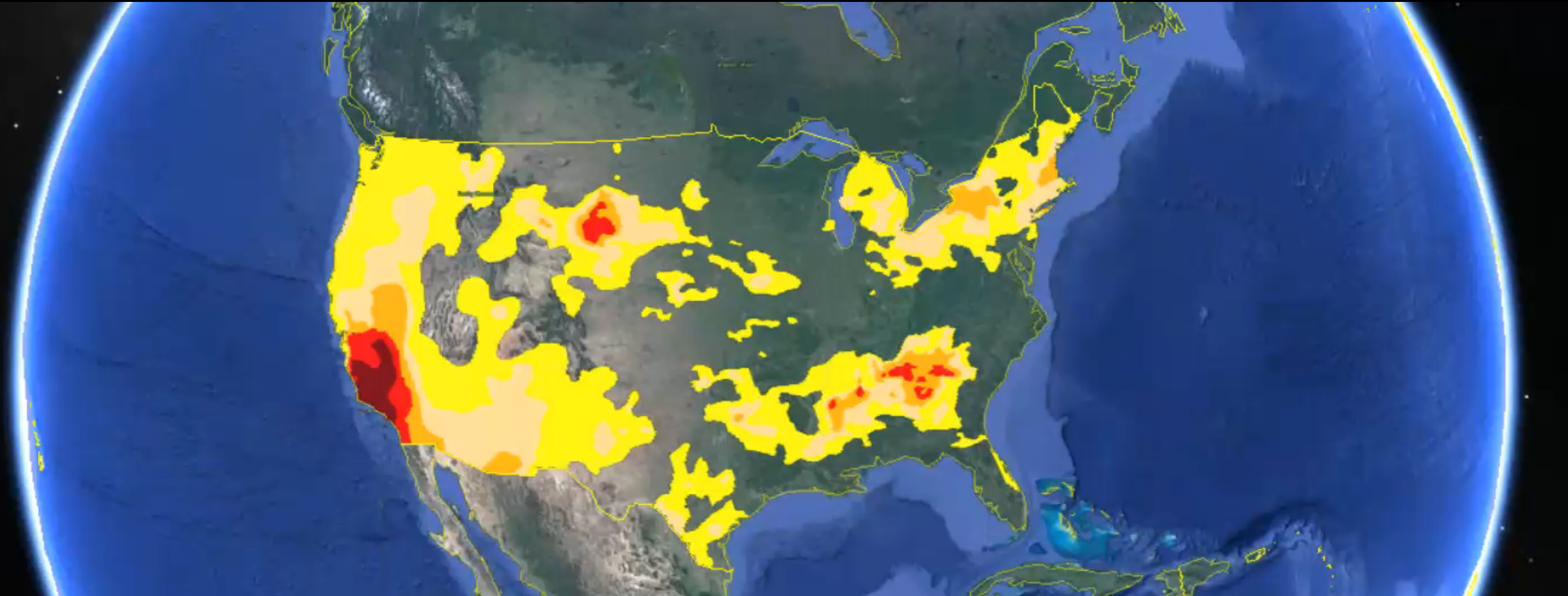


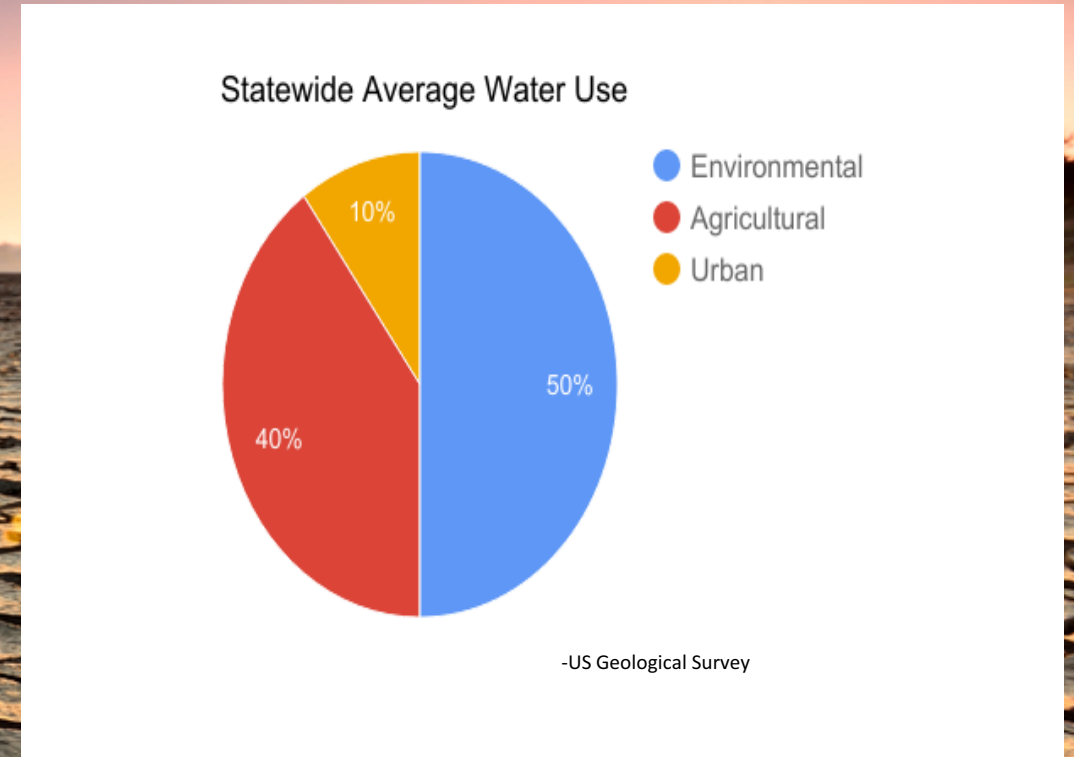
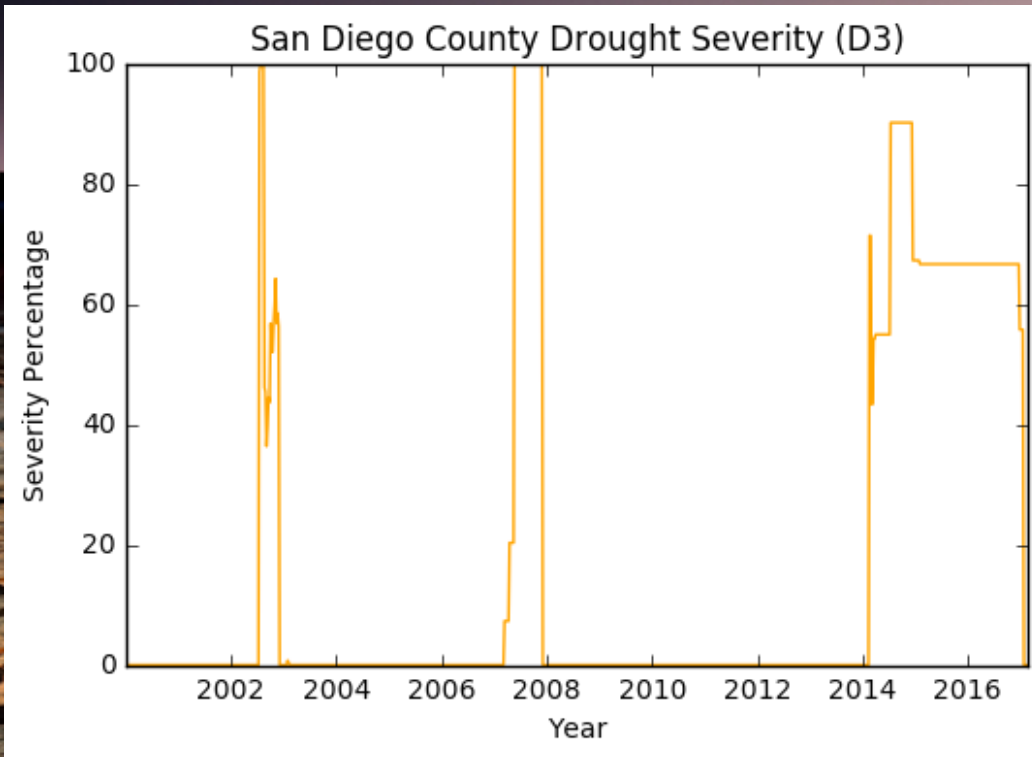
Kyle Campbell

Seth Siddle-Mitchell
DROUGHT



THE THREAT TO OUR FUTURE

Defining The Drought

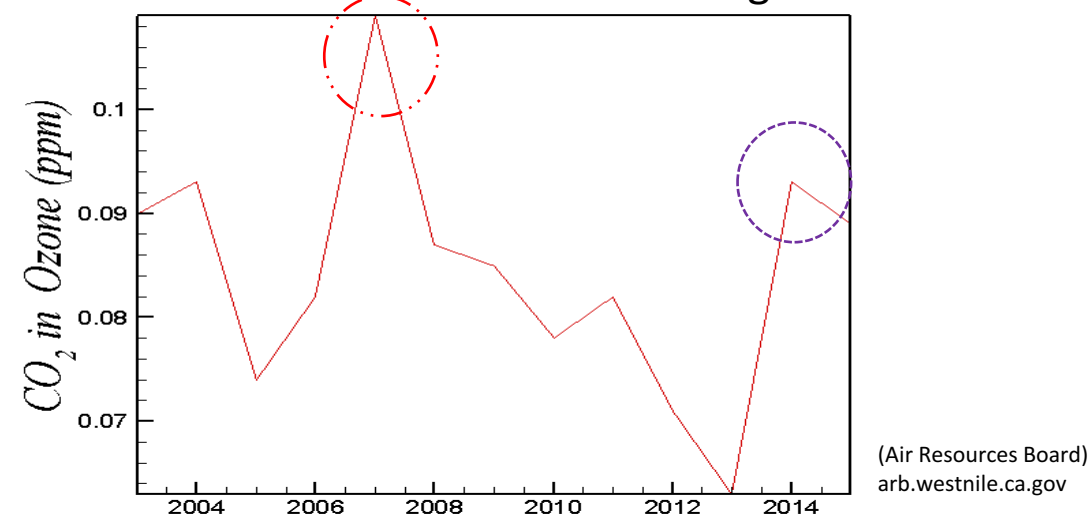


- 845 Weekly Reports From 2001 – 2017 from the United States Drought Monitor.
- U.N. warns that half the world population will face water scarcity by 2030, accelerated by climate change.

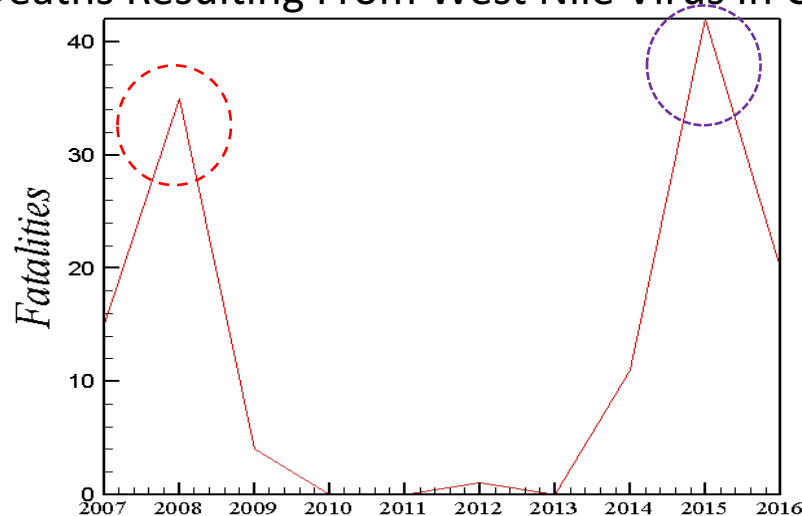
How The Drought Affects You

- In 2016, > 50 Million affected by drought
- Increases risk in wildfires (i.e. 2003 , 2007)
- Hydroelectric power decreases (14%-19% of CA total)
- Farmers lose money when crops destroyed
- Destruction of ecosystems
- Climate change projections indicate droughts will worsen

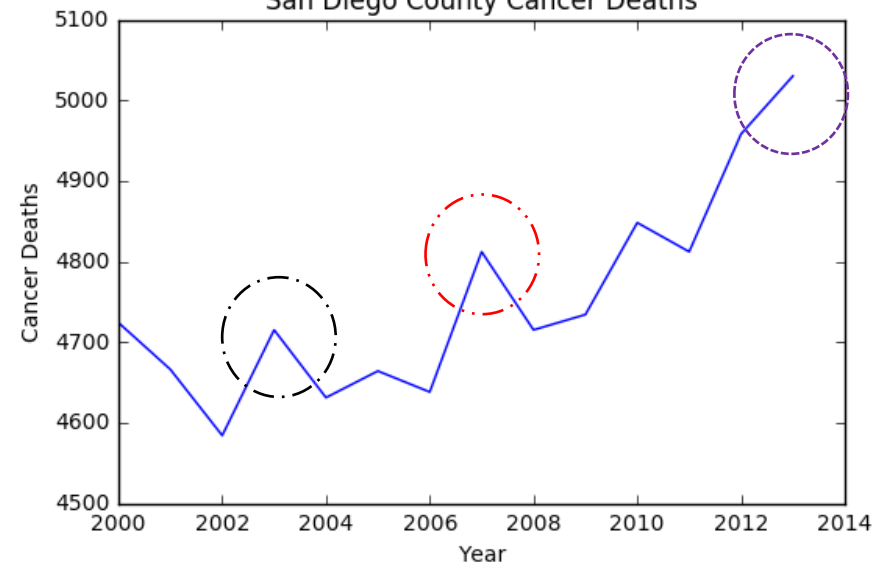
Ozone Fluctuations In San Diego



Deaths Resulting From West Nile Virus In California



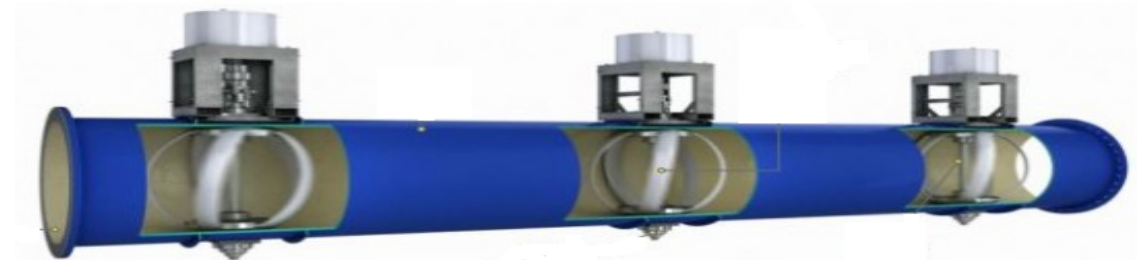
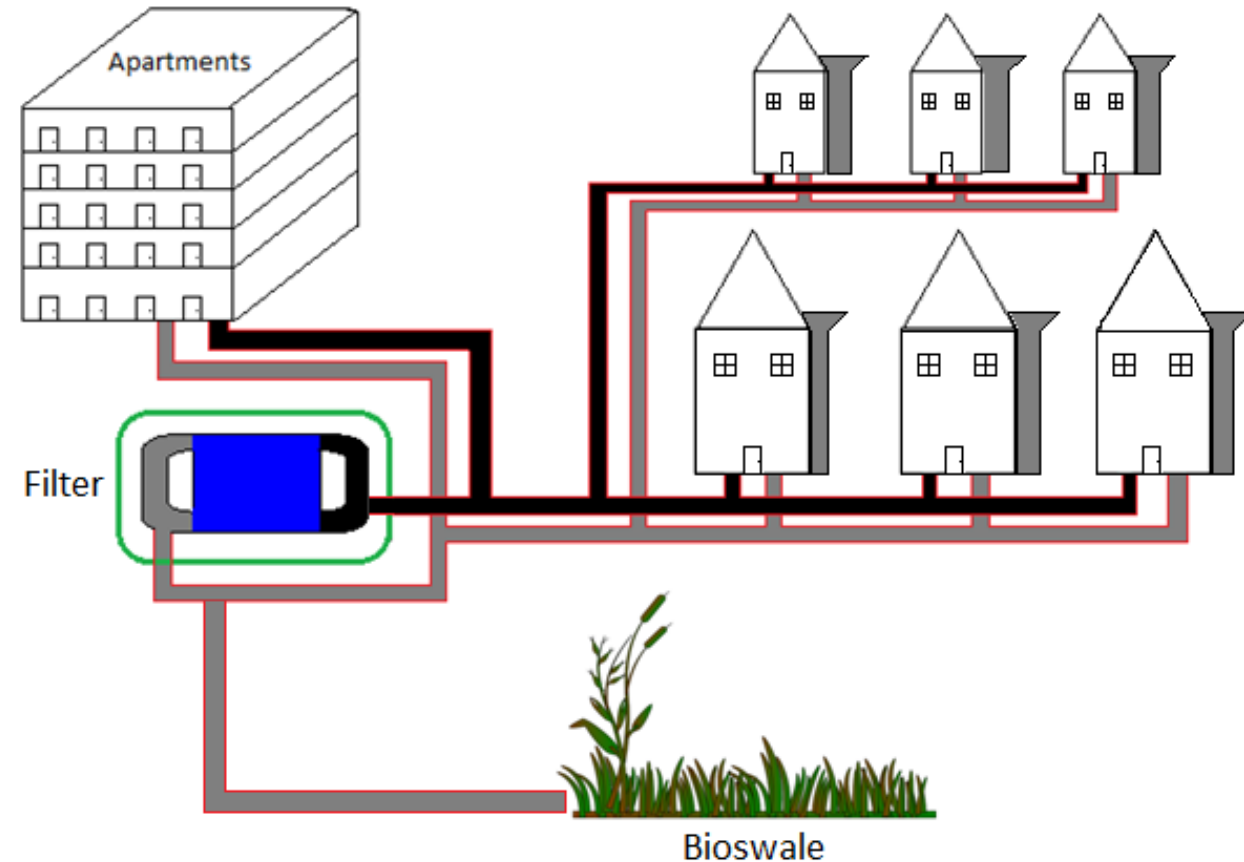
San Diego County Cancer Deaths



Our Proposal: On Site Black Water Filtration

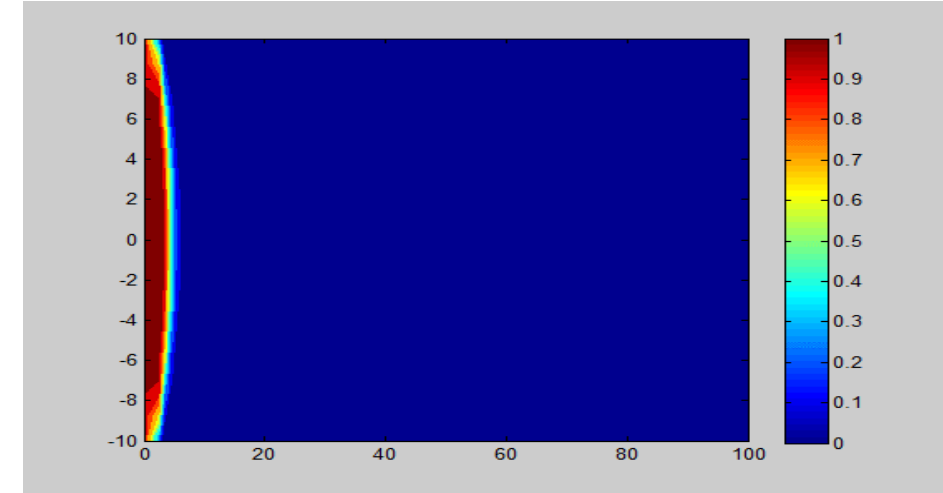
The Process

1. Microfiltration of treated waste water to remove solids, oils, bacteria
 2. Liquid goes through reverse osmosis pushing it through fine plastic membrane that filters out viruses and pharmaceuticals.
 3. Water is then treated with UV light to remove any remaining organic compounds before rejoining ground supply
- Local water recycling system
 - 1.3 billion gallons of waste created daily
 - Average American family uses 400 Gallons/day
 - OCWD recycle 70-100 Million Gallons/day
 - Enough for 850,000 people (~50% of county)
 - Minimal wasted water
 - Self-powered via turbines in pipes

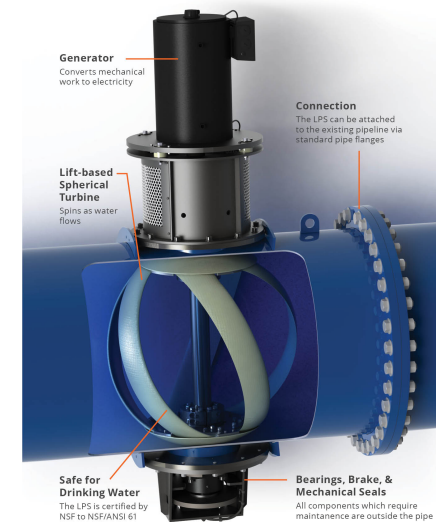


Practicality and Restrictions

- No existing similarly functioning product on this scale
- Portland implemented turbines in pipelines in 2014
- Avoid “Toilet to Tap” stigma by initially marketing non-residential
- Decrease in stagnant water
- Surplus water returned to environment
- Possible clogging on turbines from waste
- Implementation into pre-existing sewage systems



Location	Approximate Water Usage (Gal/Day)	Estimated Water Recycled (# of People)
Apartments	7,500	64
Motels/Trailer Parks	40,000	340
Schools	25,000	213
Hospitals	250 per bed	320



Turbine inside the pipeline

QUESTIONS?

“Recycled water can satisfy most water demands, as long as it is adequately treated to ensure water quality appropriate for the use.”

-United States Environmental
Protection Agency (EPA)

Collaboration

- Seth - B.S. Physics , current M.S. Aerospace Engineering
- Kyle – B.S. Material Science Engineering , current M.S. Computation Sci.
- Used Python, MATLAB , Tecplot, Google Earth

Current Drought Monitor Files

Metadata

[Combined Shapefiles](#)[KMZ](#)[WMS](#)[Shapefiles](#)[KML Files](#)[GML files](#)[OGC WMS files](#)[Excel files](#)[DM Colors](#)

Please cite the Drought Monitor by including the National Drought Mitigation Center (NDMC), the U.S. Department of Agriculture (USDA) and the National Oceanic and Atmospheric Administration (NOAA).

Data

[2017](#)[2016](#)[2015](#)[2014](#)[2013](#)[2012](#)[2011](#)[2010](#)[2009](#)[2008](#)[2007](#)[2006](#)[2005](#)[2004](#)[2003](#)[2002](#)[2001](#)[2000](#)

Download all Drought Monitor shapefiles for [2017](#).

Date	KMZ	Shapefiles		GML	WMS	Statistics		
2017-02-21	KMZ	SHP	Impacts	GML	WMS	U.S.	State	County
2017-02-14	KMZ	SHP	Impacts	GML	WMS	U.S.	State	County
2017-02-07	KMZ	SHP	Impacts	GML	WMS	U.S.	State	County
2017-01-31	KMZ	SHP	Impacts	GML	WMS	U.S.	State	County
2017-01-24	KMZ	SHP	Impacts	GML	WMS	U.S.	State	County
2017-01-17	KMZ	SHP	Impacts	GML	WMS	U.S.	State	County
2017-01-10	KMZ	SHP	Impacts	GML	WMS	U.S.	State	County
2017-01-03	KMZ	SHP	Impacts	GML	WMS	U.S.	State	County

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phone: (402) 472-6707 | fax: (402) 472-2946 | [Contact Us](#) | [Web Policy](#)



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	ReleaseDate	FIPS	County	State	Nothing	D0	D1	D2	D3	D4	ValidStart	ValidEnd	
2	12/27/2016	1001	Autauga Co	AL	0	100	100	100	9.28	0	12/27/2016	1/2/2017	
3	12/27/2016	1003	Baldwin Co	AL	0	100	53.94	10.58	0	0	12/27/2016	1/2/2017	
4	12/27/2016	1005	Barbour Co	AL	0	100	100	100	61.18	0	12/27/2016	1/2/2017	
5	12/27/2016	1007	Bibb Coun	AL	0	100	100	100	81.82	35.81	12/27/2016	1/2/2017	
6	12/27/2016	1009	Blount Cou	AL	0	100	100	100	100	91.84	12/27/2016	1/2/2017	
7	12/27/2016	1011	Bullock Co	AL	0	100	100	100	100	0	12/27/2016	1/2/2017	
8	12/27/2016	1013	Butler Cou	AL	0	100	100	100	63.11	0	12/27/2016	1/2/2017	
9	12/27/2016	1015	Calhoun Co	AL	0	100	100	100	100	100	12/27/2016	1/2/2017	
10	12/27/2016	1017	Chambers	AL	0	100	100	100	100	71.06	12/27/2016	1/2/2017	
11	12/27/2016	1019	Cherokee	AL	0	100	100	100	100	99.06	12/27/2016	1/2/2017	
12	12/27/2016	1021	Chilton Co	AL	0	100	100	100	74.3	8.03	12/27/2016	1/2/2017	
13	12/27/2016	1023	Choctaw CA	AL	0	100	100	98.79	40.1	0	12/27/2016	1/2/2017	
14	12/27/2016	1025	Clarke Cou	AL	0	100	100	100	40.98	0	12/27/2016	1/2/2017	
15	12/27/2016	1027	Clay Count	AL	0	100	100	100	100	100	12/27/2016	1/2/2017	
16	12/27/2016	1029	Cleburne C	AL	0	100	100	100	100	100	12/27/2016	1/2/2017	
17	12/27/2016	1031	Coffee Co	AL	0	100	99.78	71.4	0	0	12/27/2016	1/2/2017	
18	12/27/2016	1033	Colbert Co	AL	0	100	100	58.71	0	0	12/27/2016	1/2/2017	
19	12/27/2016	1035	Conecuh C	AL	0	100	100	100	0.5	0	12/27/2016	1/2/2017	
20	12/27/2016	1037	Coosa Cou	AL	0	100	100	100	100	76.58	12/27/2016	1/2/2017	
21	12/27/2016	1039	Covington	AL	0	100	88.44	56.28	0	0	12/27/2016	1/2/2017	
22	12/27/2016	1041	Crenshaw	AL	0	100	100	100	55.91	0	12/27/2016	1/2/2017	
23	12/27/2016	1043	Cullman Co	AL	0	100	100	100	67.28	24.72	12/27/2016	1/2/2017	
24	12/27/2016	1045	Dale Coun	AL	0	100	97.99	55.97	0	0	12/27/2016	1/2/2017	
25	12/27/2016	1047	Dallas Cou	AL	0	100	100	100	35.2	0	12/27/2016	1/2/2017	
26	12/27/2016	1049	DeKalb Co	AL	0	100	100	100	100	11.94	12/27/2016	1/2/2017	
27	12/27/2016	1051	Elmore Co	AL	0	100	100	100	32.68	0	12/27/2016	1/2/2017	
28	12/27/2016	1053	Escambia	AL	0	100	99.95	34.54	0	0	12/27/2016	1/2/2017	
29	12/27/2016	1055	Etowah Co	AL	0	100	100	100	100	99.93	12/27/2016	1/2/2017	
30	12/27/2016	1057	Fayette Co	AL	0	100	100	100	44.82	0	12/27/2016	1/2/2017	
31	12/27/2016	1059	Franklin Co	AL	0	100	100	92.58	0	0	12/27/2016	1/2/2017	

