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FLORIDA STATEWIDE AGRICULTURAL IRRIGATION DEMAND ESTIMATED AGRICULTURAL WATER DEMAND, 2018 - 2045

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List of Acronyms

AFSIRS	Agricultural Field Scale Irrigation Requirements Simulation
ALG	Agricultural Lands Geodatabase
AWS	Actual Water Savings
CDL	Cropland Data Layer
CFWI	Central Florida Water Initiative
CUP	Consumptive Use Permit
DOC	Department of Citrus
DPI	Division of Plant Industry
ET	Evapotranspiration
EWUR	Estimated Water Use Report
FAPRI	Food and Agricultural Policy Research Institute
FDACS	Florida Department of Agriculture and Consumer Services
FDOR	Florida Department of Revenue
FLUCCS	Florida Land Use/Land Cover and Forms Classification System
FRIS	Farm and Ranch Irrigation Survey
GIS	Geographic Information System
GOES	Geostationary Operational Environmental Satellites
GPD	Gallons per Day
ILG	Irrigated Lands Geodatabase
INYR	Inches/Year
LKB	Lower Kissimmee Basin
LWC	Lower West Coast
MGD	Millions of Gallons per Day
MIL	Mobile Irrigation Labs
NAIP	National Agricultural Imagery Program
NASS	National Agricultural Statistics Service
NRSP	North Ranch Sector Plan
NFWWMD	Northwest Florida Water Management District
SFWMD	South Florida Water Management Districts
SJRWMD	St. Johns River Water Management District
SRWMD	Suwannee River Water Management District
SWFWMD	Southwest Florida Water Management District
UEC	Upper East Coast
UKB	Upper Kissimmee Basin
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WMD	Water Management District
WUP	Water Use Permit

Executive Summary

The Florida Department of Agriculture and Consumer Services (FDACS) is charged with developing estimates of statewide agricultural water demand¹. This process is described as the Florida Statewide Agricultural Irrigation Demand project, or FSAID. The 2020 report is the seventh update of FSAID water use estimates. The current FSAID report extends the projection period to 2045 in order to align with upcoming regional water supply plan projection periods. The first step in estimating statewide agricultural water needs is identifying agricultural lands that are irrigated. Table ES-1 summarized irrigated lands as of crop year 2018. Figures 3 and 5 in the report provide graphics of County-level projected changes in acreage and water use. **Table ES-1** summarizes the FSAID VII updated agricultural and irrigated agricultural areas.

Table ES- 1. Florida Agricultural Acreage in Production, by District

WMD	Agricultural Lands 2018	Irrigated Crop Land 2018
	Acres	Acres
NWFWMD	658,645	52,829
SFWMD	3,014,637	1,132,766
SJRWMD	1,198,386	161,363
SRWMD	808,525	144,415
SWFWMD	1,910,398	385,244
Total	7,590,591	1,876,617

Through 2045, irrigated crop acreage is forecast to decrease by about 18,000 acres, or 1%. The associated average-year water use is projected to increase overall by about 1%, with varying impacts on individual WMDs. South Florida Water Management District (SFWMD), St. Johns River Water Management District (SJRWMD) and Southwest Florida Water Management District (SWFWMD) are forecast to see declines in irrigated areas, while the northernmost districts are expected to see increases in irrigated acreage.

The current total agricultural irrigation water use statewide is estimated at 1,970 MGD for an average year and 2,671 for a 1-in-10 dry year. **Table ES-2** provides a breakdown by district of total crop irrigation use. **Table ES-3** provides estimated water use for livestock and aquaculture.

Table ES- 2. Estimated Irrigated Cropland Water Use

WMD	2018	2018	2018
	Acres	MGD	Inches/Year
NWFWMD	52,829	42	10.70
SFWMD	1,132,766	1,245	14.78
SJRWMD	161,363	185	15.38
SRWMD	144,415	130	12.07
SWFWMD	385,244	369	12.87
Total	1,876,617	1,970	14.11

¹ Florida Statute 570.93. Department of Agriculture and Consumer Services; agricultural water conservation and agricultural water supply planning.

Table ES- 3. Estimated Livestock/Aquaculture Water Use (2018)

WMD	Livestock water use (MGD)	Aquaculture water use (MGD)
NWFWMD	2.0	4.7
SFWMD	12.1	2.5
SJRWMD	4.5	1.8
SRWMD	9.8	0.4
SWFWMD	10.2	6.3
Total	38.7	15.7

Table ES-4 shows projected water use estimates by crop, while **Table ES-5** summarizes district level irrigated acreage projections from 2018 to 2045. By 2045, total average-year agricultural irrigation water demand is estimated at 1,990 MGD.

Table ES- 4. Irrigation Demand, MGD by Crop, 2018-2045

Statewide	2018	2020	2025	2030	2035	2040	2045	
Predominant Crop	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Dry MGD
Citrus	457	450	449	450	452	453	451	666
Field Crops	119	122	125	129	134	139	144	189
Fruit (Non-citrus)	76	77	77	79	79	78	78	102
Greenhouse/Nursery	146	146	147	143	144	145	146	163
Hay	112	113	112	112	111	109	107	152
Potatoes	38	38	38	38	38	38	38	55
Sod	49	49	49	48	48	48	48	58
Sugarcane	659	660	642	643	643	644	646	891
Vegetables (Fresh Market)	313	314	317	322	327	330	333	421
Total	1,970	1,968	1,957	1,963	1,975	1,984	1,990	2,698

Table ES- 5. Projected Irrigated Acreage by Water Management District, 2018-2045

WMD	2018	2020	2025	2030	2035	2040	2045	2018-2045	2018-2045
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Difference	% Difference
NWFWMD	52,829	53,314	54,488	55,629	56,769	57,930	59,066	6,237	12%
SFWMD	1,132,766	1,129,448	1,108,957	1,105,067	1,102,432	1,098,930	1,094,503	(38,263)	-3%
SJRWMD	161,363	161,276	158,912	156,773	154,947	153,103	150,793	(10,571)	-7%
SRWMD	144,415	146,758	152,818	158,730	164,304	170,199	175,865	31,451	22%
SWFWMD	385,244	384,938	383,929	382,837	381,613	380,068	378,666	(6,578)	-2%
Total	1,876,617	1,875,734	1,859,104	1,859,037	1,860,064	1,860,230	1,858,893	(17,724)	-1%

Historical records indicate that Florida farmers have improved efficiency on average about 1% per year, overall. A long-term record of producer-reported acreage and water use was used to develop trends to

project future irrigation conservation². **Table ES-6** provides the future conservation results, which project irrigation efficiency improvements of about 7% of the total average year irrigation demand by 2045 (9% of total non-EAA irrigated demand). Detailed information on conservation methods and data sources are provided in **Appendix E**.

Table ES- 6. Estimated Efficiency Improvements by Water Management District, MGD

WMD	2020	2025	2030	2035	2040	2045
NWFWMD	0.92	3.05	4.78	5.71	6.57	7.29
SFWMD	8.79	26.58	37.85	43.94	48.11	50.82
SJRWMD	3.21	10.27	15.90	20.12	23.61	26.48
SRWMD	3.08	10.35	17.15	22.65	27.27	30.10
SWFWMD	2.99	9.36	13.00	15.71	18.03	19.79
Total	18.99	59.61	88.69	108.13	123.57	134.48
<i>*Amounts are cumulative over time; i.e. 59.61 from 2025 is included in 88.69 by 2030</i>						

The 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. A number of factors present uncertainty in future projections for Florida agricultural irrigation demand. Citrus and sugar are both large water users and are also currently more susceptible than other crops to non-price impacts, such as tariffs, trade relations, energy prices, food safety laws and environmental regulations relating to water quality. For current water use and for projections, citrus and sugarcane represent the greatest irrigation demand; dramatic shifts in either market would affect water use. Agriculture, especially citrus and sugar operations, has high fixed costs, which means that shocks to the system affect profits long before they affect acreage and water use.

The current COVID-19 virus pandemic introduces additional uncertainty into future crop prices and other factors that will affect producers' decisions about crop selection and acreage expansion or reduction. Anecdotal reports from producers in Florida have highlighted substantial losses from unharvested crops resulting from the drop in restaurant demand. A survey of producers in Florida found that revenues from agricultural product sales were down about 30% (based on about 700 respondents); Court et al. 2020. The biggest losses were among fruit and vegetable crop groups, suggesting a possible decline in vegetable and fruit crop prices in the near term as demand is well-below average. Long-term agricultural product demand changes will depend on virus control, market changes, and other factors that will be closely monitored during the coming year.

Hemp production is expected to be an emerging crop in Florida, and license applications are being processed by FDACS. Future water demand projections in Florida will likely include hemp production as more is learned about baseline acreage, future demands, and water use in Florida. Demand for Cannabidiol (CBD) oil in the U.S. is projected to be strong, which suggests there is room for production markets to grow. Estimates from within the industry project annual retail sales of CBD in the U.S. to increase from about \$2 billion in 2020 to about \$10 billion in 2024 (HID 2019).

² USDA Farm and Ranch Irrigation Survey, Florida data

Within the report, sensitivity of the estimates to various potential sources of uncertainty is described and quantified. Some portion of producer response to systemic shocks are embedded in the underlying model; the dataset incorporates housing boom and bust years, wild swings in energy prices, rapid spread of citrus greening, and two years of major natural disasters which affected agriculture. The heavy investments in capital and labor arrangements inject an inherent lag to changes in agricultural practices, which is likely to be evident within water use as well.

Introduction

The Florida Department of Agriculture and Consumer Services (FDACS) is charged with developing estimates of statewide agricultural water demand³. The process is described as the Florida Statewide Agricultural Irrigation Demand project, or FSAID; this report is the seventh annual update of FSAID water use estimates prepared by FDACS. The current and projected agricultural water use estimates incorporate an additional year of metered data for all Water Management Districts (Districts) and have utilized updated spatial data to improve the irrigated lands coverage.

The current baseline acreage and water use estimates are for the year 2018, which is the most recent year of available water use data provided by the Districts. This report includes estimates of irrigated agricultural areas and water demands for 2018 and projections for 2020 – 2045, in five-year increments. The estimates herein are provided to the Districts for their review and comment and ultimately for consideration in development of their respective water supply plans.

This report describes the agricultural land acreage estimates and methodology, followed by the water use estimates and methodology. Following the water and land use estimates, frost-freeze protection estimates, irrigation conservation estimates, and livestock and aquaculture water demand estimates are provided.

This iteration of the FSAID agricultural water demand projections can be referenced as FSAID VII (FDACS 2020). Previous FSAID reports or datasets can be referenced similarly (i.e. FSAID III; FDACS 2016).

Methodology and Agricultural Land Acreage Estimates

Two spatial datasets of Florida's agricultural lands were created for the FSAID project. The Agricultural Lands Geodatabase (ALG) includes all agricultural land, while the Irrigated Lands Geodatabase (ILG) includes only irrigated agricultural land, as well as the estimated current and projected water use for each field.

A. ALG: Development and Update of the Agricultural Lands Geodatabase

The original FSAID ALG was developed in 2014 using the following primary spatial data sources: Florida Statewide Land Use/Land Cover from the Water Management Districts, Consumptive Use Permit (CUP) polygons from the WMDs, well locations, USDA's Cropland Data Layer (CDL) data, USDA's National Agricultural Imagery Program (NAIP) aerial imagery, and Irrigated Areas layers from SJRWMD and SWFWMD. Substantial spatial data processing was completed to develop Florida's ALG and ILG in order to model current and projected agricultural water demands. The annual refinement to the ALG is based on stakeholder input, FDACS field staff reviews, FDACS BMP enrollment data, updated land use data prepared by Water Management Districts and DEP, Department of Revenue (DOR) property appraisal data (parcel data), the CDL, and recent aerial imagery. Other updates included  utilizing the most current field-verified data from USGS, and the most current available Statewide Land Use Land Cover data

³ Florida Statute 570.93. Department of Agriculture and Consumer Services; agricultural water conservation and agricultural water supply planning.

New Agricultural Areas

Updates to the non-irrigated portions of the ALG included a bulk process to identify new agricultural areas not in the existing ALG (or previous ALG versions). Areas added to the ALG included rangeland and seasonal grazing areas that are enrolled in FDACS BMPs. This process resulted in about 127k acres of rangelands and 490k acres of seasonal grazing areas being added to the ALG. The additional acreage was not included in previous ALG datasets as they were not identified as agricultural land use from existing land use data. The areas are not irrigated and are excluded from future irrigation in the projection routines that identify irrigated fields in counties projected to add irrigated area.

Cropland Data Layer Crop Classification

Another bulk process was completed to rename ALG crop types with generic crop names using the USDA Cropland Data Layer (CDL) from 2018. The following ALG crop names were included in the process to rename crops using the CDL: Cropland_Pastureland, FieldCrops, Grains, and RowCrops. Zonal calculations were completed to find the dominant (most common) CDL crop within each ALG feature. The ratio of CDL dominant crop to total ALG area of each feature was used in conjunction with the type of CDL dominant crop to decide when it was appropriate to utilize CDL crop types. Samples (n=100 in each of the five Water Management Districts) were reviewed manually using current imagery to develop decision rules for when the CDL crop type could be reliably used. Dominant CDL crop types in the following list were utilized for updating ALG crop types to ensure that uncommon or unusual  crops are not used for ALG crop classification: Corn, Cotton, Dry Beans, Grassland/Pasture, Oats, Peanuts, Rye, Sorghum, Soybeans. If the ratio of dominant CDL crop area to ALG feature area was 0.4 or greater (the threshold established based on detailed review of > 500 example fields), and the CDL crop type was one of the nine types listed above, and the ALG crop was one of the four types listed above, then the CDL crop was used. This process resulted in about 1,300 fields (40,000 acres) having a revised crop type using the 2018 CDL crops.

See **Table 1** for a breakdown by District. Example updates of ALG changes can be seen in **Appendix E**.

B. ILG: Development and Update of the 2018 Irrigated Lands Geodatabase

The Irrigated Lands Geodatabase was updated to 2018 conditions based on manual review and evaluation using 2018/2019 aerial imagery, new or modified Water Use Permits (WUPs), 2018 Cropland Data Layer from USDA (CDL), FDACS Division of Plant Industry (DPI) citrus layer, USGS field verification, and District-provided spatial data on irrigated area changes. All these datasets were used to target manual review of ILG features compared to aerial imagery and ancillary datasets. Updates were made to field geometry, crop type, irrigation system, and irrigation status (fallow or irrigated).

Data Source	Description
Water Use Permits (WUP; recent new and revised were reviewed)	WUPs typically provide information on crop type and irrigation system; any new or modified WUPs from 2017 or more recent were manually reviewed.
USDA Cropland Data Layer (CDL; 2018)	The CDL is a gridded dataset (30 meter resolution) that classifies crop type based on satellite data and groundtruthed data from the Farm Service Agency (FSA) field reports at the Common Land Unit (CLU) scale. The dataset is updated annually based on satellite data collected from April to September.
U.S. Geological Survey irrigated areas field verification (USGS; 2015-2019)	U.S. Geological Survey (USGS), under contract to FDACS, performed field work to verify irrigated areas in the following counties: Broward, Citrus, Hendry, Hernando, Miami-Dade, Palm Beach, Pasco, and Sumter
FDACS Division of Plant Industry (DPI) active citrus layer; 2019	Statewide dataset of citrus areas, with attributes indicating survey date and classification that describes active production or abandonment
water use data; 2018 annual water use totals	Adjusted irrigated coverage based on District water use data for permits with 0 or low (< 3in/yr) water use.

Updates to the ILG were reviewed with personnel at each District. Draft ILG shapefiles were provided to each District during January 2020, and meetings with the FSAID team staff in each District were conducted to collaborate on spatial data improvements. In some Districts, staff provided marked-up maps for recommended changes. In other Districts, comments were provided via email and were researched as part of continued ILG updates. In all cases, input was acknowledged and addressed.

Field verification was completed by USGS in 2019 and 2020 in Broward, Citrus, Hendry, Hernando, Miami-Dade, Palm Beach, Pasco, and Sumter Counties. This entailed field surveys from public roads to identify irrigation status, irrigation system, and crop type. The USGS spatial data were reviewed manually to edit the ILG where irrigated features in the ILG were missing or should be changed to not irrigated, where crop types were different, or where boundary adjustments were needed. Current aerial imagery was used as supporting data. This process resulted in a net change of about 6,000 acres being removed from the ILG in those counties. Most of the declines in irrigated area were converted to fallow agricultural land; conversion to development among irrigated areas was observed, but this was not common.

FDACS' Division of Plant Industry (DPI) citrus dataset was used to review irrigated citrus features in the ILG. This was done using a select by location of irrigated citrus from the ILG that contained or was within inactive citrus according to the DPI citrus layer. ILG fields with 0 or small (< 3 in/yr) 2018 permit-level water use were reviewed to evaluate irrigation status and field boundaries. 2018 and 2019 aerial imagery were used in this analysis.

Table 1 provides a summary of the total acreage in the current ILG and ALG. **Table 2** provides a breakdown by crop of acreage at the statewide level. **Appendix C** provides detailed tables by Water Management District and county, with estimates for split district counties available in **Table C- 28**.

Table 1. Summary of ALG and ILG for 2018 Baseline

WMD	ALG fields	ALG area	ILG fields	ILG area
	Fields	Acres	Fields	Acres
NWFWMD	28,701	658,645	958	52,829
SFWMD	37,760	3,014,637	7,306	1,132,766
SJRWMD	34,596	1,198,386	5,102	161,363
SRWMD	27,863	808,525	2,198	144,415
SWFWMD	41,339	1,910,398	10,379	385,244
Total FSAID VII	170,259	7,590,591	25,943	1,876,617

Table 2. 2018 Florida Irrigated Cropland Acreage by Primary Crop

Primary Crop	2018 Acres	Share of total
Citrus	539,772	29%
Field Crops	165,493	9%
Fruit (Non-citrus)	37,118	2%
Greenhouse/Nursery	58,881	3%
Hay	160,388	9%
Potatoes	31,728	2%
Sod	53,564	3%
Sugarcane	591,788	32%
Vegetables (Fresh Market)	237,884	13%
Total	1,876,617	100%

C. Projections of Future Irrigated Areas

The following sections describe how increases or decrease in irrigated area in Florida counties are estimated and spatially distributed.

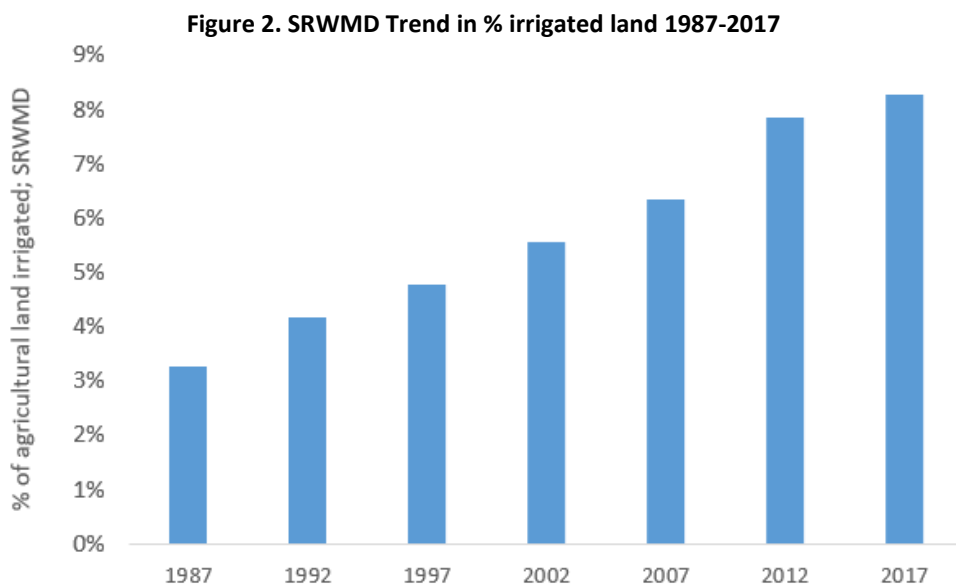
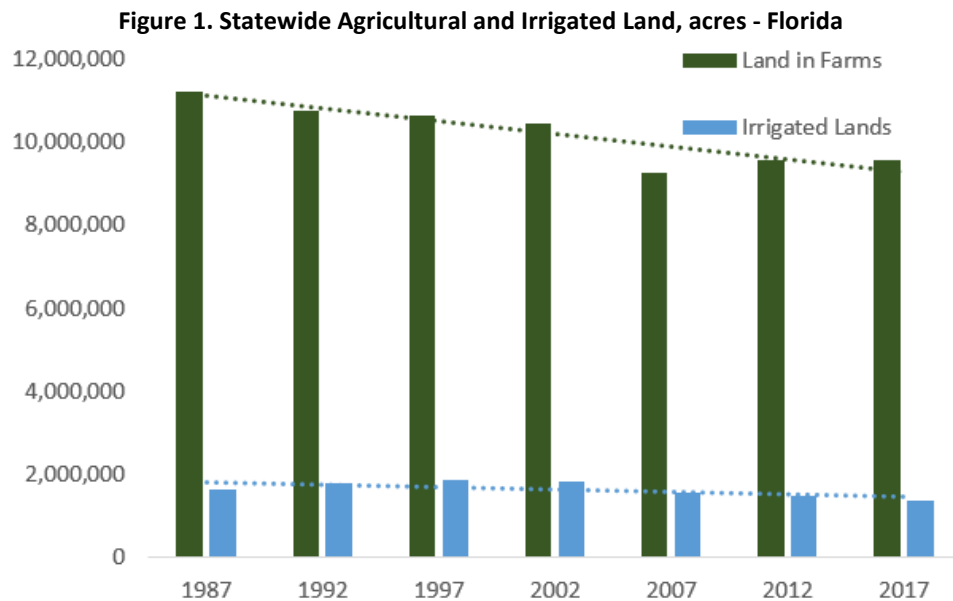
Trend Analysis from USDA Census Data

Long-term projections of irrigated agricultural lands were developed using historical, survey-based, county totals of irrigated and agricultural lands for each Florida county. The USDA National Agricultural Statistics Service (NASS) reports total agricultural land and irrigated land every five years and is the longest consistent data stream available.⁴ NASS data was used to develop trend analysis for each county from 1987-2017; **Appendix A** provides graphs of historical and projected irrigated acreage for each of Florida's 67 counties.

Total irrigated land for each county was used to build a ratio of irrigated area to agricultural area. Consistent with national trends, urbanization continues to displace agricultural land in Florida. However, a higher proportion of remaining agricultural lands become irrigated, as the long-term trends in USDA Ag

⁴ NASS data is available for 1982, but a significant change in how the data was reported in 1987 renders intertemporal comparisons not meaningful. Hence 1987 was used as the earliest year for trend analysis.

Census data show (Figure 1). The share of agricultural land in SRWMD more than doubled in the Ag Census period from 1987-2017 (Figure 2).



Regression procedures were used to forecast county-specific trends in irrigated share based on statistical fit. The trend in total agricultural land was projected to 2045 for each county, and the projected change in share of agricultural land that is irrigated was used to forecast irrigated land. The functional form of each regression was selected based on best-fit criteria from logarithmic, linear, exponential, and power forms. In some counties, trend type was selected manually based on agricultural expert input or reasonableness of projected future acreage.

Spatial Distribution of Projected Irrigated Area Changes

The county-level additions or declines in irrigated area were spatially distributed in the projections ILG using numerous decision rules for selecting ALG fields to become irrigated or ILG fields to become not irrigated. In counties with projected increases in irrigated acreage, R routines were used to select non-irrigated ALG fields to become irrigated until sufficient acreage is added in each projection period. The following conditions were used to constrain irrigated area additions, meaning if an ALG field was any of the following, it would not be a candidate for irrigation in a future period:

- Overlaps Florida Natural Areas Inventory (FNAI)
- NRCS Land Capability Classification > 5 (indicates lower quality soils)
- Overlaps a SFWMD planned surface water project.

Areas added to the ILG were prioritized based on having a WUP currently and being near roads. This means that the routine for ALG fields becoming irrigated, first looks at ALG fields overlapping an existing WUP for agricultural use, then looks at ALG fields with a distance to roadways less than half the county-average distance of ALG fields to roads, then looks at unpermitted ALG fields with above-average distance to roads. Acreage increases in Osceola County were adjusted manually to account for the additional irrigated acres specified in the North Ranch Sector Plan.

For counties with a projected decrease in irrigated area, those decreases were required to occur in non-EAA regions, as the EAA is assumed to remain stable. However, a substantial exception to this occurs in Palm Beach County, with approximately 17k acres removed from the ILG in 2025 to accommodate the A-2 reservoir. Also, the projections were adjusted to reflect land use change regulations in Palm Beach County's Ag Reserve area, in which 60% of all agricultural area is zoned to be maintained as agriculture. This constrained the acreage decline in Palm Beach County to be less than that predicted from the trend based on the historical Ag Census data.

Projected agricultural acreage and irrigated acreage through 2045 by county are provided in **Table A-1** in the **Appendix A**. **Figure 3** illustrates the changes in irrigated areas from 2018 to 2045 by county; the majority of counties with large percent increases in irrigated area are in the northern portion of the state. Resulting acreage projections by District are provided in **Table 3**.

Figure 3. County Level Projected Change in Irrigated Area: 2018 to 2045

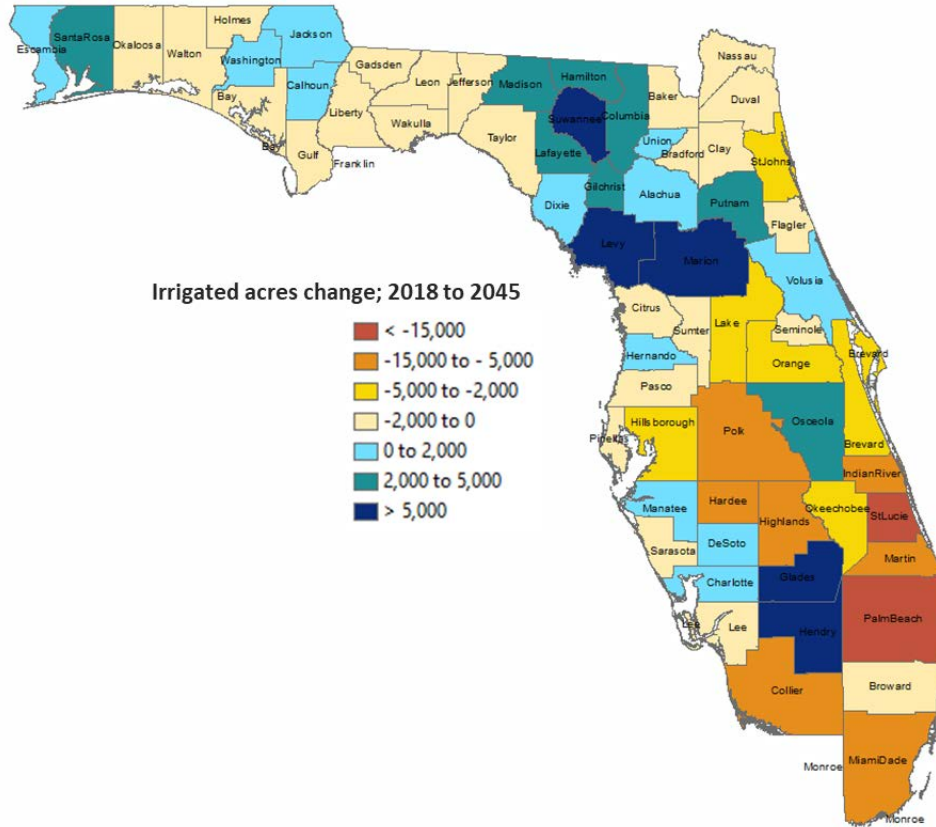


Table 3. Projected Irrigated Acreage by District

WMD	2018	2020	2025	2030	2035	2040	2045	2018-2045	2018-2045
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Difference	% Difference
NWFWMD	52,829	53,314	54,488	55,629	56,769	57,930	59,066	6,237	12%
SFWMD	1,132,766	1,129,448	1,108,957	1,105,067	1,102,432	1,098,930	1,094,503	(38,263)	-3%
SJRWMD	161,363	161,276	158,912	156,773	154,947	153,103	150,793	(10,571)	-7%
SRWMD	144,415	146,758	152,818	158,730	164,304	170,199	175,865	31,451	22%
SWFWMD	385,244	384,938	383,929	382,837	381,613	380,068	378,666	(6,578)	-2%
Total	1,876,617	1,875,734	1,859,104	1,859,037	1,860,064	1,860,230	1,858,893	(17,724)	-1%

D. Estimated Water Use

As required by Florida Statute, observations of irrigation water use form the basis for the FSAID estimates of spatially distributed statewide irrigation demand. Metered and reported water use data is collected each year from the Water Management Districts. Historical metered/reported data extends from 2007 to 2018, and these data were used to develop an analytical model to estimate irrigation water demand. The model specification is estimated using Ordinary Least Squares regression analysis to generate coefficients from the actual water use for each field-level variable. Variables include agronomic variables (crop choice, location, climate), engineering or physical factors (irrigation equipment, plot size) and economic or behavioral factors (crop prices); the dependent variable is actual water use, derived from metered or

reported water use data (hereafter, “metered data”). The model was initially developed based on published literature reflecting national trends in agricultural irrigation, and has been refined each year based on feedback from Districts, producers and academics⁵. In the FSAID VII model, approximately 64,000 field observations (from 2007-2018) are included in the dataset used to generate model coefficients. The R² or statistical “fit” of the model output to actual data is 0.77.

Appendix E provides further detail on the model inputs, a detailed example of the model and discussion of specific elements of the model including price, costs and soils data.

i. Metered Data Records

The existing dataset of metered data records across Districts includes 12 years of permit-level water use from years 2007-2018. Input data was thoroughly evaluated for outliers, infeasible estimates based on irrigated area, and statistical heterogeneity. Multiple thresholds for inclusion in the dataset were tested including multiple standard deviations from the mean by crop by district; numerous percentile-based thresholds by crop by district; and hard upper or lower bounds (e.g.; 100 inches/year). Repeated statistical testing determined that the 25th and 90th percentile thresholds performed best and had values most representative of typical irrigation practice, and these thresholds were used to cull data for input to the water demand model.

Table 4 provides a summary by crop of metered data records; this includes field-level observations for each year from 2007-2018. Therefore, the total acreage of metered data in the input dataset greatly exceeds the current ILG, which represents only current, baseline irrigated area. **Appendix E** provides additional detail on screening of input data and distribution by District.

Table 4. Metered Data Records Summary by Crop

Primary Crop	Acres	Sample Size, n
Citrus	2,646,638	25,448
Field Crops	335,879	3,915
Fruit (Non-citrus)	58,116	3,462
Greenhouse/Nursery	107,105	8,802
Hay	503,067	2,662
Potatoes	104,695	1,274
Sod	219,522	2,096
Sugarcane	746,907	2,692
Vegetables (Fresh Market)	881,893	13,561
Total	5,603,822	63,912

For context, Table 5 provides statewide average inches/year by crop as calculated by the Agricultural Field Scale Irrigation Requirements Simulation Model (AFSIRS) for FSAID I, metered data for the previous FSAID VI, and the current FSAID VII (metered) dataset.

⁵ See de Bodisco, C. (2007); Livanis, G., et al (2006); Moss, C. (1998); Schoengold, K., et al (2006); Chalfant, James A. (1984); Edwards, B. et al (1996).

Table 5. Statewide Average Inches per Year by Crop

Primary Crop	FSAID I AFSIRS results	FSAID VI Metered or Reported Usage Input	FSAID VII Metered or Reported Usage Input
Citrus	14.4	12.0	11.8
Field Crops	10.2	9.4	9.6
Fruit (Non-citrus)	16.6	27.2	25.8
Greenhouse/Nursery	48.6	29.8	29.2
Hay	15.1	9.6	9.8
Potatoes	12.5	15.2	15.3
Sod	37.5	12.0	12.1
Sugarcane	24.6	18.0	16.7
Vegetables (Fresh Market)	11.9	16.8	17.6
Total	19.5	13.8	13.6

ii. Current Water Use Estimates

The resulting current water use estimates reflect a 0.2% decrease in overall irrigated acreage over the prior year (FSAID VI) and a 0.36% decrease in overall water use as measured in Millions of Gallons per Day (MGD) and a 0.2% decrease in overall intensity, as measured in inches/year; see **Table 6**. Current baseline year 2018 irrigation water demand and the projected water demand for periods 2020-2045 were modeled using the average of rainfall and ET from 2005-2018.

Table 6. Estimated Statewide Water Use, 2018

Statewide	2018	2018	2018
Crop	Acres	MGD	IN/YR
Citrus	539,772	457	11.4
Field Crops	165,493	119	9.7
Fruit (Non-citrus)	37,118	76	27.4
Greenhouse/Nursery	58,881	146	33.4
Hay	160,388	112	9.4
Potatoes	31,728	38	16.1
Sod	53,564	49	12.4
Sugarcane	591,788	659	15.0
Vegetables (Fresh Market)	237,884	313	17.7
Total	1,876,617	1,970	14.1

Source: SFWMD and TBG Work Product *Everglades Agricultural Area (EAA) area of 451,331 acres is held constant for sugarcane at 478 MGD

E. Projected Water Use Methodology

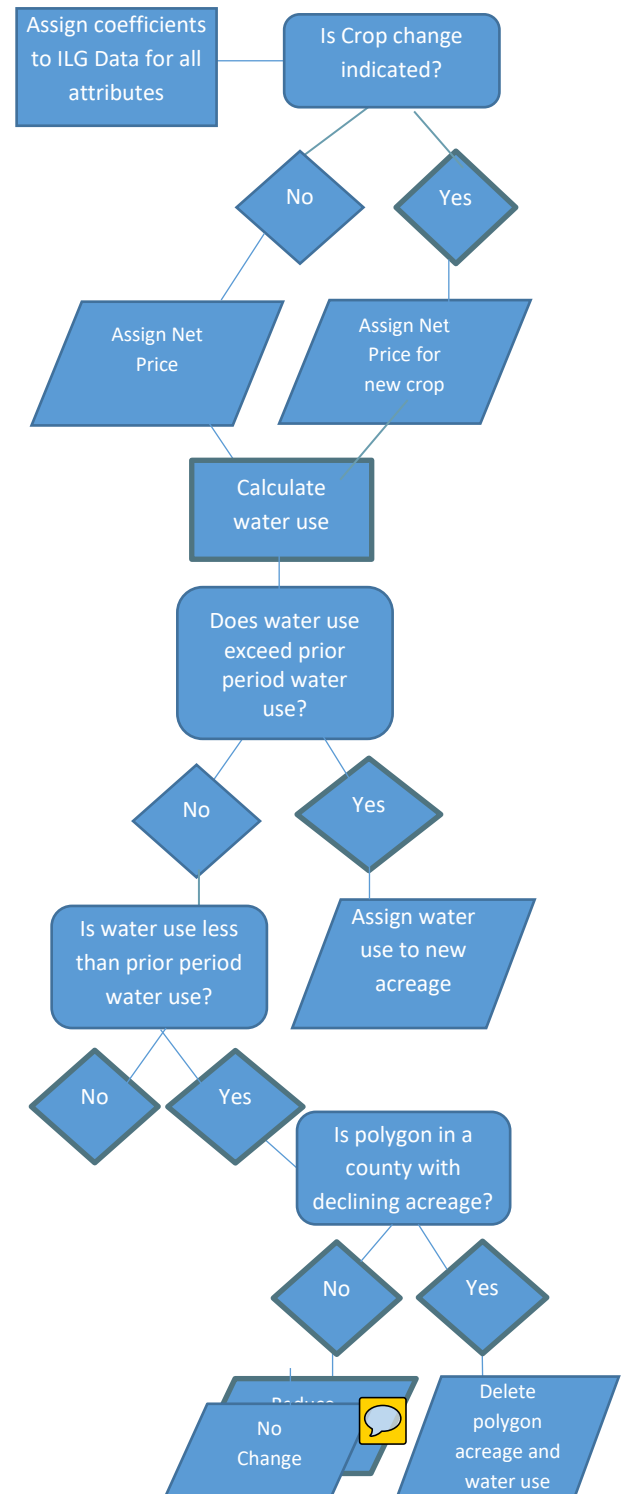
Projected water use for the time period 2020-2045 is estimated by simulating future conditions using coefficients from the econometric model, and substituting forecast future values for each variable. Since location and climate-related variables are either fixed or long-term averages, the simulation is driven mainly by price and cost forecasts and future land area, which are discussed in turn. For planning and comparison purposes, a baseline estimate for 2018 is also included that uses average values for rain and ET.

i. Price Simulation

Future water use estimates were simulated by updating each explanatory variable in the model, and using the regression equation to estimate future water use. Each variable was estimated as follows:

1. Prices and costs were forecast for five-year periods from 2020 to 2045 using 10-year crop price forecasts from USDA, Food and Agricultural Policy Research Institute (FAPRI) extended using a crop specific growth trend.
 - a. Forecast net revenue can be used to adjust crop mix to maximize farm profit subject to soil and land use constraints. Crop prices are based on crop categories, rather than individual plant types. For example, a producer adding satsumas to existing citrus production would not be considered a change, while a producer adding satsumas to a non-citrus production would be considered a change. Using current forecast trends, several crop mix changes were evaluated and addressed:
 - b. Areas with anticipated increases in acreage were previously restricted to non-citrus crop categories unless the District was currently growing citrus; the restriction was relaxed for the current version. Satsumas are increasing in areas traditionally not identified as citrus areas.
 - c. The sugarcane net revenue exceeds sod after 2035, ending the 2045 projection period about \$750 per acre higher. There is a degree of uncertainty surrounding sod production, which is closely tied to the construction industry, due to the global pandemic, but no crop mix change was incorporated for this situation.

Figure 4. Spatial Distribution of Water Use Process



2. The irrigated acreage changes were used to identify irrigated acreage for each five-year interval, as described in **Section C: Projections of Future Irrigated and Agricultural Land Area**. The net revenue variable was calculated by applying updated net revenue values to forecasted acreage.
3. ET and rainfall variables were updated by calculating mean historical values for an average year (2005-2018), assigned at the farm level.
4. Estimated coefficients from the regression model were applied to forecast variables to simulate projected water use. The change in total water use was estimated at the field level, and applied to the acreage increase or decrease in each county.

ii. Spatial Distribution of Future Water Use

Spatial distribution of water use was applied according to the process outlined in **Figure 4**. Future water use changes that exceed water applied to current acreage were allocated across fields that were added to the ILG in future periods.

In some counties, agricultural acreage might not be sufficient to absorb the projected irrigated acreage after the constraints were applied, and if so, the acreage would be capped once the available land identified in the ALG was used. Conversely, if a county indicated fewer irrigated acres, the algorithm identified fields to remove from the ILG, with accordant water use. Crops were assigned based on the indicated crop mix from modeling results; i.e. the “excess” water from crops (crops that show higher water use for increased acreage). The predominant irrigation system used in the county for the crop was assigned. Rainfall and ET were assigned in the same manner as the rest of the ILG.

iii. Sensitivity Analysis

A number of model iterations were run to test the sensitivity of various parameters and alternative approaches to measuring variables. Sensitivity analysis was conducted to compare the impacts of truncating outliers through several approaches as detailed in **Appendix E**. A variety of scenarios affecting crop prices were tested and assessed for sensitivity on results. The citrus evaluation is described in more detail in **Appendix E**.

Water Use Projection Results

F. Average Year Estimates

The resulting statewide water use estimates for each five-year period are provided in Table 7 by crop, and **Table 8** by District. The net decrease in irrigated acreage of 17,724 acres over the period through 2045 is accompanied by a net increase in irrigation volume of 20 MGD for an average year and 27 MGD for a dry year (1-in-10). The effects are unevenly distributed by District, with a 35% increase in irrigation demand expected in Suwannee River Water Management District by 2045 and a 26% increase in irrigation demand in Northwest Florida Water Management District (although the latter comprises only about 11 MGD). Detailed breakdowns of county-level acreage by crop and district are included in **Appendix C**. **Figure 5** illustrates the percent change in irrigation water demand by county from 2018 to 2045.

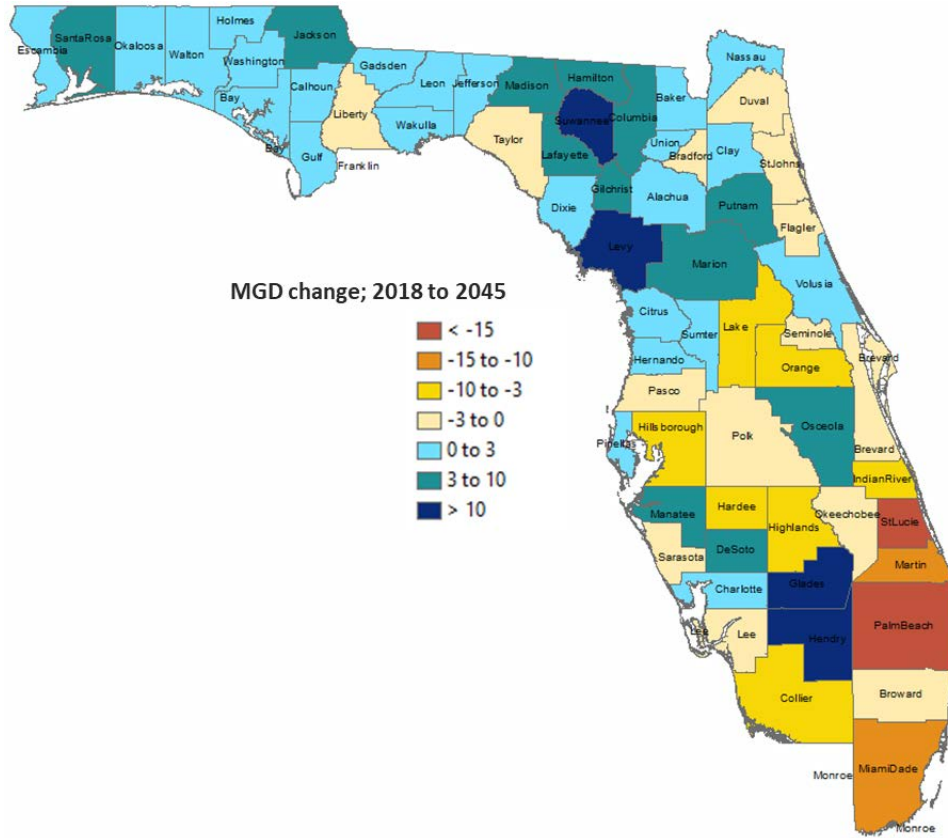
Table 7. Water Use Estimates by Crop Average Year

Statewide	2018	2020	2025	2030	2035	2040	2045
Predominant Crop	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD
Citrus	457	450	449	450	452	453	451
Field Crops	119	122	125	129	134	139	144
Fruit (Non-citrus)	76	77	77	79	79	78	78
Greenhouse/Nursery	146	146	147	143	144	145	146
Hay	112	113	112	112	111	109	107
Potatoes	38	38	38	38	38	38	38
Sod	49	49	49	48	48	48	48
Sugarcane	659	660	642	643	643	644	646
Vegetables (Fresh Market)	313	314	317	322	327	330	333
Total	1,970	1,968	1,957	1,963	1,975	1,984	1,990

Table 8. Water Use Estimates by District, Average Year

WMD	2018	2020	2025	2030	2035	2040	2045
	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD	Avg MGD
NWFWMD	42	43	45	47	49	51	53
SFWMD	1,245	1,239	1,217	1,213	1,211	1,207	1,201
SJRWMD	185	185	184	182	182	181	179
SRWMD	130	134	143	150	159	167	176
SWFWMD	369	367	369	372	376	379	381
Total	1,970	1,968	1,957	1,963	1,975	1,984	1,990

Figure 5. County level projections of change in irrigation demand: 2018 to 2045



G. Dry Year Estimates

Dry year estimates were calculated using crop and District-specific ratios of average irrigation water use to 1-in-10 use. The FSAID dry year estimates represent the irrigation demand that would be expected in 1 out of 10 years. Statewide, the overall average ratio is 1.34, but this varies widely by District. **Table E- 8** in **Appendix E** provides the ratios by crop and District and **Appendix E** also provides a more detailed description of how the average-to-dry ratios were developed. **Table 9** provides Dry Year Estimates by District, and Table 10 shows Dry Year Estimates by Crop.

Table 9. Water Use Estimates by District, Dry Year (1-in-10)

WMD	2018	2020	2025	2030	2035	2040	2045
	Dry MGD	Dry MGD	Dry MGD	Dry MGD	Dry MGD	Dry MGD	Dry MGD
NFWWMD	58	60	62	65	68	71	73
SFWMD	1,667	1,659	1,630	1,625	1,623	1,619	1,612
SJRWMD	262	262	260	257	257	255	253
SRWMD	166	172	183	193	204	215	226
SWFWMD	518	514	516	521	526	531	534
Total	2,671	2,667	2,652	2,661	2,677	2,690	2,698

Table 10. Water Use Estimates by Crop, Dry Year (1-in-10)

Statewide	2018	2020	2025	2030	2035	2040	2045
Predominant Crop	Dry MGD	Dry MGD	Dry MGD	Dry MGD	Dry MGD	Dry MGD	Dry MGD
Citrus	676	665	663	664	667	669	666
Field Crops	157	160	165	169	176	183	189
Fruit (Non-citrus)	96	98	98	101	102	101	102
Greenhouse/Nursery	163	163	165	160	161	162	163
Hay	159	160	159	158	157	155	152
Potatoes	55	55	56	56	55	55	55
Sod	60	60	59	59	58	58	58
Sugarcane	909	910	886	887	888	889	891
Vegetables (Fresh Market)	395	396	400	407	413	418	421
Total	2,671	2,667	2,652	2,661	2,677	2,690	2,698

H. Frost and Freeze Protection Estimates

Irrigation for freeze protection is used on a variety of cold-sensitive crops in Florida. Freeze protection water volumes are a small percentage of the total statewide demand for normal irrigation (about 5%), but the withdrawals happen over a brief period, meaning that the impacts from these withdrawals can be significant. Frost protection water use in FSAID is limited to the major crops commonly requiring freeze protection: strawberries, blueberries, peaches, citrus, and ferns. Freeze-related irrigation events were estimated to occur on days with minimum temperature at or below freezing for fields in the ILG where crop type matched one of those listed above.

The USGS gridded Evapotranspiration (ET) data (from GOES platform) from 1996 to 2018 were used for estimating the average number of annual freeze events at ILG fields with a crop type that would be freeze protected. The dataset includes minimum temperature at 2km grid resolution, which was used to count the annual number of freeze events at the locations of ILG fields which would likely be freeze protected. The annual freeze events at ILG locations were then averaged at the county level for the 22-year period. The average number of freeze events for a county was combined with information on crop type and irrigation system to calculate annual average amounts of freeze protection water use. To calculate the amounts of freeze-protection water, the following irrigation intensities were used: 0.07 inches/hour for micro-spray irrigated citrus, 0.2 inches/hour for blueberries, strawberries, or peaches, and 0.3 inches/hour for ferns. A 14-hour freeze event duration was used. Frost/freeze water demand for future projections of the ILG varies from the current frost/freeze demands due to the additions or deletions of ILG polygons classified as Non-Citrus Fruit (which would include strawberry, blueberries, and peaches) and Citrus. It was assumed that all additional acres of Non-Citrus Fruit and Citrus in the ILG projection periods would be irrigated for freeze protection.

The average annual frost protection demand for the current ILG was about 87 MGD on an average annual daily flow (AADF) basis. This increases to about 92 MGD by 2045 due to additions of new irrigated areas

being projected to have crop types that would be freeze protected. **Table 11** summarizes freeze protection estimates at the District level.

Table 11. Estimated Freeze Protection Estimates by Year

WMD	2018	2020	2025	2030	2035	2040	2045
	MGD	MGD	MGD	MGD	MGD	MGD	MGD
NFWWMD	0.06	0.13	0.31	0.51	0.63	0.74	0.85
SFWMD	18.72	18.74	18.75	18.72	18.82	19.01	18.67
SJRWMD	16.38	16.24	16.10	16.13	16.01	15.77	15.50
SRWMD	1.62	2.52	4.31	5.88	7.01	8.14	9.49
SWFWMD	49.84	49.75	49.25	48.87	48.49	48.04	47.71
Total	86.63	87.38	88.72	90.11	90.96	91.70	92.22

In **Appendix D, Table D-1** provides a breakdown by Crop by District for freeze protection estimates, and **Table D-2** provides the county-level breakdown.

I. Conservation Estimates/ Irrigation Efficiency Improvements

Under Florida Statute 570.93, “projected future water demands must incorporate appropriate potential water conservation factors”. For purposes of incorporating potential water conservation factors, estimates of improvements in irrigation efficiency that can reasonably be expected over the planning period have been developed.

Two main datasets were explored for the purpose of estimating future irrigation efficiency improvements: the Mobile Irrigation Labs (MIL) actual water savings (AWS) data and the USDA’s Farm and Ranch Irrigation Surveys, known as FRIS. The documented actual water savings through the MIL program are based largely on improvements in irrigation system distribution uniformity. The data available for MIL-based irrigation improvements from scheduling changes and sensor-based automation and other management improvements are not of sufficient length to develop long-term future projections in conservation. Also, the MIL program data have shown substantial water savings in some regions, but very limited participation in other areas. For example, the AWS estimated through the MIL in the Apalachicola Chattahoochee Flint River Basin has been very large in recent years, but the unusual participation rate and dominance of center-pivot irrigation systems makes it difficult to translate these results to other parts of the state.

Data reflecting changes in farmers’ use of irrigation water over the past 40 years is available from the USDA Farm and Ranch Irrigation Surveys, known as FRIS. For FSAID VII an additional survey year was added to the analysis of long term water per area trends: the 2018 Irrigation and Water Management Survey. Using long-term trends avoids the uncertainty of estimating at the field level exactly what type of management change would be made and how many farms or fields would be expected to make that change. The FRIS estimates show that over the entire time period for which data is available (1978-2018), the average farmer in Florida has decreased the amount of water used by 6,600 gallons/acre/year (which declines to 4,200 gallons/acre/year for the projection period of 2020-2045).

Some of the efficiency improvements will be due to irrigation system changes that have already been mostly implemented in many areas of the state (primarily a shift from gravity systems to drip and micro-spray systems); therefore, remaining improvements are likely to come from management changes through better scheduling and/or sensor-based automation. Evaluation of the FRIS data for the period from 2003-2018 shows approximately 5,200 gallons/acre/year in improvement, which is likely more representative of future improvements to irrigation efficiency on newly irrigated land and for fields irrigated with drip or microsprinkler systems. This is reduced to 3,500 gallons/acre/year for the projection period of 2020-2045. Two exponential trends from the FRIS dataset were used to estimate future irrigation efficiency improvement. The trend from 1978-2018 is used for currently irrigated fields that are not drip or microsprinkler irrigated, and the more conservative trend from 2003-2018 is used for newly irrigated fields or those irrigated with drip or microsprinkler. **Appendix E** provides more detail on the calculations used to derive the estimates and the supporting literature.

The resulting estimate of total irrigation efficiency improvements is 134 MGD by 2045, or about 7% of total irrigation demand. **Table 12** provides a summary of estimated efficiency improvements by District.

Table 12. Estimated Efficiency Improvements by District

WMD	2020	2025	2030	2035	2040	2045
	MGD	MGD	MGD	MGD	MGD	MGD
NFWWMD	0.92	3.05	4.78	5.71	6.57	7.29
SFWMD	8.79	26.58	37.85	43.94	48.11	50.82
SJRWMD	3.21	10.27	15.90	20.12	23.61	26.48
SRWMD	3.08	10.35	17.15	22.65	27.27	30.10
SWFWMD	2.99	9.36	13.00	15.71	18.03	19.79
Total	18.99	59.61	88.69	108.13	123.57	134.48

Detailed efficiency improvements estimates are provided in **Appendix D** by Crop by District (**Tables D-3 through D-7**), and by county (**Table D-8**).

J. Livestock and Aquaculture Water Use

Livestock demands were determined using animal inventories from USDA Ag Census data and the typically utilized per animal daily water use. The most current Ag Census (2017) was used to define the numbers of cattle, cows, poultry, horses, and other livestock. Livestock inventories from the Ag Census have remained relatively stable in Florida for the last four censuses (2002, 2007, 2012, and 2017). The inclusion of updated Ag Census data for livestock inventories did not result in major changes in total livestock water demand estimates.

For purposes of estimating the future water use, stable livestock inventories and water use are assumed in the coming decades. The approach was reviewed with experts and the cattle industry who agreed that constant livestock inventories seemed reasonable for the projection period to 2045. Extensive review of the literature and agency reports on national and global consumption of livestock products was reviewed to further assess future direction in demand of livestock products. This review confirmed the approach

of holding future livestock water demands constant. Total statewide livestock demand for current conditions is estimated at 38.7 MGD.

County-level water withdrawals for aquaculture were compiled using USGS 2015 water use data. Additionally, CUPs for several counties were found to have available metered data for aquaculture withdrawals, and these were used in conjunction with the USGS county-level aquaculture withdrawals to produce statewide aquaculture water demands. The maximum of county level sums of CUP-reported water use and USGS aquaculture water use was used. For counties with zero water use from the combination of USGS county-level aquaculture withdrawals and CUP data, aquaculture water demands may still occur if aquaculture features are present in the spatial dataset. The average statewide water demand per unit area for aquaculture features was used to estimate aquaculture water demand for features in counties with no other county total for aquaculture. Current aquaculture water use for 2018 is estimated to be 15.7 MGD. Future aquaculture demands are held constant for all counties except Miami-Dade. Future aquaculture demand is estimated to increase in Miami-Dade County from 0.56 MGD currently to 0.70 MGD in 2020 and 1.11 MGD in 2025 through 2045. The increase in Miami-Dade is based on permit information for a large Atlantic Salmon aquaculture operation.

Spatial distribution of county-level livestock and aquaculture water use at the sub-county level was achieved using ALG features with Crop2018 of Livestock or Aquaculture or Crop of Improved Pastures. While there are several crop types in the ALG that might have grazing livestock present, only improved pastures are included in the livestock layer for the purposes of spatially distributing the county totals of livestock water use. This provides sufficient spatial disaggregation of water demands, while reducing the size and complexity of the livestock/aquaculture spatial dataset.

The statewide livestock inventory and water use is summarized in **Table 13**, and the total livestock and aquaculture water demands by District are presented in **Table 14**. A table of the county totals for livestock and aquaculture water demand are provided in **Appendix D, Table D-9**.

Table 13. Statewide Livestock and Aquaculture Totals for Current and Projected Periods

Animal group	Estimated Number of Animals (FSAID III to V)	Estimated Number of Animals (FSAID VII)	Water Use per Animal (gpd/head)	Total Demand (mgd)
Dairy Cows	121,200	110,517	150	16.58
Beef Cattle	1,575,531	1,635,520	12	19.63
Poultry, chickens	13,026,011	13,142,919	0.09	1.18
Equine	120,997	90,738	12	1.09
Goats	57,613	61,159	2	0.12
Hogs	17,622	13,422	2	0.03
Sheep	11,763	24,416	2	0.05
Aquaculture	NA	NA	NA	15.72
Statewide Livestock and Aquaculture Total Demand				54.39

Table 14. Livestock and Aquaculture Total Water Use by District, MGD

WMD	Livestock Water Use (mgd)	Aquaculture Water Use (mgd)
NFWWMD	2.0	4.7
SFWMD	12.1	2.5
SJRWMD	4.5	1.8
SRWMD	9.8	0.4
SWFWMD	10.2	6.3
Total	38.7	15.7

FSAID Online Interface and Geodatabase

An online user interface was prepared to allow easier access to the agricultural acreage and water demand data. This dashboard is accessible at:

<https://datavisual.balmoralgroup.us/FDACS-FSAID7>

In addition to the web-based interface, the complete FSAID VII geodatabase has been made available. This contains shapefiles of water demand to facilitate further analysis and application of spatial water demand data. All appropriate metadata has been provided in the geodatabase. The FSAID VII geodatabase includes:

- The projections ILG: 2018 to 2045 irrigated acreage, crop type, average year and dry year water demand, conservation estimates, and freeze protection estimates (based on average 2005-2018 rainfall and ET)
- The 2018 ILG: includes only the base year 2018 irrigated areas and water demands (based on 2018 actual rainfall and ET)
- The ALG, which includes both irrigated and non-irrigated agricultural areas
- Livestock and Aquaculture: water demand estimates for all livestock and aquaculture
- Climate Factors: links the 2018 ILG with attributes for rainfall and ET (both for 2018 and 2005-2018 average), and soils (mukey and land capability classification)

Conclusions and Discussion

Summary

Overall agricultural water demand in Florida is anticipated to increase about 1% over the next 25 years (not considering the potential conservation), on a base of declining agricultural land. While irrigated lands decrease by 1% through 2045, the irrigation water demands are projected to increase by 1% due to shifts over time to crops of higher water demand and potentially increased multi-cropping. A number of factors will influence the agricultural irrigation patterns of Florida farmers over the next 25 years. The current FSAID water demand projections assume climate stability; therefore, any future rainfall and temperature changes that result in substantial impacts on irrigation water demand are not modelled here.

The increase could be partly offset by estimated improvements in efficiency. On a per acre basis, Florida farmers are projected to increase their irrigation efficiency by about 0.25% per year. Management practices can have an even greater influence than irrigation equipment, and the increased adoption of technology by Florida farmers continues to result in improvements in conservation of water. To the extent that more significant conservation quantities are desired, significant incentives are likely to be required to meaningfully shift this trajectory.

The FSAID model incorporates historical behavior, through actual water use records, as well as behavior that is forward-looking (based on projections of prices and costs), through spatial allocation of future water demand. Increased irrigation intensity revealed in the forecasts reflects both anecdotal and quantitative evidence and continues a trend reported nationally and regionally. As urbanization encroaches on rural lands, and as western irrigation practices migrate toward Florida, lands that traditionally were not irrigated, or irrigated for small portions of the year, are increasingly irrigated at a greater rate. As well, as citrus groves are replanted at higher density, producers report higher overall water use per acre. At the same time, the accelerated crop loss from greening within the citrus industry, and poor price forecasts for citrus, have dampened projected water demand from previous projections.

As described in Appendix E, hemp production in Florida is beginning, and strong consumer demand for hemp-derived products suggests this could be an important crop for Florida agriculture. As the regulatory landscape evolves and as data on current hemp production area and management practices becomes available, the future refinements to FSAID will incorporate hemp into the production types projected for future water demand.

Also, the current COVID-19 disease pandemic has introduced another source of uncertainty in agricultural demands and market conditions. Some producers in Florida have reported about 30% declines in revenues as a result of pandemic effects on markets (Court et al. 2020). The severe drop in restaurant sales impacts some Florida producers that rely heavily on sales to restaurants. This may affect crop decisions and acreage in the short term or beyond. Future estimates of agricultural water demand in Florida will evaluate agricultural market recovery and long-term impacts of COVID-19.

The U.S. Farm Bill, sugar tariffs, energy policy (e.g. biofuels), the United States-Mexico-Canada Agreement (USMCA), and water quality rules can all exert significant influence on agricultural practices, and, in turn, agricultural irrigation demand. Sugarcane and citrus are by far the greatest variables in Florida's agricultural water use. Sugarcane is the single largest user of water in Florida agriculture. However, if sugarcane production were halted tomorrow, there is not an expectation that agricultural production in the EAA would cease; rather, production would likely shift to fresh market vegetables and other products that take advantage of Florida's unique harvest market season, potentially increasing total water use. Citrus production is down markedly and expected to continue to be low for the immediate future; some producers have already shifted some productive areas to fresh vegetables and have abandoned other lands. Citrus greening still presents substantial challenges to citrus farmers' ability to plan long-term production. In current terms, avoiding all stress to citrus stock and frequently resetting groves with much smaller trees reflect different irrigation practices than traditional management. This report incorporates estimates from the Florida Department of Citrus to place realistic bounds on likely future citrus

production. Overall policy changes or external market or climate factors will affect agricultural demand for water in Florida. However, adjustments would be spread over time, and are likely to affect overall water use at the margin.

To summarize: the FSAID water demand projections are based on more than 10 years of farm-level water use data, County-specific trends in irrigated areas, historical, crop-specific price and cost data, climate factors, and location. The model is empirical in that it is built on local agricultural irrigation usage data. While there is uncertainty in the economic and environmental factors that might impact agricultural water use in Florida, the FSAID approach is data-driven and can be updated to reflect changing market or climate inputs as new insights and data emerge. The agricultural water demand datasets from the FSAID program can be used to inform water supply planning efforts in Florida.

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