# MARTIN SWCD

**Mobile Irrigation Lab**
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# QUARTERLY

# REPORT

Fiscal Year 2007

## Jan 1st to Mar 31st

**E-Mail:** mswcd@bellsouth.net **Web:** http://mswcd.tripod.com/

# Martin Soil & Water Conservation District FY 2007

## MIL 2nd Quarter Report

**DISTRICT BOARD MEMBERS**

| | |
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| Dave Lennard | Chairperson |
| Jerry Levitz | Treasurer/Secretary |
| John Stanley | Supervisor |
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**ADMINISTRATIVE ASSISTANT**
**Susan Barrett**

**MIL TEAM**
**Charles A. Lambert - Markus Braunschweiger**

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## Acknowledgements

The Martin Soil and Water Conservation District (MSWCD) recognizes the following entities for their technical support and funding for the Martin Urban Mobile Irrigation Lab:
South Florida Water Management District
USDA Natural Resources Conservation Service
Martin County Commissioners.

## Abstract

The Martin Urban Mobile Irrigation Lab completed 35 evaluations in the three months starting Jan 1st 2007 and ending March 31st 2007. These evaluations produced Potential Water Savings (PWS) of 57.5 Ac/Ft per year and Actual Water Savings (AWS) of 18.4 Ac/Ft per year.
The Martin Mobile Irrigation Lab made 35 water conservation presentations contacting 399 people in the process.

## Introduction

The Martin Soil and water Conservation District Urban Mobile Irrigation Lab was established in 1998. Its mission is to promote water conservation through on-site evaluations of irrigation systems and conservation education.

## Evaluation Methods

There are three levels of evaluation; visual inspection, pressure and flow check, and the catch can test. Visual inspections are conducted first to determine if the system is in disrepair or has poor coverage. If the system is found to be in poor condition the other levels of evaluation are not carried out. Pressure and flow checks on individual sprinkler heads or emitters are carried next. If pressure and flow are found to be uniform a catch can test may be performed to determine optimum run times for the zones in the system.

## Evaluation Results

Between January 1$^{st}$ 2007 and March 31$^{st}$ 2007 the Martin MIL performed 31 evaluations on 25.87 acres and discovered Potential Water Savings (PWS) of 57.5 Ac/Ft per year (Table 1). The Martin MIL performed 4 follow-up evaluations and documented Actual Water Savings (AWS) of 18.4 Ac/Ft per year (Tables 1 and 2).

## Problems

The Martin Mobile Irrigation Lab found the two most prevalent problems were “Turf and landscape area irrigated in same zone” (10) and “Operating time too frequent” (52).

## Attachment # 1: Martin County MIL

**MIL ID:** 10 **FY:** **2007** **Quarter:** 2

| Zipcode | ID # | Acres | county ID | Soil | System Type | Crop | [1]TDS | pH | Water Source | Pump | Motor | [2]DU | [3]EU | Problems | [4]PWS Ac-Ft | [5]FAWS Ac-Ft | [6]IAWS Ac-Ft | FU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33455 | 101 | 0.2 | 10.0 | 34 | Sprinkler | Turf | 144 | 7.4 | City | | | 65 | | 10,52 | 0.2 | | | N |
| 33455 | 102 | 0.2 | 10.0 | 34 | Sprinkler | Turf | 144 | 7.4 | City | | | 65 | | 10,52 | 0.3 | | | N |
| 33455 | 103 | 0.2 | 10.0 | 34 | Sprinkler | Turf | 144 | 7.4 | City | | | 65 | | 10,50,52 | 0.3 | | | N |
| 33455 | 104 | 0.2 | 10.0 | 34 | Sprinkler | Turf | 144 | 7.4 | City | | | 65 | | 10,50,52 | 0.5 | | | N |
| 33455 | 105 | 0.2 | 10.0 | 34 | Sprinkler | Turf | 144 | 7.4 | City | | | 65 | | 10,52 | 0.2 | | | N |
| 33455 | 106 | 0.2 | 10.0 | 34 | Sprinkler | Turf | 144 | 7.4 | City | | | 65 | | 10,50,52 | 0.6 | | | N |
| 33455 | 107 | 0.4 | 10.0 | 34 | Sprinkler | Turf | 144 | 7.4 | City | | | 65 | | 10,50,52 | 4.8 | | 2.6 | N |
| 33455 | 108 | 0.4 | 10.0 | 34 | Sprinkler | Turf | 144 | 7.4 | City | | | 65 | | 10,50,52 | 4.6 | | 2.7 | N |
| 34996 | 109 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,20,50,52 | 1.5 | | | N |
| 34996 | 110 | 1.0 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,20,50,52 | 1.6 | | | N |
| 34996 | 111 | 1.0 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,20,50,52 | 1.7 | | | N |
| 34996 | 112 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,20,50,52 | 4.5 | | | N |
| 34996 | 113 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,20,50,52 | 3.2 | | | N |
| 33455 | 114 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 303 | 9.4 | Lake | Cent | Electric | 65 | | 10,50,52 | 0.5 | | | N |
| 34996 | 115 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 2.9 | | | N |
| 34996 | 116 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 3.5 | | | N |
| 34996 | 117 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 1.2 | | | N |
| 34996 | 118 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 1.1 | | | N |
| 34996 | 119 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 0.5 | | | N |
| 34996 | 120 | 0.8 | 10.0 | 34 | Sprinkler | Turf | 201 | 7.5 | Well | Cent | Electric | 65 | | 10,50,52 | 3.2 | | | N |
| 34996 | 121 | 0.7 | 10.0 | 34 | Sprinkler | Turf | 201 | 7.5 | Well | Cent | Electric | 65 | | 10,50,52 | 2.4 | | | N |
| 34996 | 122 | 0.8 | 10.0 | 34 | Sprinkler | Turf | 201 | 7.5 | Well | Cent | Electric | 65 | | 10,50,52 | 2.8 | | | N |
| 34996 | 123 | 0.3 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 2.1 | | | N |
| 34996 | 124 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 2.3 | | | N |
| 34996 | 125 | 1.2 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 2.7 | | | N |
| 34996 | 126 | 1.1 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 1.6 | | | N |
| 34996 | 127 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 0.6 | | | N |
| 34996 | 128 | 1.0 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 0.7 | | | N |
| 34996 | 129 | 1.2 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 0.3 | | | N |
| 34996 | 130 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 3.2 | | | N |
| 34996 | 131 | 1.1 | 10.0 | 34 | Sprinkler | Turf | 261 | 7.8 | Well | Cent | Electric | 65 | | 10,50,52 | 1.7 | | | N |
| 33455 | 132 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 407 | 6.7 | Lake | Cent | Electric | 65 | | 30,50,52 | | 2.9 | | Y |
| 33455 | 133 | 0.9 | 10.0 | 34 | Sprinkler | Turf | 407 | 6.7 | Lake | Cent | Electric | 65 | | 30,50,52 | | 5.1 | | Y |
| 33455 | 134 | 0.4 | 10.0 | 34 | Sprinkler | Turf | 407 | 6.7 | City | | | 65 | | 40,50,52 | | 2.4 | | Y |
| 33455 | 135 | 0.4 | 10.0 | 34 | Sprinkler | Turf | 407 | 6.7 | City | | | 65 | | 40,50,52 | | 2.8 | | Y |
| | 136 | | | | | | | | | | | | | | | | | |
| | 137 | | | | | | | | | | | | | | | | | |
| | 138 | | | | | | | | | | | | | | | | | |
| | 139 | | | | | | | | | | | | | | | | | |
| | 140 | | | | | | | | | | | | | | | | | |
| | 141 | | | | | | | | | | | | | | | | | |
| | 142 | | | | | | | | | | | | | | | | | |
| | 143 | | | | | | | | | | | | | | | | | |
| | 144 | | | | | | | | | | | | | | | | | |
| | 145 | | | | | | | | | | | | | | | | | |
| | | **25.87** | | | | | | | | | | **65** | ### | | **57.5** | **13.1** | **5.3** | |

1. Total dissolved solids
2. Distrubution uniformity
3. Emitter uniformity
4. Potential water savings
5. Follow up actual water savings
6. Instant actual water savings

Attachment # 2: Original Evaluation and Follow up Tracking Table.

MIL ID: 10

| Yr | Qtr ID# | ID No# | Crop | EQIP | Acres | PWS ac-ft | AWS ac-ft | |
|---|---|---|---|---|---|---|---|---|
| 2006 | 4 | 17 | Turf | | 0.9171258 | 3.62 | | *Orig. Eval.* |
| 2007 | 2 | 32 | | | 0.9171258 | | 2.8617 | *Follow up* |
| 2006 | 4 | 18 | Turf | | 0.9171258 | 6.16 | | *Orig. Eval.* |
| 2007 | 2 | 33 | | | 0.9171258 | | 5.0671 | *Follow up* |
| 2006 | 4 | 19 | Turf | | 0.4476584 | 2.77 | | *Orig. Eval.* |
| 2007 | 2 | 34 | | | 0.4476584 | | 2.3602 | *Follow up* |
| 2006 | 4 | 20 | Turf | | 0.35123967 | 3.32 | | *Orig. Eval.* |
| 2007 | 2 | 35 | | | 0.35123967 | | 2.7938 | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
| | | | | | | | | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
| | | | | | | | | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
| | | | | | | | | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
| | | | | | | | | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
| | | | | | | | | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
| | | | | | | | | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
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| | | | | | | | | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
| | | | | | | | | *Follow up* |
| | | | | | | | | *Orig. Eval.* |
| | | | | | | | | *Follow up* |

**Attachment # 4 - Mobile Irrigation Lab Conservation Education Report**
**Martin Mobile Irrigation Lab**

MIL ID: 10
FY: 2007
Quarter: 2

| Date | Type of Presentation | Name of Group | Number Attending | Location | Time |
|---|---|---|---|---|---|
| 1/5/07 | MIL presentations | Home owners & walkins | 42 | County wide | 35 |
| 1/5/07 | Envirothon work | Indian River Lagoon Env. | 350 | FIT | 49 |
| 2/2/07 | MIL Presentation | Kingswood III Mgmt. | 4 | Stuart | 2.5 |
| 2/28/07 | MIL Presentation | Martin County Utilities | 3 | Stuart | 1.5 |
| | | | | | |
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| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | Total | | 399 | | 88 |

**Notes:**

First two items: Performed during entire quarter, not only on 1/5/07

**Appendix A Definitions**

## AWS and PWS Definitions

The goal of an irrigation evaluation is to determine the capacity and efficiency of an irrigation system. This information is then used to develop a sound Irrigation Water Management Plan in which, irrigation water is applied only when needed and only in amounts which can be fully utilized by healthy plants.

Properly managed irrigation is used to supplement natural rainfall. The amount of irrigation required annually is the Net Irrigation Requirement (NIR) and is defined as;

**NIR = Crop water requirement – Effective rainfall**

The efficiency of an irrigation system is defined in terms of Distribution Uniformity (DU) for sprinklers and Emission Uniformity (EU) for microirrigation. These terms are defined in the USDA-NRCS Urban Irrigation Evaluation Manual. These numbers, in the form of percentages, are used to calculate the run times of irrigation events. The annual water use of a properly managed irrigation system is;

**Gross application = NIR/DU or EU**

Potential Water Savings (PWS) – The total amount of irrigation water that can be saved annually by following the recommendations derived from an irrigation system evaluation.

$PWS_{(management)}$ - The amount of irrigation water that can be saved annually by schedule changes (run time and frequency) alone.

**PWS(man) = measured water use – projected water use**

PWS(design) – The additional amount of irrigation water that can be saved annually by improving the performance of the system and readjusting the schedule.

$$NIR/DU_{(present)} - NIR/DU_{(projected)}$$

Actual Water Savings (AWS) - The total amount of water which is saved for a period of 1 year as a direct result of following the recommendations derived from an irrigation system evaluation.

Instant AWS can be achieved if repairs are made, resulting in quantifiable water savings or if the controller settings are adjusted (schedule change) at the time of the evaluation or when the report is delivered.

AWS schedule changes can be documented in person or by phone and AWS design and repairs can be documented by follow-up evaluations.

## Appendix B Methods

The following definitions and formulas are taken from the "Mobile Irrigation Laboratory Urban Irrigation Evaluation & Troubleshooting Training Manual" (Mickler1998).

**1. Determine average application rate (Meter records water use in gallons)**

$$AAR = \frac{Volume}{Area \times Time} \times 5775.4 \quad \textbf{OR} \quad AAR = \frac{Final\ Reading - Initial\ reading}{Area \times Operating\ Time} \times 96.25$$

Where *Average application rate* = Inches per hour (iph)
*Volume* = Volume required for needle in water meter to make one complete revolution (gal)
*Area* = Irrigated area ($ft^2$)
*Time* = Time required for needle in water meter to make one complete revolution (s)

**No water meter present**

$$Flow\ rate = \frac{Volume}{Time} \times 0.01585 \quad \textbf{OR} \quad \mathrm{AAR} = \frac{Total\ Flow\ Rate}{Area} \times 96.25$$

Where *Flow rate* = Gallons per minute (GPM)
*Volume* = Volume collected (ml)
*Time* = Time that water was collected (s)

**2. Determine distribution uniformity**

$$DU = \frac{Low\ quarter\ average}{Total\ average} \times 100 \quad \textbf{OR} \quad \text{Use DU estimate sheet}$$

When *DU* = Distribution uniformity in percent
*Low quarter average* = Average volume in the 25% of cans that received the least water (ml)
*Total average* = Average volume of all cans (ml)

**3. Determine the effective application rate**

$$\text{Effective application rate} = \text{Average application rate} \times DU$$

4. **Calculate operating time**

$$\text{Watering time} = \frac{\text{Plant water requirement}}{\text{Effective application rate}} \times 60$$

Where *Watering time* = Suggested time that a zone should be operated (min)
*Plant watering requirement* = 0.5 or 0.25 depending on location (in)
*Effective application rate* = From step 3 (iph)

**5. Determine water used per operating cycle**

When used per operating cycle is calculated by the following equation:

$$\text{Current usage} = \text{Flow rate} \times \text{time}$$

Where *Current usage* = Total water used for a given zone per irrigation cycle (gal)
*Flow rate* = Determined from equations below (gpm)
*Time* = Time a zone is operated during a scheduled irrigation cycle (min)

# Appendix C

**Problem Descriptions** - Problems are irrigation system or management factors that limit irrigation system performance or efficiency. Problems are noted during the site visit, system evaluation, and/or through discussions with the operator.

| Code | Description of Problems |
|---|---|
| | **Pressure / Application Rate** |
| 1 | Under-sized pump for number and type of sprinkler heads or emitters |
| 2 | Pressure loss between pump and sprinklers/emitters due to inadequate pipe size |
| 3 | Higher pressure than manufacturer's specifications |
| 4 | Lower pressure than manufacturer's specifications |
| 5 | Low pressure due to water supply |
| 6 | Different pressure between manifolds |
| 7 | Small wetted area |
| 8 | Application rate > soil infiltration rate (ponding) |
| 9 | Air in pipelines |
| 10 | Turf and landscape area irrigated in the same zone |
| 11 | Pressure variation due to elevation differences |
| | **Emitters / Sprinklers** |
| 20 | Mixed sprinkler/emitter sizes & unmatched precipitation in the same zone |
| 21 | Mixed sprinkler/emitter brands or types in the same zone |
| 22 | Poor emitter/sprinkler uniformity due to worn orifice |
| 23 | Poor overlap due to improper sprinkler/emitter alignment or spacing |
| 24 | Various riser heights in same zone |
| 25 | Emitter/sprinkler spacing varies in same zone |
| 26 | Missing/malfunctioning emitters or sprinklers |
| 27 | Missing/malfunctioning pressure gauge/regulator/filter |
| | **Maintenance - Irrigation System** |
| 30 | Leaks and broken valves, pipe, laterals lines (Poly-tubing), emitters, sprinklers |
| 31 | Clogged filter or filter screen |
| 32 | Sprinkler heads not properly adjusted, causing overflow on paved areas |
| 33 | Clogged emitters/nozzles (due to biological, chemical or physical factors) |
| 34 | Leaning sprinklers/emitters causing non-uniform distribution |
| 35 | Malfunctioning valves |
| | **Maintenance – Landscape** |
| 40 | Stream of water blocked by vegetation |
| 41 | Variable crop spacing and stage of growth |
| 42 | Poor drainage, requiring water control |
| | **Operation / Management** |
| 50 | Operating time too long |
| 51 | Operating time too short |
| 52 | Operating time too frequent |
| 53 | No rain shut-off device |
| 54 | No soil moisture measuring device or rain gage |
| 55 | No irrigation water management plan |

**Appendix D**

# MARTIN COUNTY SOIL TYPES

| SYMBOL | NAME |
|---|---|
| 2 | Lawnwood fine sand |
| 3 | Lawnwood fine sand, depressional |
| 4 | Waveland sand |
| 5 | Waveland sand, depressional |
| 6 | Paola sand, 0 to 8% slope |
| 7 | St. Lucie sand, 0 to 8% slope |
| 8 | Palm Beach sand, 0 to 8% slope |
| 9 | Pomello sand, 0 to 5% slope |
| 10 | Basinger fine sand, depressional |
| 12 | St. Johns Variant sand |
| 13 | Placid sand |
| 14 | Satellite Variant sand |
| 15 | Electra fine sand |
| 16 | Oldsmar fine sand |
| 17 | Wabasso sand |
| 19 | Winder sand |
| 20 | Riviera fine sand |
| 21 | Pineda sand |
| 22 | Okeelanta muck |
| 23 | Urban land |
| 24 | Orsino sand, 0 to5% slope |
| 25 | Beaches |
| 26 | Pompano fine sand |
| 27 | Arents, organic substrat, 0 to 2% slope |
| 28 | Canaveral sand, 0 to 5% slope |
| 29 | Canaveral sand, 0 to 5% slope |
| 30 | Bessie muck |
| 31 | Cocoa Variant sand |
| 32 | Udorthents, 0 to 35% slope |
| 33 | Paola-Urban land complex, 0/8% slope |
| 34 | St. Lucie-Urban land complex, 0/8% |
| 35 | Salerno sand |
| 36 | Arents, 0 to 2% slope |
| 38 | Floridana fine sand, depressional |
| 39 | Quartzipsamments, 0 to 8% slope |
| 40 | Sanibel muck |
| 41 | Jonathan sand, 0 to 5% slope |

| SYMBOL | NAME |
|---|---|
| 42 | Hallandale sand |
| 44 | Boca fine sand |
| 45 | Hilolo fine sand |
| 46 | Sanibel muck |
| 47 | Pinellas fine sand |
| 48 | Jupiter sand |
| 49 | Riviera fine sand, depressional |
| 50 | Okeelanta Variant, muck |
| 51 | Pompano fine sand, occ. flooded |
| 52 | Malabar sand |
| 53 | Arents, 2 to 35% slope |
| 54 | Oldsmar fine sand, depressional |
| 55 | Basinger fine sand |
| 56 | Wabasso sand, depressional |
| 57 | Chobee loamy sand |
| 58 | Gator muck |
| 60 | Tequesta variant muck |
| 61 | Hobe fine sand, 0 to 5% slope |
| 62 | Nettles sand, depressional |
| 63 | Nettles sand |
| 64 | EauGallie fine sand |
| 65 | Tuscawilla sand |
| 66 | Holopaw fine sand |
| 67 | Aquents, frequently flooded |
| 68 | Pits |
| 69 | Hontoon muck |
| 70 | Canova Variant muck |
| 72 | Adamsville Variant sand, 0 to 5% slope |
| 73 | Samsula muck |
| 74 | Torry muck |
| 75 | Ft. Drum fine sand |
| 76 | Valkaria fine sand |
| 77 | St. Lucie sand, 8 to 20% slope |
| 78 | Pomello Variant fine sand |
| 79 | Terra Ceia Variant muck |
| 86 | Paola sand, 8 to 20% slope |

# Appendix E

**Software programs utilized:**

a.) **Microsoft Excel**
**Corel Quatro Pro** - For Spreadsheet programs
b.) **Microsoft Word**
**Word Perfect** - For word processors
c.) **Adobe Photo Shop 7.0 -** For scanning & photo manipulation
d.) **Microsoft Streets2005** - For location maps
e.) **Sierra Land Design** - For irrigation design & illustration
f.) **Microsoft Office2005** - For Publications (web site, flyers, award certificates, presentations, etc. etc..)
g.) **Adobe Acrobat 6.0 –** For reports published on the internet and transferred by E-mail

# Appendix F

**Program History**

(Brief history of individual lab.)

(Brief history of Florida's MIL program)
Lab Start Dates

1988 Lower West coast MIL
1992 South Dade MIL
1992 Indian River Lagoon MIL
1994 Palm Beach MIL
1994 Lee MIL
1998 Martin MIL
2000 St. Lucie MIL
2001 Big Cypress Basin MIL

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