
Supplementary information

Social value shift in favour of biodiversity conservation in the United States

In the format provided by the
authors and unedited

Supplementary Information for
Social Value Shift in Favor of Biodiversity Conservation in the U.S.

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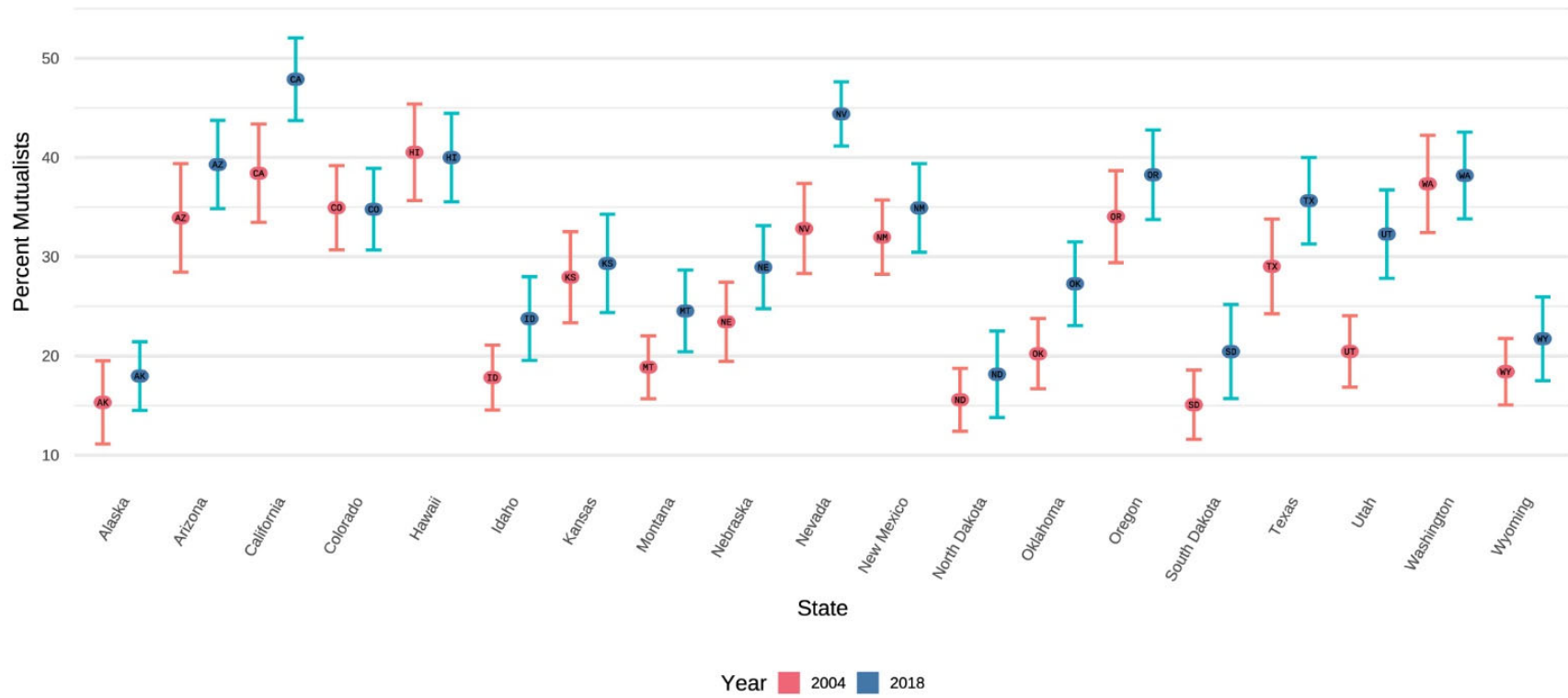
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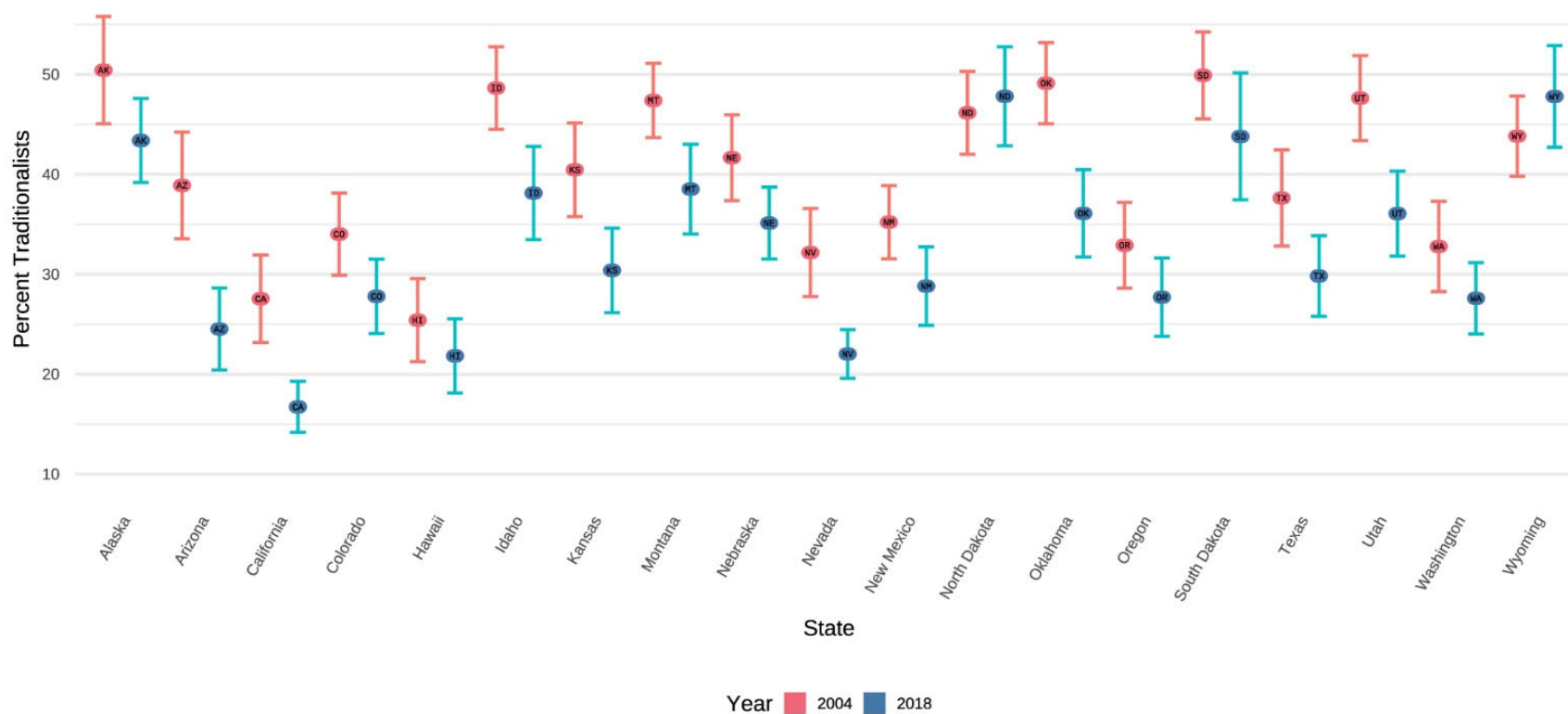
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Supplementary Fig. 1. Change in percentages of mutualists among 19 Western U.S. states between 2004 and 2018. Individual responses were weighted according to demographics within each state. Error bars represent 95% confidence intervals.



Supplementary Fig. 2. Change in percentages of traditionalists among 19 Western U.S. states between 2004 and 2018.

Individual responses were weighted according to demographics within each state. Error bars represent 95% confidence intervals.



Supplementary Tables

Supplementary Table 1. Wildlife value measurement scales used in 2004 and 2018 U.S. studies.

Wildlife value orientations, basic belief dimensions, and basic belief items ¹
Domination
<i>Appropriate use beliefs</i>
Humans should manage fish and wildlife populations so that humans benefit.
The needs of humans should take priority over fish and wildlife protection.
It is acceptable for people to kill wildlife if they think it poses a threat to their life.
It is acceptable for people to kill wildlife if they think it poses a threat to their property.
It is acceptable to use fish and wildlife in research even if it may harm or kill some animals.
Fish and wildlife are on earth primarily for people to use.
<i>Hunting beliefs</i>
We should strive for a world where there's an abundance of fish and wildlife for hunting and fishing.
Hunting is cruel and inhumane to the animals. ²
Hunting does not respect the lives of animals. ²
People who want to hunt should be provided the opportunity to do so.
Mutualism
<i>Social affiliation beliefs</i>
We should strive for a world where humans and fish and wildlife can live side by side without fear.
I view all living things as part of one big family.
Animals should have rights similar to the rights of humans.
Wildlife are like my family and I want to protect them.
<i>Caring beliefs</i>
I care about animals as much as I do other people.
It would be more rewarding for me to help animals rather than other people.
I take great comfort in the relationships I have with animals.
I feel a strong emotional bond with animals.
I value the sense of companionship I receive from animals.

¹ All survey items measured on a scale from 1 = "strongly disagree" to 7 = "strongly agree".

² Item was reverse coded prior to analysis.

Supplementary Table 2. Percentages of wildlife value types within 19 Western U.S. states, 2004 and 2018. Individual responses were weighted according to demographics within each state¹. Numbers in brackets represent 95% confidence intervals.

State	2004				2018			
	Mutualist	Traditionalist	Pluralist	Distanced	Mutualist	Traditionalist	Pluralist	Distanced
Alaska	15.3% [11.1%, 19.5%]	50.4% [45.0%, 55.8%]	27.3% [22.6%, 32.0%]	6.9% [4.1%, 9.7%]	18.0% [14.5%, 21.4%]	43.4% [39.2%, 47.6%]	29.0% [25.0%, 33.1%]	9.6% [6.9%, 12.3%]
Arizona	33.9% [28.4%, 39.4%]	38.9% [33.6%, 44.2%]	16.9% [13.3%, 20.5%]	10.3% [7.1%, 13.5%]	39.3% [34.8%, 43.8%]	24.5% [20.4%, 28.6%]	22.0% [18.3%, 25.6%]	14.2% [11.1%, 17.3%]
California	38.4% [33.5%, 43.4%]	27.5% [23.2%, 31.9%]	14.8% [11.4%, 18.1%]	19.3% [15.0%, 23.5%]	47.9% [43.7%, 52.0%]	16.7% [14.2%, 19.3%]	14.7% [12.0%, 17.5%]	20.6% [17.0%, 24.3%]
Colorado	34.9% [30.7%, 39.2%]	34.0% [29.9%, 38.1%]	21.8% [18.3%, 25.2%]	9.3% [6.7%, 11.8%]	34.8% [30.7%, 38.9%]	27.8% [24.1%, 31.5%]	23.5% [20.0%, 27.0%]	13.9% [10.8%, 17.0%]
Hawaii	40.5% [35.7%, 45.4%]	25.4% [21.2%, 29.6%]	22.2% [18.5%, 25.8%]	11.9% [8.9%, 14.9%]	40.0% [35.5%, 44.5%]	21.8% [18.1%, 25.5%]	24.5% [20.6%, 28.3%]	13.7% [10.8%, 16.6%]
Idaho	17.8% [14.5%, 21.1%]	48.6% [44.5%, 52.8%]	26.4% [22.7%, 30.0%]	7.2% [5.0%, 9.4%]	23.8% [19.5%, 28.0%]	38.1% [33.5%, 42.8%]	27.4% [23.0%, 31.8%]	10.7% [7.4%, 14.1%]
Kansas	27.9% [23.3%, 32.5%]	40.5% [35.8%, 45.1%]	21.6% [17.8%, 25.4%]	10.0% [6.8%, 13.2%]	29.3% [24.4%, 34.3%]	30.4% [26.2%, 34.6%]	23.6% [19.7%, 27.5%]	16.7% [12.4%, 21.0%]
Montana	18.9% [15.7%, 22.0%]	47.4% [43.7%, 51.1%]	27.0% [23.8%, 30.3%]	6.7% [4.7%, 8.7%]	24.5% [20.4%, 28.7%]	38.5% [34.0%, 43.0%]	29.2% [24.6%, 33.8%]	7.8% [5.2%, 10.4%]
Nebraska	23.4% [19.4%, 27.4%]	41.7% [37.4%, 46.0%]	26.5% [22.8%, 30.2%]	8.4% [5.8%, 11.0%]	28.9% [24.8%, 33.1%]	35.1% [31.5%, 38.7%]	26.5% [22.9%, 30.1%]	9.4% [6.7%, 12.2%]
Nevada	32.8% [28.3%, 37.4%]	32.2% [27.8%, 36.6%]	23.5% [19.7%, 27.4%]	11.4% [8.3%, 14.6%]	44.4% [41.2%, 47.6%]	22.0% [19.6%, 24.5%]	18.7% [16.3%, 21.1%]	14.9% [12.6%, 17.2%]
New Mexico	32.0% [28.2%, 35.7%]	35.2% [31.6%, 38.9%]	23.9% [20.7%, 27.0%]	8.9% [6.8%, 11.1%]	34.9% [30.4%, 39.4%]	28.8% [24.9%, 32.7%]	26.0% [22.2%, 29.8%]	10.3% [7.2%, 13.3%]
North Dakota	15.6% [12.4%, 18.8%]	46.2% [42.0%, 50.3%]	30.5% [26.6%, 34.3%]	7.8% [5.4%, 10.2%]	18.2% [13.8%, 22.5%]	47.8% [42.9%, 52.8%]	25.6% [21.5%, 29.8%]	8.4% [5.8%, 11.0%]
Oklahoma	20.2% [16.7%, 23.8%]	49.1% [45.1%, 53.2%]	23.0% [19.8%, 26.2%]	7.7% [5.3%, 10.0%]	27.3% [23.1%, 31.5%]	36.1% [31.7%, 40.5%]	24.6% [20.4%, 28.8%]	12.1% [8.7%, 15.4%]
Oregon	34.0% [29.4%, 38.7%]	32.9% [28.6%, 37.2%]	21.5% [17.8%, 25.3%]	11.5% [8.4%, 14.7%]	38.3% [33.8%, 42.8%]	27.7% [23.8%, 31.6%]	20.7% [17.1%, 24.2%]	13.4% [10.2%, 16.6%]

South Dakota	15.1% [11.6%, 18.6%]	49.9% [45.5%, 54.3%]	28.7% [24.8%, 32.6%]	6.3% [4.0%, 8.6%]	20.4% [15.7%, 25.2%]	43.8% [37.4%, 50.1%]	27.5% [22.0%, 33.0%]	8.3% [4.6%, 12.0%]
Texas	29.0% [24.3%, 33.8%]	37.6% [32.8%, 42.4%]	25.7% [21.5%, 30.0%]	7.6% [4.8%, 10.4%]	35.6% [31.3%, 40.0%]	29.8% [25.8%, 33.9%]	21.0% [17.5%, 24.6%]	13.5% [10.3%, 16.7%]
Utah	20.5% [16.9%, 24.0%]	47.6% [43.4%, 51.9%]	20.8% [17.5%, 24.0%]	11.2% [8.4%, 14.0%]	32.3% [27.8%, 36.7%]	36.1% [31.8%, 40.3%]	19.4% [15.7%, 23.0%]	12.3% [9.3%, 15.2%]
Washington	37.3% [32.4%, 42.2%]	32.8% [28.3%, 37.3%]	17.9% [14.4%, 21.3%]	12.0% [8.7%, 15.3%]	38.2% [33.8%, 42.6%]	27.6% [24.0%, 31.2%]	19.8% [16.6%, 23.0%]	14.4% [11.0%, 17.8%]
Wyoming	18.4% [15.1%, 21.8%]	43.8% [39.8%, 47.8%]	30.8% [27.1%, 34.4%]	7.0% [4.7%, 9.3%]	21.7% [17.5%, 26.0%]	47.8% [42.7%, 52.9%]	26.0% [21.6%, 30.3%]	4.5% [2.4%, 6.6%]

¹Data from 2018 were selected to match prior demographic sampling criteria applied in 2004 to allow for direct comparison.

Supplementary Table 3. Percentages of wildlife value types within generational cohorts in 19 Western U.S. states, 2004 and 2018. Individual responses were weighted according to demographics within each state. Numbers in brackets represent 95% confidence intervals.

Generational Cohort	2004				2018			
	Mutualist	Traditionalist	Pluralist	Distanced	Mutualist	Traditionalist	Pluralist	Distanced
Greatest Gen. (b. 1901-1927)	15.5% [13.1%, 18.0%]	42.6% [39.2%, 45.9%]	32.3% [29.1%, 35.5%]	9.6% [7.6%, 11.6%]	19.1% [8.9%, 29.3%]	36.2% [25.4%, 46.9%]	31.7% [21.0%, 42.3%]	13.1% [6.7%, 19.5%]
Silent Gen. (b. 1928-1945)	20.7% [19.1%, 22.3%]	41.6% [39.6%, 43.5%]	29.5% [27.7%, 31.3%]	8.2% [7.1%, 9.3%]	27.5% [24.9%, 30.0%]	35.6% [33.0%, 38.2%]	25.7% [23.3%, 28.1%]	11.2% [9.4%, 13.0%]
Baby Boomers (b. 1946-1964)	25.5% [24.1%, 26.8%]	41.8% [40.3%, 43.3%]	23.8% [22.5%, 25.0%]	9.0% [8.1%, 9.9%]	31.7% [29.9%, 33.5%]	33.5% [31.8%, 35.1%]	22.9% [21.4%, 24.4%]	11.9% [10.4%, 13.4%]
Gen. X (b. 1965-1980)	30.3% [28.4%, 32.3%]	39.0% [37.0%, 41.0%]	20.8% [19.2%, 22.4%]	9.9% [8.6%, 11.1%]	37.0% [34.4%, 39.7%]	28.6% [26.5%, 30.8%]	19.9% [18.0%, 21.9%]	14.4% [12.2%, 16.5%]
Millennials (b. 1981-1996)	34.7% [28.2%, 41.1%]	33.2% [27.1%, 39.3%]	20.0% [15.0%, 25.0%]	12.2% [7.7%, 16.6%]	41.5% [38.9%, 44.1%]	22.2% [20.4%, 24.0%]	20.9% [18.9%, 22.8%]	15.5% [13.4%, 17.5%]

Supplementary Table 4. Results of regression analyses examining effects of urbanization and gross domestic product on wildlife value scores and value type percentages. Data used are aggregate state-level values ($n = 19$). Measures marked with an asterisk (*) were adjusted to account for the amount of change observed relative to the amount possible given their starting values (i.e., change in proportion, divided by 1 - starting proportion). Bolded p -values indicate statistically significant effects at the $p < 0.05$ level, excluding intercepts¹.

Model outcome	Model predictor	Estimate	SE	95% CI		p
				LL	UL	
Mutualism score (2018)	Intercept	3.742	0.159	3.404	4.080	< 0.001
	Urbanization (2010)	1.197	0.213	0.746	1.649	< 0.001
	GDP (2017)	0.000	0.000	0.000	0.000	0.968
Domination score (2018)	Intercept	6.117	0.214	5.662	6.571	< 0.001
	Urbanization (2010)	-1.863	0.287	-2.470	-1.255	< 0.001
	GDP (2017)	0.000	0.000	0.000	0.000	0.076
Mutualists (2018)	Intercept	-0.135	0.057	-0.256	-0.014	0.031
	Urbanization (2010)	0.574	0.076	0.412	0.736	< 0.001
	GDP (2017)	0.000	0.000	0.000	0.000	0.176
Traditionalists (2018)	Intercept	0.762	0.071	0.612	0.913	< 0.001
	Urbanization (2010)	-0.555	0.095	-0.756	-0.354	< 0.001
	GDP (2017)	0.000	0.000	0.000	0.000	0.314
Change in mutualism score since 2004	Intercept	0.084	0.035	0.011	0.158	0.027
	Change in urbanization since 2000*	0.702	0.271	0.128	1.277	0.020
	Change in GDP since 2004*	0.000	0.000	0.000	0.000	0.312
Change in domination score since 2004	Intercept	-0.129	0.035	-0.203	-0.055	0.002
	Change in urbanization since 2000*	-0.717	0.273	-1.296	-0.139	0.018
	Change in GDP since 2004*	0.000	0.000	0.000	0.000	0.281
Change in mutualists since 2004*	Intercept	0.014	0.016	-0.021	0.048	0.417
	Change in urbanization since 2000*	0.409	0.127	0.139	0.678	0.005
	Change in GDP since 2004*	0.000	0.000	0.000	0.000	0.053
Change in traditionalists since 2004*	Intercept	-0.085	0.036	-0.161	-0.009	0.030
	Change in urbanization since 2000*	-0.346	0.279	-0.938	0.246	0.233
	Change in GDP since 2004*	0.000	0.000	0.000	0.000	0.769

¹Results of analyses reported in this table were included at the request of a reviewer. We advise caution in drawing conclusions from these results given the small sample size of the aggregated state-level data ($n = 19$). We also do not intend to make direct causal claims regarding the effects of the covariates (i.e., urbanization and GDP) on wildlife value measures, as we view these covariates as indicators of a broader suite of social change processes (see main text for more details).