OWR
Water Assessment Update

Tom Littlepage
ADECA Office of Water Resources

September 8, 2016

ADECA
building better alabama communities
Alabama Department of Economic and Community Affairs

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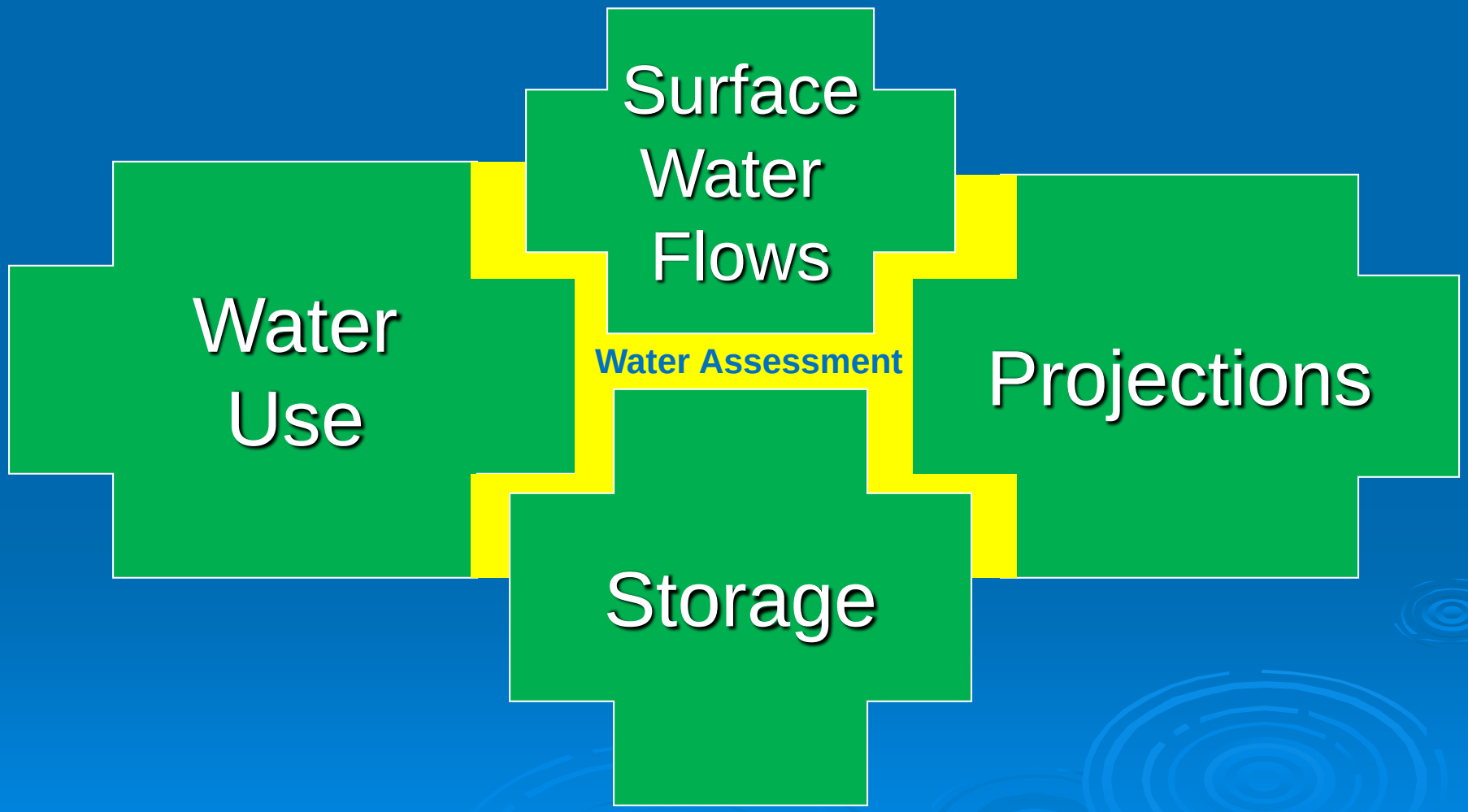
OWR Water Assessment



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OWR Toolbox

- OWR eWater System for Water Use Data (Withdrawals and Returns)
- Streamflow Analysis
- Frequency Analysis Tools
- Reservoir Operating Models
- GIS Tools
- Yield Analysis
- Instream Flow Models
- Off stream Storage Analysis Tools
- Drought Flow Models

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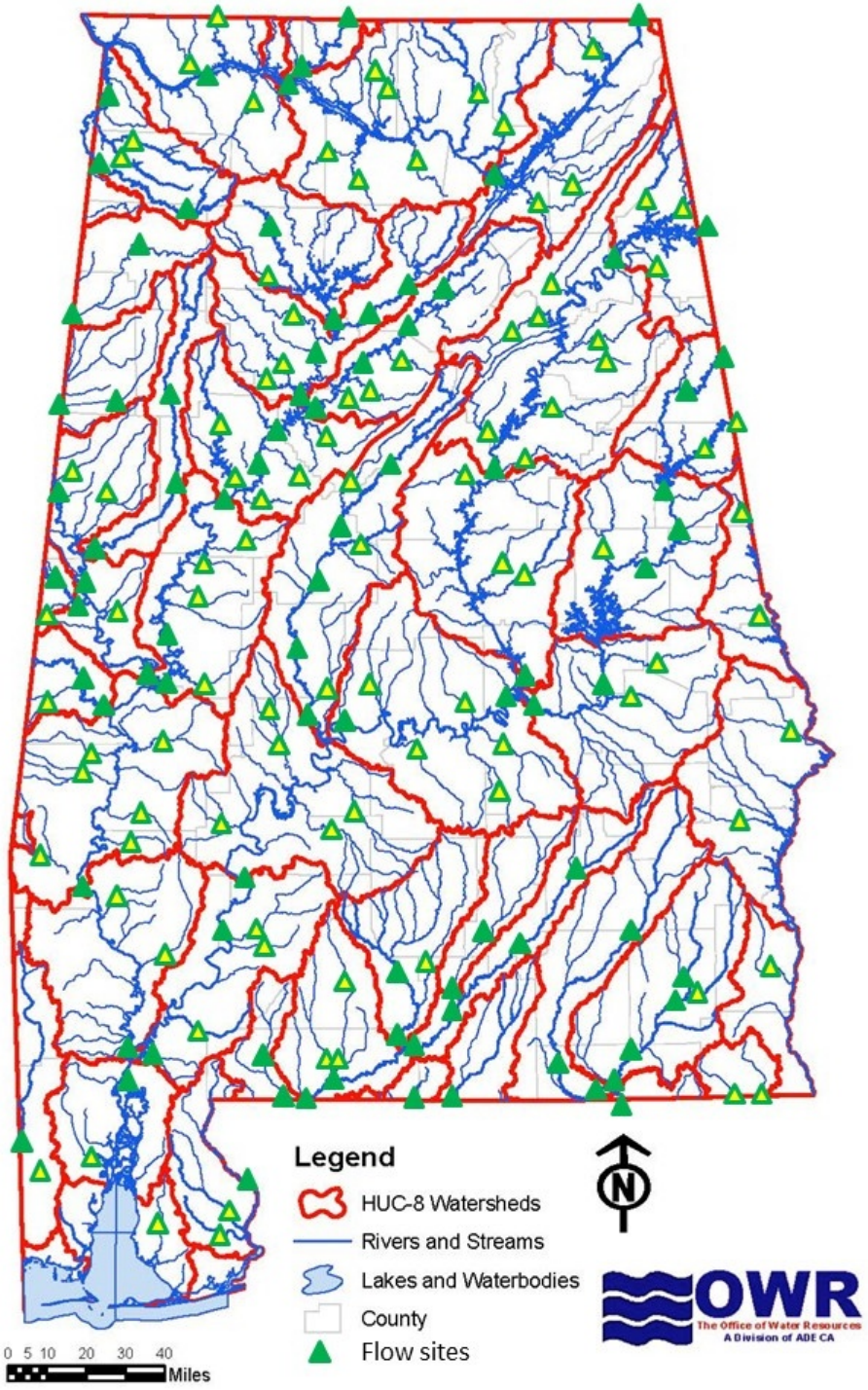

Streams and Watersheds in Alabama

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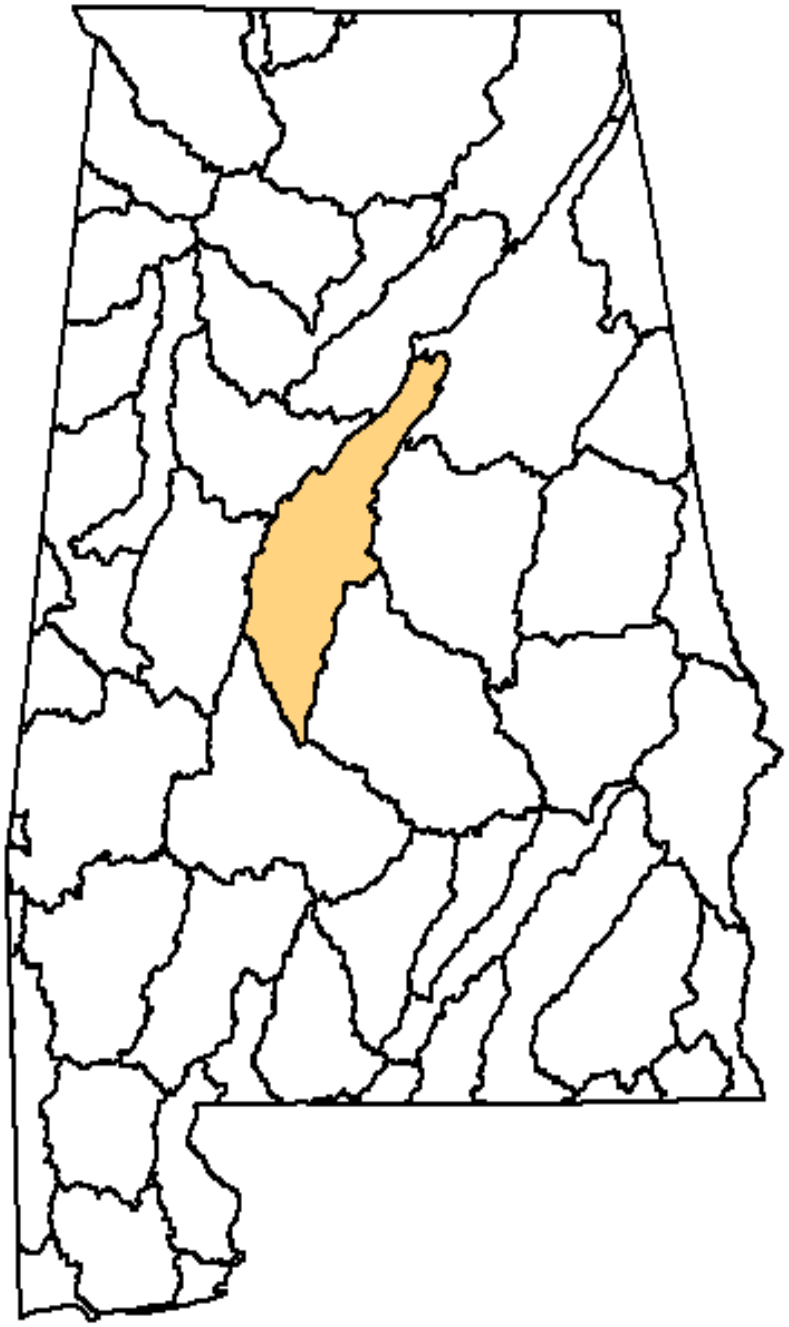

Sample HUC

03150202 (Cahaba)

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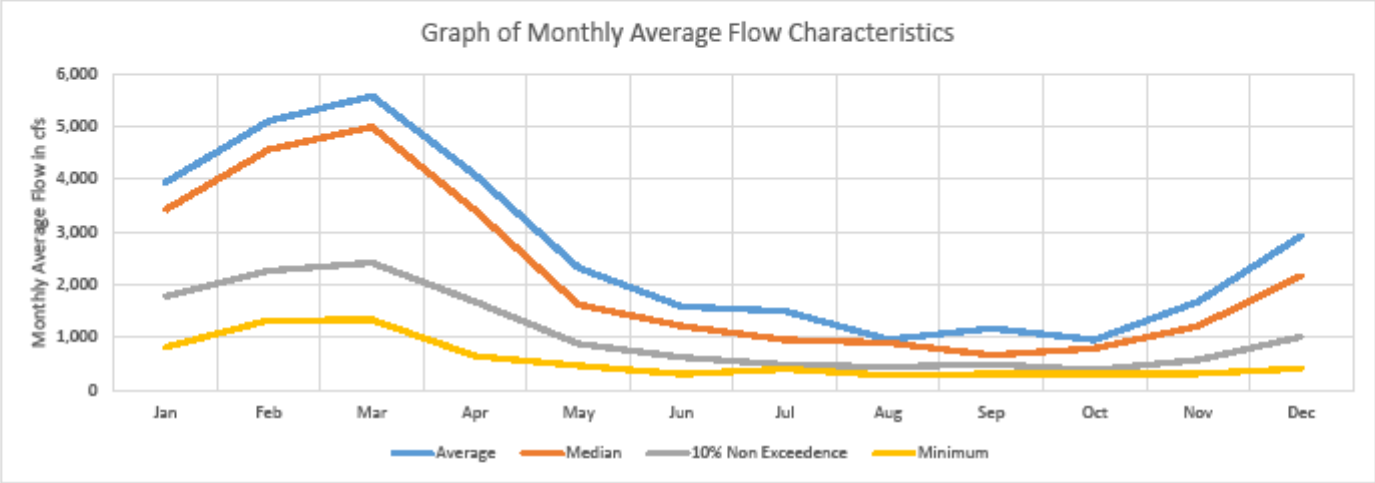
HUC Flow Summary – 03150202

Provisional Data

Gage #: Cahaba HUC Outlet Name: Cahaba HUC Outlet Monthly Analysis

Period of Record: Jan-1980 - Dec-2014 Observed Statistics of Monthly Average Flows



MONTHLY STATISTICS

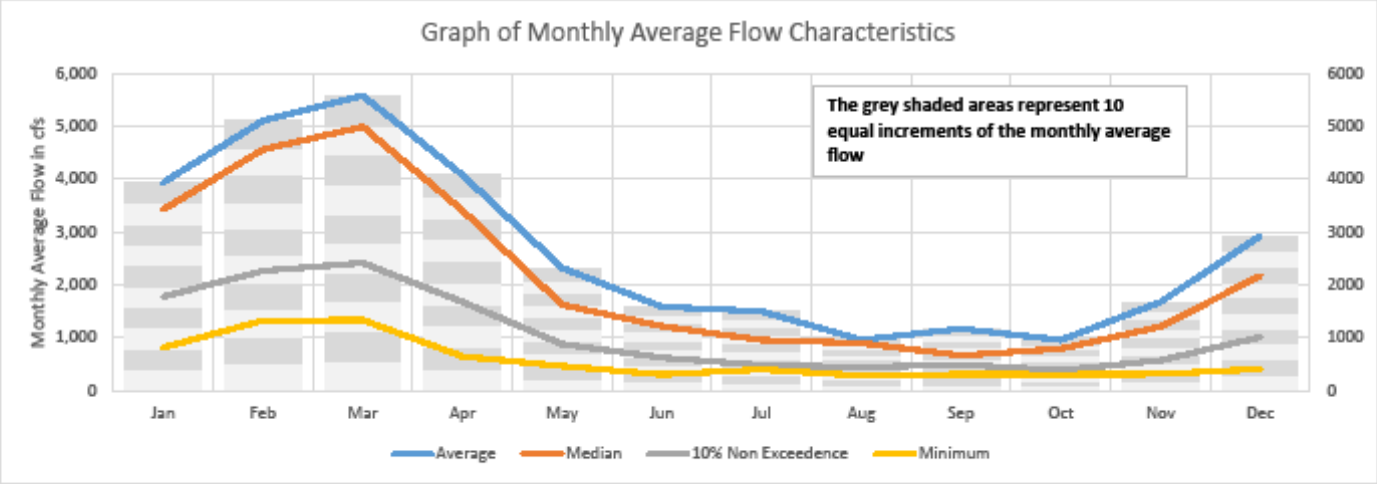
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	3,940	5,106	5,380	4,082	2,319	1,585	1,500	958	1,168	953	1,675	2,925
100%	10,450	15,960	14,970	12,330	9,466	5,504	6,661	2,348	6,530	4,446	6,445	10,360
98%	9,852	11,491	11,340	10,595	8,148	4,961	6,259	2,154	4,319	3,731	5,862	9,251
95%	8,849	8,886	9,136	9,202	6,793	4,497	5,727	1,984	3,151	2,233	4,611	8,027
90%	6,593	8,601	8,770	7,472	4,161	3,854	2,679	1,580	2,048	1,390	3,922	5,346
75%	5,348	6,126	7,488	5,056	2,405	1,736	1,520	1,156	1,288	967	1,615	3,796
50%	3,425	4,566	4,995	3,412	1,622	1,216	954	895	664	791	1,211	2,171
25%	2,319	3,243	3,369	2,383	1,118	695	693	545	538	565	789	1,464
10%	1,776	2,264	2,416	1,676	878	622	479	439	489	382	574	1,011
5%	963	1,527	1,436	1,360	802	448	431	398	441	331	436	824
2%	831	1,348	1,353	809	617	334	406	353	390	305	320	679
0%	816	1,324	1,333	645	461	304	399	278	305	302	313	408

HUC Flow Summary – 03150202

Provisional Data

Gage #: Cahaba HUC Outlet Name: Cahaba HUC Outlet Monthly Analysis

Period of Record: Jan-1980 - Dec-2014 Observed Statistics of Monthly Average Flows



MONTHLY STATISTICS

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Average	3,940	5,106	5,580	4,082	2,319	1,585	1,500	958	1,168	953	1,675	2,925
100%	10,450	15,960	14,970	12,330	9,466	5,504	6,661	2,348	6,530	4,446	6,445	10,360
98%	9,852	11,491	11,340	10,595	8,148	4,961	6,259	2,154	4,319	3,731	5,862	9,251
95%	8,849	8,886	9,136	9,202	6,793	4,497	5,727	1,984	3,151	2,233	4,611	8,027
90%	6,593	8,601	8,770	7,472	4,161	3,854	2,679	1,580	2,048	1,390	3,922	5,346
75%	5,348	6,126	7,488	5,056	2,405	1,736	1,520	1,156	1,288	967	1,615	3,796
50%	3,425	4,566	4,995	3,412	1,622	1,216	954	895	664	791	1,211	2,171
25%	2,319	3,243	3,569	2,383	1,118	695	693	545	538	565	789	1,464
10%	1,776	2,264	2,416	1,676	878	622	479	439	489	382	574	1,011
5%	963	1,527	1,456	1,360	802	448	431	398	441	331	436	824
2%	831	1,348	1,353	809	617	334	406	353	390	305	320	679
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HUC Flow Summary – 03150202

Provisional Data

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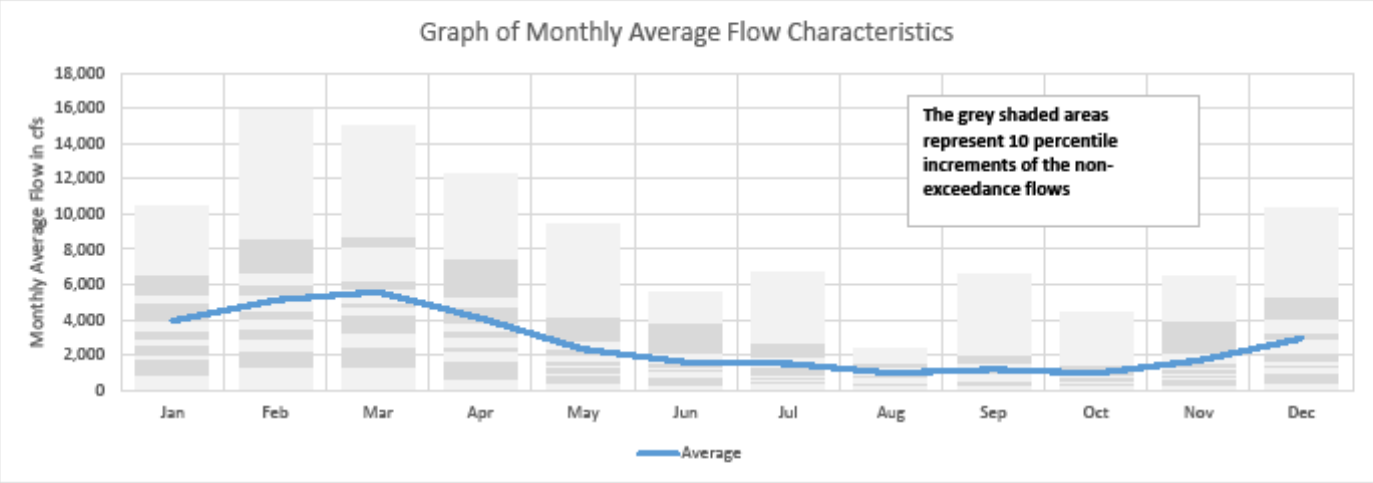


MONTHLY AVERAGE AND NON-EXCEEDANCE STATISTICS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	3,940	5,106	5,580	4,082	2,319	1,585	1,500	958	1,168	953	1,675	2,925
100%	10,450	15,960	14,970	12,330	9,466	5,504	6,661	2,348	6,530	4,446	6,445	10,360
90%	6,593	8,601	8,770	7,472	4,161	3,854	2,679	1,580	2,048	1,390	3,922	5,346
80%	5,412	6,677	8,204	5,269	2,810	2,082	1,899	1,337	1,535	984	2,150	4,090
70%	5,015	6,014	6,274	4,707	2,354	1,573	1,360	1,098	1,199	938	1,490	3,229
60%	3,941	5,373	5,727	3,878	2,058	1,308	1,000	1,012	981	863	1,360	2,917
50%	3,425	4,566	4,995	3,412	1,622	1,216	954	895	664	791	1,211	2,171
40%	2,864	4,063	4,706	3,009	1,466	1,046	810	728	600	693	978	1,652
30%	2,561	3,447	4,288	2,463	1,287	800	728	571	559	626	847	1,477
20%	2,050	2,863	3,241	2,209	955	651	622	526	520	523	758	1,342
10%	1,776	2,264	2,416	1,676	878	622	479	439	489	382	574	1,011
0%	816	1,324	1,333	645	461	304	399	278	305	302	313	408

HUC Flow Summary – 03150202

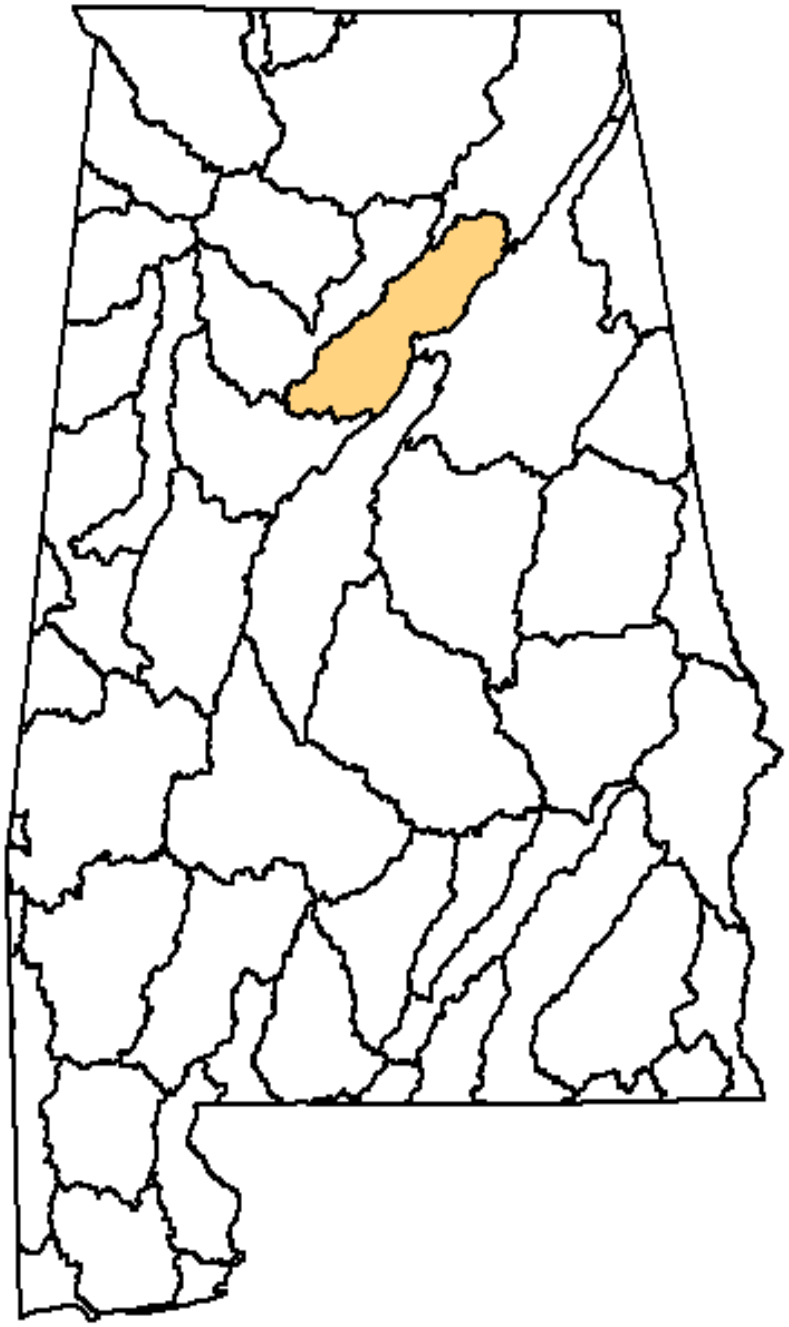
Provisional Data

Gage #: Cahaba HUC Outlet Name: Cahaba HUC Outlet

Period of Record: Jan-1980 - Dec-2014

Monthly Data (in cubic feet per second)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1980	4,432	4,102	14,970	9,779	4,274	1,441	903	716	606	1,212	1,196	936
1981	816	4,442	3,262	5,626	1,030	1,043	668	685	518	547	485	1,166
1982	5,378	7,577	3,609	6,280	2,403	1,790	1,182	1,142	520	630	950	7,726
1983	3,605	9,388	7,557	12,330	6,478	2,303	1,478	873	979	737	2,704	10,360
1984	5,673	3,333	4,327	4,693	3,991	1,080	976	1,525	659	1,234	1,452	2,943
1985	1,752	6,521	3,155	1,979	1,488	802	1,404	1,355	584	888	997	1,644
1986	1,016	1,598	1,496	645	878	621	462	450	519	632	3,609	4,089
1987	7,020	4,566	6,193	2,472	1,275	1,286	1,013	449	551	341	550	807
1988	2,880	2,534	1,363	1,563	690	348	636	388	1,218	791	2,011	1,470
1989	4,143	2,265	6,294	5,008	1,348	4,167	6,070	1,007	849	954	1,656	3,216
1990	9,570	15,960	8,629	2,943	2,337	1,048	965	556	445	468	636	1,458
1991	2,081	5,909	4,995	3,412	7,528	3,385	1,861	895	984	625	1,211	1,657
1992	2,751	5,057	3,142	2,241	878	701	722	1,169	2,010	680	4,131	5,122
1993	8,540	3,880	4,415	3,138	2,252	903	753	938	757	527	1,500	1,720
1994	2,796	4,243	6,059	4,710	1,433	1,245	2,445	1,029	1,306	1,736	1,237	3,565
1995	2,939	6,137	7,419	3,249	1,540	800	567	531	591	3,394	4,192	4,027
1996	5,549	8,619	8,924	3,783	1,590	1,292	1,561	1,332	1,007	982	1,334	2,171
1997	5,371	4,577	6,169	3,053	1,877	4,407	2,408	1,114	664	979	1,450	3,232
1998	10,450	8,574	8,127	3,922	1,639	1,216	1,101	1,019	1,270	867	1,072	1,522
1999	3,602	6,039	4,989	2,465	1,205	2,246	2,835	610	473	860	808	1,123
2000	2,159	1,324	4,538	6,621	850	654	410	510	305	302	838	831
2001	1,811	3,426	9,632	5,180	937	2,041	799	981	3,279	809	726	2,970
2002	5,161	3,531	3,529	1,830	1,334	637	866	433	1,640	1,494	3,079	5,496
2003	2,478	6,115	5,496	5,103	9,466	5,504	5,580	2,348	1,125	950	1,574	1,472
2004	2,514	5,847	2,619	2,082	1,622	1,068	991	736	3,096	871	5,588	4,242
2005	1,925	4,979	5,265	8,040	1,944	4,706	6,661	2,062	1,527	831	917	1,967
2006	3,874	5,913	4,818	2,334	2,406	625	535	561	525	701	1,399	1,347
2007	3,380	2,264	1,333	887	461	304	440	278	430	306	323	408
2008	838	2,937	2,281	2,432	2,228	688	399	1,453	566	343	313	1,495
2009	3,425	1,360	8,851	4,523	3,835	1,331	954	1,033	6,530	4,446	6,445	8,729
2010	5,952	7,300	8,513	2,462	2,358	1,606	762	853	513	506	886	1,322
2011	1,821	2,565	8,649	3,849	959	634	718	402	1,565	441	765	2,301
2012	4,042	3,153	5,505	1,573	886	491	504	1,617	2,073	990	610	2,900
2013	5,324	8,671	4,278	3,726	2,972	1,385	2,049	1,950	657	584	769	4,095
2014	2,841	4,005	4,900	8,955	2,769	1,682	817	535	557	702	1,228	2,839



Sample HUC

03160111 (Locust Fork)

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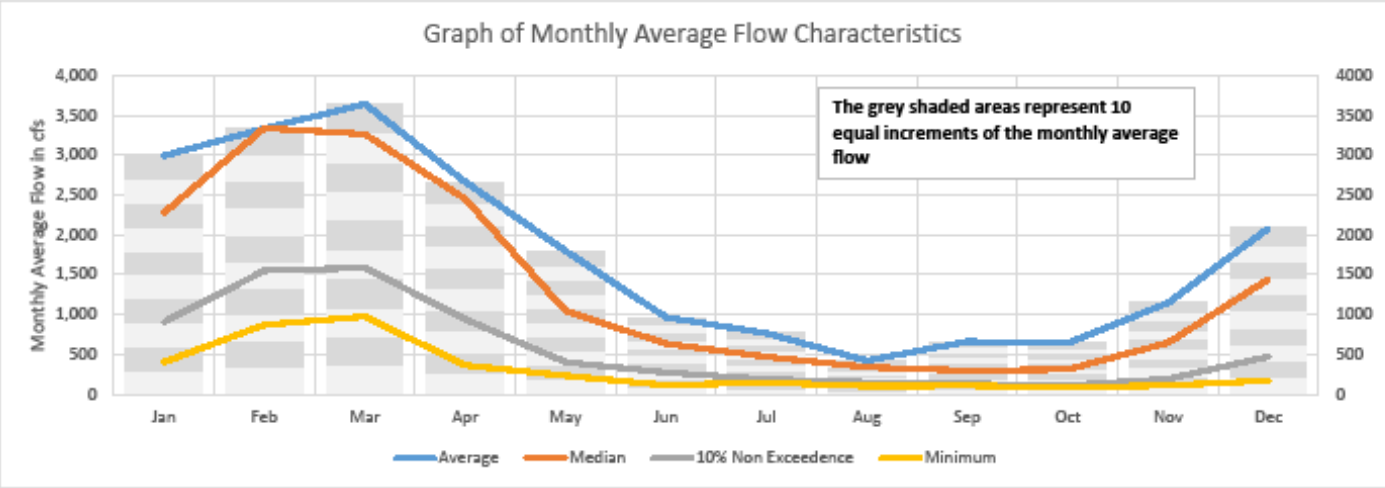
HUC Flow Summary – 03160111

Provisional Data

Gage #: Locust Fork Outlet Name: Locust Fork Outlet Monthly Analysis

Period of Record: Jan-1980 - Dec-2014 Observed Statistics of Monthly Average Flows



MONTHLY STATISTICS

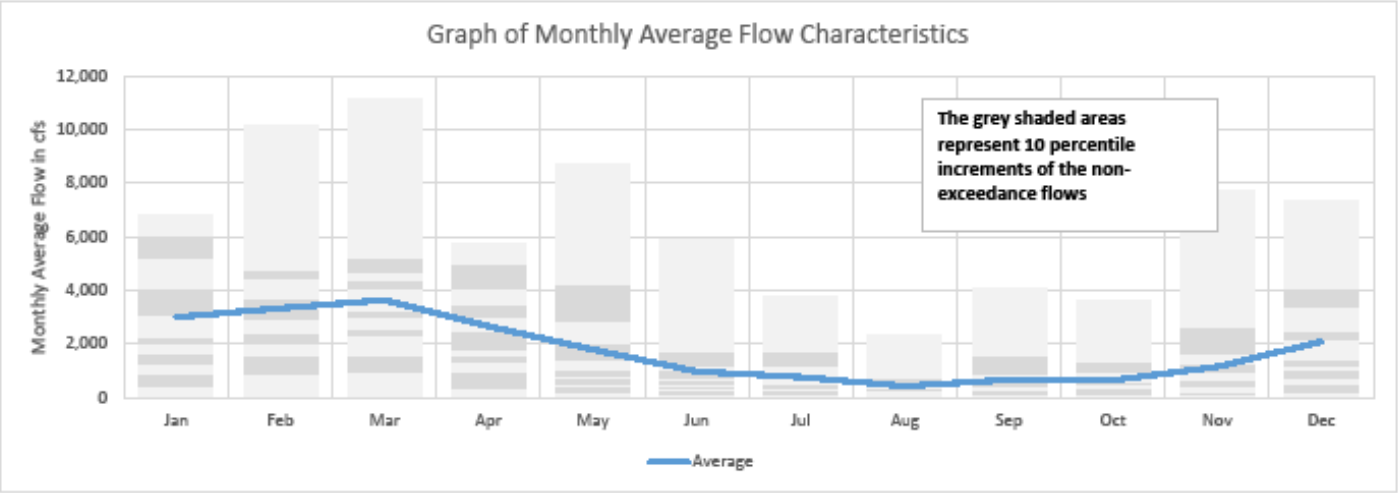
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	2,993	3,333	3,638	2,662	1,796	967	765	422	661	639	1,147	2,083
100%	6,800	10,194	11,178	5,713	8,741	5,875	3,796	2,321	4,076	3,623	7,705	7,380
98%	6,623	7,241	8,429	5,695	6,531	4,676	2,848	1,428	3,152	3,583	4,622	6,268
95%	6,332	5,649	6,018	5,578	4,931	2,614	2,072	882	2,255	2,163	3,093	5,027
90%	6,026	4,787	5,184	5,004	4,260	1,689	1,692	719	1,598	1,316	2,647	4,096
75%	4,358	4,110	4,530	3,875	2,460	1,128	1,029	493	778	664	1,357	3,047
50%	2,276	3,337	3,261	2,451	1,045	635	470	339	297	310	645	1,443
25%	1,368	2,177	2,430	1,479	602	368	244	193	168	158	276	961
10%	904	1,551	1,586	941	402	271	187	150	133	109	192	472
5%	735	1,343	1,106	644	377	209	175	130	124	104	166	323
2%	462	1,087	985	519	307	119	164	113	116	97	137	235
0%	402	872	976	364	231	115	147	102	108	85	111	171

HUC Flow Summary – 03160111

Provisional Data

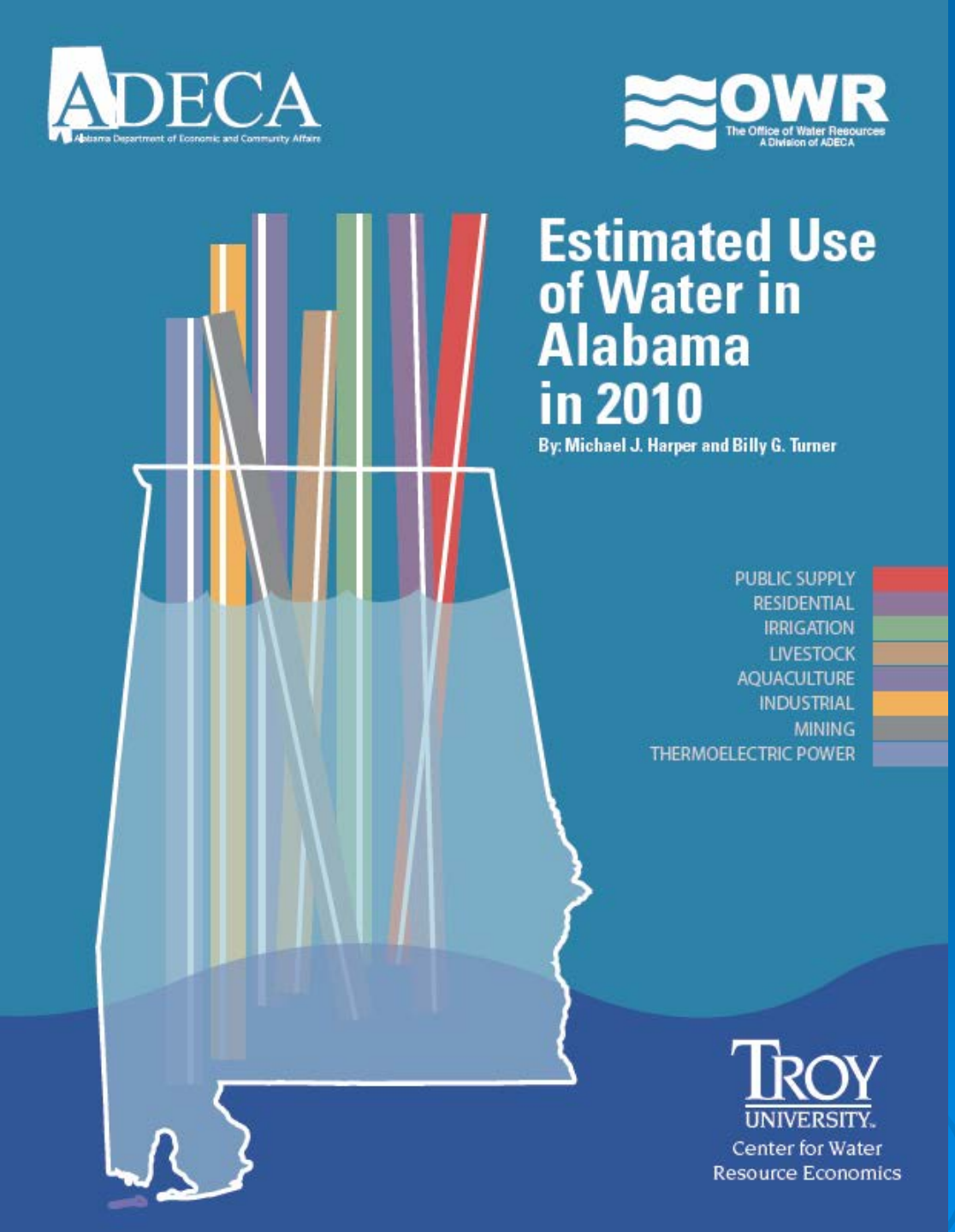
Gage #: Locust Fork Outlet Name: Locust Fork Outlet Monthly Analysis

Period of Record: Jan-1980 - Dec-2014 Observed Statistics of Monthly Average Flows



MONTHLY AVERAGE AND NON-EXCEEDANCE STATISTICS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	2,993	3,333	3,638	2,662	1,796	967	765	422	661	639	1,147	2,083
100%	6,800	10,194	11,178	5,713	8,741	5,875	3,796	2,321	4,076	3,623	7,705	7,380
90%	6,026	4,787	5,184	5,004	4,260	1,689	1,692	719	1,598	1,316	2,647	4,096
80%	5,221	4,450	4,666	4,068	2,830	1,179	1,163	507	879	979	1,649	3,349
70%	4,069	3,670	4,407	3,491	2,030	1,057	810	485	619	579	1,259	2,463
60%	3,072	3,415	4,057	2,990	1,403	748	706	394	457	475	972	2,191
50%	2,276	3,337	3,261	2,451	1,045	635	470	339	297	310	645	1,443
40%	2,015	2,895	3,015	1,788	824	481	317	255	229	201	461	1,216
30%	1,605	2,370	2,540	1,532	717	402	285	214	192	176	292	1,050
20%	1,256	1,990	2,315	1,296	490	343	227	166	153	142	251	719
10%	904	1,551	1,586	941	402	271	187	150	133	109	192	472
0%	402	872	976	364	231	115	147	102	108	85	111	171



Estimated Use of Water in Alabama in 2010

The Office of Water Resources
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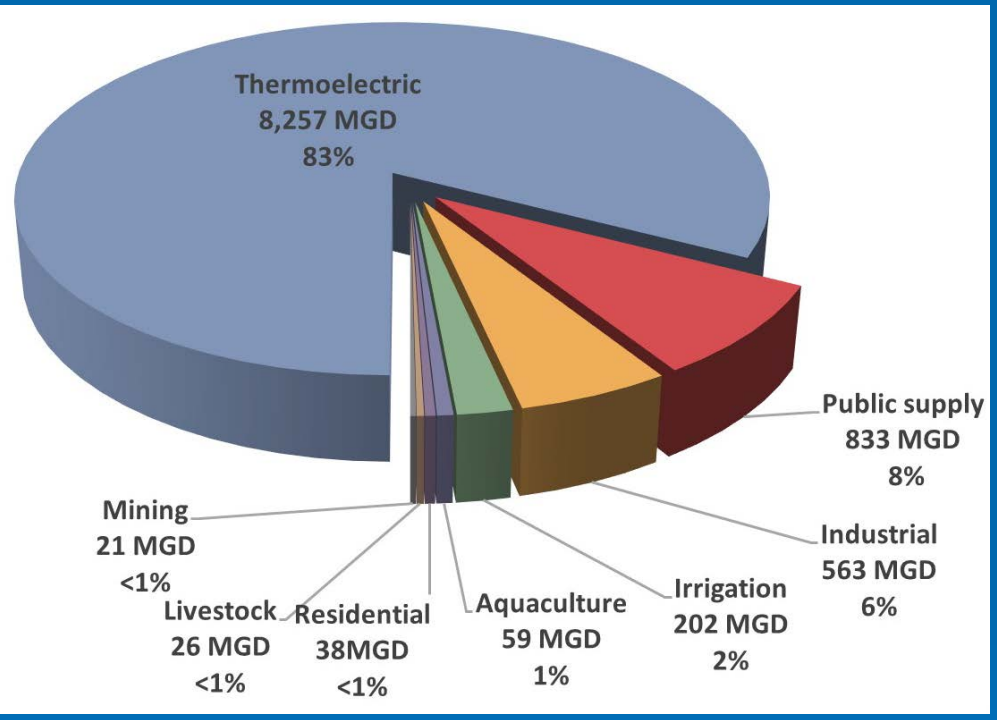
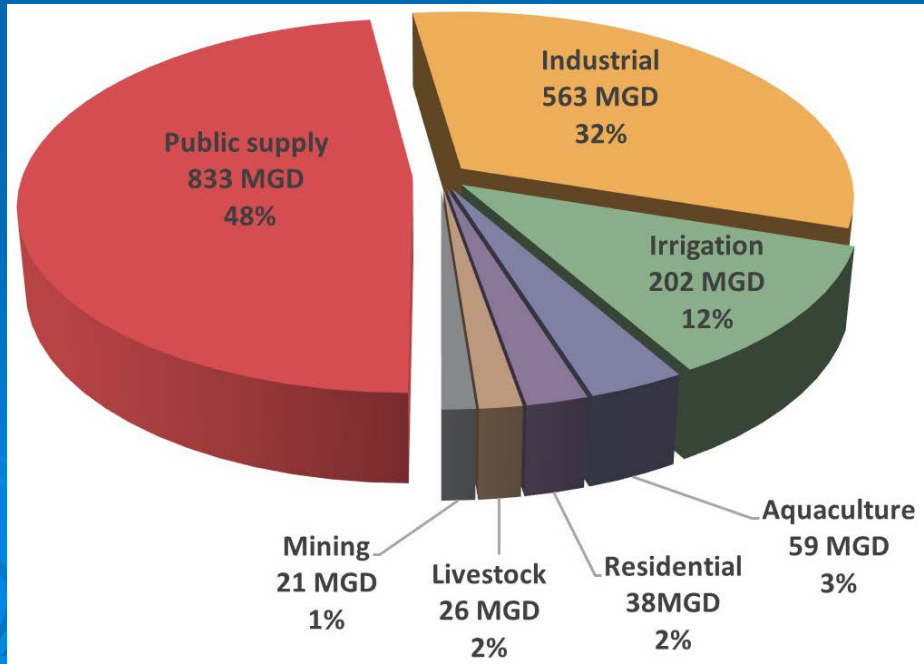
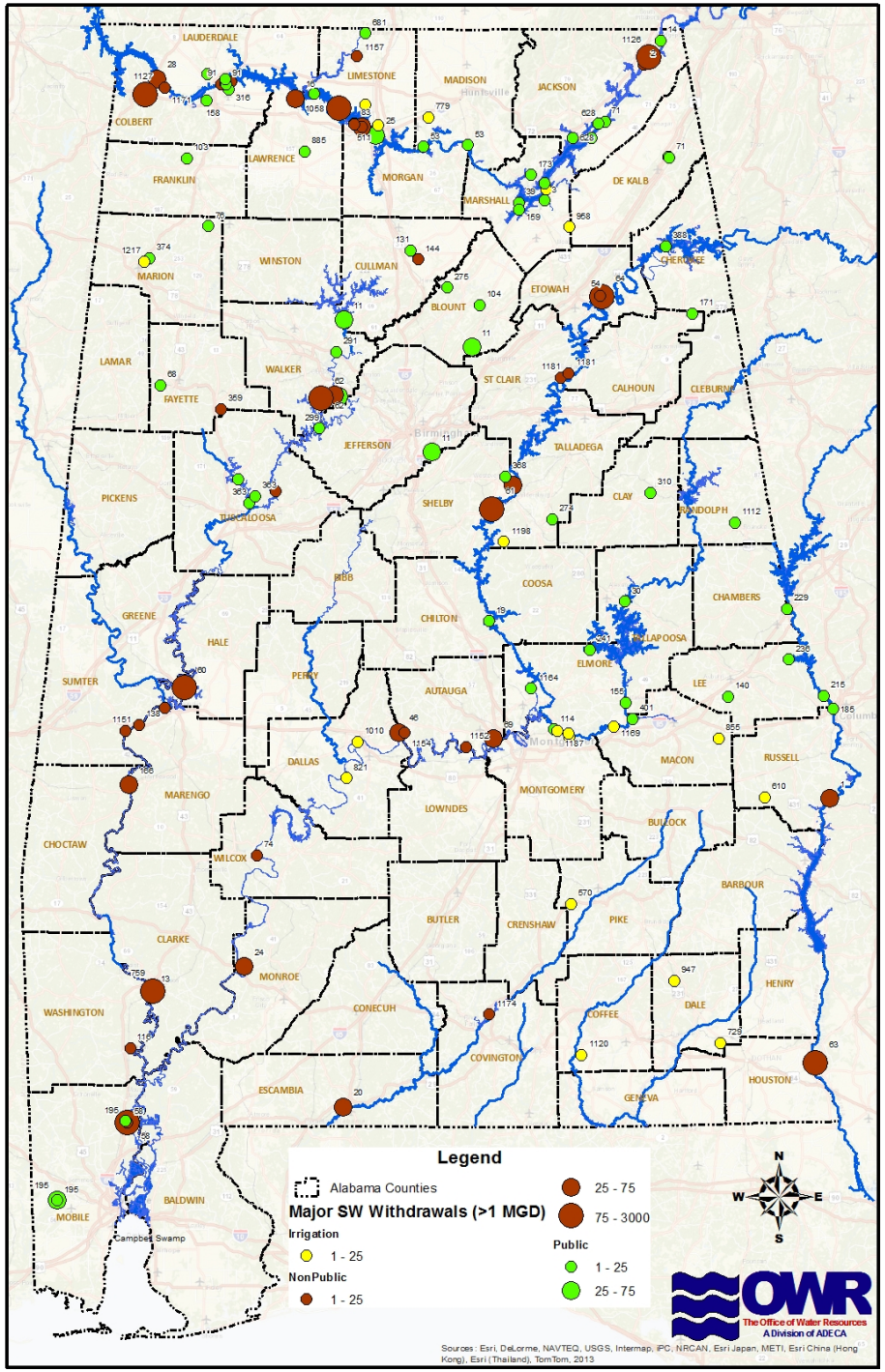
Total 2010 Water Withdrawals (By Water Use Sectors)



With Thermoelectric withdrawals

Without Thermoelectric withdrawals





Where do we withdraw water?

Regulated rivers and waterways

Why?

Reliability and certainty

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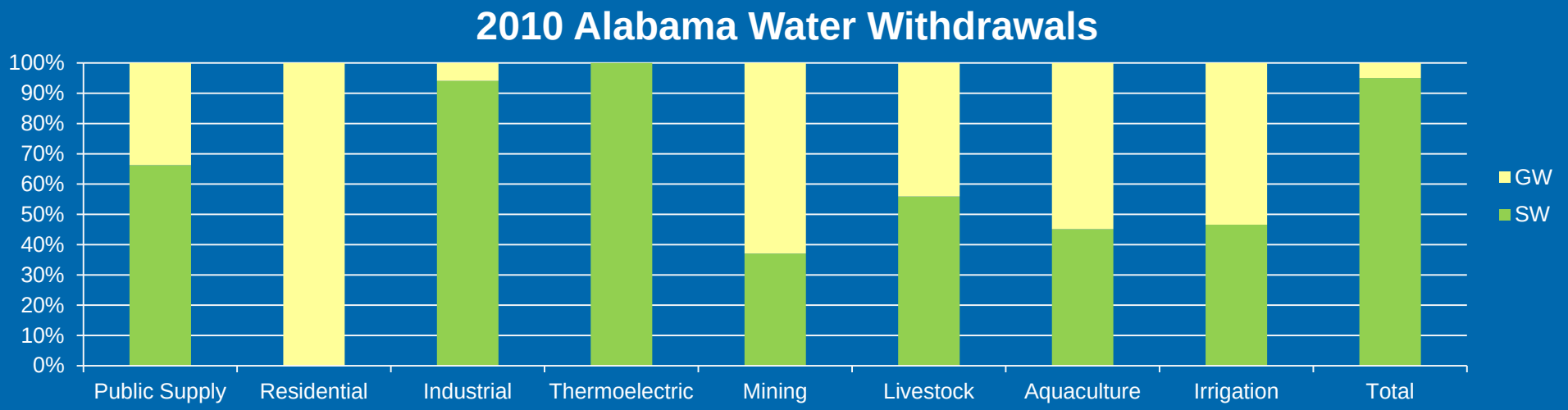
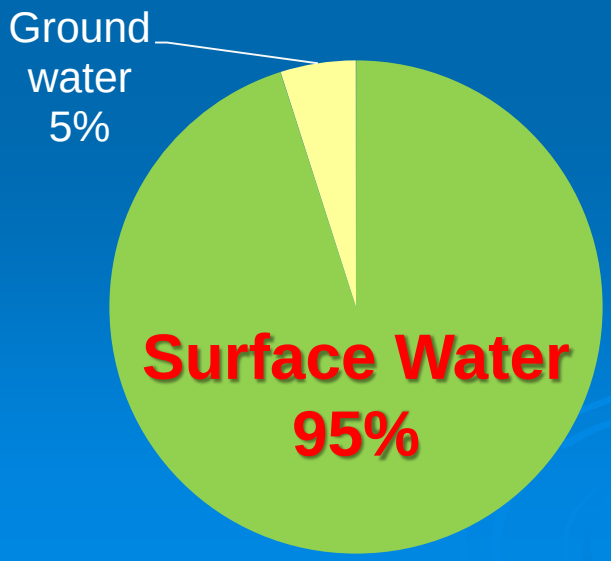
Where do we get water?





Average Usage:
Approximately 10 billion gallons/day

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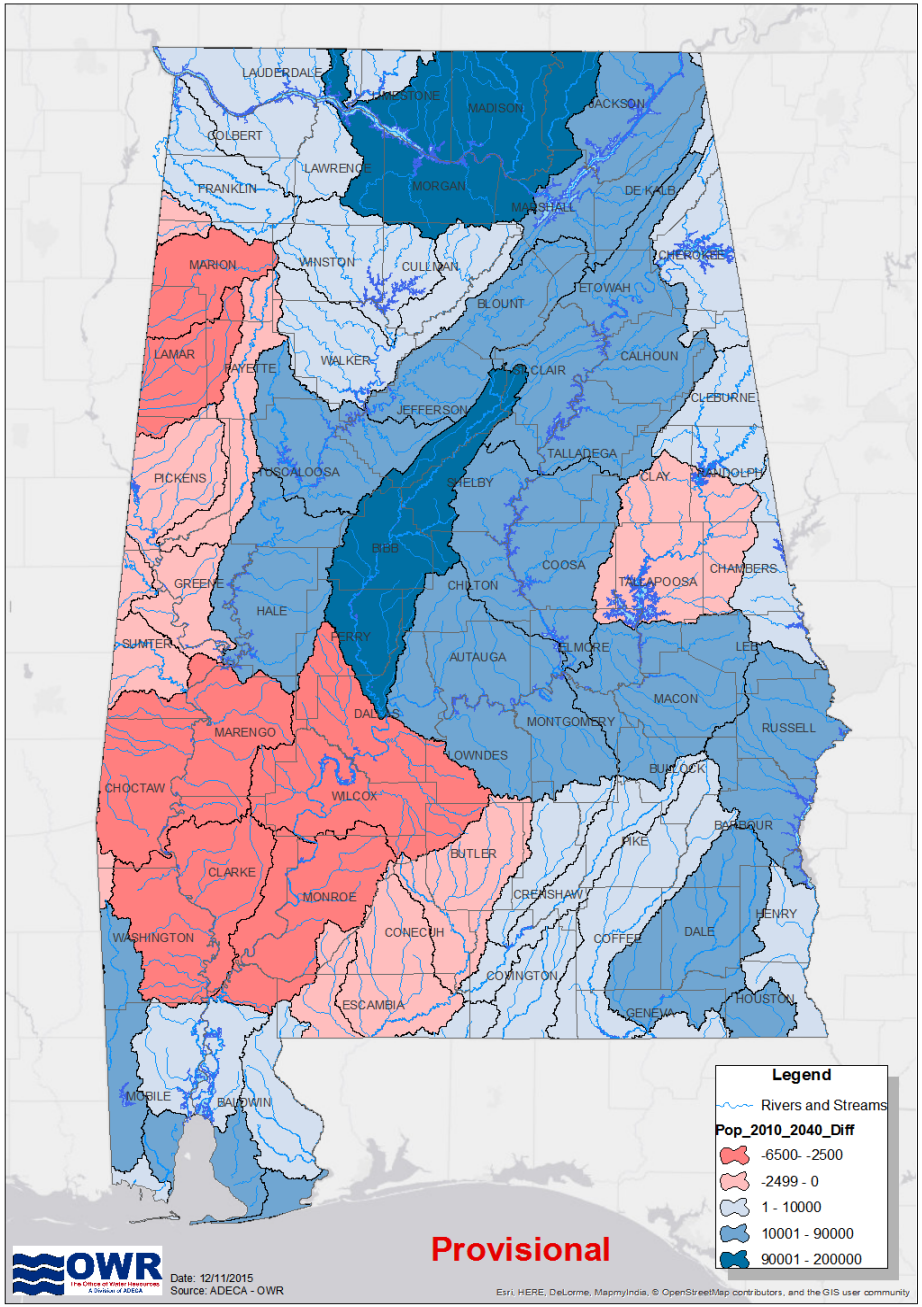
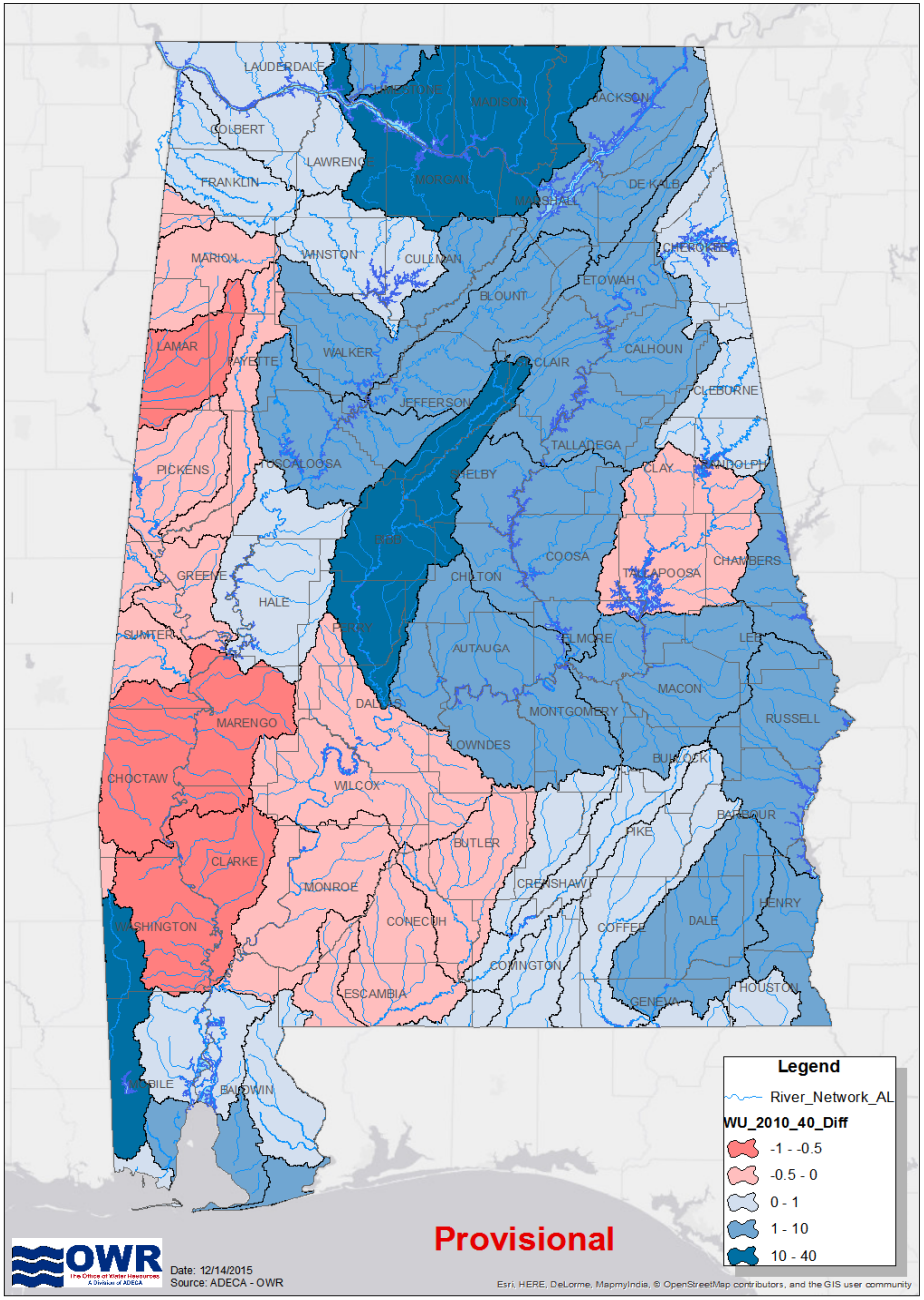
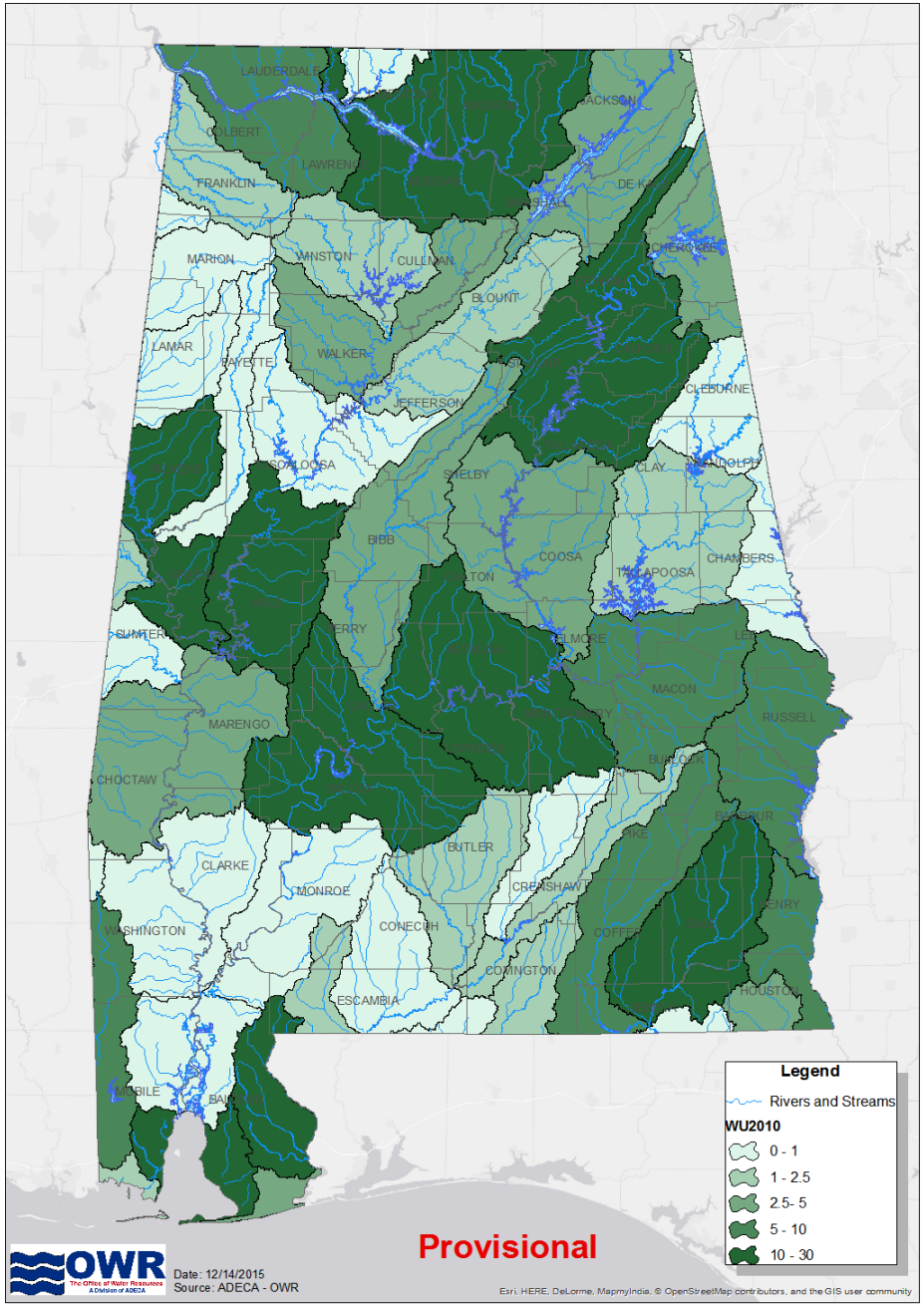
2010-2040 Difference HUC-8 Population Estimate



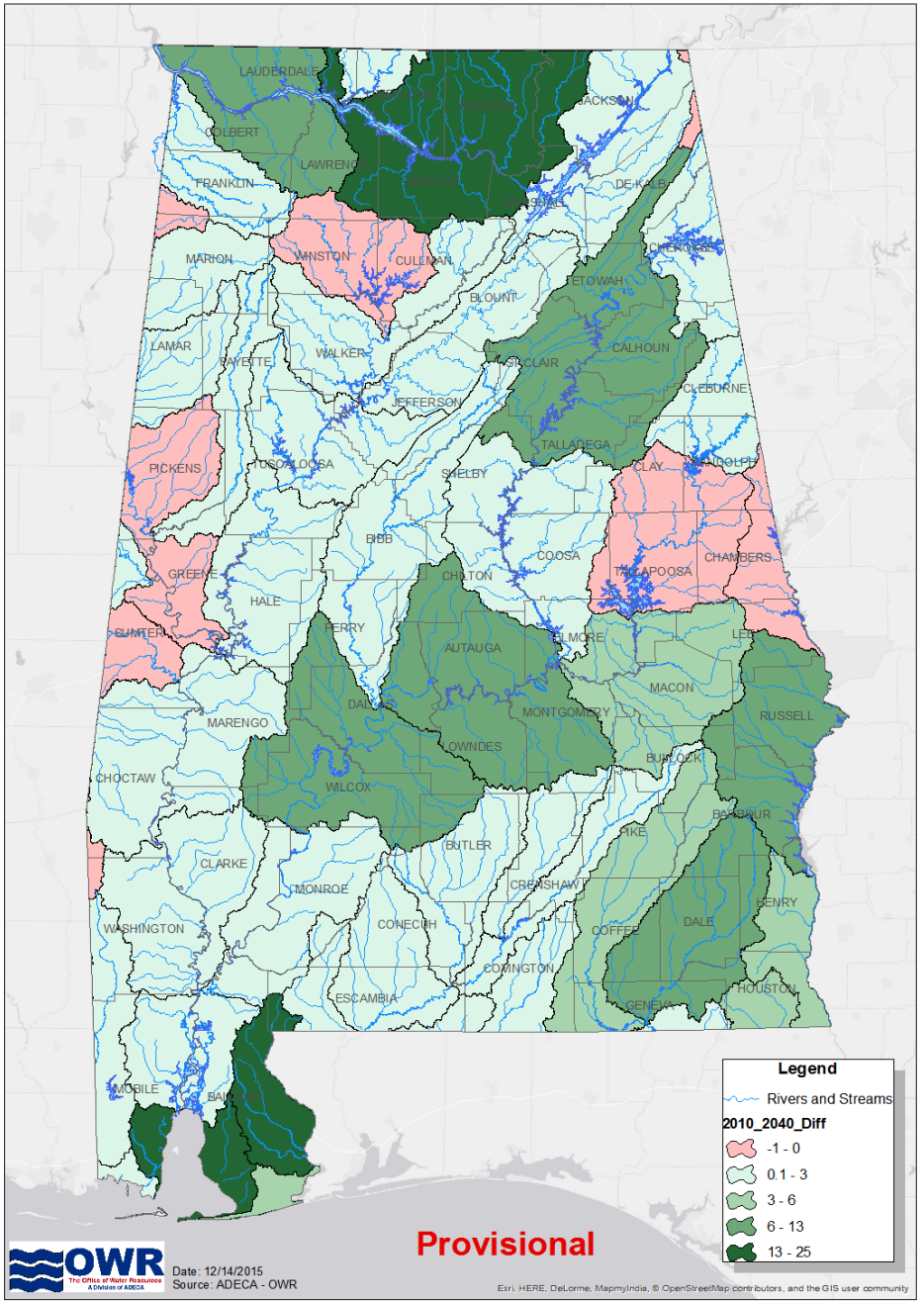
2010-2040 PWS Water Use Difference Estimate (by HUC-8) In MGD



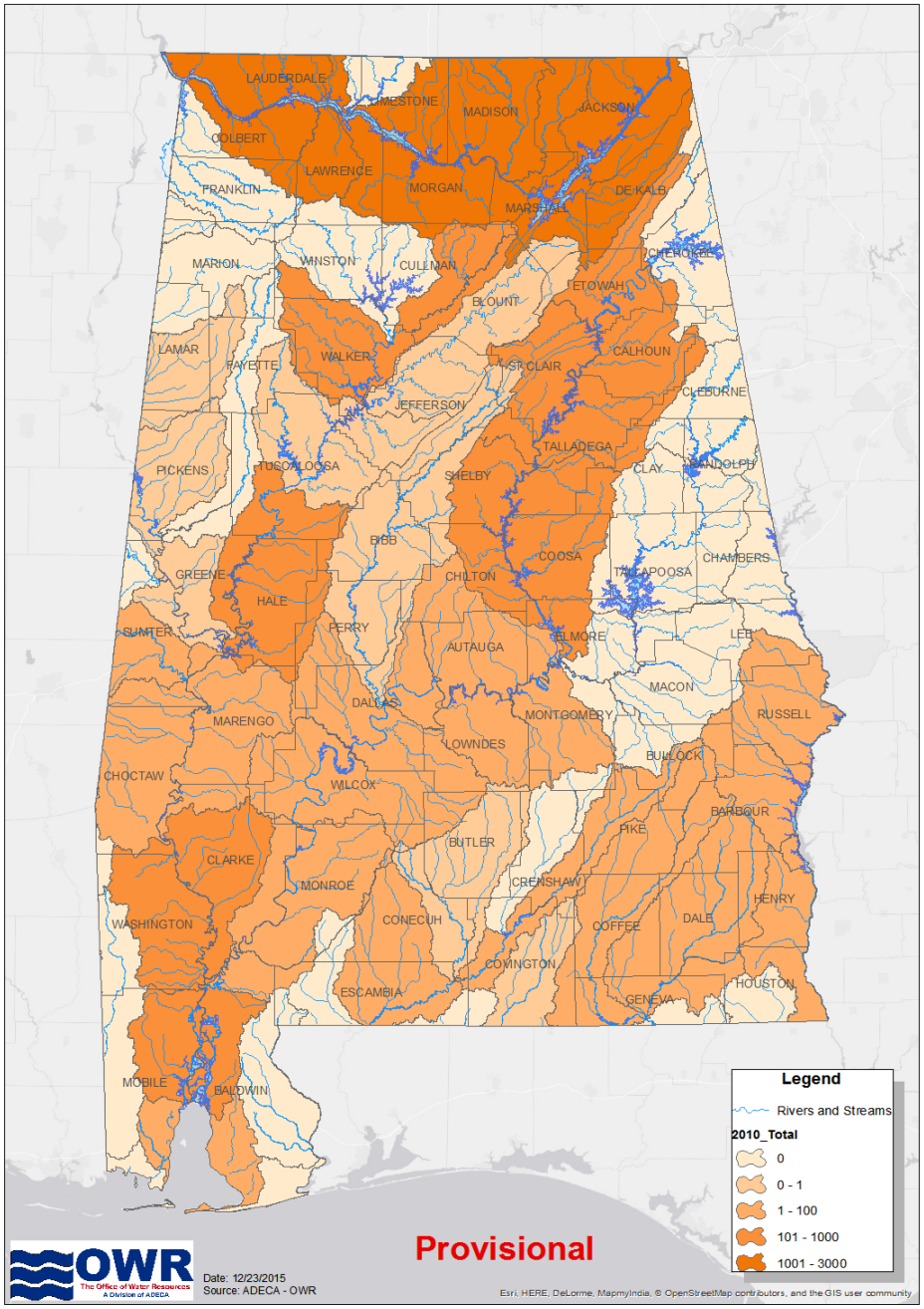
2010 Agricultural Water Use Estimate (by HUC) In MGD



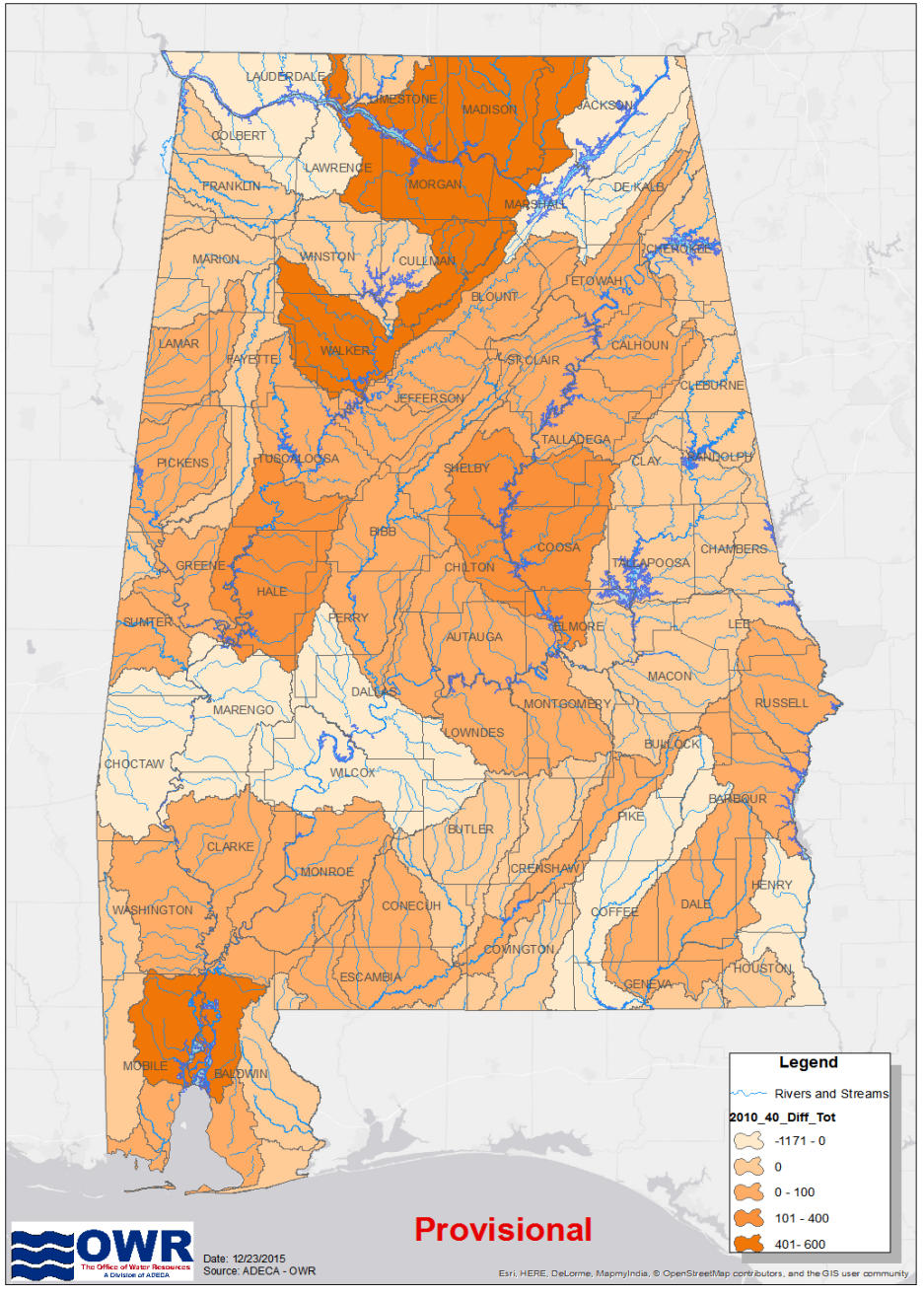
2010-2040 Agricultural Water Use Estimate (by HUC) In MGD

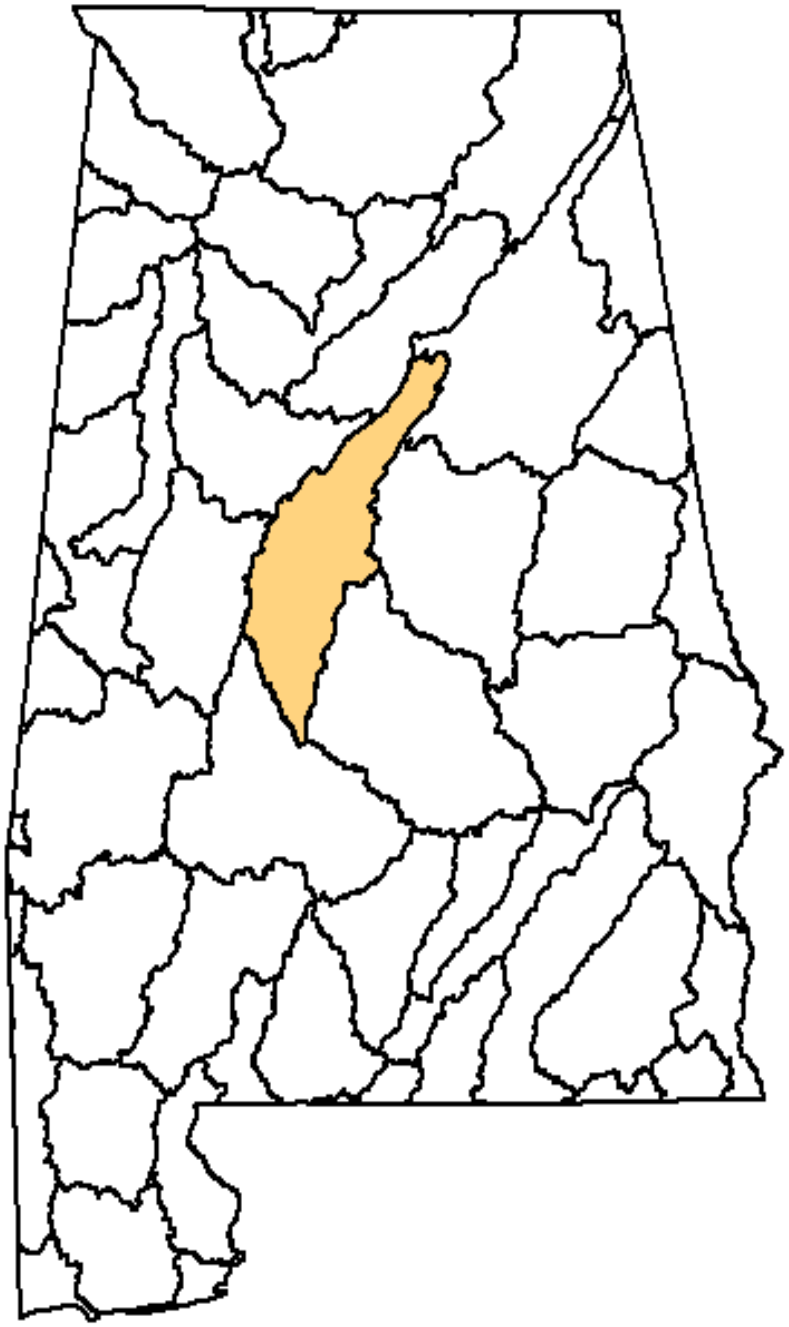


2010 Alabama Industrial Water Use Estimates (By HUC-8)



Alabama Industrial Water Use 2010-2040 Difference Estimate (By HUC-8)





Sample HUC

03150202 (Cahaba)

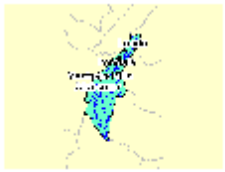
The Office of Water Resources
A Division of ADECA

HUC 03150202 (Cahaba) Demands Summary

03150202-Cahaba

Area (Thousand Acres)	1,166,492
Estimated Population (2010)	539,356
River Basin	Cahaba

PROVISIONAL DATA



Withdrawals

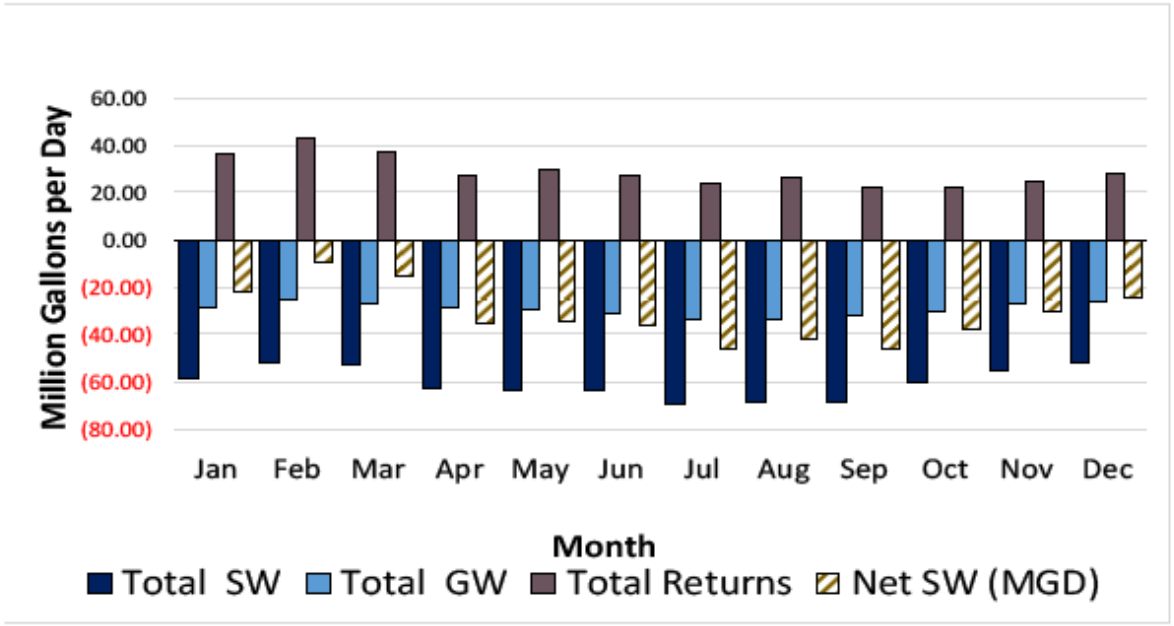
Category		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Public Supply	GW	(26.94)	(24.27)	(25.22)	(26.44)	(27.62)	(28.81)	(30.28)	(30.52)	(30.24)	(28.80)	(25.39)	(25.01)
Public Supply	SW	(55.04)	(49.33)	(47.81)	(53.94)	(53.84)	(51.32)	(55.36)	(55.58)	(55.91)	(51.17)	(49.62)	(49.45)
Industrial/Mining	GW	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)	(1.10)
Industrial/Mining	SW	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)	(0.26)
Thermoelectric	SW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture	GW	(0.24)	(0.28)	(0.38)	(0.67)	(1.04)	(1.64)	(1.83)	(1.38)	(0.93)	(0.66)	(0.34)	(0.25)
Agriculture	SW	(2.71)	(2.95)	(4.50)	(8.26)	(9.69)	(11.97)	(13.95)	(12.84)	(12.57)	(9.28)	(5.06)	(2.71)
Total	**SW**	**(58.01)**	**(52.53)**	**(52.57)**	**(62.46)**	**(63.79)**	**(63.55)**	**(69.57)**	**(68.68)**	**(68.74)**	**(60.71)**	**(54.94)**	**(52.42)**
Total	**GW**	**(28.27)**	**(25.65)**	**(26.70)**	**(28.21)**	**(29.76)**	**(31.54)**	**(33.21)**	**(32.99)**	**(32.27)**	**(30.56)**	**(26.83)**	**(26.36)**

Returns

Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Public Supply	36.14	42.04	35.67	27.46	27.48	27.25	22.84	24.92	22.73	21.77	24.57	26.52
Industrial/Mining	0.20	0.78	1.56	0.02	1.98	0.03	0.90	1.98	0.03	0.95	0.15	1.65
Thermoelectric	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Returns	36.34	42.82	37.23	27.48	29.45	27.27	23.74	26.90	22.76	22.72	24.73	28.16

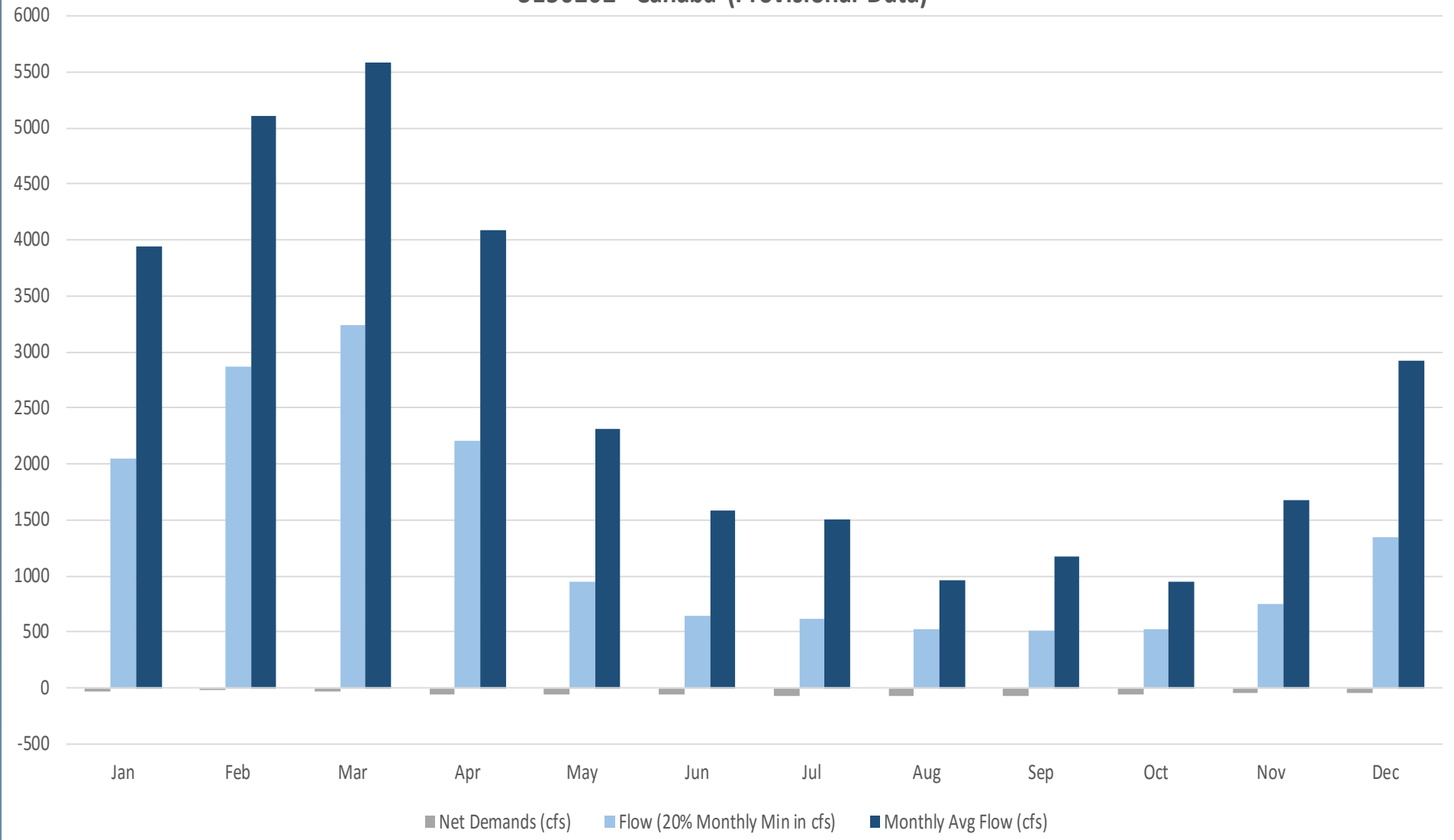
HUC 03150202 (Cahaba) Demands Summary

03150202-Cahaba												PROVISIONAL DATA
Total	SW	(58.01)	(52.53)	(52.57)	(62.46)	(63.79)	(63.55)	(69.57)	(68.68)	(68.74)	(60.71)	(54.94)	(52.42)
Total	GW	(28.27)	(25.65)	(26.70)	(28.21)	(29.76)	(31.54)	(33.21)	(32.99)	(32.27)	(30.56)	(26.83)	(26.36)
Withdrawal Total		(86.28)	(78.18)	(79.27)	(90.66)	(93.54)	(95.09)	(102.77)	(101.67)	(101.01)	(91.27)	(81.77)	(78.78)
Total Return		36.34	42.82	37.23	27.48	29.45	27.27	23.74	26.90	22.76	22.72	24.73	28.16
Net SW (MGD)		(21.67)	(9.71)	(15.34)	(34.98)	(34.33)	(36.27)	(45.83)	(41.78)	(45.98)	(37.99)	(30.21)	(24.26)

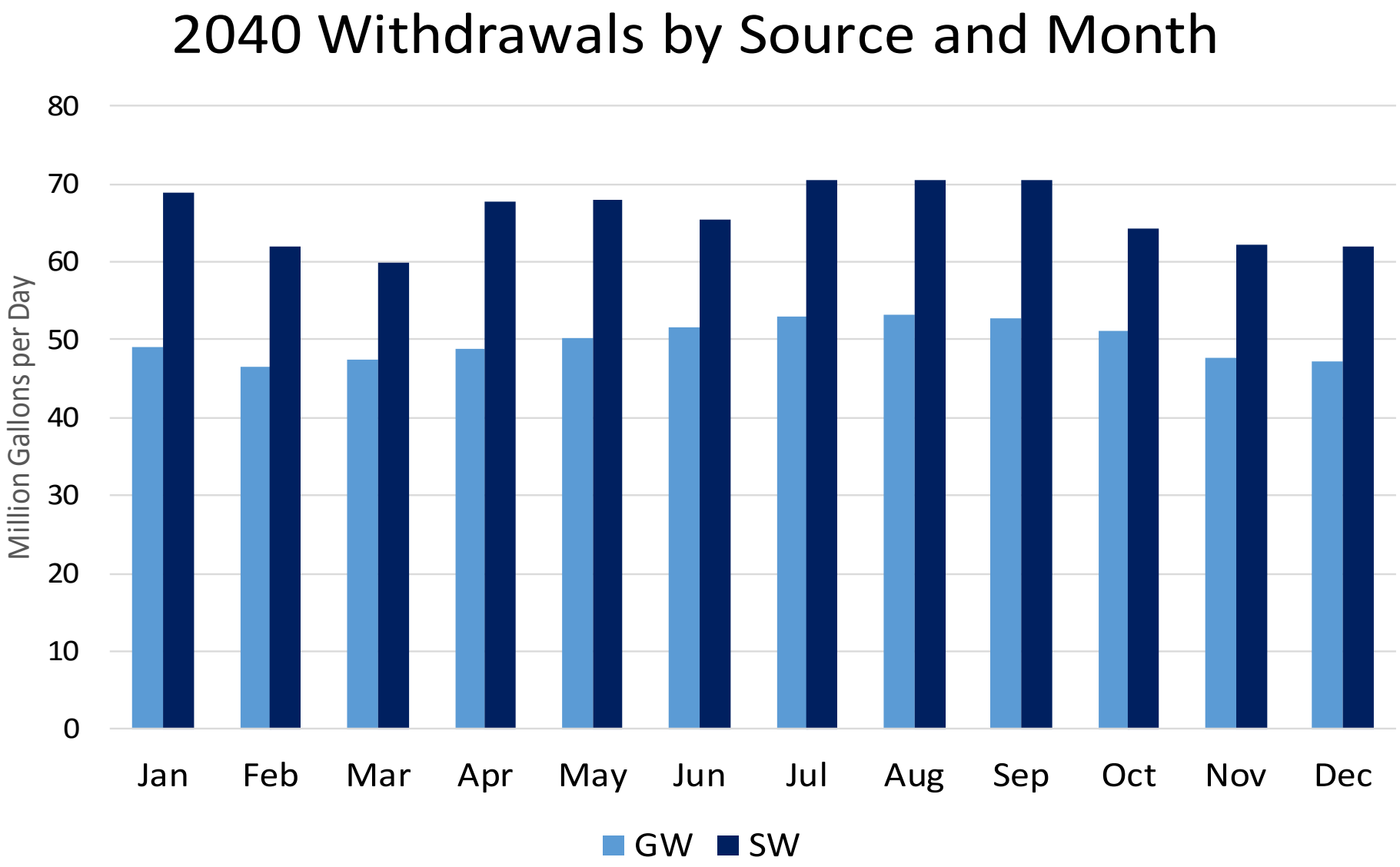


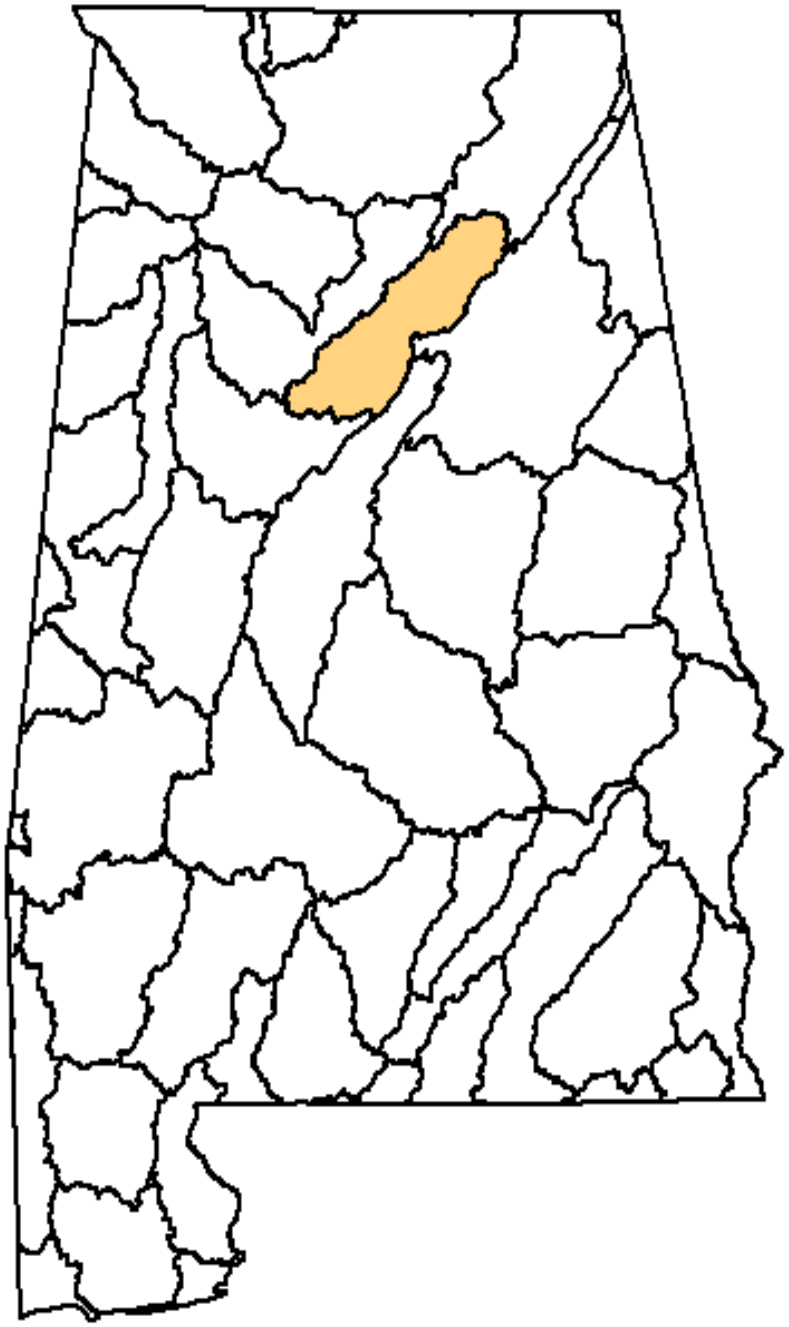
HUC Summary – 03150202 (Cahaba)
Plot of Net Demands vs. Monthly Flows (Average and 20%)

Provisional Data



HUC 03150202 - Cahaba





Sample HUC

03160111 (Locust Fork)

The Office of Water Resources
A Division of ADECA

HUC 03160111 (Locust Fork) Demands Summary

03160111-Locust Fork

Area (Thousand Acres)	773,785
Estimated Population (2010)	390,935
River Basin	Black Warrior

PROVISIONAL DATA

Withdrawals

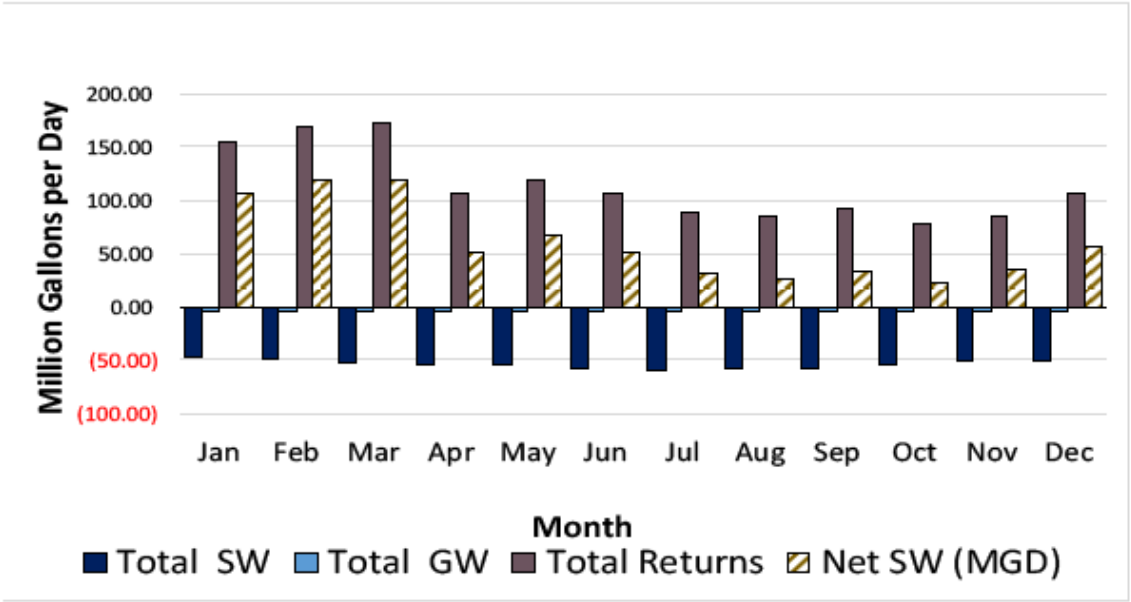
Category		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Public Supply	GW	(2.56)	(2.50)	(2.51)	(2.40)	(2.38)	(2.60)	(2.64)	(2.49)	(3.12)	(2.91)	(2.88)	(3.05)
Public Supply	SW	(46.61)	(49.00)	(50.95)	(51.59)	(50.23)	(51.86)	(54.01)	(53.42)	(53.17)	(51.73)	(50.26)	(49.74)
Industrial/Mining	GW	(0.93)	(1.03)	(0.88)	(0.86)	(0.99)	(0.87)	(0.84)	(0.90)	(1.00)	(0.86)	(0.89)	(0.86)
Industrial/Mining	SW	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)
Thermoelectric	SW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture	GW	(0.53)	(0.55)	(0.60)	(0.77)	(0.91)	(1.15)	(1.23)	(1.05)	(0.90)	(0.78)	(0.60)	(0.54)
Agriculture	SW	(0.20)	(0.30)	(0.55)	(1.94)	(3.02)	(4.37)	(5.08)	(4.39)	(4.17)	(2.67)	(0.74)	(0.20)
Total	**SW**	**(47.16)**	**(49.64)**	**(51.85)**	**(53.88)**	**(53.59)**	**(56.58)**	**(59.43)**	**(58.16)**	**(57.69)**	**(54.75)**	**(51.35)**	**(50.28)**
Total	**GW**	**(4.01)**	**(4.09)**	**(3.99)**	**(4.03)**	**(4.28)**	**(4.62)**	**(4.71)**	**(4.44)**	**(5.01)**	**(4.55)**	**(4.37)**	**(4.44)**

Returns

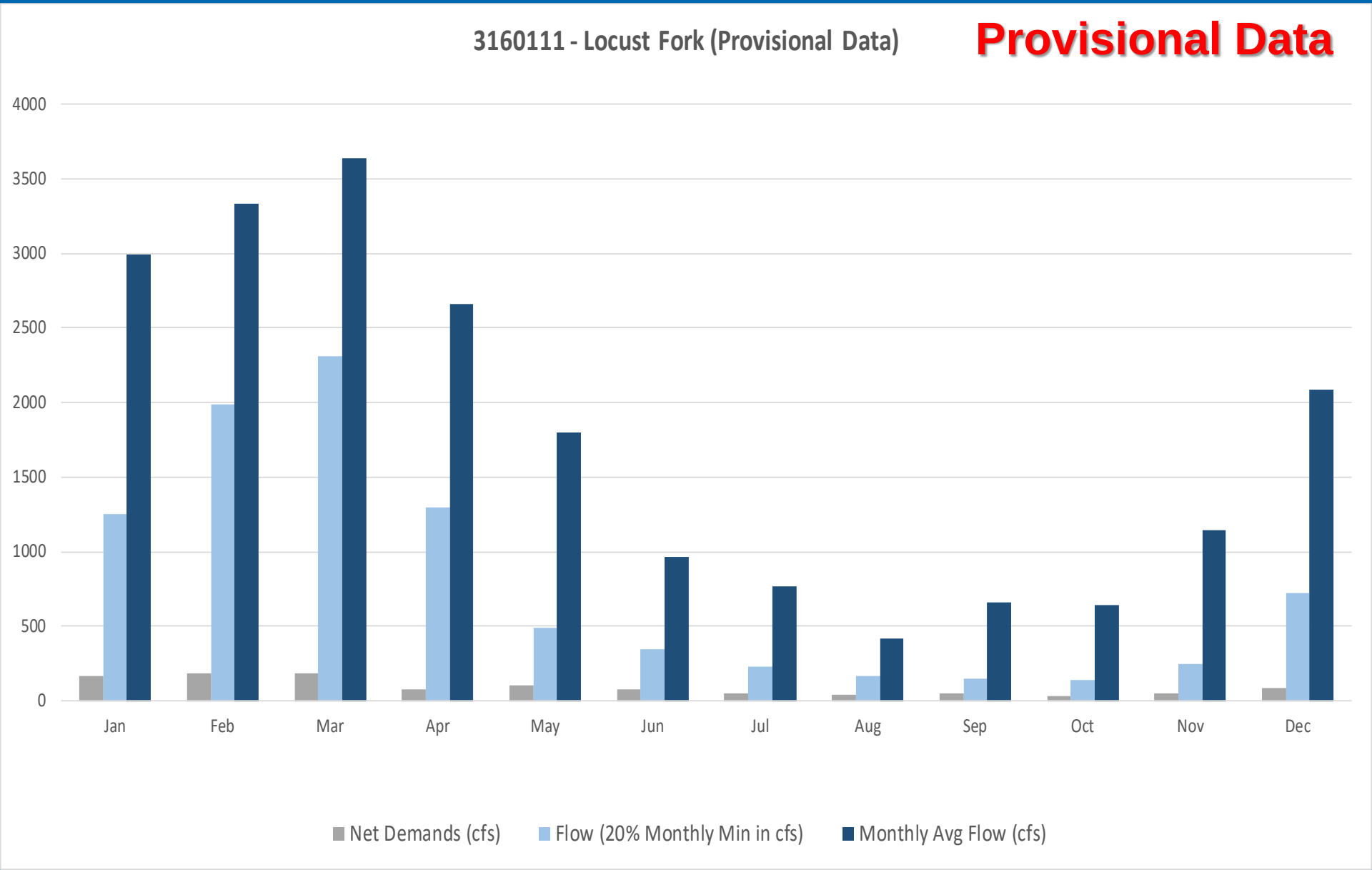
Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Public Supply	125.70	139.80	142.41	86.10	104.88	89.69	75.97	66.85	66.98	62.18	71.94	80.67
Industrial/Mining	11.74	11.74	12.87	12.09	11.79	12.10	10.89	11.10	9.73	9.78	9.07	9.08
Thermoelectric	16.16	16.16	16.16	7.11	3.15	5.63	2.85	7.11	14.59	5.30	4.51	16.16
Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Returns	153.60	167.70	171.44	105.30	119.82	107.41	89.71	85.06	91.31	77.25	85.52	105.91

HUC 03160111 (Locust Fork) Demands Summary

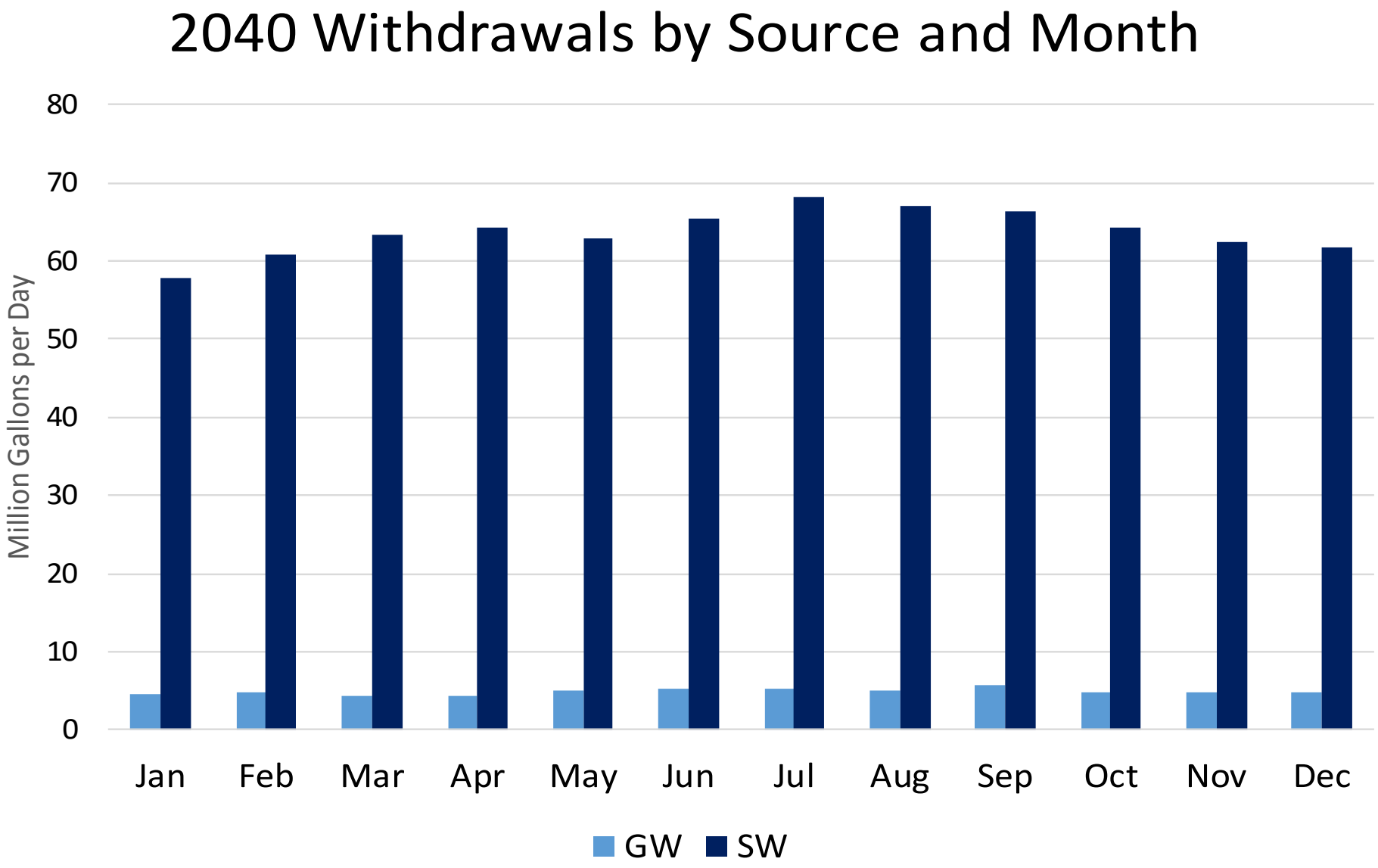
03160111-Locust Fork													PROVISIONAL DATA
Total	SW	(47.16)	(49.64)	(51.85)	(53.88)	(53.59)	(56.58)	(59.43)	(58.16)	(57.69)	(54.75)	(51.35)	(50.28)
Total	GW	(4.01)	(4.09)	(3.99)	(4.03)	(4.28)	(4.62)	(4.71)	(4.44)	(5.01)	(4.55)	(4.37)	(4.44)
Withdrawal Total		(51.17)	(53.73)	(55.84)	(57.91)	(57.87)	(61.19)	(64.14)	(62.59)	(62.70)	(59.30)	(55.72)	(54.72)
Total Return		153.60	167.70	171.44	105.30	119.82	107.41	89.71	85.06	91.31	77.25	85.52	105.91
Net SW (MGD)		106.44	118.06	119.59	51.42	66.22	50.84	30.28	26.90	33.62	22.50	34.17	55.63



HUC Summary – 03160111 (Locust Fork)
Plot of Net Demands vs. Monthly Flows (Average and 20%)



HUC 03160111 - Locust Fork



Estimated Use of Water in Alabama in 2015

- March was deadline for 2015 data submittal
- That data is currently being analyzed
- Tools developed for 2010 report are being used to help review and summarize the 2015 data
- Incorporating consumption analysis into the process

OWR
The Office of Water Resources
A Division of ADECA

Summary

The OWR Assessment Report will provide extensive information on each of Alabama 8-digit watersheds

- Surface water flows
- Water withdrawals and consumption
  - By source (SW vs. GW)
  - By category of use
  - Current demands
  - Future demands
- Population
- Water availability analysis

Questions?

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