STAKEHOLDER CHARACTER CARDS

ECOLOGIST

Climate Change Summit
ncse.ngo

Name: Byron
Age: 24
Occupation: Ornithologist

Concern: Health of local ecosystems.
Goal: Keep fish-eating bird populations healthy.

ECOLOGIST

Climate Change Summit
ncse.ngo

Name: Sarah
Age: 35
Occupation: Deep Sea Diver studying fish migration routes

Concern: The impact of dams on local fish populations and their migratory patterns.
Goal: Wants traditional migration routes restored.

ECOLOGIST

Climate Change Summit
ncse.ngo

Name: Tim
Age: 34
Occupation: Botanist

Concern: Worried about the ecosystem health of three communities 20-30 miles down river.
Goal: Improve soil quality to protect flora from becoming extinct.

ECOLOGIST

Climate Change Summit
ncse.ngo

Name: Joseph
Age: 62
Occupation: Retired fisherman, now an activist

Concern: A decrease in fish populations would mean a decrease in a food source and job source for locals.
Goal: Help restore fish populations and protect jobs.

ECOLOGIST

Climate Change Summit
ncse.ngo

Name: Richie
Age: 47
Occupation: Theoretical Biologist

Concern: Upstream ecosystem dynamics with loss of fish population over past 60 years.
Goal: Increase the fish population to pre-dam levels.

FARMER

Climate Change Summit
ncse.ngo

Name: Francis
Age: 57
Occupation: Corn Farmer

Concern: Losing crops.
Goal: Seeks clarity on who the reservoir water serves and who decides this.

FARMER

Climate Change Summit
ncse.ngo

Name: Georgia
Age: 36
Occupation: Farmer and Activist

Concern: Wishes more people in the community considered sustainable farming.
Goal: Have more people consider the impact of climate change on the local community and what it means for agricultural production.

FARMER

Climate Change Summit
ncse.ngo

Name: Gary
Age: 52
Occupation: Dairy Farmer

Concern: Major floods - Gary's brother's farm went under after suffering major flood damage two years ago.
Goal: Reduce risks of floods, and to not experience the same fate as his brother.

FARMER

Climate Change Summit
ncse.ngo

Name: Cole
Age: 54
Occupation: Dairy Farmer

Concern: Drought's effect on local agriculture.
Goal: Wants worries about droughts addressed.

FARMER

Climate Change Summit

Name: Leslie
Age: 40
Occupation: Farmer and Jewelry Maker

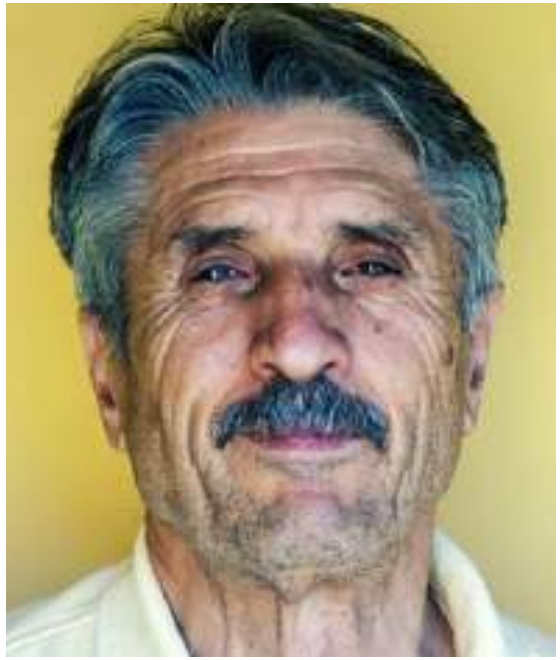
Concern: The impact of dam removal on the tourism industry.
Goal: Prevent disruption to tourism industry that supplies 60% of her local farm stand business.

HYDROELECTRIC POWER CO.

Climate Change Summit

Name: Jacob
Age: 58
Occupation: Technology Associate at Power Plant

Concern: The well-being of his family.
Goal: Doesn't want to have to switch jobs this close to retirement.



HYDROELECTRIC POWER CO.

Climate Change Summit

Name: Joan
Age: 43
Occupation: Chief of Engineering

Concern: Gaining the financial support necessary to continue projects that are integral to updating the dam.
Goal: To demonstrate that she can lead a team of engineers in a male-dominated world.

HYDROELECTRIC POWER CO.

Climate Change Summit

Name: Dale
Age: 67
Occupation: Retired

Concern: That he won't be recognized for his work over the years.
Goal: Worked at hydroelectric plant his entire life and wants his contributions positively recognized.

HYDROELECTRIC POWER CO.

Climate Change Summit

Name: David
Age: 48
Occupation: Entrepreneur

Concern: The ability to expand his investment in the future and not lose money.
Goal: Just invested $100,000 in hydroelectric industry in nearby town and wants to potentially expand investment.

HYDROELECTRIC POWER CO.

Climate Change Summit

Name: Jonah
Age: 32
Occupation: QA Tester at Hydroelectric Plant

Concern: Swift and effective dam repairs.
Goal: Wants town to pay more attention to repairs that he has noticed desperately need to be done.

HYDROLOGIST

Climate Change Summit

Name: Addison
Age: 24
Occupation: Sedimentologist

Concern: The health of the water downstream and surrounding ecosystem
Goal: Minimize sediment depletion of downstream lands.

HYDROLOGIST

Climate Change Summit

Name: Jayden
Age: 33
Occupation: State Hydroelectric Engineer

Concern: Water depletion.
Goal: To minimize evaporation rates across public waterways.

HYDROLOGIST

Climate Change Summit

Name: Parker
Age: 29
Occupation: PhD Student studying at NYU

Concern: The impact of dam removal on the nearby community and wildlife.
Goal: To gather more data about the local community.

HYDROLOGIST

Climate Change Summit

Name: Sammy
Age: 31
Occupation: Civil Engineer

Concern: The town's current flood management plan.
Goal: Mitigate flood risks and re-write the town's management plan.

HYDROLOGIST

Climate Change Summit

Name: Jessie
Age: 27
Occupation: Activist for Sustainable Beaches

Concern: Decreasing sediment levels in the area.
Goal: To keep downstream beaches habitable for humans and animals.

FISHERMAN

Climate Change Summit

Name: Lyla
Age: 53
Occupation: Fishmonger

Concern: The health of the local fishing industry.
Goal: To leave a thriving business for her kids.

FISHERMAN

Climate Change Summit

Name: Gio
Age: 75
Occupation: Retired, writing a book about local nature

Concern: The decline in fish populations.
Goal: To write a book about his observations about local fish populations so people hear his concern for local environment.

FISHERMAN

Climate Change Summit

Name: Alan
Age: 81
Occupation: Retired, but now runs small fishing tour company out of his backyard.

Concern: Doesn't want his company to go bankrupt.
Goal: To continue to grow his fishing tour company.

FISHERMAN

Climate Change Summit

Name: Chad
Age: 45
Occupation: Lawyer

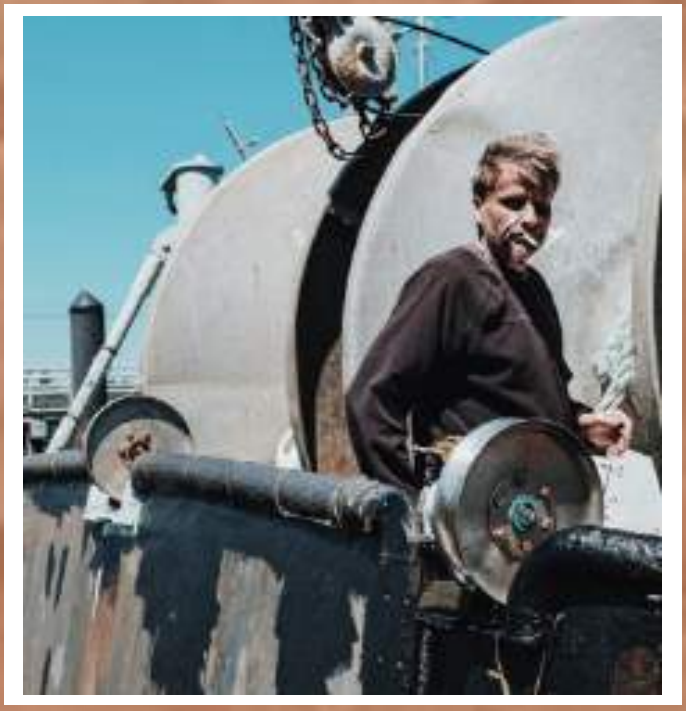
Concern: The number of fish in the lake.
Goal: To continue to fish in the nearby lakes on yearly summer fishing trips.

FISHERMAN

Climate Change Summit

Name: John
Age: 52
Occupation: Deep Sea Fisher

Concern: Worried about stability of his job as catch rates are decreasing.
Goal: To learn how to increase catch rates in his area to sustain his job.



LOCAL COMMUNITY MEMBER

Climate Change Summit

Name: Bethany
Age: 41
Occupation: Middle School Science Teacher

Concern: Getting district approval to revamp curriculum to align with the changing environment.
Goal: To continue to do ecosystem projects with her classes.

LOCAL COMMUNITY MEMBER

Climate Change Summit

Name: Anthony
Age: 35
Occupation: Professor

Concern: The community impact of dams.
Goal: To learn more information about dams and whether they benefit the community.

LOCAL COMMUNITY MEMBER

Climate Change Summit

Name: Carla
Age: 72
Occupation: Retired

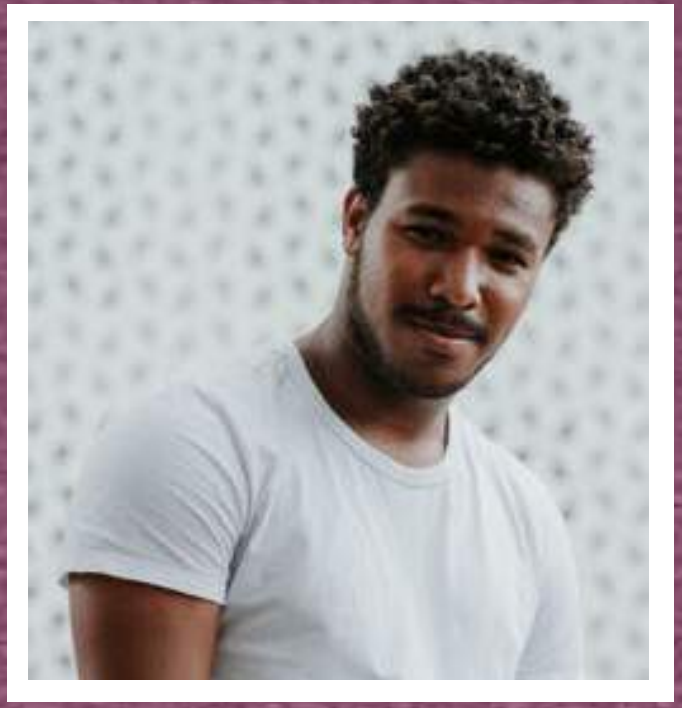
Concern: Maximizing profit on her house.
Goal: To sell her home in the next five years.

LOCAL COMMUNITY MEMBER

Climate Change Summit

Name: Jordan
Age: 29
Occupation: Surgeon

Concern: The health of the local environment; impacts on the reservoir.
Goal: To be able to still take his kids camping at the sites near the reservoir.



LOCAL COMMUNITY MEMBER

Climate Change Summit

Name: Eli
Age: 26
Occupation: Vet Tech

Concern: Unsafe blue-green algae levels in the water in the reservoir.
Goal: Wants to continue to be able to take his dog to the reservoir.

Summary of agricultural impacts of the 2016 California drought

Description	Impact	Base year levels	Percent change
Surface water shortage (million acre-ft)	2.6	10.0	-14%
Groundwater replacement (m acre-ft)	1.8	6.6	23%
Net water shortage (million acre-ft)	0.7	26.4	-2.6%
Drought-related idle land (acres)	78,780	1.2 million[a]	6.6%
Crop revenue losses ($)	$247 million	$37 billion	0.6%
Dairy and livestock revenue losses ($)	Minor	$12.4 billion	NA
Costs of additional pumping ($)	$300 million	$750 million	39.9%
Direct costs of drought ($)	$550 million	NA	NA
Total economic impact ($)	**$903 million**	NA	NA
Direct drought job losses (farm seasonal)	1,910	200,000[b]	0.9%
Total job losses from drought	**4,700**	NA	NA

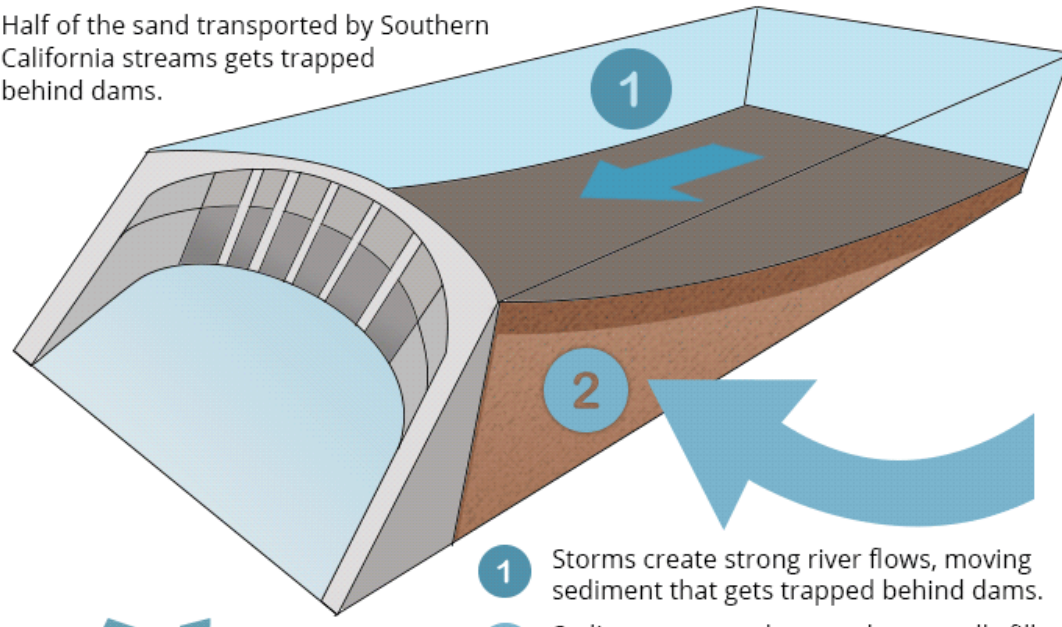
[a] NASS-AMS, 2015 estimate of normal Central Valley idle land

[b] Total agricultural employment is about 412,000, of which 200,000 is farm production.

DAMMING RIVERS, KILLING BEACHES

Dams block sand and sediment that would otherwise flow down rivers to the coast.

Half of the sand transported by Southern California streams gets trapped behind dams.



1. Storms create strong river flows, moving sediment that gets trapped behind dams.
2. Sediment accumulates and eventually fills the reservoir, diminishing its storage.

300,000

DUMP TRUCKS FILLED WITH SAND

HOW MUCH SAND?

California's 500-plus dams on coastal streams and rivers block about a quarter of the state's beach sand. That equates to 3 million cubic yards per year, enough to fill a line of dump trucks along the California coast from Oregon to Mexico.

THREE OF CALIFORNIA'S SILTED-UP DAMS

Several California reservoirs — including those behind Matilija Dam, Rindge Dam above Malibu and Searsville Dam in the Bay Area — are nearly completely full of sediment.

Matilija Dam has trapped at least 8 million cubic yards of sediment in its reservoir and, by 2020, it will be completely silted-up.

QUICK RECOVERY

River ecosystems naturally rebound after a dam is removed.

Two years after two large dams on the Elwha River in Washington state were torn down, the waterway flushed more than 26 million cubic yards of sand to the coast.

That's enough sediment to fill a line of dump trucks bumper to bumper across the U.S. and back again.

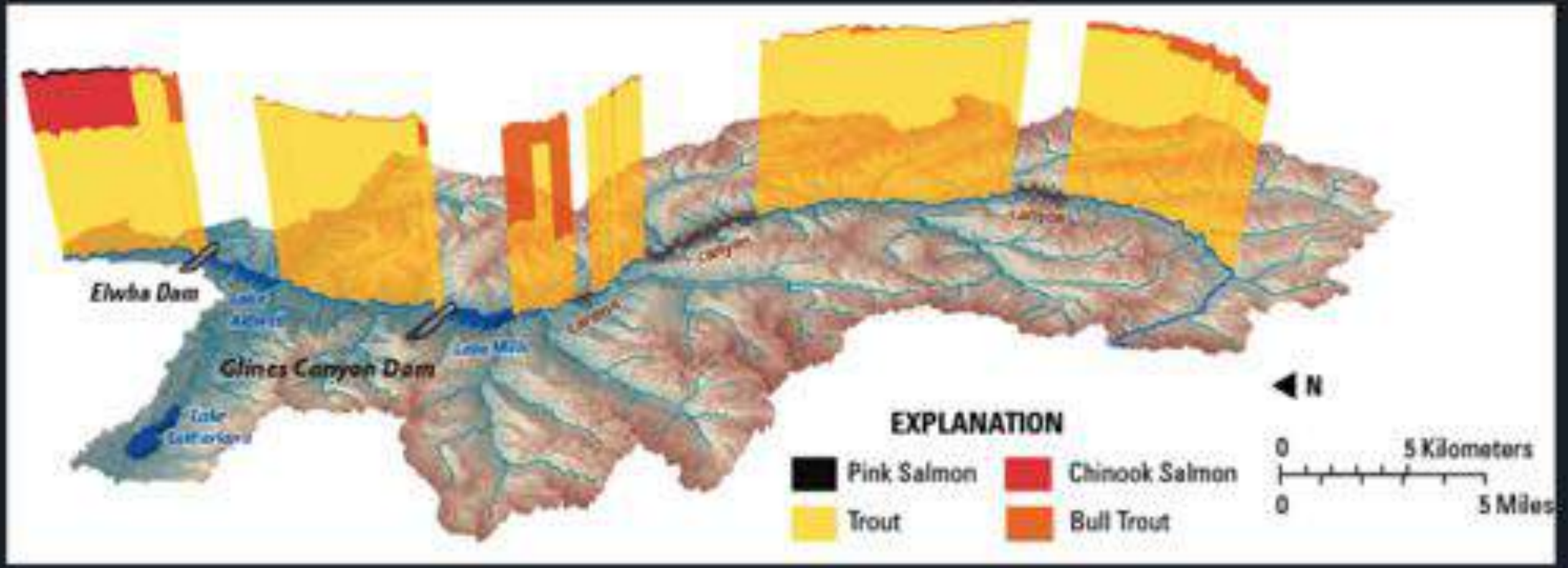


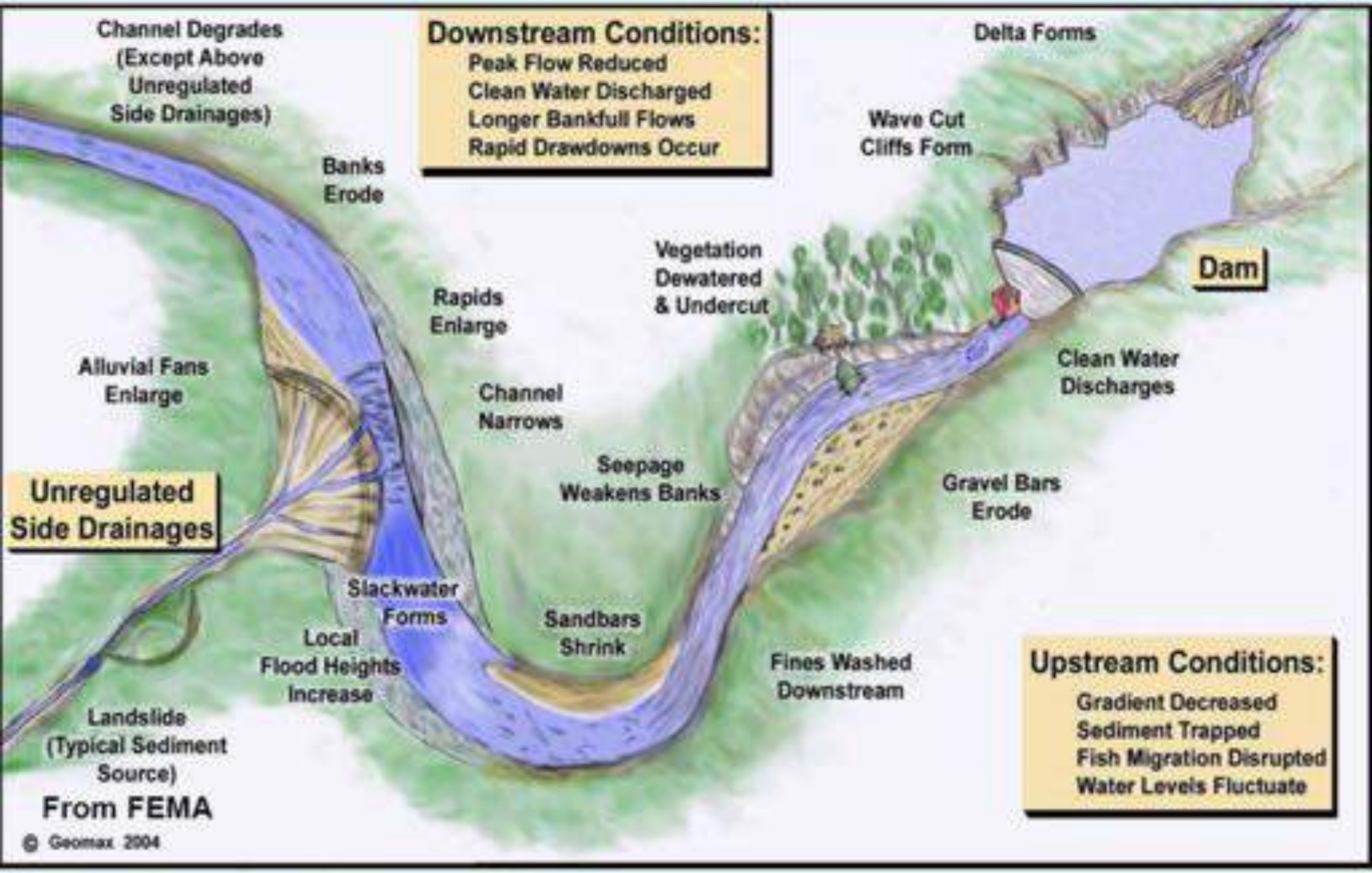
Image 1: Relative proportions of adult fish in the Elwha River counted during snorkel surveys, summer 2007. Anadromous salmon cannot pass Elwha Dam. The fish community is dominated by resident bull trout and trout.

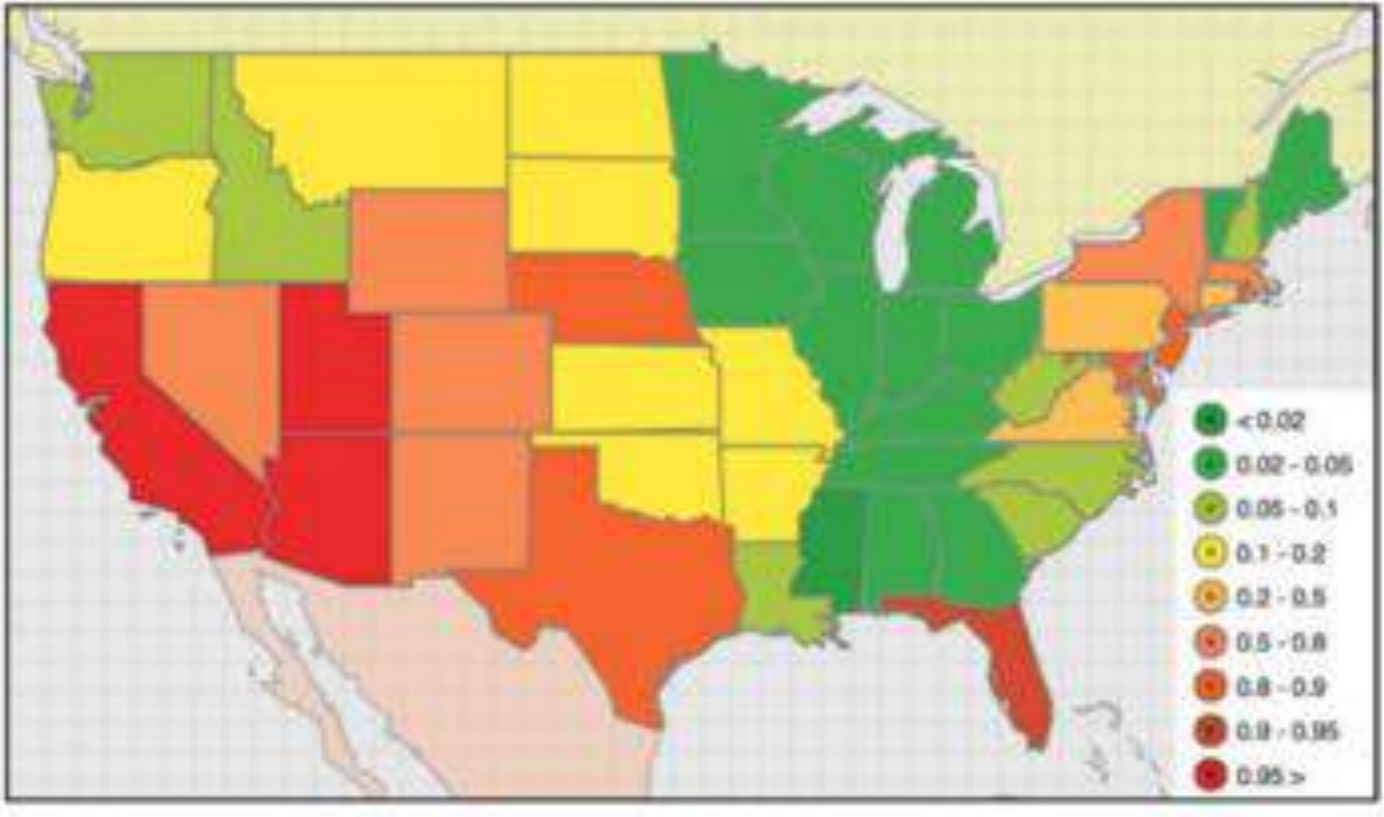
Wildlife study conducted prior to removal of Glines Canyon and Elwha River Dams, Olympic National Park, Washington

Comparison of rivers where dams have been removed versus where dams are still standing, and the percentages of native fish populations that are missing.

	Years Since Removal	% Species Missing
Otter Tail River	4	12%
Buffalo River	9	36%
Wild Rice River	5	26%
Middle River	10	78%
Roseau River	10	23%
Mustinka River	Still Standing	50%
Sand Hill River	Still Standing	42%
Red Lake River	Still Standing	20%
Tamarac River	Still Standing	24%
South Branch Two Rivers	Still Standing	31%

Effects Of Dams

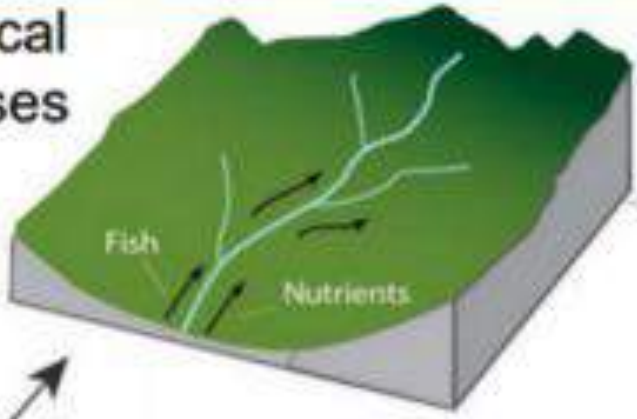




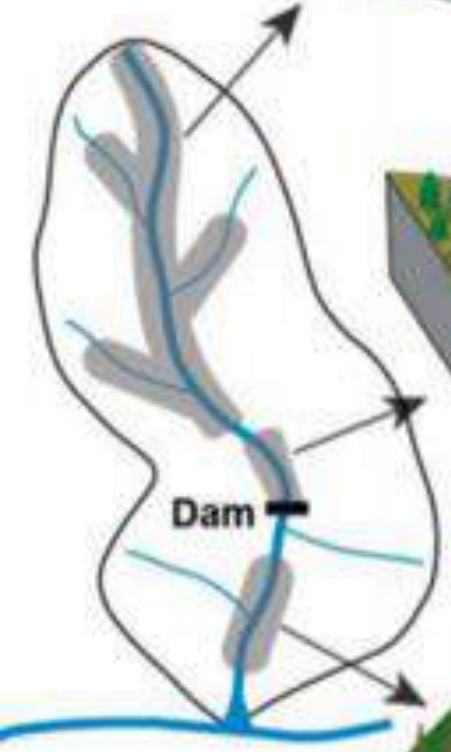
Statewide average risk of drought for the next ten years.

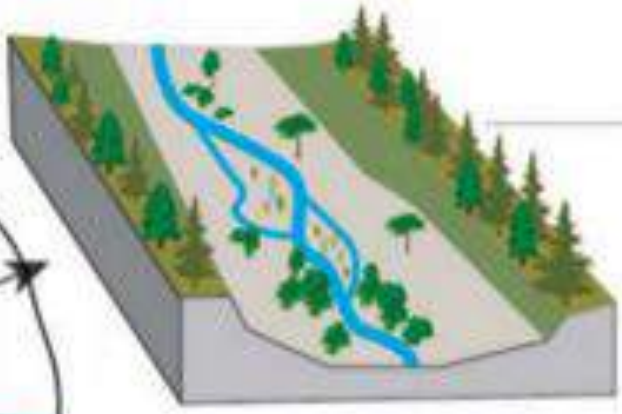
Changes to River Ecosystem after dam removal

Ecological responses

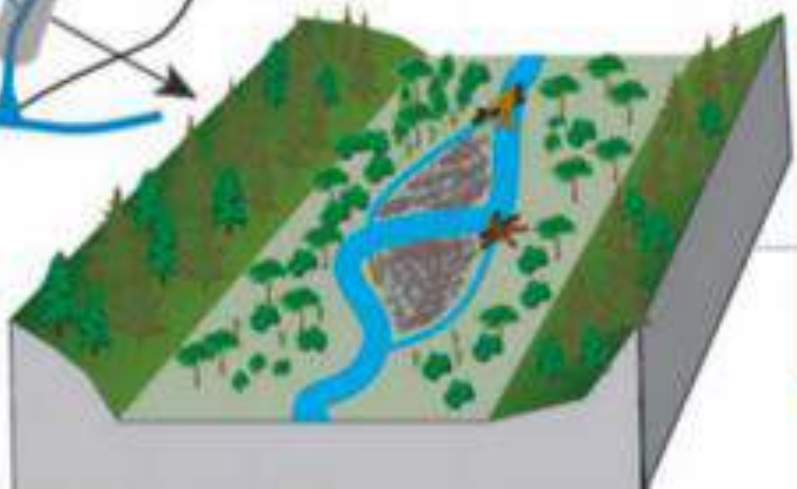


Upstream of dam:
Fish Recolonization
Nutrient subsidies





Around dam:
Revegetation
Changes to channel and floodplain



Downstream of dam:
Sediment deposition
More organic matter
Contaminants (if present)

Pess et al, in revision.

JOHNSON COUNTY RESERVOIR

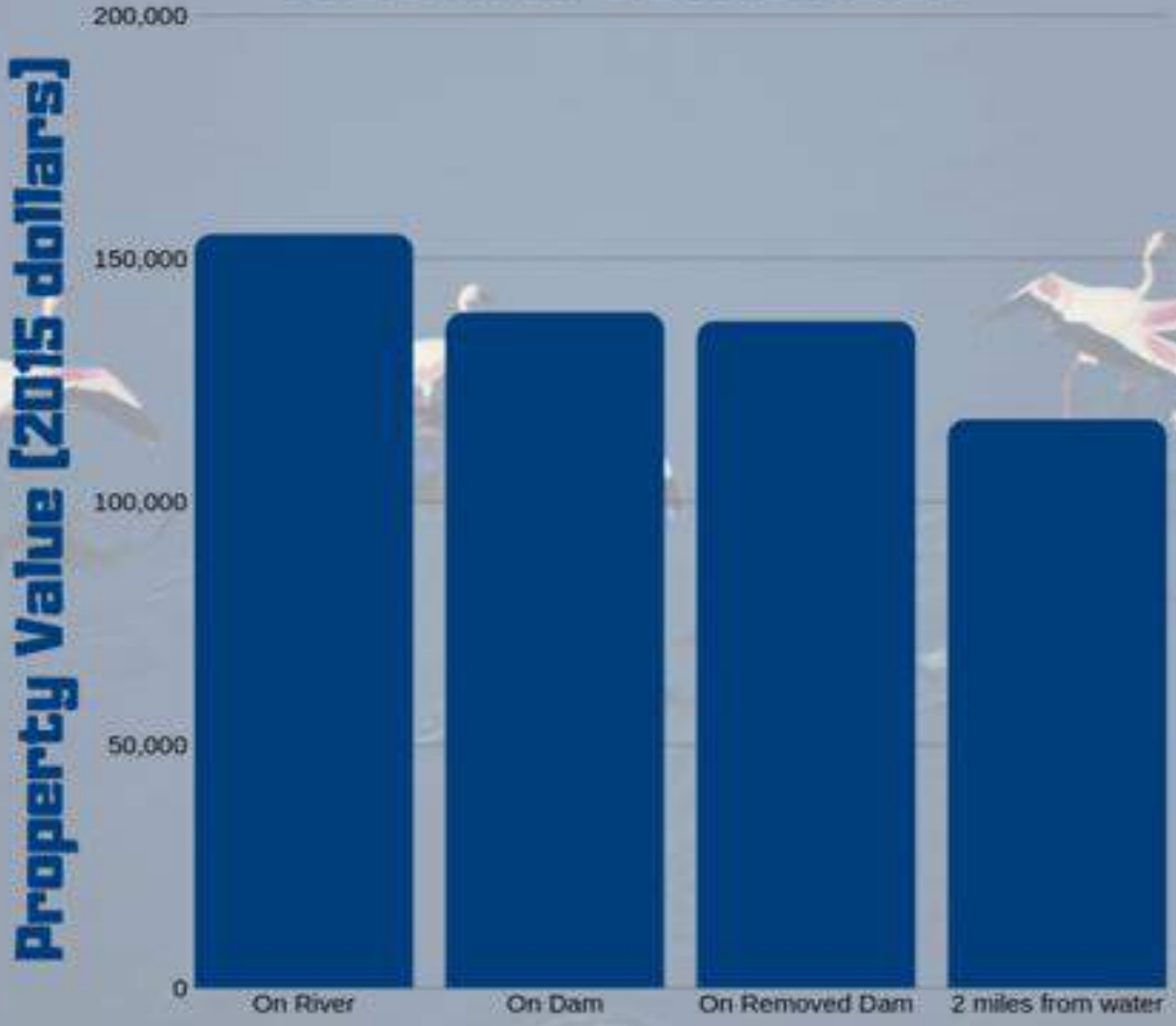
FISHING RECORDS

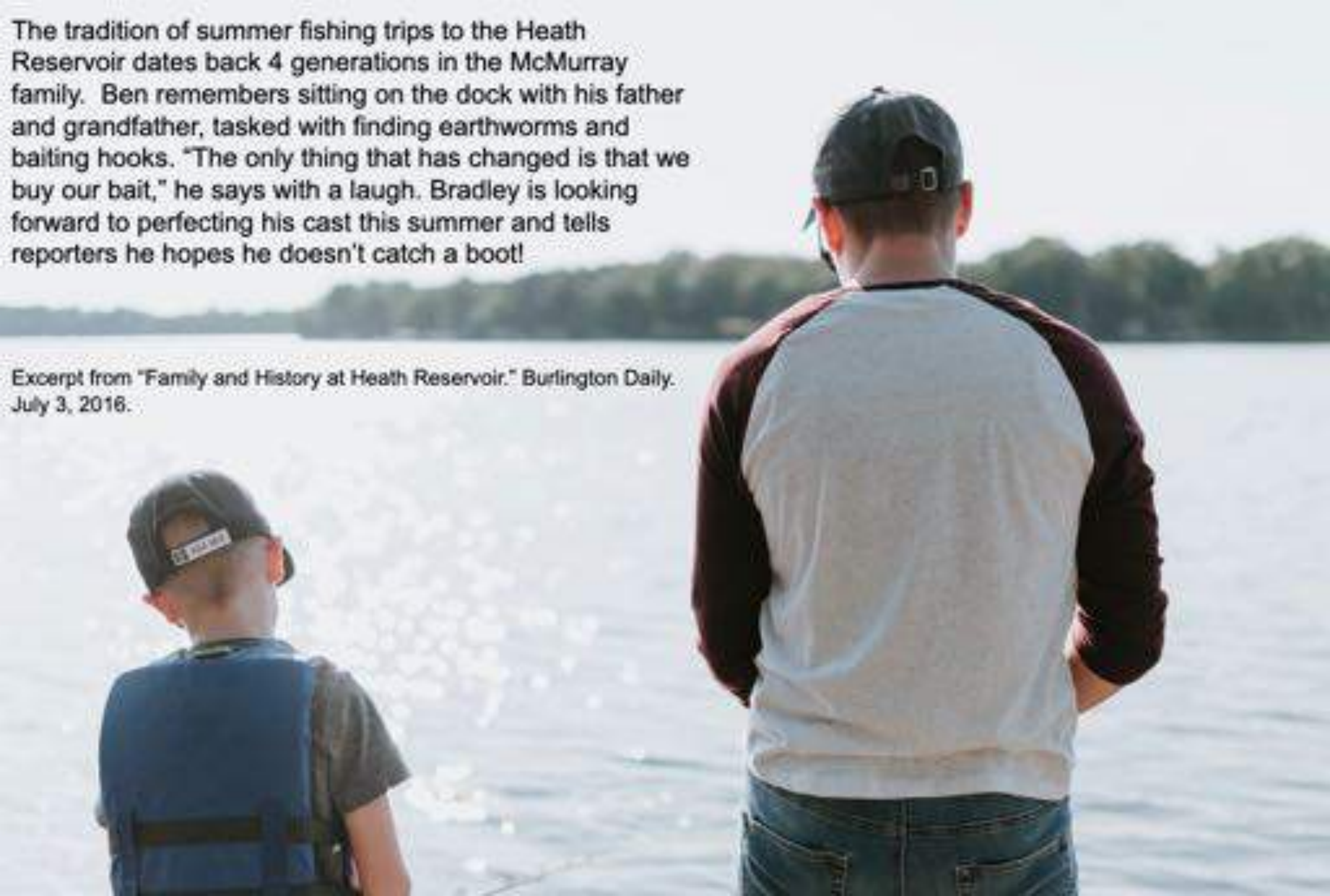
SPECIES	YEAR
Largemouth Bass	1977
Rock Bass	1964
Carp	1980
Catfish	1986
Crappie	1957
Perch	1982
Pickerel	1987
Shad	1978
Sunfish	1996
Lake Trout	1988
Rainbow Trout	1954

Records last updated September 30, 2019

Johnson County Parks and Recreation

Average Property Value in 6 Wisconsin Communities



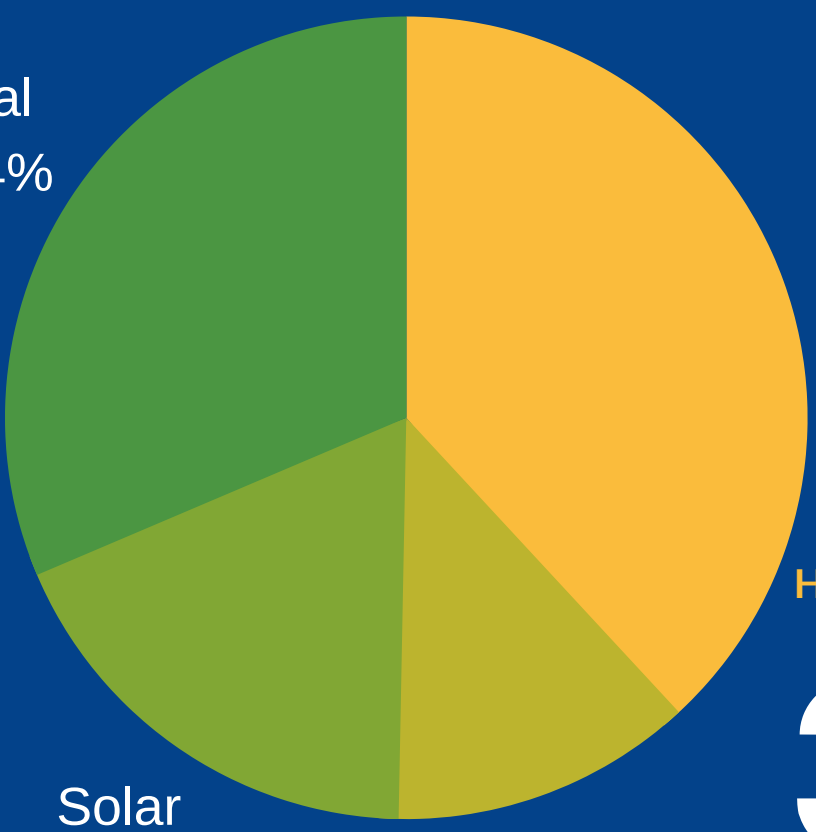


The tradition of summer fishing trips to the Heath Reservoir dates back 4 generations in the McMurray family. Ben remembers sitting on the dock with his father and grandfather, tasked with finding earthworms and baiting hooks. "The only thing that has changed is that we buy our bait," he says with a laugh. Bradley is looking forward to perfecting his cast this summer and tells reporters he hopes he doesn't catch a boot!

Excerpt from "Family and History at Heath Reservoir." Burlington Daily. July 3, 2016.

Source: Igor A. Shiklomanov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational,Scientific and Cultural Organisation (UNESCO, Paris), 1999.

Hydroelectric Can Work For You!



HYDROELETRIC JOBS ARE

38.1%

OF NON-OIL ENERGY MARKET

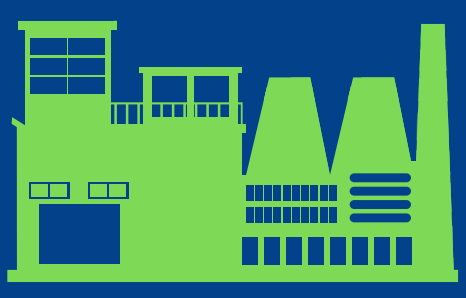
$65,000

Starting salary of dam engineer with 2-year degree

SMALL DAMS BRING

150 Jobs

INTO THE COMMUNITY



25-50%

Of dam workers plan to retire within 5 years. Will you help replace them?

DAMS IMPACT CLIMATE CHANGE

Read on to find out how climate change is expected to impact existing dam infrastructure in the next 50 years.

By Pittock and Hartman, 2011

1 MIGRATION

As growing seasons and temperatures change, plants and animals will be less able to migrate to new habitats, as dams will stand in their way.

2 FLOODING

In areas where flooding increases, dam failure rates will also increase, leading to potentially catastrophic flooding.

3 INEFFECTIVE

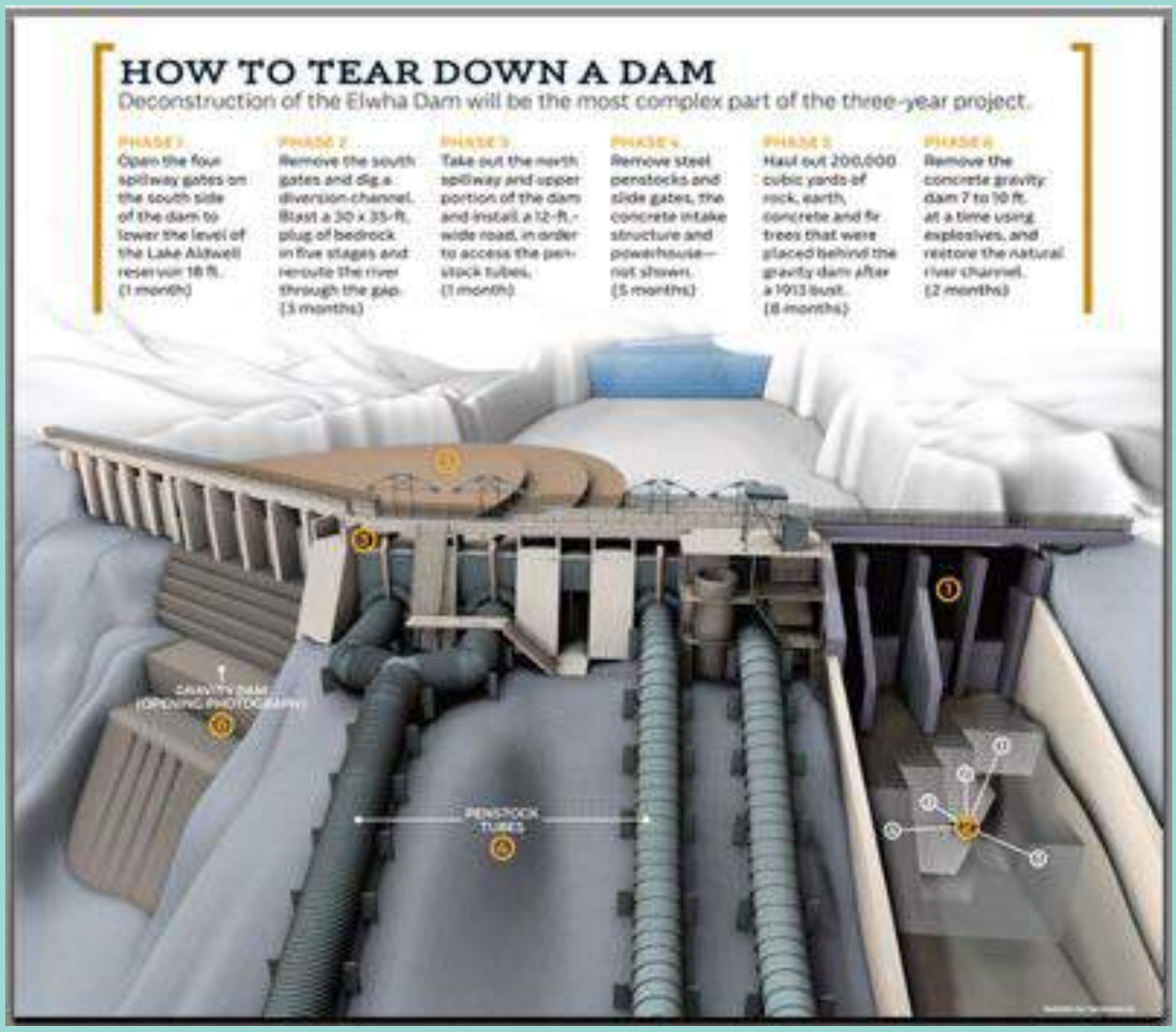
Where droughts are common, the hydrology may change, which renders hydroelectric power from dams impossible.

4 ALTERATIONS

Dams can be modified in response to climate change demands, such as storing additional water.

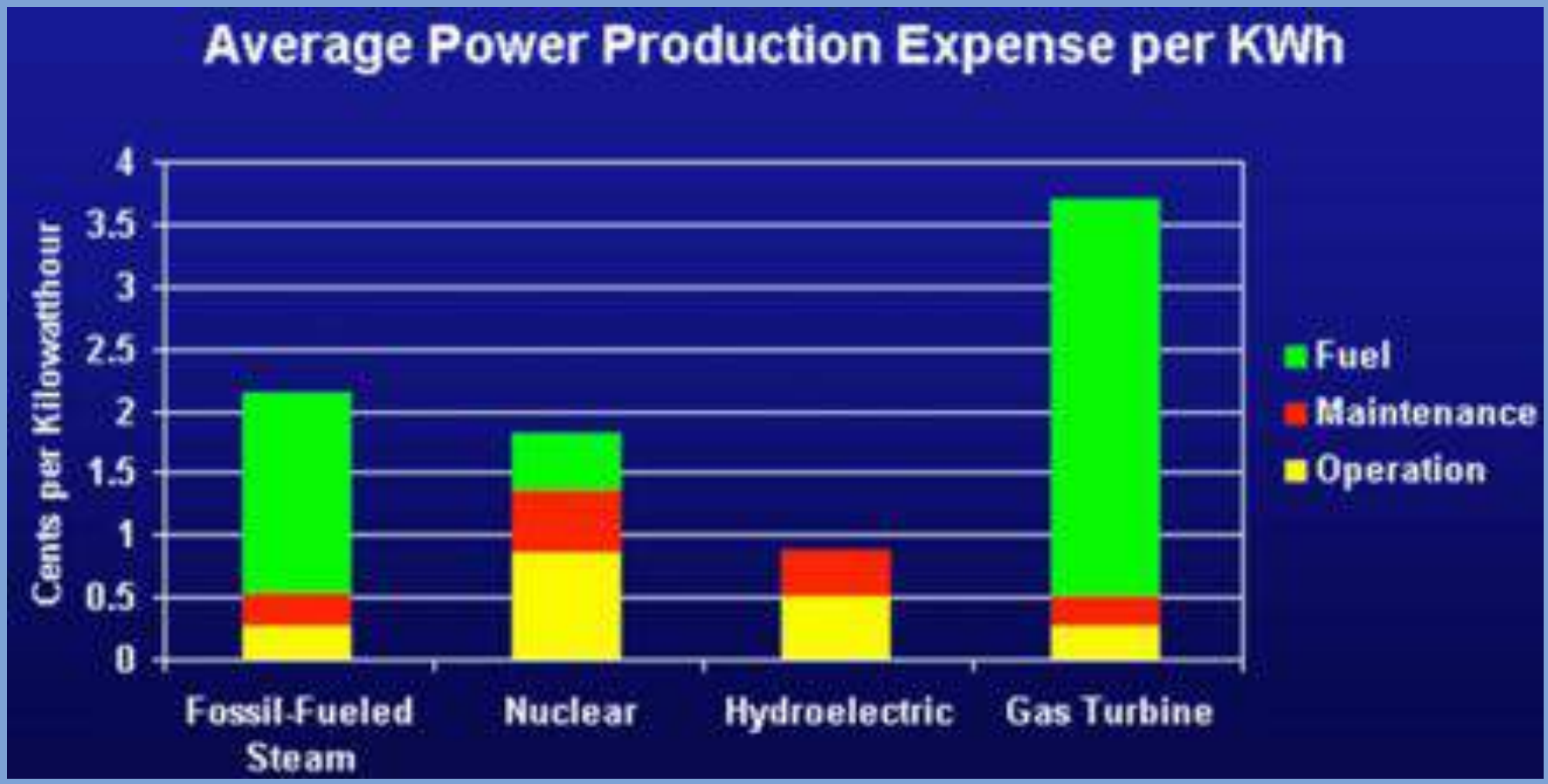
MODIFY, DON'T ADD

Because the impacts of climate change are hard to predict on a local level, best practices are repairing existing dams, not adding new ones.



“Dave Reynolds, a public information officer at Olympic National Park, says visitors should notice changes soon. The Park Service estimates salmon stocks will ultimately increase from 3,000 to 300,000, which will fuel corresponding leaps in the populations of bald eagles, otters, black bears, and other wildlife. “

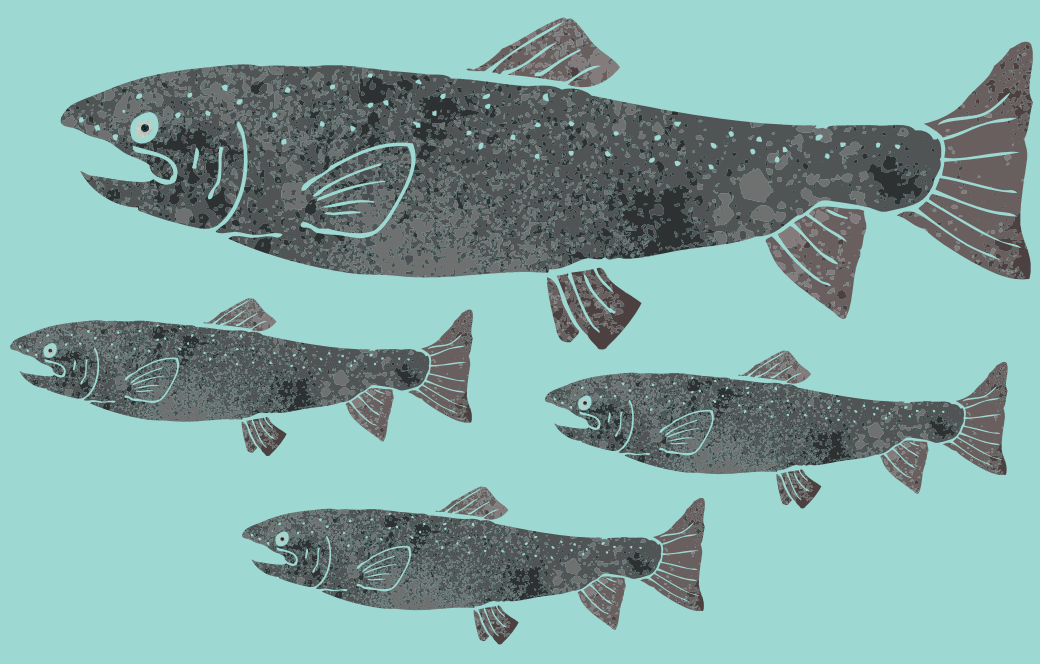
“Salmon are limited to the lower 8 kilometers of the river downstream of the Elwha Dam, where degraded spawning habitat has contributed to population declines. “



Electricity generated by hydroelectric power costs ¼ of Natural Gas

FISH POPULATIONS

EFFECTS OF THE LIBBY DAM IN THE KOOTENAI RIVER, IDAHO



-81.8%

PERCENT CHANGE IN MOUNTAIN WHITEFISH BIOMASS FROM 1980 TO 1994

-86%

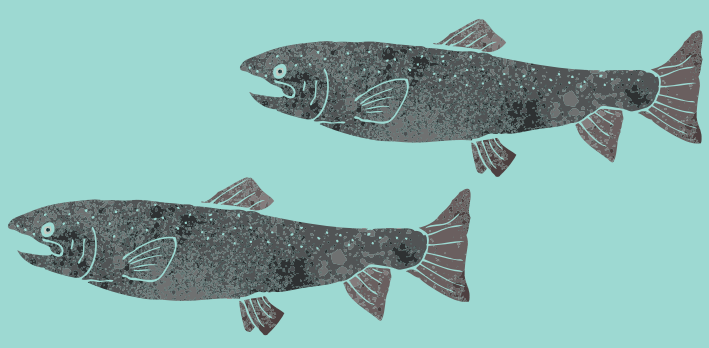
PERCENT CHANGE IN RAINBOW TROUT BIOMASS FROM 1980 TO 1994

VAUGHN L. PARAGAMIAN (2002) CHANGES IN THE SPECIES COMPOSITION OF THE FISH COMMUNITY IN A REACH OF THE KOOTENAI RIVER, IDAHO, AFTER CONSTRUCTION OF THE LIBBY DAM.
JOURNAL OF FRESHWATER ECOLOGY, 17:3, 375-383.
DOI: 10.1080/02705060.2002.9663911

THERE WAS A DECREASE IN FISH BIOMASS FOR EACH SPECIES SAMPLED - EACH TO A VARYING EXTENT.

THIS IS THOUGHT TO BE CAUSED BY THE CHANGES TO THE ECOSYSTEM CAUSED BY THE DAM.

ONE SUCH CHANGE INCLUDES THE DECREASE IN NUTRIENTS DOWNSTREAM FORM THE LIBBY DAM.



VAUGHN L. PARAGAMIAN (2002) CHANGES IN THE SPECIES COMPOSITION OF THE FISH COMMUNITY IN A REACH OF THE KOOTENAI RIVER, IDAHO, AFTER CONSTRUCTION OF THE LIBBY DAM.
JOURNAL OF FRESHWATER ECOLOGY, 17:3, 375-383.
DOI: 10.1080/02705060.2002.9663911

HEALTH ADVISORY

South Umpqua River

AVOID POOLS OF WATER IN BEDROCK ALONG THIS RIVER

Cyanobacteria (blue-green algae) can produce toxins that can cause serious illness in pets, animals and humans

- **Dogs have died after drinking water from potholes.**
- **Stay out of rock formations along the shore.**
- **Avoid water contact. Do not drink the water.**
- **Children and pets are at the greatest risk.**

Oregon Health Authority

JACKSON COUNTY Oregon

Kids playing in ponds affected by fungus due to dam construction

NEW OUTDOOR ADVENTURES AT UNDAMMED RIVERS

Wild water: A dam removal in 1999 on Maine's Kennebec River has led to rebounding wildlife and increased recreational activities.

VISITORS CAN NOW SEE NINE-FOOT STURGEON LEAPING INTO THE AIR AT EYE LEVEL. FISHERMEN ARE CATCHING SHAD FOR THE FIRST TIME IN OVER A CENTURY

Information provided by: John Rosenthal, *New Outdoor Adventures at Undammed Rivers,* National Geographic
Photograph provided by: Carl D. Walsh, Aurora Photos

THERE WILL BE NO BUSINESS AS USUAL FOR PACIFICORP, AS LONG AS THERE IS NO BUSINESS AS USUAL FOR THE KLAMATH RIVER!

UN-DAM THE KLAMATH!

September 18th, 2018 - Portland, Oregon
Day of Action
Demanding Dam Removal

SPONSORED BY THE KLAMATH JUSTICE COALITION

PACIFICORPDAYOFACTION.ORG

IMAGE FROM KLAMATHBASINCRISIS.ORG | PHOTO BY KLAMATH RIVERKEEPER

What Kind of Dam?

**Dams serve different functions in communities.
Many dams fulfill more than one function.**

Hydroelectricity

Hydroelectric dams provide power to the surrounding area. Hydroelectric power is clean and cheap, so it is a very sustainable source of energy.

Recreation

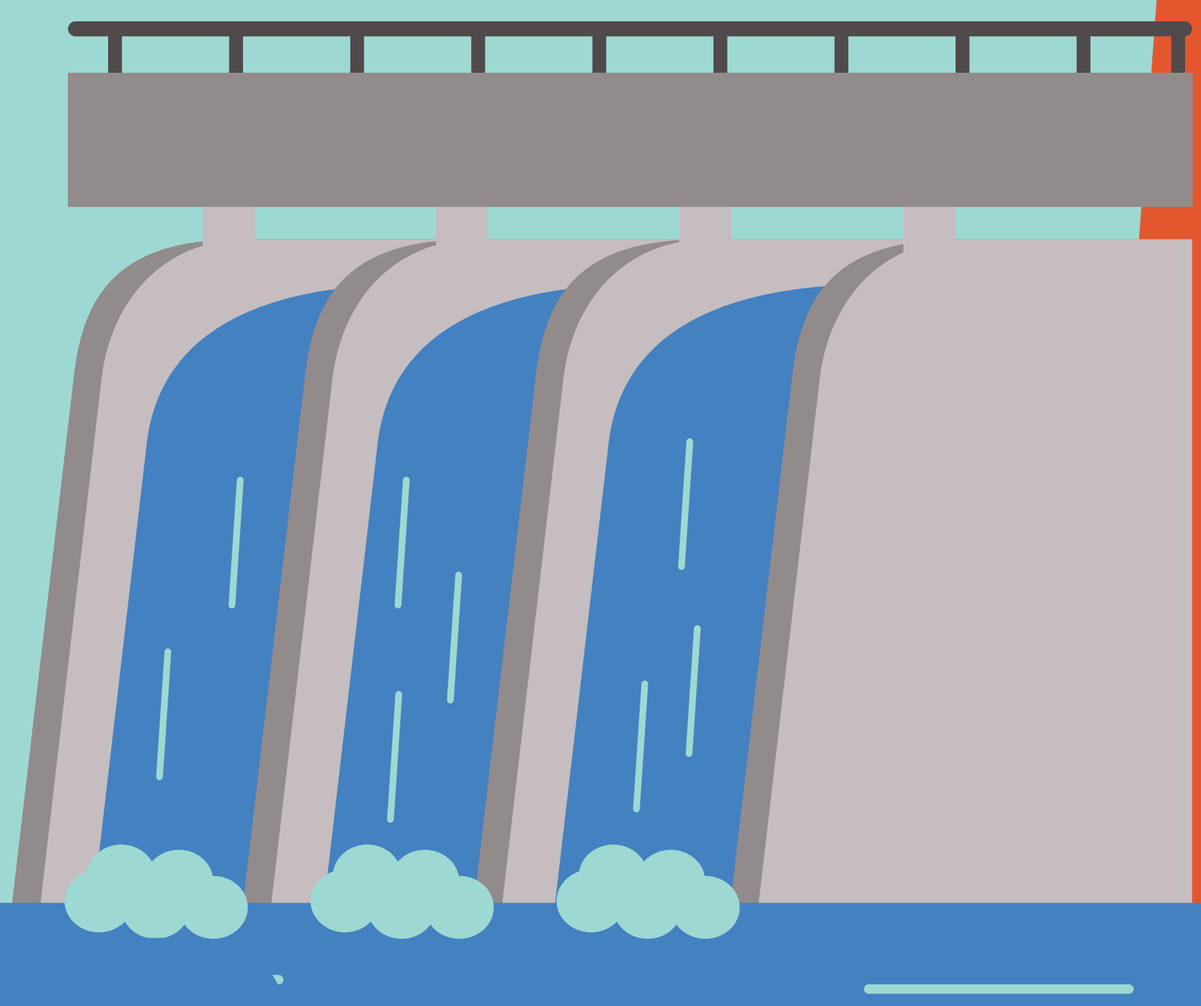
Many dams are the community's center for boating, fishing, and learning about water ecology.

Navigation

Many dams were first built to aid ships in navigating rivers. These are less popular today, but still exist around the country.

Flood Control

Dams can store water that would otherwise flood the surrounding community and can be used as a water source in times of drought.

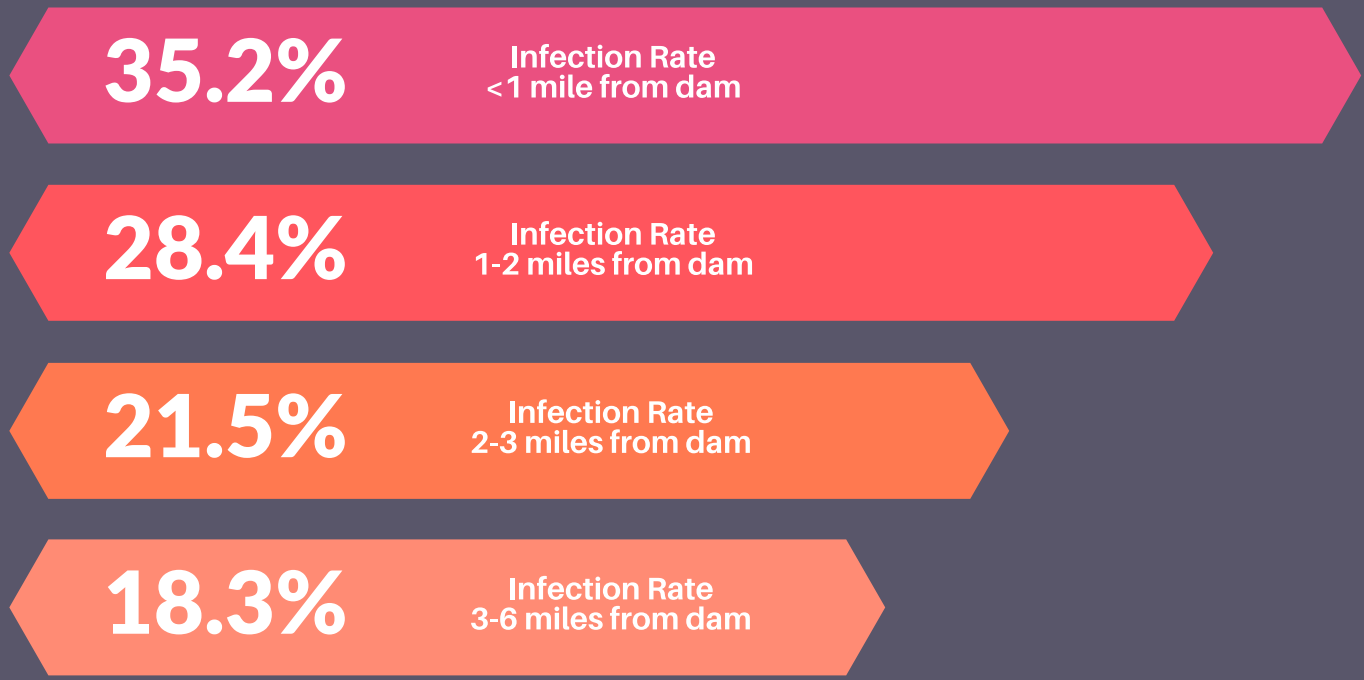


Remember, a clean dam depends on you!

Sponsored by Wisconsin Hydroelectric Inc.

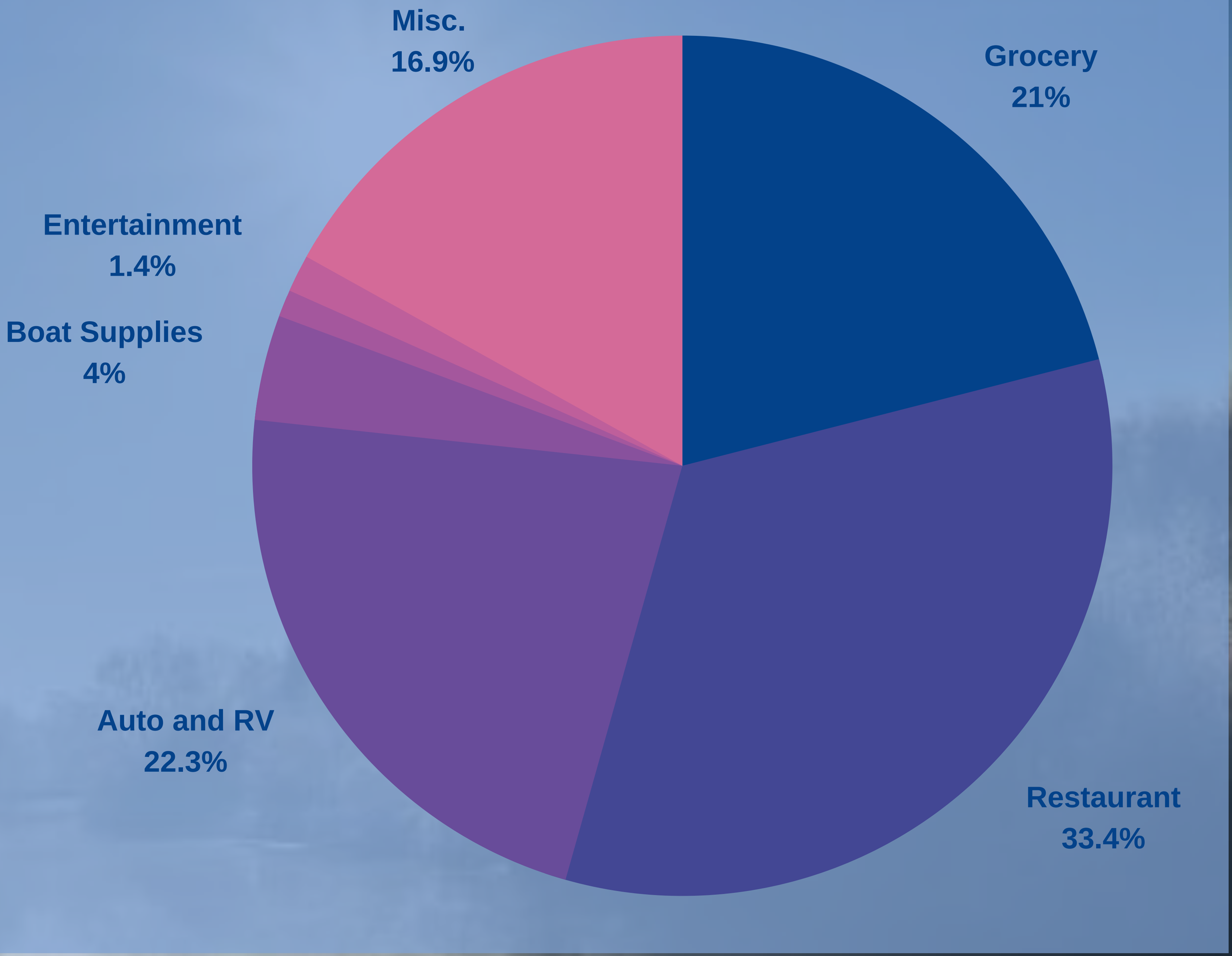
Distance from Dam impacts

Malaria Infection

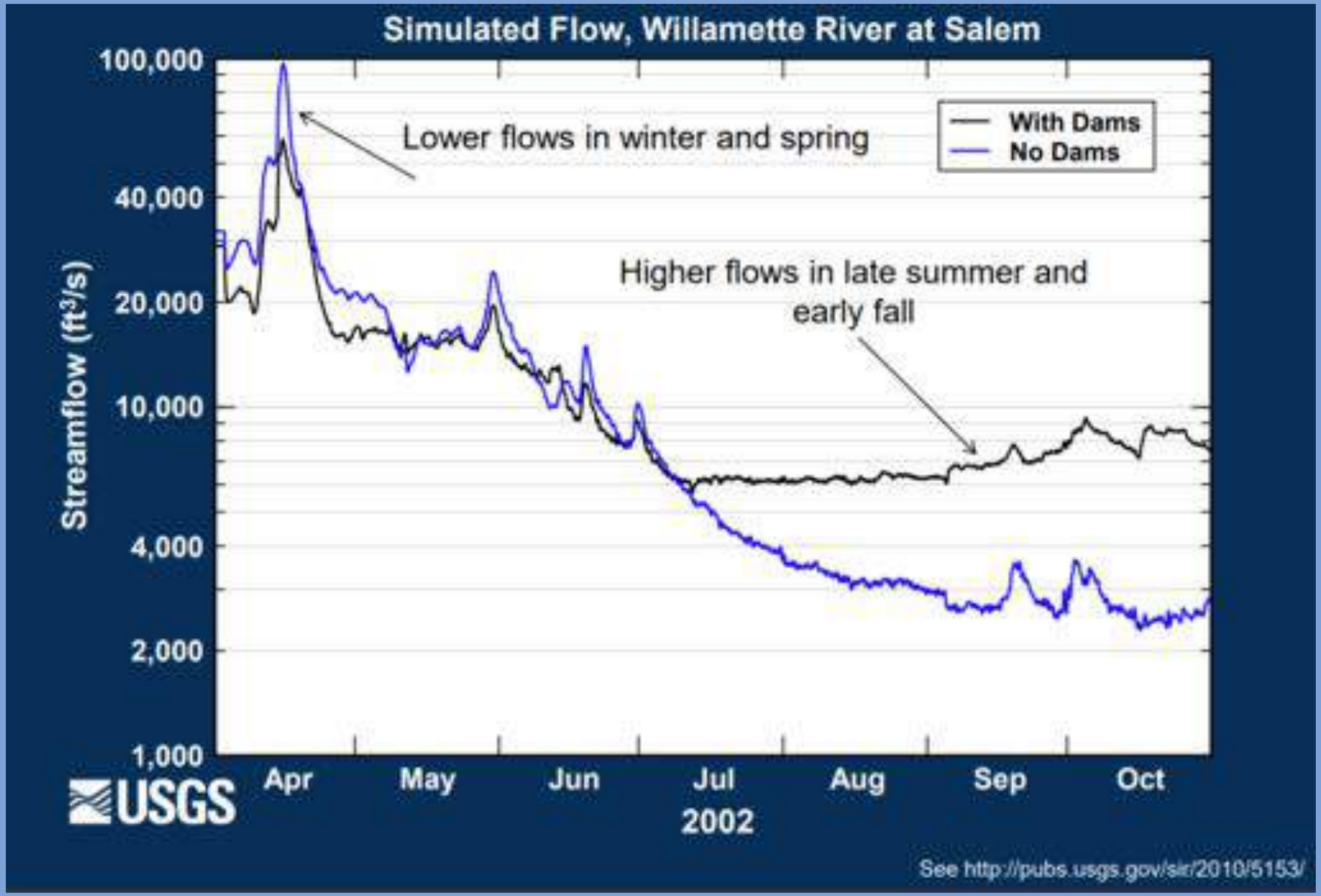


Source: Increase in Malaria Associated with Dam Proximity
(https://malariajournal.biomedcentral.com/track/pdf/10.1186/s12936-015-0873-2)

Dams Drive Spending.



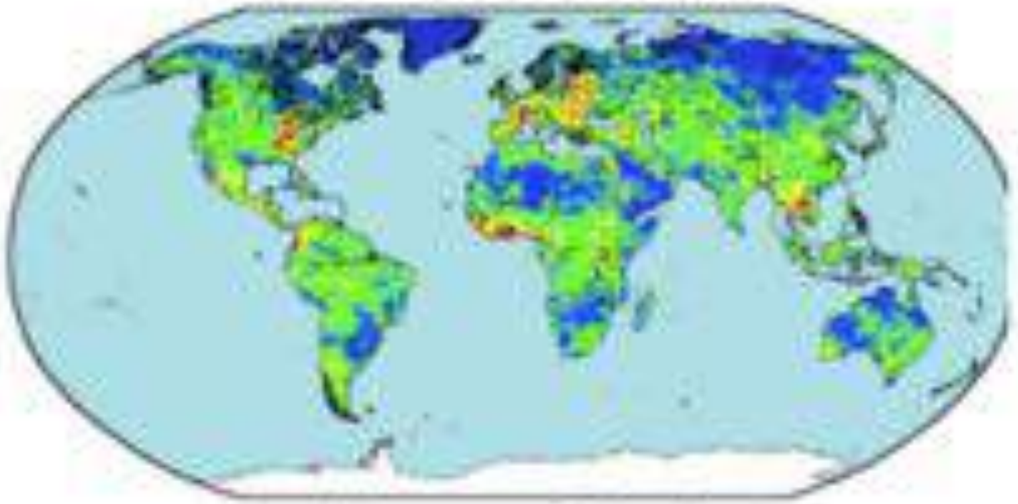
An analysis of a Michigan dam showed visitors spent almost $900,000 in the community.


Simulated Flow, Willamette River at Salem
100,000
40,000
20,000
10,000
4,000
2,000
1,000
Streamflow (ft³/s)
Lower flows in winter and spring
Higher flows in late summer and early fall
With Dams
No Dams
Apr
May
Jun
Jul
Aug
Sep
Oct
2002
USGS
See http://pubs.usgs.gov/sir/2010/5153/

Future Climate Projections of Seasonal Drought Frequency

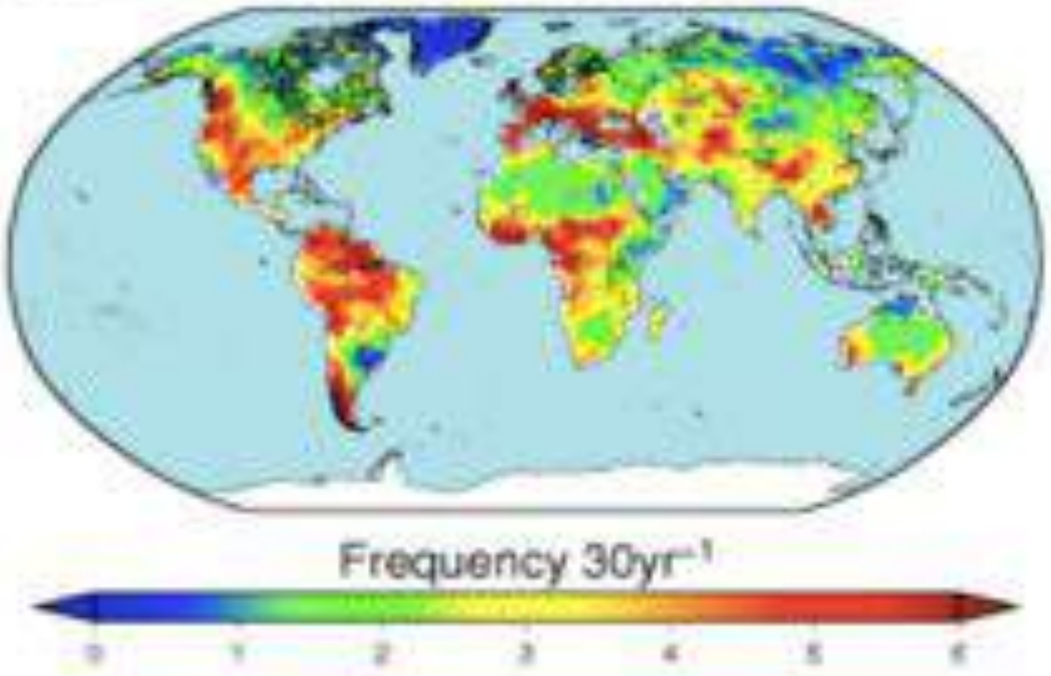
Current Climate

(a) 20C3M (1961–90) Mean



Low Emission Scenario 2070-2099

Medium Emission Scenario 2070-2099



High Emission Scenario 2070-2099

"Scientists say that, in the Missouri Basin, we'll be spending more time at each end of the spectrum — longer and more severe floods, longer and more severe droughts,"Mr. Remus said. And this year, he had "nothing but bad options."

Changes in Runoff from United States Water Resources regions

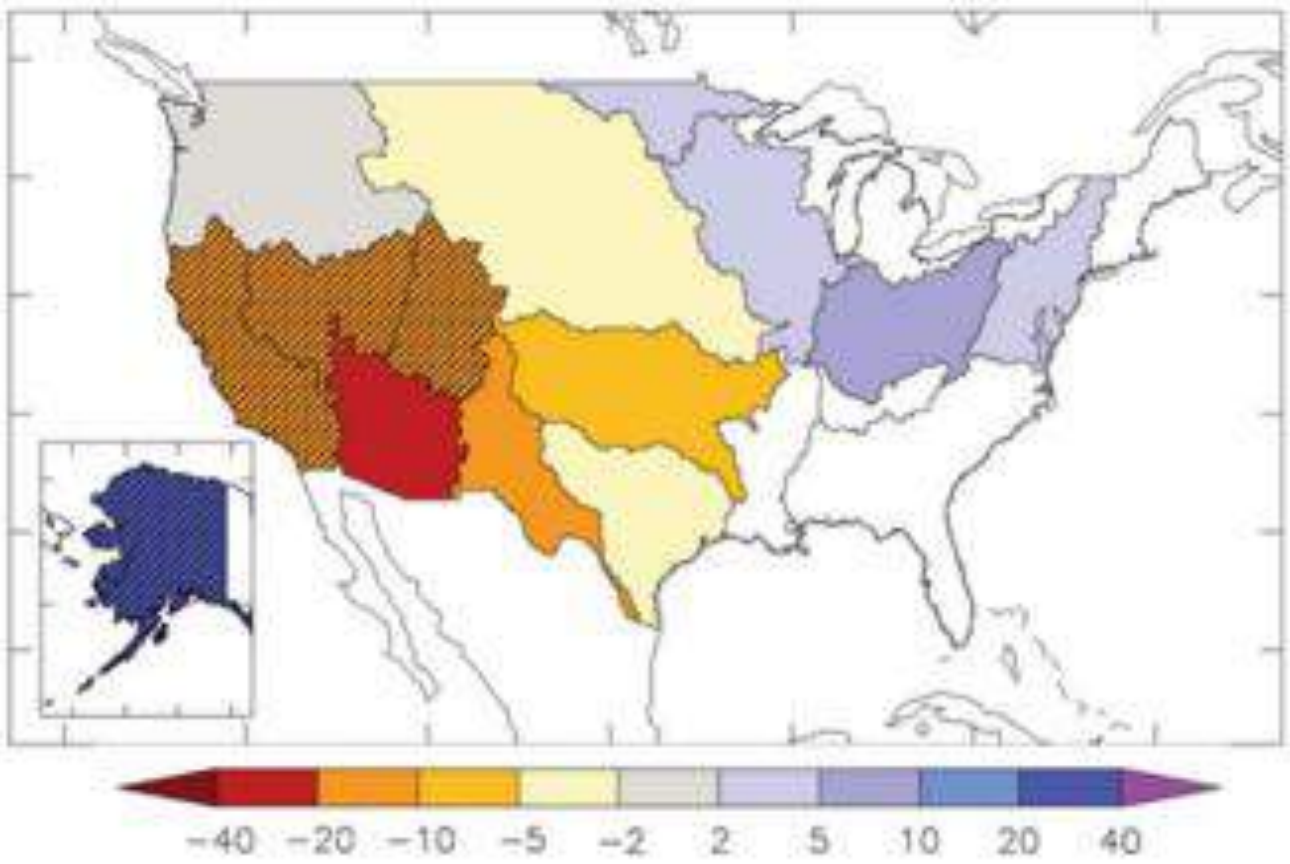
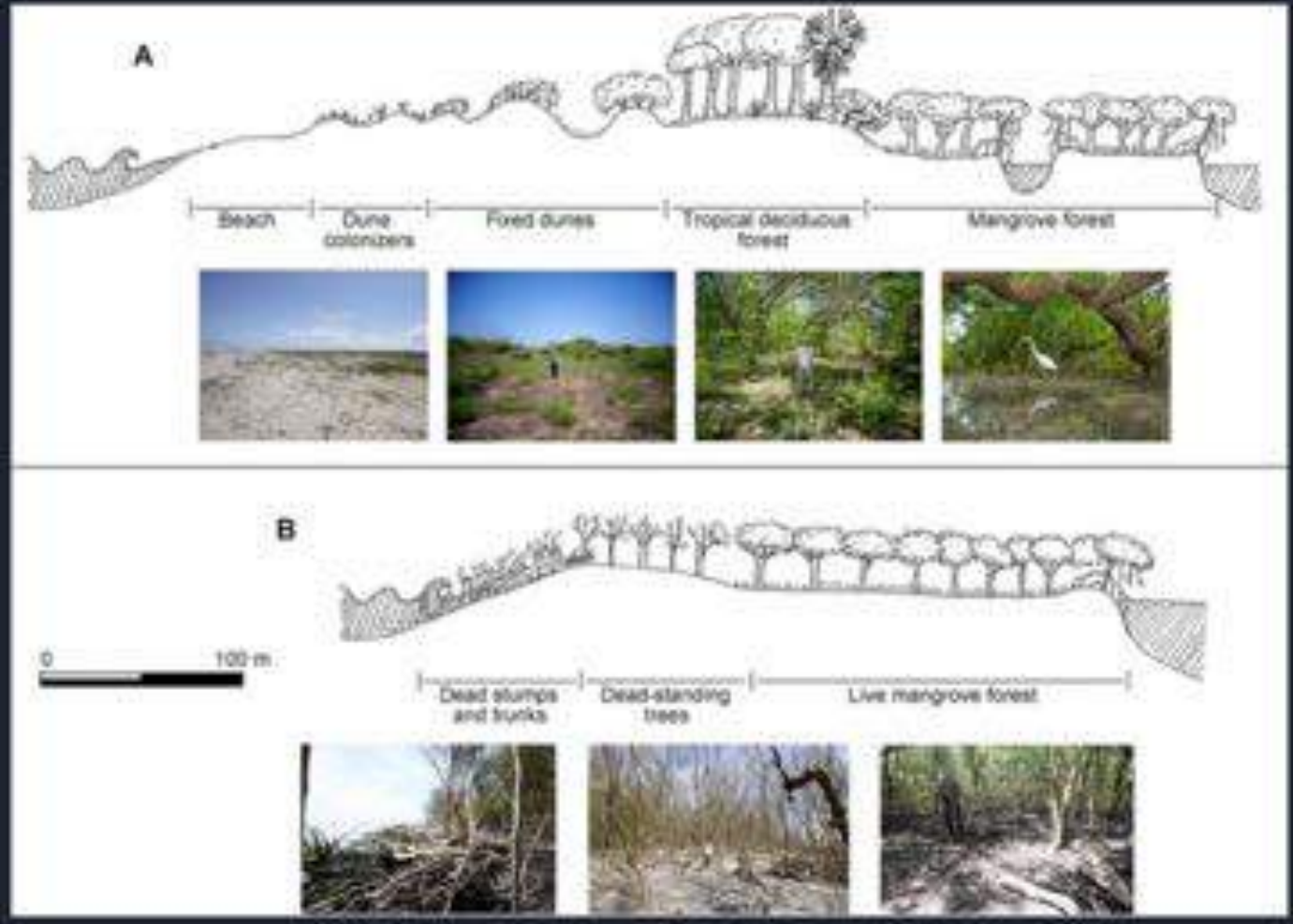


Fig. 3 Median, over 12 climate models, of the percent changes in runoff (colored scale) from United States water resources regions for 2041–2060 relative to 1901–1970. More than 66% of models agree on the sign of change in areas shown in color (white = little or no change); diagonal hatching indicates greater than 90% agreement. From Milly and others (2005) after re-plotting with data provided courtesy of P.C.D. Milly. (Color figure online)



"Still another valuable function that mangrove wetlands perform is storing "blue carbon" in plant tissue and soils, reducing the effects of climate change. But when coastlines recede and mangroves are destroyed, this carbon is released. We calculated that mangrove loss in our study region represented a loss of around $130,000 in annual carbon trading potential for this region."

Vegetation profile of sandbars of the free-flowing San Pedro River (A) and dammed Santiago River (B), where receding black mangrove forest is being eroded away into the advancing coastline. Ezcurra et al., 2019, CC BY-NC

Comparison of soil erosion rates among four different rivers in Brazil.

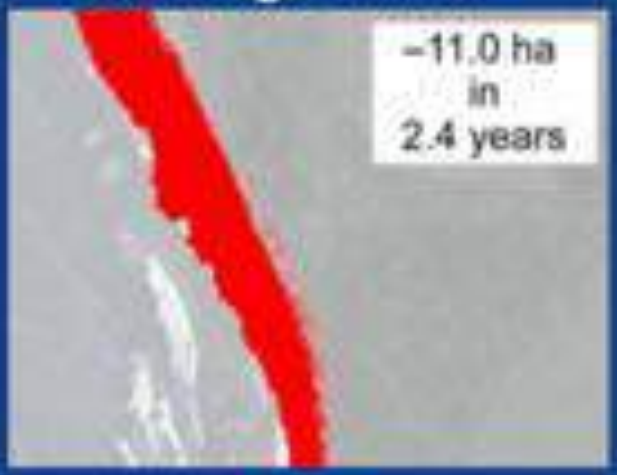
Coastal Erosion

Hectare (ha), 10000 squared meters

- loss of coastal regions
- gain of coastal regions

Coastal erosion on dammed rivers

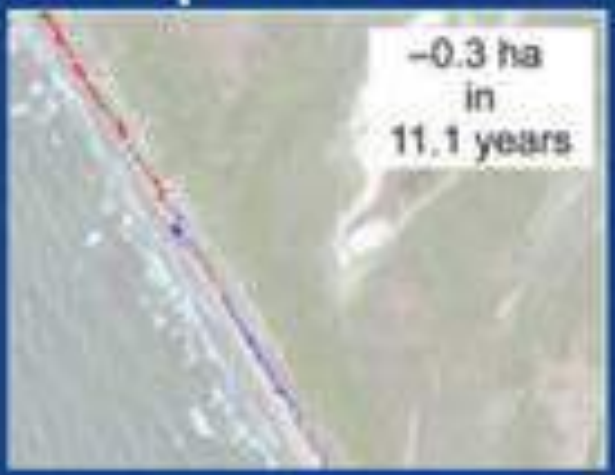
Santiago River



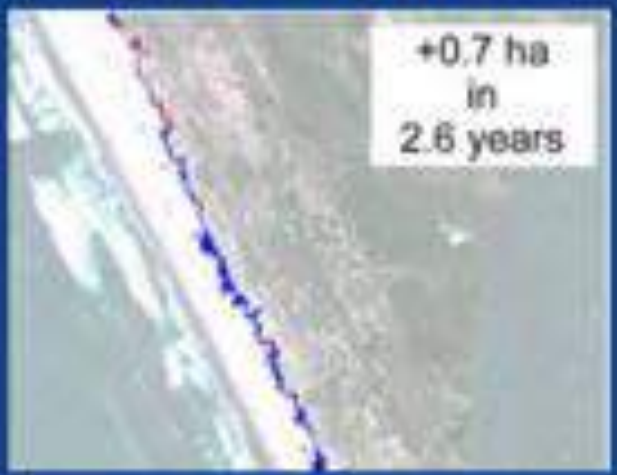
Fuerte River

Coastal erosion on un-dammed rivers

Acaponeta River



San Pedro River



FOX RIVER BASIN DAMS

SHOULD WE SAVE OUR DAMS?

INSIGHTS FROM LOCAL COMMUNITY MEMBERS

TRADITIONS

LONG-TIME RESIDENTS

"The dam was our life when we were kids. Those are childhood memories that will stick forever.

"I remember when my father helped build the dam."

COMMERCE

LOCAL BUSINESS OWNERS

"We're a river town now, and in the past few years that's an economic benefit."

"People are down here. They walk the river. They fish it. It's good for the economic development of downtown."

SAFETY

YOUNGER RESIDENTS

"I think the old dam may be a safety hazard."

"The dam is old so something needs to be done."

"Removing the dam would make it swampy and smelly."

RECREATION

FISHERMAN AND BOATERS

"It would be a little stream, not the water that fish need. There would be no fish."

"We don't want to lose the open space and the chance for people to recreate. Keep the river accessible. Don't privatize it."

NATURAL BEAUTY

OUTDOORSMEN

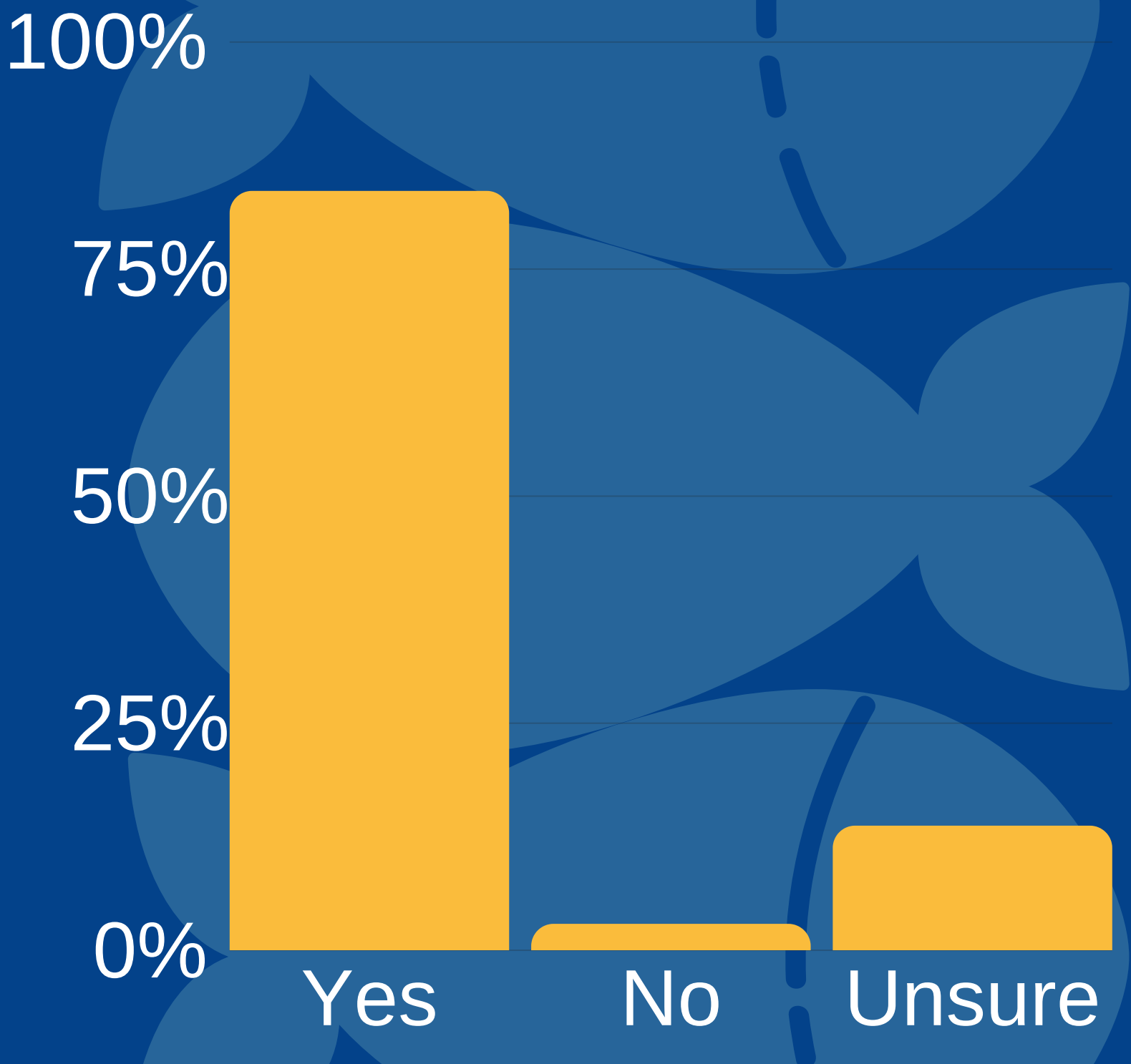
"It is one of those natural things - peaceful, unbuilt, not commerical."

"Truly this is God's country. I don't know what else you could ask for."

MAKE YOUR VOICE HEARD.

1-800-VOTE-DAMS

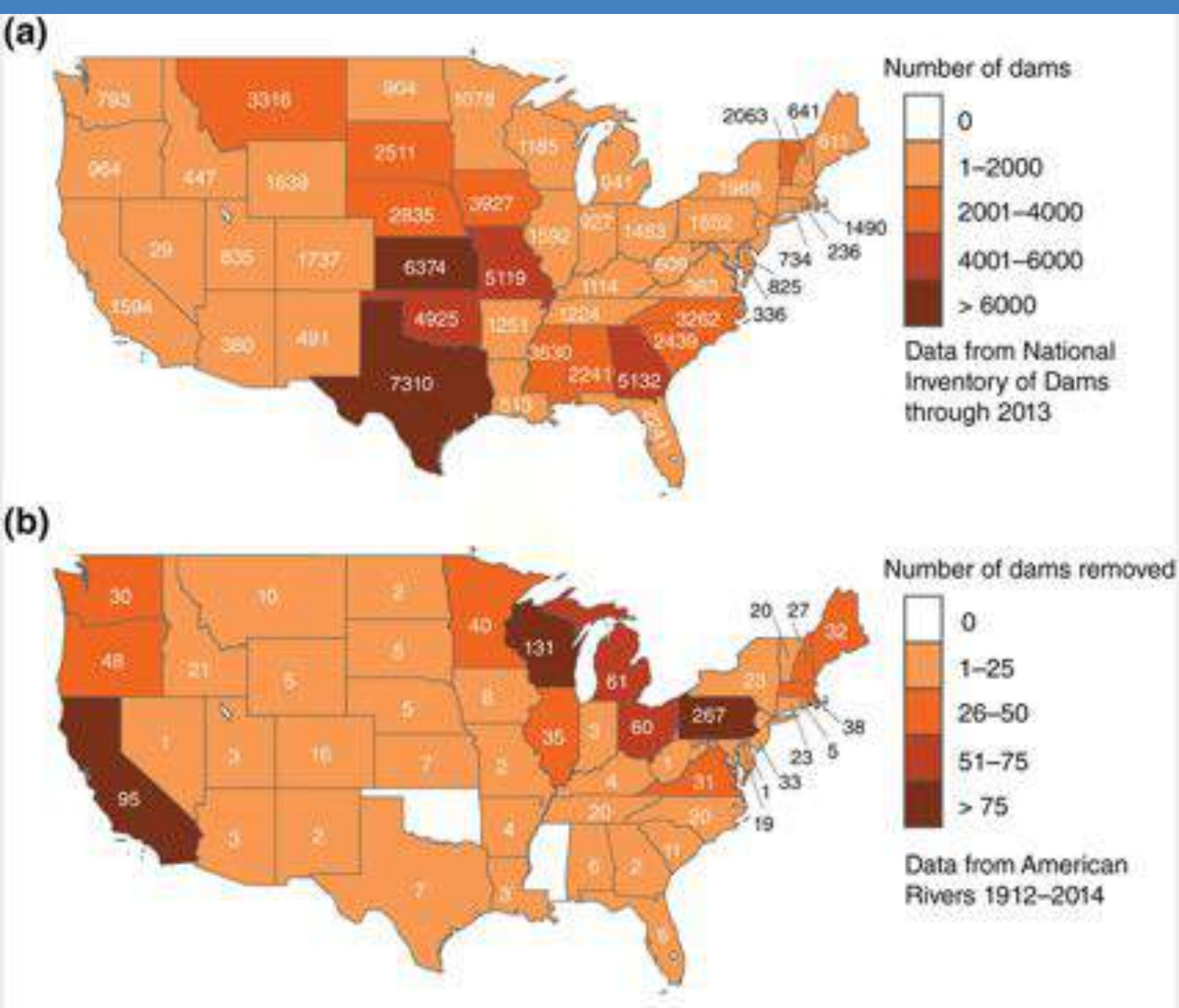
Do you think removal of Edwards Dam has been beneficial?



Based on a sample size of 500 people.

DISTRIBUTION OF DAMS IN THE U.S.

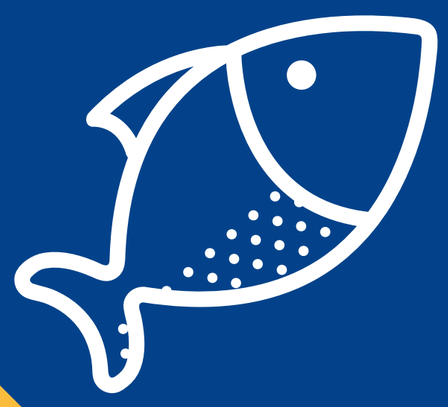
Figure 1: Distribution of dams in the contiguous U.S. (a), and the number of dams removed (b) by state. The number of dams from the National Inventory of Dams database does not accurately reflect all of the dams in the U.S.

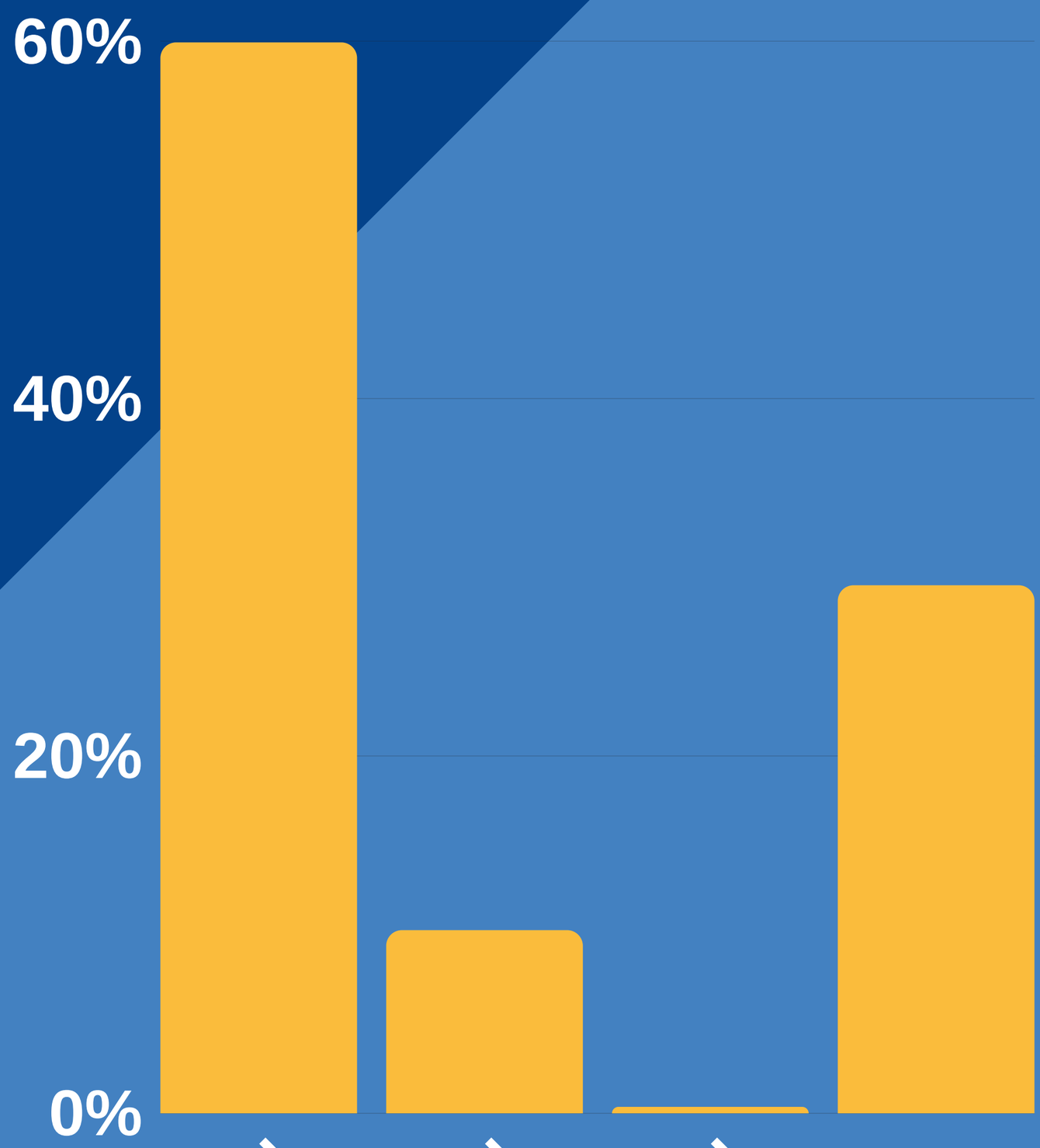


Status and trends of dam removal research in the United States - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Distribution-of-dams-in-the-contiguous-US-a-the-number-of-dams-removed-b-and-the_fig4_307872772 [accessed 21 Aug, 2019]

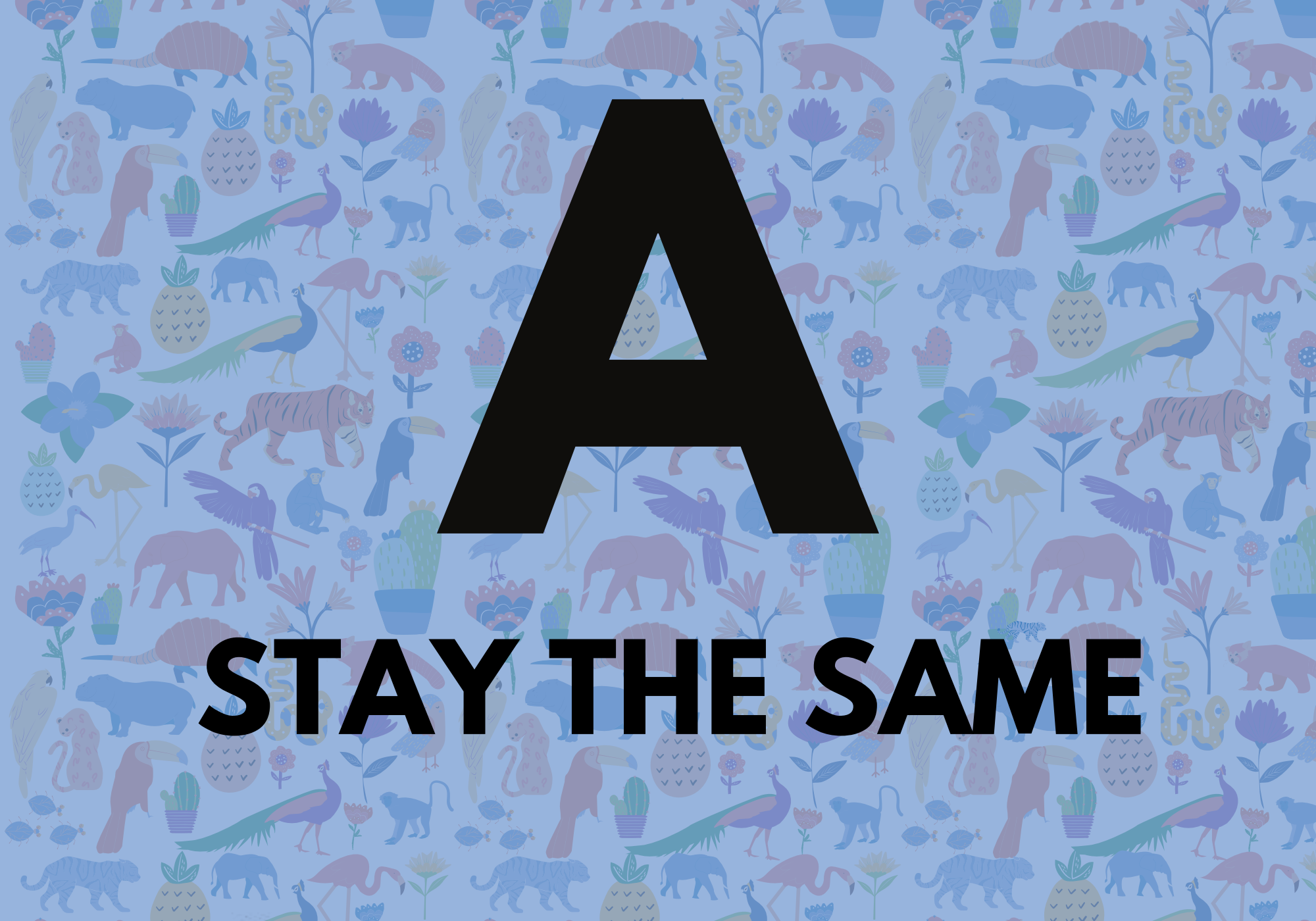
AFTER DAM REMOVAL, HOW HAS WATER QUALITY CHANGED?

WATER QUALITY ANALYSIS





CHOICE CARDS


A
STAY THE SAME


B
REMOVE


C
RESTORE
(STRUCTURAL
IMPROVEMENTS)

D

IMPROVE (ENVIRONMENTAL MODIFICATIONS)

Orinda 2019 Budget			Predicted 2020 Revenue			
		2019	A Remain	B Remove	C Restore	D Restore with Modification
City Revenue						
	User Fees and Charges	1,152,000	1,187,010	1,260,398	1,650,031	1,650,031
	Taxes	980,700	989,673	989,673	1,001,753	1,013,567
	Other Revenue Sources	390,900	397,356	397,356	397,356	397,356
	Intergovernmental Agencies	281,700	307,518	765,983	307,518	500,872
	Licenses and Permits	105,600	108,648	98,461	125,938	125,938
	Revenues from use of money and property	72,900	71,831	65,937	79,193	81,234
	TOTAL	**3,000,000**	3,062,036	3,577,808	3,561,789	3,768,998

		A Remain	B Remove	C Restore	D Restore with Modification
Cost	Direct Cost to City (2020)	1700 (needed renovations)	1,392,174	3,251,832	9,562,103
	Predicted 10 year cost	140,000 (assuming yearly renovations and 1 major issues)	1,392,174	3,251,832	9,562,103
	Estimated % Revenue Lost (2020-2030)	5.6% Loss	8.9% Loss	1.3% Gain	1.7% Gain
	Change in Property Tax Value (2020-2030)	-13,490	-80,673	35,790	58,913
	Change in Average Utilities Cost (2020)	189	893	0	-157

		A Remain	B Remove	C Restore	D Restore with Modification
Cost	Direct Cost to City	1700 (needed	1,392,174	3,251,832	9,562,103

BREAKOUT GROUP SIGNS

ECOLOGIST


Climate
Change
Summit
ncse.ngo
FARMER

HYDROELECTRIC POWER CO.

HYDROLOGIST

FISHERMAN

LOCAL COMMUNITY MEMBER

Thanks!

Climate Change Summit

ncse.ngo

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The University of Iowa

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