

Water Withdrawal Report for the Upper Savannah Basin (2022)

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This report summarizes reported water withdrawals in the Upper Savannah River basin for the year 2022, provided by the South Carolina Department of Health and Environmental Control (SCDHEC) through the Surface Water Withdrawal, Permitting, Use and Reporting Act and the Groundwater Use and Reporting Act, both administered by SCDHEC. The SCDHEC maintains a water-use database for all the registered and permitted users of all major categories (Table 1) in the state that are required to report their water withdrawals for the active months and years (SCDHEC Water Use Report, 2020)¹.

In this report, the term “withdrawal” refers to the surface or groundwater withdrawn by a water user/facility from a surface water source (river, lake, pond) or groundwater source (aquifer). SCDHEC has water withdrawal data in million gallons per month (MGM), however, for this annual report, the monthly withdrawals were summed for the required year and averaged in million gallons per day (MGD).

Table 1. Description of water use categories

Category	Description
Thermoelectric Power	Water used in generating electricity from fossil fuel (coal, oil, natural gas), geothermal, biomass, soild waste, or nuclear energy.
Hydroelectric Power	Water used in generating electricity where turbine generators are driven by falling water.
Water Supply	Water withdrawn by public and private water suppliers and conveyed to users or groups of users. Water Suppliers provide water for a variety of uses including domestic, commercial, industrial and public water use.
Industry	Water used for commercial and industrial purposes, including fabrication, processing, washing, in-plant conveyance and cooling.
Agriculture	Water used for agricultural and landscaping purposes, including turf farming and livestock management.
Golf Course	Water used to maintain golf course turf, including tee boxes, fairways, putting greens, associated practice areas and periphery aesthetic landscaping.
Mining	Water used for in conjunction with surface or subsurface mining of minerals or natural materials.
Aquaculture	Water used for raising, farming, and/or harvesting organisms that live in water, such as shrimp, fish, and other vegetal matter (seaweed).

1.1 Summary of Water Withdrawals, Excluding Hydroelectric Power

Water used for Hydroelectric Power generation is returned directly to the river from which it was withdrawn and is, therefore, omitted from this analysis. After excluding water withdrawals for Hydroelectric Power, the Upper Savannah basin (Fig. 1) had the highest total water withdrawals among the eight major river basins in the State (Table 2). In 2022, 2765.9 million gallons per day (MGD) were withdrawn from the Upper Savannah basin, accounting for 47.0 percent of the total amount of water used in the State. The basin

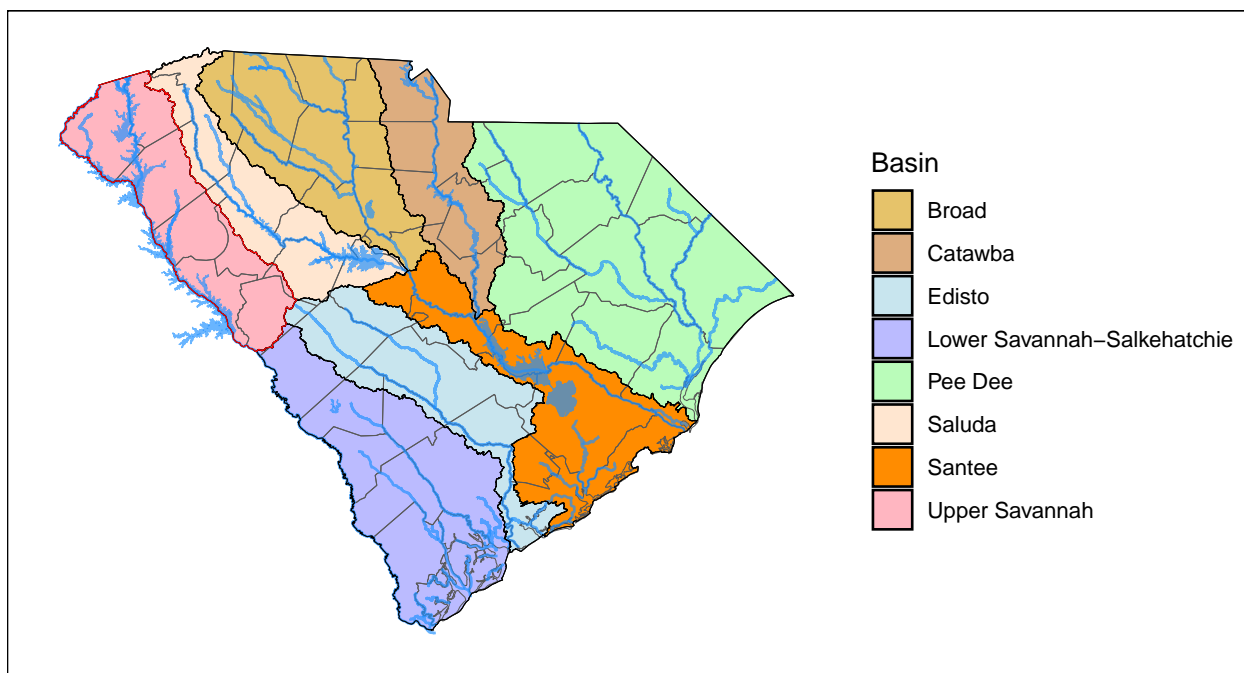


Figure 1. Major river basins in South Carolina, highlighting the Upper Savannah basin.

had the seventh highest groundwater withdrawals (0.4 MGD), accounting for 0.1 percent of the total amount of groundwater used in the State, and the highest surface water withdrawals (2765.5 MGD), accounting for 49.3 percent of the total amount of surface water used in the State (Table 2).

Table 2. 2022 Water withdrawals excluding Hydroelectric Power in the eight major river basins by source

Basin	Groundwater		Surface Water		Total	
	Withdrawals (MGD)	% of total withdrawals	Withdrawals (MGD)	% of total withdrawals	Withdrawals (MGD)	% of total withdrawals
Broad	0.5	0.2	835.0	14.9	835.5	14.2
Catawba	6.3	2.3	257.7	4.6	264.0	4.5
Edisto	64.0	22.9	64.1	1.1	128.1	2.2
Lower Savannah-Salkehatchie	73.0	26.1	155.0	2.8	228.0	3.9
Pee Dee	106.8	38.2	803.7	14.3	910.5	15.5
Saluda	0.2	0.1	244.0	4.4	244.3	4.1
Santee	28.4	10.1	482.6	8.6	511.0	8.7
Upper Savannah	0.4	0.1	2,765.5	49.3	2,765.9	47.0
Total	279.8	100.0	5,607.8	100.0	5,887.6	100.0

Table 3. 2022 Water withdrawals excluding Hydroelectric Power in the Upper Savannah basin by source

Source	Withdrawals (MGD)	% of total withdrawals
Groundwater	0.36	0.01
Surface Water	2,765.52	99.99
Total	2,765.89	100.00

Of the 2765.9 MGD withdrawn in the Upper Savannah basin in 2022, surface water sources accounted for 99.99 percent (2765.5 MGD) and groundwater sources for 0.01 percent (0.4 MGD) (Table 3). Among the water-use categories, Thermoelectric Power used, by far, the most water (2692.4 MGD) accounting for 97.3 percent of the total, followed by Water Supply (64.8 MGD; 2.3 percent) and Industry (7.4 MGD; 0.3 percent) (Table 4). The remaining water-use categories used much lesser amounts—Golf Course accounting for 0.03 percent (0.89 MGD), Agriculture for 0.01 percent (0.29 MGD), and Mining for 0.003 percent (0.09 MGD) (Table 4; Fig. 2).

Of the 2765.5 MGD withdrawn from surface water sources in the Upper Savannah basin, Thermoelectric Power accounted for 97.4 percent (2692.4 MGD), followed by Water Supply (64.7 MGD; 2.3 percent) and Industry (7.4 MGD; 0.3 percent). The remaining water use categories had much smaller withdrawals with Golf Course accounting for 0.03 percent (0.7 MGD), Agriculture for 0.01 percent (0.2 MGD), and Mining for 0.003 percent (0.09 MGD) (Table 4; Fig. 2).

Of the 0.4 MGD withdrawn from groundwater sources in the Upper Savannah basin, Golf Course had highest withdrawals, accounting for 47.8 percent (0.2 MGD), followed by Agriculture (0.1 MGD; 28.5 percent) and Water Supply (0.1 MGD; 23.6 percent) (Table 4; Fig.2).

Table 4. 2022 Water withdrawals excluding Hydroelectric Power in the Upper Savannah basin by category and source

Category	Groundwater		Surface Water		Total	
	Withdrawals (MGD)	% of total withdrawals	Withdrawals (MGD)	% of total withdrawals	Withdrawals (MGD)	% of total withdrawals
Agriculture	0.1	28.5	0.2	0.0	0.3	0.0
Golf Course	0.2	47.8	0.7	0.0	0.9	0.0
Industry	0.0	0.0	7.4	0.3	7.4	0.3
Mining	NA	NA	0.1	0.0	0.1	0.0
Thermoelectric	NA	NA	2,692.4	97.4	2,692.4	97.3
Water Supply	0.1	23.6	64.7	2.3	64.8	2.3
Total	0.4	100.0	2,765.5	100.0	2,765.9	100.0

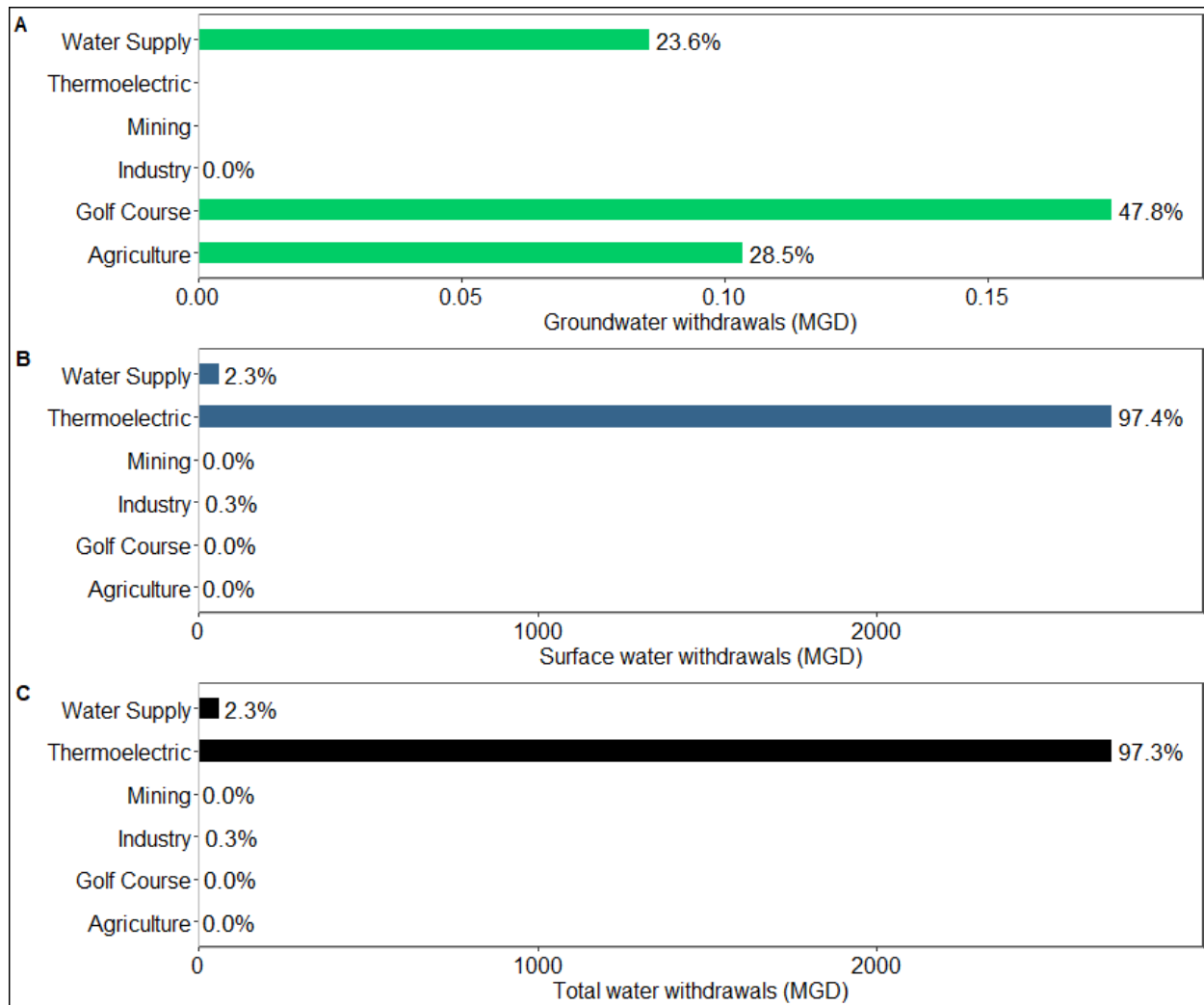


Figure 2. 2022 Water withdrawals excluding Hydroelectric Power in the Upper Savannah basin by category and source. Groundwater (A), Surface Water (B), and Total (C).

1.2 Summary of Water Withdrawals, Excluding Hydroelectric Power and Thermoelectric Power

Electrical power generation has high water use in the State (South Carolina State Water Assessment, 2009)², which tends to overshadow the use of the other major water use categories. The relative proportion of water used by the remaining categories can be clearly illustrated and understood by excluding water used for power generation. For example, on excluding the water used in the State for Hydroelectric and Thermoelectric Power, total water withdrawals in the Upper Savannah basin ranked least among the eight river basins, accounting for 4.5 percent (MGD) of the total water withdrawn in the State (Table 5). On excluding water used for power generation, the Upper Savannah basin had the seventh highest amount of surface water used in the State (75.3 MGD; 5.4 percent) and the seventh highest amount of groundwater withdrawn (0.4 MGD; 0.1 percent) (Table 5).

Table 5. 2022 Water withdrawals excluding Hydroelectric and Thermoelectric Power in the eight major river basins by source

Basin	Groundwater		Surface Water		Total	
	Withdrawals (MGD)	% of total withdrawals	Withdrawals (MGD)	% of total withdrawals	Withdrawals (MGD)	% of total withdrawals
Broad	0.5	0.2	107.8	7.7	108.3	6.4
Catawba	6.3	2.3	126.8	9.0	133.1	7.9
Edisto	64.0	22.9	64.1	4.6	128.1	7.6
Lower Savannah-Salkehatchie	73.0	26.2	155.0	11.0	228.0	13.5
Pee Dee	105.7	37.9	149.7	10.7	255.4	15.2
Saluda	0.2	0.1	244.0	17.4	244.3	14.5
Santee	28.4	10.2	482.6	34.3	511.0	30.3
Upper Savannah	0.4	0.1	75.3	5.4	75.7	4.5
Total	278.8	100.0	1,405.4	100.0	1,684.2	100.0

Table 6. 2022 Water withdrawals excluding Hydroelectric and Thermoelectric Power in the Upper Savannah basin by source

Source	Withdrawals (MGD)	% of total withdrawals
Groundwater	0.4	0.5
Surface Water	73.1	99.5
Total	73.5	100.0

Of the 75.7 MGD withdrawn in the Upper Savannah basin in 2022. Surface water sources accounted for 99.5 percent (73.1 MGD) and groundwater sources for 0.5 percent (0.4 MGD) (Table 6). Among the water-use categories, Water Supply used, by far, the most water (64.8 MGD) accounting for 88.2 percent of the total, followed by Industry (7.4 MGD; 10.1 percent) and Golf Course (0.9 MGD; 1.2 percent) (Table 7). The remaining water-use categories used much lesser amounts—Agriculture accounting for 0.4 percent (0.3 MGD) and Mining for 0.12 percent (0.1 MGD) (Table 7; Fig. 3).

Of the 75.3 MGD withdrawn from surface water sources in the Upper Savannah basin, Water Supply accounted for 88.5 percent (64.7 MGD), followed by Industry (7.4 MGD; 10.1 percent) and Golf Course (0.7

MGD; 1.0 percent). The remaining water use categories had much smaller withdrawals with Agriculture accounting for 0.3 percent (0.2 MGD) and Mining for 0.12 percent (0.1 MGD) (Table 7; Fig. 3).

Of the 0.4 MGD withdrawn from groundwater sources in the Upper Savannah basin, Golf Course had highest withdrawals, accounting for 47.8 percent (0.2 MGD), followed by Agriculture (0.1 MGD; 28.5 percent), followed by Water Supply (0.1 MGD; 23.6 percent) (Table 7; Fig.3).

Table 7. 2022 Water withdrawals excluding Hydroelectric and Thermoelectric Power in the Upper Savannah basin by category and source

Category	Groundwater		Surface Water		Total	
	Withdrawals (MGD)	% of total withdrawals	Withdrawals (MGD)	% of total withdrawals	Withdrawals (MGD)	% of total withdrawals
Agriculture	0.1	28.5	0.2	0.3	0.3	0.4
Golf Course	0.2	47.8	0.7	1.0	0.9	1.2
Industry	0.0	0.0	7.4	10.1	7.4	10.1
Mining	NA	NA	0.1	0.1	0.1	0.1
Water Supply	0.1	23.6	64.7	88.5	64.8	88.2
Total	0.4	100.0	73.1	100.0	73.5	100.0

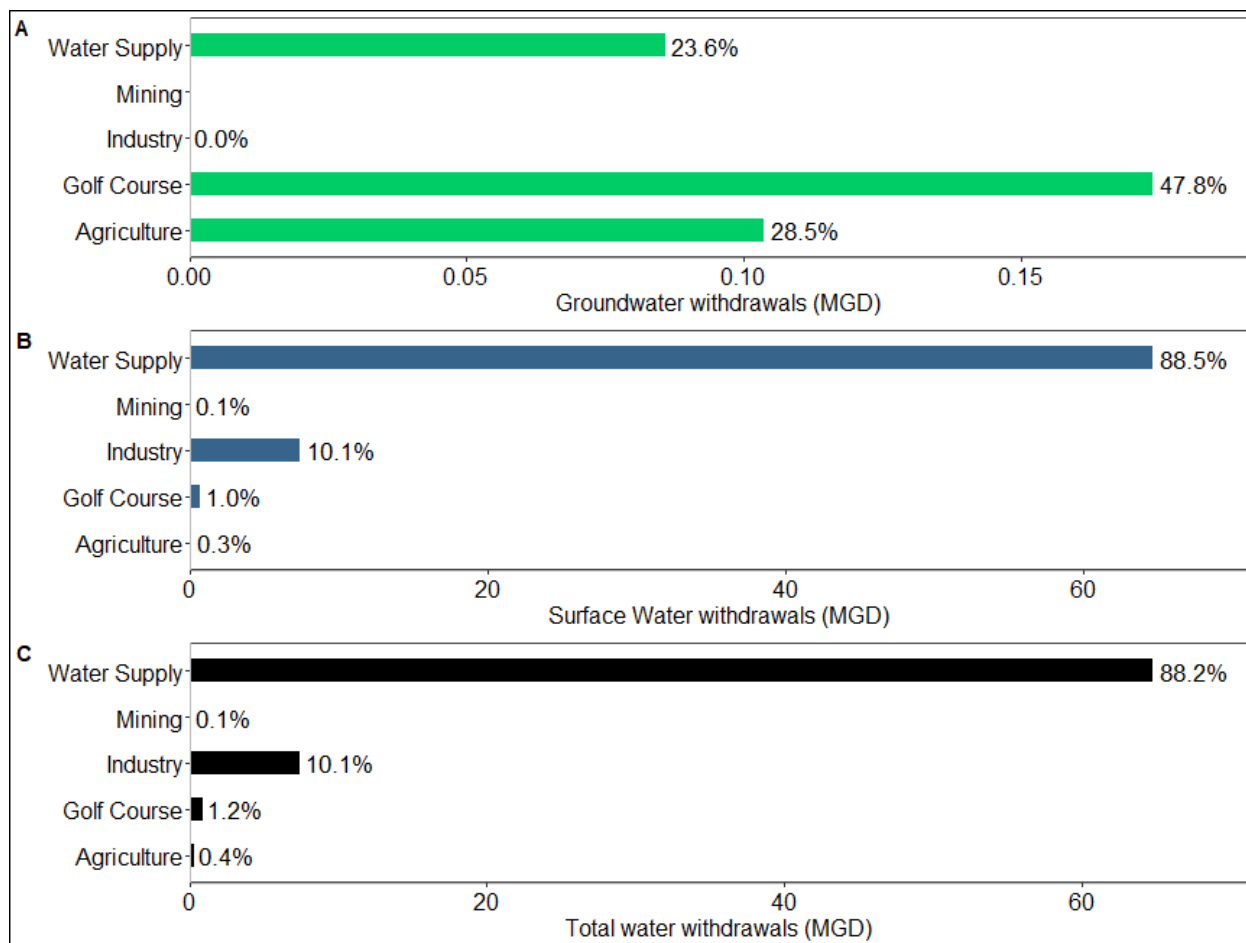


Figure 3. 2022 Water withdrawals excluding Hydroelectric and Thermoelectric Power in the Upper Savannah basin by category and source, Groundwater (A), Surface Water (B), and Total (C).

Appendix A. Water Withdrawal Trends by Category and Source (2011-2022)

A.1 Limitations of the SCDHEC Database

Although the quality of water-use data significantly improved after 2000, the database is not a complete and accurate representation of total water withdrawals in the state. Limitations of the SCDHEC database include:

1. Withdrawals from private domestic wells, small surface water irrigation ponds, and any other water withdrawals less than the reporting threshold of 3 MGM are excluded from the SCDHEC's water-use database (SCDHEC Water Use Report, 2020)¹.
2. After passing of the South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act in 2011, several facilities withdrawing less than the threshold value were not required to report their withdrawals to SCDHEC.
3. Errors in reported water withdrawals or errors introduced during data input.
4. Some users fail to add metadata such as longitude, latitude, county, and basin information for a surface water intake or groundwater well withdrawal. This can lead to some inaccuracies in the dataset.
5. Increasing trends in reported water withdrawals for some categories (Agriculture, for example) may in part be due to increased reporting compliance over the analysis period (2011 - 2022).

Owing to the above limitations, caution is warranted when interpreting trends in reported withdrawals from the SCDHEC water-use database.

A.2 Water Withdrawal for All Categories Combined, Excluding Hydroelectric Power

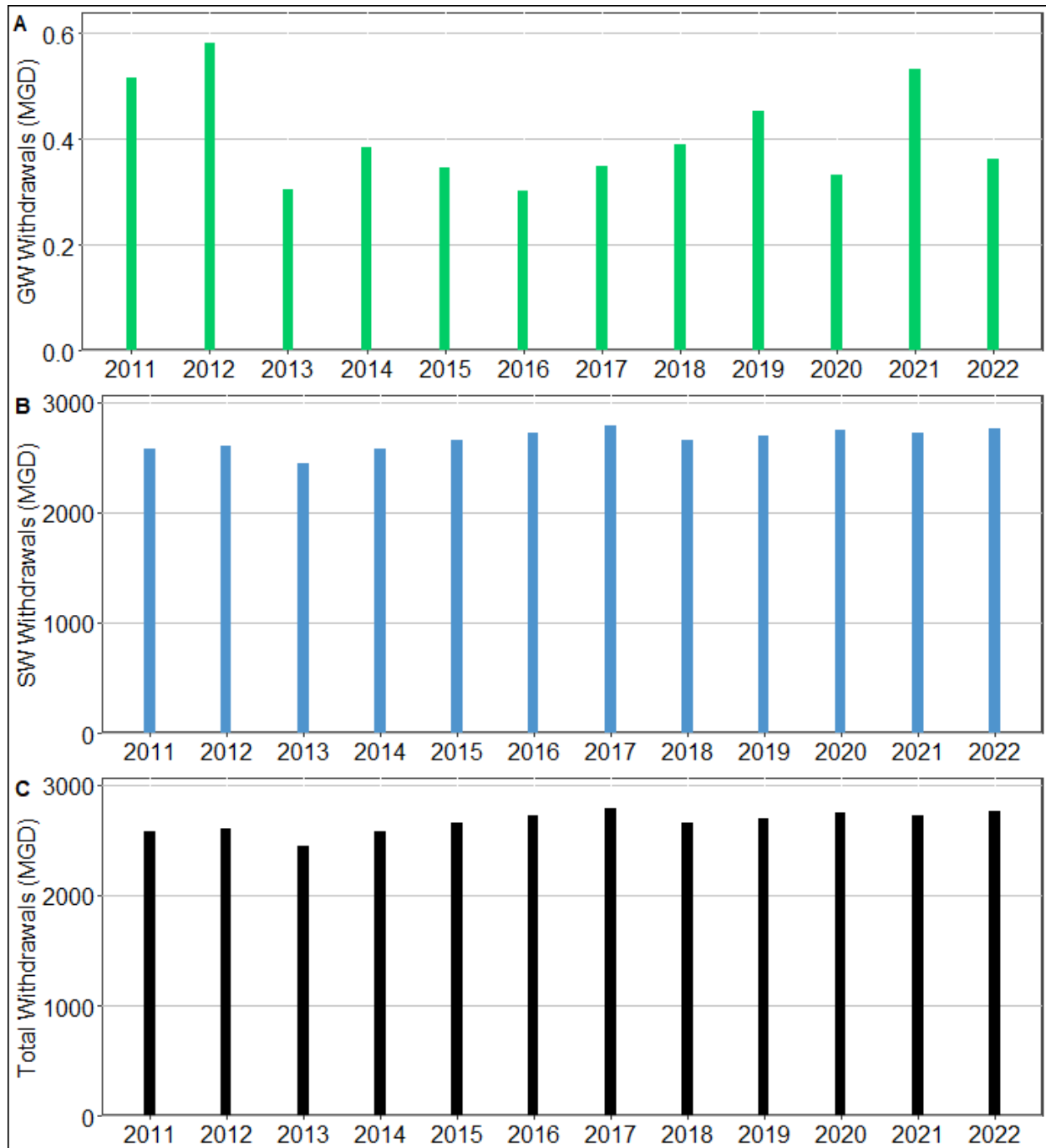


Figure A1. Annual water withdrawals excluding Hydroelectric Power in the Upper Savannah basin for remaining categories combined and by source. Groundwater (GW) (A), Surface Water (SW) (B), and Total (C).

A.3 Water Withdrawal for All Categories Combined, Excluding Hydroelectric and Thermoelectric Power

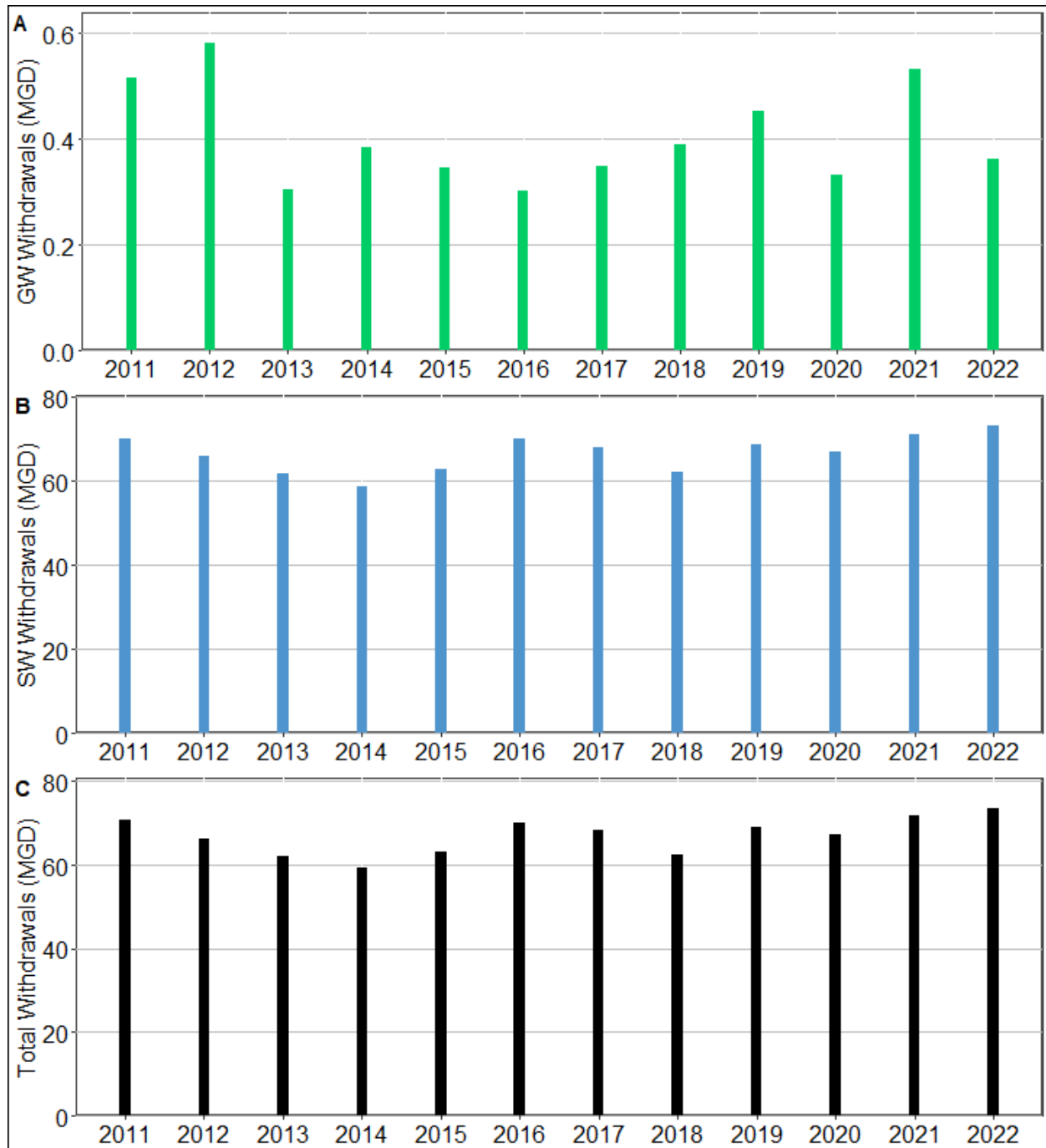


Figure A2. Annual water withdrawals excluding Hydroelectric and Thermoelectric Power in the Upper Savannah basin for remaining categories combined and by source. Groundwater (GW) (A), Surface Water (SW) (B), and Total (C).

A.4 Water Withdrawal for Thermoelectric Power

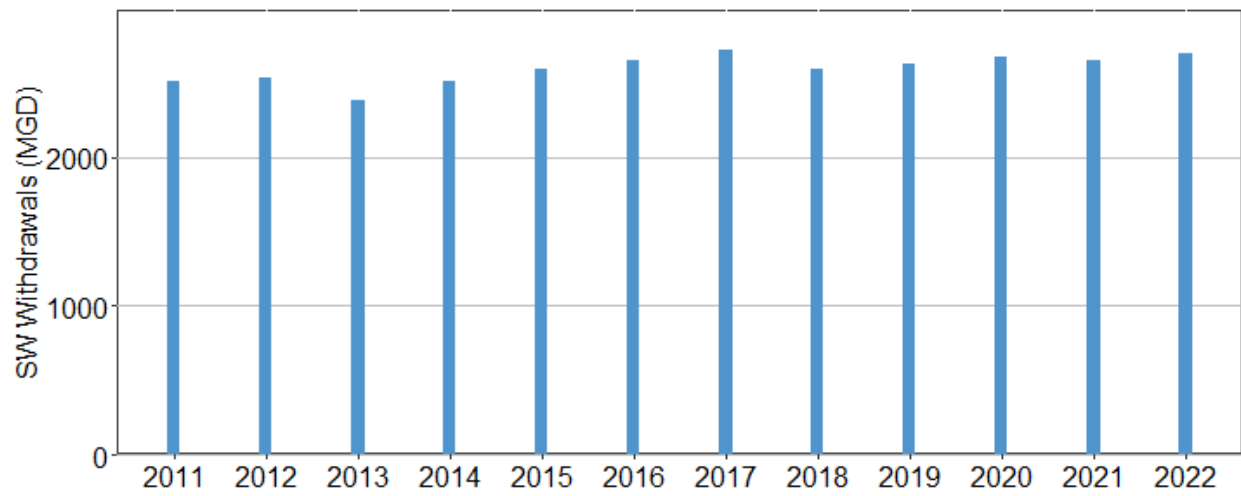


Figure A3. Annual surface water (SW) withdrawals in the Upper Savannah basin for Thermoelectric Power.

A.5 Water Withdrawal for Water Supply

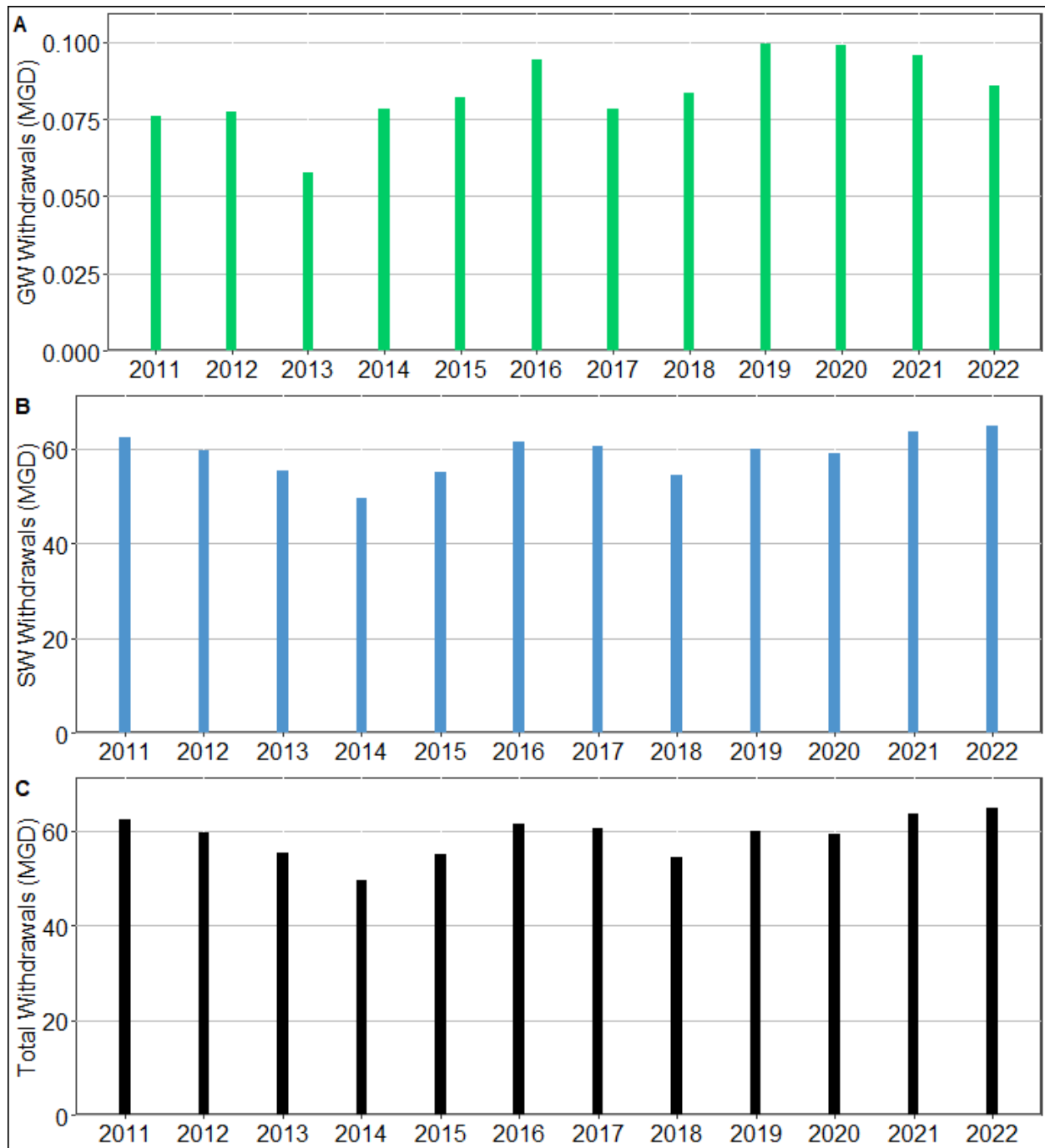


Figure A.4. Annual water withdrawals in the Upper Savannah basin for Water Supply by source. Groundwater (GW) (A), Surface Water (SW) (B), and Total (C).

A.6 Water Withdrawal for Industry

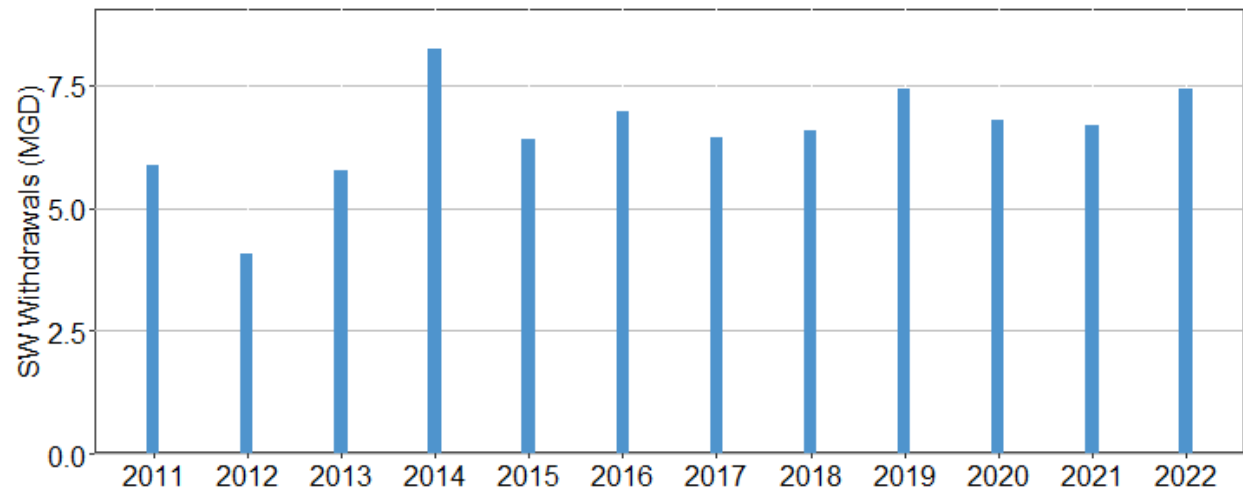


Figure A5. Annual surface water withdrawals in the Upper Savannah basin for Industry.

A.7 Water Withdrawal for Agriculture

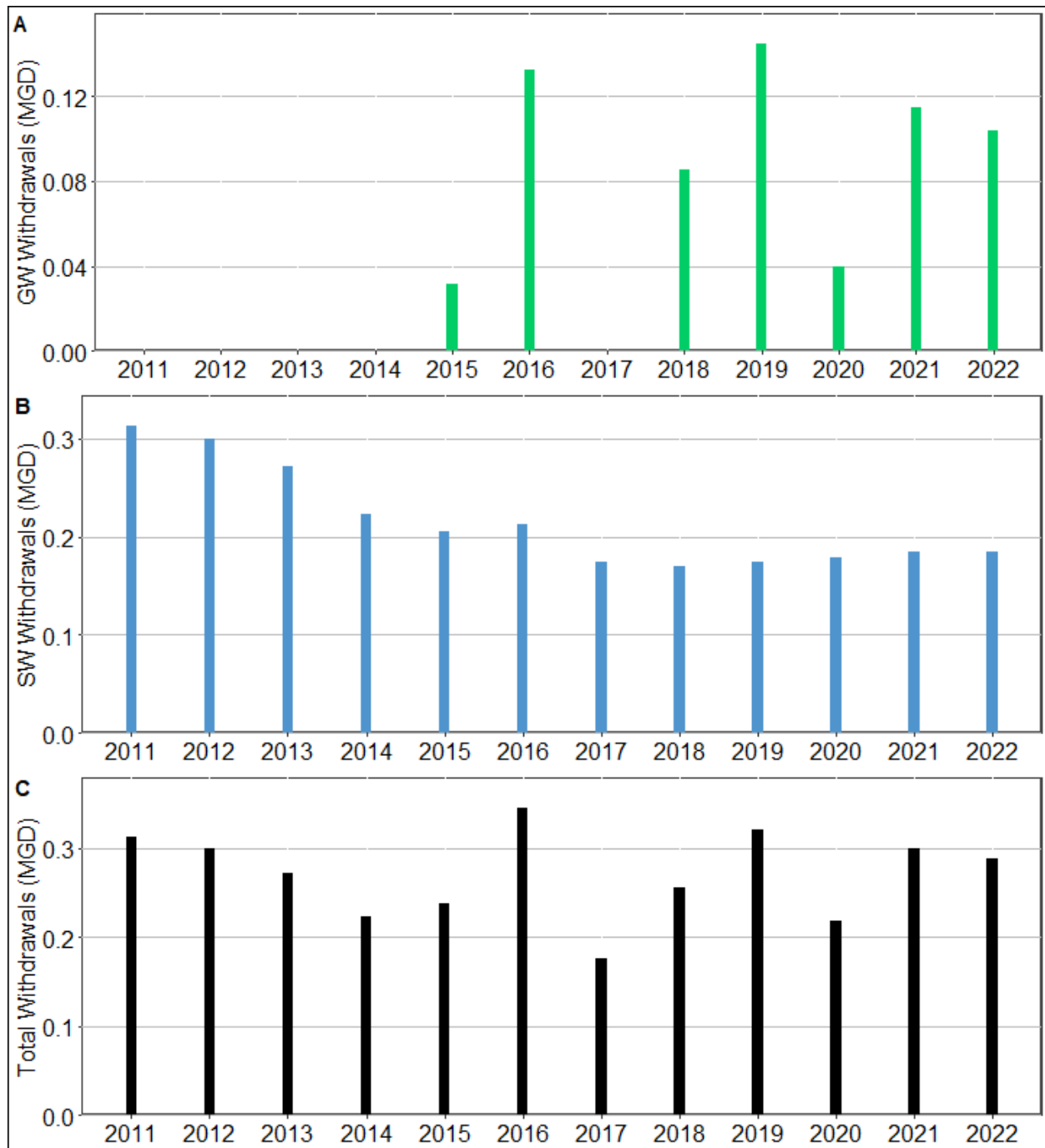


Figure A6. Annual water withdrawals in the Upper Savannah basin for Agriculture by source. Groundwater (GW) (A), Surface Water (SW) (B), and Total (C).

A.8 Water Withdrawal for Golf Course

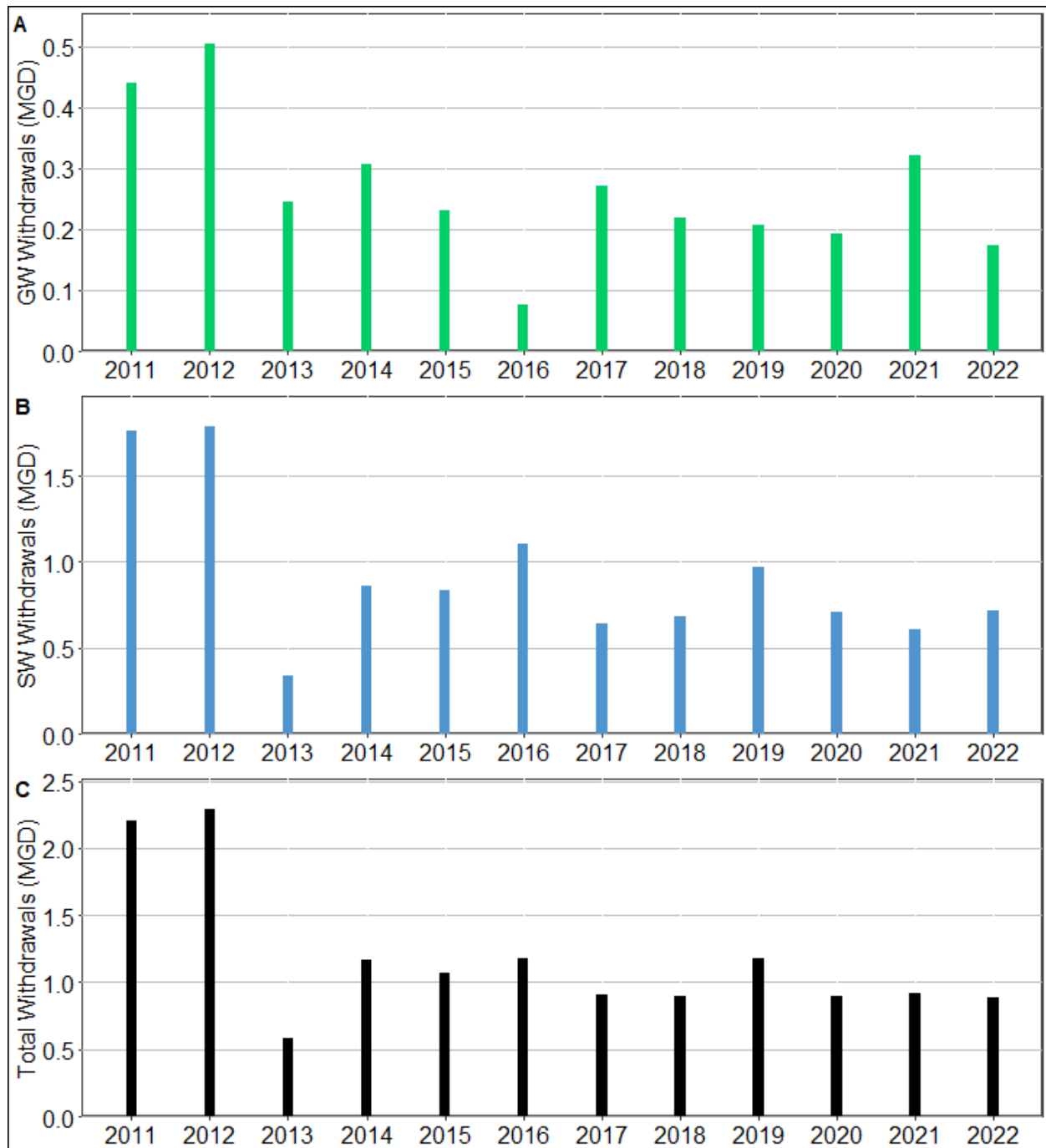


Figure A7. Annual water withdrawals in the Upper Savannah basin for Golf Course by source. Groundwater (GW) (A), Surface Water (SW) (B), and Total (C).

A.9 Water Withdrawal for Mining

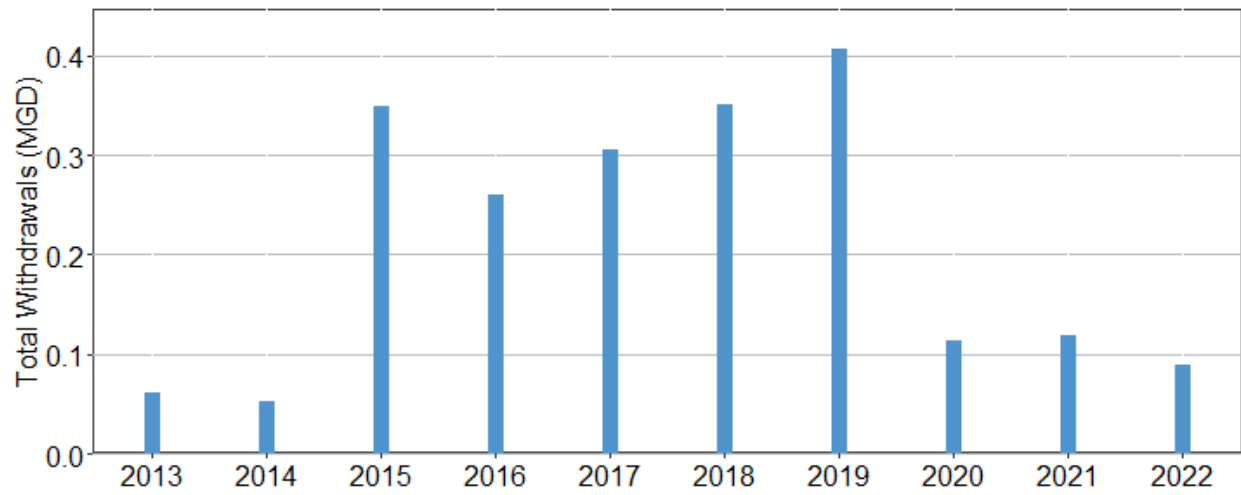


Figure A8. Annual surface water (SW) withdrawals in the Upper Savannah basin for Mining.

References

1. Craig,B., and Monroe,L.A., 2020, South Carolina Department of Health and Environmental Control (SCDHEC) Water Use Report, 87 p. (<https://scdhec.gov/surface-groundwater-annual-water-use-report>)
2. Wachob, A., Park, D.A., and Newcome R.Jr., 2009, South Carolina State Water Assessment, second edition: South Carolina Department of Natural Resources, 408 p. (https://hydrology.dnr.sc.gov/pdfs/assessment/SC_Water_Assessment_2.pdf)