THE BIG CYPRESS BASIN URBAN MOBILE IRRIGATION LAB

2017 4th Quarter & Annual Report

COLLIER SOIL AND WATER CONSERVATION DISTRICT NATURAL RESOURCES CONSERVATION SERVICE BIG CYPRESS BASIN



14700 Immokalee Rd Naples, Florida 34120 (239) 455-4100

Abstract

The Big Cypress Basin Urban Mobile Irrigation Lab (MIL) completed 25 evaluations for the fourth quarter of project year 2017. These evaluations produced Potential Water Savings (PWS) of 14.2 million gallons of water per year (43.5 acre-feet). Of the 25 evaluations 2 were follow-up evaluations performed for Follow-Up Actual Water Savings (FAWS) of .7 million gallons of water per year (2.2 acre-feet). And with changes to the homeowners' controllers, the MIL had Immediate Actual Water Savings (IAWS) of 2.3 million gallons of water (7.1 acre-feet) just by reducing long run times and multiple programs on irrigation controllers. These are documented in attachment #1. The follow-up evaluations with their original evaluations are documented in Attachment #2.

The Big Cypress Basin Urban Mobile Irrigation Lab will be acknowledged during evaluations and the numerous Rookery Bay Best Management Practices (BMP) training courses and the Waterwise and Other Irrigation Concepts course available to contractors of Collier County at Rookery Bay. The Big Cypress Basin Urban MIL has contacted Florida Gulf Coast University in efforts to conserve our natural resource and promote awareness of the MIL. The MIL also reaches the community through PowerPoint presentations and conservation expositions. The MIL is preparing an irrigation demonstration for the Annual Master Gardener Southwest Florida Yard and Garden Show.

Annual Summary

The Big Cypress Basin Urban Mobile Irrigation Lab completed 110 evaluations for the project year of 2017. The evaluations produced Potential Water Savings (PWS) of 36.1 million gallons of water per year (110.9 acre-feet). Of the 110 evaluations, 10 were follow-up evaluations. The follow-up evaluations produced a Follow-Up Actual Water Savings (FAWS) of 3.9 million gallons of water per year (11.9 acre-feet). And with changes to the homeowners' controllers, the MIL had Immediate Actual Water Savings (IAWS) of 10.2 million gallons of water per year (31.3 acre-feet) just by reducing long run times and multiple programs on irrigation controllers. The Big Cypress Basin Urban Mobile Irrigation Lab evaluated 112 acres of land in Fiscal Year 2107.

The Big Cypress Basin Urban Mobile Irrigation Lab Completed the following for Fiscal 2017:

- 110 evaluations
- 10 follow-up evaluations
- 4 Power Point Presentation
- 2 Exposition booths
- Live Forum Marco Island TV

Introduction

The Big Cypress Basin Urban Mobile Irrigation Lab's 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 efficiency 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 conducted next. If pressure and flow are found to be uniform, a catch can test is performed to determine optimum run times for the zones in the system.

Common Problems

The average operator is unaware of watering restrictions and what the proper irrigation schedule should be for their lawn and landscape. Most systems evaluated this year were using municipal sources that are expensive to operate or dual systems that have limitations on usage. The main concerns were saving money and water. Most of the evaluations requested this year were from other customer referrals and MIL flyers. The Mobile Irrigation Lab and evaluation report gives system operators and managers a realistic view of what their systems can do and how to improve their systems to save water. The major problems were blocked sprinklers and wrong settings and times on the controllers. Homeowners often have multiple programs running and overlapping other programs. Many rain sensors are bypassed and set too high. Unmatched precipitation rates with rotors on the same zone as fixed sprinklers were found almost on every site. Residents have lawn and landscaping zones watering together and overwatering landscaping areas.

Conservation Education/Outreach

For the fourth quarter 2017, the Big Cypress Basin Urban Mobile Irrigation Lab presented an irrigation booth on August 16th & 17th at the 2017 Florida Citrus Exposition held at the Lee County Civic Center. This educational program is documented in Attachment 3 with the annual education and outreach for fiscal year 2017.

Training

The training of the Master Gardeners in Collier County continues with conservation as the main objective around the Extension Office in Naples.

Attachment # 1: BCB MIL 2017

34104 34104 34108 34113 34104 34104	2	0.3	Collier		Sprinkler	Turf	City	55	3,10,20,21,22,23,24,26,30,32,40,51,52,53,54,55	0.0	0.0	0.0	F 1
34113 34104 34104	2 1	0.3	Collier	.8 .8	Sprinkler	Turf	City	65	3,10,20,21,22,23,24,20,30,32,40,51,32,33,34,35 7,10,20,21,23,30,32,34,40,51,54,55	0.2	0.0	0.0	1
34104 34104	4	0.3 0.5	Collier Collier	.8 .8	Sprinkler	Turf Turf	Reclaimed	65 65	10,20,24,30,32,40,50,52,54,55	1.7	0.0	1.5 1.0	
	5	0.5	Collier	.8	Sprinkler Sprinkler	Turf	Reclaimed City	50	3,10,24,30,32,51,52,54,55 3,7,10,21,26,30,31,32,34,40,50,52,54,55	1.6 1.0	0.0	0.9	
94104	6 7	0.3	Collier	.8	Sprinkler	Turf	City	50 60	3,7,10,20,21,24,30,32,34,40,55	0.3	0.0	0.0	
34112	8	0.3	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	City County	60	3,10,21,24,30,32,40,52,54,55 7,10,20,21,30,32,40,51,52,53,54,55	0.6	0.0	0.0	
34145	9	0.3	Collier	.8	Sprinkler	Turf	City	65	3,7,10,32,40,50,52,54,55	0.4	0.0	0.3	
34104 34104	10 11	0.3	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	City City	60 70	7,10,20,21,23,40,51,52,54,55 3,7,10,20,21,50,53,54,55	0.1	0.0	0.0	
34145	12	0.3	Collier	.8	Sprinkler	Turf	City	70	3,20,21,40	0.0	0.4	0.0	
34108 34104	13 14	1.5 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake City	70 65	4,5,10,24,40,51,52,54,55 10,20,21,23,32,51,52,54,55	0.6	0.0	0.0	H
34112	15	0.5	Collier	.8	Sprinkler	Turf	County	65	7,10,20,40,51,54	0.0	0.0	0.0	F
34119 34104	16 17	0.2	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake County	65 70	7,10,21,21,24,31,33,50,52,55 10,20,21,40,54	0.3	0.0	0.0	_
34120	18	0.3	Collier	.8	Sprinkler	Turf	Well	60	10,20,21,24,26,30,31,33,34,40,51,52,54,55	0.9	0.0	0.9	L
34104 34104	19 20	0.2	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County	60 65	3,7,10,20,21,40,50,52,54,55 3,7,10,23,30,32,52,53,54,	0.3	0.0	0.2	H
34101	21	0.3	Collier	.8	Sprinkler	Turf	County	70	3,10,20,24,32,50,54,55	0.3	0.0	0.0	L
34110 34104	22 23	0.3	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	County	70 75	3,10,21,40,51,53,54,55 3,10,21,54,	0.2	0.0 1.4	0.2	H
34104	24	2.0	Collier	.8	Sprinkler	Turf	Lake	65	10,20,40,50,53,54	0.0	6.6	0.0	L
34104 34117	25 26	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County Well	60 60	3,10,20,21,26,30,32,34,40,51,53,54,55 4,10,20,21,26,32,40,50,52,53,54,55	0.1 1.2	0.0	0.0 1.1	\vdash
34104	27	0.3	Collier	.8	Sprinkler	Turf	County	60	3,10,20,21,30,32,40,51,53,54,55	0.2	0.0	0.2	H
34104 34110	28 29	0.3 20.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Well Lake	65 60	10,20,21,24,26,40,50,52,53,54,55 4,10,20,21,31,33,40,52,53,54,55	0.9 15.4	0.0	0.9	\vdash
34145	30	0.3	Collier	.8	Sprinkler	Turf	City	55	3,10,20,21,30,31,32,34,40,50,52,54,55	1.2	0.0	0.5	L
34119 34104	31 32	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake County	60 65	4,20,21,23,30,32,34,52,54,55 7,10,20,214051,52,54,55	0.6	0.0	0.5 0.1	
34104	33	0.3	Collier	.8	Sprinkler	Turf	County	50	3,10,20,21,30,31,32,33,34,40,51,53,54,55	0.2	0.0	0.0	İ
84145	34 35	0.5	Collier	.8	Sprinkler	Turf	City	65 65	3,10,20,21,24,30,32,34,40,54,55	0.2	0.0	0.2	+
34104 34139	35 36	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County City	65 60	3,10,20,21,30,31,33,52,54,55 7,10,20,26,30,31,32,40,50,52,53,54,55	0.8	0.0	0.7	†
34145	37	0.3	Collier	.8	Sprinkler	Turf	City	60	3,7,10,20,21,25,26,30,32,34,40,51,52,54,55	0.1	0.0	0.1	\vdash
34104 34104	38 39	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	60 50	3,10,20,21,26,30,32,40,52,54,55 3,7,8,10,20,21,23,24,26,30,31,32,34,42,52,53,54,55	0.4	0.0	0.3	+
34145	40	0.4	Collier	.8	Sprinkler	Turf	City	65	10,20,21,26,40,50,52,54,55	0.9	0.0	0.4	\vdash
34109 34145	41 42	0.5	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	65 65	10,20,21,30,32,40,50,52,54,55 3,10,20,21,24,32,40,50,52,54,55	0.5 0.6	0.0	0.5 0.5	+
34145	43	0.4	Collier	.8	Sprinkler	Turf	City	65	3,7,10,21,24,32,34,40,50,52,53,54,55	1.1	0.0	1.0	F
34145 34145	44 45	0.5	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	City City	65 55	3,10,20,23,32,34,40,50,52,54,55 7,10,20,21,22,26,30,32,34,40,54,55	1.2 0.1	0.0	0.0	+
34145	46	0.3	Collier	.8	Sprinkler	Turf	City	65	4,10,20,21,24,40,54,55	0.0	0.0	0.0	
34145 34103	47 48	0.3 1.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City Lake	70 55	10,24,40,50,52,54,55 2,7,8,10,21,24,30,31,32,40,50,52,53,54,55	0.2 1.2	0.0	0.2	
34103	49	1.0	Collier	.8	Sprinkler	Turf	Lake	55	3,7,8,10,21,24,32,40,50,52,53,54,55	1.5	0.0	1.2	L
34145 34145	50 51	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	60 50	3,10,20,21,30,32,34,40,50,53,54,55 3,7,10,23,25,30,32,35,40,51,54,55	0.3	0.0	0.1	\vdash
34112	52	1.5	Collier	.8	Sprinkler	Turf	Lake	50	1,2,4,5,10,20,24,26,32,50,52,53,54,55	0.8	0.0	0.0	\vdash
34145 34145	53 54	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	55 60	7,10,20,21,22,24,32,34,40,50,52,54,55 3,10,20,21,30,32,50,52,54,55	0.3	0.0	0.0	+
34145	55	0.5	Collier	.8	Sprinkler	Turf	City	60	3,8,10,20,21,26,30,35,40,52,54,55	1.1	0.0	1.0	L
34145 34145	56 57	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	60 60	7,10,30,32,34,40,50,52,54,55 3,10,20,21,23,32,40,54,55	0.7	0.0	0.5 0.1	_
34145	58	0.3	Collier	.8	Sprinkler	Turf	City	50	3,7,10,23,24,30,32,34,40,52,54,55	0.3	0.0	0.1	T
34145 34145	59 60	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	75 50	3,10,21,32 3,7,10,20,21,22,24,30,32,34,35,40,50,54,55	0.0	0.4	0.0	\vdash
34145	61	0.5	Collier	.8	Sprinkler	Turf	City	50	7,,10,20,21,22,24,30,32,34,35,40,50,54,55	0.0	0.0	0.0	\perp
34145 34145	62 63	0.5 5.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City Reclaimed	55 65	3,7,10,20,21,22,23,26,32,40,52,54,55 10,20,24,32,40,52,54,55	0.2 4.6	0.0	0.1	
34145	64	0.5	Collier	.8	Sprinkler	Turf	Reclaimed	60	3,7,10,20,21,24,26,30,31,32,34,40,50,54,55	1.0	0.0	0.0	F
34120 34145	65 66	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Reclaimed	60 70	3,10,20,21,2334,40,50,51,53,54,55 4 10 20 21 32 50 52	0.4	0.0	0.0	\vdash
34145 34145	66 67	0.3	Collier	.8	Sprinkler Sprinkler	Turf Turf	City City	70 70	4,10,20,21,32,50,52 3,7,10,20,21,23,32,34,50,54,55	0.0	0.2	0.0	\perp
34104	68	0.3	Collier	.8	Sprinkler	Turf	City	75 65	3,40,50,53,54	0.0	0.3	0.0	\vdash
34145 34104	69 70	1.0 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Reclaimed City	65 60	3,7,10,20,21,40,50,52,54,55 7,10,20,21,22,23,24,30,32,34,51,52,54,55	2.9 0.3	0.0	0.0	
34145	71	0.4	Collier	.8	Sprinkler	Turf	City	60	10,20,21,23,32,40,52,53,54,55,	0.4	0.0	0.3	\vdash
34114 34145	72 73	0.2	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	Lake City	70 50	10,32,52,54,55 3,7,10,20,21,23,30,32,34,35,40,50,51,53,54,55	0.1	0.0	0.0	+
34110	74	0.3	Collier	.8	Sprinkler	Turf	Well	60	3,8,10,20,21,24,30,31,32,34,50,52,53,54,55	0.8	0.0	0.3	\vdash
34108 34104	75 76	0.8	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Reclaimed Well	65 70	7,10,20,21,30,34,40,50,52,53,54,55 10,20,21,31,40,53,54,55	2.9 0.5	0.0	0.0	+
34145	77	0.3	Collier	.8	Sprinkler	Turf	City	50	3,8,10,21,22,23,24,32,34,40,54,55	0.1	0.0	0.0	L
34104 34104	78 79	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City Well	50 60	3,7,10,20,21,22,23,24,25,40,51,53,54,55 10,20,21,40,50,51,52,53,54,55	0.0	0.0	0.0	\vdash
4104	80	0.3	Collier	.8	Sprinkler	Turf	City	50	4,7,10,20,21,22,23,24,25,30,32,34,40,51,52,53,54,55	0.2	0.0	0.0	L
34103 34110	81 82	0.3 5.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Well Well	70 70	10,20,21,40,52,54,55 4.10,21,32,34,40,52,53,54,55	0.2 3.2	0.0	0.1	\vdash
34110	83	0.3	Collier	.8	Sprinkler	Turf	City	50	4,10,21,32,34,40,52,53,54,55 3,10,20,21,24,26,30,32,34,40,51,52,53,54,55,	0.3	0.0	0.0	L
34102	84 85	1.0	Collier Collier	.8	Sprinkler	Turf Turf	Reclaimed	60 65	3,10,20,21,23,32,34,42,50,52,54,55	4.1 0.3	0.0	2.4 0.0	F
34145 34103	85 86	0.3	Collier	.8	Sprinkler Sprinkler	Turf	City City	55	3,10,20,23,24,32,40,54,55 3,7,10,21,23,24,30,32,40,50,52,53,54,55	0.3	0.0	0.0	L
34104	87	0.3	Collier	.8	Sprinkler	Turf	City	55 65	3,7,10,20,21,22,23,30,32,40,53,54,55	0.1	0.0	0.0	\vdash
34103 34145	88 89	10.0 0.5	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Reclaimed City	65 50	3,10,20,21,32,40,50,52,53,54,55 3,7,8,10,20,21,22,23,24,25,30,32,34,40,50,52,54,55	12.3 1.9	0.0	0.0 1.1	\dagger
34145	90	0.3	Collier	.8 g	Sprinkler	Turf	City	50 60	3,7,8,10,20,21,24,25,30,32,34,40,50,53,54,55	0.2	0.0	0.1	F
34112 34120	91 92	1.3	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	City Well	60 60	4,5,7,10,21,24,40,50,52,54,55 4,10,20,21,24,32,34,40,51,52,54,55	1.0	0.0	0.0	
34142	93	0.2	Collier	.8	Sprinkler	Turf	Reclaimed	65	10,24,31,33,40,54,55	0.0	0.0	0.0	\vdash
34142 34108	94 95	0.2	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	Reclaimed County	65 65	10,21,31,40,50,54,55 4,7,10,20,24,32,40,54,55	0.1	0.0	0.0	\vdash
84113	96	0.3	Collier	.8	Sprinkler	Turf	County	60	3,10,21,22,24,26,32,35,40,50,54,55	0.3	0.0	0.3	T
34145 34102	97 98	2.0 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	60 65	3,7,10,20,21,24,40,50,52,54,55 10,21,24,32,40,52,54,55	3.5 0.3	0.0	3.2 0.0	\vdash
34102	99	2.0	Collier	.8	Sprinkler	Turf	Reclaimed	50	1,7,8,10,20,30,32,34,40,50,52,53,55	2.3	0.0	1.8	L
34112 34102	100	0.3	Collier	.8	Sprinkler Sprinkler	Turf	Well	65 55	3,10,20,23,31,32,50,52,54,55 7,10,20,21,23,25,30,32,32,40,52,53,54,55	0.5	0.0	0.0	\vdash
34102 34112	101 102	0.5 1.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	55 70	7,10,20,21,23,25,30,32,32,40,52,53,54,55 3,20,21,51,52,54,55	0.9	0.0	0.0	\dagger
34120	103	0.3	Collier	.8	Sprinkler	Turf	Lake	60	3,7,10,20,21,23,24,32,40,54,55	0.2	0.0	0.2	\vdash
34119 34102	104 105	0.3 3.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake Reclaimed	55 65	7,8,10,20,21,22,23,24,31,32,40,54,55 10,20,21,32,34,40,50,52,54,55	0.1 2.3	0.0	0.0	\vdash
34112	106	20.0	Collier	.8	Sprinkler	Turf	Well	60	7,8,10,20,21,23,32,40,52,54,55	15.4	0.0	0.0	
34110 34102	107 108	5.0 0.5	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Well Reclaimed	70 75	4,5,7,10,20,40,54,55 10,30,40,54	0.0	0.0 1.7	0.0	\vdash
34102 34145	108	0.5	Collier	.8	Sprinkler	Turf	City	70	3,10,32,54	0.0	0.5	0.0	

Distrubution uniformity
 Potential Water Savings
 Follow up actual water savings
 Instant actual water savings

Attachment #2 Original Evaluation and Follow up Tracking Table

MIL ID: BCB 2017 1st Quarter

IVIIL ID.	500		13t Quarter	I = - · -			
Yr	Qtr ID#	ID No#	Crop	EQIP	Acres	PWS ac-ft	AWS ac-ft
2015	3	60	Turf	Sprinkler	0.3	0.26	0
2017	1	12	Turf	Sprinkler	0.3	0	0.4
2017	1	8	Turf	Sprinkler	0.5	0	0
2017	1	15	Turf	Sprinkler	0.5	0	0
2016	2	40	Turf	Sprinkler	0.3	0.3	0
2017	1	17	Turf	Sprinkler	0.3	0	0.4
2016	1	9	Turf	Sprinkler	0.25	1.46	0
2017	1	23	Turf	Sprinkler	0.25	0	1.4
2016	4	93	Turf	Sprinkler	2	9.3	0
2017	1	24	Turf	Sprinkler	2	0	6.6
2015	2	45	Turf	Sprinkler	0.25	0.4	0
2017	3	59	Turf	Sprinkler	0.25	0	0.4
2015	2	46	Turf	Sprinkler	0.25	0.2	0
2017	3	66	Turf	Sprinkler	0.25	0	0.18
2017	2	38	Turf	Sprinkler	0.3	0.38	0
2017	3	67	Turf	Sprinkler	0.3	0	0.34
2012	1	26	Turf	Sprinkler	0.5	1.8	0
2017	4	108	Turf	Sprinkler	0.5	0	1.7

MOBILE IRRIGATION LAB CONSERVATION EDUCATION REPORT ATTACHMENT 3 BIG CYPRESS BASIN URBAN MOBILE IRRIGATION LAB **4TH QUARTER 2017**

		<i>I</i>			
DATE	Type of Presentation	Name of Group	NUMBER ATTENDING	Location	TIME
10/12/2016	Best Management Practices Irrigation Module	Collier County Contractors	35	Rookery Bay National Estuarine Research Reserve	2
10/23- 24/2016	Mobile Irrigation Lab Booth	Collier County Residents	1500	IFAS Extension Center	20
2/15/2017	Shrink Your Water Bill	Beautification Advisory Committee	40	Marco Island Forum	2
3/14/2017	Best Management Practices Irrigation Module	Collier County Contractors	50	Rookery Bay National Estuarine Research Reserve	
5/11/2017	Irrigation Training Power Point Presentation	Master Gardeners of Collier County	12	IFAS Extension Center	2
6/6/2017	Best Management Practices Irrigation Module	Collier County Contractors	37	Rookery Bay National Estuarine Research Reserve	2
8/16- 17/2017	Mobile Irrigation Lab Citrus Exposition Booth	Florida Citrus and Land owners	600	Lee County Civic Center	20

20- hours 4th Quarter

NOTES: EXPOSITIONS ARE GREAT OPPORTUNITIES FOR THE MILS TO GET FAMILIARIZED WITH NEW PRODUCTS AND NEW INNOVATIONS IN THE IRRIGATION INDUSTRY AND ALSO OUTREACH FOR PARTNERSHIPS AND FUNDING.

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 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 Irrigation Guide. 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 x years 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.

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

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

Where Flow rate = Gallons per minute (GPM)
Volume = Volume collected (ml)

Time = Time that water was collected (s)

2. Determine distribution uniformity

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

Effective application rate = Average application rate x DU

4. Calculate operating time

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:

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)

If water meter records units of gallons, use the following equation:

Where *Flow rate* = Flow through a particular zone (gpm)

Time = Time required for the needle on the meter to make one complete revolution(s)

If no water meter is present, determine the flow rate from each sprinkler within one zone and add them all together.

Where Flow rate = Gallons per minute (gpm)
Volume = Volume collected (ml)

Time = Time that water was collected

Appendix B Problem Descriptions

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
Oodo	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 long Operating time too short
52	Operating time too short Operating time too short
53	No rain shut-off device
54	No soil moisture measuring device or rain gage
55	No irrigation water management plan
	110 intigation water management plan

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