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OPTIMIZATION OF BEST MANAGEMENT PRACTICES FOR BEEF CATTLE RANCHING IN THE LAKE OKEECHOBEE BASIN

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PROGRESS REPORT #1

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by J.C. Capece, M.K. Tchaou, and E.C. Rawlinson
July 23, 1998

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more information available at:
www.imok.ufl.edu/buck/stocking/reports/

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TABLE OF CONTENTS

Section Description	Tab Label
Executive Summary	Summary
Priorities for Next Quarter	Priorities
Water Quality Data	Quality
Summary	
Winter Pasture 1	1
Winter Pasture 2	2
Winter Pasture 3	3
Winter Pasture 4	4
Winter Pasture 5	5
Winter Pasture 6	6
Winter Pasture 7	7
Winter Pasture 8	8
Runoff Data	Runoff
Winter Pasture 1	9
Winter Pasture 2	10
Winter Pasture 3	11
Winter Pasture 4	12
Winter Pasture 5	13
Winter Pasture 6	14
Winter Pasture 7	15
Winter Pasture 8	16
Summer Pasture 1	17
Summer Pasture 2	18
Summer Pasture 3	19
Summer Pasture 4	20
Summer Pasture 5	21
Summer Pasture 6	22
Summer Pasture 7	23
Summer Pasture 8	24
Weather Data	Weather
Weather Station 1	25
Weather Station 2	26
Data Compact Disk	(Vol. 1 Pocket)

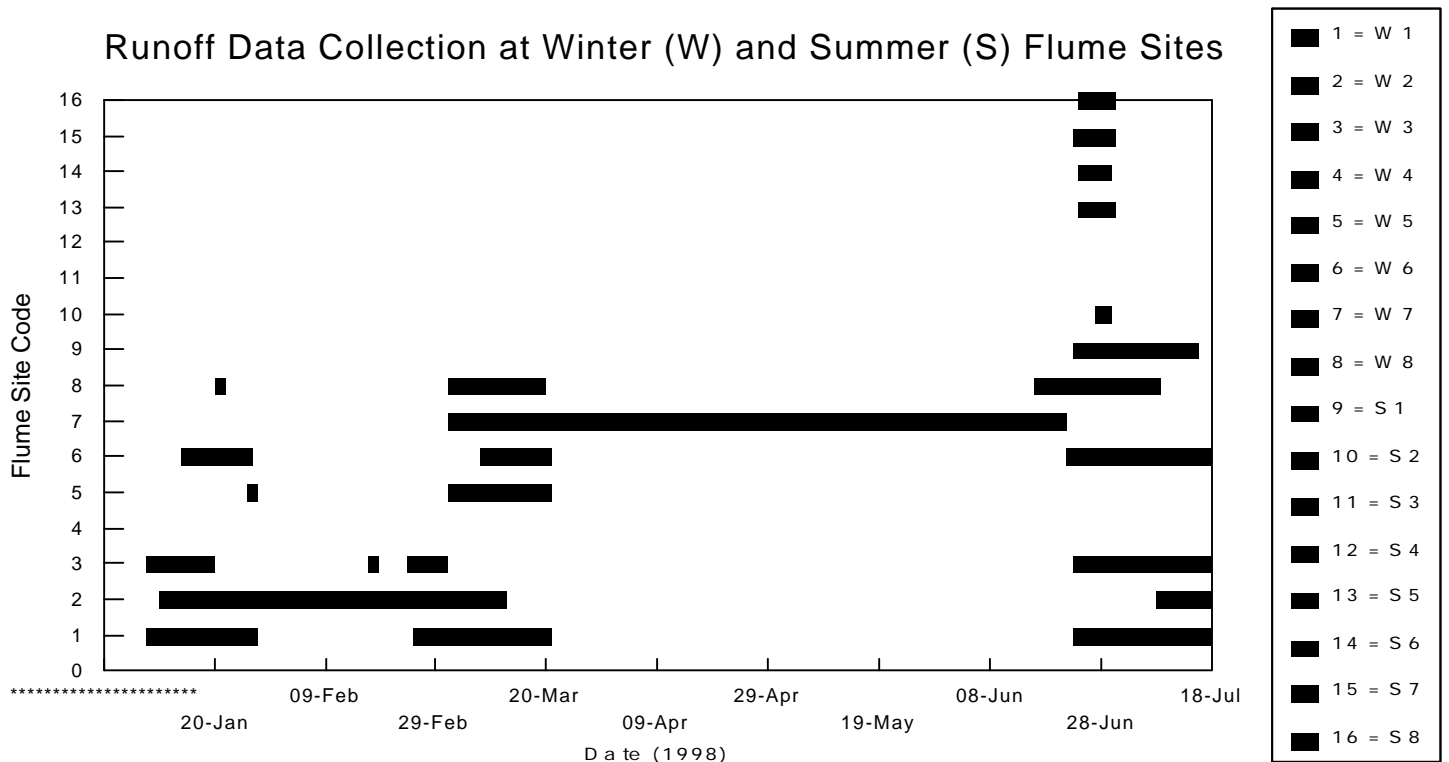
Optimization of Best Management Practices for Beef Cattle Ranching in the L. Okeechobee Basin
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 July 23, 1998 (Revised January 10, 1999)

Executive Summary

The MAERC cattle stocking rate optimization study at Buck Island Ranch is one of the most extensive best management practices projects for cattle in the nation. The scale of instrumentation and data collection is extremely ambitious – 16 pasture plots of 50 or 80 acres, each instrumented with sophisticated flow and water quality monitoring systems, plus 3 full weather measurement stations and 5 supplemental rainfall stations.

PROGRESS

Construction and instrumentation of the flow and water quality measurement systems was completed in May, 1998. Data collection began at the winter pasture array in late 1997 but has only recently started in the summer pasture array. The figure below documents runoff data collection periods for each pasture site. While the all winter pasture runoff measurement systems were operational in early 1998, data collection was suspended during the summer flume construction period and to allow for backfilling and sodding of the winter sites. All runoff data collected to date is classified as preliminary pending further inspection and modification based upon field notes (adjustments to offsets, etc.).



A standard operating procedure (SOP) has been developed for the automated water quality sampling system and for the manual grab sampling task. This SOP is posted on the project web page along with the database entry form for samples collected by the ISCO units. The project web page includes all primary project documents (statement of work, CompQAP, QAPP, and reports. The site, located at www.imok.ufl.edu/buck/stocking/, is being continually expanded to include additional site images and reports.

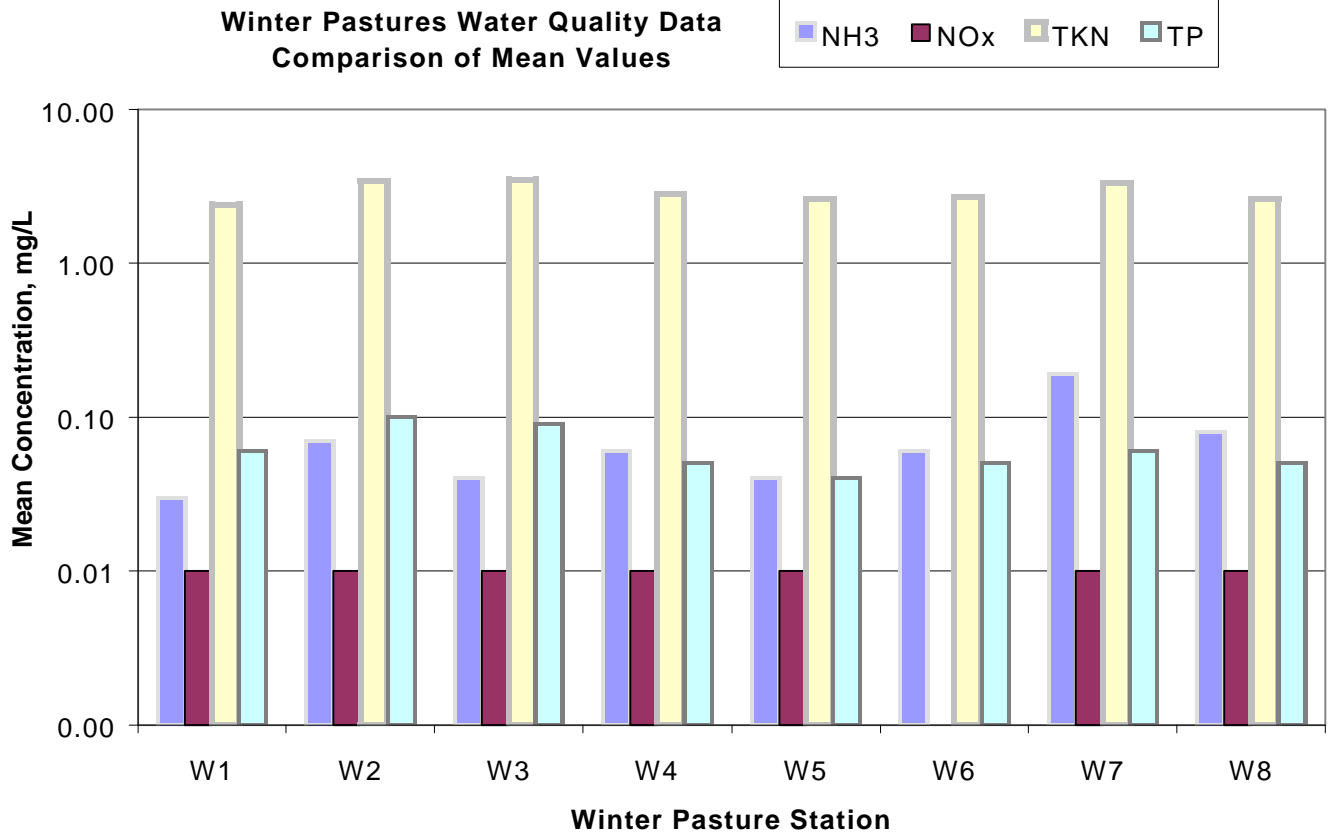
WATER QUALITY DATA

The project is currently in the “equilibration phase” during which water quality effects of the ditch and flume construction are being allowed to diminish prior to implementation of the stocking rate treatments. Water quality data collected during the early part of the project (during construction and soon after installation of the flumes) exhibited high total phosphorus concentrations, but these levels have decreased dramatically after the initial months of the project. Complete data set statistics are provided in the water quality section.

The table and graphic shown below lists mean concentration from each winter plot for the post-equilibrium portion of the data set (after Feb 1, 1998).

Station	MEAN CONCENTRATION, mg/L			
	NH3	NOX	TKN	TP
W1	0.03	0.01	2.40	0.06
W2	0.07	0.01	3.40	0.10
W3	0.04	0.01	3.50	0.09
W4	0.06	0.01	2.80	0.05
W5	0.04	0.01	2.60	0.04
W6	0.06	0.00	2.70	0.05
W7	0.19	0.01	3.30	0.06
W8	0.08	0.01	2.60	0.05

This table and graph shows a total phosphorus concentration in the range of 0.4 to 0.10 mg/L, ammonia in the range of 0.03 to 0.19 mg/L, nitrate/nitrite less than 0.01 mg/L, and total Kjeldahl nitrogen in the range of 2.4 to 3.5 mg/L. These concentrations are reasonably similar between the sites suggesting equilibrium conditions and similar response at all winter pasture plots. This relatively low noise level is encouraging for the prospects of detecting subsequent response differences between the pasture plots when subjected to the stocking rate treatments.



FLOW DATA

Little flow and water quality data has been collected from March to July because of the dry conditions on the pastures. No significant runoff events have occurred during this period. As the 1998 rainy season begins, we will be ready to capture complete datasets.

OUTREACH EFFORTS

Outreach efforts for the project are continuing. In June a project information booth was set up at the Florida Cattlemen Association annual meeting in Marco Island. In addition, the project webpage

Priorities for Next Quarter

Experiment Implementation

The equilibration phase will continue through November, 1998 at which time the winter pastures will be stocked according to the planned treatment rates. A meeting of project participants will be held to further discuss this issue and decide on a specific schedule for implementation of the treatments and system measurements.

Field Instrumentation

Instrumentation of the sites is complete. The software currently used to collect the flow data and control the automatic samplers is functional, but is undergoing review and upgrades to better address our project needs.

A UF engineering student is designing a refrigeration unit for the ISCO autosamplers. This ISCO retrofit is necessary to comply with new FDEP QA/QC requirements. A prototype unit should be tested during the next quarter.

An inventory of replacement field sensors, dataloggers, and other instruments will be assembled to ensure immediate repair and uninterrupted data collection during incidents of equipment failure.

Standard Operating Procedures

An SOP will be developed to instruct field maintenance and data collection personnel on the proper servicing and data extraction procedures for the datalogger systems. The water quality sampling SOP will also be improved and revised.

Data Processing

Previously-collected runoff data will be adjusted to reflect offset adjustments recorded in the field notes. Automated systems for data processing will be developed using SAS, SQL, HTML, and JAVA software environments.

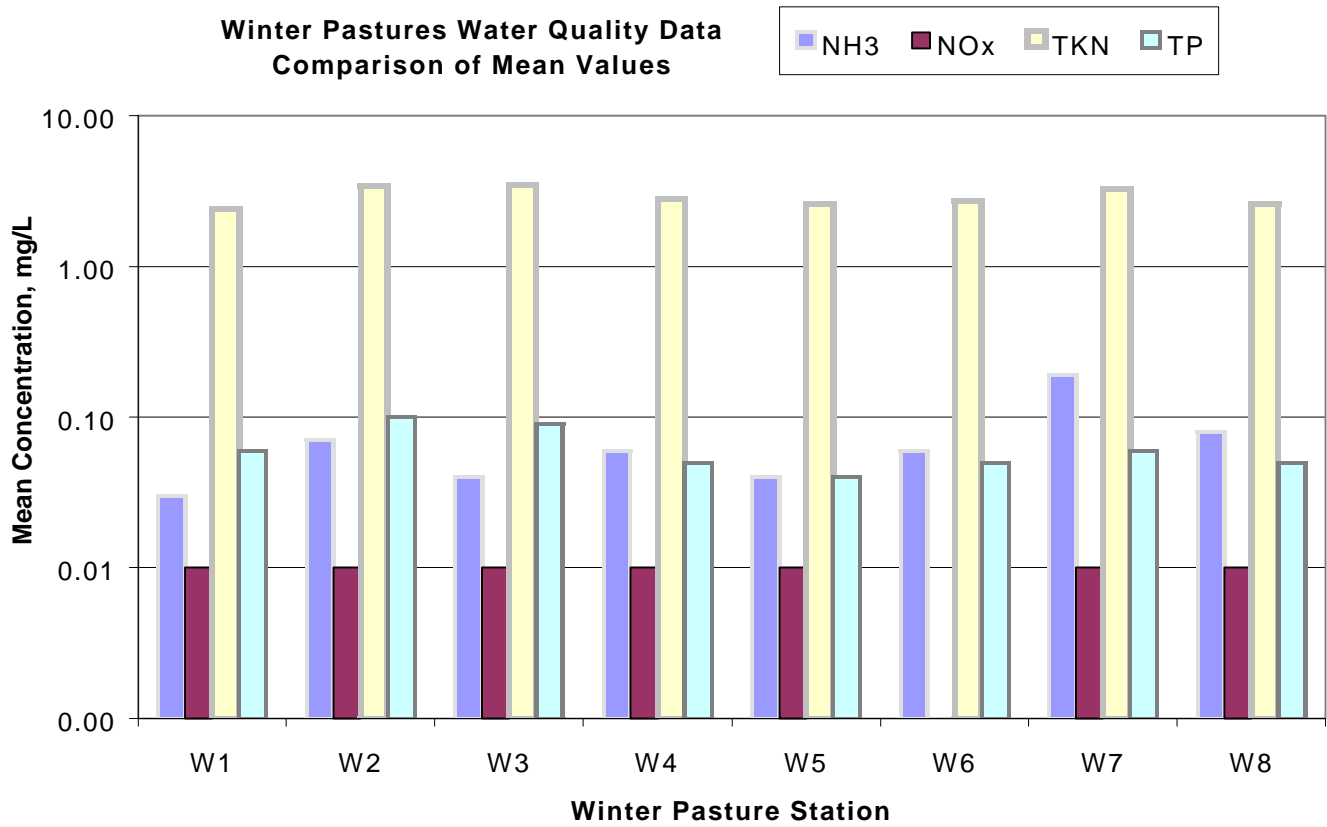
Information Dissemination

The project field systems will be more completely described in the project webpage. Other aspects of the project (soils, animal science, wildlife, etc.) will be incorporated into the project webpage.

WATER QUALITY DATA

Summary tables for the runoff water quality data collected to date are provided below. The first table and graph set shows mean concentration from each winter plot for the post-equilibrium portion of the data set (after Feb 1, 1998).

MEAN CONCENTRATION, mg/L				
Station	NH3	NOX	TKN	TP
W1	0.03	0.01	2.40	0.06
W2	0.07	0.01	3.40	0.10
W3	0.04	0.01	3.50	0.09
W4	0.06	0.01	2.80	0.05
W5	0.04	0.01	2.60	0.04
W6	0.06	0.00	2.70	0.05
W7	0.19	0.01	3.30	0.06
W8	0.08	0.01	2.60	0.05



The second table and graph set shows mean concentration from each winter plot for the full period of record.

Summary Tables for Water Quality Analysis Results.

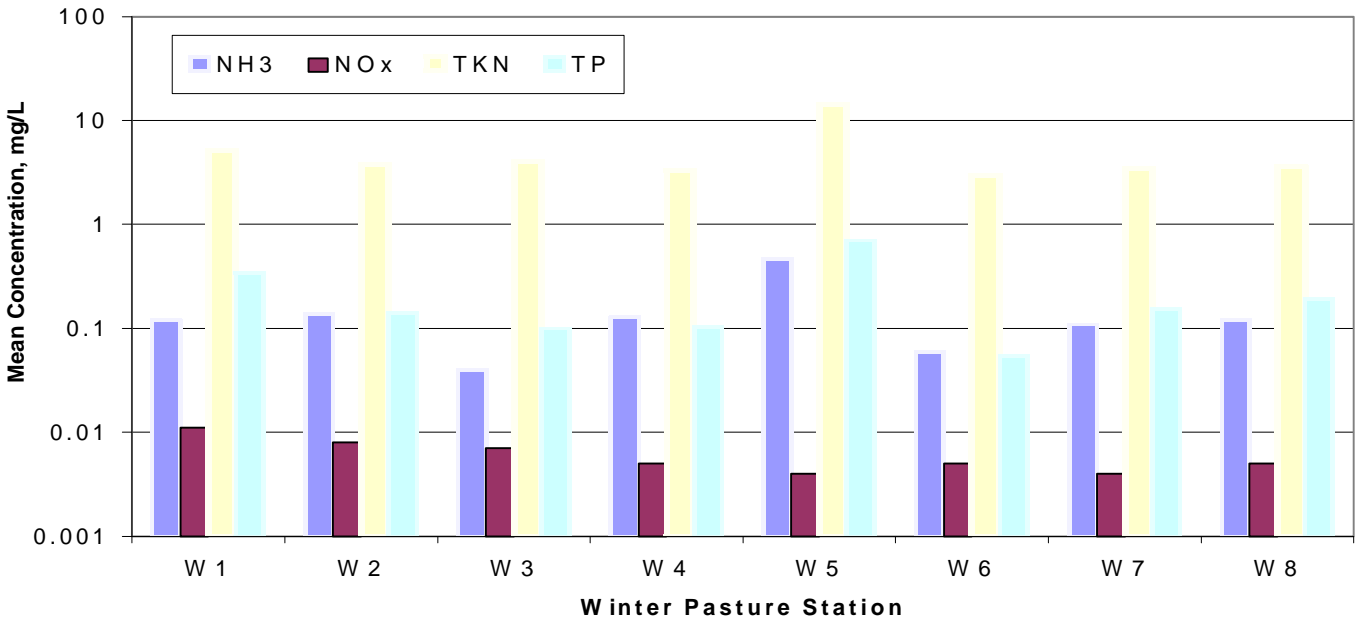
Mean Conc, mg/L				
Station	NH3	NOX	TKN	TP
W1	0.12	0.011	5.1	0.34
W2	0.14	0.008	3.8	0.14
W3	0.04	0.007	4.0	0.10
W4	0.13	0.005	3.3	0.10
W5	0.47	0.004	14.4	0.71
W6	0.06	0.005	2.9	0.05
W7	0.11	0.004	3.5	0.15
W8	0.12	0.005	3.6	0.19

Maximum Conc, mg/L				
Station	NH3	NOX	TKN	TP
W1	0.44	0.04	22.0	1.95
W2	0.99	0.02	8.0	0.72
W3	0.07	0.03	7.8	0.2
W4	0.90	0.02	8.2	0.44
W5	3.00	0.03	120.0	6.9
W6	0.27	0.03	4.9	0.18
W7	0.54	0.03	6.8	3.3
W8	0.44	0.04	15.0	1.5

Standard Dev, mg/L				
Station	NH3	NOX	TKN	TP
W1	0.11	0.012	4.1	0.43
W2	0.19	0.006	1.2	0.14
W3	0.02	0.008	2.1	0.05
W4	0.15	0.006	1.2	0.10
W5	0.60	0.006	20.0	1.17
W6	0.06	0.007	0.9	0.04
W7	0.14	0.006	1.2	0.52
W8	0.10	0.009	2.5	0.32

Minimum Conc, mg/L				
Station	NH3	NOX	TKN	TP
W1	0	0	1.30	0.030
W2	0	0	2.40	0.040
W3	0.01	0	2.00	0.050
W4	0.02	0	2.20	0.020
W5	0	0	1.60	0.020
W6	0	0	0.04	0.010
W7	0	0	1.80	0.000
W8	0	0	1.30	0.009

**Winter Pastures Water Quality Data
Comparison of Mean Values**



Comparison of these two sets of data demonstrate that the nutrient concentrations at the winter sites are stabilizing to similar levels. It remains to be seen if this trend will hold for the summer pastures. Those data will be available for the second progress report.