

Managing Oregon's Water: Climate Change and the Myth of Abundance

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Oregon Water Problem

The OWRD Strategic Plan 2001-2003 report bluntly states Oregon's water challenge:

Put very simply, there is not enough water where it is needed, when it is needed, to satisfy both existing and future water uses. This situation jeopardizes the high level of livability that Oregonians enjoy. It seriously limits the ability of Oregon's economy to grow, and threatens existing users' water supplies and the sustainability of the natural systems on which our economy relies. (p.6)

HB 3369

- State to develop an “*Integrated Water Resource Strategy*”
 - Water quantity and quality
 - Ecology
 - Economy
 - Social issues
 - Implications of climate change
- Goal to meet Oregon current and projected demand for the next 50 years
- Completed by 2012



▶ **President**

▶ **Senate**

▼ **House**

D Democratic seats won 4

R Republican seats won 1

Out of 5 open seats

▶ **Governor**

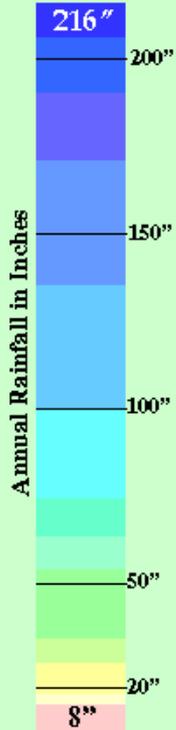
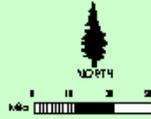
▶ **Ballot measures**

Oregon Precipitation



"STEWARDSHIP IN FORESTRY"

Rainfall



Oregon
DEPARTMENT OF
FORESTRY

2600 State Street
Salem, Oregon 97330

Oregon Climate Service, <http://www.ocs.orst.edu/ocs.html>

May 12, 1996
Oregon Department of Forestry, Graphics Services

Illusion of Water Abundance

- Oregon's surface waters already fully allocated during the summer months
- Predicted stressors to water quality and quantity
- During the surveys, 6 counties deemed "Drought Emergency Areas"



Jamie Francis/The Oregonian

Agriculture in Oregon

Grown in Oregon



Legend

Oregon's Agricultural Regions

- Coast
- Willamette Valley
- Southwest
- High Desert
- Columbia Basin
- Northeast
- Southeast

- Apples
- Blackberries
- Christmas Trees
- Cranberries
- Forestry
- Grass Seed
- Hazelnuts
- Peppermint
- Pumpkins
- Vegetable/ Flower Seed
- Beans
- Blueberries
- Corn
- Garlic
- Greenhouse/ Nursery
- Onions
- Potatoes
- Sheep
- Watermelon
- Beef
- Cherries
- Crab
- Fish
- Grapes
- Hay
- Pears
- Poultry
- Shrimp
- Wheat/Barley



California

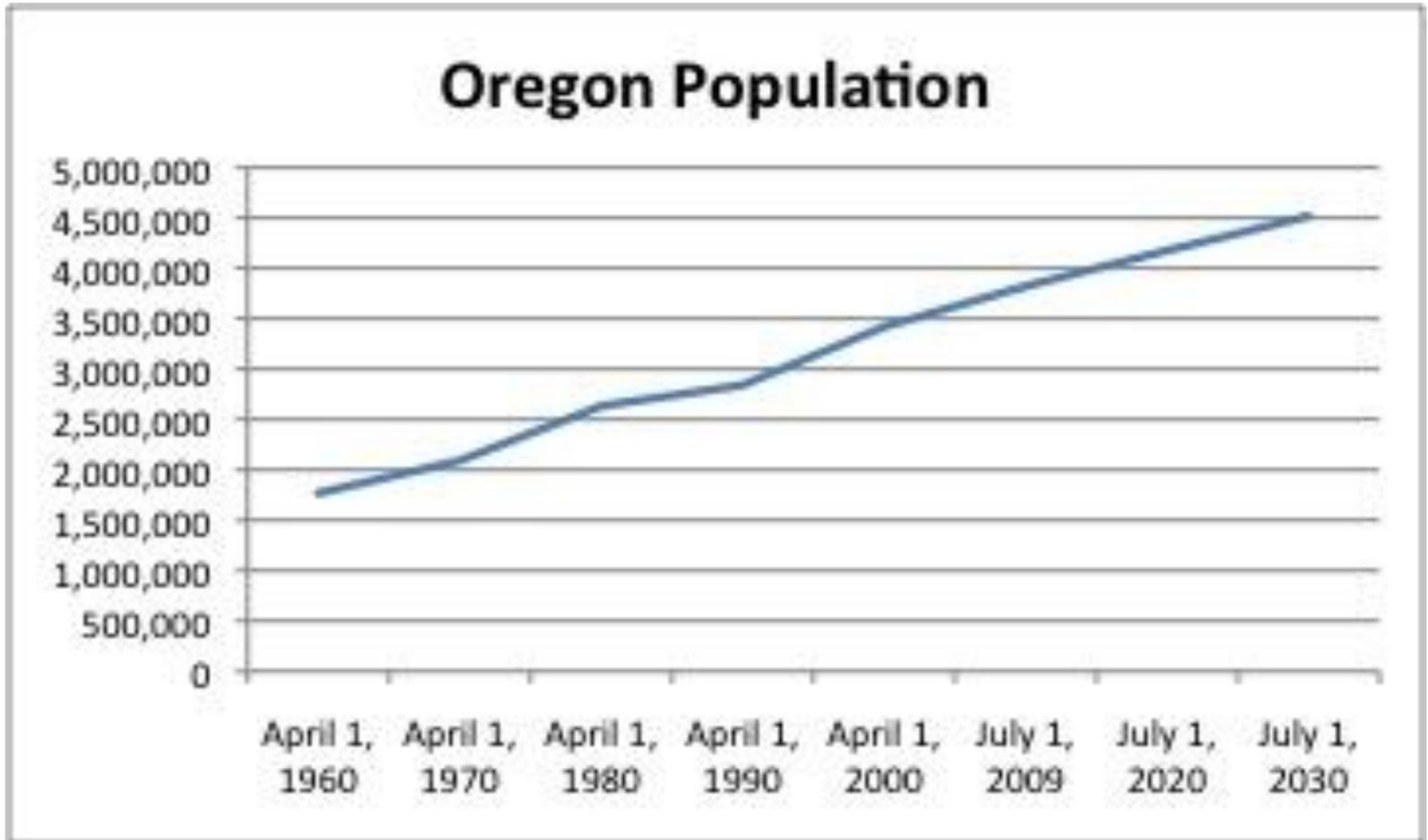


Oregon Agriculture in the Classroom Foundation

<http://aitc.oregonstate.edu>

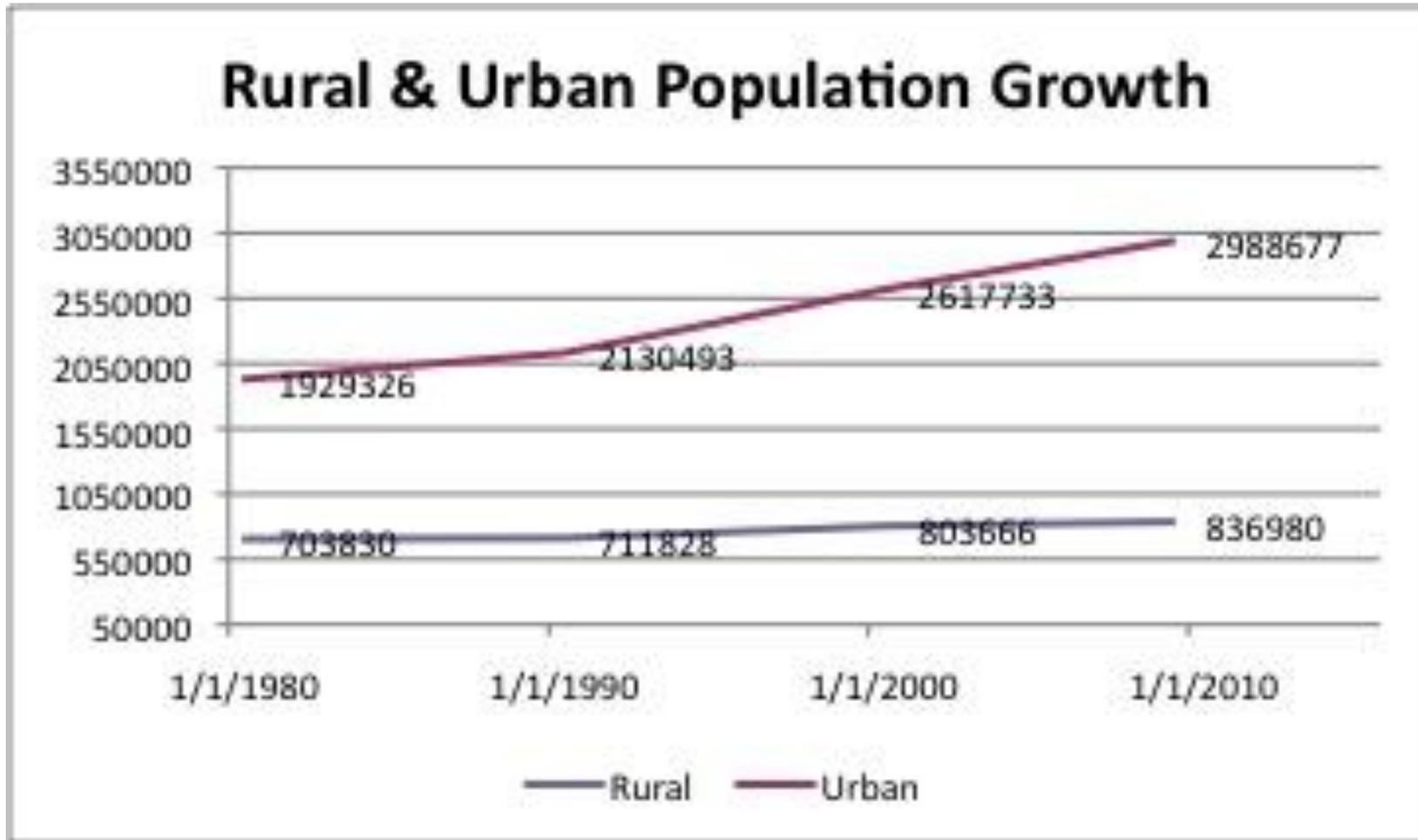
Nevada

Stressors – Population Growth



Oregon Population Research Center, 2010

Oregon Rural & Urban Population



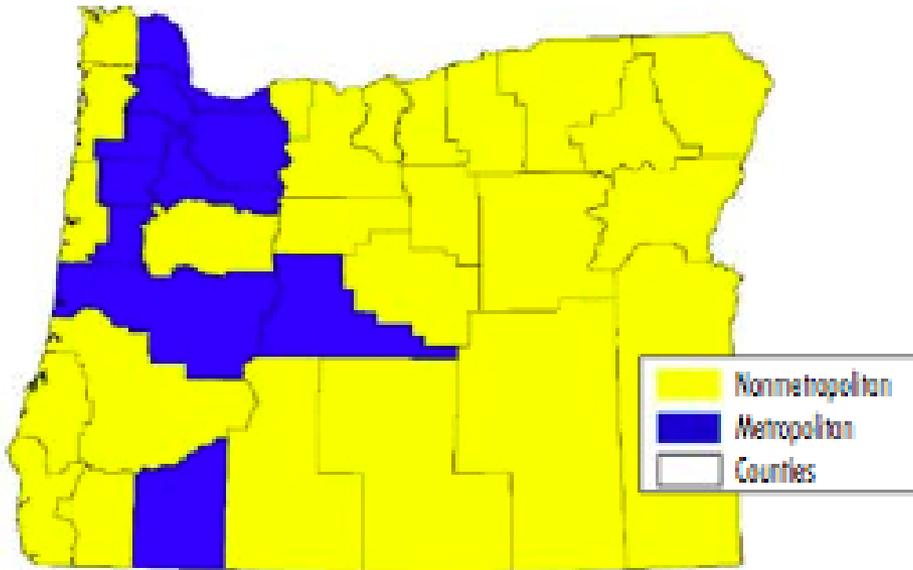
Climate change

- By 2020 Pacific Northwest projected to warm on average 1.9°F
- Full range from 1.4°F to 4.6°F by 2040
- Precipitation same, form it *falls* in will change. Less snow – more rain.
- Loss of transition snow = reduced storage = high spring flows = low summer flows

Oregon Surveys

- Two surveys of the Oregon general public: Water Policy, and Public Attitudes
- Random sample with 50/50 split of male/female
 - Water Policy: 1563
 - Public Attitudes: 1537
- Response rates:
 - Water Policy= 52.1%
 - Public Attitudes= 52.6%
- Responses weighted by age with U.S. Census

Defining Rural Counties



Crandall & Weber, 2005

- U.S. Office of Management and Budget definition of “Rural”
- Metropolitan counties = Urbanized core of 50,000 or more.
- Nonmetropolitan are remaining
- 82% of Oregon is “rural”

Characteristics of survey population

	Oregonians	Metro Counties	Nonmetro Counties
Number	813	647	166
Average Age	56	55	60
Average Years in Oregon	35	35	35
Gender (% female)	49	51	44
Education	Some College	Some college	Some college
Ideology	Moderate	Moderate	Moderate
Income	\$50,000-\$74,999	\$50,000-\$74,999	\$35,000-\$49,999

Theoretical Model

- Are rural counties different than urban counties in regards to risk, and knowledge?
- How do Oregonians perceive risk to water? and which risks can be managed with policies?



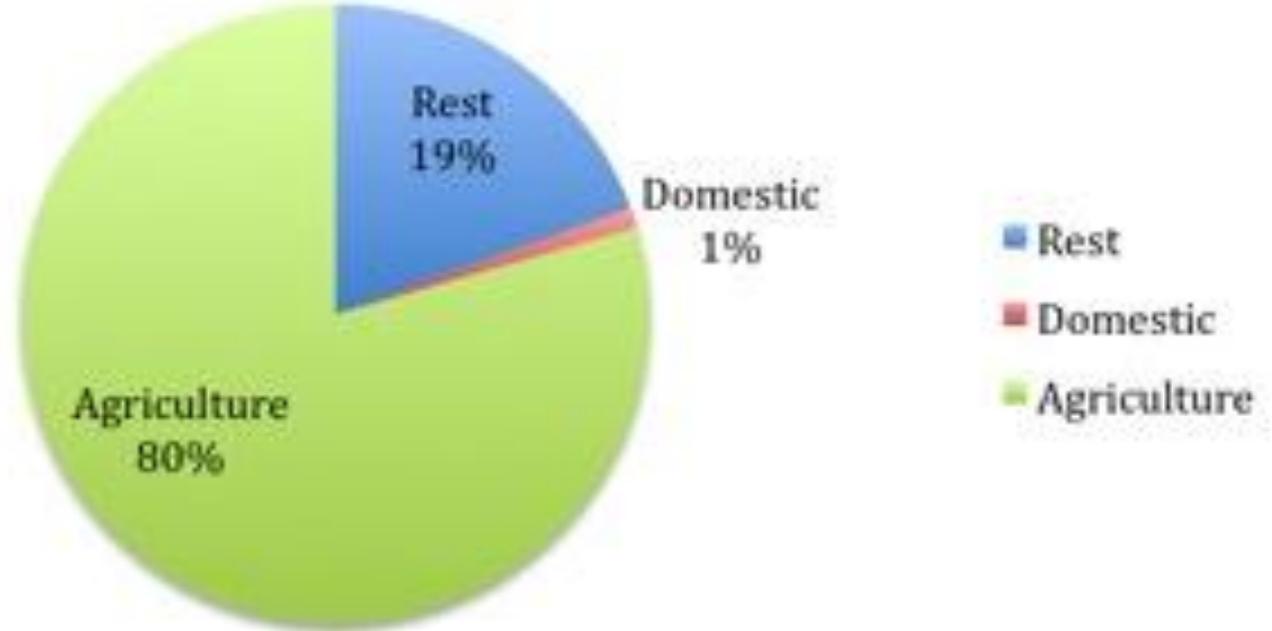
Self Determined Level of Knowledge

Knowledge Term	Level of Rurality ¹		<i>F</i> -value	<i>p</i> -value	Eta (η)
	Metro	Nonmetro			
Watershed	2.82	2.81	.098	.754	.011
Water Right	2.66	2.76	3.21	.073	.063
Clean Water Act	2.54	2.58	.011	.917	.004
Nonpoint Source Pollution	1.57	1.85	15.86	.001	.140
Prior Appropriation Doctrine	1.35	1.57	14.66	.001	.134
Exempt Well	1.77	1.96	7.48	.006	.097
Greywater	2.41	2.56	4.67	.031	.076
Hyporheic Flow	1.34	1.57	20.21	.001	.157
Snow Water Equivalent	2.32	2.66	24.87	.001	.174
Aquifer Storage and Recovery	2.25	2.34	1.67	.196	.046
Evapotranspiration	1.74	1.98	10.31	.001	.113
Safe Drinking Water Act	2.53	2.53	9.23	.002	.107
Catchment	1.82	1.93	1.90	.169	.049
Total Knowledge Scale	2.08	2.24	17.91	.001	.147

1. Variables coded on a 3-point scale from “Have not heard of the term at all ” (1) to “Know what the term means” (3). Means with different superscripts are significant at $p < .05$ based on Scheffe post-hoc test for equal variances.

Oregon Water Use

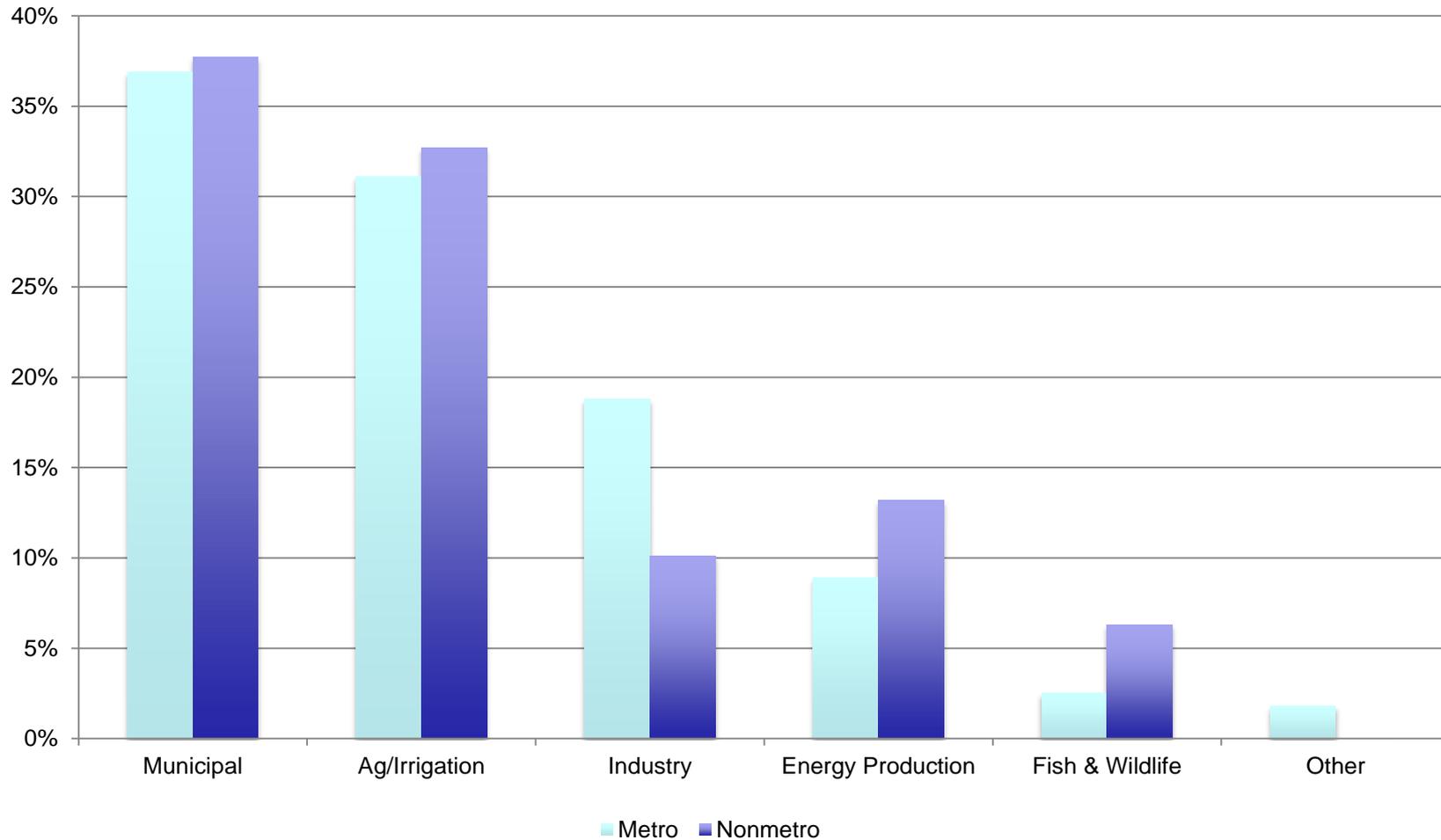
Total Oregon Water use (2005)



Kenny et al. 2009

Perceived Water Use Metro and Nonmetro

p=.006



Perceived Risks to Oregon's Water Quality and Quantity between Metro & Nonmetro counties

Risk Activity	Level of Rurality ¹		<i>F</i> -value	<i>p</i> -value	Eta (η)
	Metro	Nonmetro			
Agriculture Practices	3.41	3.24	6.75	.010	.088
Forestry Practices	3.27	3.11	4.84	.028	.049
Hydro-electric Dams	2.53	2.40	2.21	.137	.055
Drought	3.24	3.21	.177	.674	.017
Climate Change	3.07	2.82	9.36	.002	.083
Population Growth	3.12	3.12	.014	.906	.010
Irrigation of Agriculture Lands	2.74	2.70	.290	.590	.004
Water Privatization	3.01	3.22	.216	.642	.010
Industry	3.01	2.97	.010	.921	.014
Private Wells	2.14	2.16	.018	.893	.006
Total Risk Scale	2.99	2.90	2.76	.097	.051

1. Variables coded on a 4-point scale from “No Risk” (1) to “Serious Risk” (4). Means with different superscripts are significant at $p < .05$ based on Scheffe post-hoc test for equal variances.

Belief Risks can be Managed by Humans

Risk Activity	Level of Rurality ¹		<i>F</i> -value	<i>p</i> -value	Eta (η)
	Metro	Nonmetro			
Agriculture Practices	3.71	3.68	.448	.504	.024
Forestry Practices	3.67	3.57	3.284	.070	.064
Hydro-electric Dams	3.35	3.57	.173	.677	.015
Drought	2.21	2.24	.205	.651	.016
Climate Change	2.26	2.13	2.836	.093	.060
Population Growth	2.87	2.93	.515	.473	.026
Irrigation of Agriculture Lands	3.30	3.30	.001	.975	.001
Water Privatization	3.38	3.37	.002	.969	.002
Industry	3.53	3.50	.350	.554	.021
Private Wells	3.14	3.16	.044	.834	.008
Total Management Scale	3.14	3.13	.150	.698	.014

1. Variables coded on a 4-point scale from “Not at all ” (1) to “A great deal” (4). Means with different superscripts are significant at $p < .05$ based on Scheffe post-hoc test for equal variances.

Characteristics of survey population on selected variables

	Oregonians	Metro Counties	Nonmetro Counties
Number	808	603	205
Average Age (Mean)	56.8	55.5	60.5
Gender (% female)	423	325	98
Education	Some College	Some college	High School/ Vocational School
Ideology	Moderate	Liberal/Moderate	ConservativeModerate
NEP (low = 1, high = 5)	3.65	3.69	3.52

NEP Distribution

Cluster (1=Bio,2=Moderate,3=Anthro)	Frequency	Percent	Valid Percent
Valid Bio (1)	400	49.5	50.3
Moderate (2)	298	36.9	37.4
Anthro (3)	98	12.1	12.3
Total	796	98.5	100.0
Missing	12	1.5	
Total	808	100.0	

Metro vs. Non-Metro Dominant Social Paradigm or New Ecological

Paradigm?

DSP vs. NEP

1 = DSP, 6 = NEP

	Metro	Non-Metro	<i>F</i> -value	<i>p</i> -value	Eta (η)
New Ecological Paradigm (NEP)	3.6923	3.5276	5.191	.023	.081

1. Variables coded on a 5-point scale from “Strongly Disagree” (1) to “Strongly Agree” (5).

NEP and Water Knowledge

	New Ecological Paradigm ¹					
	Biocentric	Neutral	Anthropocentric	<i>F</i> -value	<i>p</i> -value	Eta (η)
Informed about water issues	2.083	2.081	2.286	3.327	.036	.091

1. Variables coded on a 4-point scale from “Not informed” (1) to “Very well informed” (4). Recoded using cluster analysis with 1=biocentric, 2=neutral, 3=anthropocentric.

Water Quantity Concern NEP

	Biocentric	Moderate	Anthro	χ^2 -value	<i>p</i> -value	ϕ
Feel water quantity is a problem in Oregon				43.459	.001	.122
Yes						
Count	260	144	40			
% within cluster	65.0%	48.3%	40.8%			
No						
Count	72	100	45			
% within cluster	18.0%	33.6%	45.9%			
Don't know						
Count	68	54	13			
% within cluster	17.0%	18.1%	13.3%			

Conclusion

- Oregon is diverse in its political, economic, social, and ecological realms.
- Rural-urban divide may not be as significant in water issues.
- Data shows the differences in perceptions and knowledge between rural and urban is minimal.

Questions?