

Barton Springs Orchard

This scenario is intended to represent an orchard that may include cultivation of peaches, nectarines or pecans. USDA data for Hays and Travis counties do not include harvest data for these crops from 1990-2007 (USDA 2007); however, the 2002 agricultural census for the two counties includes over 2000 acres of land in orchards (USDA 2002). Discussions with extension agents in Hays and Travis counties indicated that some cultivation of peaches and nectarines occurs in the Barton Springs Segment (BSS) of the Edward Aquifer, specifically in Hays County (Bryan Davis, personal communication). Crop parameters for this scenario were chosen to be reflective of a peach orchard in the BSS.

For soil parameters, the Brackett soil series was selected because it is a benchmark soil, is highly representative of areas in the BSS, and represents a soil with high-end values for vulnerability, drainage, erodibility, and slope. Brackett is a Hydrologic Group C soil with a USLE K factor of 0.37. Soil parameters for the “Brackett-Rock outcrop-Comfort complex, 1 to 8 percent slopes” were selected from Soil Data Mart to parameterize this scenario (USDA 2001; USDA 2006).

The meteorological station selected for this scenario is located in Austin, Texas. This station is the closest available weather station that includes data required for PRZM.

Parameter	Value	Source/Comments
Starting Date	Jan. 1, 1961	Meteorological File from Austin, TX (W13958)
Ending Date	Dec. 31, 1990	Meteorological File from Austin, TX (W13958)
Pan Evaporation Factor (PFAC)	0.69	PRZM Manual Figure 5.1 (EPA 1998).
Snowmelt Factor (SFAC)	0.36	PRZM Manual, Table 5.1 (EPA 1998).
Minimum Depth of Evaporation (ANETD)	25	Mid point of range (20-30), PRZM Manual, Figure 5.2 (EPA 1998).

Table 2. PRZM 3.12 Erosion and Landscape Parameters for Barton Springs - orchard.		
Parameter	Value	Source/Comments
Method to Calculate Erosion (ERFLAG)	4 (MUSS)	Default value.
USLE K Factor (USLEK)	0.37 tons EI ⁻¹ ◇	Brackett-Rock Outcrop-Comfort Complex Soil (USDA 2006).
USLE LS Factor (USLELS)	0.69	Calculated according to Haan and Barfield (1978) equation: $LS = ((\lambda/72.6)^m)((430x^2 + 30x + 0.43)/6.613)$, where λ = slope length, x = SLP/100 and m = constant. In this case, λ = 400 m (default value) and m = 0.4 (EPA 2004).
USLE P Factor (USLEP)	1	Default for orchards.
Field Area (AFIELD)	10 ha	Default value for area of standard farm pond.
NRCS Hyetograph (IREG)	4	PRZM Manual, Figure 5.12 (EPA, 1998).
Slope (SLP)	4 %	Brackett-Rock Outcrop-Comfort Complex Soil Slope range 1-8% (USDA 2006).
Hydraulic Length (HL)	356 m	Default value for Pond (EPA, 2004)
Irrigation Flag (IRFLAG)	2	Irrigation during cropping period (Kamas et al. 1998).
Irrigation Type (IRTYP)	4	Drip irrigation (Kamas et al. 1998).
Leaching Factor (FLEACH)	0	Default value (EPA 2005).
Fraction of Water Capacity when Irrigation is Applied (PCDEPL)	0.5	Default value (EPA 2005).
Maximum Rate at which Irrigation is Applied (RATEAP)	0.056	Default value (for cropping period CN (79)) (EPA 2005).
◇ EI = 100 ft-tons * in/ acre*hr		

Table 3. PRZM 3.12 Crop Parameters for Barton Springs - orchard.		
Parameter	Value	Source/Comments
Initial Crop (INICRP)	1	Default value
Initial Surface Condition (ISCOND)	3	Consistent with GA peach scenario.
Number of Different Crops (NDC)	1	Set to number of crops in simulation. Default value.
Number of Cropping Periods (NCPDS)	30	Set to weather data in meteorological file: Austin, TX (W13958).
Maximum rainfall interception storage of crop (CINTCP)	0.25	Consistent with GA peach scenario.
Maximum Active Root Depth (AMXDR)	43	Set to CORED. According to GA peach scenario, roots may grow in excess of 5 feet (152 cm).
Maximum Canopy Coverage (COVMAX)	60	Consistent with GA peach scenario.
Soil Surface Condition After Harvest (ICNAH)	3	Consistent with GA peach scenario. Residue is left on a field after harvest.
Maximum Canopy Height (HTMAX)	300 cm	Consistent with GA peach scenario.
Date of Crop Emergence (EMD, EMM, IYREM)	1/4/61	Peach trees require chilling temperatures (32-45°F) to break dormancy, which begins vegetative growth and flower production (Kamas et al. 1998). Austin mean temperatures for 1971-2000 indicate chilling temperatures are reasonable to occur November-March (NOAA 2005). Emergence and harvest dates are set according to this information. Harvest is assumed to be when peach trees are defoliated. Maturity corresponds to the time when the trees are fully leafed out. This time is estimated to take 1 month.
Date of Crop Maturity (MAD, MAM, IYRMAT)	1/5/61	
Date of Crop Harvest (HAD, HAM, IYRHAR)	16/11/61	
Maximum Dry Weight (WFMAX)	0.0	Not used in scenario.
SCS Curve Number (CN)	84, 79, 82	Gleams Manual Table H-4, meadow, hydrologic group C, good condition (USDA, 2000)
Manning's N Value (MNGN)	0.023	San Antonio winter wheat sgp 30 (I93WWWWM). Mulch tillage (MT), which includes a few tillage operations that are less in number and less aggressive than conventional tillage. This is inconsistent with the GA peach scenario, which incorporates conventional tillage. The cover code includes light cover (5) which is commonly used with mulch till (7-35% residue cover on soil surface).
USLE C Factor (USLEC)	0.028 – 0.162	San Antonio winter wheat sgp 30 (I93WWWWM).

Table 4. PRZM 3.12 Brackett-Rock Outcrop-Comfort Complex Soil Parameters for Barton Springs - orchard.		
Parameter	Value	Source/Comments
Total Soil Depth (CORED)	43 cm	NRCS Soil Data Mart Database, Hays County, for Brackett-Rock outcrop-Comfort complex, 1 to 8 percent slopes. (http://soildatamart.nrcs.usda.gov/). Additional data were listed for a 4 th HORIZN. However, these were not included in this soil profile since the 4 th HORIZN is composed of bedrock. PRZM Scenario Guidance (2004).
Number of Horizons (NHORIZ)	3	
Horizon Thickness (THKNS)	10 cm (HORIZN =1) 5 cm (HORIZN =2) 28 cm (HORIZN =3)	
Bulk Density (BD)	1.4 g/cm ³ (HORIZN =1) 1.4 g/cm ³ (HORIZN =2) 1.4 g/cm ³ (HORIZN =3)	
Initial Water Content (THETO)	0.28 cm ³ /cm ³ (HORIZN =1) 0.28 cm ³ /cm ³ (HORIZN =2) 0.251 cm ³ /cm ³ (HORIZN =3)	
Compartment Thickness (DPN)	0.1 cm (HORIZN =1) 5 cm (HORIZN =2) 4 cm (HORIZN =3)	
Field Capacity (THEFC)	0.28 cm ³ /cm ³ (HORIZN =1) 0.28 cm ³ /cm ³ (HORIZN =2) 0.251 cm ³ /cm ³ (HORIZN =3)	
Wilting Point (THEWP)	0.164 cm ³ /cm ³ (HORIZN =1) 0.164 cm ³ /cm ³ (HORIZN =2) 0.142 cm ³ /cm ³ (HORIZN =3)	
Organic Carbon Content (OC)	1.16 % (HORIZN =1) 1.16 % (HORIZN =2) 0.73 % (HORIZN =3)	

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