CALIFORNIA MELONS

This scenario is intended to represent California melon crops, such as cantaloupes, honeydew, and watermelons (Figure 1). Based on 2002 USDA National Agricultural Statistics Summary, approximately 70% of the crop acreage for the above three melon crops is cantaloupe production (USDA, 2002). The majority of cantaloupe production is in the southern San Joaquin Valley (*primarily Fresno County*). As such, soil, weather, and crop parameters for this scenario nominally represent cantaloupe production in the southern San Joaquin Valley. This scenario may also be used as a surrogate for other melon crops as determined on a case by case basis. Melons belong to the cucurbit family of plants, known as Cucurbitaceae, which includes cucumbers, gourds, squash, and pumpkins. There are several different genus names used in the family. Cantaloupes (*Cucumis melo* L. var. *antalupensis*) and honeydews (*Cucumis melo* L. var. *inodorus*) are classified in the same genus. Mixed melons include crenshaw, casaba, Santa Claus, Persian, Juan Canary, piel de sapo, and other melon types. California ranks first in the nation in production of cantaloupes. Acreage plantings for the year 2002 from the USDA National Agricultural Statistics Summary show California ranked number one with 52,727 acres of the total 105,262 planted acres in the United States. This puts the state's production at approximately 50% of all cantaloupes grown in the US (USDA, 2002). California also ranks first in the nation in production of honeydew melons. The same 2002 summary shows California ranked number one in planted honeydew acreage at 20,192 acres of the total 24,258 planted acres in the US (USDA, 2002).

There are three commonly recognized areas of melon production in California:

Area I, located in the northern San Joaquin Valley and lower Sacramento Valley grows approximately 6% of the state's cantaloupes with production focused in Stanislaus County. Area I produces 56% of the honeydews grown in the state with production in Sutter, Yolo, and Stanislaus Counties. Counties are being listed in order of highest planted acreage. Area I also produces approximately 21% of the mixed melons in Stanislaus and San Joaquin Counties. Planting of melons is from April to early July with harvest from mid-July to mid-October. Rainfall varies from about 26 inches per year in the Sacramento Valley to about 16 inches per year in Modesto in the northern San Joaquin Valley. Area I uses flood irrigation to pre-irrigate melon fields then utilizes dryland farming techniques to force the melon plants to send their root systems downward to a high water table. This allows melon growers to avoid subsequent irrigations via furrows (USDA, 1999).

Area II, the southern San Joaquin Valley, produces about 66% of the cantaloupes grown in the state. Production of cantaloupes occurs in Fresno, Merced, Kern, and Kings Counties. Area II produces 24% of the honeydews with production centered in Fresno County. Area II also produces 53% of the mixed melons in Fresno, Merced, and Kern Counties. Melons are planted from mid-March to mid-July with a harvest period from late-June into mid-to-late October depending on weather. Fresno receives about 10 inches of rainfall per year while Kern County receives about three inches per year. Furrow irrigation is very common in Area II, though there are some growers using subsurface drip irrigation in all three melon types. The growing region in Area II is commonly referred to as the westside district for melons as production occurs along the western part of the valley (USDA, 1999).

Area III, the desert growing region, covers Coachella, Imperial, and Palo Verde Valleys. Area III has both a spring and a fall crop of cantaloupes and honeydews. Planted acreage of cantaloupes and honeydews in Area III is split with about 76% of the acreage in a spring planting and the balance of 24% in a fall crop. This region grows about 28% of the state's cantaloupes with production across Imperial and Riverside Counties. Area III also produces 20% of the honeydews in the same counties. Area III produces 26% of the mixed melons with most of the production in Riverside County and minor acreage in San Bernardino County. Spring planting starts in mid-December and goes through March with harvests from mid-May into mid-July. Fall melon planting occurs in July and August with a fall harvest period from October into late December. This area produces melons with less than four inches of rainfall per year. Furrow irrigation is commonly used though there may occasionally be drip (USDA, 1999).

Melons in California are grown on a range of soils (USDA 2006), however Cerini soils are among the most productive soils for growing cantaloupes in the region when irrigated (Table 5). The Cerini series is extensive in MLRA 17 (USDA, 2003) and is the second most common soil found in melon producing areas of Fresno, Kern, and Kings, Madera, and Merced Counties, accounting for nearly 15% of melon bearing soils acreage (USDA, 2006). Cerini soils are used mainly for irrigated crops such as cotton, tomatoes, cantaloupes, garlic, onions and wheat (USDA, 2003). Cerini soils are found in Fresno and Kings Counties and are fine-loamy, mixed, superactive, thermic Fluventic Haplocambids soil. Cantaloupe bearing soils are found on slopes of 0 to 2% (Table 5). Location and metfile selections are often the most important developments affecting scenario vulnerability and protectiveness. Because nearly 60% of cantaloupe acreage, and 45% of the combined melon acreage (cantaloupes, honeydew, and watermelons) in California is located in Fresno County (USDA, 2006) the metfile closest to the center of Fresno county was chosen. The Cerini series was selected for this scenario because it is both representative of melon bearing soils, is predominant in the main melon production areas in California, and because it represents 50% of soils by drainage, the 90% for erodibility, and is among the steeper sloped cantaloupe bearing soils (Table 5). Approximately 99.5% of cantaloupe bearing soils in the AOI have a USLEK less than or equal to Cerini (0.37).

Cerini is a Hydrologic Group C soil, which includes the 50% percent cantaloupe bearing soils in drainage. Cerini soils have a USLE K factor of 0.37, which is common to 35% of cantaloupe bearing soils and includes the 90th percentile of these soils in erodibility. Approximately 14% of cantaloupe bearing soils have a pH lower than Cerini soils (7.7). However, soil pH is not currently a PRZM input parameter and is not expected to often affect chemical fate in the acidic range. Cerini soils have an A horizon from 0 to 5 inches (0-13 cm) deep and a B horizon from 5 to 52 inches (13-132 cm) deep. Cerini clay loam 0-2 percent slopes was used to parameterize this scenario (USDA 2005).

The Met station chosen was the Fresno station (93193.dvf) located at 36º 47’ N, 119º 43’ W and at an elevation of approximately 102 meters above sea level. This station receives an average of approximately 27 cm of rainfall annually. This is the closest met station to this scenario which includes data necessary for PRZM.

Table 1. PRZM 3.12 Climate and Time Parameters for Fresno, California – Melon.

Parameter	Value	Source/Comments
Starting Date	Jan. 1, 1961	Meteorological File from Fresno County, (W 93193)
Ending Date	Dec. 31, 1990	Meteorological File from Fresno County, (W 93193)
Pan Evaporation Factor (PFAC)	0.70	PRZM Manual Figure 5.1. Value represents Fresno region.
Snowmelt Factor (SFAC)	0	In areas where climatology prevents snow fall, SFAC should be set to 0.0 - PRZM Manual (EPA 1998)
Minimum Depth of Evaporation (ANETD)	17.5 cm	PRZM Manual (EPA 1998) Average of 15-20 cm

Table 2. PRZM 3.12 Erosion and Landscape Parameters for Fresno, California – Melon.		
Parameter	**Value**	**Source/Comments**
Method to Calculate Erosion (ERFLAG)	4 (MUSS)	PRZM Manual (EPA, 1998)
USLE K Factor (USLEK)	0.37 tons EI^{-1*}	USDA NRCS Soil Data Mart (http://soildatamart.nrcs.usda.gov/)
USLE LS Factor (USLELS)	0.2	PRZM Manual (EPA, 1998) Value listed for 1% slope at 400 feet. Based on Hann and Barfield (1978)
USLE P Factor (USLEP)	0.3	1% slope row crop PRZM Manual Table 5.6 (EPA, 1998)
Field Area (AFIELD)	172 ha	Area of Shipman Reservoir watershed (EPA, 1999)
NRCS Hyetograph (IREG)	1	PRZM Manual Figure 5.12 (EPA, 1998) Type I, IREG=1
Slope (SLP)	1%	Mean value for CERINI CLAY LOAM
Hydraulic Length (HL)	600 m	Shipman Reservoir (EPA, 1999)
Irrigation Flag (IRFLAG)	2	All melons are irrigated. USDA Crop Profile for Melons in CA (1999) http://www.ipmcenters.org/cropprofiles/docs/camelons.html
Irrigation Type (IRTYPE)	4 (furrow)	Furrow irrigation is the most common irrigation method. USDA Crop Profile for Melons in CA (1999). Irrigation Guidance for developing PRZM Scenarios, Table 1; (June 15, 2005).
Irrigation Rate (RATEAP) (cm/hr)	0.032 cm hr^{-1}	Irrigation Guidance for developing PRZM Scenarios, Table 1; (June 15, 2005). For CN = 87 and f = 0
* EI = 100 ft-tons * in/ acre*hr		

Table 3. PRZM 3.12 Crop Parameters for Fresno, California – Melon.		
Parameter	**Value**	**Source/Comments**
Initial Crop (INICRP)	1	Set to one for all crops (EPA, 2004).
Initial Surface Condition (ISCOND)	1	1= fallow. Fields are graded (particularly if furrow irrigation is used), followed by subsoiling to break up compacted layers (USDA, 1999)
Number of Different Crops (NDC)	1	Set to number of crops in simulation.
Number of Cropping Periods (NCPDS)	30	Set to weather data in meteorological file: San Diego, CA (W23188).
Maximum rainfall interception storage of crop (CINTCP)	0.25	Moderate to heavy canopy PRZM table 5-4. Value consistent with TX melons (EPA, 2004).
Maximum Active Root Depth (AMXDR)	46 cm	Kemble JK. Basics of crop irrigation. Alabama cooperative extension system. ANR-1169 April 2000
Maximum Canopy Coverage (COVMAX)	100	Value consistent with TX melons (EPA, 2004).
Soil Surface Condition After Harvest (ICNAH)	3	3 = residue. Melons are picked and packed directly from the vines in the field (USDA, 1999).
Date of Crop Emergence (EMD, EMM, IYREM)	16/05/61	Sixteen days post planting (USDA Crop Profile 1999). Associated with first RUSLE Date 10 days after planting.
Date of Crop Maturity (MAD, MAM, IYRMAT)	1/08/61	Melons are usually harvested at the 75% slip stage of maturity and may ripen after picking. (USDA Crop Profile 1999)
Date of Crop Harvest (HAD, HAM, IYRHAR)	02/08/61	USDA Crop Profile for Melons in CA (1999) http://www.ipmcenters.org/cropprofiles/docs/camelons.html
Maximum Dry Weight (WFMAX)	0.0	Not used in scenario

Table 3. PRZM 3.12 Crop Parameters for Fresno, California – Melon.		
Parameter	**Value**	**Source/Comments**
Maximum CropHeight (HTMAX)	25 cm	Value consistent with TX melons (EPA, 2004).
SCS Curve Number (CN)	91, 87, 88	Gleams Manual Table H-4; fallow = SR; cropping & residue = row crop (SR) poor condition; hydrological group C (USDA, 1990)
Manning's N Value (MNGN)	0.070	RUSLE Project; C23STSTN for Fresno California strawberries (USDA, 2000). This is the closest RUSLE file with similar cover and climate conditions.
USLE C Factor (USLEC)	0.007-0.019	RUSLE Project; C23STSTN for Fresno California strawberries (USDA, 2000). This is the closest RUSLE file with similar cover and climate conditions.

Table 4. PRZM 3.12 Cerini Clay loam Soil Parameters Fresno, California – Melon.		
Parameter	**Value**	**Source/Comments**
Total Soil Depth (CORED)	157 cm	NRCS Soil Data Mart (SDM) (http://soildatamart.nrcs.usda.gov)
Number of Horizons (NHORIZ)	5	NRCS Soil Data Mart (SDM)
Horizon Thickness (THKNS)	10 cm (HORIZN = 1) 3 cm (HORIZN = 2) 51 cm (HORIZN = 3) 25 cm (HORIZN = 4) 68 cm (HORIZN = 5)	NRCS Soil Data Mart (SDM). The top horizon was split into two horizons as per. PRZM Scenario Guidance (EPA, 2004).
Bulk Density (BD)	1.45 g/cm^3 (HORIZN = 1) 1.45 g/cm^3 (HORIZN = 2) 1.5 g/cm^3 (HORIZN = 3) 1.45 g/cm^3 (HORIZN = 4) 1.45 g/cm^3 (HORIZN = 5)	NRCS Soil Data Mart (SDM) (http://soildatamart.nrcs.usda.gov). Midpoint of the reported range. PRZM Scenario Guidance (EPA, 2004).
Initial Water Content (THETO)	0.313 cm^3/cm^3 (HORIZN =1) 0.313 cm^3/cm^3 (HORIZN =2) 0.326 cm^3/cm^3 (HORIZN = 3) 0.236 cm^3/cm^3 (HORIZN = 4) 0.198 cm^3/cm^3 (HORIZN = 5)	NRCS Soil Data Mart (SDM); values are mean 1/3-bar water contents of Cerini clay loam soils.
Compartment Thickness (DPN)	0.1 cm (HORIZN = 1) 3 cm (HORIZN = 2) 3 cm (HORIZN = 3) 5 cm (HORIZN = 4) 4 cm (HORIZN = 5)	NRCS Soil Data Mart (SDM) (http://soildatamart.nrcs.usda.gov). PRZM Scenario Guidance (EPA, 2004).
Field Capacity (THEFC)	0.313 cm^3/cm^3 (HORIZN =1) 0.313 cm^3/cm^3 (HORIZN =2) 0.326 cm^3/cm^3 (HORIZN = 3) 0.236 cm^3/cm^3 (HORIZN = 4) 0.198 cm^3/cm^3 (HORIZN = 5)	NRCS Soil Data Mart (SDM); values are mean 1/3-bar water contents of Cerini clay loam soils.
Wilting Point (THEWP)	0.173 cm^3/cm^3 (HORIZN =1) 0.173 cm^3/cm^3 (HORIZN =2) 0.195 cm^3/cm^3 (HORIZN = 3) 0.150 cm^3/cm^3 (HORIZN = 4) 0.115 cm^3/cm^3 (HORIZN = 5)	NRCS Soil Data Mart (SDM); values are mean 15-bar water contents of Cerini clay loam soils.
Organic Carbon Content (OC)	0.46% (HORIZN = 1) 0.46% (HORIZN = 2) 0.41% (HORIZN = 3) 0.23% (HORIZN = 4) 0.17% (HORIZN = 5)	NRCS SDM; values for horizons 1 to 3 = mean %OM / 1.724. PRZM Scenario Guidance (EPA, 2004).

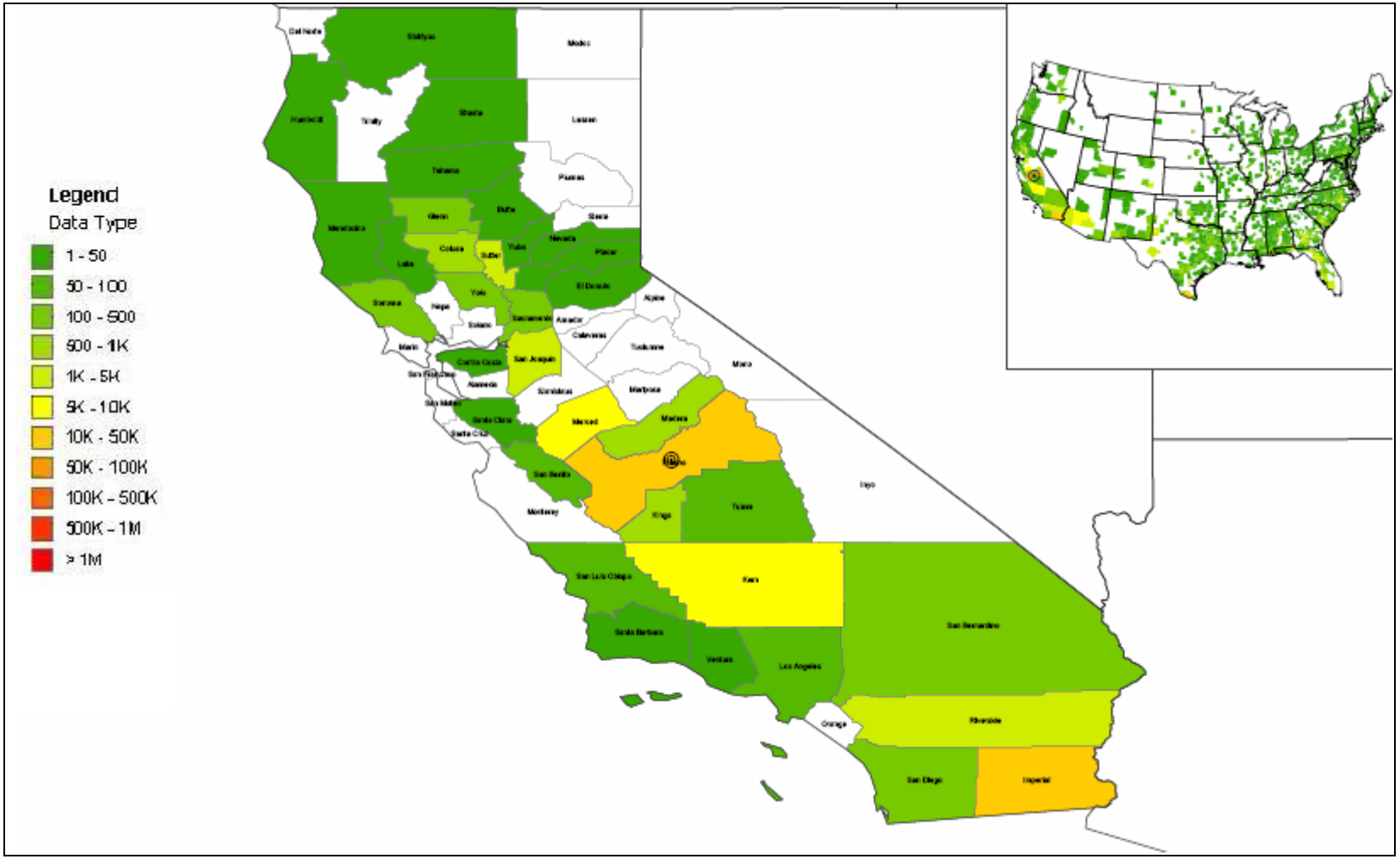

Figure 1. 2002 harvested acres for cantaloupes, honeydew melons, and watermelons based on USDA Census of Agriculture for California and conterminous United States (inset) Estimates do not include data for individual farms which NASS has excluded to protect the identify of individual farms.

Table 5. Melon Bearing Soils of Fresno, Kern, Kings, Madera, and Merced Counties (California) Ranked by Area.												
Soil	Total Acreage	% Area	Drainage	Erodibility	Slope (%)	pH	OM (%)	% Sand	% Silt	% Clay	Cantaloupe Yield (crates)	
											Irrigated	Non Irr.
CIERVO	92,670	15.9%	C/D	0.28	0-2	8.2	0.9	32	28	40	421-661	-
CERINI	88,770	15.2%	C/B	0.28-0.37	0-2	7.7	0.8	32-57	25-40	18-28	558-731	-
TRANQUILLITY	60,000	10.3%	D	0.28	0-1	8.1	1.3	6	39	55	596	-
CALFLAX	54,140	9.3%	C	0.37	0-1	8	0.8	28	40	32	519	-
WESTHAVEN	50,290	8.6%	C/B	0.37	0-2	7.6-7.8	1.2	30-35	40-45	20-30	515-946	-
EXCELSIOR	49,370	8.5%	B	0.28	0-2	7.8	0.8	60	28	12	400-763	-
DOSPALOS	36,010	6.2%	D	0.24-0.32	0-2	6.9-7.9	2-2.4	7-31.5	27.9-37	37.5-61	160-180	-
WOO	35,090	6.0%	C	0.28-0.37	0-5	7.5	1.5	28.1-55.5	14.5-37.7	22.5-42.5	200-250	-
BOLFAR	20,740	3.6%	C/B	0.32	0-2	6.8-7.9	1.4-2	35.4-43	33.6-35	22-31	220	-
DELDOTA	18,850	3.2%	D	0.24-0.28	0-2	7.9-8	1.5-2	25-26.1	28.9-30	45	160	-
ELNIDO	14,150	2.4%	C/B	0.24-0.32	0-2	6.1-7.9	1.5-2	34.2-65.7	20-37.3	11.5-28.5	180	-
PANOCHE	13,890	2.4%	C	0.37	0-5	7.8	0.7	35	37	28	591	-
CHATEAU	13,620	2.3%	D	0.28-0.32	0-2	8.2	0.75-0.8	13-22.1	27.9-37	50	190	-
DOSAMIGOS	11,320	1.9%	D	0.24-0.28	0-2	8.2	1.5	28.1-31.5	29.4-31	37.5-42.5	180	-
PAVER	8,440	1.4%	C	0.32-0.37	0-2	7.2-7.8	0.7-0.75	34-35.4	31-33.6	31-35	250-300	-
POLVADERO	6,310	1.1%	B	0.32	0-2	8.4	0.6	65	20	15	510	-
KIMBERLINA	5,500	0.9%	B	0.32	0-2	7.5	0.7	65	25	10	594	-
ESCANO	2,900	0.5%	C	0.32	0-2	7.9	2	35.4	33.6	31	170	-
CARRANZA	1,730	0.3%	B	0.43	0-2	7	0.75	35.4	33.6	31	200	-
YOKUT	770	0.1%	C	0.43	0-2	6.1	0.75	65.9	19.1	15	250	-

- Erodibility, sand, silt, and clay values are “representative” values from STATSGO.

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