APPENDIX U

DEVELOPMENT OF LEC ET RECHARGE

RES 17-06

M E M O R A N D U M

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DATE: June 7, 2002

SUBJECT: ET-Recharge calculations for the LEC for the 2000 Base simulation as part of the SFWMM2000 effort

This memo presents details of the programs and input files used to generate Grid I/O binary files of pre-processed Et-Recharge data for the LEC, which are required for the 2000 Base as part of the SFWMM2000 effort. In addition, the sensitivity of Et-Recharge calculations to land use minimum mapping unit is analyzed based on 2000 land use to determine a reasonable minimum mapping unit for creating the 2050 Base land use coverage.

Results obtained for the 2000 Base are compared with results previously obtained for SFWMM2000 verification based on 1995 land use. For information on Et-Recharge calculations for the SFWMM2000 calibration/verification refer to Michelle Irizarry's memo to Ken Tarboton (December 3, 2001).

Objectives:

1) Generate Grid I/O binary files of pre-processed Et-Recharge data required for the 2000 Base based on 2000 land use with a 5-acre minimum mapping unit, new rainfall, and new Reference ET.
2) Compare results in (1) above with values used in SFWMM2000 verification, which are based on 1995 land use, new rainfall, and new Reference ET.
3) Determine a reasonable minimum mapping unit for creating the 2050 land use coverage by determining the sensitivity of results to different minimum mapping units (polygons $\geq$5 acres, $\geq$15 acres, $\geq$20 acres) based on 2000 land use.

Procedure:

1) Version 2.3b of the main ET-Recharge program (et-sfwmm.v2.3b.f) was located on:

   /net/noles/usr1/SFWMM2000/Et-recharge/AFSIRS/NewRuns/v2.3b/polygons95/
   et-sfwmm.v2.3b.f

   and was run with the following inputs:

   a) 2000 land use polygons for the LEC with a 5-acre minimum mapping unit (See memo from Jenifer Barnes to Ken Tarboton, in preparation).
   b) New reference table which includes additional land use codes present in the 2000 land use coverage for the LEC (/net/noles/usr1/SFWMM2000/Etrecharge/AFSIRS/NewRuns/v2.3b/polygons00/all/et-newcodes.txt). Refer to Appendix 1 for a list of new land use codes and their description.
   c) New 1965-2000 daily rainfall ASCII files (/net/noles/usr1/SFWMM2000/Et-recharge/NEW_RAIN/dlyrf.$yyyy) obtained from the new rainfall binary file created for SFWMM2000 (/net/peashooter/usr2/RAIN/JUN2001_UPDATE/TIN10/rain14_2000_TIN10_v1.3_nsm.bin).
   d) New 1965-2000 daily RefET ASCII files (/net/noles/usr1/SFWMM2000/Et-recharge/NEW_RefET/$station.$yy)

2) Scripts were run to generate the Grid I/O binary files to be used in the 2000 Base (2000 land use). The binary files daily_et_input.bin and daily_nirrdmd.bin are located in:

   /net/noles/usr1/SFWMM2000/Et-recharge/AFSIRS/NewRuns/v2.3b/polygons00/all/1965-2000/

   In addition, the scripts generated statistical summaries for the different contributions to ET and irrigation demands for each of the 6 irrigated land use types (files etiu6500.dat, etu6500.dat, pet6500.dat, alv6500.dat, aoh6500.dat, aot6500.dat, glf6500.dat, lan6500.dat, and nur6500.dat in the directory shown above).

3) Steps 1) and 2) above were repeated using 2000 land use with 20-acre and 50-acre minimum mapping units.

Results:

1) Comparison of results for the 2000 Base (based on 2000 land use) and results for the SFWMM2000 verification (based on 1995 land use):

- As shown in Table 1 there was an 8,444 acre decrease in irrigated agricultural lands (ALV, AOH, and AOT) in the LEC from 1995 to 2000, which is equivalent to 3.4 2x2

mile fewer grid cells being irrigated. This is consistent with observed and expected trends in agriculture for the LEC. The relatively small decrease in agricultural-low volume and agricultural-other irrigated acreages was not enough to cause a noticeable decrease in irrigation demands (Table 2). However, the relatively large decrease in agricultural-overhead irrigated acreages produced a slight decrease in irrigation demands (by 7.1%: from 57.5 kac-ft/yr to 53.4 kac-ft/yr).

- Table 1 shows a 19,070 acre increase in irrigated urban lands in the LEC from 1995 to 2000, which is equivalent to 7.4 2x2mile additional grid cells subject to landscape irrigation (LAN). This is consistent with observed and expected trends of urban development in the LEC. This relatively large increase in landscape irrigation resulted in a 9.0% increase in irrigation demands (from 320.1 kac-ft/yr to 348.8 kac-ft/yr), which coupled with the smaller decrease in agricultural irrigation demands resulted in a 5.0% overall increase in the average daily irrigation demands for the LEC. This is consistent with a 5.1% increase in the average unsaturated ET from the irrigated areas.

- The different components of ET changed as follows (See Table 2):

  - The average unsaturated ET from the irrigated areas of the LEC increased by 5.1% from 1995 to 2000.
  - The average unsaturated ET from the non-irrigated areas of the LEC decreased by 13.5% from 1995 to 2000.
  - The average unsaturated ET for the LEC decreased by 1.7% from 1995 to 2000.
  - The average saturated ET for the LEC decreased by 2.6% from 1995 to 2000.
  - The average ET for the LEC decreased by 2.0% from 1995 to 2000.

Table 1. Comparison of 1995 and 2000 land use acreages by irrigated land use type.

Use type	1995 land use		2000 land use		Difference		% change = 100*(2000LU-1995LU)/1995LU
	acreage (acres)	% LEC area	acreage (acres)	% LEC area	acreage (acres)	% LEC area	
ALV	28,815	2.1	27,532	2.0	-1,283	-0.10	-4.5
AOH	66,518	4.9	59,508	4.4	-7,010	-0.52	-10.5
AOT	26,055	1.9	25,904	1.9	-151	-0.01	-0.6
GLF	27,810	2.1	29,247	2.2	1,437	0.11	5.2
LAN	184,277	13.7	203,347	15.1	19,070	1.41	10.3
NUR	11,832	0.9	11,525	0.9	-307	-0.02	-2.6
Total	**345,307**	**25.6**	**357,063**	**26.5**	**11,756**	**0.87**	**3.4**

ALV = agricultural-low volume irrigation, AOH = agricultural-overhead irrigation, AOT = agricultural-other irrigation, GLF = golf course irrigation, LAN = landscape irrigation, NUR = nursery irrigation
Note: Acreages shown are for pervious portion of irrigated polygons.

Table 2. Comparison of the average (entire LEC grid=527 cells, 1965-2000) contributions to ET and irrigation demands based on 1995 and 2000 land use polygons, and % difference. New rainfall and new RefET were used in both cases.

Variable	1995 land use (in/day)	2000 land use (in/day)	% difference= 100*(2000LU-1995LU)/1995LU
ET	0.0840	0.0823	-2.0
ETS	0.0313	0.0305	-2.6
ETU	0.0527	0.0518	-1.7
ETNU	0.0192	0.0166	-13.5
ETIU	0.0335	0.0352	5.1
ALV	0.0006	0.0006	0.0
AOH	0.0014	0.0013	-7.1
AOT	0.0004	0.0004	0.0
GLF	0.0013	0.0013	0.0
LAN	0.0078	0.0085	9.0
NUR	0.0006	0.0006	0.0

ET = evapotranspiration, ETS= saturated ET, ETU = unsaturated ET, ETNU = unsaturated ET from the non-irrigated areas, ETIU = unsaturated ET from the irrigated areas, ALV = agricultural-low volume irrigation demands, AOH = agricultural-overhead irrigation demands, AOT = agricultural-other irrigation demands, GLF = golf course irrigation demands, LAN = landscape irrigation demands, NUR = nursery irrigation demands

2) Comparison of the contributions to ET and irrigation demands based on 2000 land use with 20-acre and 50-acre mapping units with respect to 2000 land use with a 5-acre mapping unit:

- The land use coverages with 20-acre and 50-acre minimum mapping units were created by eliminating polygons smaller than the minimum mapping unit and assigning to those areas the land use of surrounding polygons.

- Tables 3 and 4 show comparisons of the irrigated acreages for 2000 land use with 20- and 50-acre mapping units with respect to those for the 5-acre mapping unit. Differences between estimated irrigated acreages with 20- and 50-acre mapping units and the 5-acre mapping unit are expressed as a %error in the estimate, assuming the 5-acre mapping unit produces an accurate estimate.

    - As the mapping unit increases, the estimated acreage of irrigated golf courses increases by up to a 39.9% error when polygons are aggregated to 50 acres. Typical golf courses tend to have a sinuous configuration and surround urban developments. As the mapping unit increases, golf courses tend be the dominant land use type in polygons with mixed land uses. As a result, the acreage of irrigated golf courses is overestimated resulting in a 23.1% (from 53.3 kac-ft/yr to 65.7 kac-ft/yr) and 46.2%

(from 53.3 kac-ft/yr to 78.0 kac-ft/yr) overestimation of golf course irrigation demands when using 20-acre and 50-acre mapping units, respectively (See Table 5).

- As the mapping unit increases, the acreage of landscape irrigation increases by about 2% (2.1% for 20-acre aggregation and 1.9% for 50-acre aggregation). This is because urban developments tend to be the dominant land use type (after golf courses) in polygons with mixed land uses when aggregating into larger mapping units. For example, many small lakes inside urban communities disappear when aggregating into larger polygons. The net result is an increase in irrigated landscape by 2.4% (from 348.8 kac-ft/yr to 357.0 kac-ft/yr) (See Table 5).
- The acreage of irrigated nurseries is underestimated by 7.0% and 23.0% when using 20-acre and 50-acre mapping units, respectively. This is due to the fact that nurseries tend to be relatively small and therefore tend to disappear when aggregating into larger polygons. When the mapping unit is increased to 50 acres, nursery demands are underestimated by 16.7% (from 24.6 kac-ft/yr to 20.5 kac-ft/yr).
- The acreage of agricultural-overhead irrigation is overestimated by 4.5% and 6.9% when using 20-acre and 50-acre mapping units, respectively. When the mapping unit is increased to 50 acres, agricultural-overhead irrigation demands are overestimated by 7.7% (from 53.3 kac-ft/yr to 57.5 kac-ft/yr).
- The acreage of agricultural-low volume irrigation is underestimated by 0.7% and 1.2% when using 20-acre and 50-acre mapping units, respectively. These small changes did not result in noticeable changes in agricultural-low volume irrigation demands, which remained at 24.6 kac-ft/yr.
- Small changes in the acreage of agricultural-other irrigation for the different mapping units did not result in changes in demands, which remained at 16.4 kac-ft/yr.

- The different components of ET changed as follows as a result of changes in land use mapping unit (See Table 5):

  - 3.4% and 4.8% overall increases in the average unsaturated ET from the irrigated areas of the LEC when using 20-acre and 50-acre mapping units, respectively. This is due to overall increases in irrigated acreage when aggregating into larger polygons.
  - 7.8% and 4.8% overall increases in the average unsaturated ET from the non-irrigated areas of the LEC due to 9.8% and 6.7% increases in unsaturated non-irrigated acreage when using 20-acre and 50-acre mapping units (See Tables 3 and 4), respectively.
  - 4.8% overall increases in the average unsaturated ET for the LEC when using 20-acre and 50-acre mapping units.
  - 17.4% and 22.3% overall decreases in the average saturated ET for the LEC due to 12.9% and 15.1% decreases in saturated acreage when using 20-acre and 50-acre mapping units, respectively. This reduction in saturated acreage is partly due to the disappearance of many small lakes inside urban communities when aggregating into larger polygons.
  - 3.4% and 5.2% overall decreases in the average ET for the LEC when using 20-acre and 50-acre mapping units, respectively.

- Table 6 shows the coefficients and goodness of fit for a linear regression between monthly average values based on 2000 land use with a 5-acre mapping unit, and 2000

land use with 20- and 50-acre mapping units. It is evident that the 2000 land use with a 20-acre mapping unit approximates values from the 2000 land use with a 5-acre mapping unit reasonably well with R^2 's between 0.93 and 1.00. The 2000 land use with a 50-acre mapping unit does worst in approximating values from the 2000 land use with a 5-acre mapping unit, but the R^2's remain high (0.83-0.99). However, the relatively large 46.2% overestimation and lower R^2 (0.84) for golf course irrigation demands when using a 50-acre mapping unit remain a concern. Also, due to the overestimation of urban lands when using a 50-acre mapping unit, there are more impervious areas in the LEC resulting in a 5.2% overall decrease in total ET and a lower R^2 of 0.83.

Table 3. Comparison of acreage by land use type for 2000 land use with 5- and 20-acre mapping units.

Use type	2000 land use		2000 land use polygons > 20 acres		Difference		% error = 100*(2000LUGT20ac -2000LU)/2000LU
	acreage (acres)	% LEC area	acreage (acres)	% LEC area	acreage (acres)	% LEC area	
ALV	27,532	2.0	27,331	2.0	-201	-0.01	-0.7
AOH	59,508	4.4	62,182	4.6	2,674	0.20	4.5
AOT	25,904	1.9	25,936	1.9	32	0.00	0.1
GLF	29,247	2.2	34,782	2.6	5,535	0.41	18.9
LAN	203,347	15.1	207,578	15.4	4,231	0.31	2.1
NUR	11,525	0.9	10,723	0.8	-802	-0.06	-7.0
Total	**357,063**	**26.5**	**368,532**	**27.3**	**11,469**	**0.85**	**3.2**
UNSAT-NONIRR	233,326	17.3	256,131	19.0	22,805	1.69	9.8
SAT	370,522	27.5	322,771	23.9	47,751	-3.54	-12.9

ALV = agricultural-low volume irrigation, AOH = agricultural-overhead irrigation, AOT = agricultural-other irrigation, GLF = golf course irrigation, LAN = landscape irrigation, NUR = nursery irrigation, UNSAT-NONIRR = unsaturated non-irrigated, SAT = saturated.
Note: Acreages shown are for pervious portion of unsaturated (irrigated and non-irrigated) polygons. Acreages shown for SAT represent the *total* area of saturated polygons.

Table 4. Comparison of acreage by land use type for 2000 land use with 5- and 50-acre mapping units.

Use type	2000 land use		2000 land use polygons > 50 acres		Difference		% error = 100*(2000LUGT50 ac-2000LU)/2000LU
	acreage (acres)	% LEC area	acreage (acres)	% LEC area	acreage (acres)	% LEC area	
ALV	27,532	2.0	27,206	2.0	-326	-0.02	-1.2
AOH	59,508	4.4	63,641	4.7	4,133	0.31	6.9
AOT	25,904	1.9	25,467	1.9	-437	-0.03	-1.7
GLF	29,247	2.2	40,903	3.0	11,656	0.86	39.9
LAN	203,347	15.1	207,184	15.4	3,837	0.28	1.9
NUR	11,525	0.9	9,185	0.7	-2,340	-0.17	-20.3
Total	**357,063**	**26.5**	**373,586**	**27.7**	**16,523**	**1.22**	**4.6**
UNSAT-NONIRR	233,326	17.3	248,901	18.4	15,575	1.15	6.7
SAT	370,522	27.5	314,688	23.3	-55,834	-4.14	-15.1

ALV = agricultural-low volume irrigation, AOH = agricultural-overhead irrigation, AOT = agricultural-other irrigation, GLF = golf course irrigation, LAN = landscape irrigation, NUR = nursery irrigation, UNSAT-NONIRR = unsaturated non-irrigated, SAT = saturated.
Note: Acreages shown are for pervious portion of unsaturated (irrigated and non-irrigated) polygons. Acreages shown for SAT represent the *total* area of saturated polygons.

Table 5. Comparison of the average (entire LEC grid=527 cells, 1965-2000) contributions to ET and irrigation demands based on 2000 land use with different minimum mapping unit sizes, and % difference. New rainfall and new RefET were used in all cases.

Variable	2000 land use (in/day)	2000 land use polygons > 20 acres (in/day)	% change = 100*(2000LUGT20ac-2000LU)/2000LU	200 land use polygons > 50 acres (in/day)	% error = 100*(2000LUGT50ac-2000LU)/2000LU
ET	0.0823	0.0795	-3.4	0.0780	-5.2
ETS	0.0305	0.0252	-17.4	0.0237	-22.3
ETU	0.0518	0.0543	4.8	0.0543	4.8
ETNU	0.0166	0.0179	7.8	0.0174	4.8
ETIU	0.0352	0.0364	3.4	0.0369	4.8
ALV	0.0006	0.0006	0.0	0.0006	0.0
AOH	0.0013	0.0013	0.0	0.0014	7.7
AOT	0.0004	0.0004	0.0	0.0004	0.0
GLF	0.0013	0.0016	23.1	0.0019	46.2
LAN	0.0085	0.0087	2.4	0.0087	2.4
NUR	0.0006	0.0006	0.0	0.0005	-16.7

ET = evapotranspiration, ETS= saturated ET, ETU = unsaturated ET, ETNU = unsaturated ET from the non-irrigated areas, ETIU = unsaturated ET from the irrigated areas, ALV = agricultural-low volume irrigation demands, AOH = agricultural-overhead irrigation demands, AOT = agricultural-other irrigation demands, GLF = golf course irrigation demands, LAN = landscape irrigation demands, NUR = nursery irrigation demands

Table 6. Coefficients and goodness of fit for a linear regression between monthly average values based on 2000 land use with a 5-acre mapping unit, and 2000 land use with 20- and 50-acre mapping units: $Var_{20ac}=B1*Var_{all\ polygons}+B0$; and $Var_{50ac}=B1*Var_{all\ polygons}+B0$. New rainfall and new RefET were used in all cases.

Variable	2000 land use polygons > 20 acres			2000 land use polygons > 50 acres		
	B1	B0	R^2	B1	B0	R^2
ET	0.96	5.00E-04	0.93	0.91	2.82E-03	0.83
ETU	1.01	1.92E-03	0.94	1.03	7.59E-04	0.96
ETIU	1.04	-5.90E-05	0.99	1.04	3.51E-04	0.97
ALV	1.01	-9.00E-06	1.00	1.02	-1.80E-05	0.99
AOH	1.04	8.00E-06	1.00	1.08	-7.00E-06	0.99
AOT	1.02	-1.10E-05	1.00	1.03	-3.80E-05	0.99
GLF	1.21	-3.40E-05	0.94	1.47	-9.00E-05	0.84
LAN	1.02	-1.00E-06	1.00	1.01	1.06E-04	0.97
NUR	1.00	-4.20E-05	0.99	0.97	-1.01E-04	0.92

ET = evapotranspiration, ETS= saturated ET, ETU = unsaturated ET, ETNU = unsaturated ET from the non-irrigated areas, ETIU = unsaturated ET from the irrigated areas, ALV = agricultural-low volume irrigation demands, AOH = agricultural-overhead irrigation demands, AOT = agricultural-other irrigation demands, GLF = golf course irrigation demands, LAN = landscape irrigation demands, NUR = nursery irrigation demands

MI/mi

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APPENDICES

Appendix 1. New land use codes, description and assumptions.

LAND USE CODE	LAND USE CODE DESCRIPTION	CROP	CROP DESCRIPTION	PERVIOUS FRACTION	USE TYPE	USE TYPE DESCRIPTION[1]	SAME AS LAND USE CODE/COMMENTS
100	urban & built-top	10	PASTURE	0.2	0	NONE	155 = other light industrial
120	residential med density	16	TURF,LNDSCP	0.53	2	LAN	121,123 = residential medium density, fixed single family units and mixed units
130	residential high density	16	TURF,LNDSCP	0.37	2	LAN	average of 131 (high density fixed single family), 133 and 134 (multiple units)
140	commercial and services	16	TURF,LNDSCP	0.2	2	LAN	same as most 14#'s
150	industrial	10	PASTURE	0.15	0	NONE	same as 15#'s, %PERV changes among 15#'s
160	extractive	91	water sat	N/A	0	NONE	
170	institutional	16	TURF,LNDSCP	0.6	2	LAN	same as most 17#'s
180	recreational	16	TURF,LNDSCP	0.85	2	LAN	slightly less than most 18#, excluding golf courses
190	open land	10	PASTURE	0.9	0	NONE	same as 19#'s
330	mixed rangeland	10	PASTURE	0.8	0	NONE	same as 3##'s
500	water	91	water sat	N/A	0	NONE	OK
530	reservoirs	91	water sat	N/A	0	NONE	OK, same as 53#'s
640	vegetated non-forested wetlands	92	wetland sat	N/A	0	NONE	same as 64#'s
711	*Mud, non-vegetated permeable*	92	wetland sat	N/A	0	NONE	
810	transportation	10	PASTURE	0.5	0	NONE	airports, railroads, terminals, highways/roads, ports, oil, under construction, etc?
830	utilities	10	PASTURE	0.7	0	NONE	electrical power facilities, power transmission lines, water supply plants, sewage treatment?
912	*Periphyton, wet prairie*; 910 = vegetation (special classification)	92	wetland sat	N/A	0	NONE	
913	*Polygonum/brush mixture, shrubland*; 910 = vegetation (special classification)	10	PASTURE	0.8	0	NONE	same as 320#'s
1843	*Abandoned fish camps*	10	PASTURE	0.2	0	NONE	same as 184
3291	*Bay-hardwood shrub, shrubland;* 329 = rangeland, other shrubs and brush	10	PASTURE	0.8	0	NONE	same as 329
3292	*Hardwood shrub, shrubland;* 329 = rangeland, other shrubs and brush	10	PASTURE	0.8	0	NONE	same as 329

4191	*Savanna, forested uplands;* 419 = upland pines (coniferous)	3	FOREST	0.8	0	NONE	same as 419
4192	*Pine savanna, forested uplands;* 419 = upland pines (coniferous)	3	FOREST	0.8	0	NONE	same as 419
4193	*Slash pine with palms, forested uplands;* 419 = upland pines (coniferous)	3	FOREST	0.8	0	NONE	same as 419
4194	*Slash pine with hardwoods, forested uplands;* 419 = upland pines (coniferous)	3	FOREST	0.8	0	NONE	same as 419
4195	*Slash pine with cypress, forested uplands;* 419 = upland pines (coniferous)	3	FOREST	0.8	0	NONE	same as 419
4261	*subtropical hardwood forest, forested uplands;* 426 = upland tropical hardwoods	3	FOREST	0.8	0	NONE	same as 426
4271	*Oak-sabal forest, forested uplands;* 427 = upland oak forest (hardwood)	3	FOREST	0.8	0	NONE	same as 427
4288	*Palm savanna, forested uplands;* 428 = upland cabbage palm (hardwood)	3	FOREST	0.8	0	NONE	same as 428
6111	*Bayhead, forested wetlands;* 611 = bay swamps	92	wetland sat	N/A	0	NONE	same as 611
6121	*Black mangrove, mangroves;* 612 = mangrove swamps	92	wetland sat	N/A	0	NONE	same as 612
6122	*White mangrove, mangroves;* 612 = mangrove swamps	92	wetland sat	N/A	0	NONE	same as 612
6124	*Red mangrove, mangroves;* 612 = mangrove swamps	92	wetland sat	N/A	0	NONE	same as 612
6125	*Buttonwood forest, forested wetlands*	92	wetland sat	N/A	0	NONE	
6173	*Misc. wetland hardwoods, forested wetlands;* 617 = mixed wetland hardwoods	92	wetland sat	N/A	0	NONE	same as 617
6173a	*Pond apple, forested wetlands;* 617 = mixed wetland hardwoods	92	wetland sat	N/A	0	NONE	same as 617
6173f	*Wax myrtle, shrubland*	92	wetland sat	N/A	0	NONE	same as 617
6174	*Tree Islands, forested wetlands;* 617 = mixed wetland hardwoods	92	wetland sat	N/A	0	NONE	same as 617
6174a	*Small tree Islands, forested wetlands;* 617 = mixed wetland hardwoods	92	wetland sat	N/A	0	NONE	same as 617
6174b	*Brush/tree Islands, forested wetlands;* 617 = mixed wetland hardwoods	92	wetland sat	N/A	0	NONE	same as 617
6211	*Dwarf cypress, forested wetlands;* 621 = cypress wetlands	92	wetland sat	N/A	0	NONE	same as 621
6212	*Cypress with pine, forested wetlands;* 621 = cypress wetlands	92	wetland sat	N/A	0	NONE	same as 621
6215	*Cypress domes/heads, forested wetlands;* 621 = cypress wetlands	92	wetland sat	N/A	0	NONE	same as 621

6216	*Cypress-mixed hardwoods, forested wetlands;* 621 = cypress wetlands	92	wetland sat	N/A	0	NONE	same as 621
6217	*Cypress-pine, forested wetlands;* 621 = cypress wetlands	92	wetland sat	N/A	0	NONE	same as 621
6411a	*Sawgrass-tall, tall sawgrass;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6411b	*Sawgrass-dense, sawgrass;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6411c	*Sawgrass-moderate density, sawgrass;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6411d	*Sawgrass-sparse, sawgrass;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6411e	*Sawgrass-cattail mix-dense, sawgrass/cattail mix;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6411f	*Sawgrass-cattail mix-sparse, sawgrass/cattail mix;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6411g	*Sawgrass-cattail-brush mix, sawgrass/cattail mix;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6411h	*Sawgrass-cattail-broadleaf mix, sawgrass/cattail mix;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6411i	*Sawgrass-brush mix, sawgrass/cattail mix;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6412a	*Cattail-dense, cattail;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6413	*spike rush freshwater marsh*	92	wetland sat	N/A	0	NONE	same as 641
6414	*maidencane freshwater marsh*	92	wetland sat	N/A	0	NONE	same as 641
6415	*dog fennel and low marsh grass freshwater marsh*	92	wetland sat	N/A	0	NONE	same as 641
6418	*Muhly grass, wet prairie;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6419	*Maidencane/spike rush, wet prairie;* 641 = freshwater marsh	92	wetland sat	N/A	0	NONE	same as 641
6421	*Cordgrass, wet prairie;* 642 = saltwater marshes	92	wetland sat	N/A	0	NONE	same as 642
6423	*Black rush, wet prairie;* 642 = saltwater marshes	92	wetland sat	N/A	0	NONE	same as 642
6424	*Common reed, wet prairie;* 642 = saltwater marshes	92	wetland sat	N/A	0	NONE	same as 642
6425	*Graminoid, wet prairie;* 642 = saltwater marshes	92	wetland sat	N/A	0	NONE	same as 642
6426	*Succulent, wet prairie;* 642 = saltwater marshes	92	wetland sat	N/A	0	NONE	same as 642
6431	*Wet prairie-sparse, wet prairie;* 643 = wet prairies	92	wetland sat	N/A	0	NONE	same as 643
6446	*Floating/Attached emergents, wet prairie;* 644 = emergent aquatic vegetation	92	wetland sat	N/A	0	NONE	same as 644

6447	*Broadleaf emergents, wet prairie;* 644 = emergent aquatic vegetation	92	wetland sat	N/A	0	NONE	same as 644
6448	*Leather fern, wet prairie;* 644 = emergent aquatic vegetation	92	wetland sat	N/A	0	NONE	same as 644
9122	*java plum,* 910 = vegetation (special classification)	92	wetland sat	N/A	0	NONE	
9123	*soda apple,* 910 = vegetation (special classification)	92	wetland sat	N/A	0	NONE	
9124	*tree,* 910 = vegetation (special classification)	92	wetland sat	N/A	0	NONE	

[1]NONE = Not irrigated, ALV = agricultural-low volume irrigation, AOH = agricultural-overhead irrigation, AOT = agricultural-other irrigation, GLF = golf course irrigation, LAN = landscape irrigation, NUR = nursery irrigation