

Technical Publication SJ96-4

BENCHMARK FARMS PROJECT

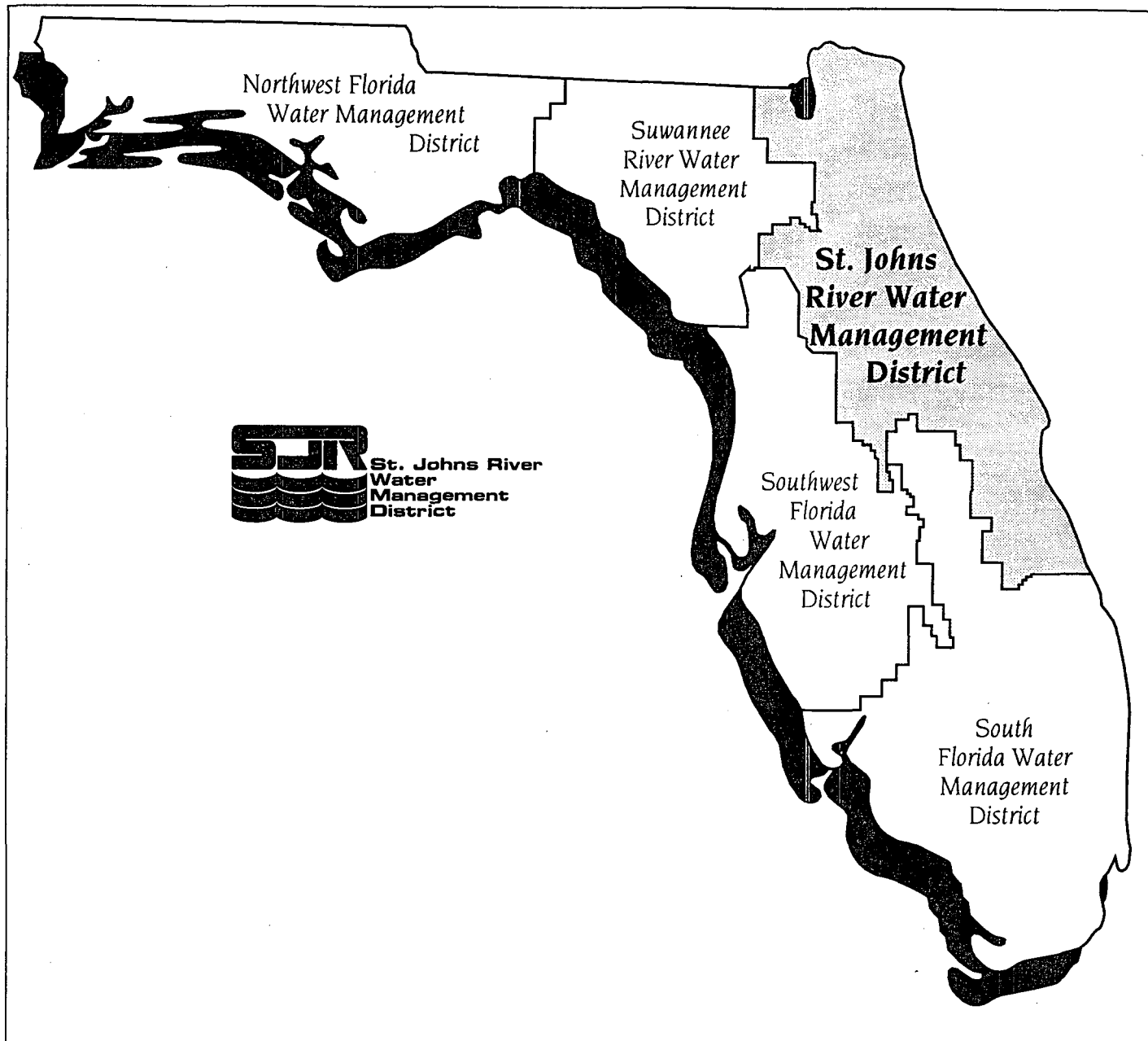
**WATER USE REPORT ON
LEATHERLEAF FERN AND POTATOES
(1990-94)**

by

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Palatka, Florida

1996



The **St. Johns River Water Management District (SJRWMD)** was created by the Florida Legislature in 1972 to be one of five water management districts in Florida. It includes all or part of 19 counties in northeast Florida. The mission of SJRWMD is to manage water resources to ensure their continued availability while maximizing environmental and economic benefits. It accomplishes its mission through regulation; applied research; assistance to federal, state, and local governments; operation and maintenance of water control works; and land acquisition and management.

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EXECUTIVE SUMMARY

In 1981, the St. Johns River Water Management District (SJRWMD) initiated an agricultural irrigation monitoring project called the Benchmark Farms Project. The purpose of this project is to collect field-measured data to evaluate crop-specific water use. In lieu of monitoring all growers in a crop area, SJRWMD established a network of monitoring sites on representative properties of agricultural water users. Grower participation in the program is voluntary; it is an ongoing program.

This report, presented as part of the Benchmark Farms Project, includes field-measured irrigation water use data on leatherleaf fern and potatoes. This information provides an overall view of crop irrigation requirements and an estimate of the water withdrawn for the crop-specific areas. This report documents water use during the 5-year period 1990–94. In 1994, SJRWMD monitored 46 leatherleaf fern sites and 55 potato sites.

During the 5-year study period, the average total water use for irrigation of leatherleaf fern (including freeze protection) was 37.53, 38.39, 41.73, 37.11, and 28.38 inches per year (in/yr), respectively. During this period, 70% of all growers used less than 45 inches (in.) of water per year and about one-third of all growers used 30–40 in. of water per year. For irrigation purposes only, 68% of all growers used less than 30 in. of water per year, 88% used less than 40 in. of water per year, and almost 40% of all growers used 20–30 in. of water per year.

Water use for the irrigation of potatoes was 13.57, 7.09, 14.67, 13.51, and 13.97 in/yr, respectively, for 1990–94. Excluding the 1991 growing season, which had an extremely high rainfall, 59% of all growers used less than 14 in. of water per year, 82% used less than 18 in. of water per year, and almost one-third used 10–14 in. of water per year. The irrigation season for potatoes is generally concentrated in the months February through May in the area covered by SJRWMD.

Water Use Report on Leatherleaf Fern and Potatoes

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INTRODUCTION

In 1981, the St. Johns River Water Management District (SJRWMD) initiated an agricultural irrigation monitoring project called the Benchmark Farms Project. The purpose of this project is to collect field-measured data to evaluate crop-specific water use. In lieu of monitoring all growers in a crop area, SJRWMD established a network of monitoring sites on representative properties of agricultural water users. Grower participation in the program is voluntary; it is an ongoing program.

Prior to 1988, the crops monitored included blueberries, cabbage, citrus, ferns, woody ornamentals, potatoes, sod, and turf grass (golf courses). The number of sites needed to have a representative sample in each crop category was not known. Most irrigation systems included in the Benchmark Farms Project were monitored using less accurate, more indirect methods than the in-line flowmeters used since 1990.

In 1988, SJRWMD contracted with the Institute of Food and Agricultural Sciences (IFAS) of the University of Florida to determine the number of monitoring sites needed to provide a representative sample for the various crops. Based on recommendations in the IFAS report (Portier 1988), the scope of the Benchmark Farms Project was changed to focus only on leatherleaf fern, potatoes, and citrus. IFAS recommended that a representative sample size of 48, 55, and 200 monitoring sites in the leatherleaf fern, potato, and citrus production areas, respectively, would be required to estimate water use to within 20% of the true water use, with a 95% confidence probability. At the same time, a decision was made to monitor water use with in-line flowmeters to assure better quality data.

Since 1989, the crop-growing areas of leatherleaf fern, potatoes, and citrus have been the focus of the ongoing Benchmark Farms Project. These three crops represent the largest agricultural water use in SJRWMD, accounting for 66.9% of the total agricultural water use, excluding pasture irrigation (Florence 1995).

In December 1994, the monitoring network consisted of 46 leatherleaf fern sites, 55 potato sites, and 75 citrus sites. These sites were equipped with in-line flowmeters.

SJRWMD uses the monitoring results to evaluate computer simulation models such as the modified Blaney-Criddle and the Agricultural Field Scale Irrigation Requirements Simulations (AFSIRS) models, which estimate crop irrigation requirements. These models are useful in areas where few or no measurements of irrigation requirements are available.

PURPOSE AND SCOPE

This report, presented as part of the Benchmark Farms Project, includes field-measured irrigation water use data on leatherleaf fern and potatoes. This information provides an overall view of crop irrigation requirements and an estimate of the water withdrawn for the crop-specific areas.

Data collected after 1989 represent the most reliable crop water use data associated with the Benchmark Farms Project; the focus of this report is the period 1990–94. Citrus water use is not included, however, because only 75 of the required 200 sites had been established by December 1994.

METHODOLOGY

Participation in the Benchmark Farms Project is completely voluntary. SJRWMD staff compiled a list of growers based on input from county agricultural extension offices and the SJRWMD consumptive use permitting database. SJRWMD staff sent out a letter to all growers in a crop community explaining the program and soliciting their participation. Enclosed with the letter was a self-addressed postcard requesting basic information (name, address, etc.). Growers who returned the postcard were contacted by telephone. Of those who did not return the postcard, a number of growers were selected at random and visited. The project was explained, and they were asked to become voluntary participants.

An on-site interview was set up with each grower or farm manager. The interview was used to determine if their farm practices were representative of other farms and if water use at the site could be

monitored accurately and without restructuring the irrigation system. Information such as site location and access, configuration of the irrigation system, and land area covered by the irrigation system was obtained during the interview. Additional information about the pump, well, and site was collected and entered into a computer database for each site. Generally, only one irrigation system was monitored per grower.

At each site selected, SJRWMD installed a permanent in-line flowmeter to record water use. The water use data were collected at each site every month and entered into a computer database. After the data were entered, water use in gallons was determined. The hours that the pump ran were calculated at sites with kilowatt meters (electric pumps) and sites with hour meters (some diesel pumps). Then the average flow rate (gallons per minute) for the month was calculated from the gallons used and the hours that the pump ran. The flow rate was then compared to the calculated flow rate for the previous 5 months to flag any inconsistencies. The data were considered "good" when the flow rate was consistent with that of previous months and with the flow rate measured when the site was established.

In situations where there were obvious problems with the flowmeter, water use was estimated using the average flow rate for the previous 5 months and the hours the pump ran. If water use could not be estimated with a high degree of certainty, the site data for that month were flagged as inaccurate. The monthly water use for each site was qualified as good, estimated, or inaccurate to indicate the quality of the data. The data in this report either are assumed to be good or were estimated with a high degree of certainty.

Other site-specific data that affect water use (e.g., acres, pump type, irrigation method) were collected and updated as changes occurred.

Water Use Report on Leatherleaf Fern and Potatoes

LEATHERLEAF FERN

Leatherleaf fern is the predominant cut foliage crop produced in the United States and the most valuable floricultural crop produced in Florida (USDA 1991). Almost all leatherleaf fern grown in Florida is produced in SJRWMD (Florida Agricultural Statistics Service 1995), primarily in Putnam, Volusia, and Lake counties (Figure 1).

Beginning in January 1993, SJRWMD conducted a field-mapping project in this area to identify all land where leatherleaf fern and other ferns were being grown (Singleton 1993). SJRWMD determined that the most leatherleaf fern, by acre, is grown in Volusia County, which accounts for 4,282 acres, with Putnam and Lake counties accounting for 832 and 438 acres, respectively. Additionally, 652 acres of leatherleaf fern mixed with other varieties of ferns were also identified in this tri-county area.

LEATHERLEAF FERN PRODUCTION

Leatherleaf fern is grown in shaded conditions. Many growers erect shadehouses for its production; others rely on naturally shaded oak hammocks. It is a shallow-root crop (less than 12 inches [in.] deep), typically grown on well-drained soils that have low water-holding capacities. Supplemental irrigation is essential for commercial production.

Because leatherleaf fern is a perennial plant, irrigation is generally required 12 months of the year. Additionally, the majority of growers use the irrigation system to apply liquid fertilizer on a weekly basis (Boggess et al. 1991). Because frost can damage leatherleaf fern, the irrigation system is also used to apply water for freeze protection. During freeze events, water is applied continuously to the fern, forming a blanket of ice which maintains the leaf temperature at approximately 32°F, even if the air temperature drops below 32°F (Henley et al. 1980).

During the period 1990–94, data were accumulated from 49 sites (Figure 2). Three of these sites were discontinued after 1990: two in Putnam County and one in Volusia County.

Water Use Report on Leatherleaf Fern and Potatoes

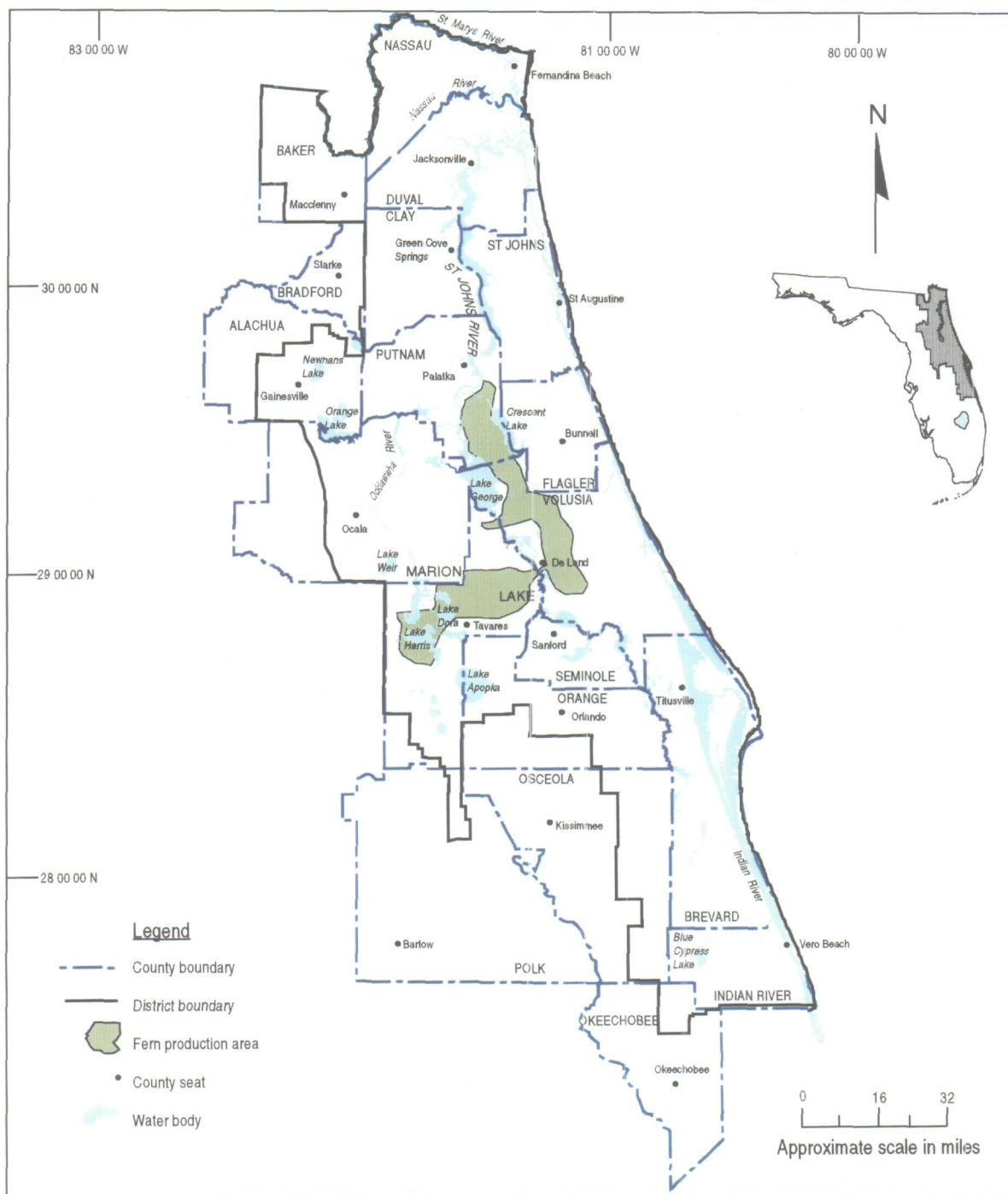
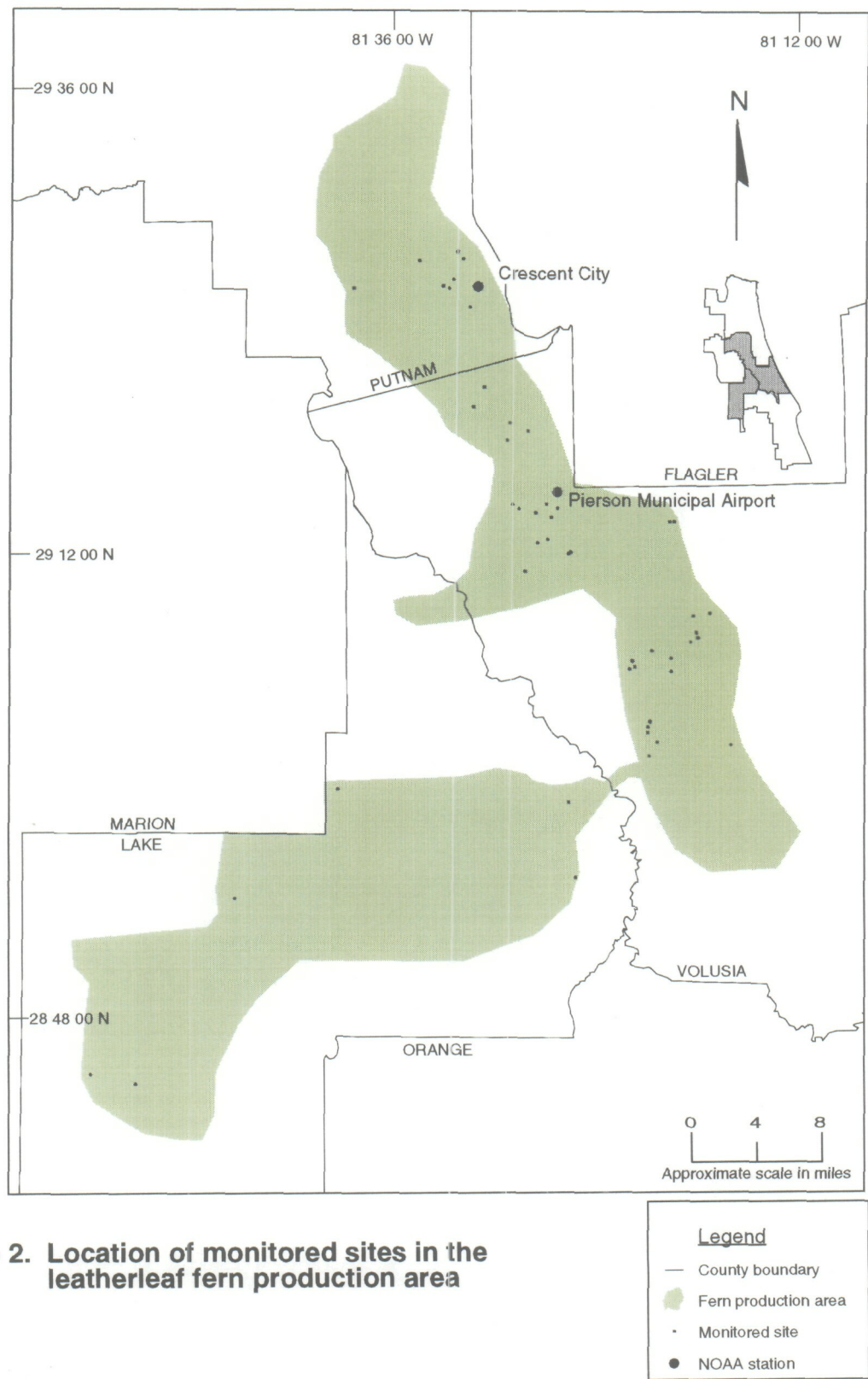


Figure 1. Leatherleaf fern production areas of Putnam, Volusia, and Lake counties



In December 1994, water use for leatherleaf fern was monitored at 46 sites as part of the Benchmark Farms Project. The monitoring network consists of 34 sites in Volusia County, 6 in Putnam County, and 6 in Lake County. The sites are distributed throughout the fern production area.

LEATHERLEAF FERN WATER USE

In this report, water use data on leatherleaf fern are reported for 1990–94. Data were analyzed on a year-by-year basis, for each year from January through December and then for the entire 5-year period of January 1990 through December 1994. The customary method of reporting crop water use is on a yearly basis, although treating the data on a yearly basis essentially bisects the crop “winter” season (the period when high-volume water use for crop freeze protection generally occurs).

Only sites providing a full 12-month set of accurate data for a particular year were included in the data analysis. Therefore, the actual number of sites included in the analysis for each year was less than the 48 sites recommended by IFAS to estimate water use of the population within 20% of the true water use. Water use was determined for 1990–94 based on 26–40 monitoring sites (Table 1). This small sample size is considered accurate to within 20% of true water use because the range and standard deviation among years are very similar, despite differences in sample size, and because estimations using a subset of the sample produce similar statistics.

Table 1. Average annual water use for irrigation and freeze protection of leatherleaf fern

Year	Number of Monitoring Sites	Average Total Water Use (inches per year)	Standard Deviation (STD) (inches)	Above Average Water Use* (inches per year)
1990	27	37.53	12.07	49.60
1991	26	38.39	12.32	50.71
1992	29	41.73	13.75	55.48
1993	40	37.11	12.65	49.76
1994	33	28.38	11.66	40.04

*Average annual water use plus 1 STD

Irrigation and Freeze Protection

The average total water use for leatherleaf fern (including freeze protection) ranged from 28.38 inches per year (in/yr) in 1994 to 41.73 in/yr in 1992 (Table 1 and Figure 3). Standard deviations in water use for the same period ranged from 11.66 in. in 1994 to 13.75 in. in 1992. Thus, for 1990–94, the water use at 1 standard deviation (STD) above average ranged from 40.04 to 55.48 in/yr. Water use (inches) for each site (including sites not used in the analysis) is listed in Appendix A.

As indicated by the high standard deviations, the total water use from one site to another can be substantially different. These differences might be attributed to differences in soil type, shading methods, freeze protection methods, sprinkler spacing, geographic location, management practices, and perhaps other parameters. These differences, however, should be expected in view of the fact that Benchmark Farms Project participants were selected randomly to cover the spectrum of growers.

In terms of total water use for leatherleaf fern (including freeze protection), 70% of all growers used less than 45 in. of water per year (Figure 4). About one-third of all growers used 30–40 in. of water per year during the 5-year period (Figure 5).

For 1990–94, the range in total water use and the average total water use vary from month to month and by time of year (Figure 6). The winter months are typically high water use months, due to the additional use of water for freeze protection. Generally, water use may be categorized into two uses, irrigation (including fertilizer and pesticide application) and freeze protection. However, the Benchmark Farms sites were monitored for total water use only, and neither irrigation nor freeze protection can be specifically identified. Attempts to monitor water use separately for freeze protection have not been successful.

Irrigation (Non-Freeze Protection)

Water use for *irrigation* can be estimated by averaging water use for the typical non-freeze months (April through October) and extrapolating to the other 5 months. Using this methodology, the total yearly irrigation water use for leatherleaf fern for 1990–94 ranged from 22.73 in/yr in 1994 to 34.42 in/yr in 1990 (Table 2 and Figure 7).

Table 2. Average annual water use for irrigation of leatherleaf fern

Year	Estimated Irrigation Water Use (inches per year)	Monthly Average (inches)	Percentage of Total Water Use
1990	34.42	2.87	91.7
1991	26.40	2.20	68.8
1992	26.74	2.23	64.1
1993	28.30	2.36	76.3
1994	22.73	1.89	80.1

Irrigation water use varies from year to year primarily because of rainfall. For the fern-growing area, the nearest National Oceanic and Atmospheric Administration (NOAA) rain gauge with long-term rainfall history is at Crescent City (Figure 2); the average rainfall was 50.28 in. for the 30-year period of 1965–94. During the period 1990–94, irrigation was highest in 1990 while rainfall for that year was more than 10 in. below the 30-year average. Rainfall for 1991–94 was near or above 45 in.; irrigation was similar for those years (Figure 8).

In terms of irrigation water use for leatherleaf fern, 68% of all growers used less than 30 in. and 88% used less than 40 in. of water per year (Figure 9). Almost 40% of all growers used 20–30 in. of water per year during the 5-year period (Figure 10).

The range in water use for irrigation varied substantially from month to month, but the average irrigation water use was generally between 2 and 3 in. per month (Table 2 and Figure 11).

Irrigation accounted for 64.1% to 91.7% of the total water use for 1990–94 (Table 2). The balance of water use can be attributed to freeze protection.

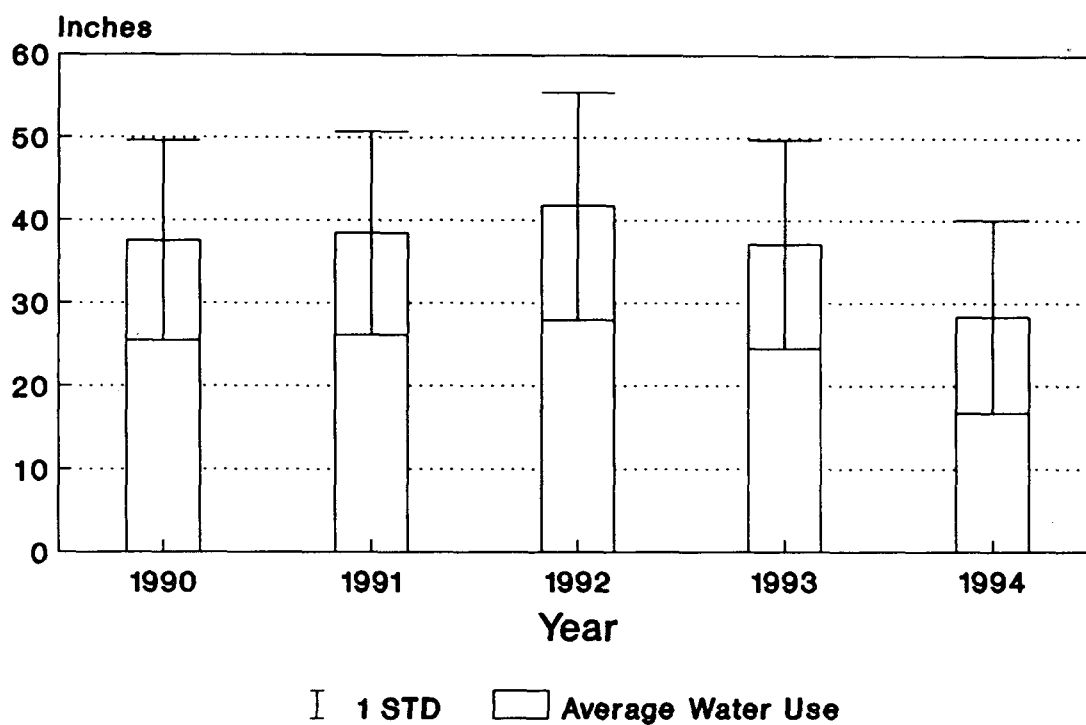


Figure 3. Total water use for leatherleaf fern by year, 1990–94. Water use includes water used for freeze protection. (STD = standard deviation)

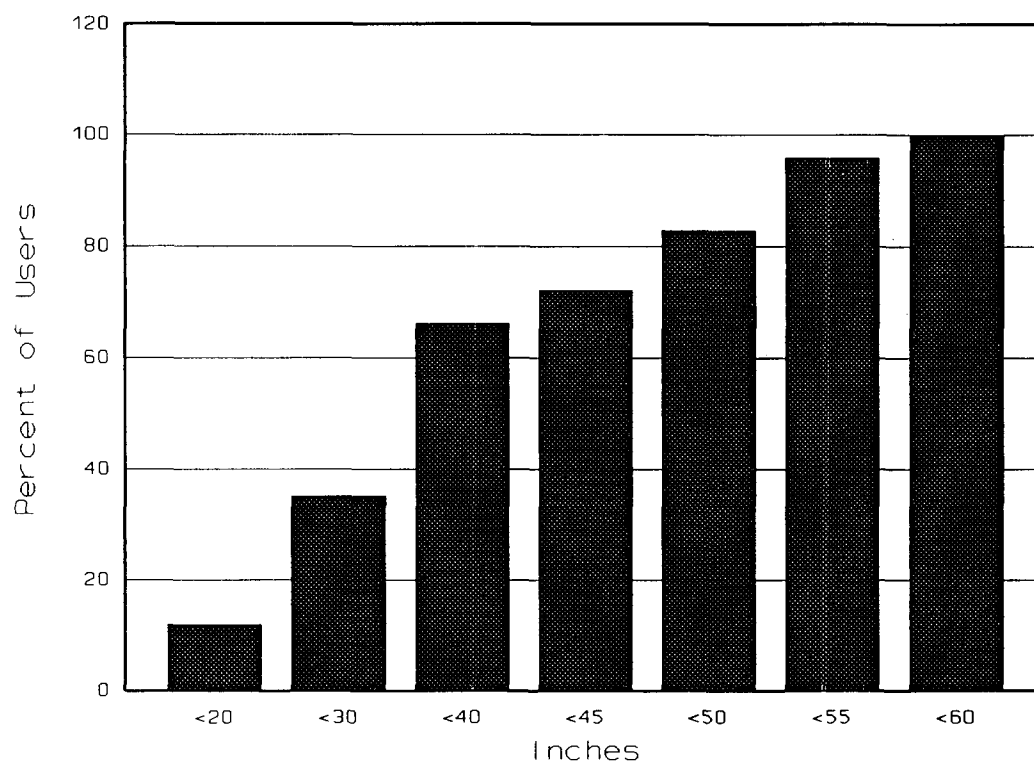


Figure 4. Cumulative distribution of total water use for leatherleaf fern by percentage of growers, 1990–94. Water use includes water used for freeze protection.

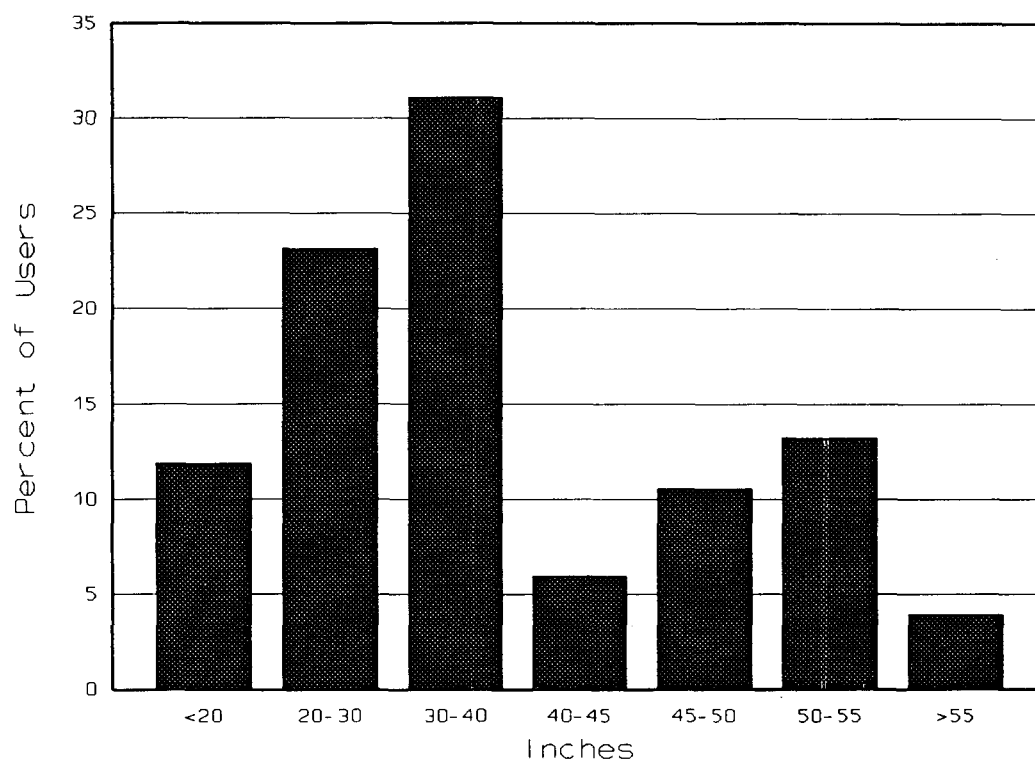


Figure 5. Distribution of total water use for leatherleaf fern by percentage of growers, 1990-94. Water use includes water used for freeze protection.

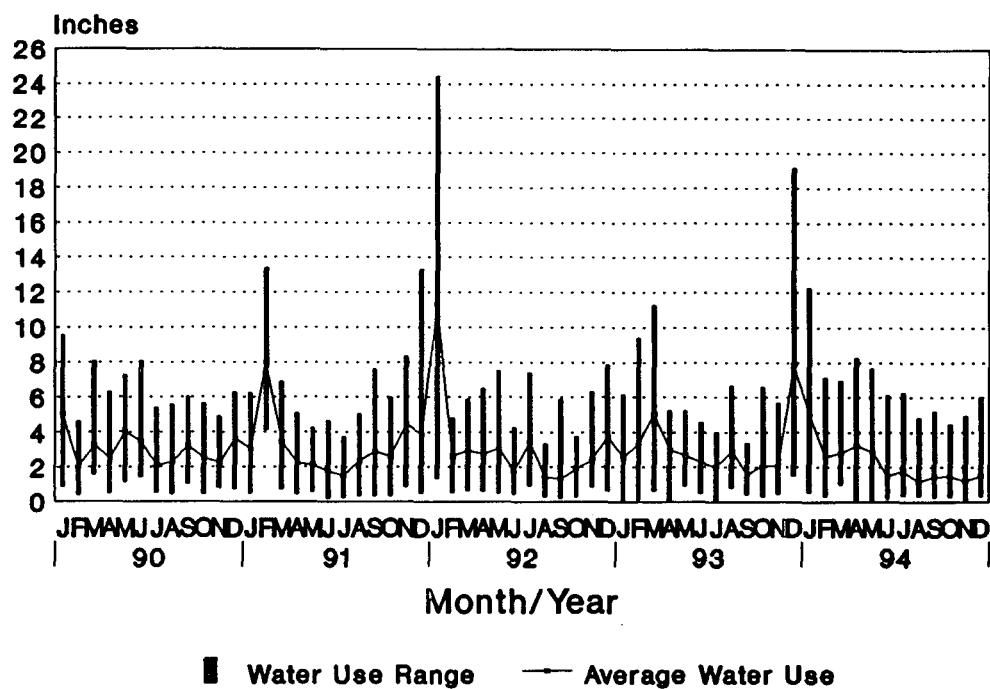


Figure 6. Total water use for leatherleaf fern by month, 1990–94. Water use includes water used for freeze protection.

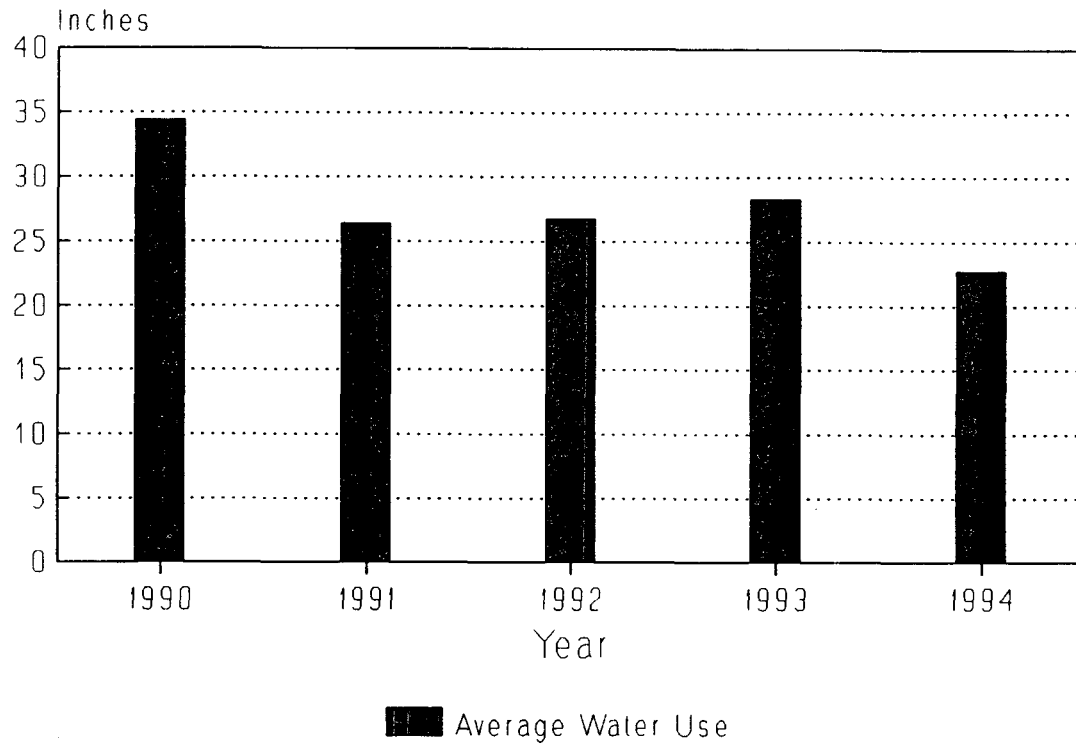


Figure 7. Average water use for irrigation of leatherleaf fern by year, 1990–94.
Water use does not include water used for freeze protection; irrigation use was estimated for the typical freeze months.

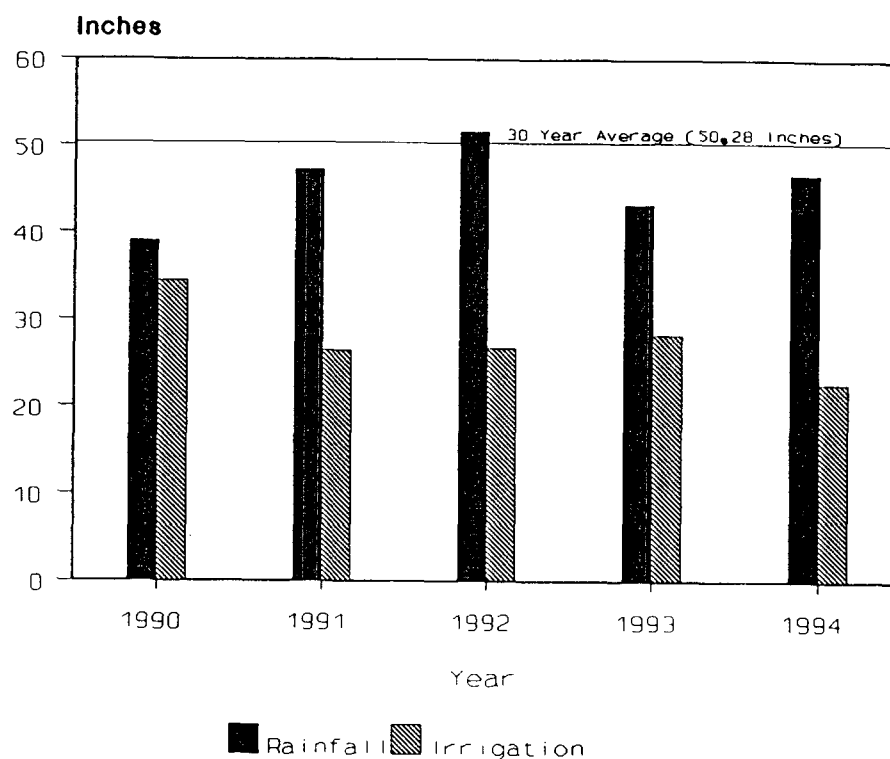


Figure 8. Comparison of rainfall to water use for irrigation of leatherleaf fern (not including freeze protection). Rainfall was collected from the National Oceanic and Atmospheric Administration station at Crescent City from 1990 to 1992 and at the SJRWMD station at Pierson Airport from 1993 to 1994.

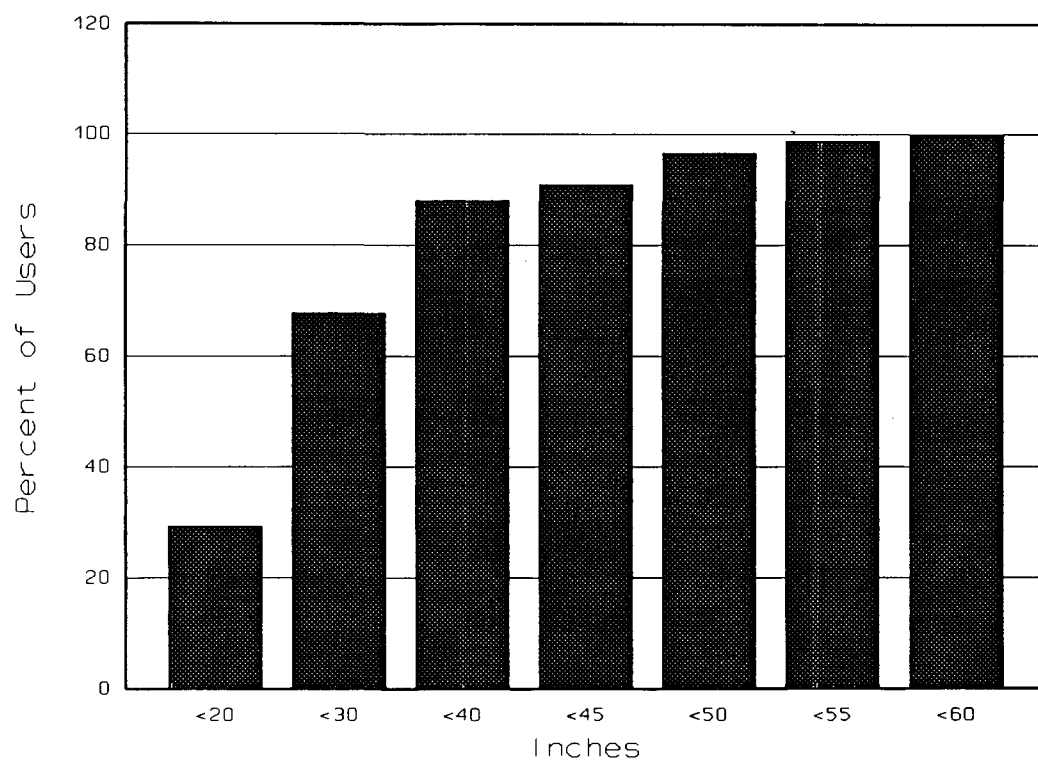


Figure 9. Cumulative distribution of water use for irrigation of leatherleaf fern by percentage of growers, 1990–94. Water use does not include water used for freeze protection; irrigation use was estimated for the typical freeze months.

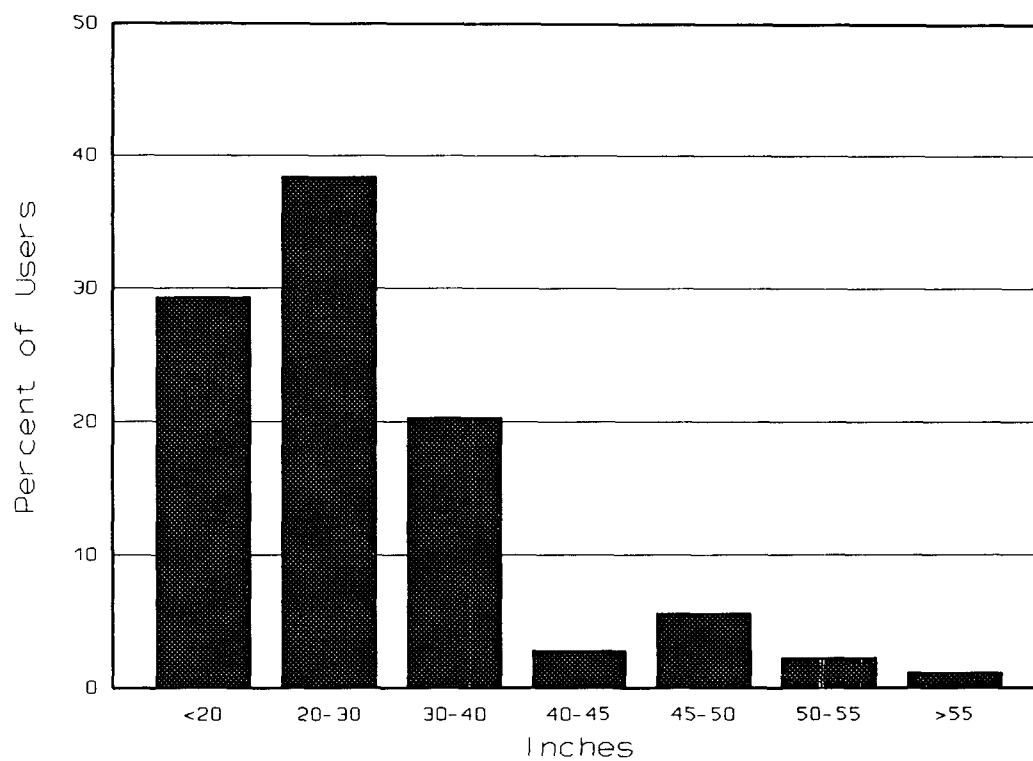


Figure 10. Distribution of water use for irrigation of leatherleaf fern by percentage of growers, 1990-94. Water use does not include water used for freeze protection; irrigation use was estimated for the typical freeze months.

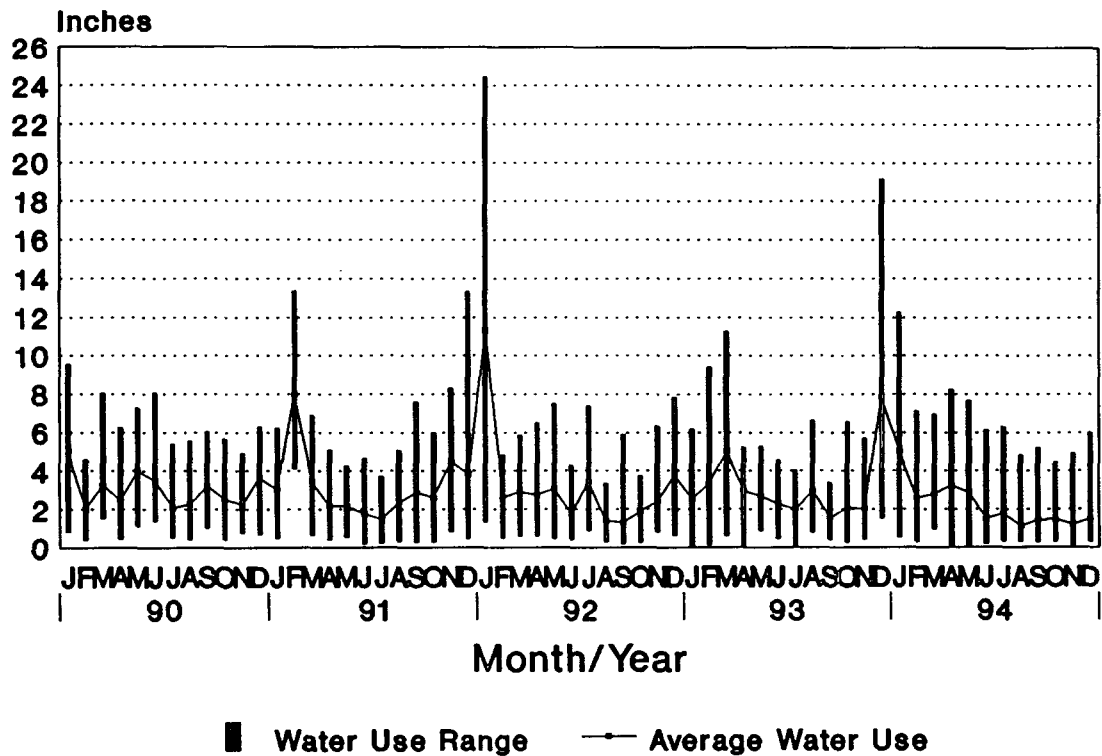


Figure 11. Water use for irrigation of leatherleaf fern by month, 1990–94. *Irrigation use for the freeze months of January–March, November, and December was estimated based on average irrigation for the non-freeze months.*

Water Use Report on Leatherleaf Fern and Potatoes

POTATOES

Potatoes are the major irrigated crop in the tri-county area of Putnam, St. Johns, and Flagler counties (Figure 12). In January 1994, SJRWMD conducted a field-mapping project in this area to identify all land used for row crops. A total of 31,795 acres was identified as being used for potato production in the tri-county area. Of this total, 21,311 acres were in St. Johns County, 5,990 acres were in Putnam County, and 4,494 acres were in Flagler County.

POTATO PRODUCTION

Potatoes are a seasonal crop grown in the tri-county area generally during the months of January through May. The irrigation season is generally concentrated from February through May.

Seepage irrigation systems and electric pumps are used exclusively in the tri-county area. Groundwater is pumped from deep wells and distributed through a pipeline to the V-shaped water furrows in the field. These furrows are commonly spaced 60 feet apart. The crop area between two water furrows is irrigated as water from the furrows seeps laterally underground, raising the water table under the crop to just below the root zone. The application efficiency of this type of system ranges from 30% to 70% (Smajstrla et al. 1991). The efficiency of any individual system can vary widely as a function of the stage of crop development, the time of year, climatic conditions, and other factors (Smajstrla et al. 1991). However, an average efficiency of 50% is commonly assumed for seepage irrigation systems in this area.

In 1994, irrigation water use for potatoes was monitored at 55 sites. The monitoring network consists of 15 sites in Putnam County, 6 in Flagler County, and 34 in St. Johns County (Figure 13). The sites are distributed throughout the potato production area.

Water Use Report on Leatherleaf Fern and Potatoes

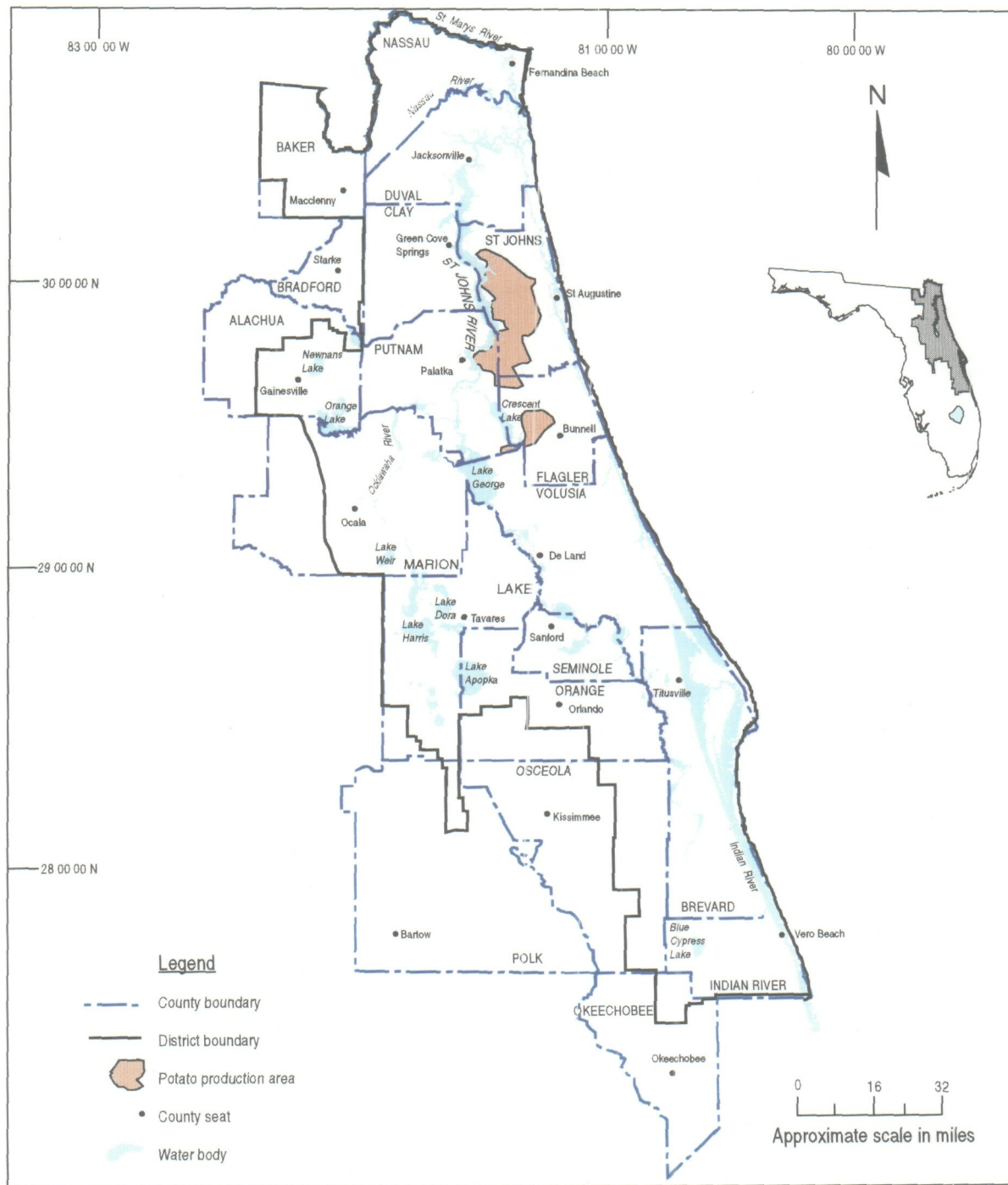


Figure 12. Potato production areas of Putnam, St. Johns, and Flagler counties

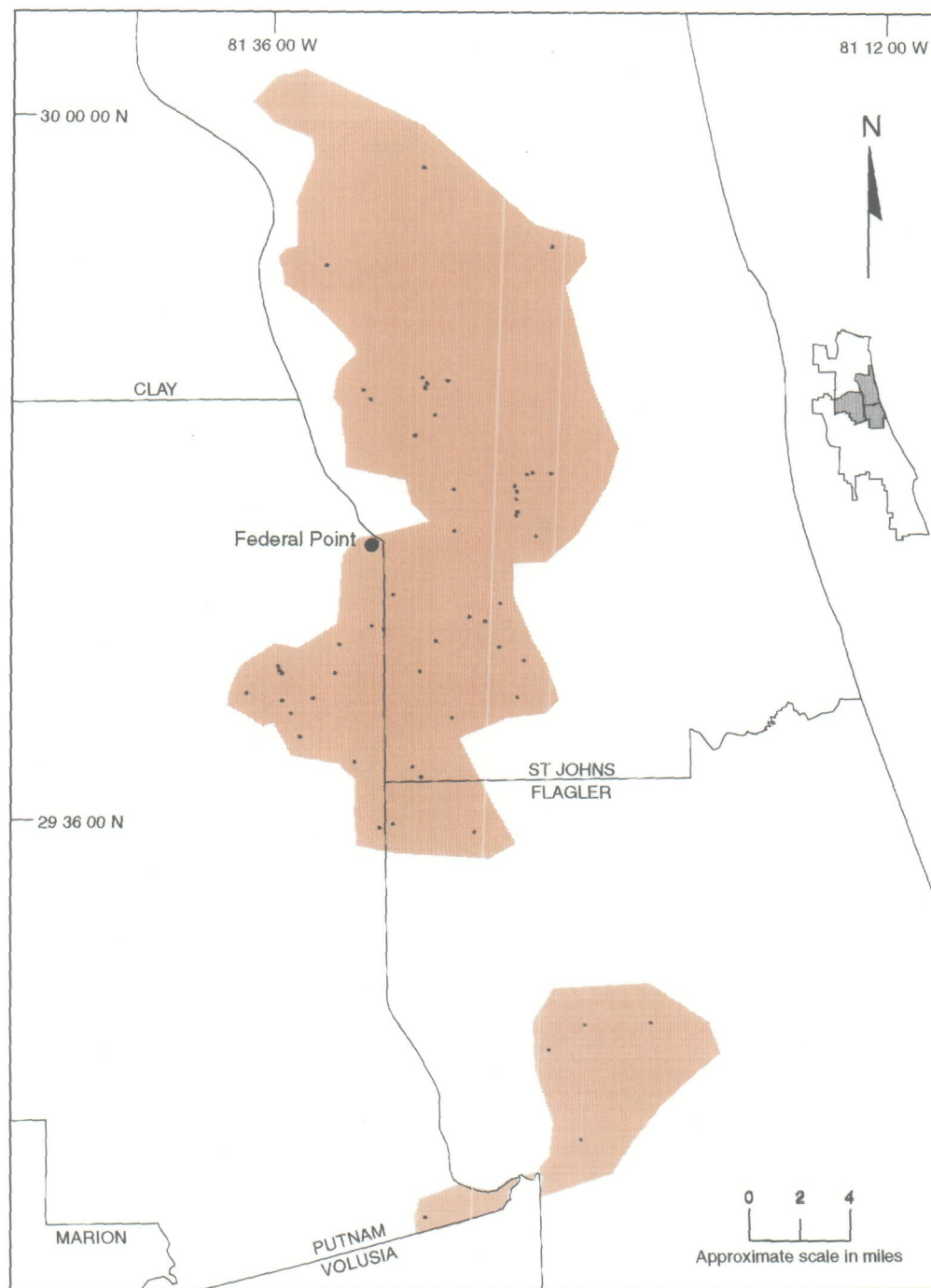
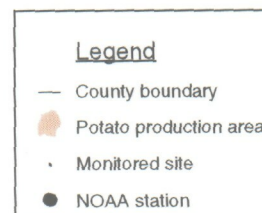


Figure 13. Location of monitored sites in the potato production areas



POTATO WATER USE

Water use data on potato production are available for the 1990–94 growing seasons. In 1990, SJRWMD installed flowmeters on 55 potato production sites to monitor irrigation water use. However, during the 1990 season many of the flowmeters malfunctioned, resulting in a loss of data from 27 of the 55 sites in the network.

After the 1990 season, the flowmeter problems were corrected so that in subsequent years (1991–94) data loss was minimal. However, some sites were not planted, some site data were not reported because another crop was grown (e.g., cabbage), or some portion of the data was missing. For this report, only potato irrigation monitoring sites with no missing monthly data for a given year were used in the data analysis. Therefore, of the 55 monitoring sites, irrigation water use was determined for the 1990–94 potato seasons based on 28–54 monitoring sites (Table 3). These data should be accurate to within 20% of the true water use because the range and standard deviation among years are very similar.

Table 3. Average annual water use for irrigation of potatoes

Year	Number of Monitoring Sites	Average Total Water Use (inches per year)	Standard Deviation (STD) (inches)	Above Average Water Use* (inches per year)
1990	28	13.57	5.68	19.25
1991	48	7.09	3.57	10.66
1992	53	14.67	5.83	20.50
1993	54	13.51	5.04	18.55
1994	52	13.97	5.74	19.71

*Average annual water use plus 1 STD

The average irrigation water use for potatoes for the 5-year period ranged from 7.09 in/yr in 1991 to 14.67 in/yr in 1992 (Table 3 and Figure 14). Standard deviations in irrigation water use for the same period ranged from 3.57 in. in 1991 to 5.83 in. in 1992. Thus, for 1990–94, water use at 1 STD above average ranged from 10.66 to 20.50 in/yr. Water use (inches) for each site (including sites not used in the analysis) is listed in Appendix B.

For the potato-growing area, the nearest NOAA rain gauge with a long-term rainfall history is at Federal Point (Figure 13). Rainfall totals in 1991 were higher than usual for the growing season of January through May. Rainfall during the 1991 growing season (25.72 in.) exceeded the 30-year average rainfall for the growing season (16.91 in.) by more than 8 in.; rainfall for the other 4 years was below the 30-year average rainfall (Figure 15). In turn, irrigation water use during the 1991 growing season was much lower than irrigation water use for the other 4 years (1990 and 1992–94) (Figure 16).

In terms of irrigation water use for potatoes, 59% of all growers used less than 14 in. and 82% used less than 18 in. of water per year during the four years 1990 and 1992–94 (Figure 17). Almost one-third of all growers used 10–14 in. of water per year during the same time period (Figure 18). These figures excluded the 1991 growing season, which was unusually wet.

If the 1991 potato growing season is included, the water use distribution changes considerably. For the 5-year period, 66% of all growers used less than 14 in. and 86% used less than 18 in. of water per year (Figure 19). Almost 40% of all growers used less than 10 in. of water per year (Figure 20).

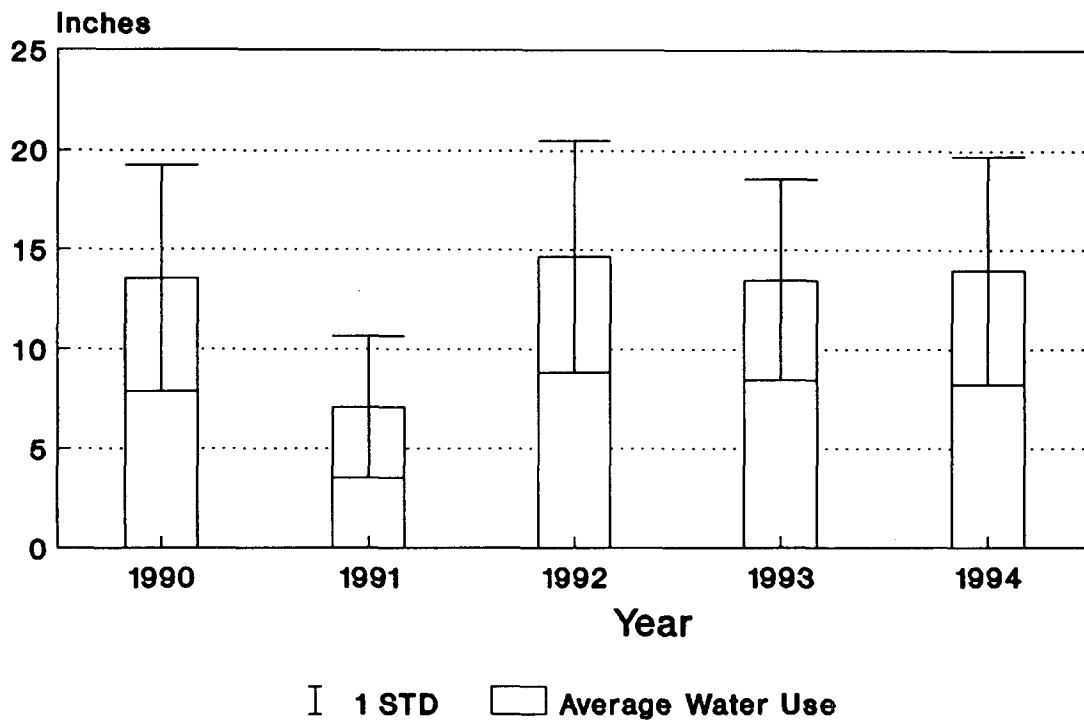


Figure 14. Water used for potato irrigation by year, 1990–94 (STD = standard deviation)

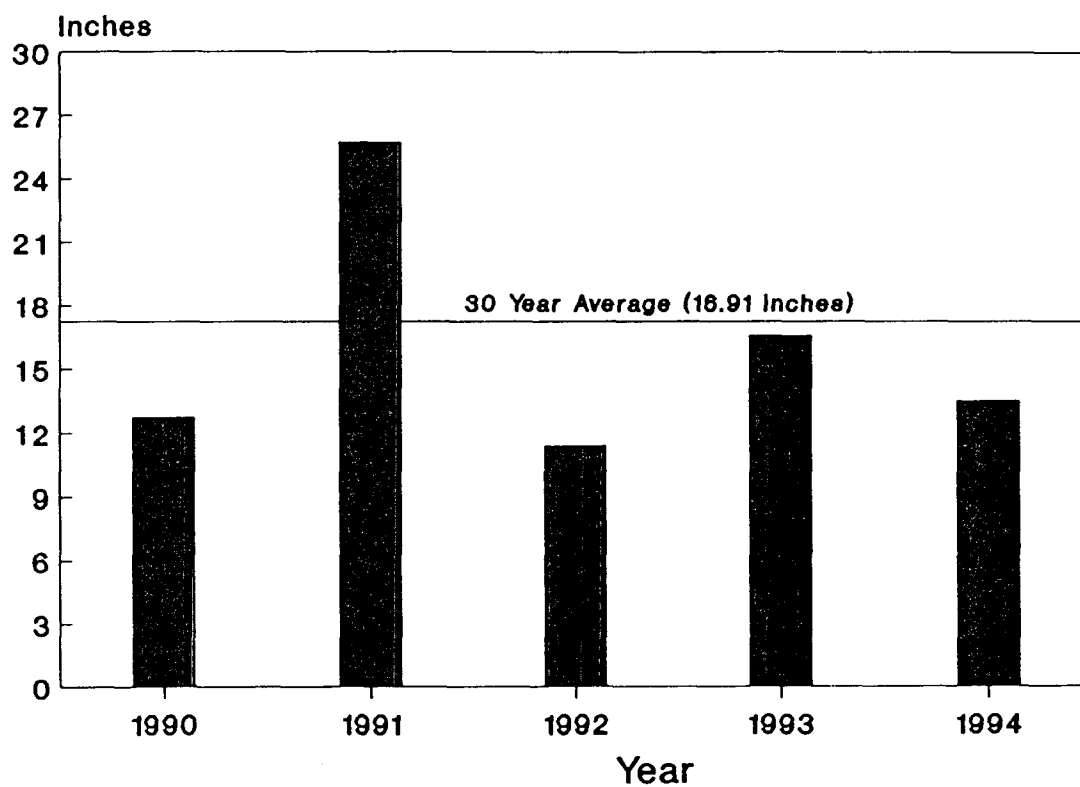


Figure 15. Rainfall totals for the tri-county potato area for the months January through May. Rainfall was collected from the National Oceanic and Atmospheric Administration station at Federal Point.

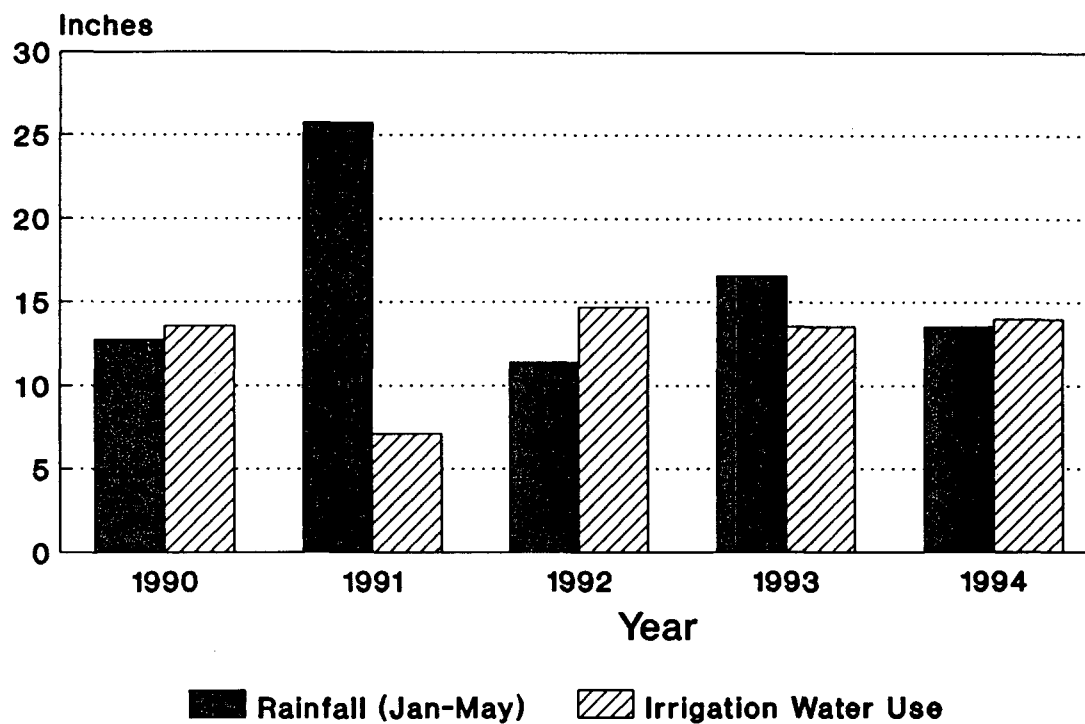


Figure 16. Comparison of rainfall to water use for potato irrigation. *Rainfall was collected from the National Oceanic and Atmospheric Administration station at Federal Point.*

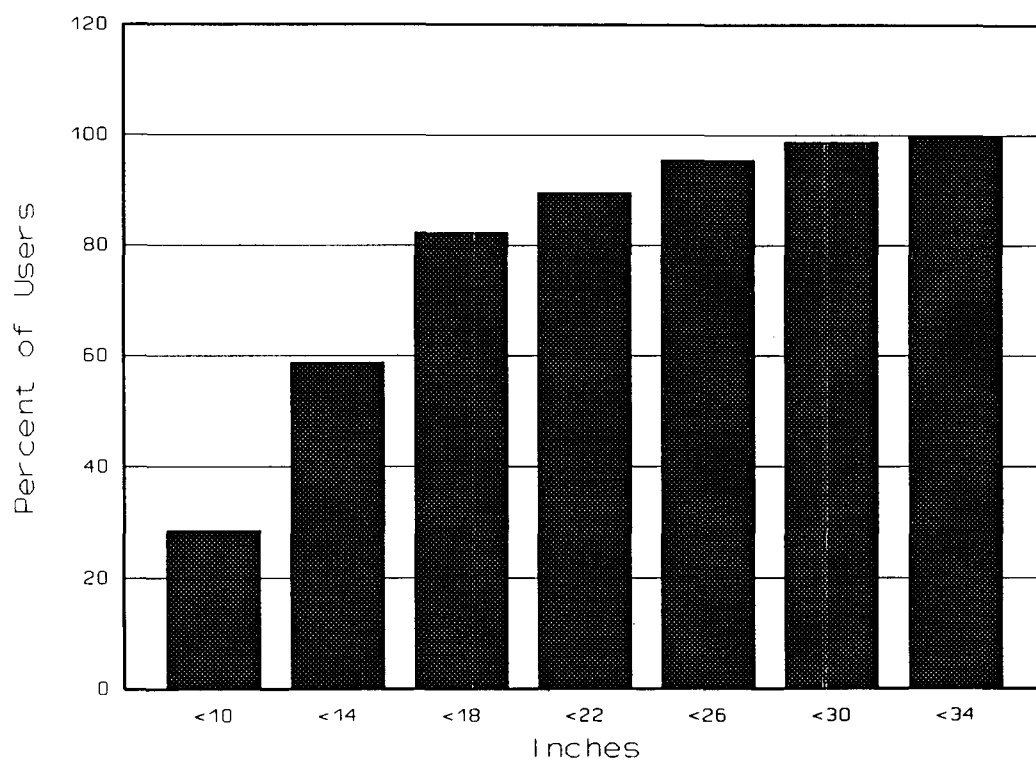


Figure 17. Cumulative distribution of water use for potato irrigation by percentage of growers, 1990 and 1992–94. The year 1991 was excluded because it was an unusually wet season.

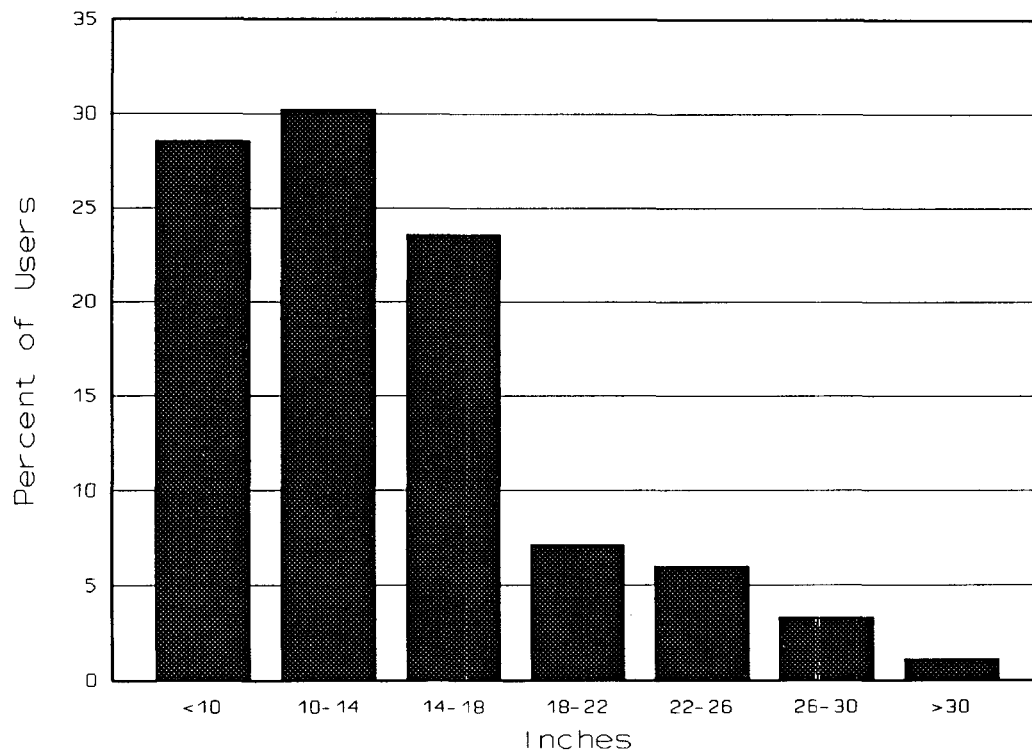


Figure 18. Distribution of water use for potato irrigation by percentage of growers, 1990 and 1992–94. The year 1991 was excluded because it was an unusually wet season.

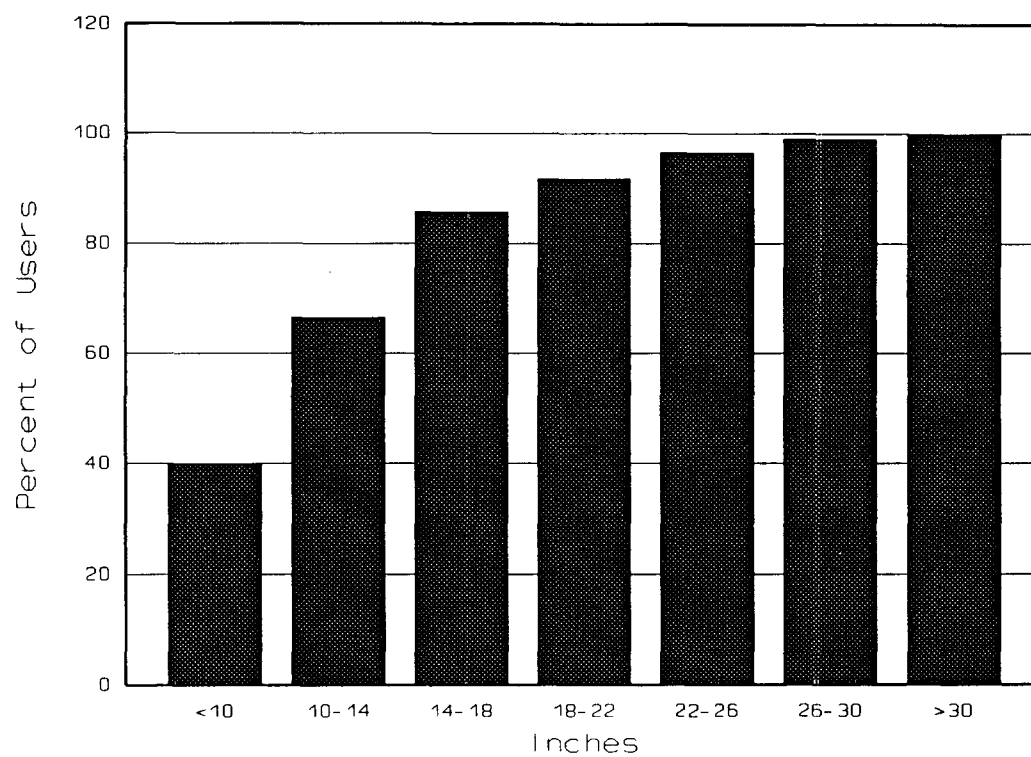


Figure 19. Cumulative distribution of water use for potato irrigation by percentage of growers, 1990-94

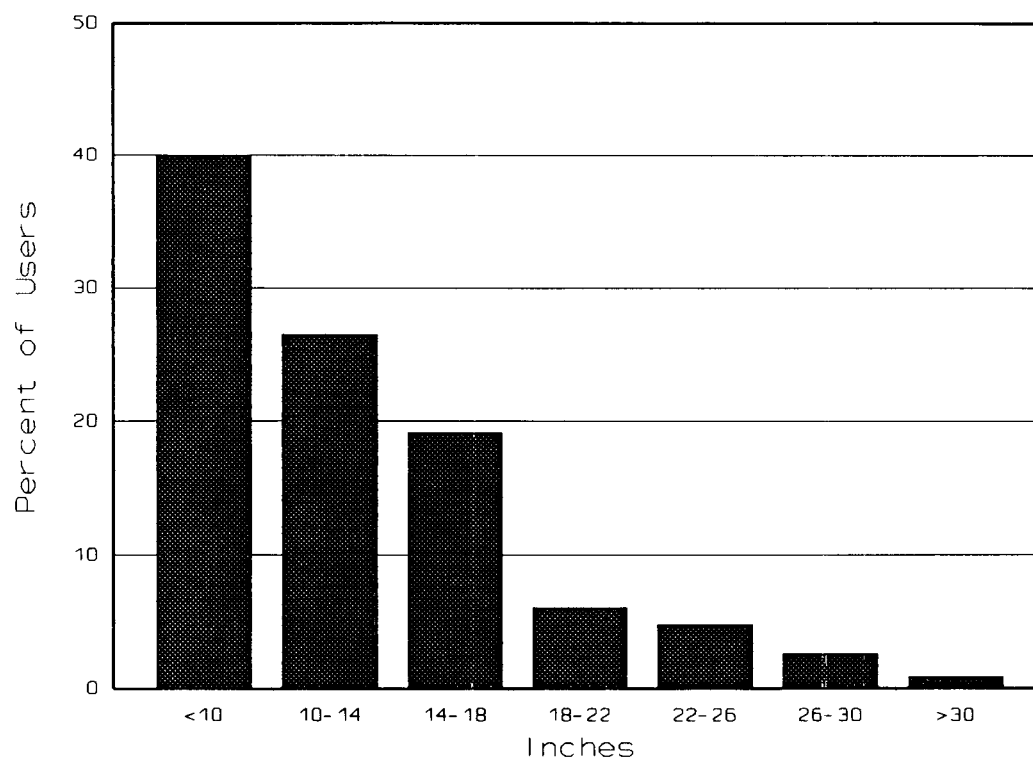


Figure 20. Distribution of water use for potato irrigation by percentage of growers, 1990-94

SUMMARY

The Benchmark Farms Project is an ongoing project that monitors agricultural irrigation; the project is designed to collect field-measured data to evaluate crop-specific water use for growers in SJRWMD. The project focuses on water use for leatherleaf fern, potatoes, and citrus irrigation. In 1994, SJRWMD monitored 46, 55, and 75 irrigation sites in the areas growing leatherleaf fern, potatoes, and citrus, respectively. Water use for leatherleaf fern and potatoes is documented in this report. Citrus water use is not reported because the 200 required sites for a representative sample have not been established.

Water is typically used each month in the production of leatherleaf fern, for either irrigation or freeze protection or both. The average total water use for leatherleaf fern (including freeze protection) was 37.53, 38.39, 41.73, 37.11, and 28.38 in./yr, for 1990–94, respectively. In terms of total water use for leatherleaf fern, 70% of all growers used less than 45 in. of water per year and about one-third used 30–40 in. of water per year during the 5-year period. For irrigation water use only, 68% of all growers used less than 30 in. of water per year, 88% used less than 40 in. of water per year, and almost 40% used 20–30 in. of water per year during the 5-year period.

Potatoes are a seasonal crop grown during the period January through May in the tri-county area of Putnam, St. Johns, and Flagler counties. The irrigation season, however, is generally concentrated in the months February through May.

The average water use for irrigation of potatoes was 13.57, 7.09, 14.67, 13.51, and 13.97 in., respectively, for 1990–94. Excluding the 1991 growing season, which had extremely high rainfall, 59% of all growers used less than 14 in. of water per year, 82% used less than 18 in. of water per year, and almost one-third used 10–14 in. of water per year.

Water Use Report on Leatherleaf Fern and Potatoes

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Water Use Report on Leatherleaf Fern and Potatoes

APPENDIX A—LEATHERLEAF FERN WATER USE BY SITE

Water Use Report on Leatherleaf Fern and Potatoes

Table A1. Leatherleaf fern monthly water use (in inches) by site, 1990

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Lake	085	1.77	0.92	1.88	1.21	1.59	1.50	1.27	0.45	1.40	0.53	0.78	2.19	15.49
Lake	087	8.18	2.56	4.75	2.80	5.76	2.27	1.41	2.38	2.89	3.39	1.85	4.93	43.17
Putnam	056		1.70	2.01	0.47	2.37	1.68	1.90	0.73	2.49	1.75	1.15	0.71	16.96
Putnam	057	5.84	1.57	3.07	2.33	2.19	2.07	2.07	2.35	3.16	2.24	2.34	3.27	32.50
Putnam	058	8.28	3.29	8.05	3.18	4.96	3.51	2.98	2.61	4.70	5.65	4.70	5.81	57.72
Putnam	059	6.14	1.69	2.09	1.45	3.08	4.97	2.08	2.10	3.61	1.95	2.12	4.58	35.86
Putnam	060	0.00	3.58	3.11	3.46	6.89	8.06	2.91	3.25	5.68	3.79	2.12	4.05	46.90
Putnam	061	7.81	2.29	4.35	6.27	5.45	4.38	3.05	5.55	4.25	0.43	2.74	2.79	49.36
Volusia	062	5.27	2.09	3.60	3.09	5.81	4.88	2.01	4.28	3.40	3.95	2.61	5.75	46.74
Volusia	063	7.03	3.04	4.09	2.63	5.40	5.30	3.81	2.26	4.44	2.56	2.45	4.95	47.96
Volusia	064	1.50	1.32	1.61	1.66	3.15	3.37	1.79	2.21	5.03			3.34	24.98
Volusia	065	6.35	1.26	1.55	1.21	2.93	2.14	2.80	1.13	2.04	2.84	2.54	2.59	29.38
Volusia	066	6.56	2.58	3.08	2.42	3.34	3.15	0.98	1.57	3.16	2.46	0.88	4.23	34.41
Volusia	067	8.02	1.55	2.78	2.86	2.92	2.26	1.73	1.72	3.17	2.55	1.85	5.27	36.68
Volusia	068	8.76	4.60	5.27	5.55	5.74	6.05	5.39	2.26	6.02	5.39	2.98	5.66	63.67
Volusia	069	2.88	3.08	4.43	5.15	4.75	5.82	2.89	3.23	4.46	4.01	3.35	4.79	48.84
Volusia	070	4.76	2.62	4.59	3.16	5.20	5.01	2.39	2.80	4.74	3.17	3.43	5.20	47.07
Volusia	071	2.06	2.69	3.65	2.27	4.28	3.55	1.91	2.29	1.63	3.00	3.06	3.65	34.04
Volusia	072				1.01	1.58	1.87	1.03	0.45	1.30	0.90	0.96	1.15	10.25
Volusia	073		2.25	1.55	1.29	1.83	2.17	0.90	1.95	2.41	2.13	1.56	1.17	19.21
Volusia	074	3.86	1.51	5.50	5.10	6.62	4.57	3.50	1.88	3.10	4.10	2.64	3.31	45.69
Volusia	075	4.42	0.41	2.16	0.52	1.69	1.39	0.52	1.25	1.03	1.36	0.78	2.82	18.35
Volusia	076	8.32	1.30	2.51	1.66	3.28	1.45	1.08	3.50	2.39	1.37	1.53	6.29	34.68
Volusia	077	4.87	1.10	2.71	1.94	3.76	3.97	0.95	3.01	2.43	2.59	1.51	4.06	32.90
Volusia	078	4.67	1.21	2.10	0.00	1.13	3.16	1.36	0.00	2.70	0.00	1.95	4.50	22.78
Volusia	079	5.59	1.89	3.42	2.24	4.31	4.54	2.25	4.02	3.36	2.85	4.91	4.69	44.07
Volusia	080	1.32	1.38	2.15	2.40	4.60	3.92	1.89	2.63	3.21	1.32	2.08	2.42	29.32
Volusia	081	9.55	3.16	3.35	3.58	6.96	3.72	2.56	3.22	4.06	3.24	3.54	5.33	52.27
Volusia	082	4.95	1.06	2.68	1.15	2.48	1.49	1.39	2.48	2.03	1.46	1.77	3.80	26.74
Volusia	083	0.84	0.96	3.36	3.36	7.27	3.49	2.07	2.32	3.39	2.18	2.04	1.16	32.44
Volusia	084	2.19	1.29	2.79	1.54	3.20	2.32	1.50	0.98	2.49	1.68	1.49	1.10	22.57
Volusia	088										2.59	1.50	1.22	5.31
Monthly Average		5.06	2.00	3.27	2.48	4.02	3.48	2.08	2.29	3.23	2.50	2.23	3.65	—

Note: — = not applicable

Blank cells indicate data not available.

Water Use Report on Leatherleaf Fern and Potatoes

Table A2. Leatherleaf fern monthly water use (in inches) by site, 1991

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Lake	085	1.48	4.78	0.68	0.60	0.66	0.20	0.64	0.88	0.31	0.78	1.17	0.94	13.12
Lake	087	4.27	4.95	3.39	2.00	2.34	0.50	1.22	3.74	1.89	1.46	3.22	3.58	32.56
Lake	104							2.21	4.05	1.57	3.78	2.57	2.99	17.17
Putnam	056	1.26	5.68	1.82	0.78	0.55	0.11							10.20
Putnam	057	2.22	6.40	3.25	1.21	2.13	0.93	1.83	2.79	2.09	1.52	5.68	7.40	37.45
Putnam	058	5.63	9.87	6.48							2.26	5.40	3.54	33.18
Putnam	059	4.14	8.08	4.66	2.76	2.73	1.25	1.32	2.52	2.87	2.76	6.66	13.31	53.06
Putnam	060	3.40	5.42	2.12	3.48	1.05	0.60	0.11						16.18
Putnam	061	5.60	9.16	3.22	2.95	2.03	1.89	1.58	4.54	3.51	3.34	5.82	6.56	50.20
Volusia	062	6.22	7.35	2.88	1.80	1.41	0.92	0.82	2.73	2.97	2.36	5.64	3.82	38.92
Volusia	063	3.20	11.27	5.62	2.10	3.42	2.76	1.68	1.60	5.21	2.54	4.97	4.35	48.72
Volusia	064	1.90	13.37	4.56	2.42	2.64	2.63	2.19	2.35	3.44	3.09	3.04	2.33	43.96
Volusia	066	3.37	11.00	3.91	0.42	1.92	0.77	0.24	1.96	5.85	3.07	5.92	2.97	41.40
Volusia	067	4.46	9.51	5.38	3.69	2.65	2.39				1.27	4.26	2.52	36.13
Volusia	068	2.33	6.14	2.84	3.97	2.78	4.61	3.72	5.05	7.59	4.11	1.48	2.01	46.63
Volusia	069	1.47	6.73	2.29	2.83	2.95	1.76	1.43	2.51	2.86	2.99	4.44	3.28	35.54
Volusia	070	2.67	9.19	4.15	2.79	4.17	2.96	1.70	2.45	4.12	3.61	4.03	4.12	45.96
Volusia	071	2.46	8.66	2.03	2.46	3.71	3.99	1.64	2.53	3.38	2.82	2.76	2.13	38.57
Volusia	072	1.70	4.14	1.80	0.84	0.11	0.55	0.71	0.74	0.96	0.31	2.74	2.14	16.74
Volusia	073	0.49	7.91	1.18	0.85	1.03	2.34	1.68	0.97	1.01	1.19	0.85	0.60	20.10
Volusia	074	1.72	6.85	3.35	2.31	2.45	2.72	0.93	1.54	1.98	1.19	1.76	1.66	28.46
Volusia	075	2.04	5.97	3.60	1.14	0.78	0.61	0.60	0.33	1.94	1.97	3.16	4.12	26.26
Volusia	076	4.86	9.05	6.88	1.08	1.75	1.13	0.85	1.34	1.92	1.85	7.32	8.27	46.30
Volusia	077	4.19	7.46	5.95	1.09	2.91	0.98	0.75	0.00	0.86	1.02	6.36	1.69	33.26
Volusia	078	2.42	8.56	4.73	1.46	1.54	1.13	2.13	2.47	2.77	2.57	6.65	5.22	41.65
Volusia	079	5.23	11.39	4.00	5.07	4.24	2.64	3.19	3.73	4.79	3.25	5.61	1.95	55.09
Volusia	080	1.32	4.88	1.47	1.27	1.03	1.59	1.68	2.22	3.70	2.21	2.96	2.66	26.99
Volusia	081	4.34	11.30	4.85	2.79	2.21	2.59	3.34	4.16	3.40	2.73	4.87	4.99	51.57
Volusia	082	2.17	7.37	3.58	2.05	1.28	1.05	0.84	1.92	1.82	3.08	3.88	3.64	32.68
Volusia	083	3.27	7.54	1.41	0.81	1.37	1.84	2.04	3.75	2.19	3.98	2.42	3.06	33.68
Volusia	084	1.54	8.25	1.08	1.26	1.24	1.37	0.84	2.17	1.01	1.39	1.82	0.85	22.82
Volusia	088				1.28	1.62	1.06	1.87	1.20	1.87	2.91	5.32	5.11	22.24
Volusia	089								1.42	2.28	5.99	4.85	2.06	16.60
Volusia	090					3.79	4.65	2.61	4.25	4.77	5.24	8.27	2.53	36.11
Volusia	091						2.58	1.03	1.33	2.30	1.92	1.34	3.06	13.56
Volusia	092						0.88	0.92	1.40	1.09	0.63	2.27	0.47	7.66
Volusia	093							1.02	2.51	3.66	1.08	4.92	4.27	17.46
Volusia	094							0.84	1.34	2.82	3.90	6.70	6.60	22.20
Monthly Average		3.05	7.94	3.44	1.99	2.08	1.76	1.48	2.31	2.79	2.50	4.20	3.63	—

Note: — = not applicable

Blank cells indicate data not available.

Appendix A—Leatherleaf Fern Water Use by Site

Table A3. Leatherleaf fern monthly water use (in inches) by site, 1992

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Lake	085	2.23	0.50	0.67	0.97	0.48		0.92	0.68	0.90	1.12	0.96	1.84	11.27
Lake	086						1.18	3.37	1.97	1.30	1.54	3.76	5.92	19.04
Lake	087	8.72	2.75	2.90	3.12	2.66	1.00	3.58	2.58	1.33	1.60	1.80	3.00	35.04
Lake	104	4.10	1.73	2.28	2.95	3.44	2.54	3.06	0.93	1.14	0.28	1.60	1.93	25.98
Lake	145									0.01		3.08	2.98	6.07
Lake	146							2.43	1.42	0.84	1.56	4.40	4.04	14.69
Putnam	057	24.44	4.83	2.57	1.86	2.48	0.45	1.93	1.86	2.99	2.07	3.13	7.07	55.68
Putnam	058	20.52	4.03	3.22	1.50	2.36	2.18	4.03	3.34	0.82	1.81	2.53	7.83	54.17
Putnam	059	17.26	3.38	4.23	3.27	2.75	1.70	1.08	1.74	5.88	1.81	3.45	6.60	53.15
Putnam	061	17.51	4.70	5.87	2.70	4.24	1.76	4.20	2.61	1.76	2.85	2.39	4.29	54.88
Putnam	141			0.86	1.04	0.89	0.77	1.22	0.61	0.91	1.17	1.20	3.16	11.83
Putnam	144							2.86	0.83	2.55	2.75	1.80	2.80	13.59
Volusia	062	12.71	2.53	3.17	2.71	2.48	0.99	5.03	2.01	1.29	2.56	1.55	4.46	41.49
Volusia	063	7.40	2.60	2.26	5.41	7.49	4.14	7.07	0.94	0.44	2.87	1.79	4.31	46.72
Volusia	064	10.01	2.24	1.48	2.45	3.13	0.98	2.11	1.27	1.36	1.93	2.25	2.98	32.19
Volusia	066	9.69	2.01	1.76	2.69	3.68	1.30	4.16	0.62	0.54	2.04	1.10	0.62	30.21
Volusia	067	6.96	1.08	2.20	2.05	1.53	1.59	1.85	1.80	1.04	1.69	1.69	3.19	26.67
Volusia	068	2.47	0.99	2.08	2.72	2.89	1.02	3.59	1.92	0.56	1.38	1.03	1.92	22.57
Volusia	069	6.45	2.86	2.21	2.97	6.09	3.37	5.09	1.01		1.32	1.52	2.48	35.37
Volusia	070	12.12	3.72	5.18	2.04	3.91	3.17	3.69	1.37	1.03	2.03	2.27	5.13	45.66
Volusia	071	5.11	2.23	2.87	1.90	3.11	1.42	2.65	1.39	0.91	1.24	1.25	0.65	24.73
Volusia	072	8.15	1.05	1.63	0.59	1.52	0.66	1.42	0.65	0.52	0.82	0.83	2.11	19.95
Volusia	073	1.88	0.63	0.60	0.96		0.64	3.00	1.12	0.75	3.13		1.41	14.12
Volusia	074	8.00	0.76	1.40			1.81	5.61					0.68	18.26
Volusia	075	12.94	2.58	2.96	1.14	2.34	1.48	2.15	0.42	1.06	1.70	1.64	4.36	34.77
Volusia	076	18.20	4.22	5.09	5.09	2.21	1.22	3.81	0.30	0.77	0.74	3.44	5.80	50.89
Volusia	077	13.86	2.49	3.79	0.92	2.53	1.25	3.25	0.01	0.53	0.85	2.79	4.75	37.02
Volusia	078	19.56	4.06	5.18	2.23	2.46	1.74	2.67	1.38	2.01	2.21	3.30	5.64	52.44
Volusia	079	12.72	3.27	2.96	4.22	4.93	3.08	4.01	1.59	1.91	3.68	3.06	2.34	47.77
Volusia	080	1.90	1.20	2.07	2.89	1.70	0.89	3.71	1.10	0.77	1.70	0.93	0.70	19.56
Volusia	081	17.75	3.09	2.96	2.62	4.46	1.98	6.63	2.35	1.64	2.09	2.73	4.61	52.91
Volusia	082	15.34	3.53	2.78	1.40	1.34	2.25	1.85	1.50	1.27	1.30	1.21	5.15	38.92
Volusia	083	4.69	2.27	2.00	3.17	4.73	1.64	3.81	1.02	1.45	1.34	1.14	1.44	28.70
Volusia	084	2.95	0.83	1.50	1.50	1.95	1.04	2.39			1.48	1.24	1.58	16.46
Volusia	088	15.08	2.88	4.61	3.14	3.54	3.50	4.62	1.84	1.94	2.56	3.52	4.95	52.18
Volusia	089	11.52	1.94		6.49	2.09		0	0	0.67	2.59	3.13	4.61	33.04
Volusia	090	16.71	3.17	4.29	4.32	4.35	1.46	5.17	2.67	1.75	3.14	4.32	7.05	58.40
Volusia	091	6.66	1.44	2.34	6.42	3.30	1.03	1.99	1.37	0.73	1.08	1.12	2.60	30.08
Volusia	092	7.08	2.42	1.75	2.24	2.61	0.83	3.85	0.66	1.12	1.93	3.21	4.63	32.33
Volusia	093	15.02	3.97		2.62	2.27	1.34	1.11	1.16	1.30	1.47	1.91	3.83	36.00
Volusia	094	20.52	3.89	4.30	2.75	2.12	4.27	2.26	0.77	0.65	3.54	6.32	7.21	58.60
Volusia	142			2.57	0.96	0.82	1.10	4.07	0.36	1.05	0.60	1.23	4.10	16.86
Volusia	162									0.20	0.43	1.22	2.46	4.31
Volusia	170												5.03	5.03
Monthly Average		11.06	2.55	2.79	2.65	2.91	1.70	3.20	1.31	1.24	1.80	2.26	3.73	—

Note: — = not applicable

Blank cells indicate data not available.

Water Use Report on Leatherleaf Fern and Potatoes

Table A4. Leatherleaf fern monthly water use (in inches) by site, 1993

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Lake	085	1.02	0.54	3.38	0.99	1.53	1.04	0.40	1.45	0.74	1.14	0.44	3.69	16.36
Lake	086	0.87				0.92	1.60	2.16	1.30	1.79	0.37			9.01
Lake	087	2.65	2.44	3.80	5.16	2.70	2.49	1.71	2.74	1.95	5.34	1.74	11.33	44.05
Lake	104	0.84	0.18	2.50	2.07	2.52	2.29	2.46	1.51	1.63	1.74	1.66	3.28	22.68
Lake	145	3.03	4.89	8.76	3.69	4.12	3.25	1.98	4.03	0.55	2.60	3.60	9.57	50.07
Lake	146	2.96	5.26	1.82	3.82	3.31	1.75	1.82	2.47	0.90	0.86	3.66	19.17	47.80
Putnam	057	3.68	9.41	8.96	2.01	3.54	4.57	1.54	2.84	1.40	1.84	1.9	10.57	52.26
Putnam	058	2.93	4.30	7.01	2.47	3.55	3.85	3.75	3.37	2.51	3.97	4.00	11.11	52.82
Putnam	059	2.55	3.71					2.05	3.53	1.23	3.35	1.38	12.31	30.11
Putnam	061	2.64	3.42	9.36	3.69	4.09	3.40	3.06	2.94	1.85	3.48	2.00	11.94	51.87
Putnam	141	1.17	2.21	2.89	1.06	1.30	1.36	1.05	1.68	0.86	1.50	0.86	5.54	21.48
Putnam	144	3.68	5.48	6.02	3.27	1.45	2.57	2.30	2.95	2.06	2.27	1.15	2.46	35.66
Volusia	062	2.35	2.89	7.66	2.84	3.57	2.25	2.64	3.79	2.29	4.46	3.58	8.26	46.58
Volusia	063	4.70	1.45	3.70	2.04	2.71	3.31	2.25	3.19	1.20	2.06	1.66	7.77	36.04
Volusia	064	2.49	3.48	7.07	3.01	2.74	2.39	2.32	3.51	0.87	2.47	1.60	7.69	39.64
Volusia	066	1.27	1.53	6.18	5.18	3.00	2.44	2.80	4.08	1.27	1.42	1.53	7.88	38.58
Volusia	067	2.27	2.00	2.33	2.24	2.05	0.80	1.66	3.36	1.24	1.02	0.95	5.91	25.83
Volusia	068	1.12	1.36	3.58	3.07	1.67		2.41	2.93	1.23	3.01	1.64	2.45	24.47
Volusia	069	1.52	2.73	3.58	2.75	3.19	2.80	2.30	3.24	0.91	2.87	5.68	7.93	39.50
Volusia	070	3.27	4.64	8.32	3.65	3.26	2.31	2.42	3.36	2.82	1.02	2.57	7.03	44.67
Volusia	071	1.89	1.91	3.91	3.02	2.87	1.86	1.86	3.16	2.78	3.89	3.16	2.13	32.44
Volusia	072	1.21	1.31	3.24	0.00	1.25	1.30	0.84	0.95	0.53	0.27	0.42	3.39	14.71
Volusia	073	1.72	0.97	1.08	2.21	1.44	1.46	1.72	1.50	0.72	0.68		3.76	17.26
Volusia	074	2.00	1.58	5.05	0.46	0.98	1.45	0.41	0.83	0.54	2.30	0.98	5.19	21.77
Volusia	075	2.36	4.48	7.89	2.75	2.38	0.58	1.44	1.19	0.54	0.98	0.97	8.87	34.43
Volusia	076	3.35	7.38	3.00	4.25	1.32	2.08	1.07	2.27	1.09	1.20	1.88	12.87	41.76
Volusia	077	2.76	4.43	6.02	2.98	2.93	2.07	1.15	2.77	2.32	0.36	1.49	9.32	38.60
Volusia	078	6.16	5.17	4.65	2.20	2.64	3.16	4.01	2.11	1.84	2.75	2.10	16.53	53.32
Volusia	079	2.60	2.81	7.15	4.17	4.90	4.37	3.90	6.63	1.77	2.19	2.57	11.03	54.09
Volusia	080	0.62	0.79	3.51	3.58	2.05	0.70	1.78	2.74	1.36	2.29	0.88	1.53	21.83
Volusia	081	3.47	6.01	8.31	3.42	1.37	2.57	1.93	3.83	1.81	2.30	2.32	7.13	44.47
Volusia	082	2.99	4.71	3.46	1.84	1.50	1.36	1.62	1.41	1.50	2.19	1.55	8.62	32.75
Volusia	083	0.82	1.74	3.26	2.28	1.75	2.70	1.71	3.06	2.48	1.25	1.74	3.79	26.58
Volusia	084	1.46	0.91	2.47	2.07	1.64	2.19	1.60	1.88	1.07	1.32	0.88	2.59	20.08
Volusia	088	3.06	4.62	8.33	3.38	2.91	2.62	2.05	5.60	1.81	3.70	2.35	9.85	50.28
Volusia	089	0.77	0.57	5.36	2.33	4.17	3.09	0.95	5.38	2.10	3.65	1.36	6.19	35.92
Volusia	090	3.61	4.22	1.22	5.22	2.80	3.20	2.50	3.23	2.56	1.83	1.49	7.74	39.62
Volusia	091	1.45	2.66	2.28	1.51	1.09	0.75	0.75	0.99	0.40	0.58	0.61	4.91	17.98
Volusia	092	3.24	3.90	6.42	3.22	2.38	1.80	0.89	2.28	1.22	2.76	2.36	8.35	38.82
Volusia	093	4.68	3.82	6.45	2.90	1.62	1.48	0.69	1.49	2.03	1.80	1.38	9.48	37.82
Volusia	094	4.58	6.57	8.58	2.37	4.56	2.99	3.16	3.63	2.30	1.84	2.69	10.79	54.06
Volusia	142	4.76	4.97	5.53	3.49	1.08	0.48	0.11	2.21	0.90	2.51	0.84	9.12	36.00
Volusia	162	1.53	1.56	0.06	0.10									3.25

Table A4—Continued

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Volusia	170	3.15	4.77	2.78	2.52	2.15	1.22	0.26	2.28	1.64	0.39	1.07	9.34	31.57
Volusia	171	0.11	0.43	0.60	3.22	3.53	0.99	1.24	1.55	0.88	0.91	0.96	3.08	17.50
Volusia	174										0.35	2.61	9.95	12.91
Monthly Average		2.47	3.28	4.83	2.76	2.48	2.17	1.83	2.76	1.49	2.02	1.87	7.76	—

Note: — = not applicable

Blank cells indicate data not available.

Water Use Report on Leatherleaf Fern and Potatoes

Table A5. Leatherleaf fern monthly water use (in inches) by site, 1994

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Lake	085	1.31	1.02		0.98	0.62	0.05	1.46	0.55	0.35		0.26	1.00	7.60
Lake	086	6.03	3.69	3.84	0.47	1.58	0.23	2.99	0.63		2.14	0.54	1.21	23.35
Lake	087	5.86	3.13	6.95	7.25	6.80	1.90	1.77	1.11	1.22	0.87	0.67	1.13	38.66
Lake	104	1.02	0.97	1.48	2.38	2.47	1.18	1.47	0.62	0.68	0.51	0.73	1.61	15.12
Lake	145	8.06	6.28	4.04	3.13	2.61	1.77	2.76	1.11	1.94	1.98	2.15	2.53	38.36
Lake	146	7.92	3.82	2.59	0.57	1.53	0.96	0.40	0.87	0.60	1.25	0.48	0.46	21.45
Putnam	057	4.22	5.42	3.03	5.56									18.23
Putnam	058	6.67	5.87	2.65	5.18	5.44	1.43	2.55	1.68	2.77	2.77	1.07	1.74	39.82
Putnam	059	7.29	4.10	4.00	4.36	2.50	0.38	1.22	2.51	2.17	2.55	1.03	0.38	32.49
Putnam	061	8.47	5.36	4.18	6.80	5.35	3.07	4.04	2.20	2.32	2.63	2.59	2.59	49.60
Putnam	141	2.04	2.52	2.05	2.53	0.43	1.45	1.00	1.13	1.03	0.83	0.87	0.43	16.31
Putnam	144	5.10	3.84	2.22	2.60	1.54	0.88	1.84	0.96	3.15	1.74	1.98	1.77	27.62
Volusia	062	5.66	4.85	4.59	5.61	5.21	4.18	4.28	3.28	3.53	3.02	3.34	3.20	50.75
Volusia	063	5.03	0.68	2.73	2.10	3.54	2.34	1.84	0.74	1.55	3.68	0.46	0.77	25.46
Volusia	064	2.14	3.54	2.01	3.01	2.46	2.41	0.93	1.63	1.33	0.92	1.39	2.26	24.03
Volusia	066	4.65	0.37	2.27	4.19	2.80	0.99	1.42	1.61	1.05	1.36	0.93	1.22	22.86
Volusia	067	4.82	1.75	1.70	1.97	2.15	1.07	1.41	0.51	0.49	0.62	0.60	0.39	17.48
Volusia	068	2.34	3.82	5.69	5.90	4.41			0.94		0.98	1.24		25.32
Volusia	069	4.35	1.73	3.72	4.14	7.54	2.90	1.82	0.51	1.28	0.62	0.71	1.30	30.62
Volusia	070	7.06	2.44	4.07	3.58	3.51	3.06	2.36	1.20	1.78	1.51	1.14	5.71	37.42
Volusia	071	1.38	3.05	4.31	3.89	3.28	3.05	2.94	1.15	1.39	1.16	1.95	0.87	28.42
Volusia	072	3.33	0.74	0.99	1.72	0.78	0.21	0.36	0.31					8.44
Volusia	073	4.03	0.86	2.10	1.68	1.36	1.03	2.11	1.09	1.06	0.56			15.88
Volusia	074	1.92	2.83	1.27	3.35	2.57	1.10	0.56	0.58	2.45	0.46	0.07	0.00	17.16
Volusia	075	6.29	0.65	1.23	1.36	0.68	0.67	0.92	0.52	0.69	1.04	0.64	1.33	16.02
Volusia	076	8.18	2.13	2.14	1.94	2.14	0.36	0.35	0.36	1.24	0.29	0.60	1.24	20.97
Volusia	077	7.75	1.52	3.54	5.43	2.88	3.81		1.02	0.56	1.67	1.61	0.81	30.60
Volusia	078	12.27	2.96	1.55	0.13	0.42	0.44	0.66	0.08	0.25	1.09	0.98	6.00	26.83
Volusia	079	4.39	3.47	3.84	4.59	6.52					2.20	2.01	2.62	29.64
Volusia	080	0.92	1.38	2.39	4.34	2.53	1.19	2.36	0.61	0.75	0.82	0.90	1.06	19.25
Volusia	081	5.65	3.84	2.01	2.55	2.03	0.95	1.81	1.47	2.39	2.11	1.02	1.61	27.44
Volusia	082	7.68	0.88	1.49	4.68	4.66	1.67	2.42	2.51	1.68	1.52	0.95	0.94	31.08
Volusia	083	2.11	1.95	1.51	3.67	3.15	1.28	1.13	0.87	0.86	1.26	0.81	0.31	18.91
Volusia	084	0.54	1.11	1.95	1.11	1.34		1.11	0.33	0.84	1.03	0.13	0.33	9.82
Volusia	088	5.65	2.37	3.65	4.26	4.08	2.62	3.35	1.68	2.37	2.15	0.98	2.01	35.17
Volusia	089	4.12	2.79	1.66	3.11	1.62	1.17							14.47
Volusia	090	5.13	1.00	2.44	3.47	3.03	1.73	1.46	1.49	1.27	2.01	1.40	2.12	26.55
Volusia	091	3.19	0.31	0.98	1.55	0.63	0.71	0.79	0.66	0.68			0.61	10.11
Volusia	092	2.78	2.49	2.78	2.23	2.44	0.54	1.86	0.40	1.13	1.01	0.81	2.30	20.77
Volusia	093	8.29	1.99	1.85	2.13	2.51	1.24	1.64	1.41		1.14	1.64	1.43	25.27
Volusia	094	7.49	1.67	3.80	1.79	2.41	0.92	1.11	1.78	1.49	1.58	1.44	1.08	26.56
Volusia	142	4.35	2.76	2.68	0.66	1.54	0.81	1.82	0.90	1.73	0.98	1.34	0.01	19.58

Table A5—Continued

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Volusia	170	6.78	2.54	1.33	2.73	2.85	1.49	2.34	1.18	0.46	0.70	1.86	1.23	25.49
Volusia	171	1.78	2.01	1.02	1.99	4.78	0.71	1.23	0.71	0.87	0.61	0.77	0.58	17.06
Volusia	174	8.49	1.83	5.10	6.77	4.33	1.02	1.23	0.94	1.52	1.43	1.76	1.70	36.12
Monthly Average		4.99	2.54	2.76	3.19	2.89	1.44	1.73	1.09	1.39	1.42	1.15	1.50	—

Note: — = not applicable

Blank cells indicate data not available.

Water Use Report on Leatherleaf Fern and Potatoes

APPENDIX B—POTATO WATER USE BY SITE

Water Use Report on Leatherleaf Fern and Potatoes

Table B1. Potato monthly water use (in inches) by site, 1990

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Flagler	003			7.42	4.77									12.19
Flagler	020			4.51	2.52	0.39								7.42
Flagler	054			4.08	1.63									5.71
Putnam	004			5.79	4.16	6.60								16.55
Putnam	008		1.54	6.46	2.97									10.97
Putnam	009		3.37	5.82	3.61									12.80
Putnam	010		1.92	5.56										7.48
Putnam	011		7.08	9.22	4.39	1.58								22.27
Putnam	013		0.81	7.78	3.70									12.29
Putnam	015			4.45	5.52	8.21								18.18
Putnam	055			8.24	2.39									10.63
St. Johns	018			5.07	2.99									8.06
St. Johns	019		0.68	8.36	3.43									12.47
St. Johns	021			7.9	3.69	2.40								13.99
St. Johns	024		1.69	5.34	2.63									9.66
St. Johns	026			6.48	6.84									13.32
St. Johns	028			11.45	5.60									17.05
St. Johns	032		0.63	9.94	6.47	2.81								19.85
St. Johns	035			6.05	3.33	0.38								9.76
St. Johns	037		0.39	8.03	4.23									12.65
St. Johns	038			8.43	3.87	*								12.30
St. Johns	042			6.54	3.22									9.76
St. Johns	044			2.78	2.57	0.79								6.14
St. Johns	045			6.07	1.87									7.94
St. Johns	046		0.25	5.08	2.61	2.29								10.23
St. Johns	047			7.95	4.32	6.92								19.19
St. Johns	048			6.97	9.90	9.86								26.73
St. Johns	049		4.94	8.03	5.74	1.06								19.77
St. Johns	050		8.22	10.38	8.08									26.68
Monthly Average		0.00	2.63	6.90	4.18	3.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—

Note: — = not applicable

*Irrigation occurred, but data are missing.

Blank cells indicate no irrigation occurred.

July through December are not production periods for potatoes.

Water Use Report on Leatherleaf Fern and Potatoes

Table B2. Potato monthly water use (in inches) by site, 1991

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Flagler	003		4.47	7.14	1.42									13.03
Flagler	020			1.55	1.15	2.30								5.00
Flagler	051		1.78	4.64										6.42
Flagler	052		1.51	4.16	0.55									6.22
Flagler	053			1.73	0.27	0.99								2.99
Flagler	054			3.46	0.66	1.90								6.02
Putnam	002		2.78	4.47	0.95	0.87								9.07
Putnam	004		1.87	3.77	3.35	0.23								9.22
Putnam	005		2.62	2.25	1.19									6.06
Putnam	006		1.99	1.90	0.43									4.32
Putnam	007		1.49	0.62	0.50	2.25								4.86
Putnam	008		4.10	2.74	0.63									7.47
Putnam	009		3.23	3.32	2.98									9.53
Putnam	010		0.96	3.71	2.29									6.96
Putnam	011		5.16	4.13	1.95									11.24
Putnam	012		2.77	1.43	1.72									5.92
Putnam	013	0.47	2.67	1.72	0.76									5.62
Putnam	014		3.16	3.70	2.78									9.64
Putnam	015		1.19	3.95	2.21	4.12								11.47
Putnam	055		4.28	5.14	5.49									14.91
St. Johns	016		1.75	1.71	1.57									5.03
St. Johns	017		2.14	1.71	2.44									6.29
St. Johns	018		2.78	1.08	1.06									4.92
St. Johns	021		1.13	1.33	1.79	0.58								4.83
St. Johns	022			0.95	1.17									2.12
St. Johns	024			*	2.21									2.21
St. Johns	025		2.29	2.86	2.71									7.86
St. Johns	026			1.39	3.76	4.73								9.88
St. Johns	027		3.29	2.08	2.30									7.67
St. Johns	028		1.42	4.37	5.44									11.23
St. Johns	029			1.04	0.95									1.99
St. Johns	030		3.24	0.87	0.91									5.02
St. Johns	031		0.90	2.73	0.83									4.46
St. Johns	032		8.32	2.99	1.08									12.39
St. Johns	033		0.57	1.69	1.03									3.29
St. Johns	034		1.61	2.69	1.67									5.97
St. Johns	036		0.40	0.83	0.16									1.39
St. Johns	038		0.76	1.82	0.25									2.83
St. Johns	039		6.37	4.68	1.84									12.89
St. Johns	040			1.33	0.59									1.92
St. Johns	041		1.82	1.63	1.00									4.45
St. Johns	042			0.37	1.21	3.08								4.66
St. Johns	043		1.60	2.23	0.69	1.06								5.58
St. Johns	044		1.81	3.25	1.34									6.40
St. Johns	045		1.35		1.70	4.34								7.39
St. Johns	046		3.86	4.58	1.40									9.84

Table B2—Continued

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
St. Johns	047		1.72	1.85	2.88	2.00								8.45
St. Johns	048				2.88	3.91								6.79
St. Johns	049		*	4.45	4.23	0.11								8.79
St. Johns	050		2.77	7.96	4.34	3.67								18.74
Monthly Average		0.47	2.51	2.77	1.77	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—

Note: — = not applicable

*Irrigation occurred, but data are missing.

Blank cells indicate no irrigation occurred.

July through December are not production periods for potatoes.

Water Use Report on Leatherleaf Fern and Potatoes

Table B3. Potato monthly water use (in inches) by site, 1992

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Flagler	003			3.97	9.34	3.82								17.13
Flagler	020			1.61	6.90	5.33								13.84
Flagler	051			1.46	6.77	2.51								10.74
Flagler	052			1.82	6.41	2.41								10.64
Flagler	053			0.41	6.84	1.76								9.01
Flagler	054			0.37	5.27	1.89								7.53
Putnam	001			0.44	4.37	3.51								8.32
Putnam	002			2.10	6.02	2.67								10.79
Putnam	004			9.51	8.69	5.91								24.11
Putnam	005	2.06		4.46	5.33	1.40								13.25
Putnam	006		2.16	6.46	5.03									13.65
Putnam	007			2.93	5.72	2.94								11.59
Putnam	008	0.57	0.77	4.50	1.82									7.66
Putnam	009			7.21	8.43	8.23								23.87
Putnam	010	1.66	0.13	6.98	4.75									13.52
Putnam	011	3.96	2.69	6.76	3.72									17.13
Putnam	012			2.97	5.72	0.86								9.55
Putnam	013		0.1	5.06	2.28									7.44
Putnam	014	1.27	0.16	7.21	5.98									14.62
Putnam	015			4.77	10.75	5.84								21.36
Putnam	055		3.75	8.06	6.17	0.87								18.85
St. Johns	016		0.46	6.78	6.81									14.05
St. Johns	017			1.82	11.95	5.24								19.01
St. Johns	018			3.21	5.49									8.70
St. Johns	019			5.67	7.43									13.10
St. Johns	021			5.72	5.47									11.19
St. Johns	022			0.89	4.55	2.99								8.43
St. Johns	024			2.89	7.68	3.71								14.28
St. Johns	025			3.96	7.60	3.15								14.71
St. Johns	026			4.14	7.81	3.76								15.71
St. Johns	027			4.86	6.73									11.59
St. Johns	028			11.02	10.82	3.58								25.42
St. Johns	029			3.53	6.60	3.25								13.38
St. Johns	030	1.13		4.40	3.14									8.67
St. Johns	031		0.14	8.15	4.62									12.91
St. Johns	032	0.60		9.29	11.74	5.43								27.06
St. Johns	033			3.26	5.71	0.81								9.78
St. Johns	034			2.22	6.52	1.26								10.00
St. Johns	036			2.88	5.45	2.63								10.96
St. Johns	037			5.35	10.83	9.15								25.33
St. Johns	038	1.82		5.00	7.26	2.15								16.23
St. Johns	039	1.45	0.18	7.16	3.66									12.45
St. Johns	040			2.80	4.69	2.35								9.84
St. Johns	041			5.51	6.12	0.83								12.46
St. Johns	042			5.52	6.89	1.76								14.17
St. Johns	043			6.18	6.05	3.45								15.68

Table B3—Continued

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
St. Johns	044			6.90	6.10	1.66								14.66
St. Johns	045			4.92	7.86	2.32								15.10
St. Johns	046		0.51	6.00	5.80	0.26								12.57
St. Johns	047			4.92	8.18	1.65								14.75
St. Johns	048			1.33	13.19	8.52								23.04
St. Johns	049			7.69	9.46	3.94								21.09
St. Johns	050	7.43	5.97	10.33	10.79	2.17								36.69
Monthly Average		2.20	1.42	4.78	6.78	3.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—

Note: — = not applicable

Blank cells indicate no irrigation occurred.

July through December are not production periods for potatoes.

Water Use Report on Leatherleaf Fern and Potatoes

Table B4. Potato monthly water use (in inches) by site, 1993

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Flagler	003				8.06	5.02								13.08
Flagler	020				7.30	6.77								14.07
Flagler	051			0.15	10.63	3.23								14.01
Flagler	052				9.05	1.20								10.25
Flagler	053				5.34	1.71								7.05
Flagler	054				8.25	4.37								12.62
Putnam	001				4.45	4.20								8.65
Putnam	002				5.44	5.87								11.31
Putnam	004			0.45	11.21	4.85								16.51
Putnam	005			1.03	7.39	1.45								9.87
Putnam	006				6.11	1.19								7.30
Putnam	007		0.70		4.66	0.58								5.94
Putnam	008		1.34	0.68	8.94									10.96
Putnam	009		0.70	0.51	10.37	12.45								24.03
Putnam	010				6.77	0.66								7.43
Putnam	011		3.25	3.15	9.67	1.41								17.48
Putnam	012		0.51		5.51	0.75								6.77
Putnam	013				6.01	3.99								10.00
Putnam	014				6.59	8.42								15.01
Putnam	015				9.28	10.46								19.74
Putnam	055		1.20	1.82	10.98	0.61								14.61
St. Johns	016				6.05	1.14								7.19
St. Johns	017				15.29	0.76								16.05
St. Johns	018				5.44	4.55								9.99
St. Johns	019				7.45	4.31								11.76
St. Johns	021		1.22	1.39	6.31	0.75								9.67
St. Johns	022				4.91	5.16								10.07
St. Johns	023				7.80	7.81								15.61
St. Johns	024				7.66	4.25								11.91
St. Johns	025		0.56	1.20	6.24	1.27								9.27
St. Johns	026		1.86	1.25	10.21	2.51								15.83
St. Johns	027			0.13	6.14	1.87								8.14
St. Johns	028			1.10	11.58	5.00								17.68
St. Johns	029				7.75	9.19								16.94
St. Johns	030		0.22		4.66	4.06								8.94
St. Johns	031				6.87	0.83								7.70
St. Johns	032			0.54	13.52	7.64								21.70
St. Johns	033				5.93	2.46								8.39
St. Johns	035				6.35	10.11								16.46
St. Johns	036				6.14	6.82								12.96
St. Johns	037			0.16	11.36	12.66								24.18
St. Johns	038				5.05	7.62								12.67
St. Johns	039			0.37	8.27	3.83								12.47
St. Johns	040			0.21	6.51	4.25								10.97
St. Johns	041				7.40	2.99								10.39
St. Johns	042				8.26	4.77								13.03

Table B4—Continued

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
St. Johns	043				7.85	8.48								16.33
St. Johns	044				9.64	6.91								16.55
St. Johns	045				9.15	7.84								16.99
St. Johns	046			0.62	7.08	7.07								14.77
St. Johns	047				7.56	11.10								18.66
St. Johns	048				6.29	12.54	6.98							25.81
St. Johns	049			1.52	8.84	4.47								14.83
St. Johns	050				10.47	11.61	6.51							28.59
Monthly Average		0.00	1.16	0.90	7.82	5.02	6.75	0.00	0.00	0.00	0.00	0.00	0.00	—

Note: — = not applicable

Blank cells indicate no irrigation occurred.

July through December are not production periods for potatoes.

Water Use Report on Leatherleaf Fern and Potatoes

Table B5. Potato monthly water use (in inches) by site, 1994

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Flagler	003			5.42	10.21									15.63
Flagler	020			2.57	8.82	4.57								15.96
Flagler	051			2.75	6.46	0.30								9.51
Flagler	052			2.90	4.83	0.32								8.05
Flagler	053		*	0.81	0.18	*								0.99
Flagler	054			3.35	8.37	0.47								12.19
Putnam	001			3.76	3.23									6.99
Putnam	002			3.39	5.73	1.04								10.16
Putnam	004			6.74	10.26	9.46								26.46
Putnam	005		2.01	4.89	10.13	3.67								20.70
Putnam	006		0.63	6.54	3.60									10.77
Putnam	007			3.09	5.54									8.63
Putnam	008		0.34	4.71	2.73									7.78
Putnam	009			8.17	14.88	10.07								33.12
Putnam	010			3.83	8.30									12.13
Putnam	011			4.98	7.30	1.84								14.12
Putnam	012			3.80	5.10									8.90
Putnam	013			2.98	1.36									4.34
Putnam	014		3.25	6.96	1.59									11.80
Putnam	015			6.36	10.59	0.40								17.35
Putnam	055		0.76	6.42	4.94									12.12
St. Johns	016			4.31	4.63									8.94
St. Johns	018			3.96	5.56									9.52
St. Johns	019			3.69	8.73	1.90								14.32
St. Johns	021		0.20	3.88	4.66									8.74
St. Johns	022			2.97	6.92	4.05								13.94
St. Johns	024			3.95	6.37	1.25								11.57
St. Johns	025		0.87	5.63	3.32									9.82
St. Johns	026		2.00	9.17	4.07									15.24
St. Johns	027			3.51	4.72	0.86								9.09
St. Johns	028			7.10	9.00	2.70								18.80
St. Johns	029			3.32	6.89	3.17								13.38
St. Johns	030			0.68	5.90									6.58
St. Johns	031			2.05	7.49	4.22								13.76
St. Johns	032			8.45	11.40									19.85
St. Johns	033			8.38	5.52									13.90
St. Johns	034			3.23	4.68	3.13								11.04
St. Johns	035			4.84	6.87	4.07								15.78
St. Johns	036			2.41	3.41									5.82
St. Johns	037		1.74	9.79	4.38									15.91
St. Johns	038			6.92	8.38									15.3
St. Johns	039		1.38	9.37	7.37									18.12
St. Johns	040			4.12	5.85	2.54								12.51
St. Johns	041			4.39	5.71									10.10
St. Johns	042			2.64	4.08	2.76								9.48
St. Johns	043			6.44	7.49	5.19								19.12

Table B5—Continued

County	Site No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
St. Johns	044			5.10	8.10	4.16								17.36
St. Johns	045			3.87	6.71	4.17								14.75
St. Johns	046			6.96	7.02	0.62								14.60
St. Johns	047		0.10	5.21	9.71	7.35								22.37
St. Johns	048			2.91	8.24	11.73								22.88
St. Johns	049			8.05	8.87	1.47								18.39
St. Johns	050		8.53	12.42	7.82									28.77
Monthly Average		0.00	1.82	4.98	6.49	3.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—

Note: — = not applicable

*Irrigation occurred, but data are missing.

Blank cells indicate no irrigation occurred.

July through December are not production periods for potatoes.