Annual Assessment of Florida's Water Resources: Supply and Demand

2024 Edition

Chapter 3

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Southwest Florida Water Management District

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Suwannee River Water Management District

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U.S. Geological Survey

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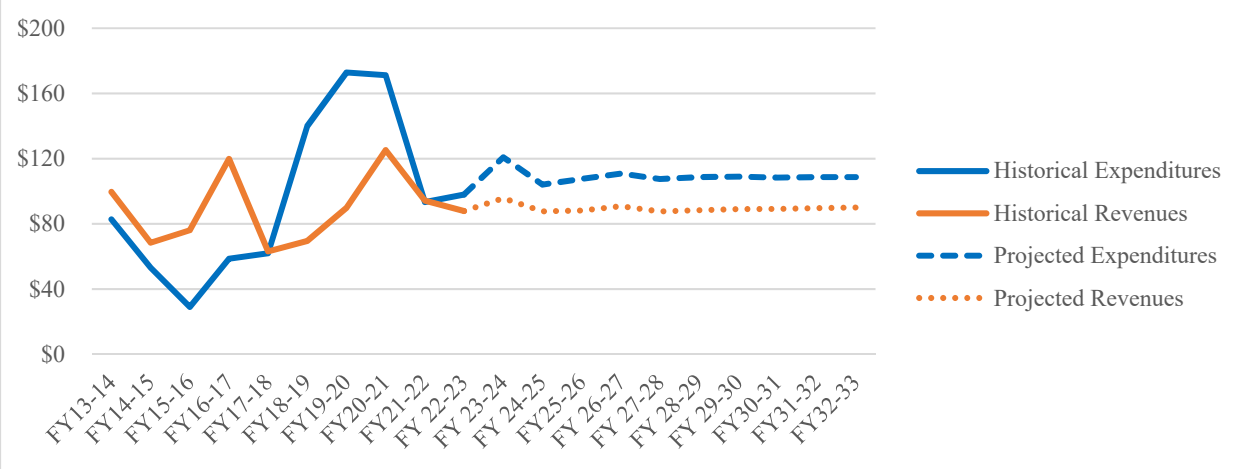
3. Florida's Water Resources: Supply and Demand

Executive Summary

Chapter 3 discusses expenditures and revenues pertaining to water supply. As used in this chapter, expenditures are not equivalent to appropriations but rather reflect disbursements, which may lag appropriations by one or more years. The state revenues discussed in this chapter are those that are typically dedicated to the purpose of water supply. The chapter has two sections. Section 3.1 discusses expenditures and revenues pertaining to water supply based on historical patterns. It provides data for completed fiscal years as well as forecasts, assuming no significant changes are made. This means that the forecasts shown in Section 3.1 do not explicitly account for the future needs developed in Section 3.2.

Section 3.1 shows that to maintain the status quo, additional state funds are needed. The graph and table show the projected state funding gap for water supply, assuming the Legislature continues its current path of expenditures.

Historical and Projected Water Supply Funding Gap - State (in $millions)



Projected Water Supply Funding Gap - State (in $millions)

	FY 23-24	FY 24-25	FY 25-26	FY 26-27	FY 27-28	FY 28-29	FY 29-30	FY 30-31	FY 31-32	FY 32-33
Projected Expenditures	$120.84	$104.07	$107.64	$110.85	$107.52	$108.67	$109.01	$108.40	$108.69	$108.70
Projected Revenues	$95.69	$87.64	$88.17	$90.83	$87.62	$88.41	$89.08	$89.12	$89.62	$90.03
Gap	**($25.15)**	**($16.43)**	**($19.47)**	**($20.02)**	**($19.90)**	**($20.26)**	**($19.93)**	**($19.28)**	**($19.07)**	**($18.68)**

The data in this table is calculated in Table 3.1.1.1 and Table 3.1.2.1

Section 3.2 shows that state investments above and beyond this gap will be needed to achieve the Legislature's intent that sufficient water is available for all existing and future reasonable-beneficial uses and the natural systems, and that the adverse effects of competition for water

supplies be avoided. The expenditures associated with ensuring that future water supplies are available to meet the increase in water demands are projected to be $1,692.85 million over the 2020 through 2040 planning horizon, with a projected state expenditure of $326.20 million over that period (Table 3.2.6.5 and Table 3.2.6.7). These expenditures are moderately lower than last year. They are based on each water management district's water demand projections and existing supply estimates as further developed by the Office of Economic and Demographic Research (EDR). If the separate water demand forecast produced by EDR's pilot model is considered, it points to considerably lower future expenditures needed to meet the increase in the future water demand (Table 3.2.10.4), partially because it assumes greater conservation efforts. The future demand not met with existing supply assumes average weather conditions and that the demand which has been met in the past will continue to be met in the future. In addition, regarding the expenditures necessary to ensure that sufficient water is available for the natural systems, EDR examined projects implementing the recovery and prevention strategies for minimum flows and minimum water levels of water courses, water bodies, and aquifers, as well as additional projects expected to primarily benefit the natural systems. Excluding Everglades expenditures, the estimated cost of these projects has been substantially revised upward to $1,580.04 million, of which the state's share is projected to be $234.77 million (Table 3.2.9.1).

Between addressing supply shortages and natural systems, $3.27 billion of investments are needed between 2020 and 2040, with $561 million comprising the state share. Overall, these investments are nearly equal to the two purposes. These estimates will continue to evolve as methodologies and the accompanying data sources are further refined. Additional research will be undertaken to provide more complete and more precise cost estimates for future editions of this annual report, including a renewed focus on the effects of water conservation and reuse.

3.1 Florida's Expenditures and Revenues Related to Water Supply

Florida's waters are the state's most basic and valued resource, providing an array of benefits crucial to existence, quality of life, and the economy. These benefits include water supply, water storage, flood protection, water purification, habitat for plant and animal species, recreational and educational opportunities, and scenic beauty. The management, protection, and restoration of Florida's surface water and groundwater require a coordinated effort among various state agencies, water management districts, public and private utilities, local governments, and other stakeholders.

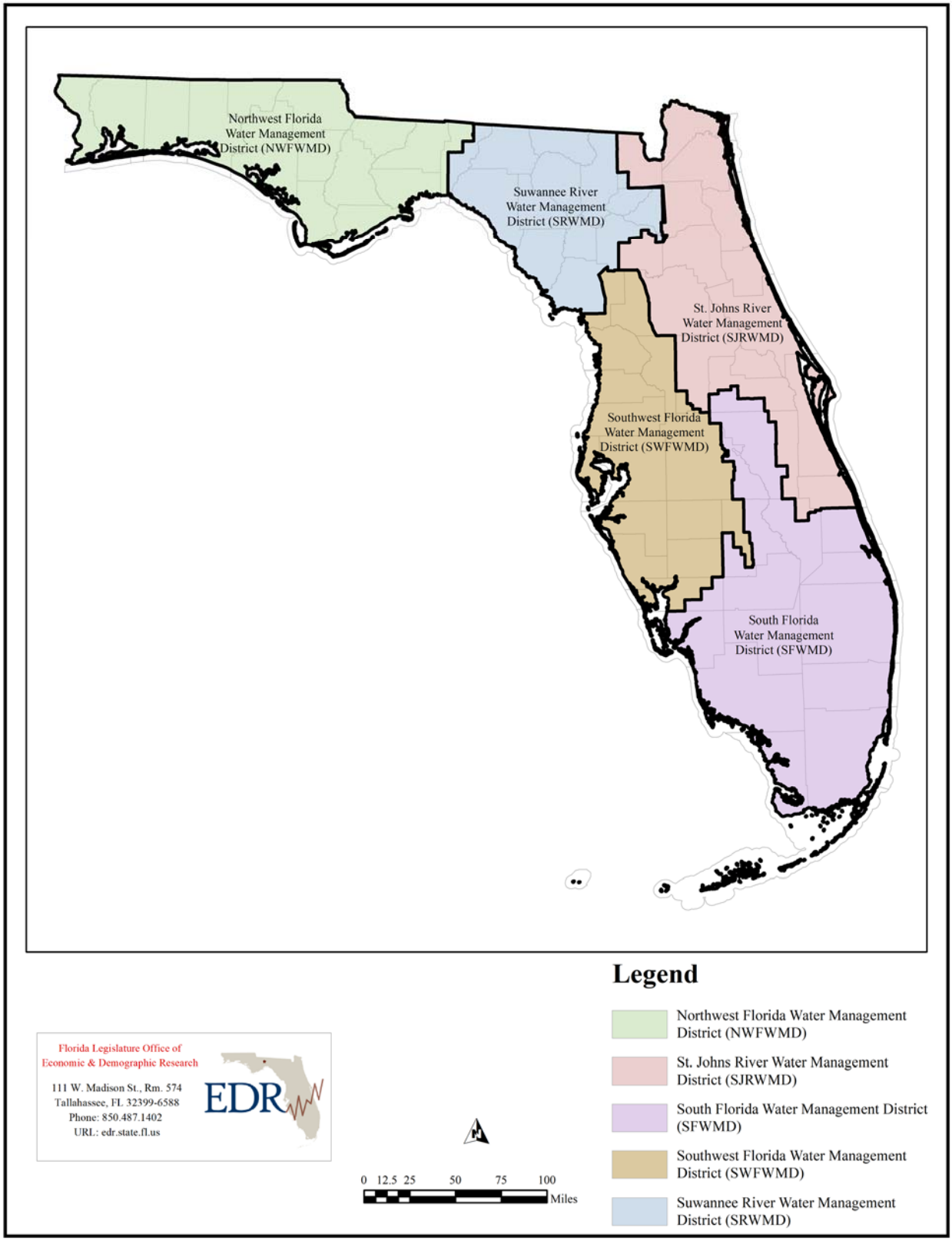
Water resource management in Florida is conducted on a state and regional level.[1] Recognizing that water resource problems vary in magnitude and complexity from region to region across the state, the Legislature vests in the Department of Environmental Protection (DEP) the power and responsibility to accomplish conservation, protection, management, and control of waters of the state, but with enough flexibility to accomplish these ends by delegating powers to the five water management districts (WMDs).[2] Chapter 373, Florida Statutes, provides the WMDs with broad authority to implement a wide range of regulatory and non-regulatory programs that address four areas of responsibility: water supply, water quality, flood protection and floodplain management, and natural systems. The five WMDs are identified in Figure 3.1.1.

This chapter of the report provides an assessment of the various programs and initiatives associated with water supply. The assessment includes historic and estimated future expenditures of water supply programs and projects, as well as forecasts of revenues used for these purposes.[3] As the projections in section 3.1 are based on historical data (and thus historical supply levels), atypical growth in water supply needs is not incorporated into these baseline forecasts. Section 3.2 focuses on the need for state investments above and beyond this level in order to achieve the Legislature's intent that sufficient water is available for all existing and future reasonable-beneficial uses and the natural systems, and that the adverse effects of competition for water supplies be avoided.

[See figure on following page]

[1] § 373.016(4)(a), Fla. Stat.
[2] § 373.016(5), Fla. Stat.
[3] In the prior edition of this report, section 3.1's data and forecasts were included in chapter 2, Florida's Expenditures and Revenues Related to Water Supply and Water Quality.

Figure 3.1.1 Water Management Districts



3.1.1 Historical and Projected Water Supply Expenditures

The Office of Economic and Demographic Research (EDR) defines water supply projects or initiatives as activities that appear to directly promote the availability of sufficient water for all existing and future reasonable-beneficial uses and the natural systems. This includes activities associated with increasing available water supplies, providing drinking water infrastructure needed to convey and treat water supplies, and conducting water supply planning initiatives.[4] For the most part, expenditures for water supply occur on the regional and local levels, with a few programs and activities, such as funding assistance and statewide oversight of the water management districts (WMDs), occurring at the state level.

Expenditures of State and Federal Funds

State-appropriated funding is primarily associated with the Drinking Water State Revolving Fund (DWSRF) administered by DEP's Division of Water Restoration Assistance pursuant to section 403.8532, Florida Statutes, and the federal Safe Drinking Water Act.[5] With funding provided by federal and state sources, the DWSRF provides low-interest loans that finance infrastructure improvements related to public water systems for the purpose of achieving and maintaining compliance with federal and state laws.[6] In order to receive the federal capitalization grant for the state revolving fund, the state must match at least 20 percent of the total grant amount made available to the state.[7] The Fiscal Year 2023-24 appropriation for the DWSRF is $331.59 million, a slight increase from the previous year's $329.36 million.

In addition to the DWSRF, beginning in Fiscal Year 2017-18, the Water Storage Facility Revolving Loan program was created with an appropriation of $30.0 million.[8] The first disbursements were made in Fiscal Year 2020-21 for a total of $3.22 million. In Fiscal Year 2021-22, an additional $9.5 million was disbursed. Since Fiscal Year 2013-14, the expenditures for the revolving funds have totaled approximately $910.04 million, with the majority originating from federal funding sources.

In Fiscal Year 2019-20, funding was established for a water supply and water resource development grant program. In the first year, $39 million was appropriated from General Revenue (GR) and $1 million from the Water Protection and Sustainability Program Trust Fund (WPSPTF). In Fiscal Year 2020-21, an additional $38.2 million was appropriated from GR and $1.8 million from WPSPTF. Of note, in Fiscal Year 2019-20, $22.48 million of the GR and $1.15 million of the WPSPTF appropriations was expended. In Fiscal Year 2020-21, $6.52 million of the GR and $0.25 million of the WPSPTF appropriations was expended. In Fiscal Year 2021-22, $1.35 million of the GR and $0.47 million of the WPSPTF appropriations was expended. In Fiscal Year 2022-23, $10.27 million of the GR and 0.17 million of the WPSPTF appropriations was expended.

[4] Activities associated with the regulation of public water systems by DEP under the Florida Safe Drinking Water Act, part IV of chapter 403, Florida Statutes, or by the Florida Department of Health under section 381.0062, Florida Statutes, are included when identifiable within EDR's water quality and other water resource-related program component.
[5] 42 U.S.C. §300f et. seq.
[6] § 403.8532(1), Fla. Stat.
[7] 42 U.S.C. § 300j-12(e).
[8] *See* § 12, ch. 2017-10, Laws of Fla.

Table 3.1.1.1 shows the annual cash expenditures since Fiscal Year 2013-14.[9] Due to the inconsistent history of these expenditures, the forecast relies on a 3-year moving average level of expenditures. Because these funds are provided for fixed capital outlay projects, the expenditures occur over multiple fiscal years.

Table 3.1.1.1 Water Supply Annual Expenditures and Forecast (in $millions)

History	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23
Drinking Water Revolving Fund	82.49	52.95	27.41	57.49	58.58	138.41	149.20	164.39	91.55	87.56
Aid for Alternative Water Supply	0.27	0.17	1.65	1.09	3.42	1.58	23.63	6.77	1.82	10.44
Total	**82.77**	**53.13**	**29.05**	**58.58**	**62.00**	**140.00**	**172.82**	**171.16**	**93.37**	**98.00**
Forecast	**FY 23-24**	**FY 24-25**	**FY 25-26**	**FY 26-27**	**FY 27-28**	**FY 28-29**	**FY 29-30**	**FY 30-31**	**FY 31-32**	**FY 32-33**
Total	**120.84**	**104.07**	**107.64**	**110.85**	**107.52**	**108.67**	**109.01**	**108.40**	**108.69**	**108.70**

Regional Expenditures

Similar to the analyses for the WMDs' conservation land acquisition and management, in order to identify WMD expenditures related to water supply, EDR reviewed the WMDs' preliminary budgets and tentative budgets developed in accordance with sections 373.535 and 373.536, Florida Statutes, respectively. These budget documents include actual audited expenditures allocated to six program areas and across each of the four areas of responsibility, including water supply.[10]

Table 3.1.1.2 provides a forecast and details a history of expenditures that the WMDs attributed to the water supply area of responsibility. These expenditures include activities related to water supply assessments, regional water supply plans, alternative water supply, minimum flows and levels and associated recovery or prevention strategies, water conservation initiatives, water resource monitoring and data collection, land acquisition and management, and regulatory water use permitting. To avoid double-counting WMD expenditures between the conservation land and water sections of this report, the total expenditures assigned to the "2.1 Land Acquisition" and "3.1 Land Management" activities have been removed[11] from the expenditures in Table 3.1.1.2. Note that the historic data is in local fiscal years, which begin October 1 and end September 30. For forecasting purposes, it has been converted to state fiscal years. Forecasts rely on a three-year moving average as it best fits the nature of the data.

[9] The personnel expenditures associated with the Drinking Water State Revolving Fund are included within the total personnel expenditures for Water Restoration Assistance, Chapter 5.

[10] The six program areas are: 1.0 Water Resources Planning and Monitoring; 2.0 Land Acquisition, Restoration and Public Works; 3.0 Operation and Maintenance of Works and Lands; 4.0 Regulation; 5.0 Outreach; and 6.0 District Management and Administration. The WMDs report expenditures in the four areas of responsibility at the program level only. Each program area contains multiple activities or sub-activities. The program allocation by area of responsibility are estimates since projects and initiatives may serve more than one purpose.

[11] While the districts are not required to allocate each activity and sub-activity among the four areas of responsibility, Northwest Florida WMD approximated that 10 percent of land acquisition and management is categorized as Water Supply, and 30 percent to each of Water Quality, Flood Protection, and Natural Systems. These shares are used across all districts and years to address the removal of subcategories 2.1 Land Acquisition and 3.1 Land Management.

Table 3.1.1.2 Water Management District Water Supply Expenditures (in $millions)

History	LFY 17-18	LFY 18-19	LFY 19-20	LFY 20-21	LFY 21-22
NWFWMD	$5.23	$3.90	$3.13	$4.15	$4.59
SJRWMD	$41.33	$25.78	$33.86	$26.17	$28.57
SFWMD	$92.45	$90.57	$110.16	$150.68	$175.41
SWFWMD	$33.25	$37.34	$44.51	$28.53	$28.66
SRWMD	$5.38	$5.58	$5.86	$5.47	$6.01
Total	**$177.64**	**$163.17**	**$197.52**	**$215.00**	**$243.24**
Forecast	**SFY 22-23**	**SFY 23-24**	**SFY 24-25**	**SFY 25-26**	**SFY 26-27**
Total	**$211.91**	**$219.57**	**$222.55**	**$218.01**	**$220.05**

Source: Annual Budgets of the Water Management Districts.

Table 3.1.1.3 provides a forecast and details a history of expenditures across all program areas that the WMDs attribute to the natural systems area of responsibility. Note that the historic data is in local fiscal years, which begin October 1 and end September 30. For forecasting purposes, it has been converted to state fiscal years. Forecasts rely on a linear trend as it best fits the nature of the data.

Table 3.1.1.3 Water Management District Natural Systems Expenditures (in $millions)

History	*LFY17-18*	*LFY18-19*	*LFY19-20*	*LFY20-21*	*LFY21-22*
NWFWMD	$4.32	$4.39	$4.11	$3.80	$2.11
SJRWMD	$7.53	$18.36	$6.38	$7.17	$9.44
SFWMD	$136.48	$138.13	$191.68	$281.01	$366.04
SWFWMD	$25.61	$29.38	$27.33	$30.41	$28.88
SRWMD	$4.29	$5.09	$5.26	$4.79	$4.97
Total	**$178.23**	**$195.34**	**$234.77**	**$327.18**	**$411.44**
Forecast	***SFY22-23***	***SFY23-24***	***SFY24-25***	***SFY25-26***	***SFY26-27***
Total	**$448.87**	**$430.16**	**$439.52**	**$434.84**	**$437.18**

Source: Annual Budgets of the Water Management Districts.

Table 3.1.1.4 provides a forecast and details a history of water supply expenditures[12] by special districts[13] that are located in multiple counties. Based on survey results, a portion of the local government expenditures identified in 537 Conservation and Resource Management and 572 Parks and Recreation may be for water supply purposes. Additionally, the Account 533 Water Utility Service Expenditures is included as a water supply expenditure of the respective government type as public utility data cannot be accurately separated from the local government data. Note that the historic data is in local fiscal years, which begin October 1 and end September 30. For forecasting purposes, it has been converted to state fiscal years. Forecasts rely on a three-year moving average growth rate as it best fits the nature of the data.

[See table on following page]

[12] For further details on the source and methodology of this data, *see* "Local Expenditures" in Section 1.2 of the Conservation Land Report.

[13] There exists a small number of governmental entities (*e.g.*, utility authorities) that cross counties but are technically not special districts. Their expenditures are included here.

Table 3.1.1.4 Water Supply Expenditures by Regional Special Districts (in $millions)

History	LFY 16-17	LFY 17-18	LFY 18-19	LFY 19-20	LFY 20-21
Supply	$284.53	$295.20	$293.85	$274.97	$283.73
Forecast	**FY 21-22**	**FY 22-23**	**FY 23-24**	**FY 24-25**	**FY 25-26**
Supply	$289.91	$288.60	$290.95	$293.79	$294.95

Source: Annual Financial Report data obtained from the Florida Department of Financial Services, Division of Accounting and Auditing, Bureau of Local Government. Account 533 and a portion of accounts 537 and 572 are shared in accordance with local government survey results.

Local Expenditures

Table 3.1.1.5 provides a forecast and details a history of water supply expenditures by local governments. Based on survey results, a portion of the local government expenditures[14] identified in accounts 537 Conservation and Resource Management and 572 Parks and Recreation may be attributed to water supply. Additionally, account 533 Water Utility Service Expenditures is included as a water supply expenditure of the respective government type as public utility data cannot be accurately separated from the local government data. In Local Fiscal Year 2020-21, the municipal expenditures were reduced substantially compared to that in the previous Local Fiscal Year, primarily due to a significant reduction in the City of Tampa's expenditures in account 533. Note that the historic data is in local fiscal years, which begin October 1 and end September 30. For forecasting purposes, it has been converted to state fiscal years. Forecasts rely on a three-year moving average growth rate as it best fits the nature of the data.

Table 3.1.1.5 Water Supply Expenditures by Local Governments (in $millions)

History	LFY 16-17	LFY 17-18	LFY 18-19	LFY 19-20	LFY 20-21
Counties	$304.59	$311.87	$327.44	$395.14	$353.87
Municipalities	$729.16	$754.97	$756.93	$1,087.87	$814.48
Special Districts	$19.68	$19.88	$19.63	$20.78	$19.29
Total	$1,053.42	$1,086.72	$1,104.00	$1,503.79	$1,187.63
Forecast	**FY 21-22**	**FY 22-23**	**FY 23-24**	**FY 24-25**	**FY 25-26**
Total	$1,277.78	$1,338.77	$1,313.68	$1,327.99	$1,344.30

3.1.2 Historical and Projected Revenues for Water Supply

EDR is required to forecast "federal, state, regional, and local government revenues dedicated in current law for the purposes… [of projects or initiatives associated with water supply] or that have been historically allocated for these purposes, as well as public and private utility revenues."[15] There are a variety of revenue sources that support water resources, including specific taxes and

[14] For further details on the source and methodology of this data, *see* "Local Expenditures" in Section 1.2 of the Conservation Land Report.
[15] § 403.921(1)(c), Fla. Stat.

fees that are dedicated in law. The following discussion identifies and forecasts the relevant water supply revenues.[16]

State-Appropriated Revenue Sources

The primary sources of state-appropriated revenue for water supply initiatives are federal grants and repayment of loans, which are deposited in the Drinking Water Revolving Loan Trust Fund.[17] The trust fund is used to provide low-interest loans for planning, engineering, design, and construction of public drinking water systems and improvements to such systems.

Based on a review of state accounts for the last ten fiscal years, a historical data series was constructed for the identified revenues. The Long-Term Revenue Analysis adopted by the Revenue Estimating Conference includes a forecast for federal grants, which is used as the basis for that part of the forecast through Fiscal Year 2032-33. For repayments of loans, a three-year moving average is used for the forecast. The historical series and the forecast are shown in Table 3.1.2.1.

Table 3.1.2.1 Revenues Available for Water Supply (in $millions)

History	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23
Federal Grants	58.39	21.26	31.22	29.69	26.74	31.55	46.34	39.69	40.31	39.67
Repayment of Loans	41.30	47.22	44.83	90.13	36.37	37.98	43.54	85.57	53.97	48.22
Total	**99.69**	**68.48**	**76.05**	**119.82**	**63.11**	**69.53**	**89.88**	**125.26**	**94.28**	**87.88**
Forecast	**FY 23-24**	**FY 24-25**	**FY 25-26**	**FY 26-27**	**FY 27-28**	**FY 28-29**	**FY 29-30**	**FY 30-31**	**FY 31-32**	**FY 32-33**
Federal Grants	33.10	32.72	32.93	33.24	31.70	32.16	32.50	32.87	33.26	33.63
Repayment of Loans	62.59	54.92	55.24	57.58	55.92	56.25	56.58	56.25	56.36	56.40
Total	**95.69**	**87.64**	**88.17**	**90.83**	**87.62**	**88.41**	**89.08**	**89.12**	**89.62**	**90.03**

In addition to the federal grants and repayment of loans, state funds, including General Revenue and Land Acquisition Trust Fund (LATF) receipts, are also deposited in the Drinking Water Revolving Loan Trust Fund to provide the state match for federal grants. On average, the state matching funds were approximately $9.98 million per year during the past ten fiscal years. These dollars are included in the revenue forecast.

Regional Revenues

This year, no table has been provided for water supply revenues associated with the WMDs. For the next report, EDR hopes to have separate breakouts for water supply and water quality that align with past experience.

Table 3.1.2.2 provides a forecast and details a history of water supply revenues from self-generated sources as well as federal and state sources to special districts that are located in multiple

[16] Private utility revenues are discussed in chapter 5.
[17] § 403.8533, Fla. Stat.

counties.[18] Similar to the expenditures, public utility revenues are contained in their respective government's revenues. Self-generated revenues include the accounts identified as 314.300 Utility Service Tax - Water, 323.300 Franchise Fee – Water, and 343.300 Charges for Services - Water Utility, as well as survey results regarding 343.700 Charges for Services – Conservation and Resource Management. The accounts identified as 334.310 State Grant – Water Supply System and 335.310 State Revenue Sharing – Water Supply System are categorized as water supply revenue from the state. Likewise, the account identified as 331.310 Federal Grant – Water Supply System is categorized as a water supply revenue from the federal government. Note that the historic data is in local fiscal years, which begin October 1 and end September 30. For forecasting purposes, it has been converted to state fiscal years. As revenues are largely based on population, forecasts rely on population growth rates.

Table 3.1.2.2 Water Supply Revenues Generated by Regional Special Districts by Government Source (in $millions)

History		LFY 16-17	LFY 17-18	LFY 18-19	LFY 19-20*	LFY 20-21*
	Self	$324.65	$333.18	$342.47	$351.69	$357.38
	State	$0.13	$-	$-	$-	$0.09
	Federal	$0.07	$-	$-	$-	$-
Forecast		**FY 21-22**	**FY 22-23**	**FY 23-24**	**FY 24-25**	**FY 25-26**
	Self	$363.37	$369.63	$375.13	$380.26	$385.27
	State	$-	$-	$-	$-	$-
	Federal	$-	$-	$-	$-	$-

Source: Annual Financial Report data obtained from the Florida Department of Financial Services, Division of Accounting and Auditing, Bureau of Local Government. Accounts 314.300, 323.300, 343.300, and survey results are applied to 343.700 for self; 334.310 and 335.310 for State; and 331.310 for Federal.

* LFY 19-20 and 20-21 had data issues for the Orlando Utilities Commission (OUC) and the Seacoast Utility Authority (SUA). An adjustment was made to manually include reported data for OUC, but no data was available for SUA. To preserve the integrity of the forecast, a placeholder was created that assumes SUA's 18-19 revenues would have grown at the same rate as the state's population.

Local Revenues

Table 3.1.2.3 provides a forecast and details a history of water supply revenues that are self-generated by local governments. Based on survey results, a portion of the local government account[19] identified as 343.700 Service Charge – Conservation and Resource Management is self-generated for use on water supply projects and initiatives. Further, the accounts identified as 314.300 Utility Service Tax – Water, 323.300 Franchise Fee – Water, and 343.300 Charges for Services – Water Utility are categorized as water supply self-generated revenue. In addition, local governments may have other revenue sources used to fund water supply initiatives, including impact fees and special assessments. Note that the historic data is in local fiscal years, which begin October 1 and end September 30. For forecasting purposes, it has been converted to state fiscal years. As revenues are largely based on population, forecasts rely on population growth rates.

[18] There exists a small number of governmental entities (*e.g.*, utility authorities) that cross counties but are technically not special districts. Their expenditures are included here.

[19] For further details on the source and methodology of this data, *see* "Local Expenditures" in Section 1.2 of the Conservation Land Report.

Table 3.1.2.3 Water Supply Revenues Generated by Local Governments (in $millions)

History	LFY 16-17	LFY 17-18	LFY 18-19	LFY 19-20*	LFY 20-21
Counties	$457.24	$465.58	$481.19	$516.85	$544.55
Municipalities	$1,440.67	$1,416.62	$1,450.46	$1,541.15	$1,635.99
Special Districts	$52.03	$58.29	$55.88	$61.93	$71.25
Total	**$1,949.94**	**$1,940.49**	**$1,987.53**	**$2,119.93**	**$2,251.78**
Forecast	**FY 21-22**	**FY 22-23**	**FY 23-24**	**FY 24-25**	**FY 25-26**
Total	**$2,255.98**	**$2,294.84**	**$2,329.00**	**$2,360.84**	**$2,391.95**

Source: Annual Financial Report data obtained from the Florida Department of Financial Services, Division of Accounting and Auditing, Bureau of Local Government. Accounts 314.300, 323.300, 343.300 and survey results are applied to Account 343.700.
* In LFY 19-20, Jacksonville (JEA) reported anomalous data in revenue code 343.300, which was excluded from the analysis to preserve the integrity of the forecast.

Table 3.1.2.4 provides a forecast and details a history of water supply revenues generated by the state and provided to local governments. The accounts identified as 334.310 State Grant – Water Supply System and 335.310 State Revenue Sharing – Water Supply System are categorized as water supply revenues from the state. Note that the historic data is in local fiscal years, which begin October 1 and end September 30. For forecasting purposes, it has been converted to state fiscal years. As revenues are largely based on population, forecasts rely on population growth rates.

Table 3.1.2.4 Water Supply Revenues Provided to Local Governments from the State (in $millions)

History	LFY 16-17	LFY 17-18	LFY 18-19	LFY 19-20	LFY 20-21
Counties	$2.25	$1.65	$2.07	$6.62	$11.80
Municipalities	$10.47	$8.10	$20.10	$12.59	$16.43
Special Districts	$0.06	$0.21	$0.09	$0.24	$0.09
Total	**$12.78**	**$9.96**	**$22.26**	**$19.46**	**$28.32**
Forecast	**FY 21-22**	**FY 22-23**	**FY 23-24**	**FY 24-25**	**FY 25-26**
Total	**$26.54**	**$27.00**	**$27.40**	**$27.78**	**$28.14**

Source: Annual Financial Report data obtained from the Florida Department of Financial Services, Division of Accounting and Auditing, Bureau of Local Government, Accounts 334.310 and 335.310.

Table 3.1.2.5 provides a forecast and details a history of water supply revenues generated by the federal government and provided to local governments. The account identified as 331.310 – Federal Grant – Water Supply System is categorized as water supply revenue from the federal government. Note that the historic data is in local fiscal years, which begin October 1 and end September 30. For forecasting purposes, it has been converted to state fiscal years. As revenues are largely based on population, forecasts rely on population growth rates.

[See table on following page]

Table 3.1.2.5 Water Supply Revenues Provided to Local Governments from the Federal Government (in $millions)

History	LFY 16-17	LFY 17-18	LFY 18-19	LFY 19-20	LFY 20-21
Counties	$-	$0.03	$0.61	$-	$0.43
Municipalities	$6.70	$5.06	$4.84	$11.95	$9.59
Special Districts	$-	$-	$0.06	$0.97	$0.44
Total	**$6.70**	**$5.09**	**$5.51**	**$12.93**	**$10.45**
Forecast	**FY 21-22**	**FY 22-23**	**FY 23-24**	**FY 24-25**	**FY 25-26**
Total	**$11.26**	**$11.45**	**$11.62**	**$11.78**	**$11.93**

Source: Annual Financial Report data obtained from the Florida Department of Financial Services, Division of Accounting and Auditing, Bureau of Local Government, Accounts 331.310.

3.1.3 Total Historical and Projected Revenues and Expenditures

This annual assessment is required to include an analysis and estimate of future expenditures "necessary to achieve the Legislature's intent that sufficient water be available for all existing and future reasonable-beneficial uses and the natural systems, and that adverse effects of competition for water supplies be avoided."[20] Table 3.1.3.1 shows the total water supply historical and projected revenues and expenditures. While projected revenues surpass projected expenditures, these projections do not necessarily indicate expected surpluses. These projections do not include water supply revenues reported under account 343.600, Charges for Services - Water-Sewer Combination Utility, or expenditures reported under account 536, Water-Sewer Service Expenditures. EDR is not currently able to separate the water supply portion from the water quality portion of those accounts. These accounts are reported in Chapter 5 of this Edition. Additionally, some local governments report their debt/loan repayments under expenditure code 517.700, Debt Service Payments - Debt Service, instead of under a water supply-related account code. For those entities, their debt repayments for water supply cannot be separated into water supply-specific debt repayments. At the statewide level, the apparent revenue surplus for water supply is overstated.

Table 3.1.3.1. Total Projected Water Supply Revenues and Expenditures.

Revenues	FY 21-22	FY 22-23	FY 23-24	FY 24-25	FY 25-26
State-Appropriated Revenues	$94.28	$87.88	$95.69	$87.64	$88.17
Regional Special Districts	$363.37	$369.63	$375.13	$380.26	$385.27
Local Governments	$2,240.69	$2,279.29	$2,313.22	$2,344.84	$2,375.74
Total	**$2,698.34**	**$2,736.80**	**$2,784.04**	**$2,812.74**	**$2,849.18**
Expenditures					
State and Federal Funds	$93.37	$98.00	$120.84	$104.07	$107.64
Water Management Districts	$626.56	$660.79	$649.73	$662.07	$652.85
Regional Special Districts	$289.91	$288.60	$290.95	$293.79	$294.95
Local Governments	$1,277.78	$1,338.77	$1,313.68	$1,327.99	$1,344.30
Total	**$2,287.62**	**$2,386.16**	**$2,375.21**	**$2,387.91**	**$2,399.74**

[20] § 403.921(1)(b), Fla. Stat.

3.2 Modeling Future Water Demand and Supply

The historical expenditures related to water supply and demand management, and spending for the protection and restoration of natural systems, were discussed in the previous section. The projected expenditures estimated in section 3.1 differ from the expenditures that will be necessary to ensure that sufficient water is available for both existing needs and future ones. Section 3.2 will show that state investments above and beyond this baseline level of expenditures may be needed to achieve the Legislature's intent that "sufficient water be available for all existing and future reasonable-beneficial uses and the natural systems, and that adverse effects of competition for water supplies be avoided."[21]

Section 3.2 starts with a review of the existing water supply planning framework in Florida. It continues with the analysis of water demand and supply, inferred supply shortage, and expenditure estimates. The final section of this chapter discusses future steps to further improve the expenditure forecast.

3.2.1 Water Supply Planning in Florida

Florida law provides a comprehensive framework for water supply planning. Water supply assessments (WSAs) and regional water supply plans (RWSPs) developed by the water management districts (WMDs) are the primary tools for long-term water demand and supply planning in Florida.[22] Under section 373.036, Florida Statutes, the governing board of each WMD must develop a district water management plan.[23] Every district water management plan must be prepared for at least a 20-year planning period and is required to address water supply, water quality, flood protection and floodplain management, and natural systems. For water supply specifically, all district water management plans include WSAs. The assessments determine whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for all existing legal uses and reasonably anticipated future needs and to sustain water resources and related natural systems over the next 20 years.

Furthermore, in cases where it is determined that existing water sources are inadequate to meet the needs over the next 20 years, RWSPs must be developed. Each RWSP contains water supply development project options and water resource development projects and programs.[24] The total capacity of the projects included in the regional water supply plans must exceed the water supply needs for all existing and future reasonable-beneficial uses within the 20-year planning horizon.

[21] § 403.928(1)(b), Fla. Stat. This section also requires EDR to compile water supply and demand projections developed by each water management district (WMD), documenting any significant differences between the methods used by WMDs.

[22] For a map of the five WMDs, see Figure 3.0.1.

[23] According to § 373.036, Florida Statutes, a governing board may substitute an annual strategic plan for the requirement to develop a district water management plan and the district water management plan annual report. The strategic plan should meet "the following minimum requirements:

1. The strategic plan establishes the water management district's strategic priorities for at least a future 5-year period.
2. The strategic plan identifies the goals, strategies, success indicators, funding sources, deliverables, and milestones to accomplish strategic priorities.
3. The strategic plan development process includes at least one publicly noticed meeting to allow public participation in its development.
4. The strategic plan includes separately, as an addendum, an annual work plan report on the implementation of the strategic plan for the previous fiscal year, addressing success indicators, deliverables, and milestones."

[24] Based on § 373.709, Fla. Stat.

Each RWSP should also take into account water conservation and other demand management measures, as well as water resource constraints, including adopted minimum flow and minimum water levels and water reservations. Both RWSPs and districtwide WSAs are required to be updated at least once every five years.[25]

The Department of Environmental Protection (DEP) is in charge of providing the Governor and Florida Legislature with an annual status summary of regional water supply planning activities in each WMD.[26] The most recently published status summary (for calendar year 2022) was published in December 2023 and is referred to in this chapter as "DEP (2023a)."[27] Florida is divided into 19 mutually exclusive water supply planning regions (Table 3.2.1.1; Figure 3.2.1.1). For presentation purposes, the DEP (2023a) report combines six of the seven water supply planning regions in the Northwest Florida Water Management District (NWFWMD), reducing the number of regions statewide from 19 to 14. Water supply is projected to meet the demand throughout the planning period in all six of those NWFWMD regions, so they do not require RWSPs. For all 14 regions, DEP includes data for "Base Year Total Water Use," "Net Demand Change," and "Water Needed," from which EDR infers available supply data. The WMDs use different schedules for their 5-year updates of the water supply assessments and plans. Specifically, 10 of the areas currently use the 2020-2040 planning horizon, while four areas (Area outside NFRWSP and North Florida Regional Water Supply Partnership, Upper East Coast, and Lower East Coast) have the 2020-2045 planning horizon. Table 3.2.1.1 summarizes the RWSPs/WSAs used in the "Annual Status Report on Regional Water Supply Planning" in DEP (2023a). Unlike previous editions, no region is still using a 20-year projection timeframe of 2015-2035.

[See table on following page]

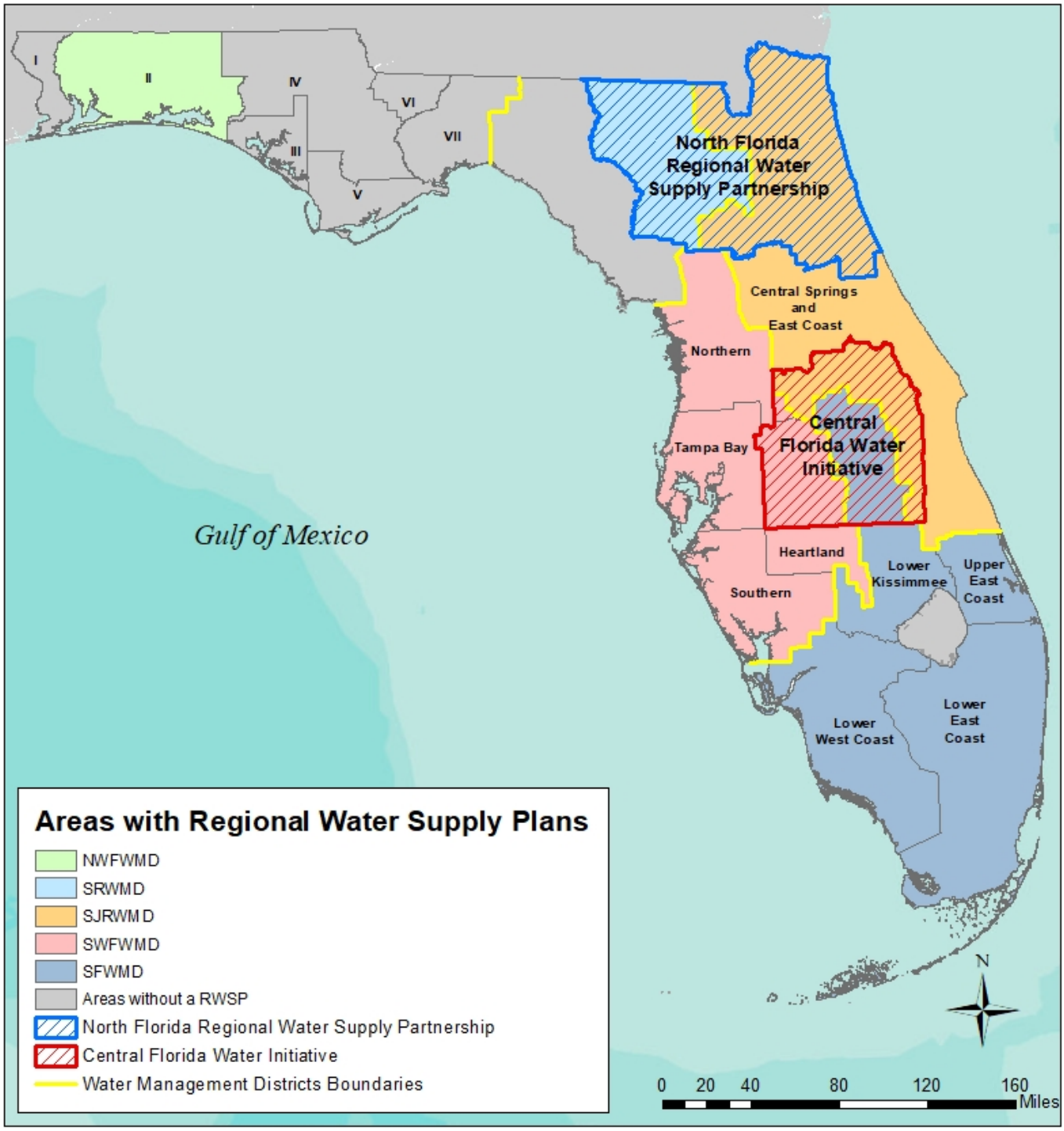
[25] § 373.036, Fla. Stat. For more details on the water supply planning process in Florida, see pages 66-70 of the 2018 Edition of this report, available online at: http://edr.state.fl.us/Content/natural-resources/index.cfm (accessed November 2023).
[26] § 373.709, Fla. Stat.
[27] DEP. 2023a. Regional Water Supply Planning 2022 Annual Report, available online at: https://floridadep.gov/water-policy/water-policy/content/water-supply.

Table 3.2.1.1 Water Supply Planning Regions

Water Management District	Water Supply Planning Region	Counties	Abbreviation	Water Supply Planning Document Referenced in DEP (2022a)	Base Year for Water Use Estimates	Planning Horizon	
						2015-2035	2020-2040
Northwest Florida Water Management District (NWFWMD)	I	Escambia	**NW – Oth**	2018 Water Supply Assessment Update (2018)	2015		
	III[a]	Bay[a]					
	IV	Calhoun, Jackson, Holmes, Liberty, Washington					V
	V[b]	Franklin and Gulf[b]					
	VI	Gadsden					
	VII	Jefferson (part), Leon, Wakulla					
	II	Okaloosa, Santa Rosa, and Walton	**NW – II**	2019 Region II Regional Water Supply Plan (2020)[c]	2015		V
Suwannee River Water Management District (SRWMD)	Area outside NFRWSP	Dixie, Jefferson (part), Lafayette, Levy (part), Madison, and Taylor	**SR – West**	Water Supply Assessment 2015-2035 (2018)	2015[f]	V	
St. Johns River Water Management District (SJRWMD)	Central Springs and East Coast (Region 2, formerly Regions 2, 4, and 5)	Brevard, Indian River Marion (part), Lake (part), Okeechobee (part), and Volusia	**SJR – CSEC**	2022 Regional Water Supply Plan (2022)[d]	2015		V
Southwest Florida Water Management District (SWFWMD)	Northern Planning Region (partially in Central Florida Water Initiative)[c]	Citrus, Hernando, Lake (part), Levy (part), Marion (part), and Sumter[e]	**SW – N**[e]	2020 Regional Water Supply Plan; partially in CFWI Regional Water Supply Plan 2020	2015		V
	Tampa Bay Planning Region	Hillsborough, Pasco, and Pinellas	**SW – TB**	2020 Regional Water Supply Plan	2015		V
	Heartland Planning Region (partially in Central Florida Water Initiative)[c]	Hardee, Highlands (part), Polk (part)[e]	**SW – H**[e]	2020 Regional Water Supply Plan; partially in CFWI Regional Water Supply Plan 2020	2015		V
	Southern Planning Region	Charlotte (part), DeSoto, Manatee, and Sarasota	**SW – S**	2020 Regional Water Supply Plan	2015		V
South Florida Water Management District (SFWMD)	Lower Kissimmee Basin	Glades (part), Highlands (part), and Okeechobee (part)	**SF – LKB**	Regional Water Supply Plan Update (2019)	2017		V
	Upper East Coast	Martin, Okeechobee (part), and St. Lucie	**SF – UEC**	Regional Water Supply Plan Update (2021)	2019		V
	Lower East Coast	Broward, Collier (part), Hendry (part), Miami-Dade, Monroe (part), and Palm Beach	**SF – LEC**	Regional Water Supply Plan Update (2018)	2016		V
	Lower West Coast	Charlotte (part), Collier (part), Glades (part), Hendry (part), Monroe (part), and Lee	**SF – LWC**	Regional Water Supply Plan Update (2017)	2020		V
SRWMD and SJRWMD	North Florida Regional Water Supply Partnership	Alachua, Baker, Bradford, Clay, Columbia, Duval, Flagler, Gilchrist, Hamilton, Nassau, Putnam, St. Johns, Suwannee, and Union	**NFRWSP**	NFRWSP Regional Water Supply Plan (2017)	2015	V[g]	
SJRWMD, SWFWMD, and SFWMD	Central Florida Water Initiative	Lake (part), Orange, Osceola, Seminole, and Polk	**CFWI**	CFWI Regional Water Supply Plan 2020	2015		V

[a] The RWSP for Region III was first approved in 2008 and updated in 2014. This plan was discontinued in December 2018.
[b] The Region V RWSP was approved in 2007 and discontinued in 2014.
[c] The 2018 WSA is incorporated by reference, with the 2018 WSA containing the technical data, modeling tools, and methods used to develop the 2019 RWSP.
[d] The final RWSP (published 02/07/2022) is available on the SJRWMD's website at https://www.sjrwmd.com/water-supply/planning/csec-rwsp/#documents (accessed December 2023).
[e] In this report, the portion of the region outside Central Florida Water Initiative is mentioned, with the abbreviations SW – N (for the Northern Region) and SW – H (for the Heartland Region). The RWSPs are available on the SWFWMD's website at https://www.swfwmd.state.fl.us/resources/plans-reports/rwsp (accessed October 2023)
[f] SR – West planning region was created following the recommendations in SRWMD WSA (2018). SRWMD is developing the first regional WSA and RWSP for SR – West and is currently in the stakeholder review process. SR – West demand projections have been updated based on data workshopped in 2022; the plan approval date is to be determined. Water Needed and Project Options quantities listed are from the previously published WSA. 1-in-10 water use projection is based on 2045 (see https://www.mysuwanneeriver.com/DocumentCenter/View/18827/Western-Water-Supply-Plan-Constraint-Assessment-Public-Workshop-Presentation?bidId= , accessed October 2023)
[g] RWSP for the 2020-2045 planning horizon is expected to be approved in Winter 2023/2024. NFRWSP demand projections have been updated based on data workshopped in 2022; the NFRWSP approval date is to be determined. Water Needed and Project Options quantities listed are from the previously published NFRWSP.
(see https://northfloridawater.com/watersupplyplan/, accessed October 2023).

Figure 3.2.1.1 Florida's WMDs and Water Supply Planning Regions



Note: WMD coloring applies only to regions that have a regional water supply plan. The hatching identifies the planning regions that cross the borders between the WMDs and where regional water supply plans were developed through collaboration by two or three WMDs.
Source: Provided by DEP, Office of Water Policy & Ecosystems Restoration.

3.2.2 The Expenditure Forecast: Role of EDR

Section 403.928, Florida Statutes, directs EDR to estimate future expenditures necessary to provide sufficient water for all existing and future reasonable-beneficial uses and the natural systems. To meet these requirements, EDR's expenditure analysis focuses on synthesizing a single statewide forecast using data from other state agencies, the plans developed by the WMDs, and the most recent economic and demographic projections adopted by the Consensus Estimating Conferences. Note that the Economic Estimating Conference develops official projections related to the national and state economies, while the Demographic Estimating Conference develops official estimates and forecasts concerning the population (§ 216.136, Fla. Stat.). In developing its estimates, the Demographic Estimating Conference uses additional materials provided by EDR (§§ 216.136 and 186.901, Fla. Stat.).[28] As part of this process, EDR contracts with the University of Florida's Bureau of Economic and Business Research (BEBR) to produce longer-term and more granular population projections. The goal for future editions of this report is to link the water expenditure forecast with the official economic and demographic forecasts for purposes of the state planning and budgeting system.

Even so, the information in DEP's annual status report (DEP 2023a[29]) provides an important basis for the EDR expenditure forecast presented in this edition. Demand estimates and projections for at least a 20-year planning horizon are developed by the WMDs using mostly standardized techniques with region-specific information. Importantly, the WMDs analyze water supply availability by simulating future demands through the use of hydrogeological models. They also fulfill the statutory requirements of water supply planning for each district as a whole and within the sub-regions.

According to WMD staff, economic conditions are considered in developing their water demand projections. Still, results combined from the regions are unlikely to be consistent with the official Florida Economic forecast or share the same overarching economic outlook, since the Florida Economic forecast is updated more frequently than the WMDs' projections. The annually updated long-term population forecast adopted by the Demographic Estimating Conference and the most recent economic forecasts used by EDR serves as the basis for EDR's water demand projections intended for statewide expenditure modeling.[30] This is largely because the WMDs' projections are not required to be annual.[31] In contrast, as Florida's legislative budgeting process is completed annually, EDR must develop annual estimates of future expenditures in support of the budgeting process. Further, for the EDR forecast, adjustments can be made each year. Alternative scenarios can be explored, such as drought, fluctuations in tourism (if the seasonal population is incorporated in the demand projections), and economic cycles. Eventually, a water demand forecast produced

[28] General provisions for the Consensus Estimating Conferences are defined in § 216.134, Fla. Stat. Specifically, the Consensus Estimating Conferences are within the legislative branch. The membership of each consensus estimating conference consists of principals and participants. The principals of each conference shall be the professional staff of the Executive Office of the Governor designated by the Governor, the coordinator of EDR, professional staff of the Senate designated by the President of the Senate, and professional staff of the House of Representatives designated by the Speaker of the House of Representatives.

[29] DEP. 2023a. Regional Water Supply Planning 2022 Annual Report, available online at: https://floridadep.gov/water-policy/water-policy/content/water-supply.

[30] EDR focuses on statewide water demand and expenditure modeling. In contrast, the WMDs focus on region-specific water demand projections, which is more appropriate for the WMDs' mission.

[31] Water demand projections are required to be developed for 5-year intervals during the planning period, see subparagraph 62-40.531(1)(a), Florida Administrative Code.

by EDR could also extend beyond the 20-year planning horizon used by the WMDs in an attempt to account for long-term trends, such as weather and climate patterns.[32]

Note that EDR's forecast should only be considered at the statewide level for the purposes identified in section 403.928, Florida Statutes, and is not appropriate for any regional regulatory or permitting use. This difference between the WMD's projections and EDR's forecast is partly because EDR is more focused on developing a reliable statewide expenditure forecast. Further, EDR currently does not intend to tailor its predictions to reflect specific regional drivers unless they later prove to be important to the statewide forecast.

3.2.3 Water Use Projections Based on WMD Data

While the most recent WSAs and RWSPs were developed or updated in different years, estimated or projected water uses are available for most regions for 2020 to 2040, based on 5-year intervals.

Based on the WMDs' data, between 2020 and 2040, the total statewide water use is projected to increase by about 842.52 million gallons per day (mgd), or approximately 13.15% (Table 3.2.3.1). Roughly two-thirds of the statewide water use increase (604.36 mgd) can be attributed to four regions: NFRWSP, CFWI, SF – LEC, and SF – LWC. Projected statewide water demand is slightly lower (less than 1.2%) than that discussed in the DEP and EDR reports last year (DEP 2022a[33], EDR 2023[34]). Specifically, for 2040, statewide WMDs' water use projections were at 7,336.08 mgd last year compared with 7,249.00 mgd reported this year (DEP 2023a). The most recent water use projections for SR – West, SF – LWC, and NFRWSP regions led to the reduction.

Overall, all but two planning regions expect an increase in water use throughout the planning period. The exception is the SW – H (outside the CFWI) and SF – UEC, where slight reductions in total water use are projected by 2040, largely due to projected decreases in agricultural irrigation.

[See table on following page]

[32] For example, the Texas 2022 State Water Plan focuses on the 2020-2070 planning period (available online at: https://www.twdb.texas.gov/waterplanning/swp/index.asp; accessed November 2023.) California also considers a 50-year planning horizon, with projected state funding needs for their State Water Plan Goal 2 "Strengthen Resiliency and Operational Flexibility of Existing and Future Infrastructure" estimated at $59.0 billion by 2068 (available online at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/Update2018/Final/California-Water-Plan-Update-2018.pdf; accessed November 2023.)

[33] DEP. 2022a. Regional Water Supply Planning 2021 Annual Report, available online at: https://floridadep.gov/water-policy/water-policy/content/water-supply.

[34] EDR. 2023. Annual Assessment of Florida Water Resources and Conservation Lands – 2023 Edition available at: http://edr.state.fl.us/Content/natural-resources/index.cfm

DEP. 2023a. Regional Water Supply Planning 2022 Annual Report, available online at: https://floridadep.gov/water-policy/water-policy/content/water-supply.

Table 3.2.3.1 Water Use Projections by WMDs

Region	Projections (mgd)					Difference between 2020 and 2040 water use projections	
	2020	2025	2030	2035	2040	mgd	%
NW – II	76.88	82.25	87.03	91.19	94.88	18	23.40%
NW – Oth	273.72	287.12	296.92	304.58	311.9	38.18	14.00%
SR – West	107.6	111.8	116.69	122.35	123.2	15.6	19.7%
SJR – CSEC	383.47	395.62	406.11	416.72	427.87	44.4	11.60%
SW – N**	142.49	153.55	163.54	173.09	181.73	39.24	27.50%
SW – TB	413.34	432.77	436.96	450.56	461.85	48.51	11.70%
SW – H**	91.52	89.45	96.17	94.96	89.15	-2.37	-2.60%
SW – S	245.02	254.22	265.77	272.99	279.33	34.31	14.00%
SF – LKB	249.9	251.83	253.68	253.83	257.49	7.59	3.00%
SF – UEC	289.26	289.70	287.84	286.07	283.96	-5.3	-1.83%
SF – LEC	1,813.99	1,863.91	1,923.28	1,963.65	2,006.54	192.55	10.60%
SF – LWC	1,013.43	1,046.53	1,080.22	1,115.00	1,147.67	134.24	17.50%
NFRWSP	571.02	603.38	628.15	653.28	676.24	105.22	18.9%
CFWI	735.24	789.49	836.65	873.94	907.59	172.35	23.40%
State	**6,406.48**	**6,651.62**	**6,879.01**	**7,072.21**	**7,249.00**	**842.52**	**13.15%**

** Portion of the region outside the CFWI.

In each water supply planning region, the demand projections are developed for six use-type categories defined in part through water supply means (*i.e.*, public supply or self-supply). The names of the categories vary slightly among the WMDs, and therefore, EDR adopts the names suggested in the 2019 regional water supply planning guidelines:[35]

a) *Public Supply (PS)* — such as water utilities supplying water for various uses, including household and community purposes, as well as commercial, industrial, institutional, mining, power generation, and recreational landscaping uses. According to the Format and Guidelines for the RWSP (DEP et al. 2019[36]), public supply uses with a current allocation greater than or equal to 0.1 mgd should be listed individually. Small public supply systems (*i.e.*, public supply systems with an allocation of less than 0.1 mgd) and individual residential irrigation wells may also be included in the PS category (DEP et al. 2019). Note that in its RWSPs, the SWFWMD combines public supply and domestic self-supply into one group, together with the estimated water use for residential irrigation wells. This group is then split into PS and Domestic Self-Supply (DSS) in DEP's report (DEP 2023a[37]) to make the categories more consistent with those used by the other WMDs.

[35] Note that these names are slightly different from that used in § 62-40.531(1)(b), Florida Administrative Code. These names also differ from those used in the 2018 and 2019 Editions of this EDR report and from those used in some of the WSAs/RWSPs. The names are consistent with the 2019 Format and Guidelines document (DEP et al. 2019).
Reference: DEP, NWFWMD, SFWMD, SWFWMD, SJRWMD, and SRWMD. 2019. Format and Guidelines for Regional Water Supply Planning. 42pp.

[36] DEP, NWFWMD, SFWMD, SWFWMD, SJRWMD, and SRWMD. 2019. Format and Guidelines for Regional Water Supply Planning. 42pp.

[37] DEP. 2023a. Regional Water Supply Planning 2022 Annual Report, available online at: https://floridadep.gov/water-policy/water-policy/content/water-supply.

b) *Domestic Self-Supply (DSS)* — such as domestic wells providing for both indoor and outdoor household uses.[38] Note that a WMD may consider individual residential irrigation wells, including those both within and outside a public supply service area, in either the DSS or the landscape / recreational use categories (DEP et al. 2019[39]). Also, the WMDs may choose to include small public supply systems in the DSS category (DEP et al. 2019).

c) *Agriculture (AG)* — includes self-supplied agricultural irrigation, livestock watering, aquaculture, and frost-freeze protection. DEP et al. (2019) suggest that all known self-supplied agriculture irrigation should be included based on the best available data. In determining the best available data, the WMDs are required to consider the DACS's future agricultural water supply demands data (§§ 373.709 and 570.93, Fla. Stat.).

d) *Landscape/Recreational (L/R)* — includes, but is not limited to, self-supplied golf courses, parks (including water parks), and commercial center irrigation (DEP et al. 2019). Note that a WMD may consider individual residential irrigation wells, including those both within and outside a public supply service area, in either the DSS or the L/R use categories (DEP et al. 2019).

e) *Commercial/Industrial/Institutional (CII)* — includes various self-supplied commercial, industrial, and institutional activities that are not supplied with water through PS. Self-supplied commercial, industrial, and institutional uses equal to or greater than 0.1 mgd may be listed individually or in the aggregate. The WMDs may exclude appropriate quantities of recirculated water from demand projections for planning purposes (DEP et al. 2019).

f) *Power Generation (PG)* — includes power generation facilities that rely on self-supplied groundwater or fresh surface water. According to DEP et al. (2019), self-supplied power generation uses with an individual water use permit or Site Certification issued by the DEP should be listed individually. Other known self-supplied power generation uses may be listed individually or in the aggregate. The WMDs should exclude recirculated water from demand projections for planning purposes.

According to DEP et al. (2019), the WMDs must account for reclaimed water[40] when analyzing and projecting demand for all water use categories except for DSS. Therefore, although category names may include the reference to "self-supply," a share of water use in these categories can be met by reclaimed water from domestic wastewater treatment plants.

As mentioned above, the WMDs' projections for the water use categories depend on local and regional data availability. While the general approach to estimating and projecting water demand is consistent among the regions, differences were identified in the specifics. A detailed analysis of

[38] As stated above, the SWFWMD combines public supply and domestic self-supply into one group, together with the estimated water use for residential irrigation wells. SWFWMD's 2020 Regional Water Supply Planning reports are available at: https://www.swfwmd.state.fl.us/resources/plans-reports/rwsp. This group is then split into the PS and DSS categories in the DEP (2023a) to make the categories more consistent with those used by the other WMDs.

[39] DEP, NWFWMD, SFWMD, SWFWMD, SJRWMD, and SRWMD. 2019. Format and Guidelines for Regional Water Supply Planning. 42pp.

[40] "Reclaimed water" is defined in Chapter 62-610.200, Florida Administrative Code, as "water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility."

the differences among the WMDs' methods can be found in Appendix A.2 in the report's 2023 Edition. Significant differences include:

- *The definition of the population used to forecast PS water use*. For each water utility included in PS, all WMDs project water demand as a product of the per capita water use rate (based on the last year or last several years) and the projected population. The definitions of the population, however, differ between the WMDs. Some WMDs explicitly base their projections on the permanent and non-permanent populations, combined.

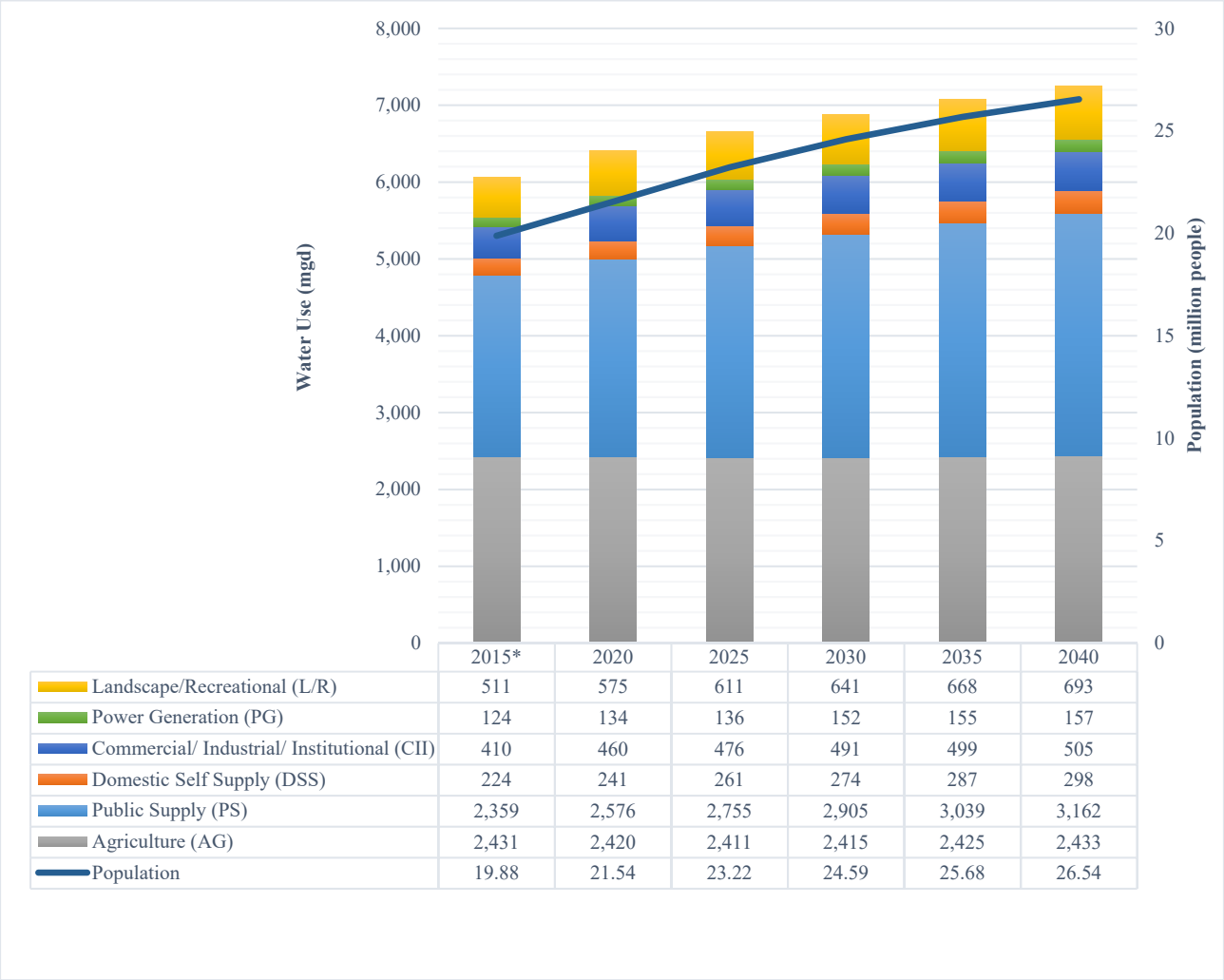
- *County population projections utilized in PS and DSS projections.* All WMDs reconcile their county population projections (*i.e.*, the total of PS and DSS populations) to that of BEBR.[41] However, the publication years for the annual BEBR projections used by the WMDs range from 2014 to 2020. Therefore, the population considered in all the WSAs/RWSPs does not add up to the most recent statewide population projections adopted by the Demographic Estimating Conference. Note that the BEBR's population projections are prepared under a contractual agreement with the Florida Legislature to support the Conference and EDR.

- *Agricultural water use projection.* Districts are required to consider irrigated agricultural acreage and demand data published in the most recent FSAID Geodatabase released by DACS (§ 373.709, Fla. Stat.). While some WMDs apply agricultural water use projections developed by DACS, others develop their projections independently (*e.g.*, using FSAID acreage data).

Water use is projected to grow in all categories, but public supply accounts for most of the total growth (*i.e.,* 586.79 mgd out of the total increase of 842.52 mgd). While the finalized statewide water use data for 2020 are not yet fully incorporated into regional plans, the WMDs have estimated that public supply finally surpassed agriculture to become the largest water use category. The rates of water use expansion in public supply (22.78%), domestic self-supply (23.44%), and landscape / recreational (20.53%) generally match the rate of population growth (23.21% in 2020-2040, based on the EDR population forecast). While water use in agriculture is also forecasted to increase, the combined use across districts only grows 0.55% over the 20-year period, a lower percentage than reported last year (1.62%). A graph summarizing this data is provided in Figure 3.2.3.1.

[41] Overall, according to Section 373.709(2)(a)1.a, Florida Statutes, "Population projections used for determining public water supply needs must be based upon the best available data. In determining the best available data, the district shall consider the University of Florida Bureau of Economic and Business Research (BEBR) medium population projections and population projection data and analysis submitted by a local government pursuant to the public workshop described in subsection (1) if the data and analysis support the local government's comprehensive plan. Any adjustment of or deviation from the BEBR projections must be fully described, and the original BEBR data must be presented along with the adjusted data."

Figure 3.2.3.1 WMDs' Water Use Projections (mgd)



	2015*	2020	2025	2030	2035	2040
Landscape/Recreational (L/R)	511	575	611	641	668	693
Power Generation (PG)	124	134	136	152	155	157
Commercial/ Industrial/ Institutional (CII)	410	460	476	491	499	505
Domestic Self Supply (DSS)	224	241	261	274	287	298
Public Supply (PS)	2,359	2,576	2,755	2,905	3,039	3,162
Agriculture (AG)	2,431	2,420	2,411	2,415	2,425	2,433
Population	19.88	21.54	23.22	24.59	25.68	26.54

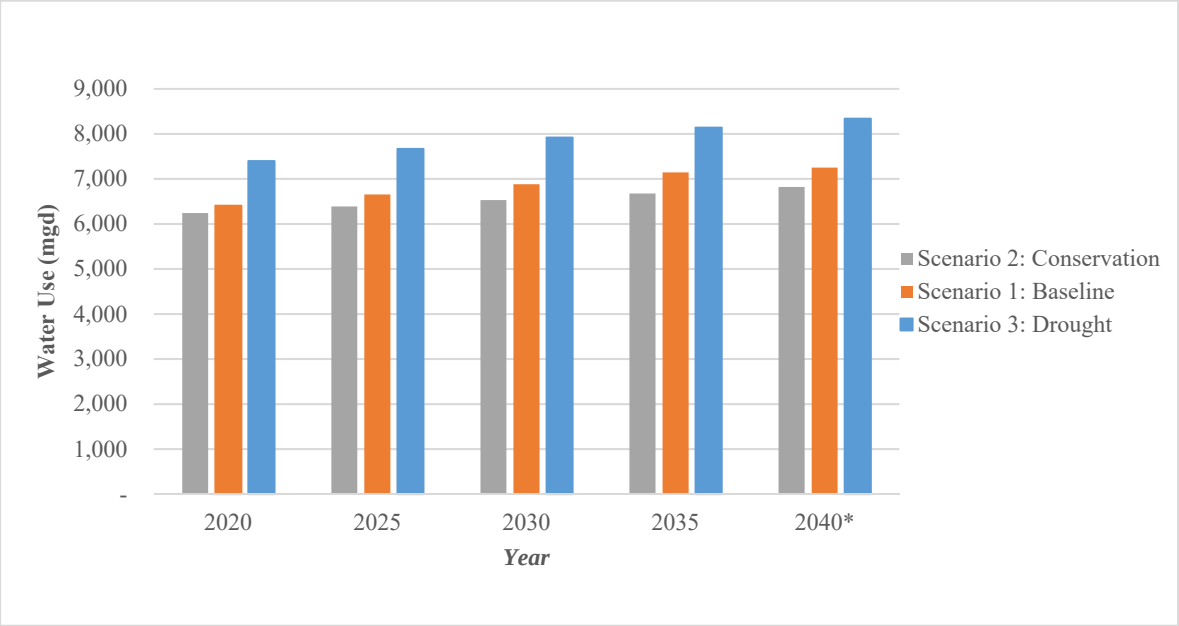
Source: DEP (2023a)
* For most regions, water use in 2015 is estimated based on available data; for selected regions with newer RWSPs, the use was projected using 2017-2020 data.

Alternative Water Use Scenarios: Impacts of Water Conservation and Droughts

The projected 2020-2040 increase in statewide water use is significant – 13.15%. EDR refers to the scenario discussed above as "Scenario 1" or "baseline scenario." The EDR expenditure forecast is based on this "baseline scenario." However, it is important to realize that part of the water use increase projected for Scenario 1 can be offset by improving water use efficiency and water conservation, which is not explicitly accounted for in the water demand projection. Conversely, the demand can exceed the projections, especially given drought conditions.

The conservation projections are intended to represent "reasonably expected demand reduction at the end of the planning period due to conservation activities" (DEP et al. 2019, p. 30).[42] According to district projections compiled by DEP, conservation could offset 427.51 mgd by 2040 statewide.[43] This would reduce the projected statewide 2040 water demand by 5.89%, from 7,249.00 mgd to 6,821.89 mgd (Figure 3.2.3.2). In terms of the projected 2020-2040 demand increase, the conservation scenario could, with appropriate investments, reduce this increase by 30.88% compared to the baseline scenario (from 842.52 mgd to 582.31 mgd).[44] This alternative scenario is referred to as Scenario 2, conservation. Note that the WMDs emphasize that any potential conservation should not be directly removed from water demand estimates since actual savings are based on endorsement and implementation of conservation measures by public supply utilities and other users, as well as being highly contingent on specific user participation rates. Substantial investments may be needed to realize these savings. As a result, conservation projections are developed by the WMDs separately from the baseline water demand projections.

Figure 3.2.3.2 Statewide Water Use Projections Based on WMDs Data



* For two regions–NFRWSP and SR-West–2040 projections were not available in DEP 2023a; EDR estimated the water use based on a linear trend. Note that for all water use categories in both regions, linear trends represented 2015-2040 data extremely well (R-squared for Ordinary Least Squares regression above 0.99, estimated in Microsoft Excel).

[42] An alternative water use scenario accounts for conservation potential. This scenario is referred to as Scenario 2, conservation. For planning purposes, water conservation is defined as "the prevention and reduction of wasteful, or unreasonable uses of water to improve the efficiency of use" (p. 30, DEP et al. [2019]).
Reference: DEP, NWFWMD, SFWMD, SWFWMD, SJRWMD, and SRWMD. 2019. Format and Guidelines for Regional Water Supply Planning. 42pp.

[43] In DEP (2023a), the value is 446.25; however, the projection extended to 2045 for three regions (i.e., NFRWSP, SF – LWC and SR – West).

[44] The calculations of the conservation potential for 2020-2040 are discussed in Section 3.2.7 of this report and Appendix A.3. This report generally includes the estimates presented in DEP (2023a), accounting for both "Conservation Projection" and "Additional Conservation Projection" from DEP (2023a).
Reference: DEP. 2023a. Regional Water Supply Planning 2022 Annual Report, available online at: https://floridadep.gov/water-policy/water-policy/content/water-supply .

The WMDs are required to incorporate a level-of-certainty planning goal associated with demand for a 1-in-10-year drought event.[45] The 1-in-10-year drought event is defined as "a year in which below normal rainfall occurs with a 10% probability of occurring in any given year" (DEP et al. 2019).[46] For the final year of their current planning horizons (*i.e.*, 2040 or 2045), all WMDs calculate the drought year water demand. These estimates are summarized in DEP (2023a). Some WMDs also provide drought demand projections for the 5-year intervals. EDR relied on these projections to develop 5-year drought demand estimates, along with a review of individual WSAs and RWSPs.[47] Statewide, the drought demand is expected to be approximately 13.15% higher than the demand in the baseline scenario. The scenario that accounts for the 1-in-10-year drought but does not explicitly consider the conservation potential is referred to as Scenario 3 (see Figure 3.2.3.2).

3.2.4 WMDs' Sufficiency Analysis and EDR's Inferred Water Supply and Inferred Water Shortage Values

The EDR expenditure forecasts rely on estimates of the differences between the projected demand and the existing water supply. If the difference is negative or zero, no investments in increasing the water supply are needed. In this case, only expenditures for maintaining or replacing existing infrastructure and investments for natural system restoration are needed. In contrast, if the projected demand is greater than the existing supply, additional water supplies should be identified, and invested in, to meet water demand growth.

As required by section 373.709(2), Florida Statutes, each water management district must include a "sufficiency analysis" in its WSAs/RWSPs. The analyses must identify "sufficient water resource and water supply development project options to meet projected water demands while preventing the loss of natural resources (…)" (SJRWMD 2022[48]). Districts' sufficiency analyses rely on models of potential effects on groundwater resources and natural systems from increased groundwater withdrawals. The Districts' studies focus on sub-regions (e.g., counties or their portions) and incorporate population and withdrawal projections and hydrologic analysis for those relatively small geographical areas. WMDs then examine the potential effects of increased withdrawals and identify the need for alternative water supply and conservation to offset the withdrawals and ensure future water demands can be met without losing natural systems. DEP summarizes the WMD's estimates of alternative water supply and conservation needs in the "Water Needed" column of the Annual Status Report on Regional Water Supply Planning. EDR utilizes the data from DEP's "Water Needed" column in calculating the "inferred water supply" and "inferred water supply shortage" values.

[45] Specifically, the Florida Statutes require the level-of-certainty planning goal associated with identifying the water supply needs of existing and future reasonable-beneficial uses to be based upon meeting those needs for a 1-in-10-year drought event (§ 373.709(2)(a)1, Fla. Stat.).

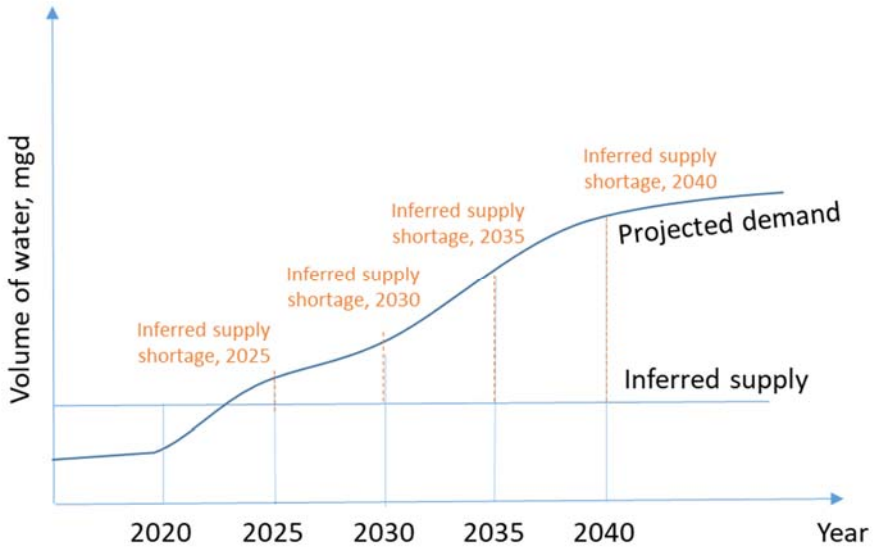
[46] Reference: DEP, NWFWMD, SFWMD, SWFWMD, SJRWMD, and SRWMD. 2019. Format and Guidelines for Regional Water Supply Planning.

[47] See Appendix A.3 of this report for a summary of EDR drought demand calculations, by region.

[48] Quoted from page 47 of the following document:
SJRWMD. 2022. Central Springs/East Coast Regional Water Supply Plan (2020–2040). February 07, 2022. Available at: https://www.sjrwmd.com/water-supply/planning/csec-rwsp/#documents (Accessed October 21, 2023.)

EDR defines the "inferred water supply shortage" as the projected water demand's exceedance over the existing inferred supply. This "inferred water supply shortage" should not be considered an actual water shortage emergency as defined in the Florida Administrative Code.[49] An "inferred water supply shortage" should instead be seen as a potential future imbalance between the projected demand and the currently existing inferred supply. For the purposes of this assessment, EDR's conceptual supply shortage is more related to a condition of water scarcity and should be first addressed by proactively investing in additional water supplies. For each planning region listed in DEP (2023a)[50] and for each period, the inferred water supply shortage is calculated as the difference between the projected demand in that period and the 2020 inferred water supply (see Figure 3.2.4.1).

Figure 3.2.4.1 Schematic Illustration of Inferred Water Supply Shortage Calculations



Any shortage calculation is, of course, dependent on supply. To infer the existing water supply, EDR subtracts "water needed" as reported in DEP (2023a) from the demand projected for the last year of the WMDs' planning horizon (*i.e.*, 2040 or 2045, depending on the region).[51] Note that this inferred supply does not necessarily represent the total water volume available for withdrawals or a precise measurement of the supply of water.[52] The dynamic nature of hydrogeology and water

[49] The "inferred water supply shortage" is developed for EDR's expenditure forecasts only and it is not the same as "water shortage" as defined in Chapter 40A-21.051, Florida Administrative Code, which describes water shortage as a situation that "usually occurs as a result of a drought." (A similar description is presented in 40A-21, 40B-21, 40C-21, 40D-21 and 40E-21, Florida Administrative Code.)

[50] DEP. 2023a. Regional Water Supply Planning 2022 Annual Report, available online at: https://floridadep.gov/water-policy/water-policy/content/water-supply .

[51] Based on DEP et al. (2019), water needed can be interpreted as the amount of water a WMD identifies as needed to meet future demands.
Reference: DEP, NWFWMD, SFWMD, SWFWMD, SJRWMD, and SRWMD. 2019. Format and Guidelines for Regional Water Supply Planning. 42pp.

[52] For example, in the NWFWMD, water resources are examined using methods such as potentiometric surface mapping, long-term hydrograph trend analysis, generalized groundwater budget evaluation, and groundwater quality analysis. Determining the total water supply is not the goal of such analysis; instead, the focus is on whether the projected demand can impact and potentially harm water resources. In addition to this general determination, the NWFWMD uses the currently permitted volumes of water for

quality do not easily lend themselves to calculating a specific static water supply. The inferred supply described, however, is the best proxy for the total water supply that EDR can use to calculate the expenditure forecasts.

Table 3.2.4.1 summarizes the water demand at the end of each WMD's planning period and related water-needed information provided by the WMDs and reported in DEP (2023a)[53]. Note that these water demand projections focus on demand Scenario 1 (baseline); that is, they do not account for potential drought nor do they explicitly consider conservation potential. The projected water demand in the last year of the region's planning horizon minus "water needed" is equal to the inferred water supply, as shown in Figure 3.2.4.2 below.

Figure 3.2.4.2 Inferred Water Supply Equation

Table 3.2.4.1 Inferring Water Supply

Planning Region	Data from DEP (2023a)			Calculations by EDR
	2035 Water Use Projection	2040 Water Use Projection	Water Needed (mgd)	Inferred Water Supply*
NW – II	91.19	94.88	5.00	89.88
NW – Oth	304.58	311.90	-	311.90
SF – LKB	253.83	257.49	0.01	257.48
SF – UEC	286.07	283.96	6.00	277.96
SF – LEC	1,963.65	2,006.54	49.55	1,956.99
SF – LWC	1,115.00	1,147.67	1.07	1,146.60
SJR – CSEC	416.72	427.87	51.10	376.77
SR – West	122.35	123.20	-	123.20
SW – N (excluding CFWI)	173.09	181.73	11.55	170.18
SW – TB	450.56	461.85	-	461.85
SW – H (excluding CFWI)	94.96	89.15	-	96.17
SW – S	272.99	279.33	-	279.33
CFWI	873.94	907.59	95.00	812.59
NFRWSP	653.28	676.24	117.00	559.24

* Estimated as 2040 water use minus water needed.

public supply to estimate the total demand that can be met, as well as related "water needed." Therefore, as long as projected demand can be met with the permitted water volumes, no other determinations of the total water supply are made by the NWFWMD. The approach is different in selected other regions, where the WMDs identify the total water availability. For example, in the CFWI, it was determined that "the CFWI Planning Area could potentially sustain up to 760 mgd of fresh groundwater withdrawals, but local management strategies will be needed (...) to address unacceptable impacts" (CFWI 2020, p. iv) . For the description of the methods used by the WMDs to identify supplies, see Appendix A.5 of this report.

Reference: CFWI. 2020. 2020 Central Florida Water Initiative (CFWI) Regional Water Supply Plan (RWSP). Available at: https://cfwiwater.com/RWSP.html (Accessed November 10, 2023.)

[53] DEP. 2023a. Regional Water Supply Planning 2022 Annual Report, available online at: https://floridadep.gov/water-policy/water-policy/content/water-supply .

To calculate the inferred supply shortage, water demand information reported in DEP (2023a) is compared with the inferred supply. The inferred supply shortage is the difference between the WMD-projected water demand and the inferred water supply reported in Table 3.2.4.1. For all regions, the inferred supply shortage is equal to the "water needed" values summarized in DEP (2023a). Note that no water availability determinations, groundwater or otherwise, are performed by EDR. Further, the analysis of regional inferred supply shortages is not an indicator of water availability on an individual permit basis.

The inferred supply and inferred supply shortage calculations contain four assumptions:

- It is assumed that the estimated demand in the base year was met with the inferred supply and that this base year quantity will continue to be met decades into the future. It does not account for the investments needed to maintain aging infrastructure, relocate wellfields due to saltwater intrusion in coastal areas, or address other impacts on the existing supply.

- It is assumed that the inferred supply in a region does not change over time without investments in alternative water supplies. In the future, EDR plans to refine this assumption. It is recognized that "Water Needed" reported above is based on the specific approaches to estimating the existing supplies used by WMDs, and in some cases, part of the "Water Needed" can still be met by the traditional groundwater sources. For example, based on feedback from SWFWMD, traditional groundwater resources are anticipated to be the primary sources to meet a majority of the projected additional water demands in SW – N through 2040.[54] Groundwater can be a less expensive water supply source as compared with alternative water supplies, and therefore, the expenditure forecast for SW – N presented in this report may exceed the actual expenditure needs. Another issue to be addressed in the future is the potential change in the inferred existing supply due to the saltwater intrusion, drought, or other issues that could potentially require additional future investments not addressed in this report.

- Regions reported as having zero "water needed" in DEP (2023a) are assumed by EDR to have an inferred supply equal to their highest projected water use. Realistically, it is highly unlikely that the existing sources[55] are precisely the same as the future demand in all of these regions; however, this assumption is still reasonable, given the limited data available.

- Although somewhat implausible, natural system restoration needs are assumed to be accounted for in the "water needed" field in DEP (2023a). Taking account of the water necessary to restore or protect natural systems is integral to EDR's statutorily required expenditure calculations. However, water for natural systems is not explicitly identified as water demand, and it is unclear to what degree natural system restoration is accounted for in the "water needed" field in DEP (2023a). The differences in methodologies used by the WMDs exacerbate this uncertainty (see Appendix A.2 in the report's 2023 Edition for further explanation).

[54] SWFWMD also continues to support the development of reclaimed water and conservation projects within the Region.
[55] Existing sources include both traditional and alternative sources already built or proposed to be built during the 20-year planning horizon.

Regardless of these assumptions and due to the complex nature of quantifying water supply across the state, EDR relies on the WMDs' water demand and water needed data to infer supply. The demand, inferred supply, and inferred supply shortage data are shown in Tables 3.2.4.2 and 3.2.4.3. Approaches used by the WMDs to evaluate existing supplies are discussed in Appendix A.4 in this report.

[See table on following page]

Table 3.2.4.2 Water Demand and Inferred Supply Based on WMD Data

Planning Regions	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Inferred Supply[i]
NW – II	76.88					82.25					87.03					91.19					94.88	89.88
NW – Oth	273.72					287.12					296.92					304.58					311.9	311.9
SR - West[ii]	107.6					111.8					116.69					122.35					123.2	123.2
SJR – CSEC	383.47					395.62					406.11					416.72					427.87	376.77
SW – N (excluding CFWI)	142.49					153.55					163.54					173.09					181.73	170.18
SW – TB	413.34					432.77					436.96					450.56					461.85	461.85
SW – H (excluding CFWI)	91.52					89.45					96.17					94.96					89.15	96.17
SW – S	245.02					254.22					265.77					272.99					279.33	279.33
SF – LKB	249.9					251.83					253.68					253.83					257.49	257.48
SF – UEC	289.26					289.7					287.84					286.07					283.96	277.96
SF – LEC	1,813.99					1,863.91					1,923.28					1,963.65					2,006.54	1,956.99
SF – LWC	1,013.43					1,046.53					1,080.22					1,115.00					1,147.67	1,146.60
NFRWSP[ii]	571.02					603.38					628.15					653.28					676.24	559.24
CFWI	735.24					789.49					836.65					873.94					907.59	812.59
Statewide	**6,406.88**					**6,651.62**					**6,879.01**					**7,072.21**					**7,249.00**	**6,920.14**

Table 3.2.4.3 Inferred Supply Shortages to Be Met through Investments

Planning Regions	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
NWF – II			-					-					1.31					5
NWF – Oth			-					-					-					-
SR – West			-					-					-					-
SJR – CSEC			18.85					29.34					39.95					51.1
SW – N (excluding CFWI)			-					-					2.91					11.55
SW – TB			-					-					-					-
SW – H (excluding CFWI)			-					-					-					-
SW – S			-					-					-					-
SF – LKB			-					-					-					0.01
SF – UEC			11.74					9.88					8.11					6.00
SF – LEC			-					-					6.66					49.55
SF – LWC			-					-					-					1.07
NFRWSP			44.14					68.91					94.04					117
CFWI			-					24.06					61.35					95
Statewide (sum of regions)			**74.73**					**132.19**					**214.33**					**336.28**

Note: These values are calculated by subtracting the inferred supply from Table 3.2.4.2 from the demand in each year of the same table and only display a value when the demand is higher than the inferred supply.

3.2.5 Water Supply and Water Resource Development Projects: Dataset Used in the EDR Expenditure Analysis

For the expenditure analysis, EDR utilizes the information about project capacity and funding available in Appendix C of DEP (2023a), referred to below as "the project appendix." Overall, the DEP project appendix includes the projects identified in the RWSPs and RPSs (recovery or prevention strategies), the projects implemented and funded by the WMDs or state agencies in the past, and the projects currently being designed or constructed (and funded or co-funded by agencies) in order to meet the RWSP and MFL (Minimum Flows and Minimum Water Levels) RPS goals.[56] Noteworthy differences exist between DEP (2023a) and the previous year's project appendix.

As part of the RWSPs developed pursuant to section 373.709, Florida Statutes, the WMDs are required to compile a list of project options for water supply development and water resource development. For the water supply development component, the project options include traditional and alternative water supply projects. The available water after incorporating these project options (*i.e.,* the total capacity) must exceed the water supply needs for all existing and future reasonable-beneficial uses within the 20-year planning horizon and take into account water conservation. Local governments, public and private utilities, regional water supply authorities, multi-jurisdictional water supply entities, self-suppliers, *etc*., can either choose among the options or develop their own projects when additional supplies are needed. Because the identified projects are statutorily required to be "technically and financially feasible," EDR relies on the appendix for part of its expenditure forecasting.

The water resource development component must support the water supply development component and the natural systems under certain circumstances. While the recovery or prevention strategies (RPSs) for adopted Minimum Flows and Minimum Water Levels (MFLs) are specifically required as part of the water resource development component, section 373.0421, Florida Statutes, also requires the WMDs to include in each RWSP any water supply development or water resource development project that is identified in an RPS. Further, the RPS must include a phased-in approach for the development of additional water supplies, implementation of conservation measures, and other actions to achieve recovery to an established minimum flow (for rivers, streams, estuaries, and springs) or minimum water level (for lakes, wetlands, and aquifers), or to prevent the existing flow or water level of such water resources from falling below the established minimum levels.

The project appendix is the most comprehensive statewide dataset of the Florida water supply and water resource development projects currently available. Nevertheless, EDR recognizes that this dataset has two limitations that could influence the expenditure estimates. First, the project appendix primarily includes projects that are eligible for district or state cost-share funding. Such projects can differ from those carried out solely by local entities. Second, the project appendix can include projects implemented or planned for multiple benefits, with water supply or MFL RPS goals being only a secondary benefit. For example, reclaimed water projects can be primarily

[56] See the complete list of the columns and project characteristics in DEP (2023a). Regional Water Supply Planning 2022 Annual Report, available online at https://floridadep.gov/water-policy/water-policy/content/water-supply .

constructed to dispose of treated wastewater, rather than offset potable water use. Some projects can also be intended to ensure water supply reliability (*e.g.*, at the time of peak demand), diversify water supply sources, and reduce demands on traditional sources rather than to meet new water demand. In addition, projects can be constructed to replace aging infrastructure, providing limited water conservation benefits. EDR assumes, however, that since the project appendix is part of DEP's RWSP Annual Status Update, most of the projects are intended to meet water demand or MFL RPS goals.

The DEP project appendix currently includes 1,978 project items. This level is 9.46% higher than last year. For each project item, the "Project Status" column indicates whether the item is canceled, completed, in construction or underway, in design, on hold, or an "RWSP or RPS option only." When canceled project items are removed 1,895 project items remain for further analysis.

The "Project Total" column in the DEP project appendix provides information about the total project funding (if any) by the state, district, and cooperating entity. Cooperative entities in the appendix include counties, municipalities, water utilities, or private entities such as farms, homeowner associations, or golf clubs. The funding information is not always reflective of the project's total implementation cost since it generally does not include information about land purchases[57] or the costs of project components ineligible for funding. This information also excludes funding provided by federal agencies, if any. EDR assumes, however, that the funding from the state, district, and cooperating entity accounts for most of the implementation cost.[58]

Further, for the projects that are listed as RWSP or RPS option only, the "Projected Total Funding (for RWSP/RPS Options Only)" column summarizes information about potential funding requirements (*i.e.*, planning-level cost estimates). This "Projected Total Funding" is an estimate only and is not verified until the project is submitted for cost-share funding to begin design or implementation. Still, this projected funding level represents the best available information regarding the future funding needs and, therefore, EDR includes it in the analysis. Below, the combined "Project Total" and "Projected Total Funding (for RWSP/RPS Options Only)" is referred to as the "project total ($)." EDR indexes "project total ($)" to state fiscal year 2022-23 (referred to as $2023 throughout this chapter).[59]

EDR also examines whether a project item on the list is a phase of a larger project. For example, the project appendix may list the construction of a water treatment facility and the construction of wells providing water to that facility as separate project items. Further, to evaluate the water or reuse flow made available by the projects (*i.e.*, the project capacity), the columns "Quantity of Water Made Available on Completion (mgd)" and "Reuse Flow Made Available on Project Completion (mgd)" are generally used.[60] For the purposes of this Edition, EDR groups the appendix's projects into more general categories in Table 3.2.5.1. Of particular note, after this

[57] For most projects, "No" is reported for the "Land Acquisition Component" spreadsheet column.
[58] See additional discussion of infrastructure cost and funding in Chapter 5.
[59] See DEP (2023a) for details. Regional Water Supply Planning 2022 Annual Report, available online at https://floridadep.gov/water-policy/water-policy/content/water-supply
[60] "Quantity of Water Made Available to Date (mgd)" and "Reuse Flow Made Available to Date (mgd)" were also reviewed. This information was used to evaluate project capacity for projects from SWFWMD that had more than one phase. Quantities available today (as opposed to "upon project completion") were also applied to estimate capacity for the following projects: SRWS00003A, SRWS00007A, SJWS00340A, and SFWS00208A. This decision was made due to discrepancies between quantities reported "today" vs. "upon completion," based on the other project details.

year's review, the projects categorized as additional water supply to meet growing demand increased by 11.94% relative to last year's review due in part to the increase in total number of projects from 1,795 in the previous edition of this EDR report to 1,968 in this edition.

Table 3.2.5.1 General Project Categories Defined by EDR

EDR Project Category	Project Description	Number of Projects in DEP Project Appendix*
Additional water supply to meet growing demand	Projects in the regions with positive 2040 inferred supply shortages, given that the projects are not associated with any MFL RPS. Specifically, the following project types are considered: • Reclaimed Water (for potable offset) • Brackish Groundwater • Surface Water • Surface Water Storage • Groundwater Recharge • Aquifer Storage and Recovery (ASR) • Stormwater • Other Project Type • Other Non-Traditional Source • Desalination • Distribution / Transmission Capacity	966
Water demand management and conservation	• PS and CII Conservation • Agricultural Conservation	697
Water for natural systems	• All projects that are not yet completed and that are associated with specific MFL RPS • Reclaimed water projects for groundwater recharge or natural system restoration, if the project status is listed as in design, in construction / underway, or on hold • All project types if the projects are in the regions with no inferred shortage, if the project status is in design, in construction/underway, or on hold	224
Other	• Flood Control Works • Data Collection and Evaluation • Water Resources Management Programs	81
Total		**1,968**

* The total is greater than the total number of the projects in the dataset since some projects fall into more than one category.

3.2.6 Expenditure Projections to Meet the Future Demand

To forecast the expenditures needed to increase existing supply and meet the future demand, EDR considered (a) capacity for the projects completed since relevant WSA/RWSPs were finalized; (b) capacity and expenditures for the projects currently in design, in construction/underway, or on hold, and (c) potential additional projects currently in RWSP/RPS Options Only status.

To forecast the expenditures needed for projects in design, in construction/underway, or on hold, EDR assumes that 50% of a project's total funding had yet to be spent if the project status is in construction/underway. However, 100% of the expenditures for projects with an on hold or in design status are included in the expenditure forecast (*i.e.*, none of the recorded funding for on hold or in-design projects has been spent). Upon completion, projects that are in design, in construction/underway, or on hold are expected to reduce the 2040 inferred water shortage from 336.27 to 228.31 mgd (see Table 3.2.6.1). The total expenditures forecasted for these projects is

$572.37 million $2023 (see Table 3.2.6.1). These expenditures are lower than the expenditures identified in the previous edition of this EDR report ($617.56 million $2022). Conversely, the total expenditure forecast for the regions with no inferred shortage are estimated to be $738.71 million $2023 compared to $686.64 million $2022 in the previous edition of this EDR report. This topic will be discussed further in 3.2.8 of this report. The difference is attributable to: (1) updates to previously recorded projects in the DEP project appendix, and (2) additional projects added to the project list.

The projects in design, construction/underway, or on hold are estimated to completely eliminate the inferred water supply shortage in the NWF – II, SF – UEC and SF – LWC. In the remaining regions that still have water supply shortages, EDR assumes that additional investments in water supply or water conservation projects will be made.

Table 3.2.6.1 Analysis of the Projects in Construction, in Design, and On Hold, by Region Where Water is Needed*

Planning Regions	Inferred Supply Shortage by 2040, mgd (end of planning period)	Water by the Projects in Design, Construction, and On Hold, mgd	Remaining Inferred Supply Shortage by 2040, mgd**	Project Expenditures in EDR Forecast (million, $2023)***
(1)	(2)	(3)	(4) = (2) – (3)	(5)
NWF – II	5	7.70	0.00	$93.58
SJR – CSEC	51.1	37.91	13.19	$90.33
SW – N****	11.55	3.01	8.54	$97.73
SF – UEC	6	11.10	0.00	$133.39
SF – LEC	49.55	0.41	49.14	$1.86
SF – LWC	1.07	7.03	0.00	$22.34
NFRWSP	117	8.90	108.10	$9.60
CFWI	95	45.67	49.33	$123.54
Statewide (sum of regions)	**336.27**	**121.72**	**228.31**	**$572.37**

* The table focuses on the regions with "Water Needed" identified in DEP (2023a). Six regions are not listed because they have no inferred supply shortage: SR – West, NWF – Other, SW – H (excluding CFWI), SW – TB, SW – S, and SF – LKB. Projects considered to be for the natural system restoration and Everglades restoration are excluded. These are the projects associated with MFL RPS, reclaimed water (for groundwater recharge or natural system restoration), and most of the projects described as restoration (in the "Project Description" field). Projects in RWSP/RPS Options Only "Project Status" field are also excluded.
** Negative values of the inferred shortage are not reported.
*** Total expenditure forecast for the regions with no inferred shortages are estimated to be $738.71 million, bringing the statewide total to $1,311.08 million ($2023).
**** Excluding CFWI.

To develop scenarios for supplying the remaining inferred supply shortage of 228.31 mgd, for each planning region, EDR identified suitable project types that have project total and project capacity. From those project types, EDR retained only those ranked as "highly" or "moderately likely" to be viable in an undated DEP report on alternative water supplies.[61] EDR used this selection as a basis for estimating the cost of closing the remaining inferred water supply shortage. These project types are summarized in Table 3.2.6.2.[62]

[61] DEP. Undated. An Assessment of Viable Alternative Water Supply Resources and Critical Funding Needs. Presented by the FDEP pursuant to Executive Order 19-12 and Chapter 2019-115, Laws of Florida.
[62] See Appendix A.5 for additional details.

Table 3.2.6.2 Project Types Identified for Each Region to Meet the Inferred Water Supply Shortage

Planning Regions where	Brackish Groundwater	Groundwater Recharge	Reclaimed Water	Surface Water Storage
SJR – CSEC	✓		✓	
SW – N (excluding CFWI) *			✓	
NFRWSP		✓	✓	
CFWI	✓		✓	
SF – LEC	✓		✓	✓

* The portion of the region excluding CFWI. Discussions with SWFWMD staff indicated that the future water demand is expected to be met with groundwater, though the District will continue implementing reclaimed water projects as well.

Reclaimed water is expected to play an essential role in meeting the increase in water demand in all regions. In addition, brackish groundwater is likely to be crucial in south and central Florida, while groundwater recharge can be a vital project type in the NFRWSP. EDR identified more than two project types to meet the future increase in demand in SF – LEC. For this region, EDR's expenditure projections only consider the most and least costly project types.

Further, expenditures per-mgd can vary widely on project capacity, prompting EDR to select the median capacity for each project type (see Table 3.2.6.3). For reclaimed water projects, the median project capacity varies among regions to reflect the differences in project sizes identified by EDR in the DEP project appendix.[63]

Table 3.2.6.3 Project Capacity, mgd of water or beneficial offset

Project Type	Median Project Capacity, mgd of water or beneficial offset
Brackish Groundwater	
SJR – CSEC	4.00
CFWI	4.20
SF – LEC	3.75
Groundwater Recharge	
NFRWSP	1.69
Reclaimed Water (for potable offset):	
NW – II	0.33
SJR – CSEC	0.24
NFRWSP	0.26
SW – N*	0.29
SF – UEC	1.21
CFWI	0.73
SF – LWC	2.20
SF – LEC	1.10
Surface water storage	1.01

* The portion of the region excluding CFWI.

Project expenditures depend on project capacity, type, and location. EDR developed a multivariate regression model to examine this relationship. The dependent variable in the model is the natural

[63] Appendix A.8 discusses alternative project capacity assumptions.

logarithm of "project total ($)" (million dollars). Various combinations of the independent variables were tested, and the final model used in the analysis is described in Appendix A.8. The model includes project capacity (i.e., the natural logarithm of water or beneficial offset for the projects), the region of project implementation, project type, and project status. The model is estimated in the "R" software environment using Fitting Generalized Linear Models (*glm)*, and it explains approximately 76.1% of the variability in the dependent variables. EDR will continue testing alternative model specifications to improve the model predictive capacity for the 2025 Edition of this report.

The regression model is then used to estimate the project expenditures (per mgd of water or beneficial offset).[64] Note that the estimated expenditures for reclaimed water projects account for the beneficial offset being only 0.55[65] of the actual project capacity. This assumption makes this project type especially expensive (Table 3.2.6.4). In contrast, brackish groundwater and groundwater recharge projects are relatively inexpensive, but they are only relevant to selected regions.

Table 3.2.6.4 Estimated Project Expenditures per Unit of Capacity (million $2023 per mgd)

Planning Regions	Brackish Groundwater	Groundwater Recharge	Reclaimed water	Surface Water Storage
SJR – CSEC	$10.62		$9.52	
SW – N*			$7.53	
NFRWSP		$0.97	$8.76	
CFWI	$1.94		$3.91	
SF – LEC	$1.59		$8.71	$3.41

* Excluding CFWI.

These estimated per-mgd expenditures are then used to forecast the investments needed to meet the remaining inferred supply shortage in each region summarized in Table 3.2.6.1. EDR uses the most and least expensive project types in these calculations (see columns 6 and 7 in Table 3.2.6.5). These expenditures are then combined with the costs of the projects currently in construction, in design, and on-hold. As shown in columns 8 and 9 in Table 3.2.6.5, the total projected expenditures to meet the inferred supply shortage by 2040 are between $1.041 and $2.345 billion (with an average of $1.693 billion). Note that "less expensive" and "more expensive" scenarios show the same costs for several regions since the inferred shortage is expected to be met with the projects already in construction, in design, or on hold. These expenditures are considerably lower than the expenditures identified in the 2023 Edition of this EDR report − $2.041 million $2022. The difference is caused by updates to RWSPs for SR – West, SF – LWC and NFRWSP [66], changes to the DEP project appendix and methodological changes governing how EDR estimates the timing of project expenditures.

[64] Median capacity is assumed for each project type, see Table 3.2.6.3.
[65] This assumption is based on the average of the beneficial offset values reported in DEP (2021), available online at https://floridadep.gov/water/domestic-wastewater/documents/2021-reuse-inventory-all-appendices-excel. In future editions of this report, EDR plans to explore alternative methods of modeling the beneficial offset provided by reclaimed water projects.
[66] In DEP (2023a) revised "Water Needs" for SF – LWC is substantially lower than that in DEP 2022a.

Table 3.2.6.5 Expenditures Forecast for the Additional Water Supply

Planning Regions	Inferred Supply Shortage by 2040, mgd	Water and Beneficial Offset* for the Projects in Design, Construction, and On Hold, (mgd)	"Project Total" for the Projects in Design, Construction, and On Hold (million, $2023)	Remaining Inferred Supply Shortage By 2040, mpg***	"Project Total" to Meet Remaining Inferred Shortage (million, $2023)		Total Forecasted Expenditure to meet 2040 Inferred Supply Shortage (million $2023)		
					Less expensive	More expensive	Less expensive	More expensive	Average
(1)	(2)	(3)	(4)	(5)	(6)	(7)	**(8)**	**(9)**	**((8) + (9)) / 2**
NWF – II	5.00	7.70	$93.58	0.00	0	0	$93.58	$93.58	$93.58
SJR – CSEC	51.10	37.91	$90.33	13.19	$125.59	$140.10	$215.92	$230.43	$223.17
SW – N**	11.55	3.01	$97.73	8.54	$64.34	$64.34	$162.08	$162.08	$162.08
SF – UEC	6.00	11.10	$133.39	0.00	0	0	$133.39	$133.39	$133.39
SF – LEC	49.55	0.41	$1.86	49.14	$78.14	$428.03	$79.99	$429.88	$254.94
SF – LWC	1.07	7.03	$22.34	0.00	0	0	$22.34	$22.34	$22.34
NFRWSP	117.00	8.90	$9.60	108.10	$104.86	$946.96	$114.45	$956.56	$535.50
CFWI	95.00	45.67	$123.54	49.33	$95.70	$192.89	$219.25	$316.43	$267.84
Statewide (sum of regions)	**336.28**	**121.72**	**$572.37**	**228.31**	**$468.63**	**$1,772.32**	**$1,041.01**	**$2,344.70**	**$1,692.85**

* Accounting for 0.55 beneficial offset coefficient for reclaimed water projects.
** Excluding CFWI.
***Negative values of the inferred shortage are not reported.

To calculate the state's funding contributions toward the total expenditures, EDR considers 193 projects from the DEP project appendix that were completed in the past. These projects are selected because the total of their state, district, and cooperating entity (or entities) funding is exactly equal to "project total ($).", and the district funding is greater than zero. The state's funding share differed among the planning regions, with the average share being the highest in the NW – II and the lowest in the SF – LEC as shown in Table 3.2.6.6. Statewide, the state funding share is 17.07 percent and the district funding share is 25.19 percent, demonstrating that the cooperative entity or entities cover(s) most of the project expenditures.

Table 3.2.6.6 Share of State's Funding in the "Project Total ($2023)"

Region	N	Share
NW – II	3	0.36
NFRWSP	23	0.27
SJR – CSEC	18	0.09
CFWI	47	0.08
SW – N (excluding CFWI)	2	0.10
SF – UEC	17	0.05
SF – LEC	43	0.03
SF – LWC	26	0.04

Note: Total expenditure forecast for the regions with no inferred shortage are estimated to be $738.71 million. Based on past projects, the average share of state funding for such projects is 0.1285 (i.e., approximately 12.85%). Therefore, EDR expects that the future state funding for the projects in the regions with no inferred water supply shortage is $94.93 million.

The estimated funding share provided by the state's expenditures in each region is used to forecast the total state expenditures needed to address the inferred water supply shortage (Table 3.2.6.7). By 2040, the total is forecasted to range between $189.12 million and $463.28 million, with an average of $326.20 million. These amounts are moderately lower than last year's report, primarily due to lower remaining inferred supply shortage and overall project costs, but also due to methodological refinements in the calculation of the state's share.

Table 3.2.6.7 Estimated State Expenditures (million $2023)

Region	Less expensive	More expensive	Average
NWF – II	$33.69	$33.69	$33.69
SJR – CSEC	$19.43	$20.74	$20.09
SW – N (excluding CFWI)	$16.21	$16.21	$16.21
SF – UEC	$6.67	$6.67	$6.67
SF – LEC	$2.40	$12.90	$7.65
SF – LWC	$0.89	$0.89	$0.89
NFRWSP	$30.90	$258.27	$144.59
CFWI	$78.93	$113.91	$96.42
Statewide (sum of regions)	**$189.12**	**$463.28**	**$326.20**

3.2.7 Expenditure Forecast, Water Conservation, and Drought

The expenditures discussed above focus on the baseline scenario for water use and related inferred shortage calculations. These expenditures do not account for the water use efficiency improvements and water conservation. The overall inferred water supply shortage can be reduced by 70.84% if water use efficiency improvements and conservation are accounted for (see Table 3.2.7.1). Given this water use scenario, the inferred water supply shortage would continue only in CFWI, NFRWSP and SJR – CSEC.

Table 3.2.7.1 The 2040 Inferred Water Supply Shortage Given Three Water Demand Scenarios

Regions	Inferred Water Supply, mgd	Baseline Water Demand (Scenario 1)		Water Demand with Conservation (Scenario 2)		Drought Demand (Scenario 3)	
		2040 Water Demand, mgd	Inferred shortage, mgd	2040 Water Demand, mgd	Inferred shortage, mgd	2040 Water Demand, mgd	Inferred shortage, mgd
NW – II	89.88	94.88	5.00	88.88	-	105.89	16.01
NW – Oth	311.90	311.90	-	307.69	-	345.07	33.17
SR – West	123.20	123.20	-	111.45	-	141.94	18.74
NFRWSP	559.24	676.24	117.00	605.41	46.17	755.76	196.52
SJR – CSEC	376.77	427.87	51.10	389.65	12.88	508.56	131.79
CFWI	812.59	907.59	95.00	851.59	39.00	1,011.00	198.41
SW – N*	170.18	181.73	11.55	167.65	-	201.40	31.22
SW – TB	461.85	461.85	-	416.88	-	501.24	39.39
SW – H*	96.17	89.15	-	80.85	-	119.74	23.57
SW – S	279.33	279.33	-	258.11	-	335.32	55.99
SF – LKB	257.48	257.49	0.01	257.49	-	303.36	45.88
SF – UEC	277.96	283.96	6.00	271.34	-	329.74	51.78
SF – LEC	1,956.99	2,006.54	49.55	1,904.14	-	2,329.11	372.12
SF – LWC	1,146.60	1,147.67	1.07	1,110.33	-	1,349.20	202.60
Statewide (sum of the regions)			**336.28**		**98.06**		**1,417.18**

* Excluding CFWI.

Despite the inferred shortage decrease in Scenario 2, EDR expects limited reductions in the projected expenditures unless most of the water use reduction is achieved through passive conservation. Specifically, for active conservation, the DEP project appendix includes 155

agricultural water conservation projects and 396 PS and CII conservation projects for which both "project total ($)" and project capacity (mgd) are provided. Median costs for these projects are $5.52 and $5.55 million per mgd, respectively. These expenditures are comparable with that for the alternative water supply projects. Therefore, implementation of the identified water conservation strategies is not expected to materially reduce projected expenditures. The only strategy to reduce the costs is to rely on inexpensive passive water conservation (such as households purchasing more efficient appliances or implementation of more stringent construction standards in new urban developments).

Table 3.2.7.2 Expenditure for Water Conservation Projects, million $2023 per mgd of Project Capacity

Project Type	Number of Observations	Mean	Median
Agricultural Conservation	155	11.97	5.52
PS and CII Conservation	396	22.84	5.55

While the water conservation scenario reduces the inferred shortage, the drought scenario can expand the inferred shortage. For example, if a 1-in-10 year drought occurs in 2040, the inferred supply shortage can increase approximately four times, from 336.28 mgd to 1,417.18 mgd (Table 3.2.7.1). Today, much of the increase in water demand under drought conditions is addressed by available surplus or managed by government-imposed, short-term restrictions on demand. Changing climate conditions may lead to more frequent, prolonged, or severe droughts, requiring significantly higher expenditures to meet water demand in such conditions.

3.2.8 Expenditures to Ensure That Sufficient Water Is Available for Natural Systems

Part of section 403.928, Florida Statutes, requires EDR to estimate the expenditures necessary to achieve the legislature's intent that sufficient water is available for the natural systems. While the WMDs may use a variety of tools to protect the natural systems, EDR primarily focuses on projects included in recovery or prevention strategies (RPSs) for the implementation of minimum flows and minimum water levels (MFLs); [67] however, there are a few additional conditions under which projects are assumed to benefit the natural systems.

Projects Associated with MFL Recovery or Prevention Strategies

Sections 373.042 and 373.0421, Florida Statutes, provide requirements for the WMDs with regard to the establishment and implementation of MFLs for water courses, water bodies, and aquifers. The MFLs are intended to define "the limit at which further withdrawals would be significantly

[67] These are the projects associated with MFL RPS, reclaimed water (for groundwater recharge or natural system restoration), and most of the projects described as restoration (in the "Project Description" field)

harmful to the water resources or ecology of the area."[68] These limits are relevant to water supply planning, permitting decisions, and the declaration of water shortages.[69]

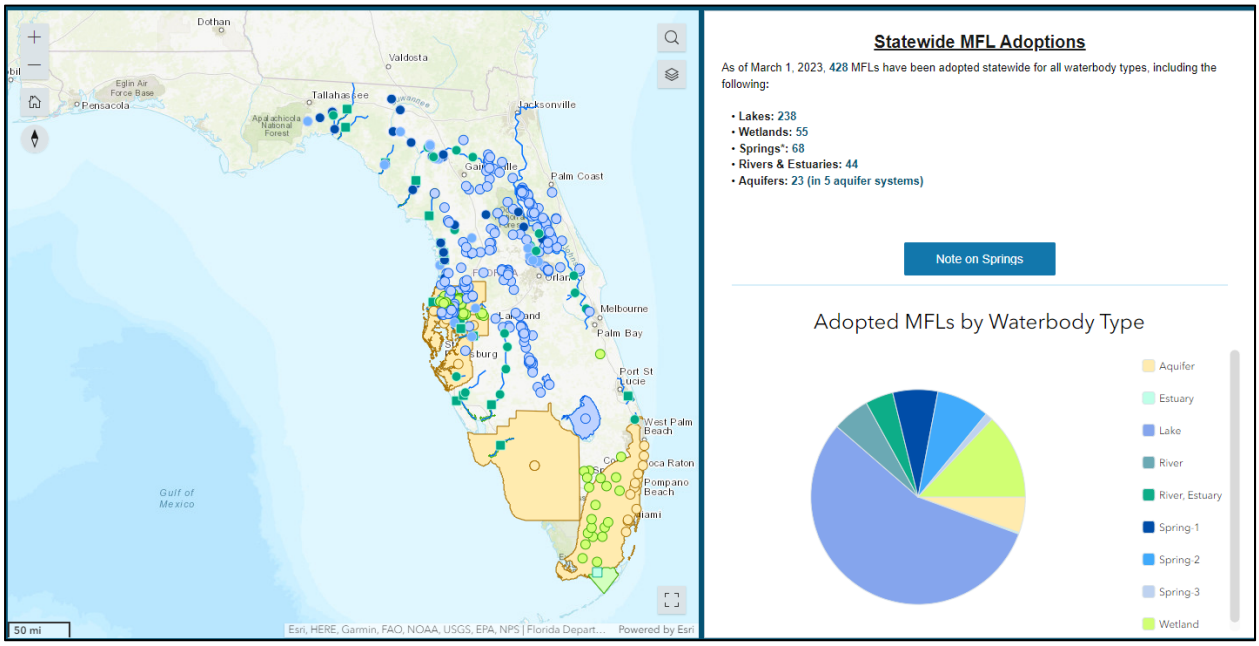
The WMDs are required to adopt (or revise) and implement recovery or prevention strategies to achieve recovery to an MFL as soon as practicable or prevent a future violation of an MFL if it is expected to occur within 20 years.[70] When developing the recovery or prevention strategy, the WMDs must include a phased-in approach or timetable to allow for the provision of water supplies for all existing and projected reasonable-beneficial uses.[71] Once the recovery or prevention strategy is adopted by the appropriate WMD, the applicable RWSP must be amended to include any water supply or water resource development projects.[72] For a visual of all currently adopted MFLs and RPSs by type and status, see Figures 3.2.8.1 and 3.2.8.2.

In 2016, the Florida Legislature strengthened the implementation of MFLs for Outstanding Florida Springs (OFSs).[73] The WMDs, excluding NWFWMD, were required to adopt MFLs for all OFSs within their jurisdictions by July 1, 2017.[74] A recovery or prevention strategy for an OFS must identify a prioritized list of projects to implement the plan and include the estimated cost and date of completion for each project, the estimated benefit from each project, and the source and amount of financial assistance available by the applicable WMD.[75] Unlike recovery or prevention strategies for other water resources, those for OFSs must be designed to achieve the MFLs no later than 20 years after adoption of the strategy and must contain a schedule establishing 5-year, 10-year, and 15-year targets to inform future planning and funding decisions.[76]

[See figure on following page]

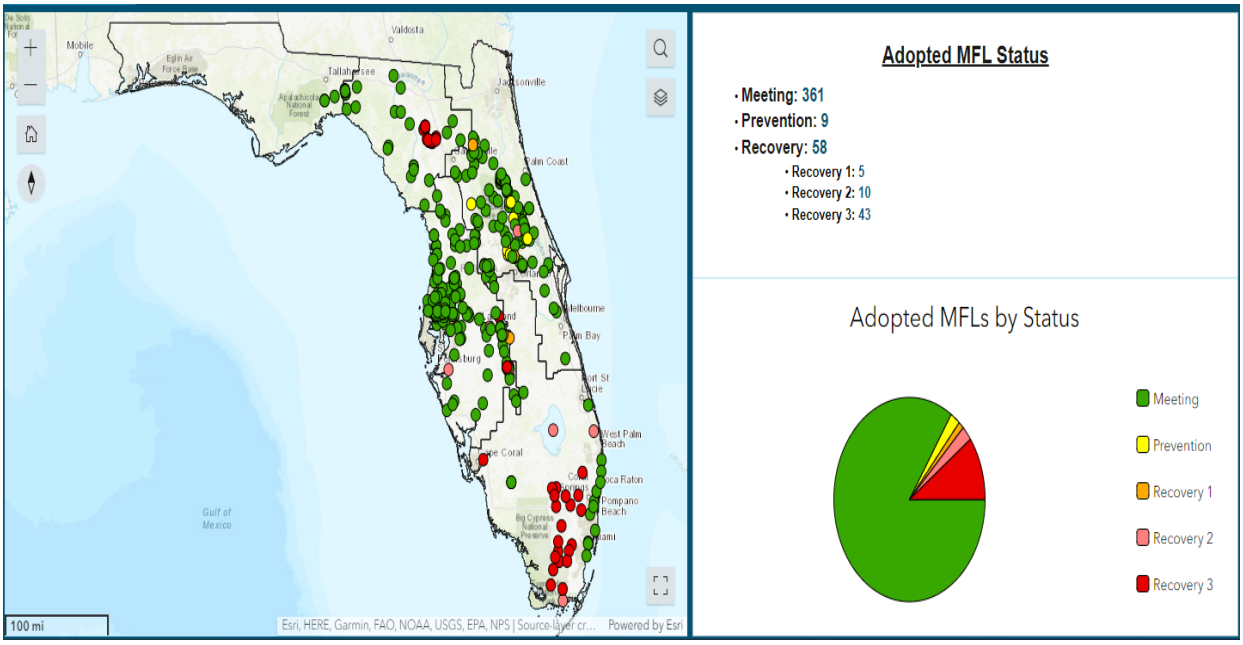
[68] § 373.042, Fla. Stat.
[69] §§ 373.705 and 373.709, Fla. Stat.; Fla. Admin. Code R. 62-40.473(3)-(4);
[70] § 373.0421(2), Fla. Stat.
[71] *Ibid.*
[72] *Ibid*.
[73] *See* 2016-1, §§ 5 and 25, Laws of Fla. (amending section 373.042, Florida Statutes, and creating section 373.805, Florida Statutes, to establish additional MFL requirements for Outstanding Florida Springs).
[74] The deadline for NWFWMD is July 1, 2026.
[75] § 373.805(4), Fla. Stat.
[76] § 373.805(4), Fla. Stat.

Figure 3.2.8.1 Locations of Adopted MFLs by Waterbody Type



Source: DEP. 2023b. 2022 Statewide Annual Report (STAR Report). Available online at: https://floridadep.gov/dear/water-quality-restoration/content/statewide-annual-report (Accessed November 2023).

Figure 3.2.8.2 Locations of Adopted MFLs with RPSs by Status



Source: DEP. 2023b. 2022 Statewide Annual Report (STAR Report). Available online at: https://floridadep.gov/dear/water-quality-restoration/content/statewide-annual-report (Accessed November 2023).

EDR analyzed "project total ($)" information for the 69 projects directly associated with the natural system restoration for which all information was available. These projects were assumed to include

those related to specific MFL RPSs, reclaimed water (for groundwater recharge or natural system restoration), and most of those described as restoration (in the "Project Description" field). EDR also assumed that 50% of the expenditures for the projects in construction/underway statuses would be incurred in the future and, therefore, should be included in the EDR expenditure forecast. EDR assumes that 100% of the expenditures for projects with an on hold or in design status should be part of the expenditure forecast (i.e., none of the recorded funding has been spent yet for on hold or in design projects). In addition, EDR also accounted for the total expenditures for the projects identified as "RWSP or RPS Option Only" (in the "Project Status" field) and associated with a specific MFL RPS. In total, it is expected that the natural system restoration projects would cost $794.01 million (see Table 3.2.8.1).

For comparison, the last edition of this EDR report projected a needed expenditure of $536.80 million. The difference between the two projections is largely caused by the addition of the Lower Hillsborough River Recovery Strategy. The remaining differences are caused by updates to the DEP project database, more granular identification of natural system restoration projects, and methodological changes governing how EDR estimates the timing of project expenditures.

For the projects associated with MFL RPSs and implemented in the past, the average percentage provided by state funding is approximately 16.87%, and the average percentage provided by districts is 27.86% (based on a sample of 189 projects). Therefore, the forecasted state expenditure for the MFL RPS projects is $133.91 million (or 0.1687 x $794.01 million).

Note that these estimates may be too low since it is unclear whether the projects in the appendix are sufficient to meet the MFL target for the related natural systems. Further, it does not account for Everglades restoration which is discussed in Chapter 7, as these projects are largely part of the Comprehensive Everglades Restoration Plan (CERP). Conversely, some of the projects considered by EDR as natural system restoration projects may in fact address the needs of the growing water demand in the region, leading to an overlap between the estimated expenditures for water supply and the natural systems.

While the DEP's Water Resource Implementation Rule states that the WMDs must expeditiously implement all adopted recovery or prevention strategies,[77] there is no generally applicable target date mandated by law to achieve the adopted MFL. Only recovery or prevention strategies for Outstanding Florida Springs (OFSs)[78] are required to contain 5-year, 10-year, and 15-year targets, with achievement of the adopted MFL to occur no later than 20 years after adoption of the strategy.[79] Without a required timeframe to achieve MFLs, the timing of the nearly $134 million in state expenditures is a decision for policy makers.

[See table on following page]

[77] Fla. Admin. Code R. 62-40.473(7).
[78] An "Outstanding Florida Spring" is defined as "all historic first magnitude springs, including their associated spring runs, as determined by the department using the most recent Florida Geological Survey springs bulletin, and the following additional springs, including their associated spring runs: (a) De Leon Springs; (b) Peacock Springs; (c) Poe Springs; (d) Rock Springs; (e) Wekiwa Springs; and (f) Gemini Springs. § 373.802(4), Fla. Stat.
[79] § 373.805(4), Fla. Stat.

Table 3.2.8.1 Projects Associated with Natural System Restoration

Regions	MFL RPS Supported, if Applicable	Project Status	Number of Projects	Project Total (million $2023)	Project Total in EDR Expenditure Forecast (million $2023)
CFWI	Restoration outside MFL RPS	RWSP or RPS Option Only	1	$8.12	$8.12
		Total	**1**	**$8.12**	**$8.12**
NFRWSP	Brooklyn and Geneva Recovery Strategy	Construction/Underway	3	$128.46	$64.23
	Brooklyn and Geneva Recovery Strategy	RWSP or RPS Option Only	3	$62.64	$62.64
	LSFIR Recovery Strategy	Construction/Underway	5	$9.27	$4.64
	LSFIR Recovery Strategy	Design	5	$13.60	$13.60
	LSFIR Recovery Strategy	On Hold	1	$0.00	$0.00
	LSFIR Recovery Strategy	RWSP or RPS Option Only	34	$165.08	$165.08
	LSFIR Recovery Strategy	RWSP or RPS Option Only	2	$3.41	$3.41
	Restoration outside MFL RPS	RWSP or RPS Option Only	1	$3.10	$3.10
		Total	**54**	**$385.56**	**$316.70**
NW – Other	LSFIR Recovery Strategy	Construction/Underway	1	$9.29	$4.64
		Total	**1**	**$9.29**	**$4.64**
SJR – CSEC	Silver Springs Prevention Strategy	Construction/Underway	1	$6.92	$3.46
	Silver Springs Prevention Strategy	RWSP or RPS Option Only	1	$12.04	$12.04
	Volusia Recovery and Prevention Strategy	Construction/Underway	1	$14.61	$7.30
	Volusia Recovery and Prevention Strategy	RWSP or RPS Option Only	6	$133.68	$133.68
	Volusia Recovery and Prevention Strategy	RWSP or RPS Option Only	1	$6.13	$6.13
		Total	**10**	**$173.38**	**$162.62**
SW – TB	Lower Hillsborough River Recovery Strategy	Design	3	$301.93	$301.93
		Total	**3**	**$301.93**	**$301.93**
Statewide (sum of the region)			**69**	**$878.28**	**$794.01**

Note: This Table does not include Everglades Restoration projects since the Comprehensive Everglades Restoration Plan (CERP) is discussed in Chapter 7.

Other Projects Potentially Intended for Natural System Protection and Restoration

In addition to the projects linked to the MFL RPS, EDR assumed that the natural system protection and restoration goals can be met with the following projects that are currently in design, construction / underway, or on hold: (a) projects classified as "Reclaimed Water (for groundwater recharge or natural system restoration)", and (b) projects where existing supplies are already sufficient for meeting projected future demands (*i.e.*, projects in the regions with no inferred water supply shortage identified in Table 3.2.8.3).

Seven "Reclaimed Water (for groundwater recharge or natural system restoration)" projects are currently being implemented in three planning regions, with the total project expenditures of $47.32 million (Table 3.2.8.2). Based on the completed groundwater recharge or natural system restoration projects, the state funds, on average, account for 12.52% of the project expenditures (with WMDs covering 27.86%). Therefore, for the projects currently in design, construction/underway, and on hold, the state funding can be estimated at $5.92 million (or $47.32 x 0.1252).

Table 3.2.8.2 Expenditures for "Reclaimed Water (for groundwater recharge or natural system restoration)" Projects Currently in Design, in Construction / Underway, or on Hold

Regions	Number of Observations	Project Total in EDR Expenditure Forecast (million $2023)
CFWI	2	$0.91
SF – LEC	1	$40.16
SR – West	2	$6.25
SW – TB	5	$17.20
Statewide (sum of the regions)	**10**	**$47.32**

Next, the projects currently being implemented in the regions that have sufficient existing supply are considered. The total implementation expenditure for these projects is $738.71 million. Based on past projects, the average share of state funding for such projects is 12.85%. Therefore, EDR expects that the future state funding for the projects in the regions with no inferred water supply shortage is $94.93 million.

Table 3.2.8.3 Expenditures for Projects Currently in Design, in Construction / Underway, or on Hold in the Regions with No Inferred Water Supply Shortage

Regions	Number of Observations	Project Total in EDR Expenditure Forecast (million $2023)
NW – Other	20	$73.12
SR – West	1	$3.14
NW – H	3	$3.61
NW – S	35	$294.11
SW – TB	37	$364.73
Statewide (sum of the regions)	**96**	**$738.71**

3.2.9 Total Projected Expenditure

Overall, ensuring that sufficient water is available for natural systems is projected to require an investment of $1,580.04 million, with $234.77 million (approximately 14.86%) being covered by the state funds (Table 3.2.9.1). In addition, the expenditure to address the 2040 inferred water supply shortage is projected at $1.693 billion, with the estimated state share being $326.20 million. Between the two initiatives, by 2040, $3.273 billion is needed,[80] with the state covering $560.97 million (Table 3.2.9.2). In the 2023 Edition, the total for both initiatives was reported as $2.926 billion with a state share of $514.79 million. The difference between the forecasts is caused by updates to the DEP project database, more granular identification of natural system restoration projects, and methodological changes governing how EDR estimates the timing of project expenditures. Most importantly, the mix between expenditures for the water supply shortages and the natural systems has changed, with each purpose now representing about one-half of the total.

[80] Assuming that the MFL RPS projects are implemented by 2040.

Table 3.2.9.1 Projected Expenditures to Ensure that Sufficient Water Is Available for Natural Systems (million $2023)

Expenditure	MFL RPS projects	Reclaimed water for groundwater recharge or natural system restoration	Projects in the regions with no inferred water supply shortage	Total
Total expenditures	$794.01	$47.32	$738.71	**$1,580.04**
State share	$133.91	$5.92	$94.93	**$234.77**

Table 3.2.9.2 Total Projected Expenditures by 2040, million $2023

Expenditures	Addressing Inferred Water Supply Shortage*	Providing Water for Natural Systems	Overall Total
Total expenditures	$1,692.85	$1,580.04	**$3,272.89**
State share of expenditures	$326.20	$234.77	**$560.97**

***** Considering the average between the less and more expensive scenarios.

3.2.10 Development of EDR's Pilot Model

To facilitate the expenditure forecast, EDR is in the process of producing an independent statewide water use forecasting model that reflects the official consensus estimating conference results[81] as well as continually updated EDR outlooks on Florida's demographics and economic conditions. This will enable on-demand fiscal simulations of various economic, demographic, and climate scenarios using the latest data. With significant updates to the demand model since the previous Edition of this report, EDR's water use projections by region differ considerably from last year. However, EDR's results statewide are similar to the previous Edition. These results are compared to the WMDs' projections to identify significant differences that may prompt additional research prior to submitting EDR's pilot model for peer-review. Submission of peer-review is still expected in the 2023-24 fiscal year, with more robust results first being reported in this Edition.

The following improvements in EDR's pilot model have been implemented relative to the model described in the 2023 Edition:

- *Inclusion of a more extensive county-level water use history*: EDR now populates the pilot model with the annual 1991 through 2021 history of water withdrawals, as opposed to the annual 1991 through 2020 dataset used for the previous edition of this report.
- Since the water use did not follow the same pattern among counties, separate models were developed for like groups (clusters) of counties. In this report, EDR used the Clustering approach to group the county-level *PS, DSS, L/R, and CII* water use history into seven

[81] The Economic Estimating Conference develops official projections related to the national and state economy, while the Demographic Estimating Conference develops official information concerning the population (§ 216.136, Fla. Stat.). General provisions for the Consensus Estimating Conferences are defined in § 216.134, Fla. Stat. Specifically, the Consensus Estimating Conferences are within the legislative branch. The membership of each estimating conference consists of principals and participants. The principals of each conference are the professional staff of the Executive Office of the Governor designated by the Governor, the coordinator of EDR, the professional staff of the Senate designated by the President of the Senate, and the professional staff of the House of Representatives designated by the Speaker of the House of Representatives.

groups. Each group has a unique forecasting model to better reflect its water use pattern. Second, EDR used the Fixed Effects (FE) and Lasso Regression techniques for modeling water use, as opposed to the FE technique used for the 2023 Edition. The Lasso Regression and FE techniques were used to improve the model's performance and better control for unobservable or unmeasurable factors such as cultural, economic, and demographic effects or differences in water use patterns across counties due to regulations and climate conditions. The FE technique allows users to account for individual (county) heterogeneity and the Lasso Regression technique is used for more accurate water use forecasts. Appendix A.6 provides a thorough and detailed explanation of EDR's current pilot model.

Other adjustments made by EDR, as compared with the 2023 Edition:

a. Water withdrawals and reclaimed water use are combined for each county to develop beneficial offset coefficients. Reclaimed water sources currently supply a relatively small share of the total water use in the state; therefore, the effect of the beneficial offset coefficient on the total water demand forecast is small. Still, EDR combined the total reclaimed water flow reported in DEP's Reuse Inventory Database and Annual Report[82] with the history of WMDs' and USGS's water use in order to capture any long-term changes in water use.
b. EDR updated the PG water use forecast using the most recent release of water use data from WMDs.
c. EDR updated the AG water use forecast to incorporate the tenth and most recent release of the Florida Statewide Agricultural Irrigation Demand (FSAID) developed by DACS.[83]

EDR's pilot water use model can now help explore the effects of weather, demographic, and economic variables on water demand and assist in the development of the expenditure forecast. However, EDR emphasizes that further refinements and peer-review of the model are still needed.

EDR's Pilot Model Treatment of Statewide Agricultural Water Use

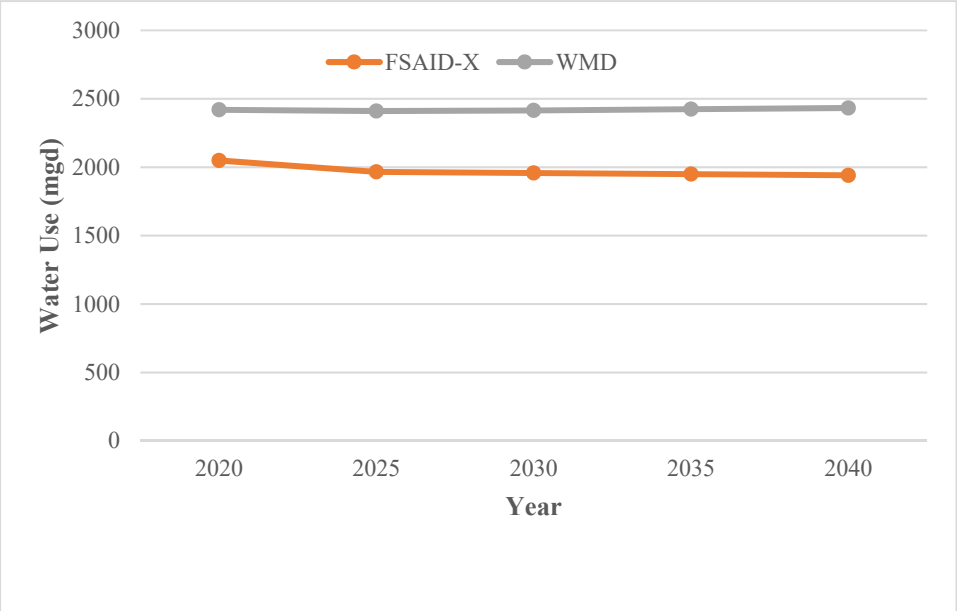
For the AG water use forecast, EDR relied on the latest release of agricultural water demand projections developed by DACS. The DACS geodatabase, referred to as the Florida Statewide Agricultural Irrigation Demand (FSAID), was developed in response to Section 570.93, Florida Statutes, which requires DACS to establish an agricultural water supply planning program. WMDs must consider the data provided by DACS as indicative of future water demands (Section 373.709, Florida Statutes). Referred to as FSAID-X, the current FSAID model "…incorporates both agronomic and economic factors that affect irrigation water demand. The model's ability to capture the variation in water use by profitability across crops and within crops over time provides an enhanced estimate of future irrigation demands" (The Balmoral Group, 2023[84]). In addition to

[82] The definitions of the use categories differ between the USGS water withdrawal and DEP reclaimed water use databases, making the water use estimates from the two databases not entirely comparable.
[83] DACS. 2023. Agricultural Water Supply Planning. Available online at: https://www.fdacs.gov/Agriculture-Industry/Water/Agricultural-Water-Supply-Planning (Accessed November 2023.)
[84] The Balmoral Group. 2023. Florida Statewide Agricultural Irrigation Demand. Estimated Agricultural Water Demand, 2021 – 2045. Available online at:

supplemental agricultural irrigation, FSAID also projects freeze protection irrigation, aquaculture, and livestock water use. Further, it differentiates the demand between average- and drought-year conditions.

The FSAID forecast meets EDR's needs by being annually updated, consistent among the water supply planning regions, and reliant on the most recent economic projections. For each water supply planning region, EDR uses average-year supplemental irrigation, freeze protection irrigation, aquaculture, and livestock water use reported in FSAID-X for 2020[85], 2025, 2030, 2035, and 2040. The potential effect of conservation reported in FSAID is not accounted for by EDR, since, for many regions, FSAID projections without conservation were already well below the projections available from the WMDs (see Fig 3.2.10.1).[86]

Figure 3.2.10.1 Statewide Agricultural Water Use Projections (mgd)



EDR's Pilot Model Treatment of PS, DSS, L/R, and CII Water Use

EDR's pilot model incorporates historical water use and economic and demographic indicator values to forecast water use for each county. These county forecasts are then allocated to the water supply planning regions using the population shares[87] for those counties split between water supply

https://www.fdacs.gov/Agriculture-Industry/Water/Agricultural-Water-Supply-Planning (Accessed November 2023.)

[85] FSAID-X projects agricultural water use for 2021, 2025, 2030, 2035, 2040 and 2045; thus, the 2020 water use projections comes from FSAID-IX, see 2023 Edition of this EDR report for details.

[86] Comparison of the water demand forecasts from WMDs and FSAID for various water supply planning regions is presented in Appendix A.7.

[87] Uses the methodology developed for EDR in BEBR's "An Analysis of Methods to Allocate BEBR's County Population Estimate and Projections to Water Management District Boundaries" (available from EDR upon request). The shares are based on Census Block population data from 2010. For blocks that are divided by a supply planning region's boundary, land area shares were used to split the block's population. See Appendix A.7 for additional details.

planning regions. However, the model's intended use is statewide expenditure projections, and, therefore, county forecasts are not presented in the main text of this report.

Historical Water Use

County-level ground and surface water withdrawals are available from the USGS for selected years between 1985 and 2015.[88] The USGS water use data is supplemented by data provided by the WMDs: NWFWMD (2016-2021), SRWMD (2015-2020), SWFWMD (1985-2021), SFWMD (2014-2021), and SJRWMD (1997-2021).[89] Further, EDR assumes that some of the reclaimed water flows reported in the DEP's Reuse Inventory Database and Annual Report[90] meets the demand in the categories traditionally classified as PS, DSS, CII, or L/R, and, should be accounted for in the historical water use dataset. The DEP Reuse Inventory Database and Annual Report, however, classifies water use categories differently than WSAs/RWSPs. EDR's approach to integrating the two water use classifications is summarized in Table 3.2.10.1. Overall, reclaimed water flow is estimated to account for a relatively small proportion of water use. Therefore, while it is important to address reclaimed water use, these assumptions likely have a small effect on the forecast, given that most of the water demand is still met by surface water or groundwater.

[See table on following page]

[88] USGS publishes statewide summary water withdrawal reports and related county data every five years. However, for selected counties, water withdrawal data are also available for the years between the 5-year summaries. EDR used the data from Microsoft Excel spreadsheets entitled "Historical Public Supply Data for 1950-2010" and entitled "Historical Water-Use in Florida" (available online at: https://www.usgs.gov/centers/car-fl-water/science/historical-water-use-florida; accessed January 2021.) These data were supplemented with the USGS report "Water Withdrawals, Uses, and Trends in Florida, 2015" by Richard Marella (available online at: https://pubs.usgs.gov/sir/2019/5147/sir20195147.pdf; accessed October 2021.) Note that for PS water use, the USGS identifies transfers for each county. Whether the transfer is import or export is described for 1985, 1990, 1995, 2000, 2005, 2010, and 2015 in summary reports published by the USGS. The transfers among counties were allocated to import or export following the pattern specified in the reports. It must be pointed out that there are slight differences in the definitions of water-use categories between USGS and WMDs, for example, in the threshold used to separate water suppliers into the PS or DSS categories. Since EDR models water demand in PS, DSS, L/R, and CII in the aggregate, these differences become irrelevant.

[89] For the counties split between WMDs, the water use from each WMD was summed for each year for which the data was available. If data were available from only one WMD, total county water use was treated as "missing." For counties partially or completely in SJRWMD, historical water withdrawals were based on the USGS data only. Further, for SRWMD, NWFWMD, and SFWMD, it was assumed that PS water transfers between counties are either accounted for or insignificant in the WMDs' data. For the SWFWMD, PS water transfers are explicitly identified in the district's data.

[90] EDR uses "Appendix D – Utilization" data from DEP's 1996-2021 reuse inventory database. The database is public information; however, EDR acknowledges that the database was initially requested from DEP by a University of Florida Research-Extension team to develop an extension publication.

Table 3.2.10.1 Assumptions Applied to Reuse Inventory Types and Subtypes

Reuse Inventory Type	Assumed Water Use Category	Notes
Residential irrigation	PS	-
Toilet flushing	PS	-
Fire protection	PS	-
Public Access Areas & Landscape Irrigation	PS and L/R	Specifically, EDR allocated to the PS category 60% of reuse water flow from "other public access areas" and "other" reuse subtypes.* In addition, 100% of the "Golf Course Irrigation" reuse subtype was assumed to be used for L/R.
Industrial	PS and CII	Within the Industrial type, only the "At Treatment Plant" subtype was considered. It was assumed to be equally split between the commercial-industrial-institutional self-supplied, public supply, and the water use internal for the treatment plants (*e.g.*, water to spray foam formed as a part of the treatment process). The internal water use was then disregarded from the analysis.

* "Other public access areas" subtype can include parks, athletic fields, schools, decorative water features, and cleaning roads and sidewalks. "Other" reuse subtype can include "decorative fountains, commercial laundries, cleaning of roads and sidewalks, vehicle washing, concrete making, and other permitted uses" (DEP 2022). Some of these activities may be met by either public supply or self-supply; they also may serve as treated wastewater disposal mechanisms. EDR attributed 60% of this reuse flow to the public supply category, rounded average of offset value reported for "Other public access areas" in Reuse Coordinating Committee and the Water Conservation Initiative Water Reuse Work Group (2003).

References: (1) DEP. 2022. 2021 Reuse Inventory (available online at: https://floridadep.gov/water/domestic-wastewater/content/reuse-inventory-database-and-annual-report; Accessed October 2023); and (2) Reuse Coordinating Committee and the Water Conservation Initiative Water Reuse Work Group. 2003. Water Reuse for Florida Strategies for Effective Use of Reclaimed Water. Available online at: https://floridadep.gov/sites/default/files/valued_resource_FinalReport_508C.pdf (Accessed October 2023.)

Economic and Demographic Indicators

EDR produces and updates multiple economic and demographic indicators characterizing the state's economy and population trends, and these indicators are used to develop the state's official forecasts. EDR also maintains a comprehensive database of the historical indicator values. Many of these indicators are significant predictors of water use, such as population, economic structure (*e.g.*, characterized by employment in various industries), and the total economic activity (*i.e.*, Florida's gross domestic product). EDR produces these forecasts for a 10-year planning period, and therefore, for this report, these forecasts are expanded using a linear trend to match the 20-year water supply planning horizon.

Many of EDR's economic forecasts are produced for the state as a whole. Water use, however, must be forecasted on the regional level to match the geography used for the existing water supply inferred from the WMDs' data. Therefore, for this report, EDR distributed the total statewide values of various economic indicators to individual counties. For this task, the counties' relative shares were estimated for each economic indicator using county historical and forecasted data from Woods and Poole Economics (2023).[91]

EDR used regression analysis to develop a model that can reasonably reproduce the Florida counties' historical water use variability. The model includes the following variables:[92]

[91] Woods and Poole Economics. 2023. Data Pamphlets for Any State, Region, or the U.S. Total. Available online at: https://www.woodsandpoole.com/our-databases/counties-metro-areas/data-pamphlets-state-region-us-totals/ (Accessed October 2023.)

[92] Various specifications of the model were examined, and the predictive powers for these specifications were compared using the adjusted R-squared values. Predicted water use was also visually compared with each county's historical water use to ensure the model does not materially misrepresent the history. Forecasted water use was also examined to ensure the model does not result in forecasted exponential growth in water use on the statewide or county levels. The statistical models described in this report are those that were judged as the best using these criteria. See Appendix A.6 for additional details.

- County population: population growth is a critical determinant of water use;[93]

- The proportion of the county population employed in accommodation and food services: tourists and visitors can significantly increase water use, especially in the PS and CII categories that include hotels and motels and other lodging and food service locations. While county historical visitor numbers are not available, employment in accommodation and food service sector can serve as a proxy reflecting fluctuation in visitation;

- The proportion of the county population employed in mining, manufacturing, and utility sectors: this value reflects the importance of industrial and mining activities in a county, which can be an important driver of CII water use;

- Total precipitation in spring months (i.e., March-May): the weather is a decisive determinant of water use, particularly in PS and L/R categories. Reduction in precipitation, especially in warm and relatively dry spring months, can increase total water use;[94]

- Time trend: this variable is intended to capture the effect of conservation and improving efficiency. For example, while the water use is expected to grow with population, this growth is expected to decelerate over time due to water use efficiency improvements.

Note that water demand can be related to these variables in a nonlinear fashion. EDR used log-transformation to transform this relationship into the form that can be captured by a linear regression analysis.

Comparison of Water Use Results in PS, DSS, L/R and CII

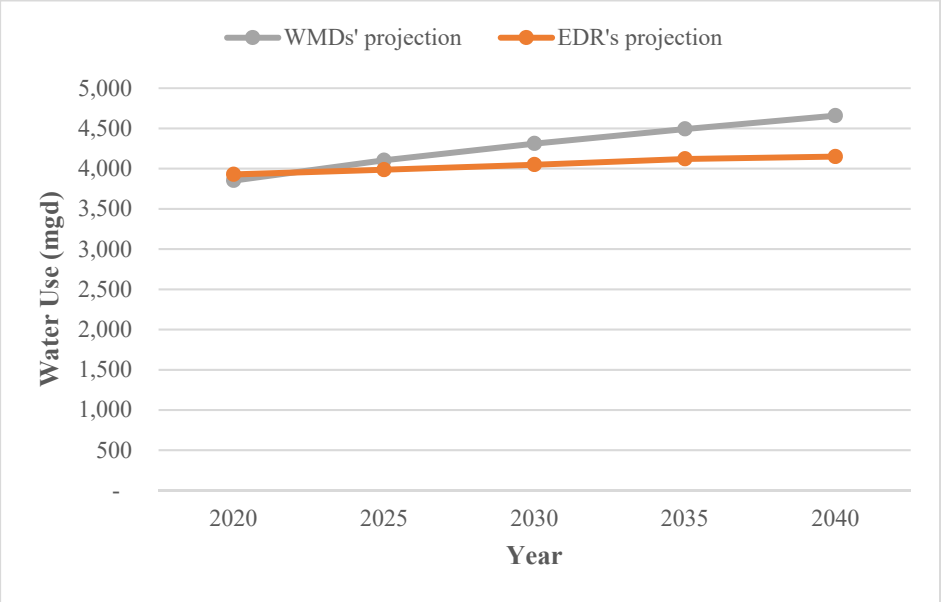
The WMD's projection and the EDR forecast are presented in Figure 3.2.10.2. EDR forecasts a continued increase in statewide water use; however, the rate of increase is lower than that projected by WMDs. One explanation can be the effect of water conservation included in the EDR forecast but not in the WMDs' demand Scenario 1 ("Baseline").

[See figure on following page]

[93] EDR also considered county population specifically in incorporated areas. The water use correlation with that population was smaller than seen for the total population in a county.

[94] EDR also examined the potential effect on water use of the total summer precipitation (June-August) and the average temperature in spring and summer months. However, these variables had a statistically significant effect on the water use.

Figure 3.2.10.2 Statewide Projected Water Use in PS, DSS, L/R, and CII (mgd)



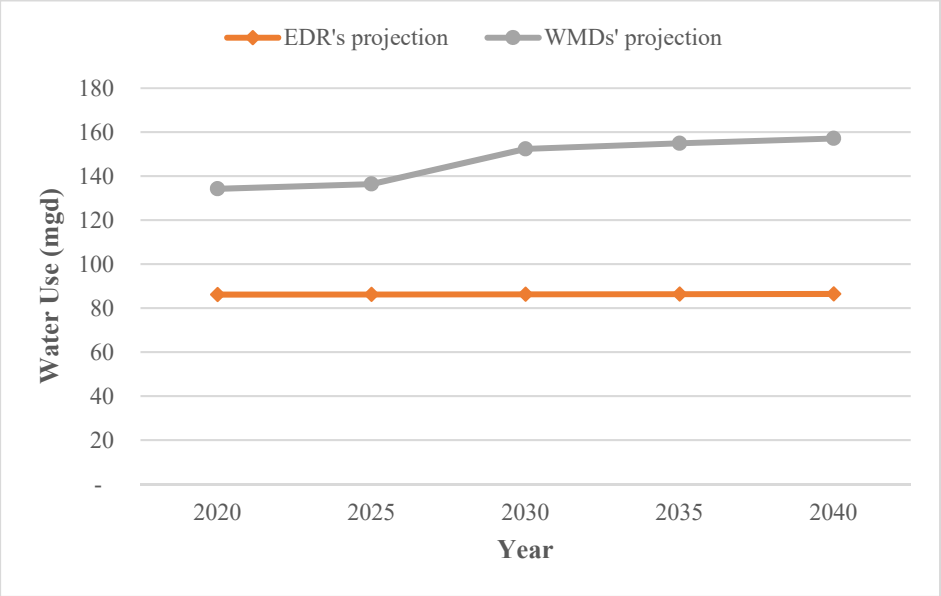
EDR's Pilot Model Treatment of PG Water Use

The discrepancy in the PG water use data from the USGS relative to the WMDs creates a significant barrier for developing EDR's PG water use model. The data provided by the NWFWMD, SRWMD, and SFWMD span two to three recent years only, and therefore, are insufficient for developing a 20-year water use projections for the EDR expenditure model. To cure this issue, EDR supplements the WMDs' data with information available from the USGS periodic water use reports; however, the data are not entirely compatible. WMDs focus on consumptive use, while the USGS reports water withdrawals that can include both consumptive use and withdrawal returned to the water source. To make the two data sources more compatible, EDR uses only freshwater withdrawals for closed-loop systems from the USGS reports (as opposed to the total freshwater withdrawals also reported by USGS). Still, for a sample of counties for which both the WMDs' and USGS' data were available, the water use reported by the two sources differed significantly, implying that additional data verification and clarification should be implemented.

An analysis of the USGS and WMD data shows zero PG water use in most counties.[95] The exceptions are 26 counties: Alachua, Bay, Citrus, DeSoto, Duval, Escambia, Hardee, Hernando, Jackson, Lake, Lee, Leon, Liberty, Manatee, Martin, Miami-Dade, Orange, Osceola, Palm Beach, Pasco, Polk, Putnam, St. Lucie, Suwannee, Volusia, and Wakulla. For these counties, water use is assumed to stay at the average historical use or is modeled using regression analysis.[96] A statewide forecast of PG water use is presented in Figure 3.2.10.3.

[95] These counties can still report water withdrawals for the PG category; however, these withdrawals are deemed to be irrelevant for the water supply planning process. For example, these counties may report significant volumes of saline water withdrawals. Since these withdrawals have a limited value in any alternative water use, EDR disregards these withdrawals from the analysis.
[96] For more details, see Appendix A.6.

Figure 3.2.10.3 Statewide Projected Water Use in PG (mgd)



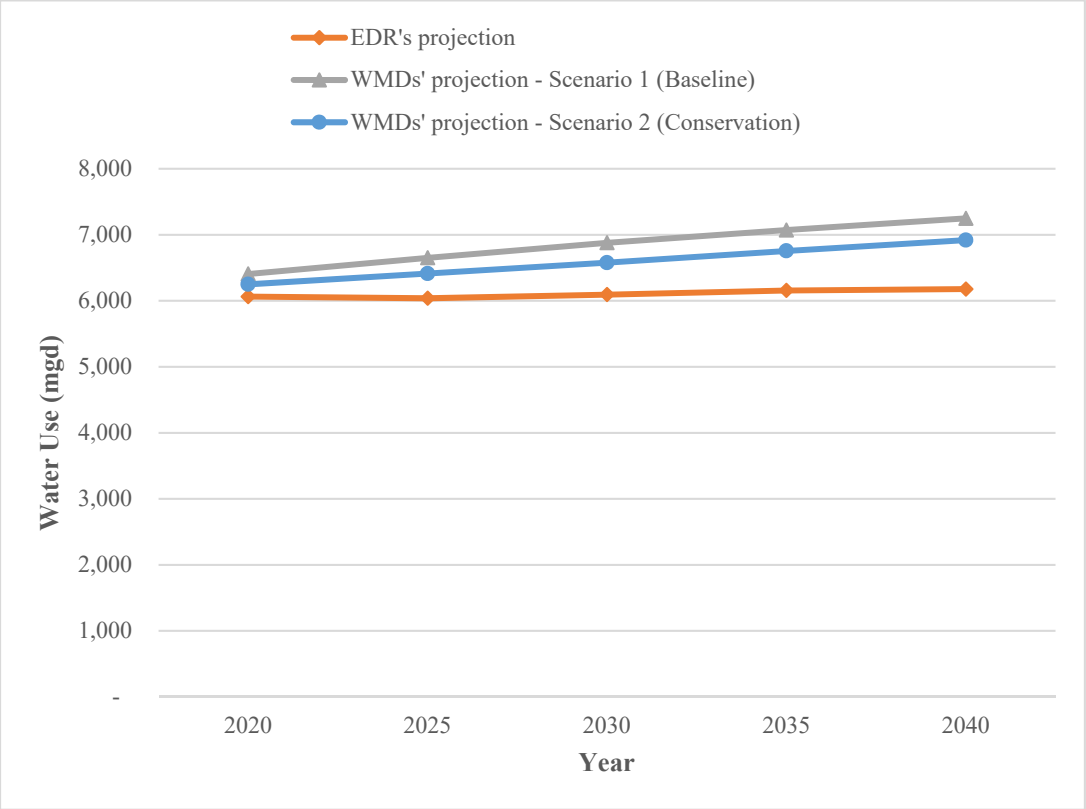
EDR's Pilot Model Water Use Summary

As presented in Figures 3.2.10.1, 3.2.10.2, and 3.2.10.3, the water use forecasts projected with EDR's pilot model are below those produced by the WMDs for the baseline scenario (Scenario 1) and the scenario with conservation (Scenario 2), as shown in Figure 3.2.10.4. Possible explanations for these differences include:

- Historical trends in water use efficiency improvements and water conservation are higher than those considered by the WMDs;
- EDR's forecast is based on updated population projections, which may be lower than those used in the WMDs' projections;
- Historical PG water use data used by EDR to develop the forecasting model are not adequate, and therefore, they do not allow accurate projections of future water use;
- The AG water use forecast from FSAID-X incorporated into the EDR statewide forecast is significantly below those developed by the WMDs.

Overall, while the EDR model and forecast presented in this edition is a significant improvement compared to the 2023 Edition, additional work and peer-review of the model are needed before EDR makes the decision to rely solely on this model to forecast expenditures. In the interim, both EDR's model based on the WMD projections and EDR's pilot model will run concurrently to produce expenditure forecasts.

Figure 3.2.10.4 Statewide Projected Water Use (mgd)



At a minimum, two issues need to be addressed to improve the forecast:

a. Analysis of both average year and drought water use scenarios (currently, only the average year conditions are considered); and

b. Examination of the determinants of water use efficiency improvements and water conservation (current forecast incorporates historical time trend for water use efficiency improvements, without considering potential investments needed to maintain or accelerate this trend).

[See table on following page]

Table 3.2.10.2 Total Water Use Forecast Produced by EDR's Pilot Statewide Water Use Model

Region	2020	2025	2030	2035	2040
NW – II	83.26	82.52	85.12	87.81	89.32
NW – Oth	295.93	287.95	287.17	288.82	288.73
SR – West	112.04	113.50	114.97	117.38	119.53
NFRWSP	604.26	601.97	606.41	614.27	617.34
SJR – CSEC	350.15	338.33	336.14	334.81	330.29
SW – N (excluding CFWI)	168.54	161.60	162.10	159.38	150.23
SW – TB	461.74	447.16	443.65	443.04	437.89
SW – H (excluding CFWI)	117.26	110.19	110.05	108.44	106.51
SW – S	316.85	313.29	316.69	319.35	319.84
CFWI	736.59	739.72	755.09	769.61	775.80
SF – LKB	122.64	117.52	116.92	116.43	116.38
SF – UEC	213.10	206.46	202.04	197.82	193.10
SF – LEC	1,791.41	1,810.86	1,830.47	1,853.15	1,869.78
SF – LWC	689.57	707.39	726.33	745.99	762.60
Statewide	**6,063.33**	**6,038.44**	**6,093.13**	**6,156.30**	**6,177.34**

EDR's Pilot Model Future Supply Shortage

EDR's pilot model uses inferred existing supply to estimate future supply shortages that should be addressed through new investments. The results confirm the conclusion made from the WMDs' water demand projections that additional water supply will need to be developed, although, the pilot model projects a smaller difference of 112.63[97] mgd between the forecasted demand and estimated water supply by 2040. In contrast, the results based on the WMDs' 2040 water use projections suggest a larger shortage of 336.28 mgd. The difference is due to the lower water use forecasted by EDR's pilot model, as compared to the WMDs' projections. EDR's pilot model indicates that water supply investments are needed in North Florida (NFRWSP) and SWFWMD (the Heartland and Southern regions). There are several additional regions with inferred supply shortages, but after accounting for water projects in design, construction and on-hold, those issues are resolved. The potential 2040 supply shortages using both methodologies can be found in Table 3.2.10.3.

[See table on following page]

[97] See Appendix A.6 for a comparison of the EDR's forecast with the WMDs' estimates and projections.

Table 3.2.10.3 2040 Supply Shortage Estimates – EDR's Pilot Model and EDR Results based on WMD Data (mgd)

Regions	Inferred Supply Shortage		Water by the Projects in Design, Construction, and On Hold, mgd	Remaining Inferred Supply Shortage by 2040, mgd**	
	Using WMD	Using EDR Pilot		Using WMD	Using EDR Pilot
(1)	(2)	(3)	(4)	(5)=(2)-(4)	(6)=(3)-(4)
NW – II	5.00	-	7.70	-	-
NW – Oth	-	-	49.29	-	-
SR – West	0.00	-	1.10	-	-
NFRWSP	117.00	58.10	8.90	108.10	49.20
SJR – CSEC	51.10	-	37.91	13.19	-
SW – N (excluding CFWI)	11.55	-	3.01	8.54	-
SW – TB	-	-	17.79	-	-
SW – H (excluding CFWI)	-	14.02	0.00	-	14.02
SW – S	-	40.51	13.61	-	26.90
CFWI	95.00	-	45.67	49.33	-
SF – LKB	0.01	-	0.00	0.01	-
SF – UEC	6.00	-	11.10	-	-
SF – LEC	49.55	-	0.41	49.14	-
SF – LWC	1.07	-	7.03	-	-
Statewide	**336.28**	**112.63**	**203.52**	**228.32**	**90.12**

EDR's Pilot Model Expenditure Forecast

In order to develop an expenditure forecast that addresses the remaining inferred supply shortage, certain assumptions regarding the projects must be made. These assumptions include the choice of project types and sizes for each region where water use is projected to exceed existing supplies. As discussed in Appendix A.8, water supply development scenarios can be derived from the past projects and future project options included in the DEP project appendix and a recent DEP assessment[98] of this issue. In that assessment, reclaimed water is ranked as a "high confidence" water source for all of the relevant regions. A similarly high rating is assigned to surface water and brackish groundwater in the SW – S and SW – H, and to groundwater recharge in the NFRWSP.

[98] DEP. Undated. An Assessment of Viable Alternative Water Supply Resources and Critical Funding Needs. Presented by the FDEP pursuant to Executive Order 19-12 and Chapter 2019-115, Laws of Florida.

Implementation Costs per Unit of Project Capacity

The EDR model presented in Appendix A.8 can predict the project costs, given specific project types, sizes, implementation regions, and status. At the regional level, an assessment of the unit project costs for the NFRWSP is discussed in the previous sections. Following a similar approach, reclaimed water project costs for SW – H (outside CFWI) are estimated at $25.79 million per mgd. Reclaimed water projects in the SWFWMD (outside CFWI) tend to be more expensive because the average size of the reclaimed water projects in the SW – H is small, which increases the cost per unit of project capacity. In turn, in the SW – S, surface water projects are large (on the median), and with an average cost estimated at $3.74 million per mgd. Brackish groundwater projects are generally more expensive (estimated at $5.47 million per mgd, on average), and reclaimed water projects are even more so (estimated at $9.27 million per mgd, on average).

Statewide Expenditure Forecast to Ensure Sufficient Water is Available

The unit cost for various project types and regions is combined with the estimates of the potential future supply expansion needs (from the pilot model) and the cost of projects already in design, construction/underway, and on hold to generate low − and high − cost expenditure scenarios. At the statewide level, the project expenditures estimated using EDR's pilot model (*i.e.*, $1,083.21 million by 2040) are considerably lower than those estimated using the WMD's water demand projections ($1,692.85 million by 2040). Greater differences appear among the expenditure projections at the regional level, with EDR's pilot model projecting needed expenditures for SW – H (outside CFWI) and SW – S where the WMD's demand estimates do not. In contrast, the WMD's demand estimates point to potential supply expansion needs in SJR – CSEC, SW – N (excluding CFWI), SF – LEC and CFWI where EDR's pilot model does not. Since EDR focuses on the statewide expenditure forecast, the pilot model's accuracy regarding specific regional expenditure predictions needs further discussion with the WMDs and DEP. These results are shown in Table 3.2.10.4 below.

As a placeholder, the expenditure forecast for the natural systems from Section 3.2.8 is included in Table 3.2.10.4 below. EDR's pilot water use model indicates higher expenditure estimates will be needed for the natural systems. Specifically, the project natural system expenditure estimated using EDR's pilot model presented in Table 3.2.10.5 (*i.e.*, $1,845.10 million by 2040) is considerably higher than those estimated using the WMD's water demand projections ($1,580.04 million by 2040)[99]. The difference is attributable to higher expenditure forecasts for the natural systems in the regions with no inferred water supply shortages. While EDR's pilot water use model relies on the same approach to estimate the natural system expenditure (which is based on the sum of the expenditures for the projects identified by the WMDs and expenditure forecasts for the natural systems in the regions with no inferred water supply shortages), the difference indicates potential issues still need to be addressed. Most importantly, how do supply estimates relate to the needs of the natural system restoration? EDR's pilot model seems to project water demand exceedance in regions considered by WMDs as having sufficient water supply. Does this mean that the projects currently in design, construction/underway, or on hold in these regions are intended for natural system restoration? In this Edition, EDR assumes that these projects are

[99] The total expenditures estimated using EDR's pilot model (i.e., $2,928.31 million by 2040) are still considerably lower than those estimated using the WMD's water demand projections ($3,272.89 million by 2040). See Appendix A.1 for a comparison of the EDR's forecast with the WMDs' estimates and projections.

intended for natural system restoration.[100] Overall, the link between the demand projections, existing supply estimates, and the water needs for the natural systems must be further discussed and clarified.

Table 3.2.10.4 Statewide Expenditures forecast, Total for 2020-2040, Pilot Model (million $2023)

Planning Regions	Projects in Design, Construction, and On Hold (million, $2023)**	Project Meet Remaining Inferred Shortage (million, $2023)		All Projects (million $2023)		
		Less expensive	More expensive	Less expensive	More expensive	Average
(1)	(2)	(3)	(4)	(5)= (2) + (3)	(6) = (2) + (4)	((5) + (6)) / 2
NFRWSP	$9.60	$47.72	$430.99	$57.32	$440.58	$248.95
SW – H*	$3.61	$361.55	$361.55	$365.16	$365.16	$365.16
SW – S	$294.11	$100.61	$249.37	$394.72	$543.48	$469.10
Statewide (sum of regions)	**$307.31**	**$509.89**	**$1,041.91**	**$817.20**	**$1,349.23**	**$1,083.21**
Natural Systems				**$1,845.10**	**$1,845.10**	**$1,845.10**
Total Expenditure				**$2,662.30**	**$3,194.33**	**$2,928.31**

* excluding CFWI. ** Total expenditure forecast for the regions with no inferred shortages is estimated to be $1,003.77 million, bringing the statewide total to $1,311.08 million ($2023).

Table 3.2.10.5 Total Projected Expenditure for 2020-2040, Pilot Model (million $2023)

Expenditures	Addressing Inferred Water Supply Shortage*	Providing Water for Natural Systems	Overall Total
Total expenditures	$1,083.21	$1,845.10	**$2,928.31**
State share of expenditures	$114.69	$265.30	**$379.99**

3.2.11 Next Steps and Recommendations

In the future, EDR plans to continue enhancing the water use forecasting model. Yet, even the current pilot model allows for the following insights:

- EDR's pilot model results in a total expenditure forecast that is, on the whole, lower than the forecast reported in Table 3.2.9.2 (*i.e.*, the forecast based on the WMDs' demand projections). The key difference is which regions are predicted to have inferred future supply shortages because the project costs vary significantly between regions (see Tables 3.2.6.4 and 3.2.6.5). While EDR is required to produce a statewide expenditure forecast, differences at the regional level determine the magnitude of the statewide expenditures.

[100] In the 2023 Edition of this EDR report, EDR assumed that these projects were not intended for natural system restoration; thus, EDR did not include them in the expenditure forecasts. In this Edition, EDR considers these projects are intended for natural systems to forecast the expenditures better. Based on past projects, the average share of state funding for these projects is 0.1285 (i.e., approximately 12.85%).

- The EDR pilot model calls for making investments in alternative water supplies slightly sooner than the forecast based on the WMD data. In fact, for the regions with potential future supply shortages, the bulk of the water supply expenditures are needed in the 2020s (see Appendix A.1 for details).

- Significant improvements in water use efficiency and conservation are forecasted by EDR's pilot model. While some of these improvements can be costless (*i.e.*, passive conservation), others will require significant investments. In the future, the expenditures needed to maintain or accelerate water use efficiency improvements and water conservation should be further explored.

- A critical area for improvement is a better understanding of "beneficial use volume for the total reclaimed water flow" as used in DEP's reclaimed water use inventory and database. Furthermore, EDR's pilot model forecast is based on the assumption that the existing reclaimed water use is precisely equal to the available reclaimed water supply. Additional analysis is needed to verify the assumption and strengthen the evaluation of existing reclaimed water supply.

- Expenditures for natural system protection and restoration should be better integrated into EDR's pilot model in the future. The 2024 Edition takes an initial step in this process by discussing the expenditures needed for the projects currently in design, construction/underway, or on hold in the regions with no "Water Needed" identified in DEP (2023a).

- The 2024 Edition includes a limited discussion of drought preparedness expenditures. The discussion of drought impacts on future water demand, existing supplies, and natural systems should be expanded in future editions.

Overall, EDR will continue enhancing the water use and expenditure forecasting model in preparation for submission for peer-review.

Appendix A: Additional Resources Regarding Water Supply and Demand Modelling and Expenditures Forecasts

The following are the appendices related to Chapter 3.

A.1 Total Projected Expenditures

Table A.1.1 Difference in Total Projected Expenditures between Using WMD's Projection of Future Water Use and EDR Projections of Future Water Use by 2040

Expenditures	Addressing Inferred Water Supply Shortage*	Providing Water for Natural Systems	Overall Total
Using EDR Pilot Model's Projections of Future Water Use			
Total expenditures	$1,083.21	$1,845.10	$2,928.31
State share of expenditures	$114.69	$265.30	$379.99
Using WMD's Projections of Future Water Use			
Total expenditures	$1,692.85	$1,580.04	$3,272.89
State share of expenditures	$326.20	$234.77	$560.97
Difference			
Difference in total expenditure	**$609.64**	**-$265.06**	**$344.58**
Difference in state share expenditures	**$211.52**	**-$30.54**	**$180.98**

Note: Positive numbers indicate total projected expenditures using WMD's future water use projections are higher than those estimated using the EDR Pilot Model's future water use projections.

Table A.1.2 Difference in Cumulative State Share Expenditures

Year	2020-2025	2026-2030	2031-2035	2036-2040	Total (for 2020-2040)
State share using WMD	136.25	178.28	48.30	198.13	560.97
State share using EDR Pilot	137.69	134.56	5.03	102.71	379.99
Difference in state share expenditure	**-1.44**	**43.73**	**43.27**	**95.42**	**180.98**

Note: Positive numbers indicate total projected expenditures using WMD's future water use projections are higher than those estimated using the EDR Pilot Model's future water use projections.

A.2 Conservation Potential

Definitions

Water conservation is defined as "the efficient use of water. Water conservation does not include water supply source switching, which, though valuable in reducing the use of traditional water supplies, does not improve the efficiency of use" (DEP 2019, p. 5)[101]. The conservation projection is "the projected conservation savings of all water users or a subset of water users that could be achieved during the planning horizon. Districts develop this projection using the best available information and methodologies … Districts may present these quantities as a range, with the low

[101] DEP, NWFWMD, SFWMD, SWFWMD, SJRWMD, and SRWMD. 2019. Format and Guidelines for Regional Water Supply Planning. 42pp.

end of the range being likely to be achieved and the high end of the range being the conservation potential or some portion of it" (DEP 2019, p. 7).[102]

Note that the WMDs emphasize that potential conservation should not be directly removed from water demand estimates. The actual savings are based on the endorsement and implementation of conservation measures by public supply utilities and other users and are highly contingent on specific user participation rates. Nevertheless, for this analysis, EDR subtracted the conservation projections from the demand projections to evaluate the potential impact of the water use efficiency improvements and to recognize the conservation improvements evident in the historical data. EDR acknowledges that conservation investments, potentially substantial in magnitude, are likely needed for these efficiency improvements to be realized.

2020-2040 Water Use Forecast with Conservation

DEP (2023a) summarizes the WMDs' conservation projections for the WMDs' current planning period. Since the planning period differs among the WMDs, no consistent statewide conservation projection is available for 2020-2040. The conservation potential is also presented as the total for the planning period, with no specific dates for the use reduction.

To derive a statewide 2020-2040 water use forecast that accounts for the conservation potential, EDR first considered the regions planning for 2020-2040. For these regions, the alternative 2040 water use forecast was estimated as the difference between the 2040 water use and conservation projections. For 2020, 2025, 2030, and 2035, the regional water use forecast with conservation was estimated by interpolating the 2015 water demand (*i.e.*, the base year use) and the 2040 forecast with conservation (Table A.2.1).

Table A.2.1 Water Use Forecast with Conservation (Regions with 2020-2040 Planning Horizons)

Region	Data from DEP (2023a)			EDR Calculations (mgd)				
	Base Year Water Use (mgd)	Projected 2040 Water Use	Conservation Projection*	2020	2025	2030	2035	2040
NW – II	69.73	94.88	6.00	73.56	77.39	81.22	85.05	88.88
NW – Oth	254.01	311.49	3.80	264.74	275.48	286.22	296.95	307.69
SF – LKB	245.42	257.49	0.00	247.73	250.17	252.61	255.05	257.49
SF – UEC	291.11	283.96	12.62	272.63	272.31	271.98	271.66	271.34
SF – LEC	1757.29	2006.54	102.40	1,772.52	1,805.42	1,838.33	1,871.23	1,904.14
SJR – CSEC	353.17	427.87	38.22	360.47	367.76	375.06	382.35	389.65
SWF – N**	131.08	181.73	14.08	138.39	145.71	153.02	160.33	167.65
SWF – TB	385.71	461.85	44.97	391.95	398.18	404.41	410.65	416.88
SWF – H**	94.91	89.15	8.30	92.10	89.28	86.47	83.66	80.85
SWF – S	234.95	279.33	21.22	239.58	244.21	248.85	253.48	258.11
CFWI	667.12	907.59	56.00	704.01	740.91	777.80	814.70	851.59

* The total of "Conservation Projection" and "Additional Conservation Projection" in DEP (2023a). ** Portion of the region outside the CFWI.

Next, for the three regions that use the 2020-2045 planning period (*i.e.*, SR – West, NFRWSP and SF – LWC), EDR derived the alternative 2045 water use by subtracting the conservation

[102] DEP, NWFWMD, SFWMD, SWFWMD, SJRWMD, and SRWMD. 2019. Format and Guidelines for Regional Water Supply Planning. 42pp.

projections from the 2045 water use reported in DEP (2023a). For 2015, 2020, 2025, 2030, 2035 and 2040, the regional water use was then estimated by interpolating between the base year's water use (*i.e.*, 2015 or 2020) and the alternative 2040 or 2045 forecast. Finally, the 2040 water use was extrapolated from the 2015 or 2020 to 2045 estimated use with conservation (Table A.2.2).

Table A.2.2 Water Use Forecast with Conservation (Regions with 2020-2045 Planning Horizons)

Region	Data from DEP (2023a)			EDR Calculations (mgd)				
	Base Year Water Use (mgd)	Projected 2040 Water Use	Conservation Projection*	2020	2025	2030	2035	2040
SR – West	109.25	123.18	10.90	102.73	104.91	107.09	109.27	111.45
NFRWSP	529.61	676.24	82.93	565.31	575.34	585.36	595.38	605.41
SF – LWC	1,013.43	1,147.67	44.81	1,013.43	1,037.66	1,061.88	1,086.11	1,110.33

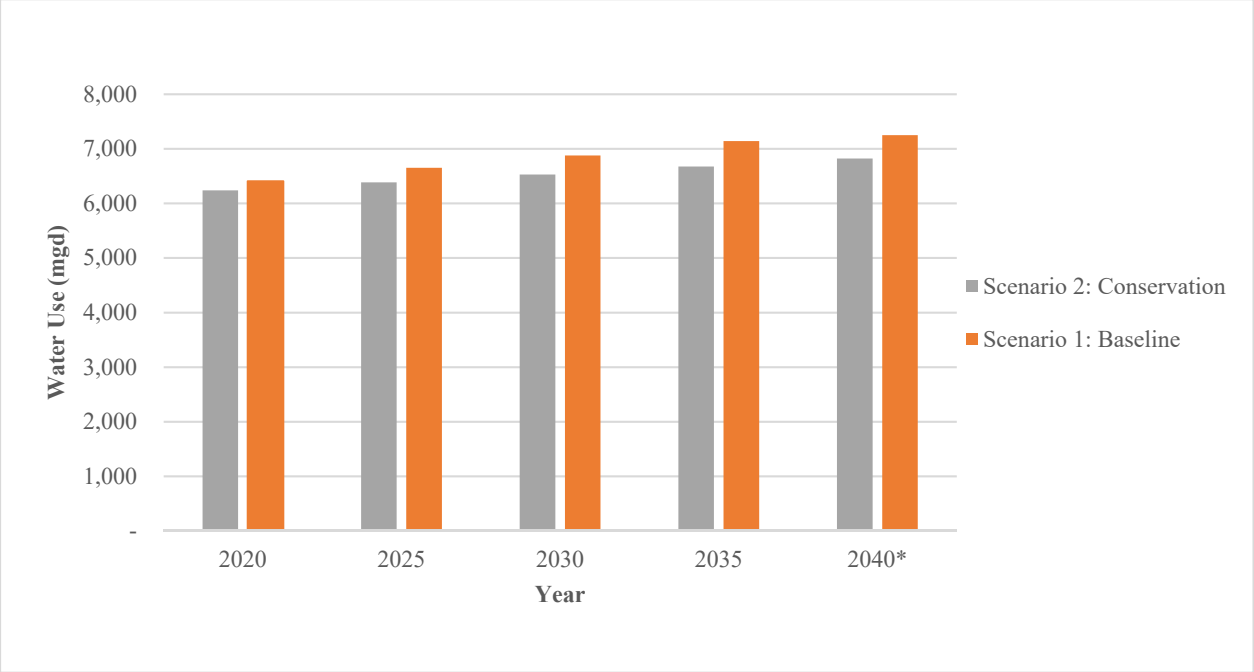
* The total of "Conservation Projection" and "Additional Conservation Projection" in DEP (2023a)

The statewide water demand forecasts for the two scenarios – with and without accounting for the conservation potential – are shown in Table A.2.3 and Figure A.2.1. By 2040, conservation can potentially reduce statewide water use by 427.51 mgd. This volume is slightly higher than the total conservation potential reported in DEP (2022a) since water conservation potential was revised from 53 mgd in DEP (2022a) to 83 mgd in DEP (2023a) for NFRWSP, and from 26.3 mgd in DEP (2022a) to 44.8 mgd in DEP (2023a) for SF – LWC.

Table A.2.3 Comparison of the Statewide Water Use Forecasts

Scenario	2020	2025	2030	2035	2040	2020-2040 difference	
						mgd	%
With conservation	6,239.15	6,384.73	6,530.30	6,675.88	6,821.46	582.31	9.33%
Without conservation	6,406.38	6,651.62	6,879.01	7,141.76	7,248.97	842.59	13.15%

Figure A.2.1 Statewide Water Demand Projections With and Without Conservation

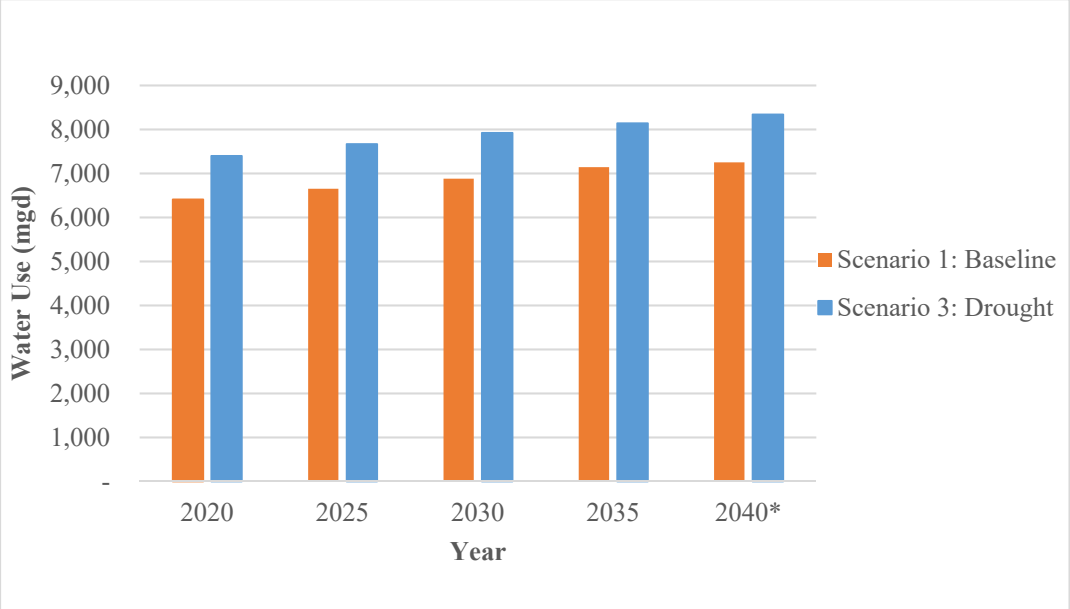


Note: * For two regions – SR – West and NFRWSP – 2040 projections were not available in DEP 2023; EDR estimated the water use based on a linear trend. Note that for all water use categories in both regions, the linear trend represented 2020-2045 data extremely well (R-squared for Ordinary Least Squares regression above 0.99, estimated in Microsoft Excel).

A.3 Drought-Year Water Use Estimates

This appendix summarizes EDR's calculations of water use given a scenario of recurring droughts. The calculations are based on the WMDs' projections of drought demand for the last year of the WMDs' water supply planning horizon. For most of the WMD's water supply planning regions, this appendix follows a similar format. First, a table with each WMD's projections is presented. The projections are used to calculate the percent increase in water use during a drought year, focusing on the planning horizon's last year. In the second table, this percentage and each WMD's water use estimates and projections for the baseline scenario are utilized to calculate the drought water use for the 5-year periods. At the end of the appendix, EDR summarizes the WMDs' methods to account for drought in their water use projections.

Figure A.3.1 Statewide Water Demand Projections With and Without Drought



NWFWMD

Table A.3.1 Projections of 2040 Water Use

Region	Baseline Scenario (Average Rainfall): Water Use (mgd)*	Drought Scenario	
		Water Use (mgd)	% (compared with the baseline scenario)
NWF-II	94.88	105.89	111.61%
NWF-Oth	311.90	345.07	110.63%
Total	406.78	450.96	110.86%

* Source: DEP (2022a).

Table A.3.2 Water Use Estimates and Projections for 2020-2040, Baseline and Drought Scenarios (mgd)

Region	Baseline Scenario (Data from DEP 2023a)					Drought Scenario (Using % increase from Table A.4.1)				
	2020	2025	2030	2035	2040	2020	2025	2030	2035	2040
NWF-II	76.88	82.25	87.03	91.19	94.88	85.80	91.80	97.12	101.77	105.89
NWF-Oth	273.72	287.12	296.92	304.58	311.90	302.83	317.65	328.49	336.97	345.07
Total	350.60	369.37	383.94	395.77	406.78	388.63	409.45	425.62	438.74	450.96

SRWMD: SR – West Water Supply Planning Region

Table A.3.3 Projections of 2045 Water Use

Region	Baseline Scenario (Average Rainfall): Water Use (mgd)*	Drought Scenario	
		Water Use (mgd)	% (compared with the baseline scenario)
SR – West	127.00	147.33	116.01%

* Source: DEP (2023a).

Table A.3.4 Water Use Estimates and Projections for 2020-2040, Baseline and Drought Scenarios (mgd)

Region	Average Demand (Data from DEP 2023a)					Demand during Drought (Using % increase from Table A.4.3)				
	2020	2025	2030	2035	2040*	2020	2025	2030	2035	2040
SR – West	106.53	110.92	116.69	122.35	122.35	123.58	128.68	135.37	141.94	141.94

* Calculated by EDR based on a linear trend of 2020-2045 data provided by the SRWMD.

SRWMD and SJRWMD: NFRWSP Planning Region

Table A.3.5 Projections of 2045 Water Use

Region	Baseline Scenario (Average Rainfall): Water Use (mgd)*	Drought Scenario	
		Water Use (mgd)	Water Use (mgd)
NFRWSP	698.36	780.48	111.76%

* Source: DEP (2023a).

Table A.3.6 Water Use Estimates and Projections for 2020-2040, Baseline and Drought Scenarios (mgd)

Use Category	Average Demand (Data from DEP 2023a)					Demand during Drought (Using % increase from Table A.4.5)				
	2020	2025	2030	2035	2040	2020	2025	2030	2035	2040
Total for NFRWSP	571.02	603.38	628.15	653.28	676.24	638.17	674.33	702.01	730.10	755.76

* Calculated by EDR based on a linear trend of 2020-2045 data summarized in DEP (2023a).

SWFWMD: All Planning Regions

The SWFWMD provides drought demand estimates for each of the 5-year intervals in its planning horizon. However, some of the SWFWMD's regions are partially in the CFWI. Therefore, EDR calculated water use for the portions of the regions outside the CFWI. These calculations are described in the tables below.

Table A.3.7 Drought Water Use Estimates and Projections: SWFWMD Regions not in CFWI

Region	2015	2020	2025	2030	2035	2040
SW – TB	422.08	450.52	470.79	475.59	489.7	501.24
SW – S	286.62	297.54	307.69	320.17	328.19	335.32

Source: SWFWMD's RWSPs.

Table A.3.8 SWFWMD's Projections of 2040 Drought Water Use for the Regions Partially in CFWI

Region	Drought Water Use: Total for the region (mgd)*	Drought Water Use: Portion of the Region outside CFWI	
		Volume (Mgd)**	% of the total demand in the region
SW – N	202.54	201.81	99.64
SW – H	418.72	119.74	28.60

* Source: SWFWMD's RWSPs.
** Source: DEP (2023a).

Table A.3.9 EDR Calculations of Drought Water Use in SWFWMD's regions partially in CFWI

Region	2015	2020	2025	2030	2035	2040	Notes
SW – N	145.85	158.6	170.94	181.89	192.74	202.54	Source: SWFWMD's RWSPs
SW – N (excluding CFWI)	145.32	158.03	170.32	181.23	192.05	201.81	Drought use estimated or projected for SW – N by SWFWMD multiplied by 0.9964 (see Table A.4.8)
SW – H	383.14	397.05	400.99	417.09	420.04	418.72	Source: SWFWMD's RWSPs
SW – H (excluding CFWI)	119.20	123.53	124.75	129.76	130.68	130.27	Drought use estimated or projected for SW – H by SWFWMD multiplied by 0.286 (see Table A.4.8)

Table A.3.10 Drought Water Use Projections: All SWFWMD Regions outside CFWI

Region	2015	2020	2025	2030	2035	2040
SW – N (excluding CFWI)*	145.32	158.03	170.32	181.23	192.05	201.81
SW – TB**	422.08	450.52	470.79	475.59	489.7	501.24
SW – H (excluding CFWI) *	109.57	113.54	114.67	119.27	120.12	119.74
SW – S**	286.62	297.54	307.69	320.17	328.19	335.32

* Source: SWFWMD's RWSPs
** See Table A.4.9.

SFWMD: All Planning Regions

SFWMD provides drought demand estimates for each 5-year interval in its planning horizon, as summarized in Table A.3.11 below.

Table A.3.11 SFWMD Projections of Drought Water Use

From RWSPs	2015	2020	2025	2030	2035	2040
SF – LKB	290.05	294.98	297.01	299.35	299.24	303.36
SF – UEC	383.89	337.15	335.87	334.66	332.71	329.74
SF – LEC	2,048.23	2,128.28	2,176.09	2,239.18	2,282.87	2,329.11
SF – LWC	1,108.81	1,163.39	1,209.49	1,252.45	1,312.74	1,356.84

Source: SFWMD's RWSPs.

SJRWM, SWFWMD, and SFWMD: CFWI Planning Region

Table A.3.12 Projections of 2040 Water Use

Region	Baseline Scenario (Average Rainfall): Water Use (mgd)*	Drought Scenario	
		Water Use (mgd)	% (compared with the baseline scenario)
CFWI	907.59	1,011.00	111.39%

* Source: DEP (2023a).

Table A.3.13 Water Use Estimates and Projections for 2020-2040, Baseline and Drought Scenarios (mgd)

Region	Average Demand (Data from DEP 2022a)					Demand during Drought (Using % increase from Table A.4.12)				
	2020	2025	2030	2035	2040	2020	2025	2030	2035	2040
CFWI	735.24	789.49	836.65	873.94	907.59	819.01	879.44	931.98	973.52	1,011.00

SJRWMD: SJR – CSEC Planning Region

Table A.3.14 Projections of 2040 Water Use

Region	Baseline Scenario (Average Rainfall): Water Use (mgd)*	Drought Scenario	
		Water Use (mgd)	% (compared with the baseline scenario)
SJR – CSEC	427.87	508.56	118.86%

** Source: DEP (2023a).

Table A.3.15 Water Use Estimates and Projections for 2020-2040, Baseline and Drought Scenarios (mgd)

Region	Baseline Scenario (Data from DEP 2020a)					Drought Scenario (Using % increase from Table A.4.14)				
	2020	2025	2030	2035	2040	2020	2025	2030	2035	2040
SJR – CSEC	383.47	395.62	406.11	416.72	427.87	455.79	470.23	482.70	495.31	508.56

Statewide Water Use Projections for a Scenario of Recurring Droughts
Table A.3.16 summarizes water use estimates and projections for the scenario of recurring droughts. EDR calculates these estimates using the WMDs' data reported in their WSAs/RWSPs. Calculation details are presented in the series of tables above.

Table A.3.16 Projected Statewide Water Use for a Scenario of Recurring Droughts (mgd)

Region	2020	2025	2030	2035	2040
NWFWMD	388.63	409.45	425.62	438.74	450.96
SR – West	123.58	128.68	135.37	141.94	141.94
NFRWSP	638.17	674.33	702.01	730.10	755.76
SJR – CSEC	455.79	470.23	482.70	495.31	508.56
SWFWMD (excluding CFWI)	1019.63	1063.47	1096.27	1130.05	1158.11
SFWMD (excluding CFWI)	3951.95	4038.44	4144.15	4228.09	4311.41
CFWI	819.01	879.44	931.98	973.52	1,011.00
Statewide Water Use – Drought Scenario	**7,396.76**	**7,664.04**	**7,918.09**	**8,137.74**	**8,337.73**
For comparison:					
Statewide Water Use – Baseline Scenario (average rainfall)	6,406.38	6,651.62	6,879.01	7,141.76	7,248.97
Drought Demand as % from Average Year Demand	115.46%	115.22%	115.11%	113.95%	115.02%

Methods Used by WMDs to Develop the Drought Water Use Projections

NWFWMD. Annual average streamflow and precipitation data were analyzed for over 30 years, with 2011 selected as a dry year compared to the average year of 2015. An increase in PS water usage during 2011 generated the drought event multiplier of 1.07, or a 7% increase over an average year. The same factors were also presumed to affect DSS. Therefore, the drought year projections for PS and DSS both use a 1.07 multiplier.

The FSAID IV generated dry year estimates by crop. The dry-to-average year ratio in northwest Florida ranges from a low of 1.17 for greenhouse/nursery crops to a high of 1.72 for hay. These estimates generated agricultural drought demand by the NWFWMD's planning regions. The AFSIRS simulations in the FSAID IV were accepted for the L/R category, with the estimated dry-to-average year multiplier for sod or perennial grass being 1.34. Finally, the water use in the CII and PG sectors is assumed to remain unchanged during droughts.[103]

SRWMD and SJRWMD. Water demand in PS and DSS is assumed to increase by 6% given the 1-in-10 year drought, based on the recommendations of the 1-in-10-Year Drought Subcommittee of the Water Planning Coordination Group (WDPS 1998[104]). For AG drought demand, the FSAID II forecast was utilized. For the L/R category, a 1-in-10-year drought factor was developed for each county, using the highest year water use from 2006-2014 and the percent increase from the average 2006-2014 L/R water use. For example, if water use in 2007 was 5 percent higher than

[103] To clarify, the FSAID IV data was accepted and used in the 2018 WSA. Except for the sod/perennial grass 1.34 multiplier for the L/R category, the NWFWMD did not exercise any tools, applications, or calculations.
[104] WDPS. 1998. Final Report: 1-in-10-Year Drought Requirement in Florida's Water Supply Planning Process. SJRWMD, Palatka, FL.

the 2006-2014 average, 5 percent was applied to the average 2035 water demand to project the 2035 1-in-10 year water demand. Finally, the 1-in-10-Year Drought Subcommittee of the Water Planning Coordination Group, as stated in their final report, determined that drought events do not significantly impact water use in the CII and PG self-supply categories.

SWFWMD (excluding CFWI). Water demand in PS and DSS was assumed to increase by 6% during the 1-in-10 drought year (WDPS 1998). For the L/R category, the 1-in-10-year drought water use factor was assumed to be 1.3 for golf course irrigation, and 1.26 for non-golf uses. Based on Water Planning Coordination Group (1998), drought events are not expected to impact the CII and PG self-supply use. Finally, for the AG irrigation drought-year demand, crop-specific scaling factors from the FSAID V forecast were derived and then applied for individual WUPs, accounting for the relevant surface water and groundwater split. Aquaculture and livestock water uses were assumed not to be affected by drought.

SFWMD (excluding CFWI). Drought water use for PS and DSS categories was calculated using drought demand factors for each county. For example, a 1.03 multiplier was utilized for Monroe County, and a coefficient of 1.10 was applied for Palm Beach and Broward Counties. In turn, for the AG and L/R categories, crop- and basin-specific irrigation rates from the Agricultural Field Scale Irrigation Requirements Simulation (AFSIRS) were the basis for the drought use forecast. AFSIRS is a water budget model for calculating irrigation demands that estimate demand based on basin-specific data. Finally, drought demand for CII and PG was assumed to be equal to that for the average year.

CFWI. Water demand in PS and DSS was assumed to increase by 6% during the 1-in-10 drought year (WDPS 1998). For AG, the FSAID IV drought demand projections were utilized. For L/R, each county was characterized by a drought factor, using the highest year of water use from 2011-2015 and the average use from the same period. Finally, drought demand for CII and PG was assumed to be equal to that for the average year.

The methods used by various WMDs are summarized in Table A.3.17 below.

[See table on following page]

Table A.3.17 Statewide Drought Demand Projection Method

Region	PS and DSS	AG	L/R	CII and PG
NWFWMD	1.07 multiplier	FSAID IV	Sod or perennial grass multiplier of 1.34 (from FSAID IV)	Water use is assumed to remain unchanged during the drought year
SRWMD and SJRWMD	1.06 multiplier	FSAID II	Drought factor was developed for each county, using the highest year water use from 2006-2014 and the percent increase from the average 2006-2014 L/R water use	
SWFWMD (except CFWI)	1.06 multiplier	FSAID V and WUP information	Drought water use factor was assumed to be 1.3 for golf course irrigation, and 1.26 for non-golf uses	
SFWMD (except CFWI)	County-specific drought demand multipliers	AFSIRS and FSAID VIII	AFSIRS	
CFWI	1.06 multiplier	FSAID IV	Drought factor was developed for each county, using the highest year water use from 2011-2015 and the percent increase from the average 2011-2015 L/R water use	
SJR – CSEC	1.06 multiplier	FSAID IV	Drought factor was developed for each county, using the highest year water use from 2007-2015 and the percent increase from the average 2007-2015 L/R water use. For example, if water use in 2012 was X percent higher than the 2007–2015 annual average, X percent was applied to the 2040 water demand to project a 2040 1-in-10 year water demand.	

A.4 Description of the Methods Used By the WMDs to Identify Supplies

Different estimation methods are used to quantify "Estimated Existing Sources Available to Meet Future Demands," which makes it difficult to compare the values reported for the various supply planning regions. The following estimation methods to quantify "Estimated Existing Sources Available to Meet Future Demands" are utilized:[105]

•***Permitted but unused water (SWFWMD)*:** This value represents the permitted but unused quantities of surface water, brackish groundwater, and Upper Floridan Aquifer groundwater within each of the District's four planning regions.[106] In general, the SWFWMD calculates this as the difference between total permitted allocations, which have been determined to not cause harm to the water resources of the area or interfere with existing legal uses, and the currently reported withdrawals of those permittees at the time of RWSP development.[107]

•***Permitted but unused water and unused DEP permitted treatment capacity (SFWMD)***: For the SFWMD planning regions, the public supply category is projected to grow, while the other water use categories, such as agricultural self-supply, are expected to remain relatively stable or to decline. Therefore, the assessment of the existing water supply focuses only on the sources available for public supply. To estimate "Existing Sources Available to Meet Future Demand," with the exception of the Upper Kissimmee Basin Planning Area which is included in the CFWI, the SFWMD considers the permitted but unused water and unused DEP permitted

[105] For the SJR – CSEC region, the data are not available. The RWSP is expected to be available for public review in the spring of 2021.
[106] Potential water supplies from the surficial aquifer, seawater desalination, and reclaimed water are accounted for among the alternative water supply options.
[107] For each permittee, the SWFWMD evaluates the level of water use as either a five-year average of reported withdrawals or a single year estimate.

treatment capacity. For each supplier, projects are then identified to meet the difference between the projected demand[108] and the permitted allocation or existing treatment capacity.[109]

•***Currently permitted water for public supply (NWFWMD)***: The NWFWMD uses the currently permitted volumes of water for public supply to estimate demand that can be met. This districtwide data is used in the DEP's annual metrics submission.

•***Hydrogeological computer models of planning-level groundwater withdrawal scenarios (CFWI and NFRWSP)***: Hydrogeologic computer models are used to examine groundwater withdrawal scenarios corresponding to the projected demands at the planning-region level for public supply (PS), domestic self-supply (DSS), commercial-industrial-institutional-mining self-supply (CII), recreational landscape irrigation self-supply (L/R), agricultural self-supply (AG), and power generation self-supply (PG) categories. The models are used to determine the estimated maximum withdrawal levels after which further increases in withdrawals may be constrained by at least one natural system (*e.g.*, a violation of a minimum flow or minimum water level).[110] For the CFWI, their model[111] indicated that, on a water supply planning level, alternative sources or conservation would be needed to meet all "Net Demand Change." For the NFRWSP, several groundwater withdrawal scenarios were assessed using a hydrogeological model.[112] For all the scenarios considered, water withdrawals were constrained by at least one natural system. Therefore, "Estimated Existing Sources Available to Meet Future Demands" for the NFRWSP were listed as "Not Quantified." It is possible that water projects must be completed in the NFRWSP area to meet the base year water demand in addition to the "Net Demand Change."

A.5 Project Scenarios to Meet Future Demand Increase

To develop future project scenarios, EDR examines the volume of water or beneficial offset for the projects listed as "RWSP/RPS Options Only" in the DEP project appendix.[113] EDR focuses on the regions with inferred water supply shortages. "RWSP/RPS Options Only" projects in each region are examined, and their types are summarized in Table A.5.1.

For future project expenditure projections, EDR further narrowed the list of project types for each region. To accomplish this, "means to meet future demand" identified in DEP (undated) were

[108] Utilities apply various methodologies to forecast future demand based on the number of people per connection, the number of connections, and other characteristics of their service areas. The SFWMD has its own methodology to project demand (based on BEBR population projections, five-year average per capita use, etc.). As a part of the RWSP development process, the SFWMD and utilities discuss and agree to the amount of water needed for the region.

[109] Note that the utilities are planning and reporting based on their peak capacity. The projects identified by the public supply companies also focus on projected peak capacity since utilities need to meet peak future demand. Unless utility-specific coefficients are estimated, the average capacity is approximately 80 percent of the peak capacity.

[110] While water may be available on a permit-by-permit basis, the hydrogeological modeling provides a planning-level estimate of how much water the WMDs must identify through conservation or AWS project options.

[111] The East Central Florida Transient Groundwater Flow Model.

[112] The North Florida-Southeast Georgia regional groundwater flow model, with groundwater being the traditional water source for the region.

[113] The only exception is NW – II, where all projects are considered, since no "RWSP/RPS Options Only" projects are identified.

considered.[114] DEP (undated) classified potential alternative sources to meet future water demand based on the likelihood the source will be utilized.[115] This likelihood (aka "confidence rating") reflected expectations for the source meeting all or a portion of the region's future needs. This likelihood was reported as "high" (likely to be used regionally and locally), "moderate" (may be used regionally and likely to be used locally), and low (unlikely to be used regionally, but may be used locally). (see Table A.5.1).

To summarize, EDR selected only the project types that have "high" or "moderate" likelihood (based on DEP, undated), and which were also present among "RWSP/RPS Options Only" in the DEP project appendix. These project types are summarized in Table A.5.2.

[114] DEP. Undated. An Assessment of Viable Alternative Water Supply Resources and Critical Funding Needs. Presented by the FDEP pursuant to Executive Order 19-12 and Chapter 2019-115, Laws of Florida.
[115] DEP (undated) also states the quantity each source is estimated to produce; these estimates are not used in the EDR analysis.

Table A.5.1 Project Types Identified in "RWSP/RPS Options Only" in DEP Project Appendix and in "Means to Meet Future Demands" in DEP (undated)

Regions	ASR	Brackish Groundwater	Groundwater Recharge	Other Non-Traditional Sources	Other Project Type	Reclaimed water	Seawater Desalination	Stormwater	Surface Water	Surface Water Storage
SJR – CSEC										
NFRWSP										
SW – N*										
CFWI										
SF – LEC										

* excluding CFWI

Legend:

Confidence rating from DEP (undated):

high (likely to be used locally and regionally)

medium (likely to be used locally; may be used regionally)

low (may be used locally, unlikely to be used regionally)

EDR rating:

project type is present in "RWSP/RPS Options Only" (exception for NW – II applies)

Table A.5.2 Project Types Selected for EDR Expenditure Scenarios

	ASR	Brackish Groundwater	Groundwater Recharge	Other Non-Traditional Sources	Other Project Type	Reclaimed water	Seawater Desalination	Stormwater	Surface Water	Surface Water Storage
SJR – CSEC										
NFRWSP										
SW – N										
CFWI										
SF – LEC										

* excluding CFWI

A.6 EDR's Water Demand/Use Pilot Model and Comparison of EDR and WMD Statewide Water Use Projections

A summary of the differences between EDR's projections and WMD's projections are presented in Table A.6.1 to Table A.6.5

Agricultural Water Use Projections

Table A.6.1 Agricultural Water Use Projections

	2020*	2025	2030	2035	2040
FSAID-10 Projection					
NW – II	2.92	3.20	3.52	3.77	4.02
NW – Other	46.96	47.79	48.84	50.01	51.09
SR – West	61.33	64.73	67.29	70.22	73.16
NFRWSP	156.46	156.44	158.79	161.52	164.10
SJR – CSEC	90.43	81.12	79.52	77.61	75.69
SW – N (excluding CFWI)	26.65	26.19	26.21	26.28	26.75
SW – TB	50.54	46.61	44.43	42.16	39.90
SW – H (excluding CFWI)	101.17	94.36	94.62	93.17	91.54
SW – S	165.88	156.18	156.55	155.58	154.41
CFWI	130.56	122.78	122.41	120.25	117.81
SF – LKB	111.41	106.77	105.79	104.88	104.40
SF – UEC	123.38	115.58	111.48	106.76	102.30
SF – LEC	654.12	629.19	629.59	629.89	630.35
SF – LWC	327.52	315.12	309.03	307.61	305.79
Statewide	**2,049.33**	**1,966.05**	**1,958.05**	**1,949.71**	**1,941.32**
Water Management Districts' Projections					
NW – II	3.00	3.241	3.523	3.769	3.967
NW – Other	42.339	45.319	47.822	50.739	53.533
SR – West*	49.3	52.31	56.65	61.07	61.07
NFRWSP*	149.64	155.25	159.64	164.83	170.05
SJR – CSEC	119.12	119.46	120.71	121.6	122.91
SW – N (excluding CFWI)	19.58	21.14	22.87	24.64	26.43
SW – TB	46.12	44.18	42.35	40.45	38.16
SW – H (excluding CFWI)	71.53	68.99	66.26	65.2	62.18
SW – S	105.58	106.48	107.52	108.55	109.65
CFWI	157.19	157.89	159.66	161.72	163.49
SF – LKB	241.31	243.01	244.66	244.63	248.14
SF – UEC	169.98	162.45	154.16	146.24	138.31
SF – LEC	653.25	643.51	637.51	631.06	625.27
SF – LWC	592.02	587.62	591.71	600.43	610.04
Statewide	**2,419.96**	**2,410.85**	**2,415.05**	**2,424.93**	**2,433.20**
Difference between WMDs' and FSAID-10 projections**					
NW – II	0.08	0.04	0.01	0.00	-0.06
NW – Other	-4.62	-2.47	-1.02	0.73	2.45
SR – West	-12.03	-12.42	-10.64	-9.15	-8.37
NFRWSP	-6.82	-1.19	0.85	3.31	-17.23
SJR – CSEC	28.69	38.34	41.19	43.99	47.22
SW – N (excluding CFWI)	-7.07	-5.05	-3.34	-1.64	-0.32
SW – TB	-4.42	-2.43	-2.08	-1.71	-1.74
SW – H (excluding CFWI)	-29.64	-25.37	-28.36	-27.97	-29.36
SW – S	-60.30	-49.70	-49.03	-47.03	-44.76
CFWI	26.63	35.11	37.25	41.47	45.68
SF – LKB	129.90	136.24	138.87	139.75	143.74
SF – UEC	46.60	46.87	42.68	39.48	36.01
SF – LEC	-0.87	14.32	7.92	1.17	-5.08
SF – LWC	264.50	272.50	282.68	292.82	304.25
Statewide	**370.64**	**444.80**	**456.99**	**475.22**	**491.88**

* 2020 water use projections comes from FSAID-9, see 2023 Edition of this EDR report for details. ** Positive numbers indicate WMD's projections are higher than FSAID's projections.

PS, DSS, L/R, and CII Water Use: Data and Model Estimation

Data

The data used to develop the combined PS, DSS, L/R, and CII forecast are summarized in the graphics below. First, historical water use data are presented in Figure A.6.1. Broward, Hillsborough, Miami-Dade, Orange, and Palm-Beach stand out as counties with exceptionally high use. Also, while in most counties, water use is stable or growing, in a few counties, the use decreases (*e.g.*, Polk, Putnam, and Escambia). It is also observed that for Gulf, Hamilton, and Sumter counties, water use follows different trends before and after 2000. This observation was verified by separately examining the trends in each use category for these counties (*i.e.*, independently examining PS, DSS, L/R, and CII). Therefore, for the regression analysis, different models were developed for each group of counties, which share similarities in water usage patterns (see Figure A 6.11). In this report, EDR used the Clustering approach to group the county-level PS, DSS, L/R, and CII water use history into seven groups. Each group has a separate forecasting model to better reflect its water use pattern[116]. Second, EDR used Fixed Effects (FE) and Lasso Regression techniques for modeling the water use, as opposed to the FE technique used for the report's 2023 Edition. The FE technique was used to control for unobservable or unmeasurable factors such as cultural, economic, and demographic factors or differences in water use patterns across the counties due to regulations and climate conditions. That is, the FE technique allows users to account for individual (county) heterogeneity. The Lasso Regression technique was used for more accurate water use forecasts. EDR intends to continue improving the forecasting model.

[See figure on following page]

[116] Rondinel-Oviedo (2020) provides additional explanations of internal and external factors affecting water consumption. Available online at: https://doi.org/10.1080/02508060.2020.1830360
Avni et al. (2015) presents an approach for water consumption data clustering. Available online at: https://doi.org/10.1002/2014WR016662

Figure A.6.1 Total Estimated PS, DSS, L/R, and CII Water Use, by County (mgd)

The next series of graphs displays the historical and forecasted values of the economic and demographic variables used in the EDR water use models. These values are developed from (a) an EDR database of historical and forecasted statewide economic and county demographic data, and (b) county-level history and projections available from Woods and Poole Economics (2023)[117]. In other words, EDR state-level economic values are "distributed" to the individual counties based on the proportion values estimated by EDR from Woods and Poole Economics (2023).

Figure A.6.2 shows county population, both historical data and the forecast (EDR 2023)[118]. Similar to the water use shown in the previous Figure, the population in Broward, Hillsborough, Miami-Dade, Orange, and Palm-Beach counties stands out as exceptionally high compared with the other counties. The population in these and other counties is projected to continue growing.

[See figure on following page]

[117] Woods and Poole Economics Data. 2023. Available online at: https://www.woodsandpoole.com/our-databases/

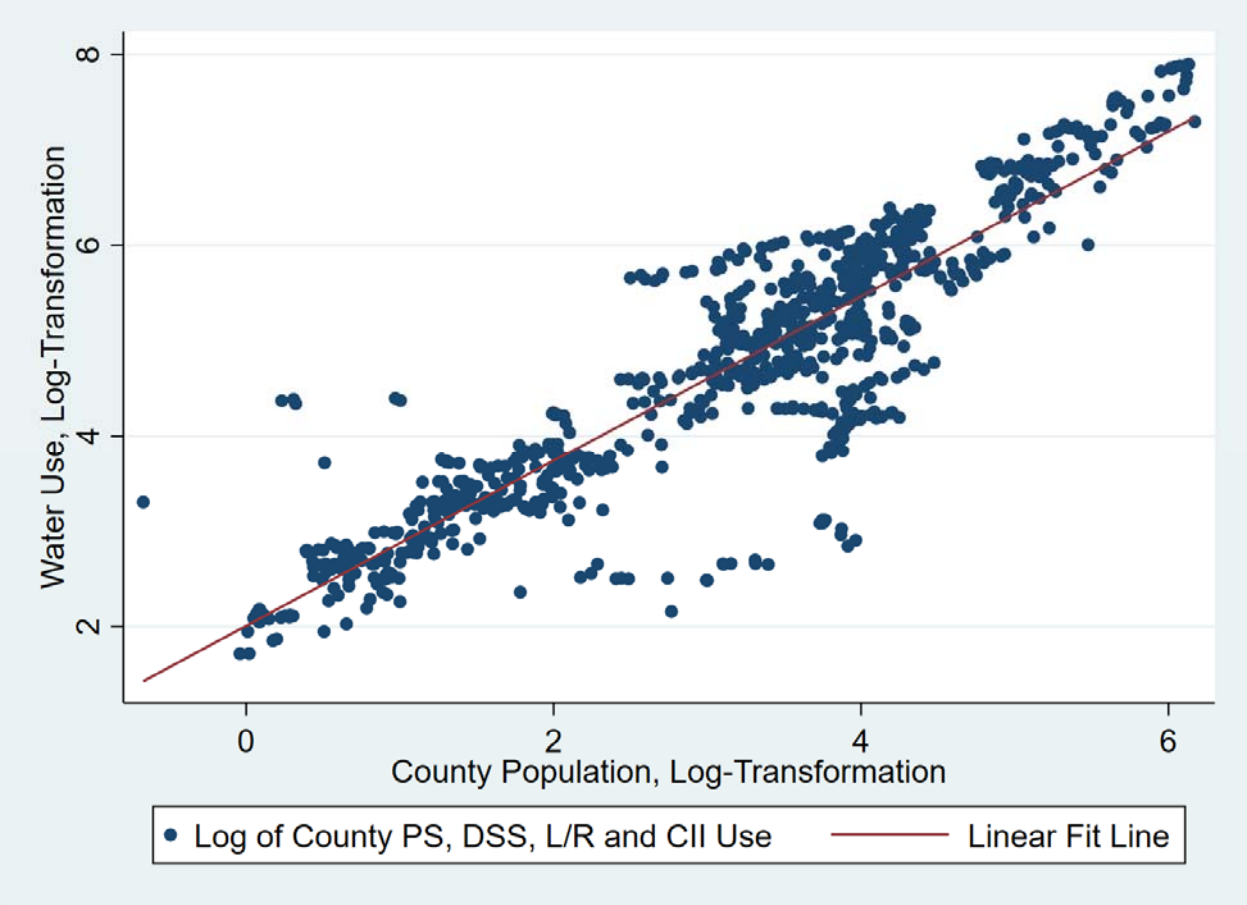
[118] EDR Population and Demographic Data. 2023. Available online at: http://edr.state.fl.us/Content/population-demographics/data/index.cfm

Figure A.6.2 Population, by County (million people)

The total county water use in PS, DSS, L/R, and CII categories was correlated with the county population. Specifically, the relation between (a) the natural logarithm of water use and (b) the natural logarithm of the population is close to linear. See Figure A.6.3 for an illustration.

[See figure on following page]

Figure A.6.3 Scatter Plot for Total PS, DSS, L/R, and CII Water Use (mgd) and Total County Population (thousand people), Log-Transformations



Next, Florida employment in accommodation and food services (NAICS 72) demonstrates the relative share of tourism-related activities in the county economy. Statewide data for 1990 – 2033 are obtained from EDR's database of Florida's economic and demographic indicators. EDR's state forecast is extended to 2034 – 2040, assuming a linear trend. Historical and forecasted county Accommodation & Food Services Employment (TT051) levels are examined (Woods and Poole Economics 2023)[119] and used as a model to allocate EDR's state employment figures to the individual counties. In other words, each county's employment as a share of the state's total employment is calculated. These proportions from Woods and Poole Economics (2023) are then applied to the EDR statewide forecast to estimate county employment. To assess the share of tourism-related activities in the county economy, EDR calculated the ratio of accommodation and food services employment to the county population. The final result is displayed in Figure A.6.4. In most counties, the proportion of the population employed in accommodation and food services is less than 0.1 (*i.e.*, 10% of the population). The exception is Monroe County, where the share fluctuates between 0.1 and 0.2. The proportion is also relatively high in the Bay, Okaloosa, Orange, and Walton Counties (which may reflect the importance of tourism associated with Destin-Panama City and Orlando).

[119] Woods and Poole Economics Data. 2023. Available online at: https://www.woodsandpoole.com/our-databases/

Figure A.6.4 Estimated Ratio of Accommodation and Food Services Employment in the Total County Population

Note: Population is in thousand.

The proportion of the population employed in mining, manufacturing, and utility sectors is also calculated. The state employment in the following industries was identified in the EDR state dataset for 1990 through 2033: mining (NAICS 21), utilities (NAICS 22), and manufacturing (NAICS 31-33). Next, EDR's state forecasts for the industries were extended to 2034 – 2040 using a linear trend. To allocate the state forecast to individual counties, historical and forecasted values for mining (TT035), utilities (TT036), and manufacturing (TT038) were examined (Woods and Poole Economics 2022). Each county's employment as a share of the state's total employment is calculated for every year, aggregating the three sectors. These proportions are then applied to the EDR statewide forecasts to derive counties' employment from EDR's state employment values. This derivation process ensures that the sum of the county employment is equal to the official state forecast. The proportion of the population employed in mining, manufacturing, and utility sectors is very low for most counties–less than 0.03 (or 3% of the population) and it dropped significantly over time, see Figure A.6.5.

[See figure on following page]

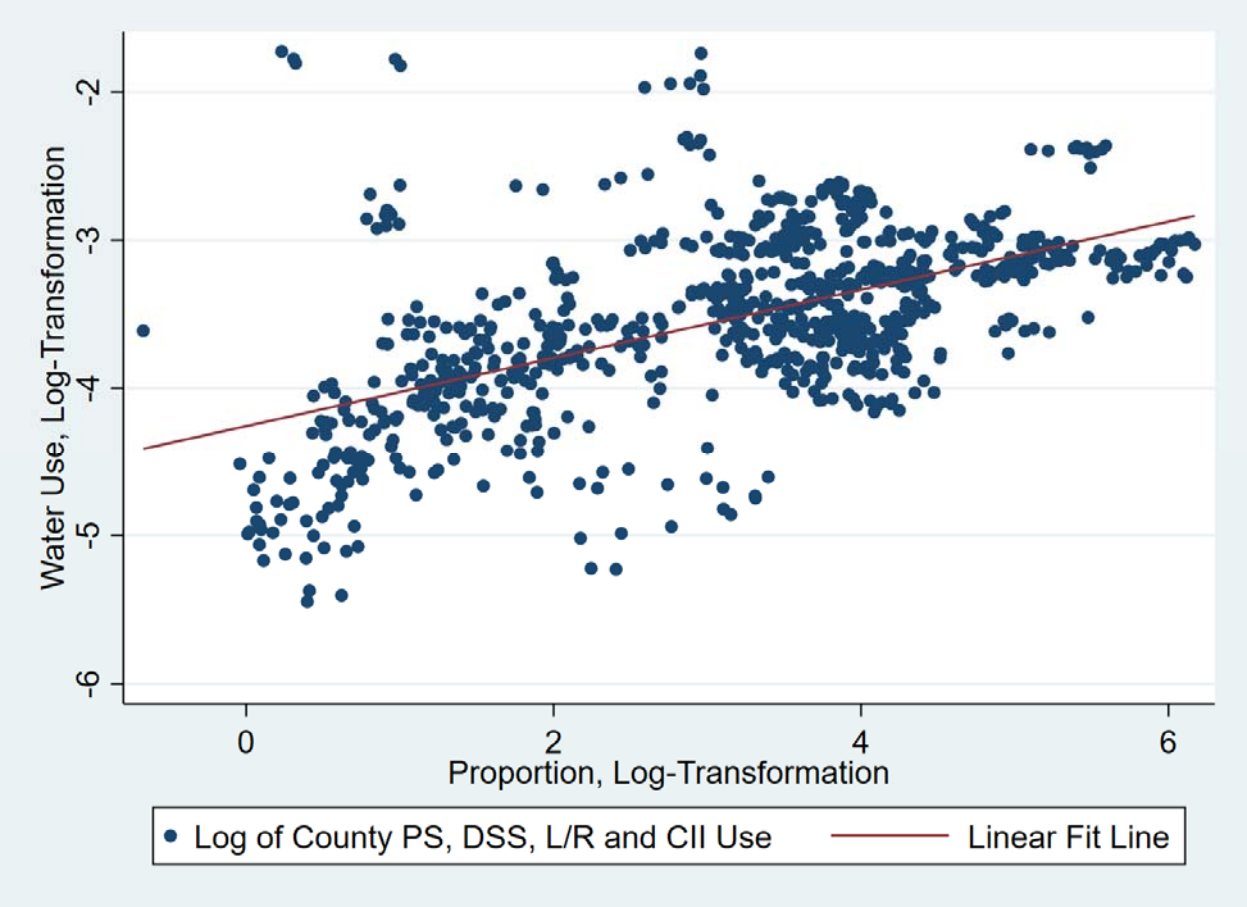
Figure A.6.5 Estimated Ratio of Mining, Utilities, and Manufacturing Employment in the Total County Population

Note: Population is in thousand.

As shown in Figures A.6.6 and A.6.7, county water use is positively correlated with the proportion of the county population employed in accommodation and food services, as well as with the proportion employed in mining, manufacturing, and utilities. The correlation is smaller than that with the county population, and the dispersion of the water use observations around the linear fit line is large. The potential effect on water use is likely small for the proportion of the population employed in mining, manufacturing, and utilities (see the slope of the linear fit line in Figure A.6.7).

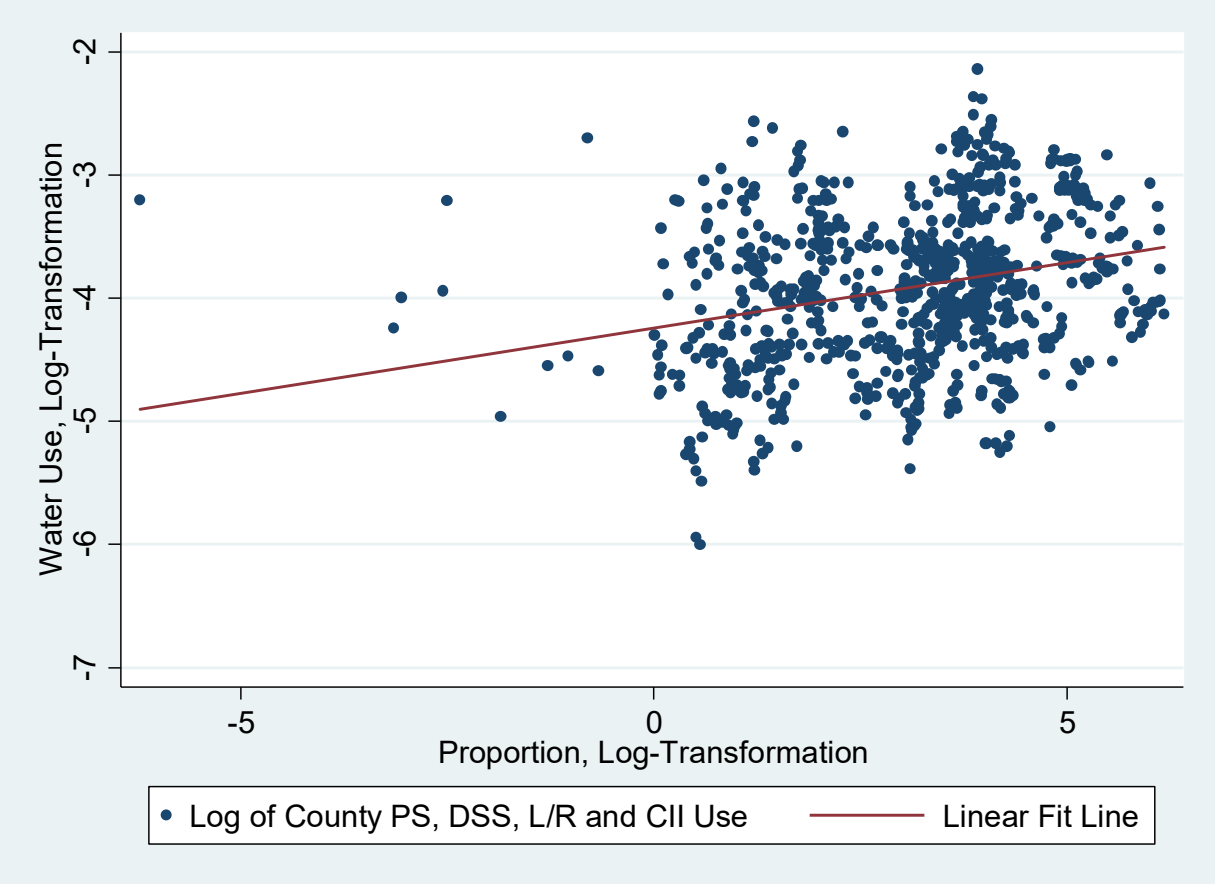
[See figure on following page]

Figure A.6.6 Scatter Plot for Total County PS, DSS, L/R, and CII Water Use (mgd) and the Proportion of County Population Employed in Accommodation and Food Services, Log-Transformations



[See figure on following page]

Figure A.6.7 Scatter Plot for Total County PS, DSS, L/R, and CII Water Use (mgd) and the Proportion of County Population Employed in Mining, Manufacturing, and Utilities, Log-Transformations

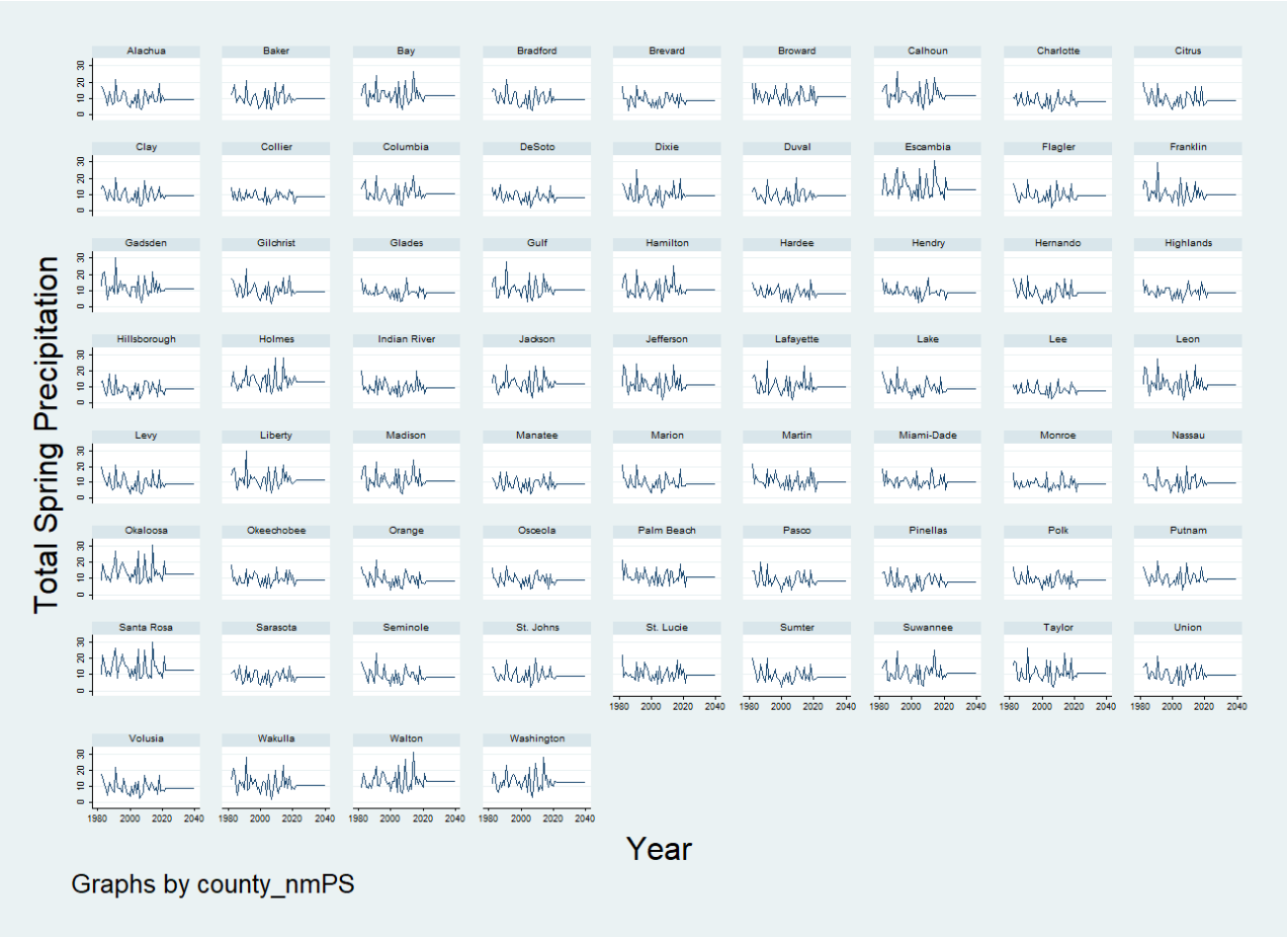


In addition to demographic and economic variables, weather and climate variability can also impact water use. EDR obtained total precipitation and average temperature for March-May and June-August periods for each county from NOAA (2023[120]). Among the weather variables, total spring precipitation was included in the final water use model. For the water use forecast, 2000-2022 average precipitation is assumed for each county (see Figure A.6.8). Water use shows a (weak) negative correlation with March-May county precipitation (Figure A.6.9).

[See figure on following page]

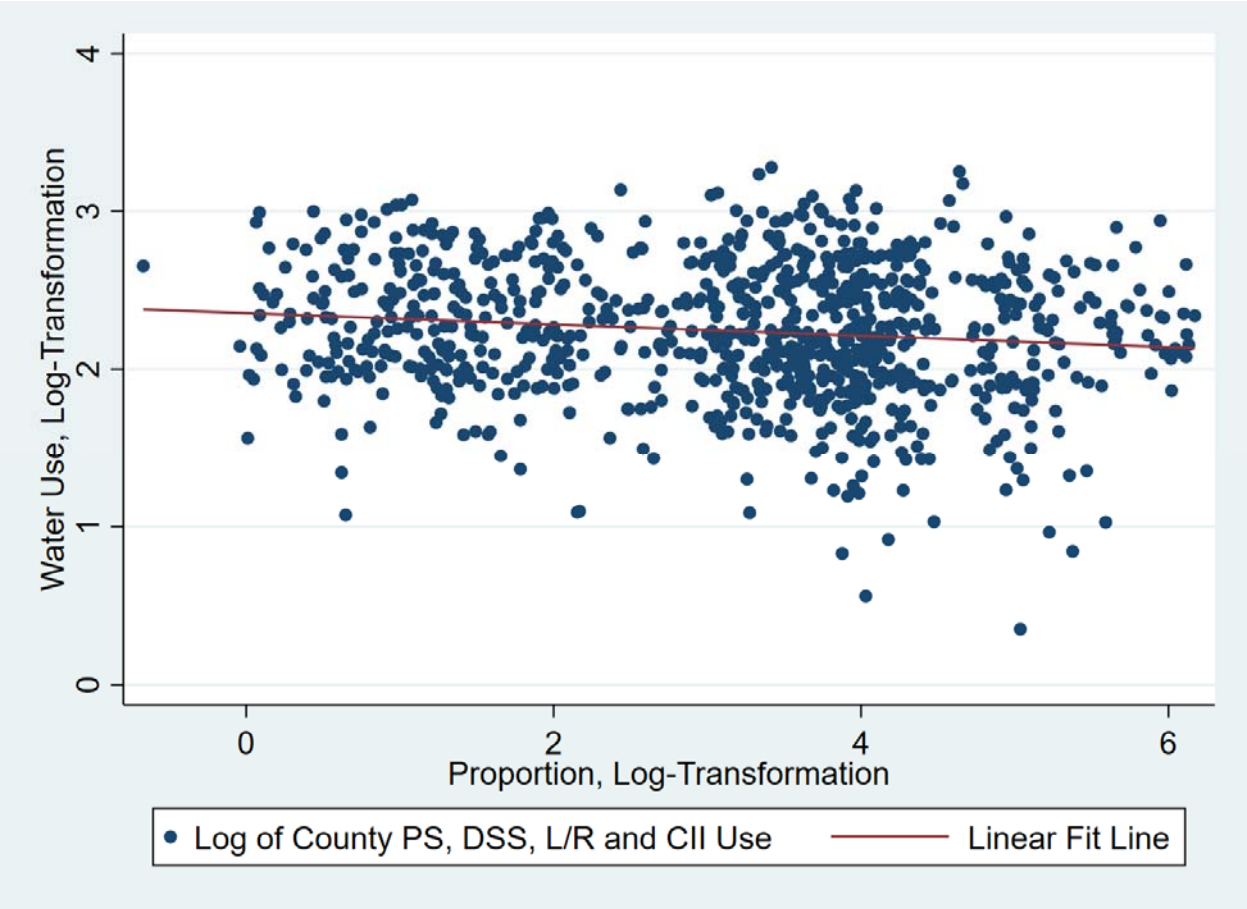
[120] NOAA. County Time Series. Available online at: https://www.ncdc.noaa.gov/cag/county/time-series . (Accessed June 2023.)

Figure A.6.8 Total Precipitation from March Through May (inches)



[See figure on following page]

Figure A.6.9 Scatter Plot for Total County PS, DSS, L/R, and CII Water Use (mgd) and the County Precipitation from March Through May (inches), Log-Transformations



County population, precipitation, time trend, and employment proportions in accommodation and food services, as well as in mining, manufacturing, and utilities, can explain water use variation among most of the counties over time.

EDR's Pilot PS, DSS, L/R and CII Water Use Model Development

Regression analysis was used to estimate coefficients for the following seven models associated with seven clusters of water use. To find the optimal number of clusters, EDR follows a commonly used method, the Elbow curve, which shows the percentage variance explained as a function of the number of clusters. Figure 6.10 shows the Elbow curve for varying values of the number of clusters. The curve suggests that a considerable amount of variance in the data can be explained with four clusters. However, EDR opts to choose seven clusters to explain most of the variance in the data. The FE and Lasso Regression techniques were also used (as opposed to the FE technique used in the 2023 Edition) to control for unobservable or unmeasurable factors such as cultural, economic, and demographic factors or differences in water use patterns (see Figure 6.11) across the counties due to regulations and climate conditions.

For all seven models, coefficients were estimated using the *regress* procedure in STATA 13.1 and R programming software.[121] The procedure executed a linear (county) fixed effects regression analysis. Option "*vce(cluster county_FIPS)*" was added to account for correlation in observations from the same county when estimating the standard error.[122] The models adequately represent the variability of the dependent variable – county water use (R-squared = 0.78 or higher).

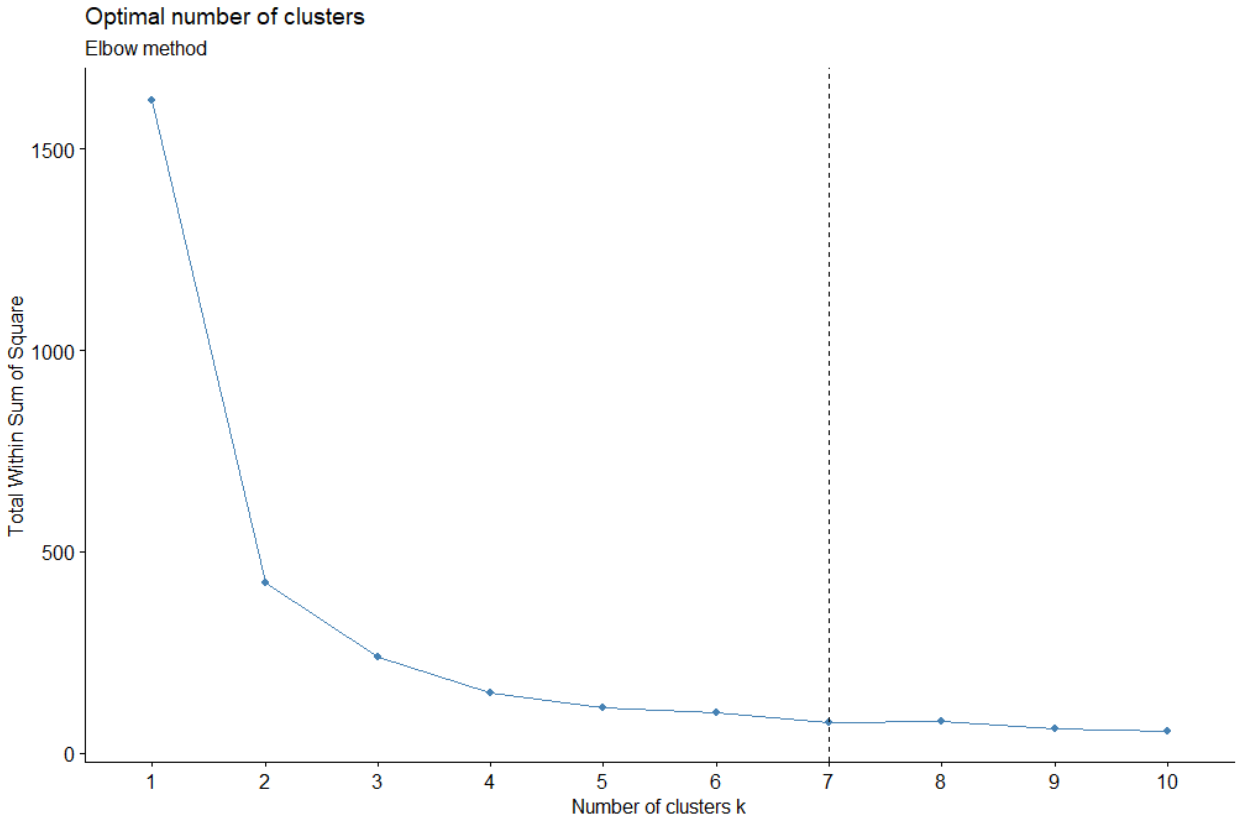
County water use forecasts generated by the seven models were combined to estimate water use for specific water supply planning regions.

[See figure on following page]

[121] StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP.
R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing https://www.R-project.org/.

[122] This option relaxes the usual OLS linear regression analysis requirement specifying that all the observations should be independent. See more in STATA. Undated. vce options — Variance estimators. Available online at: https://www.stata.com/manuals13/xtvce_options.pdf (Accessed October 2023.)

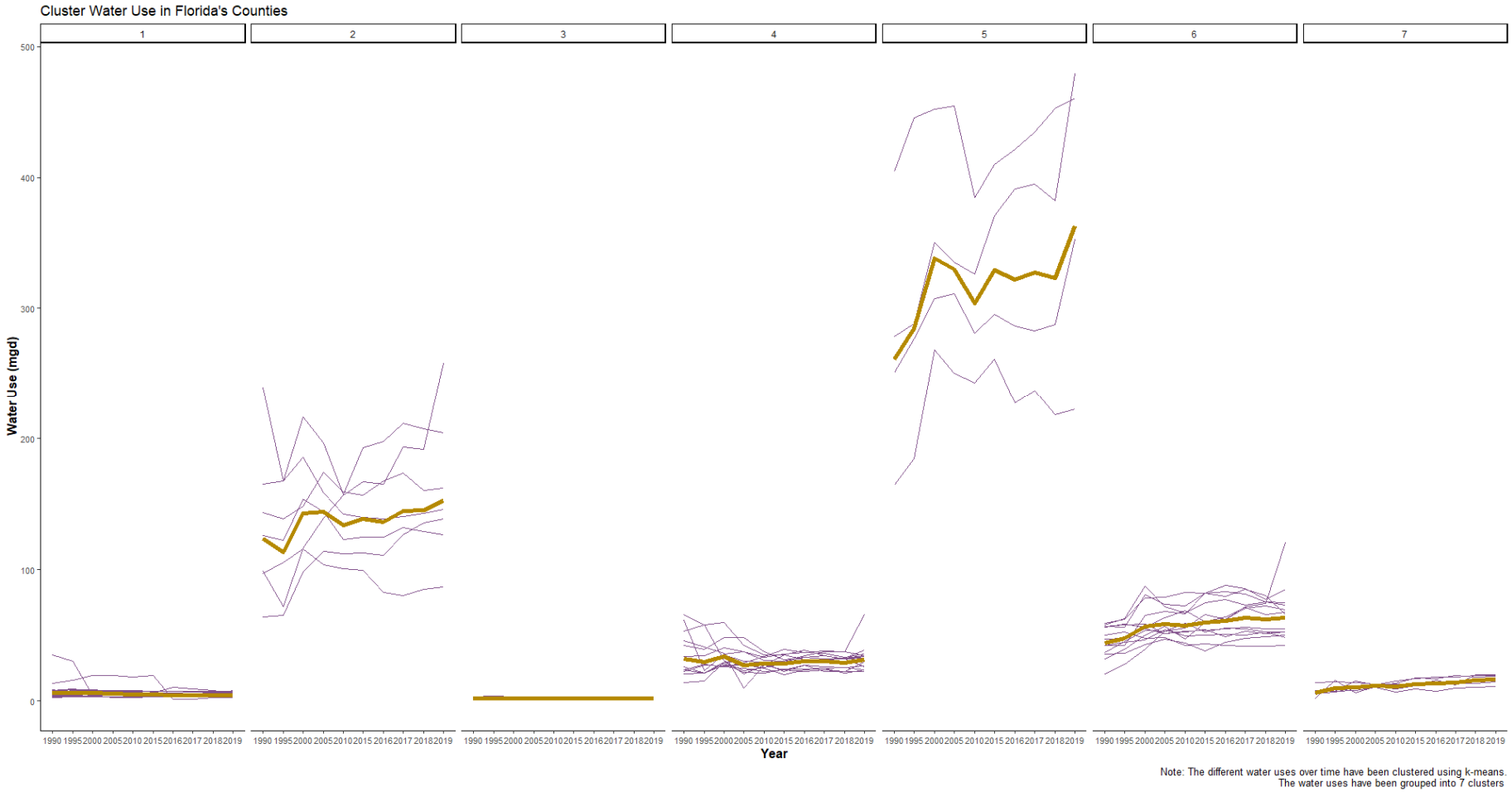
Figure A.6.10 Optimal Number of Clusters



Note: The optimal number of clusters has been identified using the Elbow method using Cluster and Factoextra packages in R programming software[123]. The optimal number of clusters is associated with the point after which the distortion/inertia (total within the sum of the squares) starts decreasing linearly.

[123] R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing https://www.R-project.org/.

Figure A.6.11. Clustering Water Use



Note: The different water uses in 67 Florida counties have been clustered into 7 clusters using k-means using R programming software. The gold lines are the mean water use of clusters while the purple lines represent individual county water use over time.

Table A.6.2 PSS, DSS, L/R, and CII Water Use Projections and Forecasts

	2020	2025	2030	2035	2040
EDR Forecast					
NW – II	80.20	79.18	81.46	83.91	85.16
NW – Other	229.98	221.17	219.34	219.81	218.65
SR – West	50.71	48.77	47.68	47.17	46.37
NFRWSP	422.44	420.17	422.26	427.39	427.88
SJR – CSEC	255.57	253.06	252.48	253.06	250.45
SW – N (excluding CFWI)	134.68	128.18	128.67	125.88	116.26
SW – TB	410.92	400.33	399.04	400.72	397.85
SW – H (excluding CFWI)	16.09	15.82	15.40	15.25	14.94
SW – S	146.32	152.46	155.49	159.12	160.78
CFWI	598.97	609.79	625.42	642.01	650.53
SF – LKB	11.23	10.75	11.13	11.55	11.98
SF – UEC	80.86	82.03	81.71	82.21	81.95
SF – LEC	1,128.18	1,172.57	1,191.78	1,214.15	1,230.34
SF – LWC	361.69	391.91	416.94	438.02	456.45
Statewide	***3,927.85***	***3,986.18***	***4,048.80***	***4,120.23***	***4,149.58***
Water Management Districts' Projections					
NW – II	73.87	79.01	83.5	87.42	90.91
NW – Other	206.22	215.45	221.37	226.12	230.61
SR – West*	57.23	58.61	60.04	61.28	61.28
NFRWSP*	400.05	426.32	445.83	464.16	480.19
SJR – CSEC	252.21	263.9	272.98	282.53	292.34
SW – N (excluding CFWI)	121.11	130.56	138.71	146.37	153.09
SW – TB	366.88	388.24	394.25	409.74	423.31
SW – H (excluding CFWI)	19.99	20.46	29.91	29.76	26.97
SW – S	135.75	143.82	154.08	160.04	165.04
CFWI	567.05	620.54	665.86	701.03	732.83
SF – LKB	8.59	8.82	9.02	9.2	9.35
SF – UEC	101.81	109.78	116.21	122.36	128.18
SF – LEC	1120.99	1180.65	1233.02	1279.84	1328.52
SF – LWC	419.87	457.3	486.82	512.54	535.6
Statewide	**3,851.62**	**4,103.46**	**4,311.60**	**4,492.39**	**4,658.22**
Difference between WMDs' and EDR projections*					
NW – II	-6.33	-0.17	2.04	3.51	5.75
NW – Other	-23.76	-5.72	2.03	6.31	11.96
SR – West	6.52	9.84	12.36	14.11	16.38
NFRWSP	-22.39	6.15	23.57	36.77	70.43
SJR – CSEC	-3.36	10.84	20.50	29.47	41.89
SW – N (excluding CFWI)	-13.57	2.38	10.04	20.49	36.83
SW – TB	-44.04	-12.09	-4.79	9.02	25.46
SW – H (excluding CFWI)	3.90	4.64	14.51	14.51	12.03
SW – S	-10.57	-8.64	-1.41	0.92	4.26
CFWI	-31.92	10.75	40.44	59.02	82.30
SF – LKB	-2.64	-1.93	-2.11	-2.35	-2.63
SF – UEC	20.95	27.75	34.50	40.15	46.23
SF – LEC	-7.19	8.08	41.24	65.69	98.18
SF – LWC	58.18	65.39	69.88	74.52	79.15
Statewide	**-76.23**	**117.28**	**262.80**	**372.16**	**528.23**

* Font colors are used to indicate positive and negative differences between the WMDs' and the EDR's projections. Positive numbers indicate WMD's projections are higher than EDR's projections

PG Water Use: Data and Model Estimation

For Power Generation water use, historical data from the USGS and WMDs showed that for most of the counties, PG water use was zero. It was assumed that the withdrawal would remain at zero in the future. For several counties, no specific patterns in historical water use were identified, and therefore, future water use is assumed to be equal to average historical use (see Table A.6.3). For the following three counties, regression analysis was applied to forecast PG water use: Hardee, Osceola, and Pasco. The figures below illustrate the model specifications and the forecasts produced for each county. Regression models include such variables as county population, employment in manufacturing, mining, and utility industries; and time trend.

[See figure on following page]

Table A.6.3 Assumptions about PG Water Use

County FIPS	County Name	Estimated Water Use Value (mgd)	Notes
12001	Alachua	2.34	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12003	Baker	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12005	Bay	4.6	Average; WMD data for 2016-2018
12007	Bradford	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12009	Brevard	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12011	Broward	0	Average; WMD data for 2014-2018
12013	Calhoun	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12015	Charlotte	0	Average; WMD data for 2014-2018
12017	Citrus	2.674	Use average PG water use in 2016-2018
12019	Clay	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12021	Collier	0	Average; WMD data for 2014-2018
12023	Columbia	0	Average; WMD data for 2016-2018
12027	DeSoto	0.07	Use average PG water use in 2016-2018
12029	Dixie	0	Average; WMD data for 2016-2018
12031	Duval	5.19	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12033	Escambia	9.71	Average; WMD data for 2016-2018
12035	Flagler	0	Average; WMD data for 2016-2018
12037	Franklin	0	Average; WMD data for 2016-2018
12039	Gadsden	0	Average; WMD data for 2016-2018
12041	Gilchrist	0	Average; WMD data for 2016-2018
12043	Glades	0	Average; WMD data for 2014-2018
12045	Gulf	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12047	Hamilton	0	Average; WMD data for 2016-2018
12049	Hardee	Varies	Based on regression analysis, see description below
12051	Hendry	0	Average; WMD data for 2014-2018
12053	Hernando	4.54	Use average PG water use in 2016-2018
12055	Highlands	0	Average; WMD data for 2014-2018
12057	Hillsborough	0	Average; WMD data for 2002-2018
12059	Holmes	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12061	Indian River	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12063	Jackson	1.41	Average; WMD data for 2016-2018
12065	Jefferson	0	Average; WMD data for 2016-2018
12067	Lafayette	0	Average; WMD data for 2016-2018
12069	Lake	0.24	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12071	Lee	0.36	Average; WMD data for 2014-2018
12073	Leon	2.5	Average; WMD data for 2016-2018
12075	Levy	0	Average; WMD data for 2016-2018
12077	Liberty	0.48	Average; WMD data for 2016-2018
12079	Madison	0	Average; WMD data for 2016-2018
12081	Manatee	4.58	Average; WMD data for 2006-2018
12083	Marion	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12085	Martin	7.5	Average; WMD data for 2014-2018
12086	Miami-Dade	7.92	Average; WMD data for 2014-2018
12087	Monroe	0	Average; WMD data for 2014-2018
12089	Nassau	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12091	Okaloosa	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12093	Okeechobee	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12095	Orange	0.59	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12097	Osceola	Varies	Based on regression analysis, see description below
12099	Palm Beach	1.18	Average; WMD data for 2014-2018
12101	Pasco	Varies	Based on regression analysis, see description below
12103	Pinellas	0	Average; WMD data for 1991-2018
12105	Polk	6.16	Average; WMD data for 2014-2018
12107	Putnam	17.79	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12109	St Johns	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12111	St Lucie	1.35	Average; WMD data for 2014-2018
12113	Santa Rosa	0.14	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12115	Sarasota	0	Average; WMD data for 2002-2018
12117	Seminole	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12119	Sumter	0	Average; WMD data for 1991-2018
12121	Suwannee	0.04	Average; WMD data for 2016-2018
12123	Taylor	0	Average; WMD data for 2016-2018
12125	Union	0	Average; WMD data for 2016-2018
12127	Volusia	3.99	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12129	Wakulla	0.29	Average; WMD data for 2016-2018
12131	Walton	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)
12133	Washington	0	Average water use in 2000, 2005, 2010, and 2015 (freshwater withdrawals for closed loop systems, USGS)

Table A.6.4 PG: WMDs' Water Use Projections and EDR Forecasts

	2020	2025	2030	2035	2040
EDR Forecast					
NW – II	0.14	0.14	0.14	0.14	0.14
NW – Other	18.99	18.99	18.99	18.99	18.99
SR – West	0.00	0.00	0.00	0.00	0.00
NFRWSP	25.36	25.36	25.36	25.36	25.36
SJR – CSEC	4.15	4.15	4.15	4.15	4.15
SW – N (excluding CFWI)	7.22	7.22	7.22	7.22	7.22
SW – TB	0.27	0.22	0.19	0.16	0.15
SW – H (excluding CFWI)	0.00	0.02	0.02	0.02	0.02
SW – S	4.65	4.65	4.65	4.65	4.65
CFWI	7.06	7.16	7.26	7.36	7.45
SF – LKB	0.00	0.00	0.00	0.00	0.00
SF – UEC	8.85	8.85	8.85	8.85	8.85
SF – LEC	9.10	9.10	9.10	9.10	9.10
SF – LWC	0.36	0.36	0.36	0.36	0.36
Statewide	***86.16***	***86.21***	***86.28***	***86.36***	***86.44***
Water Management Districts' Projections					
NW – II	0	0	0	0	0
NW – Other	25.16	26.33	27.73	27.73	27.76
SR – West	0	0	0	0	0
NFRWSP	21.33	21.81	22.68	24.29	26
SJR – CSEC	12.14	12.26	12.42	12.59	12.62
SW – N (excluding CFWI)	1.8	1.85	1.96	2.08	2.21
SW – TB	0.34	0.35	0.36	0.37	0.38
SW – H (excluding CFWI)	0	0	0	0	0
SW – S	3.69	3.92	4.17	4.4	4.64
CFWI	11	11.06	11.13	11.19	11.27
SF – LKB	0	0	0	0	0
SF – UEC	17.47	17.47	17.47	17.47	17.47
SF – LEC	39.75	39.75	52.75	52.75	52.75
SF – LWC	1.54	1.61	1.69	2.03	2.03
Statewide	134.22	136.41	152.36	154.9	157.13
Difference between WMDs' and EDR projections*					
NW – II	-0.14	-0.14	-0.14	-0.14	-0.14
NW – Other	6.17	7.34	8.74	8.74	8.77
SR – West	0.00	0.00	0.00	0.00	0.00
NFRWSP	-4.03	-3.55	-2.68	-1.07	0.64
SJR – CSEC	7.99	8.11	8.27	8.44	8.47
SW – N (excluding CFWI)	-5.42	-5.37	-5.26	-5.14	-5.01
SW – TB	0.07	0.13	0.17	0.21	0.23
SW – H (excluding CFWI)	0.00	-0.02	-0.02	-0.02	-0.02
SW – S	-0.96	-0.73	-0.48	-0.25	-0.01
CFWI	3.94	3.90	3.87	3.83	3.82
SF – LKB	0.00	0.00	0.00	0.00	0.00
SF – UEC	8.62	8.62	8.62	8.62	8.62
SF – LEC	30.65	30.65	43.65	43.65	43.65
SF – LWC	1.18	1.25	1.33	1.67	1.67
Statewide	**48.06**	**50.20**	**66.08**	**68.54**	**70.69**

* Font colors are used to indicate positive and negative differences between the WMDs' and the EDR's projections. Positive numbers indicate WMD's projections are higher than EDR's projections

Total Water Use Projections and Forecasts

Table A.6.5 Total Water Use Projections and Forecasts

	2020	2025	2030	2035	2040
EDR Forecast					
NW – II	83.26	82.52	85.12	87.81	89.32
NW – Other	295.93	287.95	287.17	288.82	288.73
SR – West	112.04	113.50	114.97	117.38	119.53
NFRWSP	604.26	601.97	606.41	614.27	617.34
SJR – CSEC	350.15	338.33	336.14	334.81	330.29
SW – N (excluding CFWI)	168.54	161.60	162.10	159.38	150.23
SW – TB	461.74	447.16	443.65	443.04	437.89
SW – H (excluding CFWI)	117.26	110.19	110.05	108.44	106.51
SW – S	316.85	313.29	316.69	319.35	319.84
CFWI	736.59	739.72	755.09	769.61	775.80
SF – LKB	122.64	117.52	116.92	116.43	116.38
SF – UEC	213.10	206.46	202.04	197.82	193.10
SF – LEC	1,791.41	1,810.86	1,830.47	1,853.15	1,869.78
SF – LWC	689.57	707.39	726.33	745.99	762.60
Statewide	**6,063.33**	**6,038.44**	**6,093.13**	**6,156.30**	**6,177.34**
Water Management Districts' Projections					
NW – II	76.88	82.25	87.03	91.19	94.88
NW – Other	273.72	287.12	296.92	304.58	311.9
SR – West	106.53	110.92	116.69	122.35	122.35
NFRWSP	571.02	603.38	628.15	653.28	676.24
SJR – CSEC	383.47	395.62	406.11	416.72	427.87
SW – N (excluding CFWI)	142.49	153.55	163.54	173.09	181.73
SW – TB	413.34	432.77	436.96	450.56	461.85
SW – H (excluding CFWI)	91.52	89.45	96.17	94.96	89.15
SW – S	245.02	254.22	265.77	272.99	279.33
CFWI	735.24	789.49	836.65	873.94	907.59
SF – LKB	249.9	251.83	253.68	253.83	257.49
SF – UEC	289.26	289.7	287.84	286.07	283.96
SF – LEC	1,813.99	1,863.91	1,923.28	1,963.65	2,006.54
SF – LWC	1,013.43	1,046.53	1,080.22	1,115.00	1,147.67
Statewide	***6,405.81***	***6,650.74***	***6,879.01***	***7,072.21***	***7,248.55***
Difference between WMDs' and EDR projections*					
NW – II	-6.38	-0.27	1.91	3.38	5.56
NW – Other	-22.21	-0.83	9.75	15.76	23.17
SR – West	-5.51	-2.58	1.72	4.97	2.82
NFRWSP	-33.24	1.41	21.74	39.01	58.90
SJR – CSEC	33.32	57.29	69.97	81.91	97.58
SW – N (excluding CFWI)	-26.05	-8.05	1.44	13.71	31.50
SW – TB	-48.40	-14.39	-6.69	7.52	23.96
SW – H (excluding CFWI)	-25.74	-20.74	-13.88	-13.48	-17.36
SW – S	-71.83	-59.07	-50.92	-46.36	-40.51
CFWI	-1.35	49.77	81.56	104.33	131.79
SF – LKB	127.26	134.31	136.76	137.40	141.11
SF – UEC	76.16	83.24	85.80	88.25	90.86
SF – LEC	22.58	53.05	92.81	110.50	136.76
SF – LWC	323.86	339.14	353.89	369.01	385.07
Statewide	***342.48***	***612.30***	***785.88***	***915.91***	***1071.21***

* Font colors are used to indicate positive and negative differences between the WMDs' and the EDR's projections. Positive numbers indicate WMD's projections are higher than EDR's projections

A.7 Population and Water Use for the Counties Divided Between Water Supply Planning Regions

A special procedure was applied to the counties split among two or more supply planning regions. First, the county population distribution was assessed using census block information. The proportion of the population in each supply planning region was estimated. EDR further assumed that the population distribution would remain unchanged in the planning horizon. For example, suppose in 2021, 90% of a county's population resided in water supply planning region A, and 10% resided in Region B. It is assumed that the population distribution among the regions will remain at 90% and 10% for the planning horizon, regardless of population growth. The specific percentage assumed for each region and each county is presented in Table A.7.1.

[See table on following page]

Table A.7.1 Percent of County Population in Various Water Supply Planning Regions

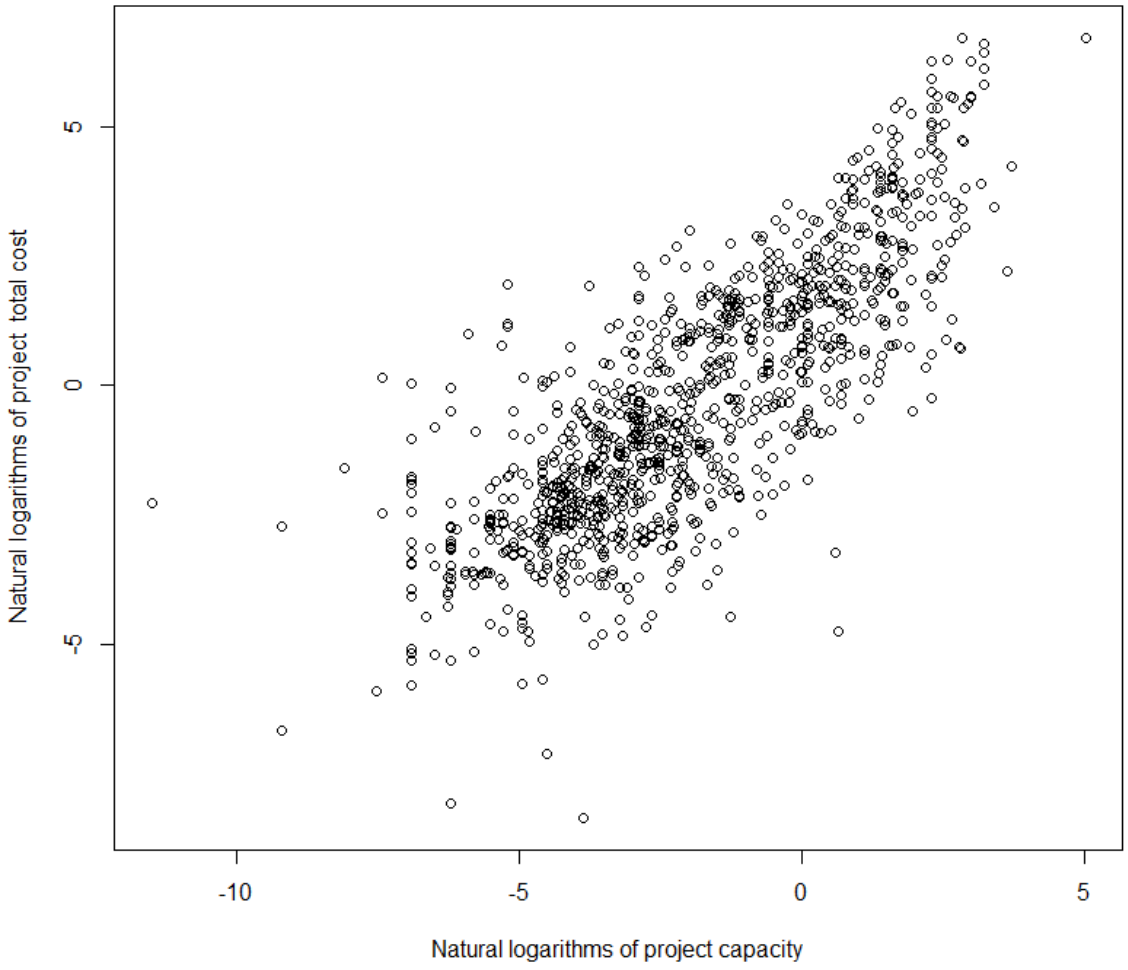
	NWF REG I	NWF REG II	NWF REG III	NWF REG IV	NWF REG V	NWF REG VI	NWF REG VII	SR EX-NFRWSP	SJR CSEC	SW – H*	SW – N*	SW – S	SW – TB	SF LEC	SF LKB	SF LWC	SF UEC	CFWI	NFRWSP
Alachua	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Baker	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Bay	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Bradford	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Brevard	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Broward	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%
Calhoun	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Charlotte	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**99.15%**	0.00%	0.00%	0.00%	**0.85%**	0.00%	0.00%	0.00%
Citrus	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Clay	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Collier	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**0.01%**	0.00%	**99.99%**	0.00%	0.00%	0.00%
Columbia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
DeSoto	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Dixie	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Duval	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Escambia	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Flagler	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Franklin	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Gadsden	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Gilchrist	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Glades	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**32.08%**	**67.92%**	0.00%	0.00%	0.00%
Gulf	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hamilton	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Hardee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hendry	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**10.44%**	0.00%	**89.56%**	0.00%	0.00%	0.00%
Hernando	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Highlands	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**91.31%**	0.00%	0.00%	0.00%	0.00%	**8.69%**	0.00%	0.00%	0.00%	0.00%
Hillsborough	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Holmes	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Indian River	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Jackson	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Jefferson	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**67.64%**	**32.36%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lafayette	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Lake	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**64.88%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**35.12%**	0.00%
Lee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%
Leon	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Levy	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**42.96%**	0.00%	0.00%	**57.04%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Liberty	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Madison	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Manatee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Marion	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**68.59%**	0.00%	**31.41%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Martin	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%
Miami-Dade	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%
Monroe	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**99.99%**	0.00%	**0.01%**	0.00%	0.00%	0.00%
Nassau	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Okaloosa	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Okeechobee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**2.59%**	0.00%	0.00%	0.00%	0.00%	0.00%	**91.95%**	0.00%	**5.46%**	0.00%	0.00%
Orange	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%
Osceola	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%
Palm Beach	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%
Pasco	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Pinellas	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Polk	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%
Putnam	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Santa Rosa	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Sarasota	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Seminole	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%
St. Johns	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
St. Lucie	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%
Sumter	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Suwannee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Taylor	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Union	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**
Volusia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wakulla	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Walton	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Washington	0.00%	0.00%	0.00%	**100.00%**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

*excluding CFWI

A.8 Regression Analysis of Project Expenditures

Regression analysis was used to explore the relationship between project expenditures and project types, capacities, regions of implementation, and project status. To develop a regression model, 1,125 projects from the project appendix were selected. These were projects identified as "Additional water supply" and "Water for natural systems" projects.[124] The natural logarithm of "project total ($)" was strongly correlated with the natural logarithm of the project capacity. As shown in the scatter plot in Figure A.8.1, the relationship between these two variables is linear. Since log-transformation is applied to both variables, the results can be interpreted as each one percent change in project capacity leading to a one percent change in the "project total ($)."

Figure A.8.1 Scatter Plot, Natural Logarithms of "Project total ($)" and Project Capacity (mgd)



The DEP project appendix provides information about project capacity, type, status, and region of implementation. The regression model includes all these characteristics. However, EDR revised slightly how it modeled the effects of project capacity, type, status, and region of implementation

[124] Note project type "Reclaimed Water (for groundwater recharge or natural system restoration)" was excluded.

on the expenditures for this year's analysis. The model now explains approximately 76.1% of the variability in the dependent variable (as opposed to 75% in the report's 2023 Edition). EDR will continue testing alternative model specifications to improve the predictive model capacity for this report's 2025 Edition.

Table A.8.1 Regression Analysis Results (dependent variable is the natural logarithm of "project total", in million $2023)

Variable description	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	0.771	0.305	2.527	0.012
Natural Logarithms of project capacity	0.577	0.022	26.375	0.000
Project Type				
Brackish Groundwater	0.529	0.322	1.646	0.100
Desalination	1.805	0.690	2.617	0.009
Groundwater Recharge	-0.951	0.399	-2.381	0.017
Other	-1.036	0.303	-3.419	0.001
Reclaimed Water (for potable offset)	0.456	0.298	1.529	0.127
Storm Water	-0.410	0.417	-0.985	0.325
Surface Water	0.609	0.342	1.780	0.075
Surface Water Storage	0.558	0.550	1.014	0.311
Aquifer Storage and Recovery	Baseline, captured in the intercept			
Project Status				
Construction/Underway	0.314	0.127	2.468	0.014
Design	0.258	0.217	1.185	0.236
On Hold	-0.783	1.266	-0.618	0.536
RWSP or RPS Option Only	1.128	0.125	9.023	0.000
Complete	Baseline, captured in the intercept			
Project Region				
NFRWSP	0.371	0.135	2.750	0.006
NW – II	1.052	0.425	2.474	0.014
NW – Other	0.935	0.327	2.861	0.004
SF – LEC	-0.149	0.135	-1.107	0.269
SF – LKB	-1.002	0.523	-1.914	0.056
SF – LWC	0.061	0.197	0.311	0.756
SF – UEC	-0.108	0.226	-0.477	0.633
SJR – CSEC	0.442	0.144	3.076	0.002
SR – West	2.007	0.521	3.853	0.000
SW – H	0.756	0.453	1.669	0.096
SW – N	0.262	0.214	1.228	0.220
SW – S	0.571	0.163	3.497	0.000
SW – TB	0.393	0.144	2.732	0.006
CFWI	Baseline, captured in the intercept			

Table A.8.1 presents the regression results showing that expenditures increase with the project capacity. Note that since natural logarithm transformations are used for both expenditure and capacity, the model coefficient reflects a one percent change in the expenditure for a one percent change in capacity. As expected, the model shows that expenditures increase with the project's capacity. The model results also show that the "RWSP or RPS Option Only" projects are more expensive than those completed in the past and those currently in construction, in design, or on hold (other things being equal). Groundwater recharge and stormwater projects are identified as statistically less expensive (aquifer storage and recovery category being the reference category). Finally, the SF – LEC, SF – LKB, and SF – UEC regions tend to be less costly (when compared with projects in the CFWI).

This regression model is used to estimate the expenditures for various project types, capacities, and regions. Estimated project expenditures for median project capacity are presented in Table A.8.2. Note that if the model results for "RWSP or RPS Option Only" status are used, the estimated project expenditure becomes significantly higher. The expenditure can be lowered for all project types and regions if larger projects are constructed.

Table A.8.2 Estimated Project Expenditures, Using Regression Model Coefficient for Median Project Capacity

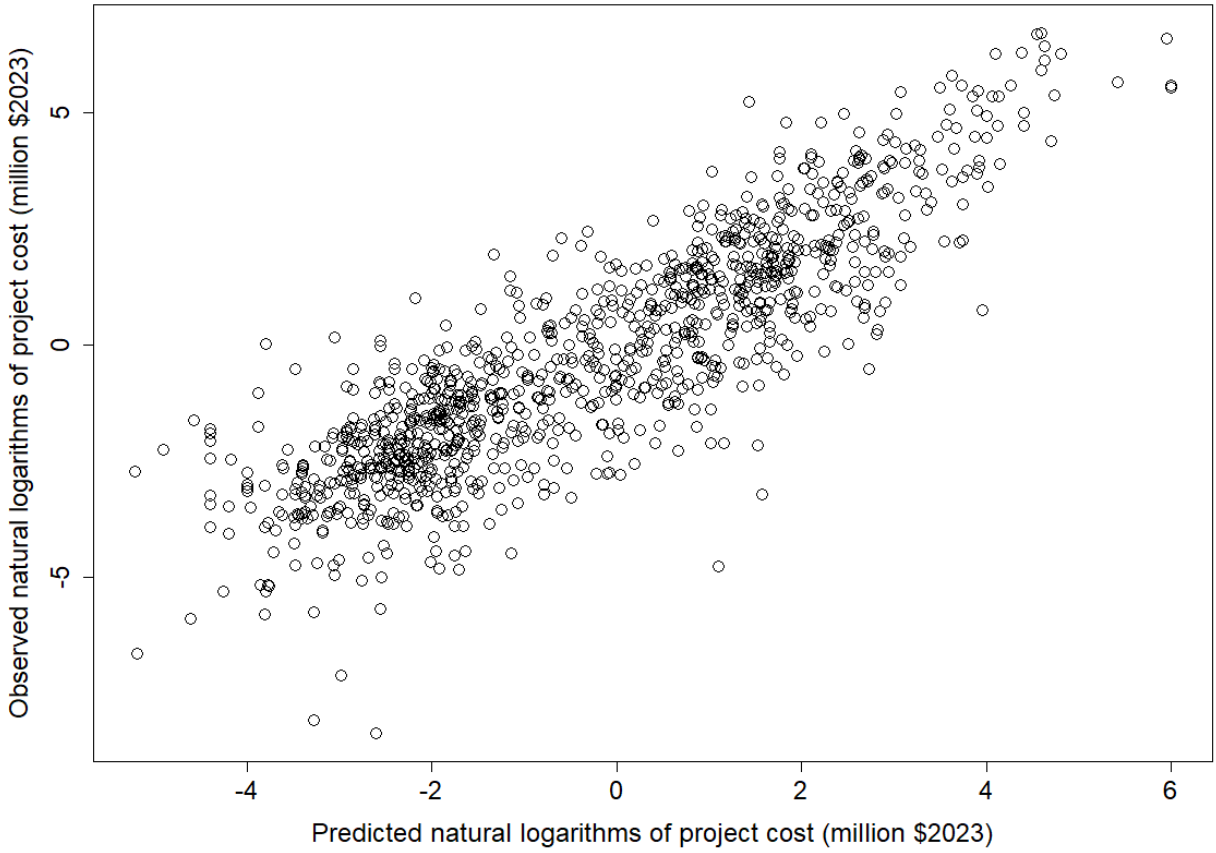
Project Type	Region	Median Project Capacity (mgd)	Total Expenditure (million $2023)	Expenditure Per mgd of the beneficial offset (million $2023)
Aquifer Storage and Recovery	SF – LEC	6.75	3.85	0.57
Brackish Groundwater	SF – LEC	3.75	5.96	1.59
Brackish Groundwater	CFWI	4.20	8.15	1.94
Brackish Groundwater	SW – S	1.50	8.21	5.47
Groundwater Recharge	NFRWSP	1.69	1.64	0.97
Reclaimed Water (for potable offset):	NW – II	0.33	5.15	15.61
Reclaimed Water (for potable offset):	SR– West	0.28	12.05	43.82
Reclaimed Water (for potable offset):	NFRWSP	0.26	2.26	8.76
Reclaimed Water (for potable offset):	SW – N*	0.29	2.15	7.53
Reclaimed Water (for potable offset):	CFWI	0.73	2.84	3.91
Reclaimed Water (for potable offset):	SF – LWC	2.20	5.72	2.60
Reclaimed Water (for potable offset):	SF – LEC	1.10	9.58	8.71
Reclaimed Water (for potable offset):	SW – S	0.26	2.37	9.27
Reclaimed Water (for potable offset):	SW – H	0.05	1.29	25.79
Surface water storage	SF – LEC	1.01	3.44	3.41
Surface water storage	SW – S	8.85	33.10	3.74

*excluding CFWI

Overall, groundwater recharge projects in the NFRWSP and Aquifer Storage and Recovery projects in the SF – LEC stand out as relatively inexpensive for the median project capacity.[125] In contrast, reclaimed water projects (especially in the NW – II, SR– West, NFRWSP, SW – N, SF – LEC, SW – S and SW – H) are expensive (per mgd of the beneficial offset). The beneficial offset is assumed to be 0.55 of the actual project capacity, increasing the per-unit expenditures for reclaimed water projects.

[125] Note that groundwater recharge projects' costs may be underestimated since the DEP project appendix does not account for the land purchase expenditures.

Figure A.8.2 Scatter Plot, Natural Logarithms of Predicted Project Total ($2023) and Observed Project Total ($2023)



This regression equation is used to estimate the expenditures for various project types, capacities, and regions. A comparison of estimated and observed project expenditures is presented in Figure A.8.2. Overall, the model seems to predict the project expenditures well. EDR will continue testing alternative model specifications to improve the predictive model capacity for this report's 2025 Edition.

A.9 Effect of Inflation on "Project Total $" Estimates

The effect of inflation on the cost and funding needs is an important element of the analysis, given that the earliest completion date of a project item listed in the project appendix is 1990s. To account for inflation and convert all "project total $" estimates to 2023 dollars, the construction cost index was used. [126]

[See table on following page]

[126] ENR. Construction Cost Index. Available online at: https://www.enr.com/economics/historical_indices/construction_cost_index_history (accessed October 2023)

Table A.9.1 Year and Inflation Multipliers for "Project Total ($)"

State FY Assumed by EDR for "Project Total ($)" Estimates	Inflation Index used to index "Project Total ($)" to State FY$2023
2023	1
2022	1.023
2021	1.097
2020	1.161
2019	1.180
2018	1.203
2017	1.239
2016	1.287
2015	1.326
2014	1.357
2013	1.394
2012	1.430
2011	1.467
2010	1.512
2009	1.553
2008	1.601
2007	1.671
2006	1.717
2005	1.787
2004	1.870
2003	1.988
2002	2.036
2001	2.098
2000	2.139
1999	2.196
1998	2.248
1997	2.284
1996	2.368
1995	2.432
1994	2.461
1993	2.554
1992	2.670
1991	2.752
1990	2.812