

Appendix D. Details of land cover and loading assumptions

The purpose of this appendix is to provide some of the detailed loading assumptions underlying modeling used for the ICM Project. The workplan called for the use of existing WARMF model inputs and results for the project. Thus, full documentation of the existing models is cited in the report. A re-do of the modeling or its documentation is not called for in the scope of work or workplan. Nevertheless, it is hoped that the elements presented here are helpful to readers in understanding what the WARMF inputs and results consisted of, and how they were used to provide loading quantities that served as inputs to surface and subsurface salt and nitrate balances for the IAZs. To the extent that further information is needed, readers are directed first to appropriate sections of the ICM report, and then to references describing the WARMF modeling work that was performed and documented as part of other projects.

Inherent limitations of land cover classes

It should be noted that, due to unavoidable, even very careful approximations in the development of gross-scale surface and groundwater quality trends, some uncertainties must be acknowledged when employing results for regulatory purposes. Some of these limitations include the following:

- Only generic crop classes have been considered. Thus, much of the variability that occurs in real fields (e.g., real-world variability in applied water quality, inter-annual variability in land cover, fine-scale variability in soil and irrigation practices) will not have been taken into account in this gross-scale analysis. Further, despite a best effort, important factors such as partitioning of flow between surface & subsurface drainage, and deep percolation, may yet be imperfect reflections of actual conditions, due to the complexity of Central Valley hydrologic systems, including those entailed in delivery and application of irrigation water, and of collection, reuse, and discharge of irrigation return flows.
- Most of the work in this scope will have been executed with some data summarized at coarse spatial and temporal scales. Yet, we know that some of the important processes with respect to salt and nitrate transport have important fine-scale spatial and temporal components. That is, important transport events may occur brief periods and in relatively small areas of the analyzed domain, and thus not be fully reflected by a coarse-scale analysis. Such an analysis can inform basin planning, but even as it does, is best understood along with its inherent imperfections.
- Authors of land cover classification schemes set them up to meet specific purposes, which vary. Therefore, classifications set up primarily to track the use of water differ from those used to classify amounts of fertilizer applied. Both of these differ from those used for WARMF modeling, where water, applied constituents, and the fate of those constituents are all of interest. Lastly, land cover classifications in various WARMF domains, while similar, were adapted to meet the technical differences and varied interests of stakeholders involved in each process. Since the models were not necessarily envisioned for the current use, there are also trivial linguistic, syntactic, and typographical differences among the names for what are otherwise identical classes. To the greatest extent possible, the most reasonable practicable correspondences among classification schemes has been employed, based on knowledge of the work done with the classes, and the use to which they are currently being put.

Another, more general limitation relates to underlying data on which to base the descriptions of land cover classes in water quality models. Quantities of materials applied to fields, and yields attained, are central to the calculation of the fate of applied materials. Yet sampling data for these parameters as they occur in the field is extremely rare. Thus, parameters are estimated based on literature, including recommended application rates and county-level crop production reports. Estimates could be improved if they could be checked against a sampling of actual application rates, paired if possible with production data for the same fields.

Land cover classes and input parameters developed for the ICM

The existing WARMF runs contain the land cover assumptions employed in the ICM. These are not re-documented here. However, the land cover classes for each model are presented in Table 1, along with their correspondences to:

1. One another. This shows changes made for each WARMF model in response to site-specific conditions (e.g., crop mixtures in the area), and variations in names (see previous discussion).
2. Classes employed by DWR in documenting crop mixtures and water use by detailed analysis unit (DAU). Crop mixtures in DAUs were used to compare groups of WARMF catchments to non-WARMF areas that they might represent, and to adjust loading output for representative WARMF catchments so that it would represent analogous non-WARMF areas (see Appendix B for elaboration on this process).
3. Classes employed by Roosenstock et al. (2013) in their study of N application and uptake rates. As noted in the document, the results of this work were employed where analogous crop classes could be identified, since the work is more in-depth, and goes beyond consultation of literature and production recommendations.
4. Assumptions in WARMF for each land cover class regarding the % nitrate in fertilizer (vs. other forms), the % impervious surfaces in the class, and the % of the class area that is irrigated.

Table 2 shows the relationship between Tule River WARMF land cover classes and those used by DWR in land cover surveys. This relationship was established explicitly during the ICM for Task 7. It is implicit in other WARMF runs (since irrigated land cover classes in WARMF catchments are mapped based on DWR surveys), but re-development of such tables for other WARMF runs is out of scope.

As mentioned, although re-running WARMF models was out-of-scope, new runs were made to include changes to key assumptions that were altered during the ICM: nitrogen application and uptake rates (see item 3 in previous list). These new inputs are documented in Table 3. The first page of Table 3 shows the following for WARMF land cover classes:

1. Whether Roosenstock et al. (2013) results (U) or original WARMF inputs (C) were employed.
2. If rates were adjusted based on fertilization zone (see later discussion), the basis of this adjustment. These are crop classes that tended to recur in county crop reports (2010 and 11) from representative counties the length of the valley, so that relative rates of production could be compared among zones. The most applicable among these recurring classes was selected to adjust N uptake and application rates geographically throughout the Central Valley.
3. Uptake and application rates for each fertilization zone, for each crop class. The rates used in the WARMF model re-runs were later adjusted upward in sensitivity analysis runs, so that these rates are labeled as “Low” in this part of Table 3.

After initial WARMF runs, two sensitivity analysis runs were developed based on nitrogen use efficiency (NUE) for each land cover class. For irrigated land cover classes, if $NUE > 80\%$, then a low NUE (85% of the original rate for Alfalfa, 50% for other classes) was assumed to estimate a “High N rate”, and a moderate NUE (90% of the original rate for Alfalfa, 70% for other classes) was assumed to estimate a “Moderate N rate”. These calculated NUE’s (from modified WARMF inputs), and altered NUE’s (for High and Moderate N rates) are shown on page 2 of Table 3. Resulting N application and uptake assumptions for each scenario are shown on pages 2 and 3 of Table 3.

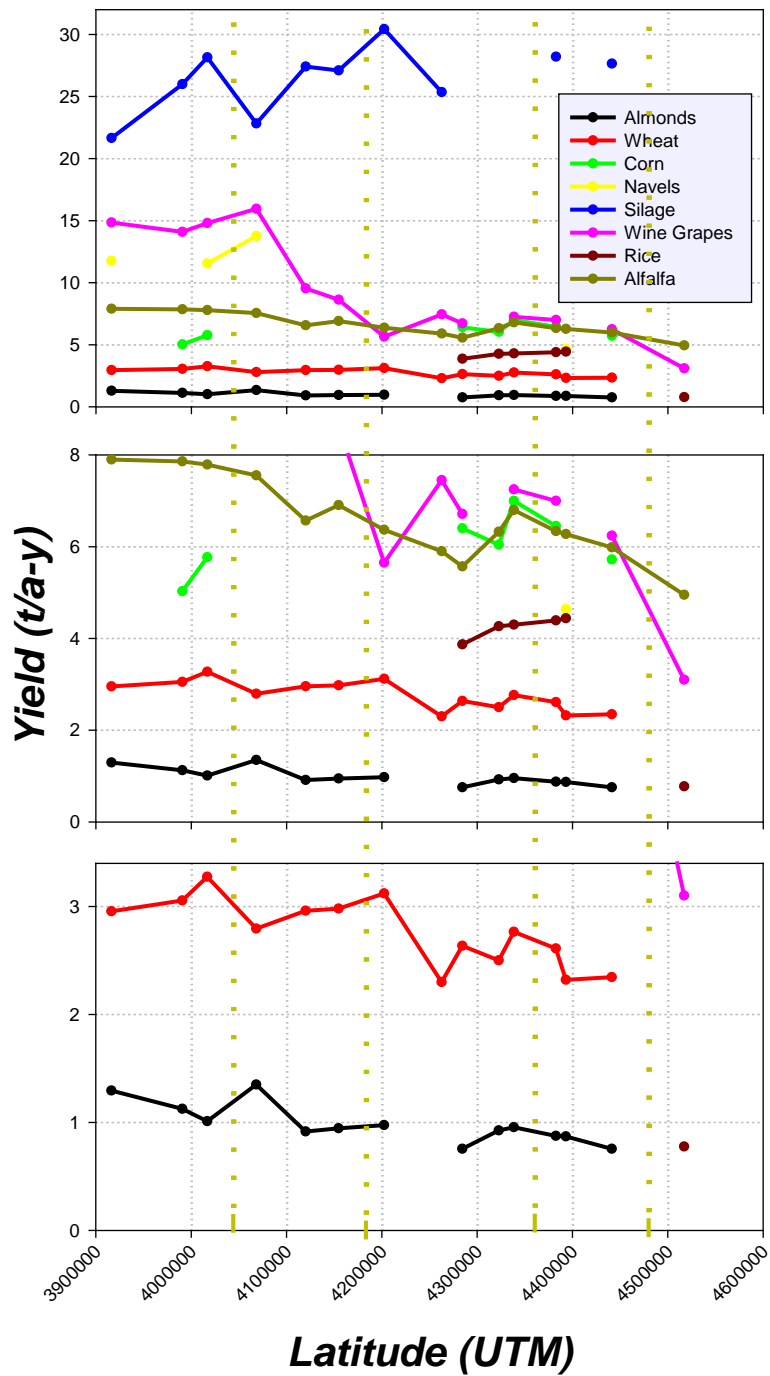
Sensitivity analysis was performed outside of WARMF, and is described in detail in the main body of the ICM report. The methodology relied in scaling of WARMF output from the Low N rate scenario runs, based on calculated N balances for whole IAZ’s. Three additional scenarios were later added, in which NUE for ALL land cover classes was reduced to 90, 75, and 60% of that assumed in the High N rate (low NUE) scenario. Explicit, class-by-class N rates were never developed for these scenarios, and thus are not presented. Rather, the changes in NUE being global, they are applied in the context of the N balances presented in the report.

Fertilization zones

Delineation of fertilization zones was documented in previous reports for the ICM project. It is repeated here for readers’ convenience.

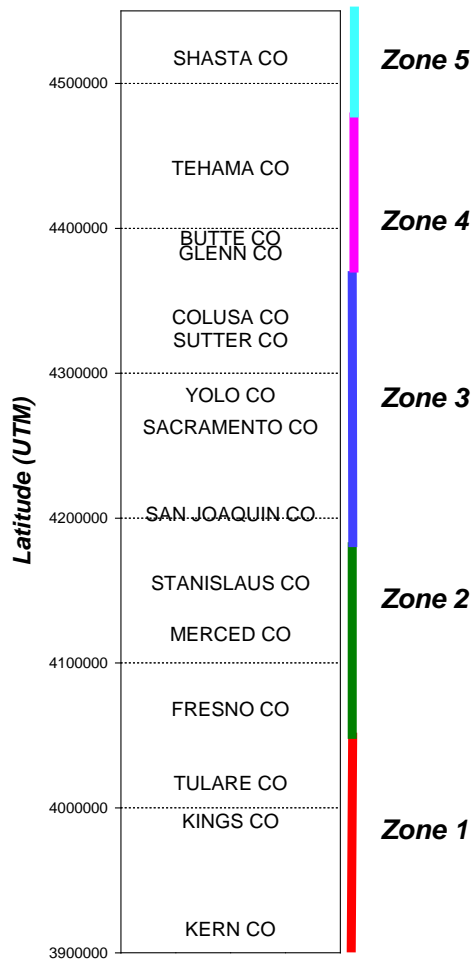
County crop reports were reviewed for representative counties the length of the Central Valley, and common crops (crops recurring in multiple counties, south to north) were identified. Yields for 2010 and 2011 were extracted from the reports, and are plotted in Figure 1.

FIGURE 1. AG COMMISSIONER YIELDS OF COMMON CROPS AS A BASIS FOR N UPTAKE ZONES



Four breakpoints were selected visually from Figure 1 to subdivide the Central Valley into 5 Fertilizer Zones, shown in Figure 2.

FIGURE 2. COUNTIES GROUPED BY ZONES, PLOTTED BY CENTROIDS.



Remaining loading assumptions are documented in the main body of this report, or in documentation of WARMF models employed for the ICM analysis.

Table 1. Cover classes in WARMF models related to those used for DWR DAU's.

WARMF Class Names			DWR DAU Class	Roosenstock class			WARMF assumption (n.a. if class n.a.)		
Tule	SJV	Sac	(n.a. where WARMF is n.a.)	Tule	SJV	SAC	% nitrate	% impermeous	% irrigated
Cotton	Cotton	Cotton	Cotton	Cotton	Cotton	Cotton	100	0	100
Farmsteads	Farmsteads	Farmsteads	Other	Pasture	Pasture	Pasture	50	10	80
Flowers and Nursery	Flowers and nursery	Flowers and nursery	Other	Vegetables and Berries	Vegetables and Berries	Vegetables and Berries	30	10	45
Lagoon	n.a.	Lagoon	Dair_ac	n.a.	n.a.	n.a.	0	0	100
Land constrained dairy land app	n.a.	n.a.	Dair_ac	n.a.	n.a.	n.a.	5	0	100
Olives, Citrus, and Subtropicals	Olives, citrus, and subtropicals	Olives, citrus & subtropicals	Subtrop	Subtropical	Subtropical	Subtropical	70	0	100
Orchard	Orchard	Orchard	All orchard	Tree Fruit	Tree Fruit	Tree Fruit	70	0	100
Row Crops	Other row crops	Other row crops	Other row crops	Vegetables and Berries	Vegetables and Berries	Vegetables and Berries	70	0	100
Perennial Forages	Perennial forages	Perennial forages	Corn	Pasture	Field Crops	Pasture	0	0	100
Unconstrained Dairy Land App	Double Crop DLA	Double Crop DLA	Dair_ac	n.a.	n.a.	n.a.	5	0	100
Comm./Industrial	Urban commercial	Urban Commercial	Urban	Pasture	Pasture	Pasture	50	60	5
Urban Landscape	Urban landscape and open space	Urban landscape	Urban	Pasture	Pasture	Pasture	50	0	90
Residential	Urban residential	Urban residential	Urban	Pasture	Pasture	Pasture	50	30	25
Vines	Vines	Vines	Vine	Grapes	Grapes	Grapes	70	0	100
Warm Season Cereals and Forages	Warm season cereals and forages	Warm season cereals/forages	Corn	Field Crops	Field Crops	Field Crops	70	0	100
Winter Grains and Safflower	Winter grains and safflower	Winter grains & safflower	Grain_Saf	Grain and Hay	Grain and Hay	Grain and Hay	100	0	100
Deciduous	Deciduous Forest	Deciduous Forest	Other	n.a.	n.a.	n.a.	0	0	0
Confined Feeding	Other CAFOs	Other CAFOs	Other	n.a.	n.a.	n.a.	50	35	100
Coniferous	Evergreen Forest	Evergreen Forest	Other	n.a.	n.a.	n.a.	0	0	0
Fallow	Fallow	Fallow	Other	n.a.	n.a.	n.a.	0	0	0
Facility	n.a.	DairyPA	Dair_ac	n.a.	n.a.	n.a.	50	35	100
Grassland/Herbaceous	Grassland/Herbaceous	Grassland/Herbaceous	Other	n.a.	n.a.	n.a.	0	0	0
Marsh	Marsh	Marsh	Other	n.a.	n.a.	n.a.	0	0	0
Mixed Forest	Mixed Forest	Mixed Forest	Other	n.a.	n.a.	n.a.	0	0	0
Resting Dairy Land App	n.a.	n.a.	Dair_ac	n.a.	n.a.	n.a.	100	0	100
Scrub/Shrub	Shrub/Scrub	Shrub/Scrub	Other	n.a.	n.a.	n.a.	0	0	0
Sewage Treatment Including Ponds	Sewage treatment plant including	Sewage plant incl. ponds	Urban	n.a.	n.a.	n.a.	0	40	0
Urban C&I, Low ISA	n.a.	n.a.	Urban	Pasture	n.a.	n.a.	50	10	5
Barren	Barren Land	Barren land	Other	n.a.	n.a.	n.a.	0	0	0
Water	Water	Water	Other	n.a.	n.a.	n.a.	0	0	0
n.a.	Native classes unsegregated	Native Classes Unsegregated	Other	n.a.	n.a.	n.a.	0	0	0
n.a.	Almonds	n.a.	All orchard	n.a.	Tree Fruit	n.a.	70	0	100
n.a.	Pistachios	n.a.	All orchard	n.a.	Tree Fruit	n.a.	70	0	100
n.a.	Alfalfa	n.a.	Past_Alf	n.a.	Pasture	n.a.	0	0	100
n.a.	Grain	n.a.	Corn	n.a.	Field Crops	n.a.	70	0	100
n.a.	Corn	n.a.	Corn	n.a.	Field Crops	n.a.	70	0	100
n.a.	Tomatoes	n.a.	Other row crops	n.a.	Vegetables and Berries	n.a.	70	0	100
n.a.	Sugar Beets	n.a.	Other row crops	n.a.	Vegetables and Berries	n.a.	70	0	100
n.a.	Potatoes	n.a.	Other row crops	n.a.	Vegetables and Berries	n.a.	70	0	100
n.a.	Onions and Garlic	n.a.	Other row crops	n.a.	Vegetables and Berries	n.a.	70	0	100
n.a.	Cucurbits	n.a.	Other row crops	n.a.	Vegetables and Berries	n.a.	70	0	100
n.a.	Beans	n.a.	Other row crops	n.a.	Vegetables and Berries	n.a.	70	0	100
n.a.	Rice	Rice	Rice	n.a.	Rice	Rice	0	0	100
n.a.	Perennial forages DLA	Perennial Forages DLA	Dair_ac	n.a.	n.a.	n.a.	5	0	100
n.a.	Urban industrial	Urban industrial	Urban	n.a.	Pasture	Pasture	50	60	5
n.a.	Paved areas	Paved areas	Urban	n.a.	n.a.	n.a.	0	100	0

Table 2. Tule River WARMF classes related to DWR land cover classes.

OID	Group	Class	Subclass	Class_Subclass_ID	Subclass_Name	Tule 2013
1	II	F	1	F1	Cotton	Cotton
2	II	F	2	F2	Safflower	Winter grains and safflower
3	II	F	3	F3	Flax	Other row crops
4	II	F	4	F4	Hops	Vines
5	II	P	5	P5	Induced high water table	Marsh
6	II	F	5	F5	Sugar beets	Other row crops
7	II	F	6	F6	Corn (field & sweet)	Warm season cereals and forages
8	II	F	7	F7	Grain sorghum	Warm season cereals and forages
9	II	F	8	F8	Sudan	Warm season cereals and forages
10	II	F	9	F9	Castor beans	Other row crops
11	II	F	10	F10	Beans (dry)	Other row crops
12	II	F	11	F11	Miscellaneous field	Other row crops
13	II	F	12	F12	Sunflowers	Other row crops
14	II	G	1	G1	Barley	Winter grains and safflower
15	II	G	2	G2	Wheat	Winter grains and safflower
16	II	G	3	G3	Oats	Winter grains and safflower
17	II	G	6	G6	Miscellaneous and mixed grain and hay	Winter grains and safflower
18	II	P	1	P1	Alfalfa & alfalfa mixtures	Perennial forages
19	II	P	2	P2	Clover native pasture	Perennial forages
20	II	P	3	P3	Mixed pasture	Perennial forages
21	II	P	4	P4	Native pasture	Perennial forages
22	II	P	6	P6	Misc. grasses (normally grown for seed)	Perennial forages
23	II	P	7	P7	Turf farms	Perennial forages
24	II	R		R	RICE	Rice
25	II	D	1	D1	Apples	Orchard
26	II	D	2	D2	Apricots	Orchard
27	II	D	3	D3	Cherries	Orchard
28	II	D	5	D5	Peaches and nectarines	Orchard
29	II	D	6	D6	Pears	Orchard
30	II	D	7	D7	Plums	Orchard
31	II	D	8	D8	Prunes	Orchard
32	II	D	9	D9	Figs	Orchard
33	II	D	10	D10	Miscellaneous deciduous	Orchard
34	II	D	12	D12	Almonds	Orchard
35	II	D	13	D13	Walnuts	Orchard
36	II	D	14	D14	Pistachios	Orchard
37	II	V	1	V1	Table grapes	Vines
38	II	V	2	V2	Wine grapes	Vines
39	II	V	3	V3	Raisin grapes	Vines
40	II	C	1	C1	Grapefruit	Olives, citrus, and subtropicals
41	II	C	2	C2	Lemons	Olives, citrus, and subtropicals
42	II	C	3	C3	Oranges	Olives, citrus, and subtropicals
43	II	C	4	C4	Dates	Olives, citrus, and subtropicals
44	II	C	5	C5	Avocados	Olives, citrus, and subtropicals
45	II	C	6	C6	Olives	Olives, citrus, and subtropicals
46	II	C	7	C7	Miscellaneous subtropical fruits	Olives, citrus, and subtropicals
47	II	C	8	C8	Kiwis	Vines
48	II	C	9	C9	Jojoba	Other row crops
49	II	C	10	C10	Eucalyptus	Deciduous Forest
50	II	T	1	T1	Artichokes	Other row crops
51	II	T	2	T2	Asparagus	Other row crops
52	II	T	3	T3	Beans (green)	Other row crops
53	II	T	4	T4	Cole crops (when breakdown is not needed)	Other row crops

Table 2. Tule River WARMF classes related to DWR land cover classes.

OID	Group	Class	Subclass	Class_Subclass_ID	Subclass_Name	Tule 2013
54	II	T	6	T6	Carrots	Other row crops
55	II	T	7	T7	Celery	Other row crops
56	II	T	8	T8	Lettuce (all types)	Other row crops
57	II	T	9	T9	Melons, squash, and cucumbers (all types)	Other row crops
58	II	T	10	T10	Onions and garlic	Other row crops
59	II	T	11	T11	Peas	Other row crops
60	II	T	12	T12	Potatoes	Other row crops
61	II	T	13	T13	Sweet potatoes	Other row crops
62	II	T	14	T14	Spinach	Other row crops
63	II	T	15	T15	Tomatoes	Other row crops
64	II	T	16	T16	Flowers, nursery & Christmas tree farms	Flowers and nursery
65	II	T	17	T17	Mixed (four or more)	Other row crops
66	II	T	18	T18	Miscellaneous truck	Other row crops
67	II	T	19	T19	Bush berries	Vines
68	II	T	20	T20	Strawberries	Other row crops
69	II	T	21	T21	Peppers (chili, bell, etc.)	Other row crops
70	II	T	22	T22	Broccoli	Other row crops
71	II	T	23	T23	Cabbage	Other row crops
72	II	T	24	T24	Cauliflower	Other row crops
73	II	T	25	T25	Brussels sprouts	Other row crops
74	II	I	1	I1	Land not cropped the current or previous crop season, but cropped within the past three years	Fallow
75	II	I	2	I2	New lands being prepared for crop production	Fallow
76	III	S	1	S1	Farmsteads	Farmsteads
77	III	S	2	S2	Livestock feed lots	Other CAFOs
78	III	S	3	S3	Dairies	Farmsteads
79	III	S	4	S4	Poultry farms	Other CAFOs
80	IV	U		U	URBAN	Urban residential
81	IV	UC	1	UC1	Offices, retailers, etc	Urban commercial and industrial
82	IV	UC	2	UC2	Hotels	Urban commercial and industrial
83	IV	UC	3	UC3	Motels	Urban commercial and industrial
84	IV	UC	4	UC4	Recreation vehicle parking, camp sites	Urban commercial and industrial
85	IV	UC	5	UC5	Institutions (hospitals, prisons, reformatories, asylums, etc. , having a reasonably constant 24-hour resident population)	Urban commercial and industrial
86	IV	UC	6	UC6	Schools (yards to be mapped separately if large enough)	Urban commercial and industrial
87	IV	UC	7	UC7	Municipal auditoriums, theaters, churches, buildings and stands associated with race tracks, football stadiums, baseball parks, rodeo arenas, amusement parks, etc	Urban commercial and industrial
88	IV	UC	8	UC8	Miscellaneous high water use (to be used to indicate a high water use condition not covered by the above categories)	Urban landscape
89	IV	UC		UC	COMMERCIAL	Urban commercial and industrial

Table 2. Tule River WARMF classes related to DWR land cover classes.

OID	Group	Class	Subclass	Class_Subclass_ID	Subclass_Name	Tule 2013
90	IV	UI	1	UI1	Manufacturing, assembling, and general processing	Urban commercial and industrial
91	IV	UI	2	UI2	Extractive industries (oil fields, rock quarries, gravel pits, rock and gravel processing plants, etc.)	Urban C&I, low impermeous surface
92	IV	UI	3	UI3	Storage and distribution (warehouses, substations, railroad marshalling yards, tank farms, etc.)	Urban commercial and industrial
93	IV	UI	6	UI6	Saw mills	Urban C&I, low impermeous surface
94	IV	UI	7	UI7	Oil refineries	Urban commercial and industrial
95	IV	UI	8	UI8	Paper mills	Urban commercial and industrial
96	IV	UI	9	UI9	Meat packing plants	Urban commercial and industrial
97	IV	UI	10	UI10	Steel and aluminum mills	Urban commercial and industrial
98	IV	UI	11	UI11	Fruit and vegetable canneries and general food processing	Urban commercial and industrial
99	IV	UI	12	UI12	Miscellaneous high water use (to be used to indicate a high water use condition not covered by other categories)	Urban landscape
100	IV	UI	13	UI13	Sewage treatment plant including ponds	Sewage treatment plant including ponds
101	IV	UI	14	UI14	Waste accumulation sites (public dumps, sewage sludge sites, landfill and hazardous waste sites, etc.)	Urban C&I, low impermeous surface
102	IV	UI	15	UI15	Wind farms, solar collector farms, etc	Urban C&I, low impermeous surface
103	IV	UI		UI	INDUSTRIAL	Urban commercial and industrial
104	IV	UL	1	UL1	Lawn area - irrigated	Urban landscape
105	IV	UL	2	UL2	Golf course - irrigated	Urban landscape
106	IV	UL	3	UL3	Ornamental landscape (excluding lawns) - irrigated	Urban landscape
107	IV	UL	4	UL4	Cemeteries - irrigated	Urban landscape
108	IV	UL	5	UL5	Cemeteries - not irrigated	Grassland/Herbaceous
109	IV	UL		UL	URBAN LANDSCAPE	Urban landscape
110	IV	UR	1	UR1	Single family dwellings with lot sizes greater than 1 acre up to 5 acres (ranchettes, etc.)	Farmsteads
111	IV	UR	2	UR2	Single family dwellings with a density of 1 unit/acre up to 8+ units/acre	Farmsteads
112	IV	UR	3	UR3	Multiple family (apartments, condos, townhouses, barracks, bungalows, duplexes, etc.)	Urban residential
113	IV	UR	4	UR4	Trailer courts	Urban residential
114	IV	UR		UR	Urban residential	Urban residential
115	IV	UV	1	UV1	Unpaved areas (vacant lots, graveled surfaces, play yards, developable open lands within urban areas, etc.)	Urban C&I, low impermeous surface
116	IV	UV	3	UV3	Railroad right of way	Urban C&I, low impermeous surface

Table 2. Tule River WARMF classes related to DWR land cover classes.

OID	Group	Class	Subclass	Class_Subclass_ID	Subclass_Name	Tule 2013
117	IV	UV	4	UV4	Paved areas (parking lots, paved roads, oiled surfaces, flood control channels, tennis court areas, auto sales lots, etc.)	Paved areas
118	IV	UV	6	UV6	Airport runways	Paved areas
119	IV	UV		UV	VACANT	Urban C&I, low impervious surface
120	V	NB	1	NB1	Dry stream channels	Shrub/Scrub
121	V	NB	2	NB2	Mine Tailing	Barren land
122	V	NB	3	NB3	Barren land	Barren land
123	V	NB	4	NB4	Salt flats	Barren land
124	V	NB	5	NB5	Sand dunes	Barren land
125	V	NB		NB	BARREN AND WASTELAND	Barren land
126	V	NC		NC	NATIVE CLASSES UNSEGREGATED	Native Classes Unsegregated
127	V	NR	1	NR1	Marsh lands, tules and sedges	Marsh
128	V	NR	2	NR2	Natural high water table meadow	Marsh
129	V	NR	3	NR3	Trees, shrubs or other larger stream side or watercourse vegetation	Deciduous Forest
130	V	NR	4	NR4	Seasonal duck marsh, dry or only partially wet during summer	Marsh
131	V	NR	5	NR5	Permanent duck marsh, flooded during summer	Marsh
132	V	NR		NR	RIPARIAN VEGETATION	Deciduous Forest
133	V	NV	1	NV1	Grass land	Grassland/Herbaceous
134	V	NV	2	NV2	Light brush	Shrub/Scrub
135	V	NV	3	NV3	Medium brush	Shrub/Scrub
136	V	NV	4	NV4	Heavy brush	Shrub/Scrub
137	V	NV	5	NV5	Brush and timber	Mixed Forest
138	V	NV	6	NV6	Forest	Mixed Forest
139	V	NV	7	NV7	Oak grass land	Grassland/Herbaceous
140	V	NV		NV	NATIVE VEGETATION	Grassland/Herbaceous
141	V	NW		NW	WATER SURFACE	Water
142	VI	NS		NS	NOT SURVEYED	Native Classes Unsegregated
143	IV	UR	1	UR11	Single family dwellings with lot sizes greater than 1 acre up to 5 acres (ranchettes, etc.) with 0% to 25% area irrigated	Farmsteads
144	IV	UR	2	UR21	Single family dwellings with a density of 1 unit/acre up to 8+ units/acre with 0% to 25% area irrigated	Urban residential
145	IV	UR	3	UR31	Multiple family (apartments, condos, townhouses, barracks, bungalows, duplexes, etc.) with 0% to 25% area irrigated	Urban residential
146	IV	UR	4	UR41	Trailer courts with 0% to 25% area irrigated	Urban residential
147	IV	UR	1	UR12	Single family dwellings with lot sizes greater than 1 acre up to 5 acres (ranchettes, etc.) with 26% to 50% area irrigated	Farmsteads
148	IV	UR	2	UR22	Single family dwellings with a density of 1 unit/acre up to 8+ units/acre with 26% to 50% area irrigated	Urban residential

Table 2. Tule River WARMF classes related to DWR land cover classes.

OID	Group	Class	Subclass	Class_Subclass_ID	Subclass_Name	Tule 2013
149	IV	UR	3	UR32	Multiple family (apartments, condos, townhouses, barracks, bungalows, duplexes, etc.) with 26% to 50% area irrigated	Urban residential
150	IV	UR	4	UR42	Trailer courts with 26% to 50% area irrigated	Urban residential
151	IV	UR	1	UR13	Single family dwellings with lot sizes greater than 1 acre up to 5 acres (ranchettes, etc.) with 51% to 75% area irrigated	Farmsteads
152	IV	UR	2	UR23	Single family dwellings with a density of 1 unit/acre up to 8+ units/acre with 51% to 75% area irrigated	Urban residential
153	IV	UR	3	UR33	Multiple family (apartments, condos, townhouses, barracks, bungalows, duplexes, etc.) with 51% to 75% area irrigated	Urban residential
154	IV	UR	4	UR43	Trailer courts with 51% to 75% area irrigated	Urban residential
155	IV	UR	1	UR14	Single family dwellings with lot sizes greater than 1 acre up to 5 acres (ranchettes, etc.) with 76% or greater	Farmsteads
156	IV	UR	2	UR24	Single family dwellings with a density of 1 unit/acre up to 8+ units/acre with 76% or greater	Urban residential
157	IV	UR	3	UR34	Multiple family (apartments, condos, townhouses, barracks, bungalows, duplexes, etc.) with 76% or greater	Urban residential
158	IV	UR	4	UR44	Trailer courts with 76% or greater	Urban residential
159	VI	Z		Z	Outside Study Area	Urban landscape
160	II	V		V	Vinyard	Vines
161	II	D		D	DECIDUOUS FRUITS AND NUTS	Orchard
162	II	E		E	Entry Denied	Native Classes Unsegregated
163	II	F		F	FIELD CROPS	Warm season cereals and forages
164	II	G		G	GRAIN AND HAY CROPS	Winter grains and safflower
165	II	P		P	PASTURE	Perennial forages
166	II	T		T	TRUCK, NURSERY AND BERRY CROPS	Other row crops
167	II	C		C	CITRUS AND SUBTROPICAL	Olives, citrus, and subtropicals