

**DEP Agreement No.:** G0024

**Grantee Name:** University of Florida, Department of Agricultural and Biological Engineering

**Grantee Address:** PO Box 110570, Rogers Hall, University of Florida, Gainesville Florida 32611-0570

**Grantee's Grant Manager:** Wendy Graham

**Quarterly Reporting Period:** December 31, 2004 – March 31- 2005

**Project Title:** Demonstration of Water Quality Best Management Practices for Beef Cattle Ranching in the Lake Okeechobee Basin

**Provide a summary of project accomplishments (Include a comparison of actual accomplishments to the objectives established for the period. If goals were not met provide reasons why)**

- 1) Task 1: The Project work plan is complete.**
- 2) Task 2: Identification of cooperators is complete.**
- 3) Task 3: Nutrient Management Assessments have been obtained from NRCS and DACS.**
- 4) Task 4: Selecting specific sites for BMP demonstration is complete.**
- 5) Task 5: Site Instrumentation and Baseline monitoring:**

Site instrumentation was completed in March 2004. Data collection, system testing and debugging began in April 2004. As noted in an earlier report, occurrence of several hurricanes and instrumentation malfunctioning and failures resulted in spotty data during April to October 2004. Responsibility for baseline monitoring was subcontracted to John Capece at Southern DataStream (SDS) in November 2004. All monitoring systems are now fully operational. The QAPP was revised and resubmitted to DEP for approval in January 2005. Final approval for the QAPP was received in April 2005.

A phone conference was held on April 1, 2005 to discuss the status of the pre-BMP monitoring data with agency personnel. Odi Villapando (SFWMD), Kim Shugar (FDEP), John Capece (Southern DataStream), Sanjay Shukla (UF-IFAS), Ken Campbell (UF-IFAS), and Wendy Graham (UF-IFAS) participated in the call. Rich Budell was unable to participate but was updated immediately after the phone call on the same day.

During the phone call it was agreed that to maximize the scientific utility of the dataset being collected at Pelaez Ranch the pre-BMP period will be extended through October 2005. This is necessary because due to the adverse weather conditions (drought then 4 hurricanes) that occurred during 2004 we did not get a representative or reliable pre-BMP data set.

Within the current budget the post-BMP period will run from October 2005 through April 2006. If further funds can be acquired the post-BMP period will be extended through October 2006, and the total project period through the end of December 2006.

If further funds cannot be required we will not have a sufficiently long post-BMP period to make reliable comparisons, but we will still have a data set that will be useful for initial model calibration. It was agreed that it was preferable to complete the pre-BMP dataset with the hope of extending the post-BMP data period, than to move forward with an inadequate pre-BMP dataset from which we could never draw reliable conclusions.

## **Surface Flow Monitoring**

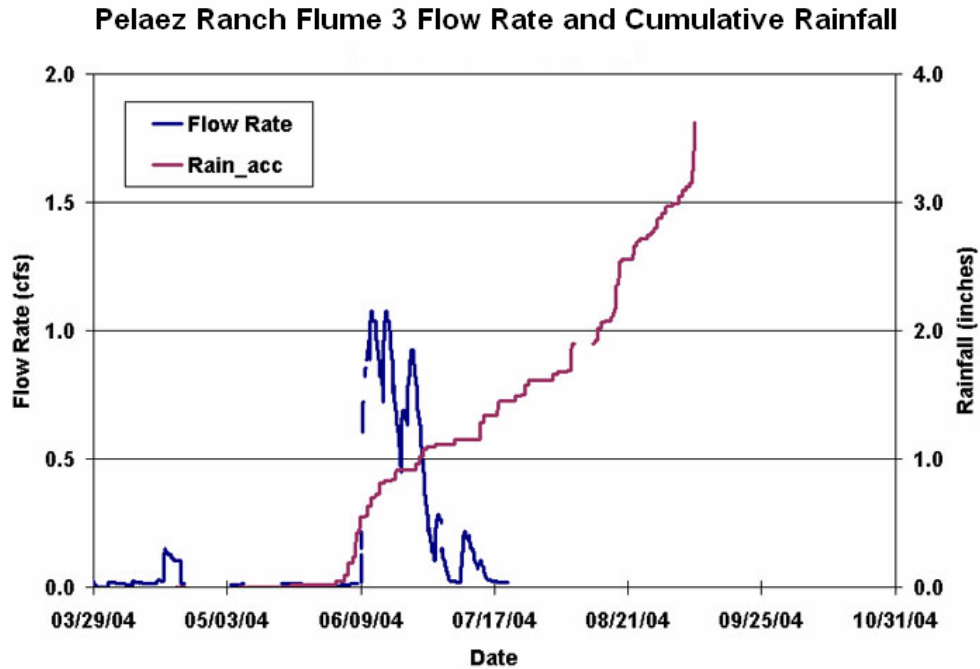
Locations of the surface monitoring locations are shown in Figure 1. Examples of the flow data collected for surface water monitoring stations during the April to October 2004 trouble shooting period are presented in Figures 3, 4, and 5. Peak flows for the monitoring stations 3,4, and 5 varied from 1 to 3.5 cfs, with highest peak flow at the main watershed outlet that drains the entire ranch. Flow data from monitoring stations 1 and 2 for the April to October 2004 time period continue to be de-bugged.

Examples of surface water total P concentrations for events in June, 2004 at surface water monitoring stations 1 through 5 are provided in Tables 1 through 5, respectively. During these events the highest total P levels (approximately 1100 to 3000 ppb) were observed at Flume 1 which is the outlet of the western wetland in the northwest corner of the ranch. Total P concentrations at Flume 4 at the outlet of the eastern wetland ranged from approximately 600 to 1100 ppb. Flume 2 which drains pastures in the southwest corner of the ranch had total P concentrations which ranged from 300 to 1800 ppb. Flume 3 which drains the eastern portion of the ranch had total P concentrations in the range of 100 to 300 ppb. Flume 5, the main watershed outlet that integrates flow from Flumes 1, 2 and 3, had total P concentrations ranging primarily from 200-800 ppb, with one reading of 1458 ppb.

Complete analyses of the surface flow data including flows, concentrations, and loads for the April 2004 through November 2004 troubleshooting period and the November 2004 though April 2005 time per-BMP period are on-going and will be presented in the next quarterly report.

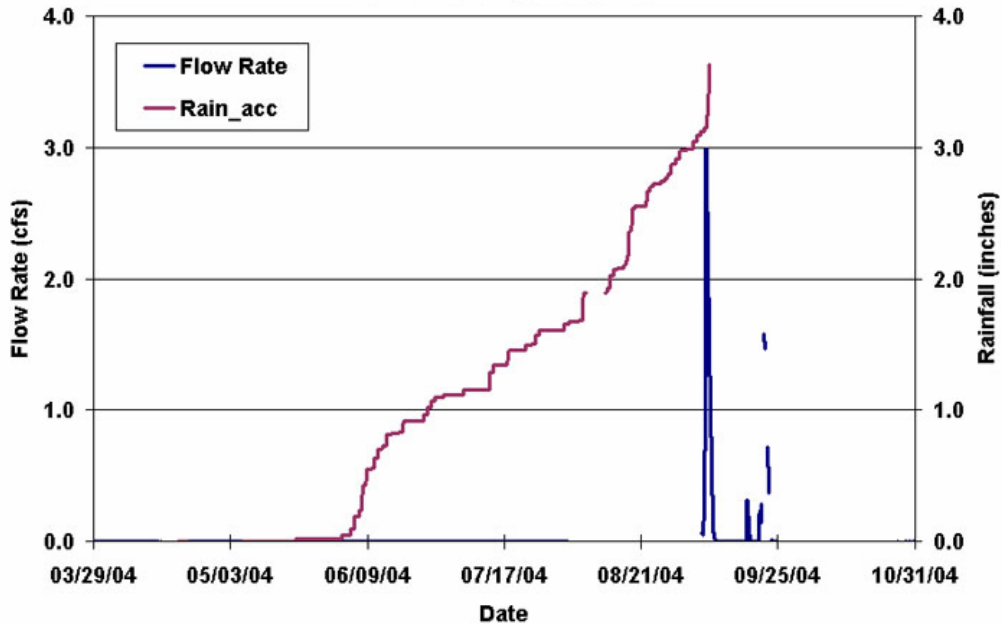


**Figure 1.** Locations of surface water quantity and quality and weather monitoring stations.



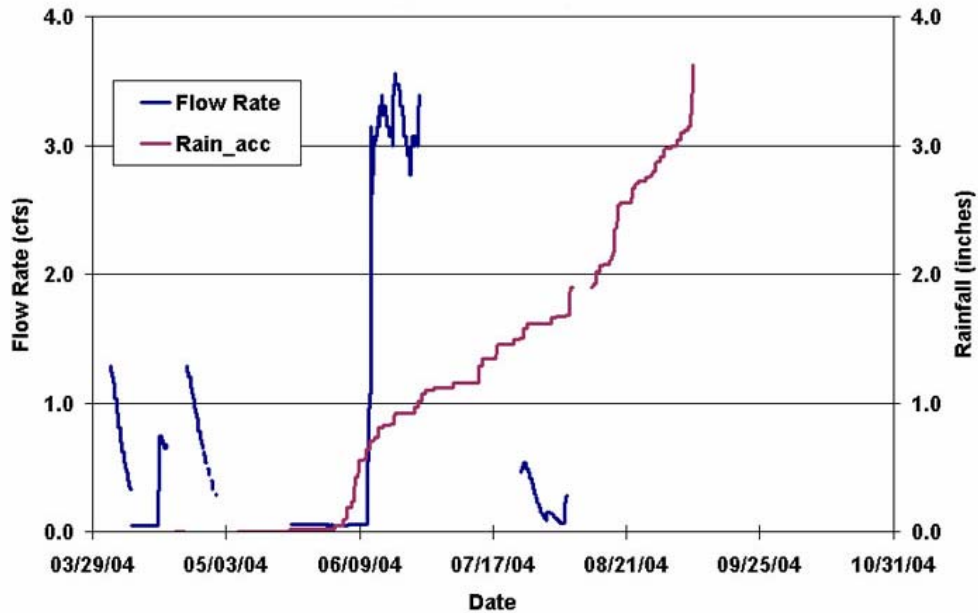
**Figure 2.** Flow rate (cfs) and cumulative rainfall (inches) between 03/29/2004 and 10/31/2004 as measured at surface water monitoring site 3.

**Pelaez Ranch Flume 4 Flow Rate and Cumulative Rainfall**



**Figure 3.** Flow rate (cfs) and cumulative rainfall (inches) between 03/29/2004 and 10/31/2004 as measured at surface water monitoring site 4.

**Pelaez Ranch Flume 5 Flow Rate and Cumulative Rainfall**



**Figure 4.** Flow rate (cfs) and cumulative rainfall (inches) between 03/29/2004 and 10/31/2004 as measured at surface water monitoring site 5.

Table 1. P concentrations (ppb) in the surface water quality samples taken by the autosamplers on 06/10/2004 and 06/14/2004 at site 1.

Autosampler Sample ID	TP (ppb)	TP (ppb)
	06/10/04	06/14/04
1	1307	2018
2	1526	2151
3	1504	2394
4	1571	2245
5	1451	2268
6	1591	1780
7	1532	2264
8	1570	2020
9	1544	1828
10	1521	2057
11	1497	1661
12	1314	2623
13	1257	2926
14	1258	2734
15	1101	
16	1300	
17	1232	
18	1286	
19	1348	
20	1308	
21	1308	
22	1195	
23	1365	
24	1284	

Table 2 P concentrations (ppb) in the surface water quality samples taken by the autosamplers on 06/09/2004 and 06/10/2004 at site 2.

Autosampler Sample ID	TP	TP
	06/09/04	06/10/04
1	808	880
2	1757	623
3	1699	
4	1606	
5	1511	
6	283	

Table 3 P concentrations (ppb) in the surface water quality samples taken by the autosamplers on June 9, 10, and 14, 2004 at site 3.

Autosampler Sample ID	TP	TP	TP
	06/09/04	06/10/04	06/14/04
1	243	285	158
2	130	243	328
3	100	230	279
4	107	252	285
5	86	255	279
6	98	286	253
7	99	282	250
8	116	228	266
9	118	248	318
10	105	277	310
11	112	253	289
12	98	263	243
13	108	236	298
14	99	227	278
15	118	234	315
16	96	239	301
17	114	240	258
18	87	247	213
19	102	252	248
20	121	252	226
21	116	329	235
22	102	263	232
23	91	305	243
24	516	130	287

Table 4. P concentrations (ppb) in the surface water quality samples taken by the autosamplers on June 10, 2004 at site 4.

Autosampler Sample ID	TP
	06/10/04
1	1116
2	788
3	806
4	771
5	740
6	725
7	727
8	704
9	725
10	1164
11	701
12	675
13	654

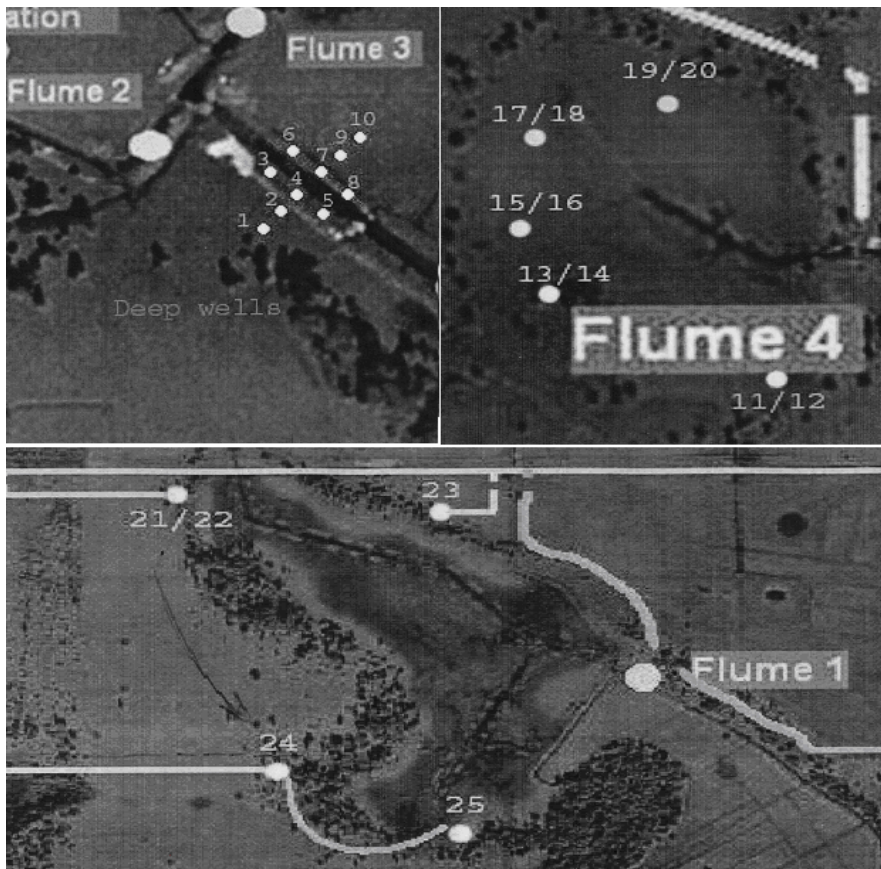
Table 5. Total P concentrations (ppb) in the surface water quality samples taken by the autosamplers on June 9, 10, and 14, 2004 at site 5.

Autosampler Sample ID	TP	TP	TP
	06/09/04	06/10/04	06/14/04
1	494	486	660
2	709	443	264
3	528	425	858
4	561	492	290
5	546	347	368
6	426	510	323
7	483	511	338
8	437	569	290
9	434	399	318
10	573	432	344
11	445	437	323
12	572	488	
13	494	492	411
14	489	545	443
15	414	529	604
16	357	530	487
17	347	526	640
18	284	500	728
19	324	311	767
20	315	558	720
21	298	519	807
22	238	561	804
23	283	529	744
24	282	1458	792

## Ground Water Monitoring

The locations of the groundwater wells are shown in Figure 5. Depth to groundwater and groundwater quality observations were taken monthly during the April 2004 through March 2005 time period. In April 2005 pressure transducers were installed in a subset of the wells to obtain continuous groundwater elevation measurements. Examples of water quality measurements from the ground water monitoring wells located at the stream crossing BMP site (near stations 2, 3, and 5) and the two wetland water retention sites (stations 1 and 4) are presented in Tables 6 and 7. The preliminary data indicates that the ground water concentration of electrical conductivity and total P at some of the stream crossing site wells (wells 1 through 10) were considerably higher than those at the wetland water retention site wells (wells 11 through 25). Complete analyses of the groundwater elevation, flow directions and concentrations will be provided in the next quarterly report.

We plan to deploy the passive flux meters (PFMs) in all wells in May or June 2005 to directly measure groundwater and phosphorus flux. Each well will receive a PFM the length of the well screen. The PFMs will use an anion exchange resin with alcohol tracers. The resins are designed to sorb phosphorus and slowly release tracers as a function of the groundwater velocity moving through the device. The mass of alcohol released at each well is less than ounce and since these are degraded in the environment we expect they will persist for a short period of time after leaving the well. The PFMs will be deployed for a period of one month then extracted for sampling. The resins will be tested for phosphorous and tracers. The results will be used to calculate the local groundwater flow velocity and the phosphorous mass flux over the one month period.



**Figure 5. Locations of the ground water wells.**

**Table 6.** Physical parameters of ground water as measured in Palaez Ranch on December 16, 2004

<b>Sample ID</b>	<b>Temperature</b>	<b>PH</b>	<b>EC</b>
W-1	23.2	4.93	1281
W-2	23.1	5.18	1566
W-3	22.8	5.34	440
W-4	21.6	5.57	1350
W-5	21.5	5.53	1570
W-6	22.3	5.27	215
W-7	22.8	5.28	226
W-8	22.6	5.35	209
W-9	23.1	5.62	278
W-10	22.2	5.90	316
W-11	21.5	4.81	240
W-13	21.2	5.20	315
W-15	21.2	5.19	239
W-17	21.2	5.79	446
W-19	21.3	5.29	331
W-21	21.7	5.64	196

**Table 7.** Ground water quality results for samples collected on December 13, 2004.

<b>Well#</b>	<b>NOx-N (mg/L)</b>	<b>Ortho P (ug/L)</b>	<b>Total P (ug/L)</b>	<b>TKN (mg/L)</b>
W1	0.2	4.3	15.5	2.7
W2	0.1	8.6	47.2	2.7
W3	0.1	7.2	64.4	2.6
W4	0.0	21.5	131.7	3.8
W5	0.1	471.8	1306.0	5.2
W6	0.2	42.6	77.4	3.8
W7	0.1	7.8	29.4	1.9
W8	0.1	8.6	38.5	2.9
W9	0.2	16.6	131.8	2.1
W10	0.1	338.4	50.4	1.7
W11	0.1	6.8	13.4	1.6
W13	0.1	3.2	11.2	1.3
W15	0.0	4.6	14.9	1.9
W17	0.0	3.3	6.1	2.1
W19	0.0	12.5	9.4	2.7
W21	0.2	13.5	96.5	3.6

## **6) Task 6: Amendments Evaluation.**

A recommendation by the Soil Amendments group to conduct Water Treatment Residuals (WTR) studies using rainfall simulators according to the protocol established by the *National Phosphorus Research Project for Simulated Rainfall – Surface Runoff Studies* (<http://pswmru.arsup.psu.edu/phosphorus/nprp.htm>) was approved by the Interagency Workgroup at their November 17, 2004 meeting. This change from doing plot studies was made because of difficulties in finding willing cooperators who would allow demonstration plots on their land. The treatments outlined in the revised project will be used in the rainfall simulation studies.

Testing of initial rainfall box design for leaching and runoff characteristics was completed in January – March 2005. Based on these tests, slight modifications were made in the design to accommodate improved control of water table depth. Sixteen boxes have been constructed to accommodate the first set of soil samples to be obtained from Larson Dairy.

Mr. Larson has given approval to obtain bulk soil samples from his sprayfield as soon as he has completed his Spring hay harvesting on that field. He anticipates that this will be by mid-May. At that time, we will obtain sufficient soil to conduct our studies and initiate the simulation studies. The simulation studies will include 1) applying soil treatments (WTR application method on two impacted soils) to rainfall boxes and letting them equilibrate for four weeks; and 2) running simulations and analyses of leachate and runoff samples after the equilibration period.

**7) Task 7: BMP implementation:** To be initiated in October 2005.

**8) Task 8: Economic Analyses:** To be initiated in October 2005.

**9) Task 9: Hydrologic Monitoring of BMP effectiveness:** To begin in October 2005

## **10) Task 10: Hydrologic Model Evaluation:**

Two existing hydrologic models are being used to evaluate the water-quality effectiveness of BMP implementation for this project. The Beef Ranch Decision Support System (BRADSS) was developed by researchers at University of Florida and Watershed Assessment Model-View (WAMView) was developed by a private engineering consulting firm, Soil and Water Engineering Technology (SWET). These models are physically-based tools that have been valuable in the assessment of watershed-related hydrologic and water quality properties. Both models have been acquired, installed, and tested in the UF-ABE hydrologic modeling computer lab.

Both BRADSS and WAMView are based upon geographical information systems (GIS) and therefore require systematic input of spatial data. Currently GIS coverages (topography, soils, vegetation coverages, landuse) and climate data are being obtained and formatted for input into both models. Water quantity and quality data from the Pelaez site are being compiled and formatted for comparison of model results with observed data.

## **11) Task 11: BMP Education:**

The following Extension Education Activities were conducted by Mitch Flinchum between Dec 31, 2004 and March 31, 2005

- Met with Extension Indian Reservation Agent and 2 leaders in the Tribe regarding wetland enhancement and BMPs. Distributed 10 BMP pocket record books.
- Participated in the Kissimmee Cattle Institute and Trade show with exhibit on Lake Okeechobee Protection Program and Best Management Practices in the Lake basins. Distributed 40 BMP pocket record books.

- Participated two sessions of FDACS rule making meetings (Lorita and Kissimmee). Distributed 12 BMP pocket record books.
- Participated in Cattlemen's Legislative dinner and discussion in Kissimmee. Distributed 15 BMP pocket record books.
- Compiled and distributed historical land and herd management data on the Larson paired wetland study.
- Presented Wetland Enhancement grant poster at the National Integrated Water Quality Conference in San Diego, CA.
- Distributed 400 South Florida Wetland newsletters.