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Survey Report

Suwannee River Partnership

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Contents

Glossary & Acronyms

BMAP	Basin Management Action Plan: The primary tool for TMDL implementation a TMDL. A BMAP prescribes restoration strategies to reduce pollution and meet TMDL goals.
CARES	County Alliance for Responsible Environmental Stewardship
Center PIE	University of Florida/IFAS Center for Public Issues Education
DEP	Florida Department of Environmental Protection
EPA	Federal Environmental Protection Agency
MIL	Mobile Irrigation Lab
SRP	Suwannee River Partnership
SRWMD	Suwannee River Water Management District
TMDL	Total Maximum Daily Load: A calculation of the maximum amount of a given pollutant that a water body can absorb and still maintain its designated uses

Background

Over the last two decades, nitrate levels in the Suwannee and Santa Fe river basin has been exponentially increasing. Elevated nitrate levels can cause health problems in humans and have negative impacts on water resources and the environment.

The Suwannee River Partnership (SRP) was formed in 1999 as a coalition of state, federal and regional agencies, local governments, and private industry representatives. Their aim: to work together to reduce nitrate levels in the surface waters and groundwater within the Suwannee and Santa Fe river basins, or watersheds.

Initially, the SRP's efforts were limited to the Middle Suwannee River Basin. In 2003, SRP expanded its scope to include the Santa Fe River Basin and the entire Suwannee River Water Management District area. The SRP now includes 60 Federal, State, and Local agencies as well as private associations and businesses.

The partnerships mission is to provide researched-based solutions that protect and conserve the water resources within the Suwannee River Water Management District by emphasizing the implementation of voluntary or incentive-based programs.The SRP is actively involved with educational and research programs, such as the County Alliance for Responsible Environmental Stewardship (CARES), Florida Yards & Neighborhoods, and Total Maximum Daily Load (TMDLs) development and implementation. One of the SRPs primary focuses is the promotion of agricultural Best Management Practices (BMPs) to protect water quality and quantity in the watershed. A key component of the SRP's strategy to protect the water resources of the basin is to verify BMPs are effective at reducing nitrogen. The University of Florida leads the effort to test BMPs on the Live Oak research center and on individual farms.

A TMDL is a term in the water quality field that addresses water pollutants. A TMDL is a calculation of the maximum amount of a given pollutant that a water body can absorb and still maintain its designated uses (e.g., drinking water, fishing, swimming, shellfish harvesting). One water body may have several TMDLs, one for each targeted pollutant. Some pollutants for which TMDLs have been set include: total phosphorus, total nitrogen, iron, etc.). TMDLs are developed by the Florida Department of Environmental Protection (DEP) and the federal Environmental Protection Agency (EPA). There are several pollutants found in the Suwannee/Santa Fe river basins, and Basin Management Action Plan (BMAP) is developed once a TMDL has been written and approved. A BMAP is the primary tool for implementing a TMDL; it outlines restoration strategies that will reduce pollution to meet the TMDL goals. The development of a BMAP involves a stakeholder advisory group and each BMAP is unique and based on the characteristics and impairments of each waterbody.

The Suwannee & Santa Fe river basin has multiple TMDLs for various pollutants. BMAPs are in the process of being developed and implemented and there are concerns regarding water supply and conservation. The survey is an effort to better understand the level of awareness of producers in the basin regarding water quality and quantity issues and efforts. Also, the recommendations based on the data will help the SRP better target producers in terms of water quality/quantity topics, levels of interest, communication mediums, and strategies.

Methods

The survey was developed by a panel consisting of University of Florida Agricultural Engineering faculty, University of Florida Center for Public Issues Education (PIE Center) staff, and SRP staff. After review, it was edited, approved by the University of Florida Institutional Review Board and prepared for dissemination.

Initially, the survey was designed to be an online survey. However, it became clear that many of the producers in the basin did not provide or utilize an email address, making an online survey inappropriate for the audience. Given the costs and timeline associated with a mail survey and the budget of the SRP, it was decided to utilize workshops, tours, and meetings to distribute the survey (face-to-face). This would allow SRP staff to explain the purpose and importance of completing the survey, thus increasing participation and increasing interest and membership in the organization. The SRP list of contacts (producers in the basin) number approximately 500 individuals.

This survey utilized a purposive sample of producers in the basin. Producers who attended farming technique and water conservation workshops were asked to fill out a hard copy of the survey while in attendance. There were seven workshops/meetings utilized in total. These meetings took place between December 11, 2011-August 31, 2012. Participation was voluntary and sign in sheets were collected to ensure that no producer took the survey more than one time. Each meeting/workshop was attended by the same SRP staff, the same announcement was given, and the dissemination and collection was the same to ensure consistency. This method also helped the SRP increase their list of known producers and their contact information to include for future outreach efforts.

The first meeting, a watermelon workshop held on December 11, 2011 served as the pilot for the project. Because there were very few changes made after the pilot and because the number of respondents was limited, it was decided to include the pilot group in the total. It should also be noted that many of the respondents (n=14) from the Otter Springs meeting held on were missing a whole page (8) in the survey.

The hard copies of the survey were then entered into an online version using Qualtrics survey software. Results were analyzed using SPSS statistical software for quantitative questions and Weft QDA for qualitative (open-ended) questions. Results for both quantitative and qualitative questions are reported together in the report.

Limitations & Assumptions of Study

- Because this was not a random sample of SRP-known/documented producers in the basin, results are not able to be generalized to all producers in the basin. Any producers who did not attend workshops or meetings were not eligible to participate in the survey and as such, are not represented in the results. However, SRP staff were confident that the Water Issues meetings and workshops held during the December 2011-August 2012 timeframe focused on pertinent and timely issues that would attract a large number of producers in the basin and provide a representative sample.

- Although a handful of surveys were not fully complete, there were still included in the survey as they provide insight into crops grown in the basin. All of the surveys included filled out at least five questions. Only one survey was thrown out that was completely blank (N=104).

- There could be some degree of social desirability bias as a result of the nature of this purposive sample. The meetings and workshops all included some kind of water quality/conservation component or update, so participants were actively thinking about the issues and being presented with information about them.

- A total of 14 respondents were missing page eight at the Otter Springs workshop, which means that they missed questions 23-25 (where they get information about water use BMPs; interest in attending SRP workshop; and additional comments/suggestions). Response rates are lower for these questions.

- While some of the questions suffer from low response rates, they are not all due to respondents skipping questions as "skip logic" questions account for those for whom the question does not apply (see *Appendix A* for the final survey instrument with skip logic displayed).

- It appears that some respondents did not realize that the survey was double-sided.

Findings

A total of 104 surveys were collected from seven different workshops/meetings. The seven meetings included:

1) Watermelon Workshop-December 11, 2012 (16 respondents)

2) Conservation Farming Group Meeting-February 21, 2012 (11 respondents)

3) Live Oak Water Issues Meeting-May 1, 2012 (30 respondents)

4) Oleno Park Water Issues Meeting-May 14, 2012 (16 respondents)

5) Otter Springs Water Issues Meeting-May 29, 2012 (17 respondents)

6) Corn and Peanut Growers Tour-August 7, 2012 (8 respondents)

7) Hamilton County Peanut Tour-August 21, 2012 (6 respondents)

Findings are sorted into seven categories: demographics, commodities/crops, water quality, water quantity, BMPs, irrigation, and communication.

Demographics

Of the 104 respondents, 94 completed the demographic questions.

Nearly 28 percent (n=26) of respondents were between 46-55 years of age; another 27 percent (n=25) of respondents were between the ages of 56-65. An additional 16 percent (n=15) are over the age of 65. This means that over 70 percent of the respondents are over the age of 46 (and between the ages of 46-65). On the other hand, less than 30 percent of respondents are under the age of 46 (see *Table 1*).

Table 1: Age demographics of respondents

Age (n=94)	Percentage	Frequency (n)
18-25	2.1	2
26-35	12.8	12
36-45	14.9	14
46-55	27.7	26
56-65	26.6	25
Over 65	16.0	15

A strong majority of the survey respondents (who completed question, n=94) and attendance at meetings and workshops were male (94 percent, n=88), while only 6 percent (n=6) were women.

Regarding level of education, 36 percent (n=34) of respondents received a high school diploma or GED equivalent, followed by 31 percent (n=29) receiving a Bachelor's degree, and 21 percent (20) having "some college" experience (see *Table 2*).

Table 2: Education levels of respondents

Education level (n=94)	Percentage	Frequency (n)
Some high school	4.3	4
High school/GED diploma	36.2	34
Some college	21.3	20
Associate's Degree	4.3	4
Bachelor's Degree	30.9	29
Master's Degree	2.1	2
Doctorate Degree	1.1	1

Commodities/Crops

Of the 104 total respondents, 103 reported the commodities or crops that they grew (see *Table 3*). The most numerous commodity was beef/cattle (71 percent, n=73), followed by hay (61 percent, n=63), peanuts (51.5 percent, n=53), corn (47 percent, n=48), "other" (27 percent, n=28), and "other vegetables" (25 percent, 26). Respondents were asked to write in commodities or crops if they selected "other." Those reported include sorghum, rye, trees, soybeans, peas, tobacco, poultry, oats, small grains, wheat, cotton, butterbeans, and hogs.

Table 3: Commodities & crops reported by respondents

Commodities & Crops (n=103)	Percentage	Frequency (n)
Beef	70.9	73
Hay	61.2	63
Peanuts	51.5	53
Corn	46.6	48
Other	27.2	28
Other vegetables	25.2	26
Watermelon	22.3	23
Dairy	10.7	11
Blueberries or Other fruit	2.9	3

Of the 94 who answered a question about planting cover crops, 84 percent (n=79) indicated that they do, while 12 percent did not (n=11) and 4 percent reported that the question "did not apply" (n=4). Of the 79 who did plant cover crops, 70.5 percent (n=56) did so for profit, at least sometimes while 29.5 (n=23) did not sell the cover crop.

Water Quality

Questions regarding water quality include respondent knowledge of TMDL definition, awareness of TMDLs in the Suwannee/Santa Fe river basins, familiarity with BMAPs, and individual water concerns.

Of the 104 respondents, 34 percent (n=35) accurately answered the definition of a TMDL. However, 41 percent (n=32) chose an incorrect definition and 24.5 percent (n=25) indicated that they did not know the TMDL definition.

Table 4: Knowledge of TMDL definition

Definition (n=102)	Percentage	Frequency (n)
A way to address waterbodies with water quality issue	34.3	35
Do not know	24.5	25
A term to describe a water supply or quantity issue	23.5	24
A set amount of water one can use	17.6	18

Of the total respondents who answered the question (n=96), the majority did not know about TMDLs in the Suwannee & Santa Fe river basins (63.5 percent, n=61). This was followed by 21 percent (n=20) indicating that "maybe" they knew and only 16 percent (n=15) that did know about TMDLs in the basin.

Respondents were then asked to indicate what kinds of TMDLs (e.g. pollutants) existed within the basin (see *Table 5*). Respondents indicated that TMDLS for nutrients (51 percent, n=49), "do not know" (43 percent, n=41), sediment (24 percent, n=25), metals (24 percent, n=25), and mercury (22 percent, n=21) existed in the basin.

Table 5: Knowledge of specific TMDLs in the basin

Specific TMDLs (n=96)	Percentage	Frequency (n)
Nutrients	51	49
Do not know	42.7	41
Sediment	24	25
Metals	24	25
Mercury	21.9	21
Unknown pollutant	18.8	18
Pathogens	17.7	17
Dissolved oxygen	11.5	11

A majority of respondents who answered the question (n=95) indicated that they were familiar with BMAPs (49.5 percent, n=46), followed by 33 percent (n=31) being unfamiliar with BMAPs, and 18 percent (n=17) indicating that they "did not know" if they are familiar with BMAPs.

Forty-eight percent (n=46) of respondents indicated that they were aware a BMAP was being developed in the basin, whereas 44 percent "did not know" (n=42), and only 8 percent indicated that they were not aware (n=8).

Water Quantity

Questions regarding water quantity include respondents' perceived importance of conservation, chief concerns, whether or not individuals are implementing water conservation BMPs, and general importance of BMPs.

A strong majority of respondents indicated that conserving water was "extremely important" (63 percent, n=57), followed by 30 percent believing it was "very important" (n=27). Very few respondents indicated that conserving water was not important (see *Table 6* below).

Table 6: Importance of conserving water

Importance of conserving water (n=90)	Percent	Frequency (n)
Extremely important	63.3	57
Very important	30.0	27
Somewhat important	5.6	5
Somewhat unimportant	0	0
Very unimportant	1.1	1
Not at all important	0	0

Respondents were asked to write in their chief concerns regarding water quantity and conservation. Because it is an open-ended question where you asking participants to reflect upon and think of concerns, a low response rate is somewhat expected. Respondents were asked to rank their concerns. Unsurprisingly, there are more responses for the biggest concern, as many respondents may not have been able to think of three (n=54).

For the number one concern, the most numerous responses were for supply/quantity. These comments included responses such as "quantity of aquifer water available," and "supply for the future." The next most numerous concern was for nutrients (even though the question asked about quantity and conservation), such as "nutrient management" or "waste." There were also concerns listing equity and specific groups using too much or taking water, examples include "urban development," "golf courses," "water bottling plants," and "limiting irrigation amounts."

Under the concerns ranked 2nd most important (n=40), equity or specific groups were the most numerous, followed by supply and then quality. Under the concerns ranked 3rd most important (n=35), equity or specific groups were the most numerous, followed by a tie for supply and quality.

Overall, the most comments were made about supply and conservation concerns (n=40), followed by equity or specific groups (n=37), nutrients (n=36), other (n=11), and regulations (n=6). Responses for other included: "current drought; lack of hard data; no new permits for irrigation wells; strip tillage; protecting our rivers; data collection errors and omissions; BMPs; sink holes; overage of drainage ditches; no rain; and reuse of contaminated water.

Best Management Practices

Questions about BMPs included current adoption and perceived importance of BMPs. Of the 91 respondents who answered the question, 96 percent (n=87) indicated that they have adopted and are currently implementing a water quantity/conservation BMP. Only 4 percent (n=4) reported not using any kind of BMP. Of the 87 who use BMPs, they were asked to report which ones they use. Although many BMPs saw over 50 percent adoption by respondents, improving irrigation efficiency, scheduling and managing irrigation, and utilizing recommended rates and timing proved to be the most commonly used BMPs by producers (see *Table 7* below).

Table 7: Adoption of water conservation BMPs

Water conservation BMP (n=87)	Percentage	Frequency (n)
Improving irrigation system efficiency	77	67
Irrigation scheduling & management	71.3	62
Recommended rates & timing	71.3	62
GPS/light	67.8	59
Split applications	66.7	58
Integrated Pest Management	64.4	56
NRCS conservation practices	62.1	54
Precision agriculture soil sampling	60.9	53
Cropping systems	55.2	48
Tissue/plant sap testing	52.9	46
Proper placement	48.3	42
Other	4.6	4

Of the 4 percent (n=4) that indicated that they did not utilize any BMPs, 3 followed up as to why they are not. None of these respondents indicated that BMPs were not important, citing lack of time (n=2), labor (n=1), no need for irrigation (n=1), or brand new operation (n=1).

Next, respondents were asked how important they perceived each BMP to be. Although not all respondents completed the entire question, improving irrigation efficiency, scheduling and managing irrigation, and utilizing recommended rates and timing proved to be the most important BMPs as perceived by producers in the basin. This is similar to the adopted BMPs (see *Table 7*), although the similarities depart after from there (see *Table 8*).

Table 8: Importance of specific water conservation BMPs

Water conservation BMP	Percentage	Frequency (n)
Improving irrigation system efficiency (n=86)	84.9	73
Irrigation scheduling & management (n=86)	79.1	68
Recommended rates & timing (n=84)	75.0	63
Proper placement (n=85)	70.6	60
Split applications (n=85)	69.4	59
Precision agriculture soil sampling (n=87)	62.1	54
NRCS conservation practices (n=83)	61.2	52
Integrated Pest Management (n=85)	60.7	51
Cropping systems (n=85)	57.6	49
GPS/light (n=85)	56.5	48
Tissue/plant sap testing (n=85)	44.6	57

Ninety-three producers responded to a question about using conservation tillage. Of these, a majority (60 percent, n=56) indicated that they did use conservation tillage, while 32 percent (n=30) did not and 7.5 percent reported that the question was not applicable (n=7).

Respondents were asked if they might adopt more BMPs if an incentive were offered. Of the 84 who responded to the question, a strong majority (71 percent, n=60) indicated that they would be willing do more, while 14 percent (n=12) reported that while they are not currently using BMPs, they would be willing to do so with an incentive. An additional 9.5 percent (n=8) reported that they would not be willing to adopt more BMPs with an incentive and 5 percent (n=5) said the question was not applicable.

Irrigation

Questions about irrigation on the part of producers included what kind of system being used, pressure, specifications, age, and modifications or changes to systems. Questions were also asked about the Mobile Irrigation Lab (MIL), how irrigation applications are scheduled, and how often rainfall is measured.

Of the 94 that answered the question regarding what kind of irrigation system they use, a strong majority (69 percent, n=65) indicated that they use a center pivot or linear move system (see *Table 9*). Of the 65 who indicated they use a center pivot or linear move system, 44 wrote in what pressure they run the system at and 52 answered questions about drop nozzles. Ninety-four percent (n=49) use drop nozzles on their center pivot/linear move, while 3.2 percent (n=2) did not and 1.9 percent (n=1) did not know if they had drop nozzles on their system. Pressure was reported in both pounds per square inch (PSI), pounds (lbs) and percentage (see *Appendix B*). Age of systems also varied widely (see *Appendix C*). Respondents were asked if changes have been made to irrigation systems to make them more efficient. Of the 72 who answered the question, over half (51 percent, n=37) responded that they had made changes, while 35 percent (n=25) had not reported major changes and 14 percent (n=10) had a system that was less than five years old.

Table 9: Type of irrigation system used by producers

Type of irrigation system (n=94)	Percent	Frequency (n)
Center pivot or linear move	69.1	65
Traveling gun	31.9	30
Drip irrigation	29.8	28
Do not irrigate/NA	13.8	13
Other	5.3	5
Mirco-sprinkler	2.1	2

Awareness of the Mobile Irrigation Lab (MIL) was strong (see *Table 10* below). Of the 83 respondents who answered the question, 63 percent (n=52) knew about the MIL program, while 34 percent (n=28) did not and 4 percent “maybe” knew about it (N=3). Many producers (53 percent, n=37) indicated that they had participated in the MIL program in the past, while 20 percent (n=14) were not familiar and 19 percent had not participated to date (n=13).

Table 10: Mobile Irrigation Lab participation

MIL participation (n=92)	Percent	Frequency (n)
Have participated in the past	52.9	37
Not familiar with program	20.0	14
Have not participated to date	18.6	13
Interested in participating	8.6	6

When asked how producers schedule their irrigation applications, most respondents reported using soil moisture measurements (58 percent, n=43), based on past experiences (53 percent, n=39) or using a fixed schedule based on crop growth stage (43 percent, n=32).

Table 11: How producers schedule irrigation applications

Method of scheduling irrigation applications (n=74)	Percent	Frequency (n)
Soil moisture measurement	58.1	43
Based on past experiences	52.7	39
Fixed scheduled based on crop growth stage	43.2	32
Checkbook method	17.6	13
UF/IFAS	9.5	7
Evapotranspiration	5.4	4
Ask expert/other producers	1.4	1
Other	1.4	1

When asked how often producers measure rainfall at each field, 86 of 104 answered the question and a strong majority indicated that they "regularly" measure rainfall at each field (78 percent, n=67). This was followed by "sometimes" (17 percent, n=15), and 5 percent reporting that they do not measure rainfall at each field (n=4).

Communication

To better understand where producers in the Suwannee and Santa Fe river basins currently get information about farming techniques, BMPs, and water issues in order to be able to target them in information campaigns, survey participants were asked questions about what sources of information they utilize, as well as whether or not they would like more opportunities to gain and share information with local organizations and other producers.

Of the 88 who answered the question about where they get information about farm practices and techniques, respondents reported that local extension agents (74 percent, n=65), local organizations (52 percent, n=46), and media sources including magazines, newspapers, and newsletters (37.5 percent, n=33) were the most utilized communication sources (see *Table 12* below).

Table 12: Popularity of sources of information about farm practices and techniques

Source of information (n=88)	Percent	Frequency (n)
Local extension	73.9	65
Local organizations	52.3	46
Media sources	37.5	33
Friends & family	35.2	31
Internet	20.5	18
Other	11.4	10
EDIS documents	8.0	7
Local TV/radio	5.7	5
TV/radio	2.3	2
Local media	0	0
Social media	0	0

While similar, respondents were next asked where they receive information about water use BMPs. Of the 70 that responded, a strong majority, much like the farm practices and techniques question, indicated that they get information from local extension (73 percent, n=51) and local organizations (51 percent, n=36). However, after that, the results vary significantly (see *Table 13*).

Table 13: Popularity of sources of information about water use BMPs

Source of information (n=70)	Percent	Frequency (n)
Local extension	72.9	51
Local organizations	51.4	36
Friends & family	18.6	13
Internet	17.1	12
Media sources	17.1	12
Other	11.4	8
EDIS documents	5.7	4
TV/radio	2.9	2
Local media	2.9	2
Local TV/radio	1.4	1
Social media	1.4	1

NOTE: This page was missing for 14 survey respondents

While only 61 respondents answered a question about attending a workshop with producers and other industry stakeholders in the Suwannee and Santa Fe river basins to share practices and perceptions of water conservation BMPs, 74 percent (n=45) indicated that they would be interested in such an event. Twenty-six percent (n=16) were not interested. Of the wanting to attend such a workshop, most (80.5 percent, n=33) were interested in learning more about funding for BMPs, while there was also considerable interest in what kinds of BMPs to use and where to get more information (66 percent, n=27 for both).

Recommendations and Observations

Recommendations are broken into categories by topic. These categories include: general, water quality, water quantity and conservation, BMPs, irrigation, and communication.

General

- **Consider your audience.** This is an older male demographic, with more than 70 percent of the respondents over the age of 46. On the other hand, less than 30 percent of respondents are under the age of 46. This should be considered when any kind of event or information dissemination is being planned. Consider ways of addressing an older demographic and "teaching an old dog new tricks," especially when it comes to agricultural practices and new technologies.

- **Stick to traditional media.** For the same reason that it was decided not to conduct an online survey, be cautious of using online sources, social media, etc. to disseminate information. While this may be part of the communication strategy for those who do utilize online sources and those who may not be well represented in the survey (for example. spouses or children of producers who participate in farm activities and decisions), traditional media sources will likely work best for reaching this older target audience. Producers in the basin indicate that they depend on local sources, print media (newspaper, magazines, newsletters), and friends and family for information. TV and radio did not rate very high with this audience.

- **Producers care about water issues.** A significant finding in this data, indicated by a myriad of questions, is that producers in the basin demonstrate genuine concerns about water quality and future supply of water in the basin. Involving them more in these issues and the decisions that will affect them could provide better "buy in" down the line.

- **Producers depend on local sources for information and technology.** Between local extension agents and resources (agents, EDIS, events, etc.), local organizations such as the Suwannee River Partnership, and local research entities such as the University of Florida/IFAS, producers in the Suwannee and Santa Fe river basins are getting a lot of their information about farm practices and technology as well as water issues and BMPs from local sources. If anything, this can be capitalized and expanded.

- **Producers pay attention to their peers.** Friends and family were a significant source of information for producers in the basin. It would seem that providing information, tours, and events that also offer a social outlet is a good means of reaching producers. Highlighting "success stories" of individual producers in the basin (with BMPs, conservation measures, conservation easements, etc.) can be another way to utilize the power of norms and social relationships with this demographic. In addition, for an information campaign, a good strategy might be to utilize someone in a leadership role who is respected by the producers (e.g. and

opinion leader, someone who as influence and a voice among local producers) to be the face of an information/outreach campaign.

- **Beef, hay, peanuts and corn seem to be the most common crops in the basin.** According to this data, beef (cattle), hay, peanuts, and corn are the most popular commodities and crops grown in the basin. When disseminating information or putting together a communication campaign, it would be wise to highlight or utilize anecdotes with these commodities/crops.

Water Quality

- **What's a TMDL?** While producers may be concerned and care about water quality issues, a large number of respondents could not correctly identify the definition of a TMDL. Only 34 percent (n=35) accurately answered the definition of a TMDL. Forty-one percent (n=32) chose an incorrect definition and 24.5 percent (n=25) indicated that they did not know the TMDL definition. It should be noted that there is a definition of a TMDL provided in the survey, and the workshops and meetings where the survey was disseminated addressed the TMDL issue, but still a significant number of respondents got it wrong. This could be due to the technical nature of TMDLs, but because they seem to be a serious issue in the basin and BMAPs are being developed that could affect producers, increasing awareness should be made a priority.

- **Nutrient issues are fairly well known.** When respondents were then asked to indicate what kinds of TMDLs (e.g. pollutants) existed within the basin respondents indicated that there were TMDLS for nutrients (51 percent, n=49), "do not know" (43 percent, n=41), sediment (24 percent, n=25), metals (24 percent, n=25), and mercury (22 percent, n=21) in the basin. The higher awareness of the nutrient issue may also be attributed to the meeting/workshop addressing nutrient issues (albeit briefly). If producers really do know about nutrient issues in the basin, this could be capitalized on when developing information about more general or bigger-picture water quality issues.

- **The connection between water quality, TMDLs and BMAPs should be made a priority.** There seems to be a bit of a disconnect when it comes to how TMDLs are related to water quality and BMAPs. A majority of respondents indicated that they were familiar with BMAPs (49.5 percent, n=46), followed by 33 percent (n=31) being unfamiliar with BMAPs, and 18 percent (n=17) indicating that they "do not know" if they are familiar with BMAPs. Forty-eight percent (n=46) of respondents indicated that they were aware a BMAP was being developed in the basin, whereas 44 percent "did not know" (n=42), and only 8 percent indicated that they were not aware (n=8). Although awareness is higher for knowing, it is followed very closely by "do not know." Producers do not seem to be very involved in the TMDL process. Agencies could do a better job of outreach and information dissemination.

- **Consider using Community Based Social Marketing strategies to increase awareness and encourage BMP adoption.** Community Based Social Marketing (CBSM) marries traditional marketing approaches with public good solutions to issues that affect communities. Since water quality and quantity issues are ones that pose problems for the larger community (not just individuals but all producers and the communities in the basin), CBSM strategies could very effectively be used to increase awareness and BMP adoption. Consider this as the "next phase" in the process (for more information, see Doug McKenzie-Mohr's *Fostering*

Sustainable Behavior: An Introduction to Community-Based Social Marketing or follow up regarding University of Florida CBSM specialists).

Water Quantity & Conservation

- **Conservation is viewed positively.** One of the most important findings of this study is that a strong majority of respondents believe that conserving water is "extremely important" (63 percent, n=57), followed by 30 percent believing it was "very important" (n=27). Very few respondents indicated that conserving water was not important. Because this is one of the biggest issues affecting the future production of agricultural in the basin, knowing that people care about the issue and think it is very important is a really great foundation. It should be noted that supply issues was a major topic at these meetings where the survey was distributed.

- **Producer concerns center on supply, quality, and equity.** Respondents have real concerns about water in the basin. While there were many allusions to supply and quality, there were also a lot of specific parties mentioned regarding the equity of water distribution. Communications about water issues can be boiled down into these three main categories: supply, quality, equity—and may be emphasized as such. When asked to write in specific concerns regarding water, the most comments were made about supply and conservation concerns (n=40), followed by equity or specific groups (n=37), nutrients (n=36), other (n=11), and regulations (n=6). Responses for other included: "current drought; lack of hard data; no new permits for irrigation wells; strip tillage; protecting our rivers; data collection errors and omissions; BMPs; sink holes; overage of drainage ditches; no rain; and reuse of contaminated water.

Best Management Practices

- **Most producers are using BMPs.** Though this self-reported data, 96 percent (n=87) of respondents indicated that they have adopted and are currently implementing a water quantity/conservation BMP. This is huge. Only 4 percent (n=4) reported not using any kind of BMP. This should be emphasized in a communication campaign; it provides a positive framing of behavior changes and also can be effective at further normalizing the behavior by highlighting opinion leaders.

- **Most of the BMPs utilized are irrigation-related.** The most frequently reported BMPs being utilized by producers in the basin include improving irrigation efficiency, scheduling and managing irrigation, and utilizing recommended rates and timing. The SRP should consider the list of BMPs to see if these are the "most important" BMPs or, since these three seem to have a high adoption rate, if it is time to emphasize others that do not have such a high rate of adoption.

- **Adopted BMPs are not synonymous with BMPs perceived as the most important.** improving irrigation efficiency, scheduling and managing irrigation, and utilizing recommended rates and timing proved to be the most important BMPs as perceived by producers in the basin, which is the same as the top three adopted BMPs. However, there the similarities depart. For example, "proper placement" was one of the least adopted BMPs but considered the 4th most important. GPS was one of the most adopted BMPs but not considered that important in the list of BMPs. Why are BMPs viewed as "very important" not being adopted and implemented? What are the barriers? This should be further explored to figure out if technology, resources, funding, labor, etc. are the biggest barriers to adoption. Community-based Social Marketing strategies could effectively be used for encouraging BMP adoption.

- **Consider increasing incentives for BMP adoption.** Because a strong majority (71 percent, n=60) indicated that they would be willing do more (BMPs) if there were additional incentives, it is worth considering what incentives might help increase BMP adoption. If incentives are possible and they would increase BMP adoption, this strategy should definitely be considered.

Irrigation

- **Most producers utilize Center Pivot/Linear Move irrigation systems.** Almost 70 percent of respondents use a Center Pivot/Linear Move system. Is this the most efficient/effective irrigation system? If not, what can be done to encourage the use of other systems?

- **Many producers have not made changes to their irrigation system; many of these systems are quite old.** While many producers indicate that they have retrofitted or added drop nozzles to their systems, many others have not. Just over half (51 percent, n=37) of respondents reported that they had made changes, while 35 percent (n=25) had not reported major changes. What can be done to increase updates to older systems? This could be another CBSM strategy (identifying barriers and acknowledging them). Is it funding/resources? Access to new technology? CBSM could help identify these barriers and address them directly.

- **Increase participation in the Mobile Irrigation lab (MIL).** There was a strong majority of respondents who knew about the MIL program (63 percent, n=52), while 34 percent (n=28) did not and 4 percent "maybe" knew about it (N=3). Many producers (53 percent, n=37) indicated that they had participated in the MIL program in the past, while 20 percent (n=14) were not familiar and 19 percent had not participated to date (n=13). This leaves a lot of room for improvement. If producers participated in the past, why are they not anymore? Was the program discontinued? Is it only necessary for a short time? What can be done to increase awareness and adoption of the program?

- **Many producers are basing their irrigation schedule on past experiences.** While a majority of respondents reported using soil moisture measurements (58 percent, n=43) to schedule irrigation applications, a good amount also reported basing the application on past experiences (53 percent, n=39) or using a fixed schedule based on crop growth stage (43 percent, n=32). These latter two do not seem like the best available technology or, perhaps, the most reliable. What can be done about increasing the adoption of newer technology? CBSM strategies could be used to identify barriers to adoption of newer/different irrigation scheduling technologies.

- **Increase the number of producers measuring rainfall to one-hundred percent.** While a strong majority indicated that they "regularly" measure rainfall at each field (78 percent, n=67), this was followed by "sometimes" (17 percent, n=15), and 5 percent reporting that they do not measure rainfall at each field (n=4). This strategy does not require high-tech tools or an abundance of time, so why is everyone not doing it? What can be done to increase adoption of this practice? SRP provided rain gauges as an incentive to fill out the survey; tactics like this could be effective at increasing adoption by providing the simple tools to make it a regular practice.

Appendix A: SRP Survey Instrument

The final survey instrument (see next page) was developed with a panel of experts including University of Florida/IFAS Agricultural Engineering faculty, University of Florida/IFAS PIE Center staff, and Suwannee River Partnership staff.

Initially, the survey was intended to be online, but with limited email addresses available and limited funds, it was decided to utilize upcoming workshops and meetings that would attract diverse producers in the Suwannee and Santa Fe river basins. Staff felt that this purposive sample would provide a satisfactory cross-section of producers in the basin and also provide a means of increasing producer contacts and contact information (for the Suwannee River Partnership). After receiving University of Florida Institutional Review Board (IRB) approval, it was pilot tested at a watermelon workshop for producers. Only minor changes were made as a result of the pilot test, having to do with clarity and question wording. The content remained the same, so the pilot was included in the final survey.

Agricultural Producers' Use and Perceptions of Water Quality and Conservation BMPs in the Suwannee and Santa Fe River Basin

1. Are you a currently a producer of agricultural products in either the Suwannee or Santa Fe River basin?

   ❑ Yes 1

   ❑ No 2 → **If NO is selected, please stop here and return survey in the enclosed pre-addressed and postage-paid envelope. Thanks!**

2. Which of the following commodities do you produce at your operation? (*Please check all that apply*)

   ❑ Beef cattle 1
   ❑ Dairy 2
   ❑ Hay 3
   ❑ Watermelon 4
   ❑ Vegetables 5
   ❑ Other (*Please specify*) 6 _____

3. A "TMDL" (Total Maximum Daily Load) is...

   ❑ A term to describe a water supply or quantity issue 1
   ❑ A way to address waterbodies with water quality issues 2
   ❑ A set amount of water that one can use 3
   ❑ I do not know 4

The following is a definition of a TMDL. Please read it and move on to the next question.

A Total Maximum Daily Load (TMDL) is a term in the water quality field that addresses water pollutants. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. TMDLs are developed by the Florida Department of Environmental Protection (DEP) and the U.S. Environmental Protection Agency (EPA) to address water quality issues such as pathogens, nutrients, sediment, mercury, and metals found in "impaired," or polluted, waterbodies.

4. Are you aware of any TMDLs in the Suwannee and Santa Fe River Basin?

   ❑ Yes$_1$ (*please list known TMDLs in the Suwannee/Santa Fe River Basin below*)

   _____

   ❑No $_2$

   ❑Maybe $_3$

5. TMDLs in the Suwannee and Santa Fe River basin include waterbodies impaired for: (*check all that apply*)

   ❑ Metals $_1$
   ❑ Nutrients $_2$
   ❑ Sediment $_3$
   ❑ Pathogens $_4$
   ❑ Mercury $_5$
   ❑ Dissolved oxygen $_6$
   ❑ Unknown pollutants $_7$
   ❑ Do not know $_8$

6. Are you familiar with "Basin Management Action Plans" (BMAPs)?

   ❑ Yes $_1$
   ❑ Do not know $_2$
   ❑ No $_3$

The following is a definition of a BMAP. Please read it and move on to the next question.

A Basin Management Action Plan (BMAP) is the primary tool for implementing a TMDL once it has been developed for a specific waterbody or basin. A BMAP outlines restoration strategies that will reduce pollution to meet the TMDL goals. The development of a BMAP involves a stakeholder advisory group and varies between waterbodies due to unique characteristics and impairments.

7. Are you aware that the Florida DEP is currently in the process of developing a BMAP for the Suwannee and Santa Fe River Basin?

   ❑Yes $_1$
   ❑No $_2$
   ❑Do not know $_3$

8. How important do you think it is to conserve water? (*Please mark one*)

	Extremely Important 1	Very Important 2	Somewhat Important 3	Somewhat Unimportant 4	Very Unimportant 5	Not at all Important 6
Conserving water is. . .	❑	❑	❑	❑	❑	❑

9. Please state what you think the three biggest concerns relating to water quantity and conservation. (*Enter them in a ranking order with #1 being the biggest factor and # 3 being the third biggest factor.)*

Factor #1 1 _____
Factor #2 2 _____
Factor #3 3 _____

10. Do you currently use any best management practices (BMPs) with regards to water quantity/conservation?

❑ Yes 1

❑ No 2

If NO is selected to question 10...

10B. Which of the following best describes why you are NOT currently using water BMPs: (*Please mark all that apply*)

- ❑ Too expensive to implement 1
- ❑ Not important to me 2
- ❑ Not enough time to implement 3
- ❑ Not enough labor to implement 4
- ❑ Other (*Please specify*) 5

_____

10C. Which of the following factors would help you to consider using water quantity/conservation BMPs? (*Please check all that apply*)

- ❑ Government grants for implementation 1
- ❑ Additional training 2
- ❑ Opportunities to share and gain ideas from other producers in the area 3
- ❑ There is nothing that would encourage me to consider **implementing water quantity/conservation BMPs** 4
- ❑ Other (*Please specify*) 5

_____

If YES is selected...

10A. Which of the following BMPs do you incorporate into your production process? (*Please mark all that apply*)

- ❑ Tissue/plant sap testing 1
- ❑ NRCS conservation practices 2
- ❑ Split applications 3
- ❑ Proper placement 4
- ❑ Recommended rates and timing 5
- ❑ GPS/lightbar 6
- ❑ Improving irrigation system efficiency 7
- ❑ Irrigation scheduling and management 8
- ❑ Cropping systems (conservation tillage, sod-based rotation) 9
- ❑ Precision agriculture soil sampling 10
- ❑ Integrated Pest Management (IPM) 11
- ❑ Other (*Please specify*) 12

_____

11. How important do you feel each of the following water conservation BMPs are?
(Please select one for each BMP)

	Not Important $_1$	Somewhat Important$_2$	Very Important $_3$
Tissue/plant sap testing $_1$	❑	❑	❑
NRCS conservation practices $_2$	❑	❑	❑
Split applications $_3$	❑	❑	❑
Proper placement $_4$	❑	❑	❑
Recommended rates and timing $_5$	❑	❑	❑
GPS/lightbar $_6$	❑	❑	❑
Improving irrigation system efficiency $_7$	❑	❑	❑
Irrigation scheduling and management $_8$	❑	❑	❑
Cropping systems $_9$ (conservation tillage, sod-based rotation)	❑	❑	❑
Precision agriculture soil sampling $_{10}$	❑	❑	❑
Integrated Pest Management (IPM) $_{11}$	❑	❑	❑
Other (*Please specify*) $_{12}$	❑	❑	❑

12. What type of irrigation system do you currently use? (*Check all that apply*)

- ☐ Center pivot or linear move 1
- ☐ Drip irrigation 2
- ☐ Micro-sprinkler 3
- ☐ Traveling gun 4
- ☐ Other sprinkler (*please describe below*) 5

_____

If CENTER PIVOT/LINEAR MOVE or OTHER is chosen…

12A. What pressure does your center pivot/linear move system run at? (*Please describe in the box below*)

12B. Do you have drop nozzles on your center pivot/linear move system?

- ○ Yes 1
- ○ Do not know 2
- ○ No 3
- ○ I do not have a Center Pivot/Linear Move system

13. How old is the system(s) you are currently using?
*(Please write below. *If you have multiple systems, please list them all below and specify the age of each system.)*

14. If any of the system(s) are more than five years old, have you made any changes to make your system more efficient?

- ☐ No major changes 1
- ☐ Yes (*Please specify the changes*) 2 _____
- ☐ My system is less than five years old 3

15. Are you familiar with the Mobile Irrigation Lab (MIL)?

- ❑ Yes 1
- ❑ No 2
- ❑ Maybe 3

The following is a definition of the Mobile Irrigation Lab (MIL) program. Please read it and move on to the next question.

The Mobile Irrigation Lab program is an ongoing joint effort between the Water Management District (WMD), the U.S. Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS) and the Florida Department of Agriculture and Consumer Services (FDACS). The Mobile Irrigation Lab is a free service to the agricultural community. Any grower can contact the District to arrange a free evaluation. It was expanded to help growers meet water use permit conditions.

16. The following describes my participation in the MIL program. . .

- ❑ I am interested in participating in the MIL program. 1
- ❑ I have participated in the MIL program in the past. 2
- ❑ I have not participated in the MIL program to date. 3

17. How do you schedule your irrigation applications? (*Check all that apply*)

- ❑ Based on past experiences 1
- ❑ Soil moisture measurement 2
- ❑ Fixed schedule based on crop growth stage 3
- ❑ Evapotranspiration 4
- ❑ Checkbook method (based on ET and on-farm rainfall 5
- ❑ Other (please describe below) 6 _____

17A. When scheduling the evapotranspiration application, what do you use? (*Check all that apply*)

- ☐ Soil water budget 1
- ☐ Checkbook method (based on ET and on-farm rainfa
- ☐ Other (*please describe*) 3 _____

18. Do you measure rainfall at each field?

- ❑ Yes, regularly 1
- ❑ Yes, sometimes 2
- ❑ No, not at all 3
- ❑ Yes, regularly 1

19. Do you plant a cover crop in between crops that you grow for profit?

- ❑ Yes, sometimes 2
- ❑ No, not at all 3

20. Are you using conservation tillage? (*Involves the planting, growing and harvesting of crops with minimal disturbance to the soil surface. Conservation tillage is designed to reduce erosion and maintain or improve soil health properties.)*

- ❑ Yes 1
- ❑ No 2

If YES...

21A. Please describe specifically how you use conservation tillage (*below*).

21. If you were offered an incentive to use water quantity/conservation BMPs, such as assistance opening up a new market for your product, would you be more willing to use BMPs?

- ❑ I am already using water conservation BMPs but would be willing to use more with an incentive. 1
- ❑ I am already using water conservation BMPs and would NOT be willing to use more. 2
- ❑ I am NOT using water conservation BMPs, but would consider doing so with an incentive. 3
- ❑ I am NOT using water conservation BMPs and an incentive would not make a difference. 4

22. Where do you usually get information about farm practices, techniques, and BMPs? (*Select all that apply*)

- ❑ Local Extension 1
- ❑ Media sources (magazines, newspapers, newsletters, etc.) 2
- ❑ Local TV or radio 3
- ❑ Local organizations (such as the Suwannee River Partnership) 4
- ❑ Friends and family 5
- ❑ TV or radio 7
- ❑ Local media sources 8
- ❑ Other (please specify) 6_____

23. Would you be interested in attending a workshop in which producers and other industry stakeholders along the Suwannee and Santa Fe River basin would be invited to share their perceptions of water conservation BMPs?

❑ Yes 1

❑ No 2

If YES…

23A. What types of discussion items or questions would you like to see addressed as part of the workshop? (*Please check all that apply*)

- ❑ How do I find funding to implement water quantity/conservation BMPs? 1
- ❑ Which water quantity/conservation BMPs should I be using? 2
- ❑ Where I can find more information 3
- ❑ Other (*please specify*) 4_____

24. Are there any additional comments/suggestions you have in reference to water quantity/conservation BMPs?

The following three demographic questions are for research purposes only. They will not impact any of your previous answers, nor do they affect your participation in water conservation BMPs. These questions are simply for statistical purposes. Also, your name cannot be identified with any answers you provide in this survey.

25. What is your age? (*Please select one*)

- ❑ 18-25 1
- ❑ 26-35 2
- ❑ 36-45 3
- ❑ 46-55 4
- ❑ 56-65 5
- ❑ Over 65 6

26. What is your gender?

- ❑ Male 1
- ❑ Female 2

27. What is the highest level of education you received? (*Please select one*)

- ❑ Some High School 1
- ❑ High School Graduate /GED 2
- ❑ Some College 3
- ❑ Associate's Degree/2 year degree 4
- ❑ Bachelor's Degree/ 4-year degree 5
- ❑ Master's Degree 6
- ❑ Doctoral Degree 7

If you would like to sign up for the Suwannee River Partnership (SRP) ListServe or newsletter mailings, please list your email address below:

Thank you for participating in our survey! Your feedback is important.

For more information on water quality and quantity in the Suwannee and Santa Fe River Basin, please visit http://www.suwannee.org

Appendix B: Center Pivot/Linear Move system pressure

The list below shows the responses provided regarding the pressure used for Center Pivot/Linear Move systems.

50%
30
35
35
41
+/- 40 psi
18-44 psi
20-35 psi
20-40
20-45
23 psi
25 #
25 lbs
25 lbs
25 lbs
25-30 lbs
25-30 psi
25-40 psi
29-40
30 lbs
30 psi
30 psi
30 psi
30 psi
30 psi and less
30-35 psi
30-60 psi
35 psi
35-40
35-40 psi
40 lbs
40 psi
40 psi
40 psi
45 psi
45 psi, 800 gpm
47 psi
50 lbs
50 lbs
70 psi
80 psi
Center pivot 35 psi. Pipe 70 psi
chose YES and NO in 12B (multiple systems, some have drop nozzles some do not?)

Appendix C: Irrigation system age

Below is a comprehensive list of responses provided regarding the age of irrigation systems.

0

1 over 15 years old (no drop nozzle). 1 new in 2012 (has drop nozzle).
1 to 15 years
1 year
1 year to 15 years
1 year to 30 years
1 year, 20 years, 18 years
1 year, 5 years, 8 years (x2), 10 years
10 pivots: 1 to 10 years old
10 years
1-10 years old
1-15 years old
1-15 years old
1-5 years
18 year pivot
1975, 1979, 1980, 1981, 1985, 1991, 1993, 1996, 1998, 2002, 2005, 2009, 2010, 2011, 2012
1980 (x1), 1990 (x3), 1998 (x3), 2004 (x3), 2012 (x2)
1985 and newer
1989-2003
1992, 1993, 1997, 2000, 2003, 2005 (x5), 2011 (x2)
20 year drum (?) / 10 years / 6 years (x2) / 1 year
20 years
20 years
20 years old
20 years retrofitted to current
2000-13 years old / 2004-9 years old
2-10 years
2-25 years
2-25 years on 19 systems
2-30 years
25 years. New drip every year.
3 systems: 1, 2, and 3 years old
3 traveling guns: 15 years old / Center pivot: 5-6 years
3, all less than 1 year old
35 12" wells: Impact sprinklers and drip tubing on blueberries and 6-8 on watermelons. Vary in age from new to 15 years old.
4 or 5 (one) and 5 or 6 (two)
4 pivots: 2 years, 7: 5+ years
4 years
4 years old
5 years
5 years

5 years
5 years
5 years
5 years
5 years and 15 years
5 years old
5-10 years. All have been retrofitted
6 months
6 years
6 years
6-10 years
7 to 30 years old
7 years
8 pivots from 1 to 10 years old
8 years
Approximately 6 years
Brand new to 20 years
Brand new to 25 years
Center Pivot: new in 2012. Traveling gun: 10 years old
N/A
N/A (12B: "I do not have a Center Pivot/Linear Move system")
New sprinklers
old
old
Old traveler
Old traveling / Old
Oldest: 4 years. Newest: 5 months.
Oldest: 7 years. Newest: 5 months.
one 2002, the other 2010
Pivot Center: 3-4 years old
Travelers are 30 years old