warm, High Rainfall - Reduced Emissions
Hot, Low Rainfall - Reduced Emissions



Regional Pattern by End of Century (BAU)

*Percent of Russian Bodega WMA		End of Century (2070-2099)		
Vegetation Exposure Class	Recent (1981-2010)	CCSM	CNRM	Miroc
Unsuitable (80% to 95%)	4	14	9	10
Climate stressed (95% to 100%)	2	28	22	28
Highly Climate Stressed (99%-100%)	0	18	62	34
Climate Stressed (Non-Analog)	0	0	0	0

*Percent area excludes urban and ag lands

Adaptive Management Logic Model

Pepperwood PRESERVE

DRIVERS	MECHANISMS OF CHANGE	IMPACT ON PRESERVE	MANAGEMENT RESPONSES
LAND USE: loss of indigenous land management, legacy impacts of 19th century agricultural practices, 20th century habitat conversion and fire suppression	Reduced fire frequency, reduced cultivation of native plants for food and fiber, introduction of European livestock/ forage and overgrazing, alteration of wetlands and waterways, road construction, groundwater pumping and stream diversions, land conversion	Increased tree densities (saplings) in forests and woodlands, legacy grazing impacts in grasslands (compaction and erosion), road-related erosion, gullying and stream network incision, habitat fragmentation on adjacent lands, invasive species introductions (see below)	Forest thinning/fuels reduction, Conservation Grazing Program, site-specific erosion control treatments for streams and road network, prescribed burns, invasive species control (see below)
NATIVE SPECIES LOSSES	Intentional eradication, overhunting, habitat loss, competition with invasive species	Impacts to food chain (loss of top predators including grizzly bear and wolf), reduced biological disturbance (e.g., loss of elk migrations), amphibian declines	Conservation grazing to limit non-native plants in grasslands, native plant propagation and planting, avoiding disturbance of sensitive habitats during breeding/rearing seasons
INVASIVE SPECIES	Intentional and inadvertent introductions of non-native plants and animals	Conversion of grasslands from predominantly native perennial to non-native annual grasses and forbs, feral pig and turkey predation of acorns and other food sources, loss of oak woodlands via Douglas-fir invasions, invasive plant species present throughout preserve	Hunting program for pigs and turkeys, invasive plant eradication using manual, flaming and limited herbicide applications, Douglas-fir removal, prescribed burns
POLLUTION	Auto emissions cause aerial deposition of nitrogen and ozone	Nitrogen additions increase soil fertility, increase ammonia/ium availability and soil acidity, shift in species composition	Biomass removal via grazing
CLIMATE CHANGE	Greenhouse gas emissions cause global warming	Projected air temperature increases on order of 5–10°F by 2100, more variable rainfall, more frequent droughts, increased evaporation and climatic water deficits, shifts in species composition, increased fire risks	Identify vulnerable resources, promote ecosystem resilience, enhance watershed infiltration capacity, monitor

Thank you.

Pepperwood
PRESERVE