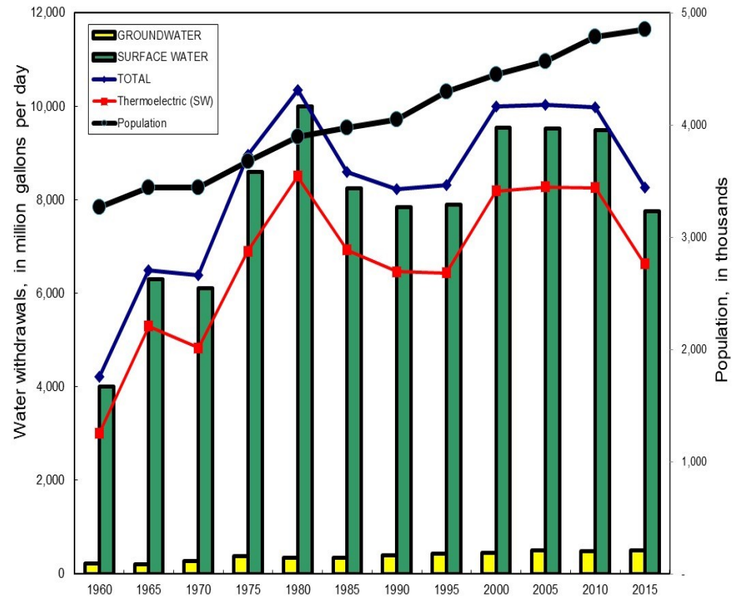
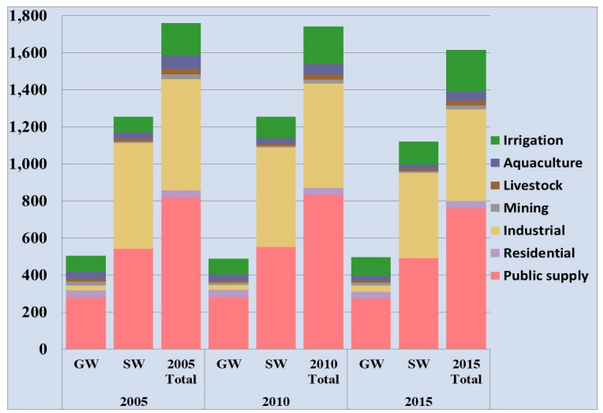
Water Withdrawals in Alabama, 1960 to 2015

The graph in figure 15 shows trends from 1960 to 2015 in statewide water withdrawal estimates and population. For the 20 year period from 1960 to 1980, total water withdrawals steadily increased from about 4,220 MGD to 10,350 MGD. From 1980 to 2000, changes in thermoelectric-power production processes reduced total water withdrawals. From 2000 to 2010, total water withdrawals were relatively constant before declining in 2015 partly due to changes in thermoelectric-power production processes. The thermoelectric-power production withdrawals significantly influence the trends for surface-water withdrawals in Alabama and accounted for more than 80 percent of total withdrawals in 2015. Groundwater withdrawals have steadily increased over the same 55 year period, but only represent 6 percent of the total 2015 water withdrawals. These water withdrawal changes have occurred while Alabama's population has increased from 3.3 million to 4.9 million in a near linear fashion.

Figure 15. Water withdrawals in Alabama, by source, 1960 to 2015, in MGD.



Total Withdrawals Without Thermoelectric, 2005, 2010 and 2015



The graph in figure 16 shows a comparison of water sources, water use sectors, and withdrawal totals between 2005, 2010, and 2015. The total water withdrawals shown were 1,614 MGD for 2015, 1,741 MGD for 2010 and 1,759 MGD for 2005 (8% decrease from 2005 to 2015). In the individual sectors, public water supply withdrawals were 816 MGD in 2005, increased to 833 MGD in 2010, then decreased to 762 MGD in 2015 (7% decrease from 2005 to 2015). Self-supplied industrial water withdrawals were 600 MGD in 2005, decreased to 566 MGD in 2010, then decreased to 495 MGD in 2015 (21% decrease from 2005 to 2015). Irrigation water withdrawals increased from 172 MGD in 2005, then increased to 202 MGD in 2010, then increased again in 2015 to 223 MGD (30% increase from 2005 to 2015). This is reflective of a 40% increase in estimated irrigated acreage from 136,000 acres in 2005, to 169,000 acres in 2010, to 189,000 acres in 2015. Aquaculture withdrawals were 75 MGD in 2005, decreased to 59 MGD in 2010, then decreased further to 49 MGD in 2015 (53% decrease from 2005 to 2015). The combined total of the remaining sectors (self-supplied residential, mining, and livestock) was 95 MGD in 2005, then decreased to 85 MGD In 2010, and stayed at 85 MGD for 2015 (11% decrease from 2005 to 2015).

Figure 16. Water withdrawals in Alabama by water use sectors and source, 2005 to 2015, in MGD.

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ADECA Alabama Department of Economic and Community Affairs

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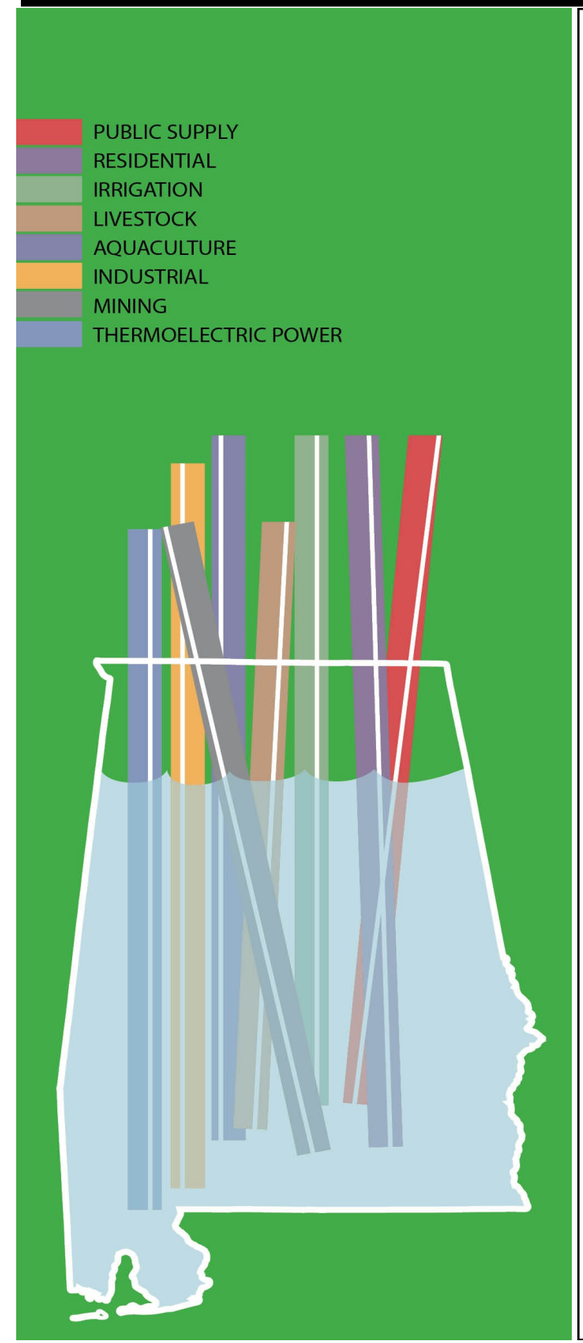
Estimated 2015 Water Use and Surface Water Availability in Alabama Fact Sheet



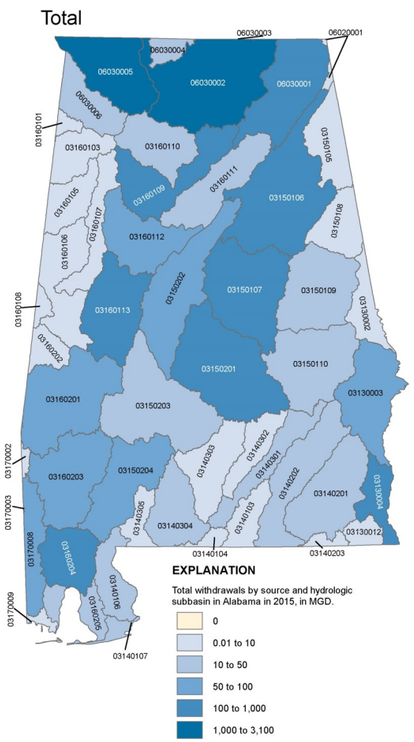
This fact sheet, prepared by the Alabama Department of Economic and Community Affairs, Office of Water Resources (OWR), provides a summary of information contained in the report, "Estimated 2015 Water Use and Surface Water Availability in Alabama." The report provides a comprehensive summary of 2015 water withdrawals, returns, and net demand for each of the state's 67 counties and 53 eight-digit hydrologic unit code subbasins; a monthly comparison of withdrawals and net consumption from 2010 to 2015 at the subbasin level; and a comparative analysis of consumption and streamflows at the subbasin level for both 2010 and 2015. The information is presented in a number of tables, charts, and maps as well as appendices that supplement the main report and provide additional detailed information on water demands and streamflows within individual subbasins. The report includes a new enhancement to the "Water Use in Alabama" series by adding monthly summaries of net consumption and the Relative Net Demand (RND) analyses to the water withdrawal summaries.

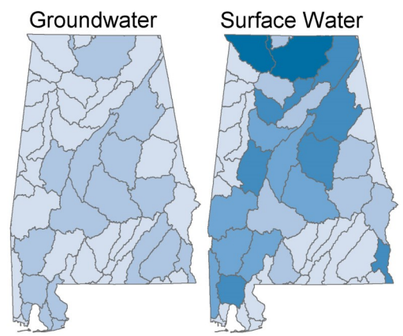
Key Findings:

- A significant factor in water use and consumption is rainfall. In 2010, statewide rainfall was approximately 10 inches below normal while the 2015 average rainfall was approximately 3 inches above normal.
- Total withdrawals for 2015 were estimated to be 8,239 MGD, which was an 18% decrease from 2010.
- Surface water was the source for 94% of all withdrawals (figure 4) and 70% of the water withdrawals excluding the thermoelectric sector (figure 5).
- Total returns for 2015 were estimated to be 7,629 MGD, which was a 19% decrease from 2010.
- Total Consumptive Net Demand for 2015 was estimated to be 114 MGD, which is less than a 1.4% consumption rate compared when compared to total withdrawals.
- For 2015, the highest RND ratio was 0.316 for September in the Escatawpa subbasin (03170008). For 2010, the highest RND ratio was 0.546 for October in the Mulberry Fork subbasin (03160109).

2015 Withdrawals

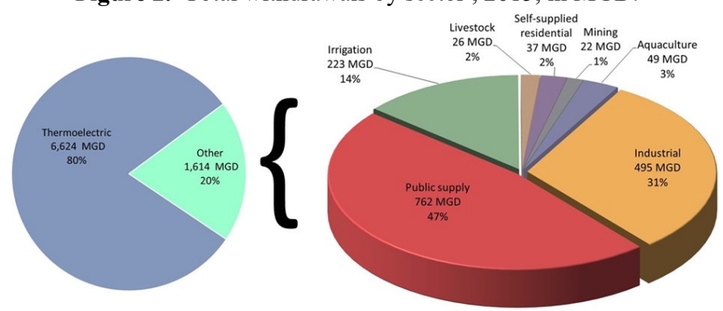
Figure 1. Total withdrawals by subbasin in





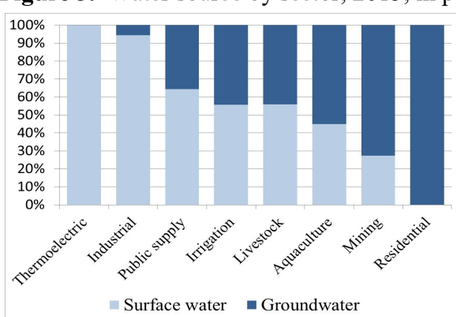
Total withdrawals in Alabama for 2015 were determined from estimates of withdrawal from eight water use sectors: public supply, self-supplied residential, irrigation, livestock, aquaculture, industrial, mining, and thermoelectric power. Total water withdrawals for 2015 were estimated to be 8,239 MGD. For 2015, the thermoelectric sector accounted for 80 percent of the total water withdrawals (6,624 MGD). The remaining 20 percent was made up of public supply (47%), industrial (31%), irrigation (14%), aquaculture (3%), self-supplied residential (2%), livestock (2%), and mining (1%) (figures 1 and 2).

Figure 2. Total withdrawals by sector , 2015, in MGD.



Distribution of Total Withdrawals by Sector and Source of Supply

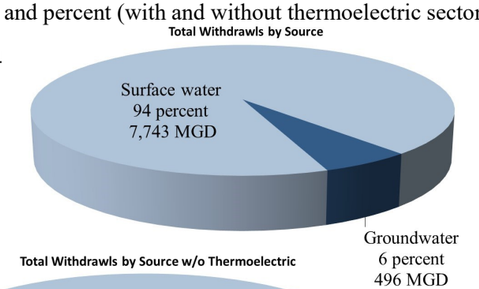
Figure 3. Water source by sector, 2015, in percent.



Thermoelectric-power withdrawals were exclusively from surface water and self-supplied residential withdrawals were exclusively from groundwater. Surface water was the primary source for industrial, public supply, irrigation, and livestock; while groundwater was the primary source for aquaculture and mining (figure 3).

Figures 4 and 5. Total water withdrawals, by source, 2015, in MGD and percent (with and without thermoelectric sector).

Fig. 4



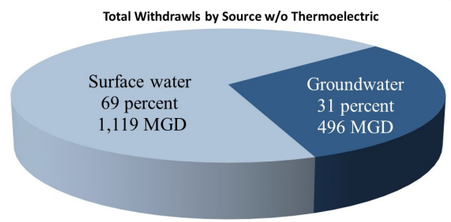


Fig. 5

Figure 13. Map of Average Annual RND Ratios by subbasin in Alabama for 2010.

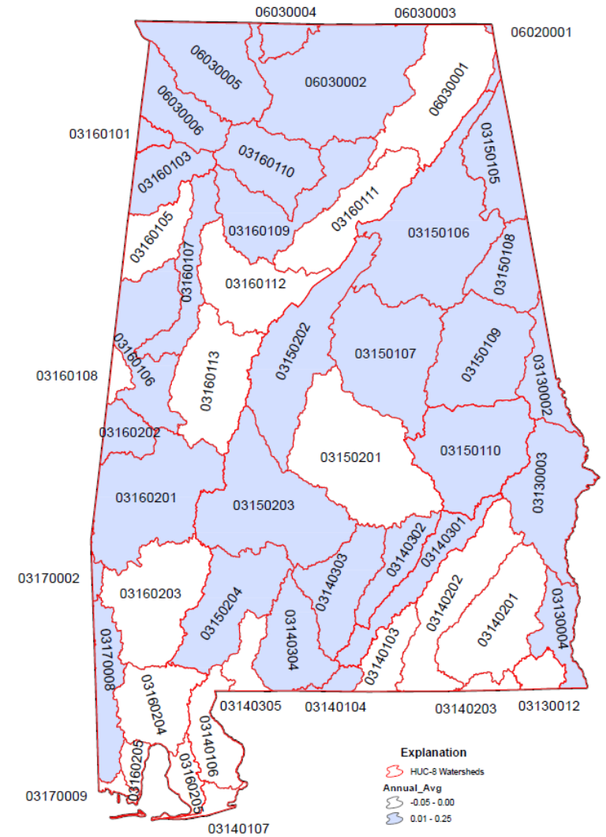
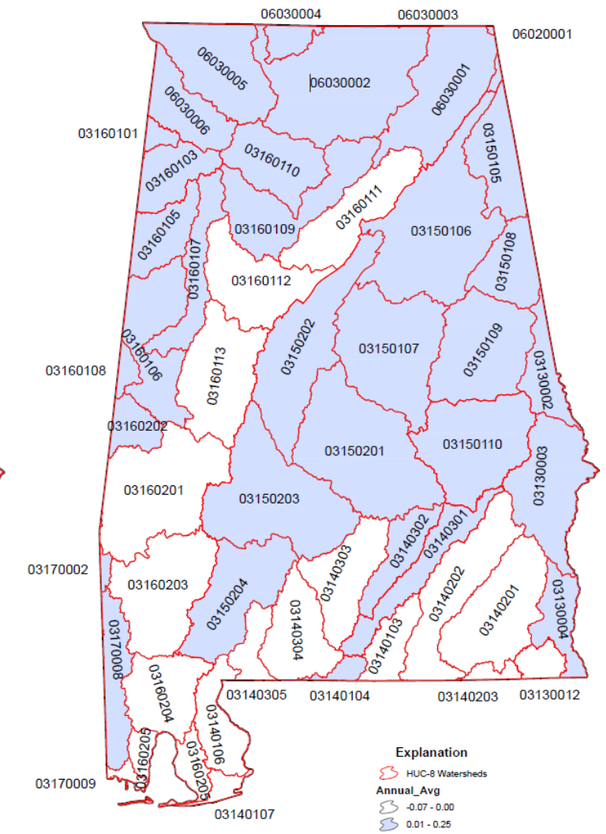


Figure 14. Map of Average Annual RND Ratios by subbasin in Alabama for 2015.



Surface water availability in a subbasin was evaluated by comparing the consumptive use (or net demand) with the streamflow in the subbasin. The comparison was accomplished by calculating the relative net demand (RND) which is the ratio of the net demands (including all upstream demands) to the estimated streamflow at the mouth of that basin.

For this report, RND ratios were calculated for 2010 and 2015 and compared with each other. For example, in the Middle Coosa subbasin (03150106), the 2010 average annual net demand was 7.78 MGD (or 11.98 cubic feet per second (cfs)) and the estimated average annual flow for 2010 was 11,463 cfs, resulting in an RND ratio of 0.001. The corresponding 2015 values for the same subbasin was a net demand of 6.93 MGD (or 10.98 cfs) and an estimated average annual flow of 8,462 cfs, resulting in a 2015 average annual RND ratio of the same value, 0.001.

The average annual RND ratios for 2010 and 2015 were calculated in every subbasin (figures 13 and 14) as well as for each month in both years. Four seasonal RND ratios were also calculated for January - March, April - June, July - September, and October - December by averaging the respective monthly RND ratios for the months of each season by year. Complete tables and maps of this data and information are available in Appendices J and K, respectively, in the full report.

Public supply	Industrial, thermoelectric, and mining	Agriculture	Total use and RND maps

Figure 9. Change in public-supply demand by subbasin from 2010 to 2015 in Alabama, in MGD.

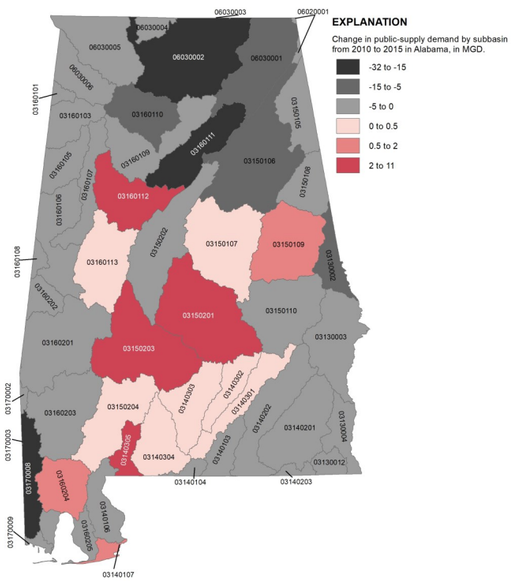
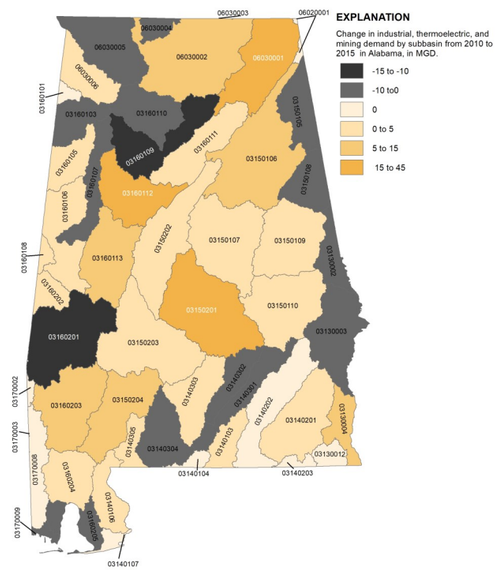


Figure 10. Change in industrial, thermoelectric, and mining demand by subbasin from 2010 to 2015 in



Net water demand comparisons were completed for three sectors of use: public supply (figure 9); industrial, thermoelectric, and mining (figure 10); and agriculture (figure 11) as well as net total water demand (figure 12). These maps are visual representations of the comparative data provided in table 1 on pages 4 and 5.

Figure 11. Change in agriculture demand by subbasin from 2010 to 2015 in Alabama, in MGD.

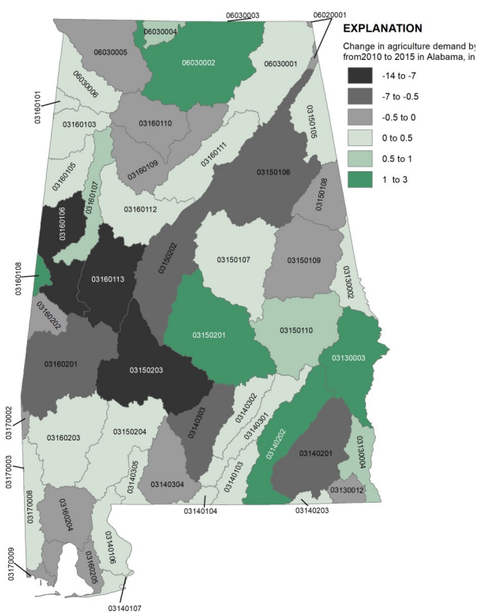
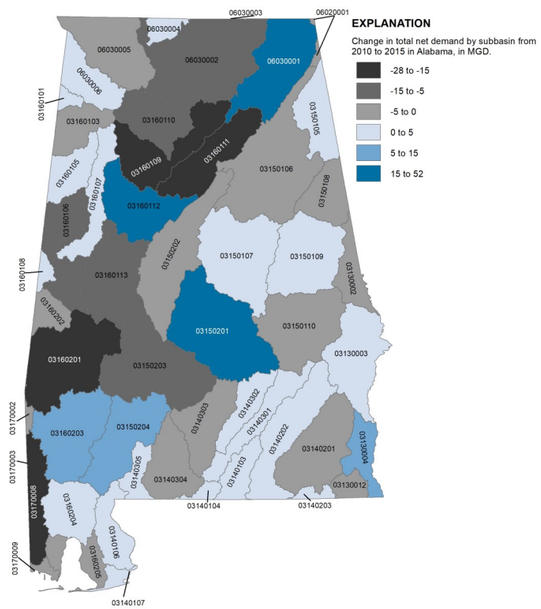
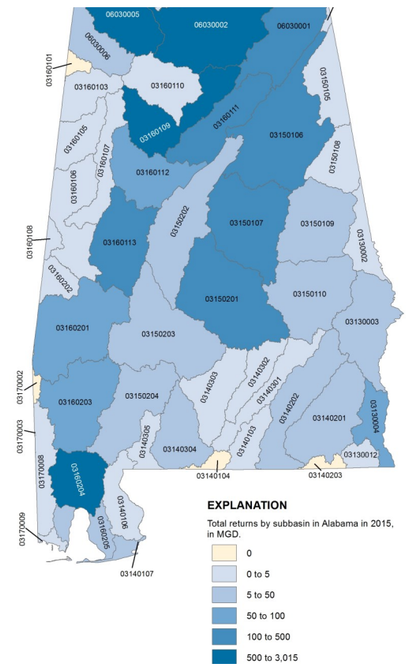


Figure 12. Change in total net demand by subbasin from 2010 to 2015 in Alabama, in MGD.



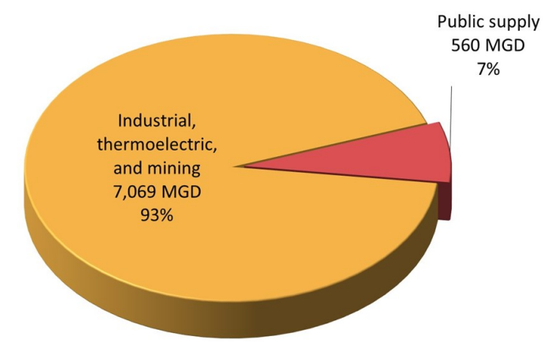
2015 Returns

Figure 6. Total returns by subbasin in Alabama in 2015, in MGD.



Total Alabama statewide returns for 2015 were determined from returns for two major sectors; the industrial, thermoelectric-power, and mining sector and the public supply sector. Total returns were estimated to be 7,629 MGD for 2015. Estimates of returns by sector indicate that the industrial, thermoelectric, and mining sector accounted for approximately 96 percent (7,069 MGD) of the total returns for 2015, with the public supply sector accounting for the remaining 7 percent (560 MGD) (figures 6 and 7).

Figure 7. Total returns by sector in Alabama in 2015, in MGD.

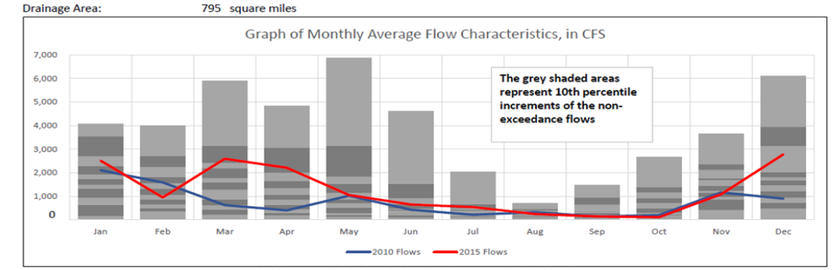


Example Surface Water Assessment Subbasin Output—Bear Creek Subbasin (06030006)

This chart provides a sample of the output for each subbasin using the Bear Creek subbasin (06030006) as an example. Figure 8 displays both the 2010 (in blue) and 2015 (in red) monthly average flows for the Bear Creek subbasin in comparison to the historical statistical summary of the streamflows for that subbasin. Streamflow statistics were based on observed and estimated monthly streamflows for the 40-year period from January 1975 through December 2014.

Figure 8. Bear Creek Subbasin Flow Statistics Summary

Gage#: 06030006 Name: Bear Creek
Period of Record: Jan-1975 - Dec-2014
Drainage Area: 795 square miles



MONTHLY AVERAGE AND NON-EXCEEDANCE STATISTICS, in CFS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	1,879	1,506	1,750	1,427	1,377	718	406	277	406	715	1,549	2,012
100%	4,078	4,010	5,903	4,843	6,872	4,618	2,048	716	1,487	2,674	3,660	6,111
98%	3,963	3,826	5,167	4,733	5,449	2,707	1,418	571	1,339	2,321	3,031	5,073
95%	3,850	3,635	4,626	3,839	3,963	2,158	1,003	475	1,242	2,175	2,519	4,512
90%	3,542	2,719	3,135	3,070	3,147	1,540	674	454	944	1,403	2,353	3,942
75%	2,518	2,117	2,276	1,889	1,685	823	476	365	499	1,097	1,911	2,483
50%	1,729	1,322	1,589	1,064	871	433	286	245	292	499	1,443	1,671
25%	1,148	793	698	542	386	293	196	149	139	219	1,084	1,116
10%	641	494	452	305	204	195	145	114	120	132	862	735
5%	299	393	378	224	181	148	132	107	104	125	661	580
2%	238	377	299	194	135	99	128	104	101	115	486	499
0%	167	355	227	191	134	97	122	99	90	100	425	477
2010 Flows	2,106	1,591	629	403	1,025	431	218	326	149	204	1,166	904
2015 Flows	2,510	952	2,591	2,211	1,055	652	543	247	145	115	1,088	2,779

Table 1. Change in net demand by subbasin in Alabama from 2010 to 2015, in MGD.

		Public Supply Net				Industrial Net	
Subbasin number	Subbasin name	2010 Demand	2015 Demand	Change from 2010	Percent Change	2010 Demand	2015 Demand
03130002	Middle Chattahoochee-Lake Harding	8.36	3.24	-5.12	-61%	-2.13	0.00
03130003	Middle Chattahoochee-Walter F	1.79	1.27	-0.52	-29%	6.66	6.46
03130004	Lower Chattahoochee	-4.18	-4.45	-0.27	6%	7.76	21.70
03130012	Chipola	-1.62	-2.18	-0.56	34%	0.00	0.00
03140103	Yellow	-1.35	-1.35	0.00	0%	-0.18	0.00
03140104	Blackwater	0.00	0.00	0.00	0%	0.00	0.00
03140106	Perdido	-2.32	-2.99	-0.67	29%	-0.38	0.00
03140107	Perdido Bay	-6.44	-5.11	1.33	-21%	0.00	0.00
03140201	Upper Choctawhatchee	-12.26	-13.10	-0.84	7%	-3.64	-2.83
03140202	Pea	-5.84	-5.99	-0.15	3%	-0.93	-0.93
03140203	Lower Choctawhatchee	0.00	0.00	0.00	0%	0.01	0.00
03140301	Upper Conecuh	-1.95	-1.47	0.48	-25%	1.58	1.03
03140302	Patsaliga	-0.41	-0.31	0.10	-24%	0.05	0.04
03140303	Sepulga	-1.92	-1.68	0.24	-13%	-0.04	-0.02
03140304	Lower Conecuh	-2.33	-2.02	0.31	-13%	1.10	-2.28
03140305	Escambia	-2.92	-0.92	2.00	-69%	-0.10	-0.02
03150105	Upper Coosa	0.13	-0.20	-0.33	-253%	0.01	0.00
03150106	Middle Coosa	-8.20	-15.00	-6.79	83%	-6.37	6.17
03150107	Lower Coosa	-0.67	-0.43	0.24	-36%	-7.59	-6.93
03150108	Upper Tallapoosa	0.59	0.42	-0.17	-29%	0.02	0.00
03150109	Middle Tallapoosa	11.09	12.24	1.15	10%	-0.22	-0.09
03150110	Lower Tallapoosa	17.78	13.90	-3.88	-22%	0.38	0.96
03150201	Upper Alabama	-39.98	-37.80	2.18	-5%	-23.47	5.44
03150202	Cahaba	24.08	23.60	-0.48	-2%	-0.59	0.15
03150203	Middle Alabama	-0.46	1.55	2.00	-441%	-0.49	0.05
03150204	Lower Alabama	-1.08	-0.80	0.28	-26%	-3.41	3.59
03160101	Upper Tombigbee	0.00	0.00	0.00	0%	0.02	0.01
03160103	Buttahatchee	0.47	0.24	-0.23	-49%	0.04	0.00
03160105	Luxapallila	1.09	-0.18	-1.26	-117%	-1.56	-0.22
03160106	Middle Tombigbee-Lubbub	-0.80	-1.00	-0.20	26%	-0.25	0.51
03160107	Sipsey	-1.42	-1.62	-0.21	15%	0.59	0.25
03160108	Noxubee	0.00	0.00	0.00	0%	-3.05	-1.22
03160109	Mulberry	38.15	35.68	-2.47	-6%	55.61	42.32
03160110	Sipsey Fork	18.85	11.62	-7.22	-38%	0.03	0.03
03160111	Locust	-29.89	-61.60	-31.71	106%	-20.24	-16.22
03160112	Upper Black Warrior	-29.18	-18.37	10.81	-37%	-71.50	-30.89
03160113	Lower Black Warrior	-4.94	-4.77	0.17	-3%	-0.96	7.21
03160201	Middle Tombigbee-Chickasaw	-2.32	-3.59	-1.27	55%	12.88	-1.43
03160202	Sucarnoochee	-1.12	-1.38	-0.26	23%	1.07	1.21
03160203	Lower Tombigbee	1.12	-2.73	-3.85	-343%	-16.02	-5.84
03160204	Mobile-Tensaw	-45.19	-43.61	1.58	-4%	-13.74	-11.07
03160205	Mobile Bay	-2.55	-3.12	-0.57	22%	-3.21	-3.55
03170002	Upper Chickasawhay	0.00	0.00	0.00	0%	0.00	0.00
03170003	Lower Chickasawhay	0.00	0.00	0.00	0%	0.00	0.00
03170008	Escatawpa	69.86	52.35	-17.51	-25%	0.00	0.00
03170009	Mississippi Coastal	-0.97	-1.53	-0.56	57%	-0.39	-0.47
06020001	Middle Tennessee-Chickamauga	0.00	0.00	0.00	0%	0.00	0.00
06030001	Guntersville Lake	20.15	13.34	-6.81	-34%	-36.91	1.93
06030002	Wheeler Lake	10.06	-12.26	-22.32	-222%	-3.53	11.32
06030003	Upper Elk	0.00	0.00	0.00	0%	0.00	0.00
06030004	Lower Elk	7.78	7.58	-0.20	-3%	0.33	-0.01
06030005	Pickwick Lake	4.66	1.28	-3.38	-73%	-0.79	-2.18
06030006	Bear	3.96	3.44	-0.52	-13%	-3.11	-1.23
Totals		**27.69**	**-69.79**	**-97.48**	**-352%**	**-136.71**	**22.96**

Table 1. Change in net demand by subbasin in Alabama from 2010 to 2015, in MGD - Continued.

Industrial Net		Agriculture Net				Total Net			
Change from 2010	Percent Change	2010 Demand	2015 Demand	Change from 2010	Percent Change	2010 Demand	2015 Demand	Change from 2010	Percent Change
2.13	-100%	0.49	0.66	0.17	35%	6.72	3.89	-2.82	-42%
-0.19	-3%	8.82	10.25	1.43	16%	17.27	17.98	0.72	4%
13.94	180%	2.99	3.56	0.57	19%	6.57	20.82	14.24	217%
0.00	0%	1.38	0.92	-0.47	-34%	-0.24	-1.26	-1.02	426%
0.18	-100%	1.03	1.27	0.24	24%	-0.50	-0.08	0.42	-84%
0.00	0%	0.14	0.17	0.03	17%	0.14	0.17	0.03	17%
0.38	-100%	2.23	2.58	0.35	16%	-0.48	-0.42	0.06	-13%
0.00	0%	1.50	1.92	0.42	28%	-4.94	-3.19	1.75	-35%
0.81	-22%	10.21	7.91	-2.29	-22%	-5.69	-8.01	-2.32	41%
0.00	0%	3.97	4.99	1.02	26%	-2.80	-1.93	0.87	-31%
0.00	-36%	0.47	0.75	0.29	61%	0.47	0.76	0.28	60%
-0.55	-35%	1.79	1.94	0.15	8%	1.42	1.50	0.08	5%
-0.01	-16%	0.67	0.99	0.32	48%	0.31	0.72	0.41	134%
0.02	-60%	2.30	1.55	-0.75	-32%	0.34	-0.14	-0.48	-140%
-3.37	-308%	0.72	0.69	-0.03	-4%	-0.51	-3.60	-3.09	605%
0.08	-76%	0.25	0.28	0.02	9%	-2.77	-0.67	2.10	-76%
-0.01	-99%	3.59	3.96	0.36	10%	3.73	3.76	0.03	1%
12.53	-197%	18.66	11.83	-6.83	-37%	4.09	3.00	-1.09	-27%
0.66	-9%	3.63	3.97	0.34	9%	-4.63	-3.39	1.23	-27%
-0.02	-100%	0.66	0.40	-0.25	-39%	1.27	0.82	-0.44	-35%
0.13	-60%	1.98	1.49	-0.49	-25%	12.85	13.64	0.79	6%
0.58	152%	7.15	7.91	0.76	11%	25.32	22.77	-2.55	-10%
28.91	-123%	7.28	10.16	2.88	40%	-56.17	-22.20	33.97	-60%
0.74	-125%	8.27	7.27	-1.00	-12%	31.76	31.01	-0.74	-2%
0.54	-109%	16.18	6.64	-9.54	-59%	15.23	8.24	-7.00	-46%
6.99	-205%	0.72	1.11	0.39	55%	-3.77	3.90	7.67	-203%
0.00	-20%	0.10	0.11	0.02	20%	0.11	0.13	0.02	13%
-0.04	-99%	0.32	0.37	0.05	16%	0.83	0.61	-0.22	-26%
1.34	-86%	0.34	0.50	0.17	49%	-0.14	0.10	0.24	-172%
0.76	-307%	10.87	2.54	-8.33	-77%	9.83	2.06	-7.77	-79%
-0.34	-57%	1.04	2.00	0.96	92%	0.21	0.63	0.42	196%
1.84	-60%	1.04	2.96	1.92	185%	-2.01	1.75	3.76	-187%
-13.29	-24%	1.63	1.51	-0.12	-7%	95.39	79.51	-15.88	-17%
-0.01	-22%	1.61	1.50	-0.12	-7%	20.49	13.15	-7.35	-36%
4.02	-20%	2.82	2.96	0.13	5%	-47.31	-74.87	-27.56	58%
40.60	-57%	3.69	3.90	0.21	6%	-96.99	-45.37	51.62	-53%
8.17	-848%	25.06	11.11	-13.95	-56%	19.15	13.55	-5.60	-29%
-14.31	-111%	2.76	1.74	-1.02	-37%	13.32	-3.28	-16.60	-125%
0.14	13%	0.81	0.58	-0.23	-28%	0.76	0.41	-0.35	-46%
10.18	-64%	0.27	0.43	0.16	57%	-14.63	-8.14	6.48	-44%
2.68	-19%	3.07	2.66	-0.41	-13%	-55.87	-52.02	3.85	-7%
-0.34	11%	5.22	4.77	-0.46	-9%	-0.54	-1.91	-1.37	254%
0.00	0%	0.01	0.00	-0.01	-59%	0.01	0.00	-0.01	-59%
0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
0.00	0%	0.67	0.88	0.21	31%	70.54	53.23	-17.30	-25%
-0.07	19%	0.39	0.26	-0.13	-34%	-0.97	-1.74	-0.77	79%
0.00	0%	0.16	0.15	0.00	0%	0.16	0.15	0.00	-3%
38.84	-105%	3.68	3.90	0.22	6%	-13.08	19.17	32.25	-247%
14.85	-421%	11.14	13.06	1.91	17%	17.68	12.12	-5.56	-31%
0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
-0.34	-102%	1.56	2.35	0.79	50%	9.67	9.93	0.25	3%
-1.39	175%	4.63	4.44	-0.19	-4%	8.50	3.54	-4.96	-58%
1.88	-60%	1.06	1.28	0.22	20%	1.91	3.49	1.58	83%
159.66	**-117%**	**191.04**	**161.12**	**-29.91**	**-16%**	**82.02**	**114.29**	**32.27**	**39%**