

**FLORIDA DEPARTMENT OF AGRICULTURE  
AND CONSUMER SERVICES**  
*OFFICE OF AGRICULTURAL WATER POLICY*



**2010**

**REPORT ON THE IMPLEMENTATION OF AGRICULTURAL BEST  
MANAGEMENT PRACTICES**



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AGRICULTURAL BEST MANAGEMENT PRACTICES**

*Prepared by*

**FLORIDA DEPARTMENT OF AGRICULTURE  
AND CONSUMER SERVICES**

***OFFICE OF AGRICULTURAL WATER POLICY***



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## INTRODUCTION

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### AGRICULTURAL BEST MANAGEMENT PRACTICES

Agricultural water quality and quantity best management practices (BMPs) are an integral part of water resource protection. The Florida Legislature has recognized this in various statutes, including the Florida Watershed Restoration Act (403.067, F.S.), under which the Florida Department of Environmental Protection (FDEP) establishes total maximum daily loads, which are water quality targets for impaired waters. Under the Act, nonpoint sources, including agriculture, are responsible for implementing rule-adopted BMPs to help achieve TMDLs.

BMPs are individual or combined practices determined through research, field testing, and expert review to be the most effective and practicable means for improving water quality, taking into account economic and technological considerations. Two key categories of agricultural BMPs are nutrient management and irrigation management. Nutrient management addresses the type, amount, timing, and placement of fertilizer. Irrigation management involves the maintenance, scheduling, and overall efficiency of irrigation systems. BMPs include both management and structural practices, such as efficient use of fertilizer, efficient irrigation, erosion control, setbacks from waterbodies, stormwater ponds, and culvert/riser installations, among others. For more detailed information on BMPs for various commodities, visit: <http://www.floridaagwaterpolicy.com/BestManagementPractices.html>

### OFFICE OF AGRICULTURAL WATER POLICY ROLE IN BMPs

#### ***BMP Development and Implementation***

The Office of Agricultural Water Policy (OAWP) within the Florida Department of Agriculture and Consumer Services (FDACS) works cooperatively with agricultural producers and industry groups, the university system, FDEP, the water management districts, environmental representatives, and other interested parties to develop and implement agricultural BMPs for “traditional” agricultural commodities (those other than silviculture or aquaculture, which are addressed by other divisions within FDACS). Producers participate in OAWP BMP programs by submitting Notices of Intent to implement the BMPs, along with a checklist of practices applicable to the acres being enrolled.

The OAWP employs field staff and contracts with service providers to help producers understand, select, and implement BMPs. Depending on the region of the state, service providers include the soil and water conservation districts, University of Florida Institute of Food and Agricultural Sciences, and resource development and conservation councils. They give technical assistance to producers and help conduct cost-share programs, as funding allows. The OAWP also helps provide educational workshops, field days, and other opportunities for farmers to learn about and share information on BMPs.

### ***BMP Tracking and Follow-up***

To record and track enrollments, the OAWP uses a best management practices tracking system, and has begun mapping acres enrolled in order to give a general picture of BMP coverage around the state. The success of the mapping effort varies by region, depending on the availability and accuracy of geographic information systems data.

For commodities other than silviculture and aquaculture, the OAWP conducts a BMP Implementation Assurance program that has three regional components: the Suwannee River Partnership (SRP), the Lake Okeechobee Protection Program (LOPP), and the remaining areas of the state. Based on program-specific needs, Implementation Assurance efforts in the SRP and LOPP have been focused primarily on site inspections for animal operations (with some exceptions). To provide BMP follow up and programmatic evaluation for the rest of the state, within limited resources, the OAWP conducts mail-out surveys on a cyclical basis by commodity, followed by selected site visits. Commodities in the SRP and LOPP that are enrolled under statewide FDACS-OAWP BMP manuals also receive the mail-out surveys. The specifics of these three components are discussed in the following section.

The 2008 and 2009 OAWP Implementation Assurance Reports addressed the SRP, the LOPP, and the Ridge Citrus, Indian River Area Citrus, Gulf Citrus, and Peace River/Manasota Basin Citrus programs. This 2010 report addresses the SRP, the LOPP, and the vegetable and agronomic crop BMP programs. All the OAWP BMP Implementation Assurance reports can be found at: <http://www.floridaagwaterpolicy.com/ImplementationAssurance.html>

Collecting data on BMP enrollment and implementation helps FDACS:

- ✓ Provide accountability and demonstrate the level of producer adherence to BMPs.
- ✓ Identify needs for additional education and implementation assistance for producers.
- ✓ Communicate the importance of BMP implementation to producers
- ✓ Measure the success of BMP programs – This is particularly important to help maintain legislative, agency, and public support for this incentive-based approach to reducing agricultural impacts to water resources.
- ✓ Keep NOI records up to date, so OAWP can more accurately report program enrollment rates and provide producers with program updates and information.

## **BMP IMPLEMENTATION ASSURANCE - PROCESS AND FINDINGS**

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### **I. SUWANNEE RIVER PARTNERSHIP BMP IMPLEMENTATION ASSURANCE**

#### ***PROCESS***

The Suwannee River Partnership region is a priority area for FDACS, the Suwannee River Water Management District, FDEP, local governments, and others, who developed an agreement in 1999 to work together to: *assess sources of nutrient loadings to the Suwannee River Basin and optimize reductions in loadings to waters of the basin, emphasizing voluntary, incentive-based programs for protecting the environment and public health.* SRP goals include achieving 80-100 percent farmer participation in BMP implementation, operation, and maintenance, through the use of conservation plans and FDACS-adopted BMP manuals. Staff efforts have focused on dairies, poultry operations, and vegetable and row crop farms. The process for BMP Implementation Assurance in the Suwannee River Partnership is summarized below.

#### **Dairy and Poultry Farms**

Approximately annually, FDACS inspectors from the Dairy Division and SRP staff visit dairy and poultry farms participating in the Suwannee River Partnership, to ensure that BMPs are maintained. They fill out evaluation forms and assign a rating of *Satisfactory*, *Conditional*, or *Unsatisfactory*. For a *Satisfactory* rating no further action is required, other than regular inspections. For a *Conditional* or *Unsatisfactory* rating a reasonable period of time is given for corrections to be made before a follow-up site visit is conducted. Additional follow-up site visits are scheduled as circumstances warrant.

#### **Vegetable and Row Crop Operations**

SRP staff and technicians visit vegetable and row crop operations that receive cost-share funds, to ensure that they are keeping fertilization and irrigation records, which is a cost-share requirement. SRP staff have begun making site visits to these operations, which will occur at least once every five years. In addition, the FDACS OAWP conducts region-based or statewide surveys for other commodities, which include the relevant enrolled operations in the Suwannee River basin. The responses of Suwannee River basin growers to a survey on vegetable and row crop operations are included in the statewide results from that survey later in this report.

#### ***FINDINGS FOR THE SUWANNEE RIVER BASIN***

BMP Implementation assurance activities have been formally conducted in the Suwannee River Basin since 2005. The Suwannee River Partnership has produced two detailed annual reports on BMP “quality assurance.” The BMP participation rates and site inspection findings summarized below are from the 2010 annual report.

**BMP Participation Rates**

***Dairies***

Forty-two of the 48 dairies in the basin (87.5%) have Conservation Plans. Six farms have chosen not to participate in formal BMP implementation at this time. Of the 42 dairies participating:

- Thirty-six farms are fully implementing their plans, representing approximately 35,000 cows out of about 38,000 (92%) in the basin.
- Forty dairies have installed structural waste management systems.

***Poultry***

Of 130 poultry farms in the basin, all are participating in BMP implementation, all have fully implemented Conservation Plans, and all have installed structural waste management systems.

***Vegetable and Agronomic Crops***

About 157,509 acres of crop farms are enrolled in BMPs under the 2005 FDACS Water Quality/Quantity BMPs for Vegetable and Agronomic Crops. This represents more than 70% of the crop farm acreage in the basin.

**Site Inspection Findings**

In 2010, 21 dairy and 81 poultry operations were inspected at least once, and some were visited twice or more. The total number of inspections was 32 for dairy and 91 for poultry. Inspection categories for dairy operations are dairy collection and transport, manure storage, manure utilization, and dairy record keeping. Inspection categories for poultry operations are litter management, mortality management, and litter records. Not all inspection categories were ranked during each inspection.

**Table 1** shows the ratings given for BMP implementation by inspection category, according to the 2010 annual report.

**TABLE 1. SUMMARY OF SITE INSPECTION RESULTS FOR THE SUWANNEE RIVER BASIN (2010)**

BMPs	SATISFACTORY	CONDITIONAL	UNSATISFACTORY
<b>DAIRY (32 OPERATIONS VISITED)</b>	<b>Note:</b> Some dairy operations visited more than once		
Dairy Collection and Transport	31 (97%)	0	1 (3%)
Manure Storage	31 (97%)	0	1 (3%)
Manure Utilization	30 (94%)	1 (3%)	1 (3%)
Dairy Record Keeping (31 ratings)	23 (74%)	4 (13%)	4 (13%)
<b>POULTRY (91 OPERATIONS VISITED)</b>	<b>Note:</b> Some poultry operations visited more than once		
Litter Management	90 (99%)	1(1%)	0
Mortality Management	87 (96%)	4 (4%)	0
Litter Records	74 (81%)	17(19%)	0

### **Inspection Category Descriptions**

***Dairy collection and transport*** - includes maintaining and operating the collection and transport components within a waste management system, such as feeding or free stall barns, concrete pads, concrete ditches, pipes, collection pits, sand traps, and solids separators, among others. These facility components are evaluated based on a standard outlined in the operation/maintenance section of the farm's Comprehensive Nutrient Management Plan.

***Dairy manure storage*** - includes maintaining and operating the manure storage components of the waste management system. Factors that are evaluated include the storage area having an adequate freeboard level to allow for large storm events, maintaining the areas, and preventing spills.

***Dairy manure utilization*** - includes utilization of manure solids and wastewater on a growing crop to recycle nutrients to minimize water quality impacts. The evaluation includes an assessment of the total quantity of nutrients being applied to a spray field to ensure the system is kept in nutrient balance.

***Poultry litter management*** - includes storing and utilizing manure/litter from poultry operations in a manner to reduce water quality impacts. Evaluation includes an assessment of whether the operation is properly storing litter, and of the total quantity of nutrients being applied to an application field (normally pasture or forage harvested for hay) to ensure the system is kept in nutrient balance.

***Poultry mortality management*** - includes proper composting of dead birds on a poultry operation. Evaluation includes an assessment of whether dead birds are properly mixed with carbon-containing material, and turned properly to maintain correct temperatures for adequate composting.

### **BMP Implementation Deficiencies**

The most common deficiency found in BMP implementation was in record keeping. Records may have been incomplete or, in some cases, not kept at all. However, the ratings for record keeping improved over the previous year, and SRP staff continue to work with producers on this important aspect of BMPs.

### **Educational needs**

There is a need to continue to provide information on:

- The requirements of water resource regulatory programs applicable to agriculture
- The environmental and economic benefits of BMPs
- The long-term commitment required in implementing BMPs
- The importance of record keeping

## II. LAKE OKEECHOBEE WATERSHED BMP IMPLEMENTATION ASSURANCE

### PROCESS

The Northern Everglades and Estuaries Protection Program, section 373.4595, F.S., mandates the implementation of FDACS-adopted BMPs verified by FDEP as effective, on all lands within the Lake Okeechobee Watershed. Producers who do not implement BMPs must conduct water quality monitoring prescribed by FDEP or the South Florida Water Management District (SFWMD), in order to demonstrate compliance with the SFWMD's Works of the District program.

FDACS is responsible for working with agricultural landowners to implement phosphorus-load-reducing BMPs on farms and ranch lands in the Lake Okeechobee Watershed. The OAWP has a dedicated staff person to visit the operations within the basin that have submitted an NOI. To date, most of these have been the cow-calf operations that have implemented Conservation Plans. However, dairy, nursery, citrus, and other agricultural commodities have or will receive formal site inspections. The overall approach to implementation assurance in the watershed is summarized below.

- Each operation is visited upon completion of cost-shared structural BMPs, to ensure these BMPs have been properly installed, prior to receiving state cost-share funds.
- General Implementation Assurance site inspections are conducted generally in order of when Conservation Plans are completed and implemented, usually within six months of plan implementation.
- Staff fills out a review/checklist form and assigns an overall rating of *Satisfactory*, *Conditional*, or *Unsatisfactory*.
- For operations that receive a *Satisfactory* rating, no follow-up visit is necessary. However, OAWP staff will conduct "routine" site visits as workload allows. At this time, maintenance of structural BMPs will be reviewed and rated.
- For a rating of *Unsatisfactory* or *Conditional*, there is a scheduled follow-up inspection, usually within 120 days, to check on progress.
- Additional follow-up site visits are scheduled as circumstances warrant.

The BMPs commonly reviewed during site inspections are:

#### Structural BMPs

- ✓ Culverts/Culvert risers
- ✓ Fences
- ✓ Water troughs/ well capping

#### Management BMPs

- ✓ Nutrient management
- ✓ Maintenance of structural BMPs
- ✓ Record keeping

## FINDINGS FOR THE LAKE OKEECHOBEE WATERSHED

### BMP PARTICIPATION RATES

As of March 31, 2011, approximately 996,571 out of an estimated 1.38 million agricultural acres (72%) were enrolled in the Lake Okeechobee Protection Program.

### SITE INSPECTION FINDINGS

Site inspections in this program focus primarily on cow/calf operations with conservation plans because of the significant cost share provided and the importance of the BMPs to phosphorus management, which is a priority of the South Florida Water Management District. The OAWP conducts region-based or statewide surveys for other commodities, which include the relevant enrolled operations in the Lake Okeechobee Watershed. Responses by LOW growers to a survey on vegetable and row crop operations are included in the statewide results from that survey later in this report.

Between November 2009 and December 2010, OAWP staff visited 41 operations, representing 45,904 of the enrolled acres in the Lake Okeechobee Watershed. These operations included 36 cow/calf; two dairy; one sod; one row crop; and one citrus. Prior to the 2010 evaluation period, FDACS staff had inspected 76 operations with completed conservation plans, representing approximately 124,224 acres. With the 2010 inspections, the number of acres that have received BMP follow-up visits is 170,128 on 117 operations, or 17 percent of the total enrolled acres in the watershed. As previously mentioned, acres enrolled under FDACS BMP manuals also receive written BMP surveys. To date, these have been citrus and vegetable/row crop operations.

The forty-one site visits included evaluations of records, as well as structural and management BMPs addressing nutrient management (for phosphates) and irrigation management. Thirty-four (83%) of the operations visited received an overall *Satisfactory* rating, and seven (17%) received an overall rating of *Conditional*. These *Conditional* ratings were due to structural BMPs that are awaiting approval from the Natural Resources Conservation Service, which is providing cost share for the structures.

- **Nutrient Management (Phosphates)** - Nine of the forty-one operations inspected had made phosphate applications. All of these had adequate, up-to-date records of the soil test analysis, and applications were in line with the test analysis.
- **Irrigation Management** - Three producers received *Satisfactory* ratings in this management category. The remaining thirty-eight producers do not use irrigation systems; therefore this management category is not applicable to them.
- **Structural BMPs** - Seven producers are awaiting approval of structural BMPs from the Natural Resources Conservation Service, which is providing cost share for the structures. As a result, these producers received *Conditional* ratings.

**Table 2** provides a breakdown of the site inspection findings by category for the Lake Okeechobee Watershed BMP Program.

**TABLE 2. BREAKDOWN OF SITE INSPECTION RESULTS FOR LAKE OKEECHOBEE WATERSHED<sup>1</sup>**

<b>NUTRIENT MANAGEMENT (PHOSPHATES)</b>	<b>Y</b>	<b>N</b>	<b>NA</b>		
Is P fertilizer being applied?	9	32	0		
Does the producer have records on P application rates available for review on all applicable crops?	9	0	32		
Are the records on P application rates up to date?	9	0	32		
Do the records adequately document the P application rates being used?	9	0	32		
Was a soil sample performed for the crops on which P was applied?	9	0	32		
Was a tissue sample performed for the crop(s) on which P was applied, as applicable to the crop(s)?	2	6	33		
Is all P fertilizer being applied at rates specified by soil and/or tissue test results?	9	0	32		
Is the nutrient management component of the site-specific conservation plan fully implemented?	9	0	32		
<b>IRRIGATION MANAGEMENT</b>	<b>Y</b>	<b>N</b>	<b>NA</b>		
Does the producer have records on irrigation BMP implementation available for review?	3	0	38		
Are the irrigation records up to date?	3	0	38		
Do the records adequately document the implementation of the irrigation BMPs?	3	0	38		
Have the applicable irrigation management BMPs been implemented per the NOI schedule?	3	0	38		
<b>STRUCTURAL BMPs</b>	<b>Y</b>	<b>N</b>	<b>NA</b>		
Were all physical BMPs implemented per the conservation plan?	34	7	NA		
<b>BMP CATEGORIES (41 OPERATIONS VISITED)</b>	<b>S</b>	<b>C</b>	<b>U</b>	<b>NA</b>	<b>% S</b>
<b>Nutrient Management (for phosphates)</b>	41	0	0	0	100
<b>Irrigation Management</b>	3	1	0	37	98
<b>Structural BMPs</b>	34	7	0	0	83
<b>OVERALL RATINGS</b>	34	7	0	0	83

<sup>1</sup> S - Satisfactory; C - Conditional; U - Unsatisfactory; N/A - Not Applicable

### III. BMP IMPLEMENTATION ASSURANCE OUTSIDE THE SRP AND THE LOW

Due to the large workload involved in conducting BMP follow up in areas of the state outside of the Suwannee River Partnership area and the Lake Okeechobee Watershed, OAWP staff developed a standardized approach, which can be tailored to different commodities or regions of the state. This approach is summarized below. The combination of mail-out surveys and selected site visits allows limited staff resources to collect a substantial amount of data.

- Conduct a survey for each program/commodity on a staggered schedule, focusing primarily on nutrient management, irrigation management, water resource protection, and sedimentation/erosion control BMPs.
- Distribute surveys and data update sheets via mail to all property owners/leaseholders who have submitted NOIs *(after culling out duplicate or*

*inactive NOIs*). The data update sheets allow producers to provide current contact, parcel number, and acreage information.

- Conduct site visits up front where a large number of NOIs have been submitted for a single operation (NOI threshold varies for each program). Conduct selected site visits subsequent to the survey as spot checks/quality control to support the survey process, observe practices, check records, gather information on education and technical assistance needs, stay in touch with growers and their circumstances, etc.

The planned timeline for these implementation assurance activities, shown in **Table 3**, is based on the order in which each BMP program came or will come into effect. The intent is to conduct a survey approximately every five years for each manual.

**TABLE 3. APPROXIMATE TIMELINE FOR OAWP IMPLEMENTATION ASSURANCE OUTSIDE THE SUWANNEE AND OKEECHOBEE REGIONS**

BMP IMPLEMENTATION ASSURANCE ACTIVITIES	ESTIMATED TIMELINE
Ridge Citrus	Completed 2008 - 09
Indian River Citrus	Completed 2008 - 09
Peace River/Manasota Citrus	Completed 2009 -10
Gulf Citrus	Completed 2009 -10
Statewide Vegetables/Agronomic Crops	Completed 2010
Statewide Container Nursery	2011
Statewide Sod	2012
Statewide Cow/Calf	2013
Statewide Equine (to be adopted)	Within 5 years of adoption
Statewide Specialty Fruit/Nut (to be adopted)	Within 5 years of adoption
Statewide Consolidated Citrus (to be adopted)	Within 5 years of revision adoption
Vegetable/Agronomic Crops (revised version)	Within 5 years of consolidation adoption
Container Nursery (revised/expanded version)	Within 5 years of revision adoption

## 2010 SURVEY FINDINGS FOR VEGETABLE AND AGRONOMIC CROP BMPs

### PRACTICES SURVEYED

The Florida Vegetable and Agronomic Crops BMP implementation survey was designed to evaluate the use of applicable nutrient, water management, water resource protection, and erosion control BMPs by the producers enrolled in the program. The survey contained a series of questions about management actions producers were conducting on their operations, which corresponded to the targeted BMPs. This provided a means to evaluate on a programmatic level the degree to which the producers collectively are implementing the BMPs. In some cases, a producer may not have had to or been able to implement a BMP selected on the NOI (e.g., another means was used for addressing an issue, or the practice became economically not feasible), or might be implementing a BMP originally indicated on the NOI as not applicable.

**FLORIDA VEGETABLE AND AGRONOMIC CROPS BMP IMPLEMENTATION**

Beginning In August 2010, 353 of the 354 growers listed in the BMPTS under the Florida Vegetable and Agronomic Crops BMP program were mailed a survey, along with a data update sheet for each NOI. OAWP staff visited the remaining grower to fill out the survey and data update sheets on site. Collectively, these 354 growers represent a total of 815,652 enrolled acres. Of the 354 surveys, OAWP received responses on 138 (39%), a significant return rate, representing 209 NOIs and 274,837 acres. The remaining producers did not respond; it is not clear whether these producers are still in production. OAWP staff will make additional attempts to contact these producers to determine their status. **Table 4** summarizes the survey response rates and status of BMP program participation.

**TABLE 4. FLORIDA VEGETABLE AND AGRONOMIC CROPS BMP SURVEY RESPONSE RATE AND PROGRAM PARTICIPATION**

	<i># of Producers</i>	<i>Related NOIs</i>	<i>Related BMPTS Acres</i>
<b>SURVEY RESPONSE INFORMATION</b>			
Enrollments	354	543	815,652
Surveys mailed	353	537	815,324
On-site surveys conducted	1	6	328
Responses to survey by mail	137	203	274,509
Non-submittals	216	334	540,815
<b>PROGRAM PARTICIPATION STATUS</b>			
Confirmed active	135	206	*282,355
Confirmed <u>inactive</u>	3	3	(479)
Unconfirmed (no response)	216	334	540,815

\* Based on acreage increases and decreases reported on data update sheets

**FLORIDA VEGETABLE AND AGRONOMIC CROPS BMP SURVEY FINDINGS**

**Table 5** shows the ratio of BMPs being implemented overall, as compared with the BMPs that were selected on NOIs (tan column). A ratio of less than 100% means that, collectively, fewer operations implemented the practice than would be expected based on the BMPs shown as applicable on their NOIs. This table also shows the percentage of NOIs associated with BMPs being implemented by those who selected the practices, and the percentage of NOIs associated with BMPs being implemented by those who did not select them (blue and green columns).

**Figures 1 and 2** show a graphic comparison of the BMPs selected on all the survey respondents' NOIs (209) to the BMP-related management actions being conducted, in terms both of number of NOIs and acreage represented.

According to their NOIs, the survey respondents, on average, had identified 45% of the BMPs surveyed as being applicable to/implemented on their operations. Based on their

responses to the questions in the survey regarding management actions, producers collectively were implementing 48% of the BMPs surveyed. Therefore, the average actual implementation rate (ratio of BMPs indicated as applicable on NOIs to BMP-related management actions being conducted) was 106% (48%/45%). This result shows that, collectively, producers are implementing more of the survey-targeted BMPs than would be expected based on the original NOIs.

One possible reason for this result is that, with improvements in agriculture-related technology, many producers are using management actions that formerly were not feasible for their operations. For example, **BMP 32** deals with the use of controlled-release fertilizers (CRFs). Thirty-two of the 209 NOIs (15% of the respondents, representing 5% of the respondent acres) listed CRFs on their NOIs as applicable to the management of their operations. Due to advances in CRF technology, and its greater acceptance within the industry, more producers are using this technology today. Perhaps in part because of this, the survey responses indicate that operations associated with 83 of the 209 NOIs are using CRFs to some degree. This is 40% of the respondent NOIs, accounting for nearly 75% of the total respondent acreage (211,624 acres).

Some BMPs were not implemented at the rate selected. One example of this is **BMP 14 - Soil Survey**. The questionnaire asked what the predominant soil series was on the producer's operation, as a means of evaluating whether producers are familiar with and make use of the USDA-NRCS Soil Survey. Respondents associated with 150 (72%) of the 209 NOIs represented had indicated this as an applicable practice. Respondents representing 57 of the 209 NOIs (27%) provided the soil series name. However, many additional producers described their soils, and know how their soils respond in agricultural production. The response rate to this question is most useful in guiding OAWP and IFAS Extension agents in how to provide producers better access to BMP-related reference materials.

**TABLE 5. NUMBER AND PERCENTAGE OF NOIs ASSOCIATED WITH BMP SELECTION AND IMPLEMENTATION**

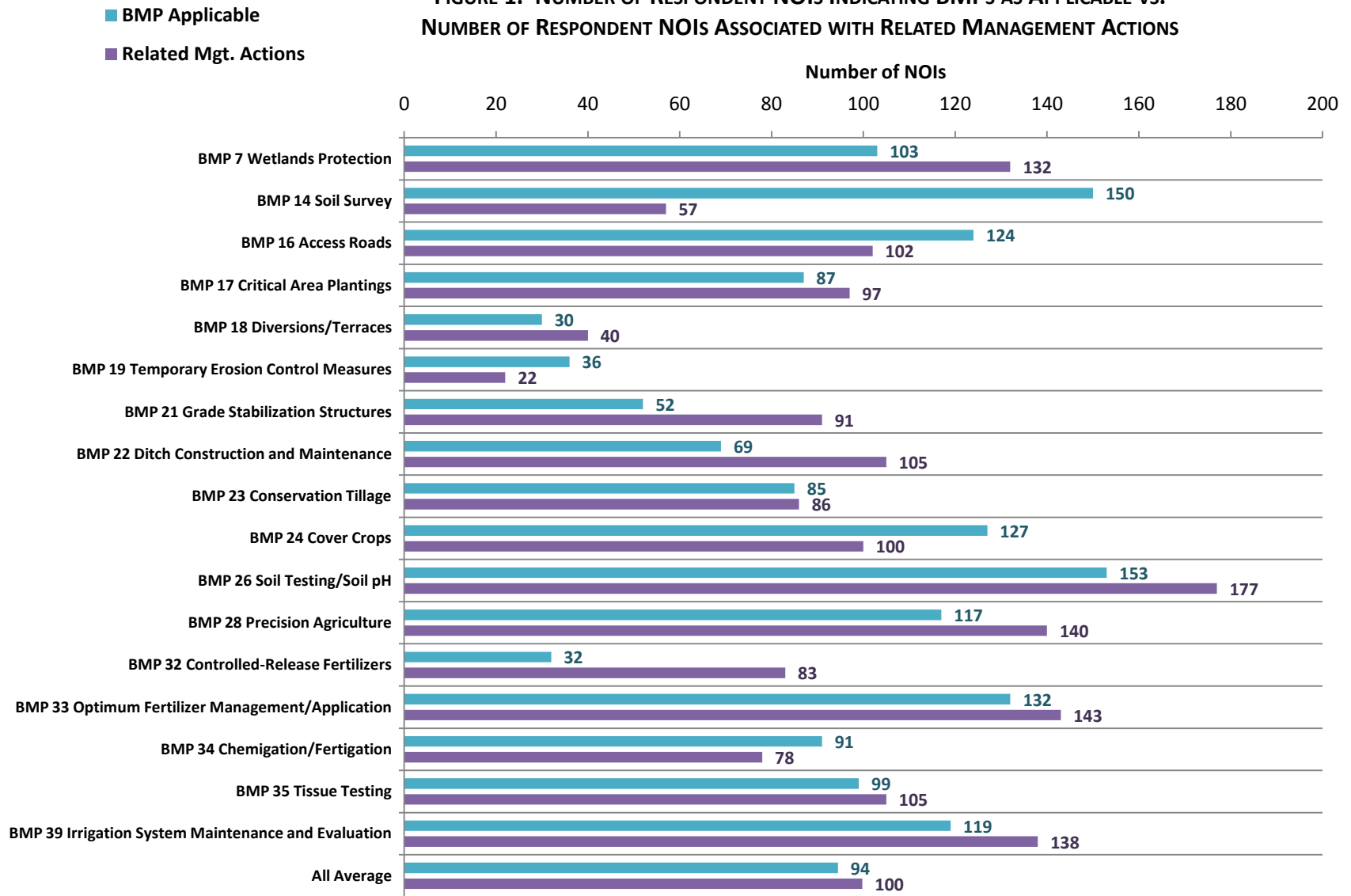
BMP #	Practice	Selected*		Implemented* (some not selected)		Ratio of Selected to Implemented	Selected and Implemented**		Not Selected but Implemented***	
		Count	%	Count	%		Count	%	Count	%
7	Wetlands Protection	103	49%	132	63%	128%	68	67%	64	59%
14	Soil Survey	150	71%	57	27%	38%	48	32%	9	15%
16	Access Roads	124	59%	102	49%	82%	56	46%	46	53%
17	Critical Area Plantings	87	42%	97	46%	111%	43	50%	54	44%
18	Diversions/Terraces	30	14%	40	19%	133%	11	37%	29	16%
19	Temporary Erosion Control	36	17%	22	11%	61%	7	19%	15	9%
21	Grade Stabilization	52	25%	91	44%	175%	26	50%	65	41%
22	Ditch Constr./Maintenance	69	33%	105	50%	152%	53	78%	52	37%
23	Conservation Tillage	85	41%	86	41%	101%	50	60%	36	29%
24	Cover Crops	127	61%	100	48%	79%	89	71%	11	13%
26	Soil Testing/Soil pH	153	73%	177	85%	116%	123	81%	54	93%
28	Precision Agriculture	117	56%	140	67%	120%	75	65%	65	70%
32	Controlled-Release Fertilizers	32	15%	83	40%	259%	13	42%	70	40%
33	Optimum Fertigation Management/Application	132	63%	143	68%	108%	89	68%	54	68%
34	Chemigation/Fertigation	91	44%	78	37%	86%	59	66%	19	16%
35	Tissue Testing	99	47%	105	50%	106%	49	50%	56	50%
39	Irrigation System Maintenance/Evaluation	119	57%	138	66%	116%	90	77%	48	52%
<b>All</b>	<b>Average</b>	94	45%	100	48%	106%				

\*% based on 209 NOIs represented in the survey

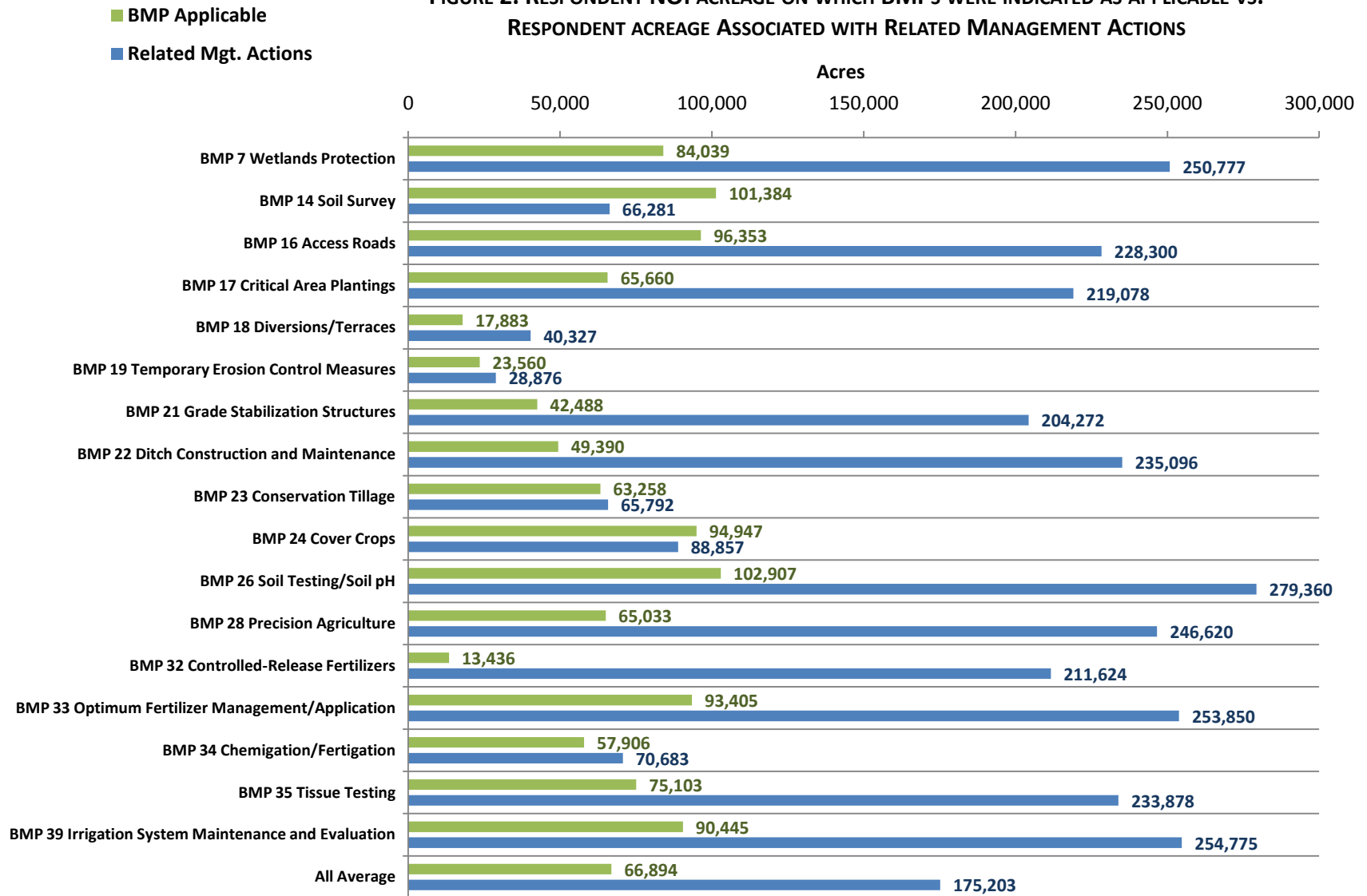
\*\*% based on # of practices selected

\*\*\* % based on # of practices not selected

**FIGURE 1. NUMBER OF RESPONDENT NOIs INDICATING BMPs AS APPLICABLE VS. NUMBER OF RESPONDENT NOIs ASSOCIATED WITH RELATED MANAGEMENT ACTIONS**



**FIGURE 2. RESPONDENT NOI ACREAGE ON WHICH BMPs WERE INDICATED AS APPLICABLE VS. RESPONDENT ACREAGE ASSOCIATED WITH RELATED MANAGEMENT ACTIONS**



**APPENDIX 1. DESCRIPTION OF SURVEYED PRACTICES FROM WATER QUALITY/QUANTITY  
BEST MANAGEMENT PRACTICES FOR VEGETABLE AND AGRONOMIC CROPS**

#	BMP CATEGORY	BRIEF DESCRIPTION OF PRACTICE
7	<b>WETLANDS PROTECTION</b>	Appropriate wetland setbacks and buffers
8	<b>GRASSED WATERWAYS</b>	Vegetated channels used to convey runoff water
9	<b>FILTER STRIPS</b>	Areas of permanent vegetation used to trap soil particles
10	<b>FIELD BORDERS</b>	Permanent vegetation established around production fields
11	<b>RIPARIAN BUFFERS</b>	Area of trees or shrubs adjacent to natural water bodies
12	<b>CONTOUR FARMING</b>	Crop production rows follow natural contours and are perpendicular to the slope
13	<b>LAND LEVELING</b>	Reshaping the land surface to specific grade
14	<b>SOIL SURVEY</b>	Recognition of the USDA-NRCS descriptions, classifications, and mapping of soils
15	<b>SEDIMENT BASINS</b>	Constructed ponds used to trap debris and sediments in runoff water
16	<b>ACCESS ROADS</b>	Should be designed such that culverts, cross ditches, and turnouts maintain pre-development hydrologic conditions
17	<b>CRITICAL AREA PLANTINGS</b>	Establishment of permanent vegetation in highly erodible areas
18	<b>DIVERSIONS/TERRACES</b>	Cross-slope embankments or channels to divert runoff from cropland
19	<b>TEMPORARY EROSION CONTROL MEASURES</b>	Temporary sediment barriers
21	<b>GRADE STABILIZATION STRUCTURES</b>	Used to control the grade and head cutting in drainage channels
22	<b>DITCH CONSTRUCTION AND MAINTENANCE</b>	Appropriate construction and maintenance of drainage structures
23	<b>CONSERVATION TILLAGE</b>	Use of minimal-soil-disturbance tillage methods
24	<b>COVER CROPS</b>	Vegetation established to protect the soil from erosion and enhance soil health during fallow periods
26	<b>SOIL TESTING/SOIL PH</b>	Laboratory analysis of soil chemical properties, used to determine fertilization requirements
28	<b>PRECISION AGRICULTURE</b>	GPS and computer-assisted management of production inputs to reduce waste
32	<b>CONTROLLED-RELEASE FERTILIZERS</b>	Water-soluble fertilizer that is encapsulated to release over time, in response to soil temperature and/or moisture
33	<b>OPTIMUM FERTILIZATION MANAGEMENT/APPLICATION</b>	Appropriate source, timing, placement, and rate of fertilizer applications
34	<b>CHEMIGATION/FERTIGATION</b>	Chemical or fertilizer applications applied through the irrigation system
35	<b>TISSUE TESTING</b>	Chemical analysis of plant tissues as a diagnostic tool in determination of nutrient status
36	<b>WATER SUPPLY</b>	The analysis of the quality of the irrigation water source being used
39	<b>IRRIGATION SYSTEM MAINTENANCE/EVALUATION</b>	An aspect of the management plan dealing with the timely evaluation and repair of all elements of the irrigation system
40	<b>IRRIGATION SCHEDULING</b>	The planning and decision-making processes used to determine and meet a crop's irrigation needs