

SOUTH CAROLINA IRRIGATION GUIDE

CHAPTER 4. IRRIGATION WATER REQUIREMENTS

Contents

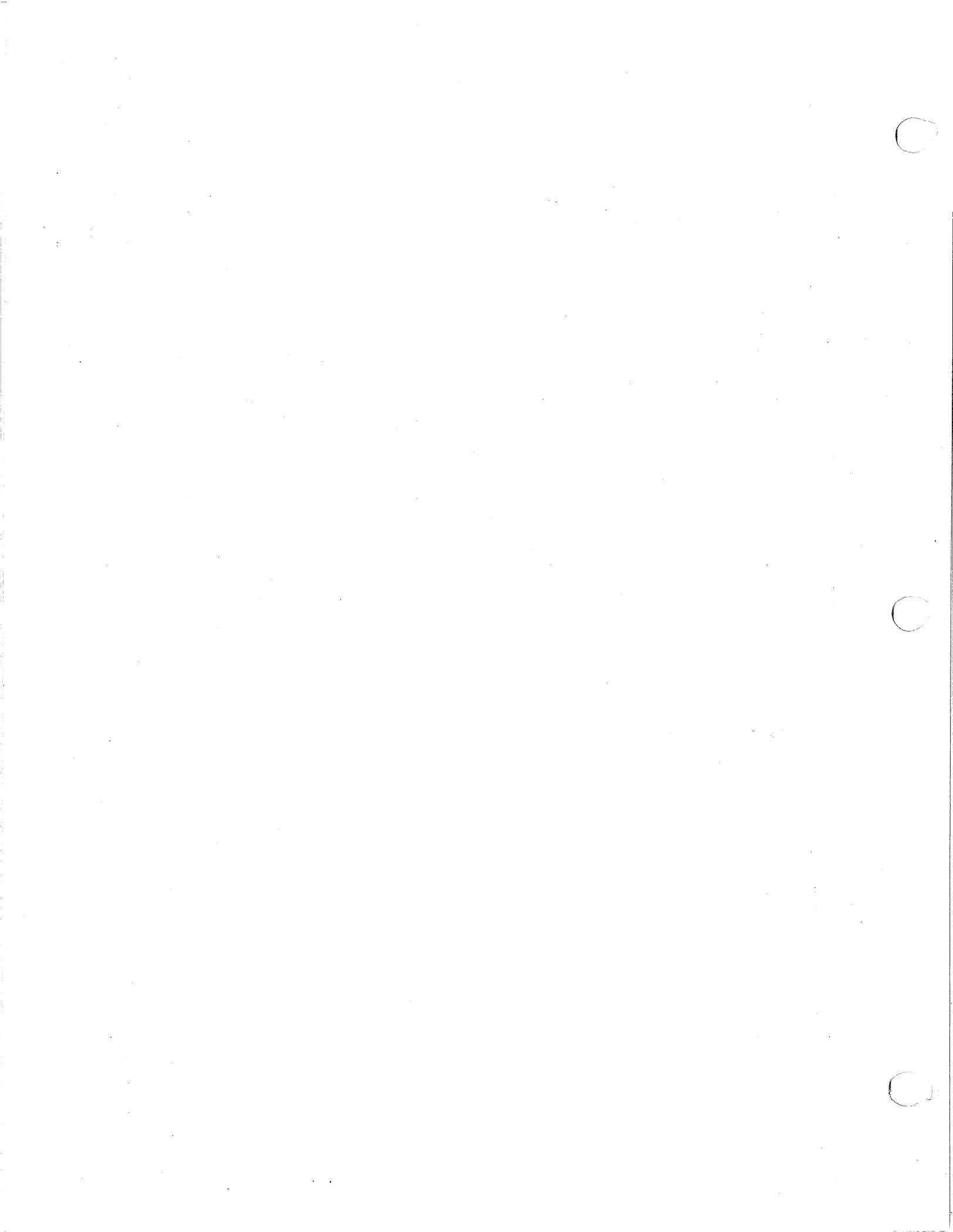
	<u>Page</u>
General.....	4-1
Consumptive Water Use and Irrigation Needs.....	4-1
Climatic Zones.....	4-1
Modifications for Trickle Irrigation Systems.....	4-1
Consumptive Use.....	4-1
Effective Rainfall.....	4-2
Net Irrigation Application Requirements.....	4-2
Gross Irrigation Requirements.....	4-2
Pre-Irrigation Requirements.....	4-3
Peak Consumptive Use Rate.....	4-3
Irrigation Frequency.....	4-3
Irrigation Period.....	4-3
Seasonal Net Irrigation Requirement.....	4-4
Seasonal Gross Irrigation Requirement.....	4-4
Seasonal Irrigation Storage Requirements.....	4-4
Example Computations.....	4-4
Recommended Design Peaks For South Carolina Crops.....	4-7
Consumptive Use and Irrigation Water Requirement.....	4-8

Figures

Figure 4-1	South Carolina Climatic Zones.....	4-6
------------	------------------------------------	-----

Tables

Table 4-1	Recommended Design Peaks For South Carolina Crops Inches/Day.....	4-7
Table 4-2	Consumptive Use and Irrigation Water Requirements-Inches.....	4-8
	Climatic Zone 1.....	4-8
	Climatic Zone 2.....	4-12
	Climatic Zone 3.....	4-16



SOUTH CAROLINA IRRIGATION GUIDE
CHAPTER 4. IRRIGATION WATER REQUIREMENTS

GENERAL

Water requirements for irrigation are based on several factors including the crop, climatic factors, soil texture and fertility, and the quality of irrigation water. The method of irrigation also affects water requirements by changing the efficiency and perhaps the consumptive use rate (trickle irrigation).

Soils and crops are respectively covered in Chapters 2 and 3. Climatic factors and water quality concerns are included in this chapter.

CONSUMPTIVE WATER USE AND IRRIGATION NEEDS

CLIMATIC ZONES

Several climatic factors influence the quantity of water needed for irrigation. Because of the effects of climate and the variation of climate, crops, and planting dates within the state, South Carolina was divided into three climatic zones. These zones are shown on page 4-6.

MODIFICATIONS FOR TRICKLE IRRIGATION SYSTEMS

Trickle irrigation systems are designed and managed to deliver light, frequent applications of water that wet only a portion of the soil. The irrigation procedures given in Chapters 2 and 3 of this Guide must be adjusted for trickle application. To meet the objective of trickle irrigation, water application is based on moisture replacement in a small area of the soil. This requires determining the wetted area, wetting pattern, and vertical and horizontal water movement in the soil. The values of water requirements, consumptive use, and frequency of irrigation are adjusted accordingly. See Chapter 10-D of this Irrigation Guide and Chapter 7 of the SCS National Engineering Handbook, Section 15 (copy maintained by SCS Engineers), for more detailed procedures for trickle irrigation.

CONSUMPTIVE USE

Consumptive use is the amount of water required to meet evapotranspiration needs so that plant production is not limited due to lack of water. Evapotranspiration and consumptive use are usually expressed in inches per day (in./day) and are used interchangeably in this publication.

The consumptive use of crops in this Guide has been calculated by criteria given in SCS Technical Release 21, dated April 1967 and revised September 1970. Normal monthly temperature, precipitation, and annual rainfall for the period 1951-1980 were used as input data to determine water requirements of various crops. Table 4-2 lists the average monthly, and seasonal

consumptive use of crops and effective rainfall for the different zones and irrigation water needs based upon 0.75 inches net depth of applications. Slight adjustments may be made for net application depths other than 0.75 inch, but for normal use (0.5 inch to 1.5 inches applied) no adjustments are required.

Input data used in calculating values for the tables in this chapter are in the appendix. Because South Carolina is located in the humid region, the seasonal consumptive-use coefficient (K) used for each crop was the lower value given in Table 2 of SCS Technical Release 21 (Revised September 1970).

EFFECTIVE RAINFALL

Effective rainfall is that portion of the total rainfall which does not evaporate, run off, or percolate below the root zone and is available to the plant to meet its consumptive use requirements.

Since there are no effective rainfall records available, total rainfall records are used and an estimate made of the percent of the total which is effective.

NET IRRIGATION APPLICATION

The net irrigation application is dependent upon the capacity of the soil profile in the root zone to store available moisture and the moisture deficit allowed. The moisture deficit is the percent of the total available moisture in the soil that evapotranspiration is allowed to remove before it is replaced by irrigation. Usually this amount is 40-50%.

Research has shown that irrigating when the moisture deficit is only 40% may significantly increase yields above that of a 50% deficit for some crops.

Net Irrigation Application =

(available soil moisture in the managed root zone) X percent deficit managed.

Example: 2.0 inches X 0.40 = 0.80 inches

GROSS IRRIGATION APPLICATION

The gross irrigation application is the net irrigation application plus the water "wasted" due to evaporation, deep percolation, non-uniform distribution, etc.

Gross Irrigation Application = $\frac{\text{Net Irrigation Application}}{\text{Irrigation Efficiency (usually 70-80%)}}$

Example: $\frac{0.8 \text{ inches}}{0.70} = 1.14 \text{ inches}$

The irrigation system must pump 1.14 inches of water to get 0.8 inches of water to the managed root zone.

IRRIGATION EFFICIENCY

The irrigation (system) efficiency is defined as the product of the application eff. x pattern eff. where

$$\text{application eff.} = \frac{\text{weighted average catch (system)} \times 100}{\text{Gross Application}}$$

and

$$\text{pattern eff.} = \frac{\text{weighted average (Low 25\%)} \times 100}{\text{Weighted Average (System)}}$$

PRE-IRRIGATION REQUIREMENTS

All values given in this chapter assume that the soil is at field capacity at the beginning of the growing season. For most of South Carolina, this is true in the early spring but late season crops may need irrigation before or shortly after planting to bring the soil moisture up to field capacity. This irrigation is not included in the values in this chapter.

PEAK CONSUMPTIVE USE RATE

The peak consumptive use rate is the highest daily amount of evapotranspiration that a crop has during its growing season. It is measured in inches per day. The duration of this peak may be days or weeks.

Design peak use rates are values based on the peak consumptive use rates from TR-21, research information, or various other state guides.

The design peak use rates should be used to determine the required flow capacity of the system. These rates are shown in the table 4-1.

IRRIGATION FREQUENCY

Irrigation frequency refers to the number of days from the beginning of one irrigation cycle to the beginning of the next cycle, assuming no effective rainfall between irrigations.

Example: Irrigate when 40% of the available moisture is depleted.
Available moisture in the root zone (18 in.) is 2.0 inches.
Crop: Corn, Peak daily consumptive use 0.33 in.

$$\text{Irrigation Frequency} = \frac{\text{Net Irrigation Application}}{\text{Peak Daily Consumptive Use}}$$

$$\text{Irrigation Frequency} = \frac{0.4 \times 2.0 \text{ in.}}{0.33 \text{ in./day}} = 2.42 \text{ days or 2 days and 10 hours}$$

This means that with no effective rainfall the system must be started at the beginning point every 2 days and 10 hours. When the use rate is less than the peak period use, the irrigation cycle will be longer.

IRRIGATION PERIOD

The irrigation period is the time that it takes the system to complete one irrigation cycle on the designed area. The irrigation period should be less than the irrigation frequency to allow for regular equipment maintenance and the repair of equipment breakdowns.

SEASONAL NET IRRIGATION REQUIREMENT

The seasonal net irrigation requirement is the amount of water needed to satisfy crop consumptive use requirements in excess of the effective rainfall during the growing season. This amount is expressed in inches and is given in the tables in this chapter. These values are computed using the TR-21 computer program based upon an 80% chance of occurrence of effective rainfall. If actual planting dates differ significantly from those indicated in the tables, water use and irrigation requirements within each month must be adjusted accordingly.

SEASONAL GROSS IRRIGATION REQUIREMENT

The seasonal gross irrigation requirement is the amount of water that must be pumped during the growing season to get the net irrigation requirement in the root zone.

$$\text{Seasonal Gross Irrigation Requirement} = \frac{\text{Net Irrigation Requirement}}{\text{Irrigation Efficiency}}$$

The values given in the tables in this chapter are based on 70% irrigation system efficiency and should provide an adequate water supply 8 out of 10 years on an average. (Measurement of overall system efficiencies of several centerpivot systems in South Carolina yielded efficiencies ranging from 32 to 76 percent with an average near 70. System efficiency is defined as the product of application eff. x pattern eff.)

IRRIGATION STORAGE REQUIREMENTS

In computing the required water storage volume for irrigation, the number of irrigations desired, the gross irrigation amount per application, recharge, insoak, and evaporation must be considered. Measurements of recharge should be during a dry period of the irrigation season if possible.

EXAMPLE COMPUTATIONS

Example No. 1:

Crop - 100 acres of corn for grain in Newberry County, South Carolina, planted in period 3/10 to 4/21 to be irrigated by sprinkler irrigation. Assume system efficiency = 70 percent.

Determine the following:

Climatic Zone - from page 4-6 = Zone 1

Design peak use rate - from page 4-7 = 0.30 inches/day

Seasonal gross irrigation requirement from page 4-8 = 16.2 inches.

Seasonal gross storage requirement needed to be available for irrigation

$$\frac{100 \text{ ac.} \times 16.2 \text{ inches}}{12 \text{ in./ft.}} = \underline{135} \text{ acre feet}$$

Seasonal gross storage volume needed assuming 80% efficiency of the storage reservoir = $\frac{135}{.8} = \underline{169}$ acre ft.

Find the pumping rate needed if irrigating 18 hours/day during the peak use period -

$$Q = \frac{453 AD}{H} \quad \text{Where } Q = \text{flow rate, gallons/min. (GPM)}$$

A = Area irrigated = 100 ac.
D = Peak use rate/ eff. = $\frac{0.30}{0.7} = 0.43$
H = Hours of pumping = 18

$$= \frac{453(100)(0.43)}{18}$$
$$= \underline{1082} \text{ GPM}$$

Example No. 2: Same system as example 1. Assume only a two week supply of water is desired by the landowner to be available during the peak use period. Find the gross storage needed assuming 80% efficiency of the storage reservoir.

$$\text{Volume} = \frac{(100 \text{ acres}) \times (0.43 \text{ inch/day}) \times (14 \text{ days})}{(0.80) 12 \text{ in./ft.}} = \underline{63} \text{ ac. ft.}$$

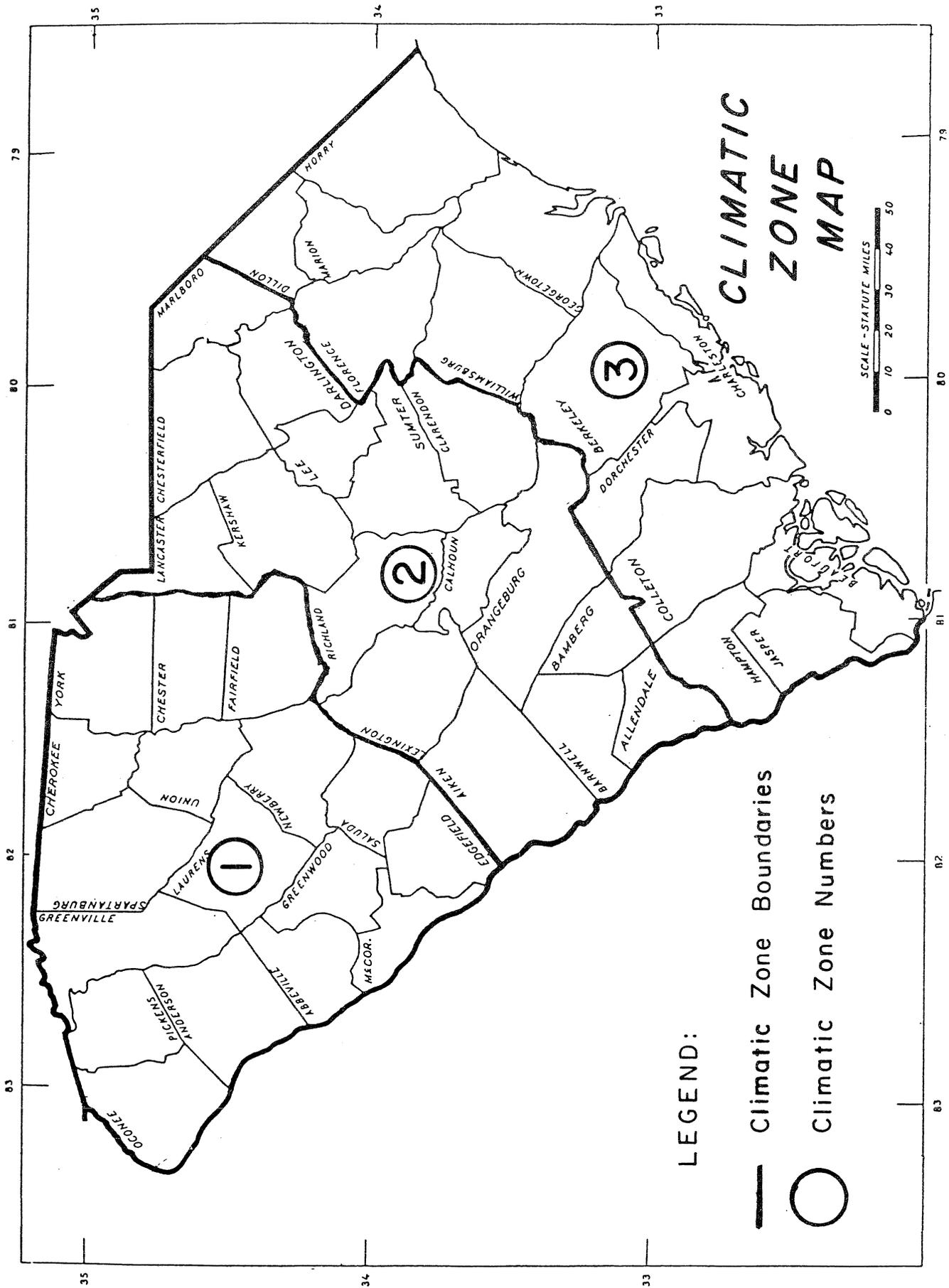


Figure 4-1
4-6

Recommended Design Peaks For South Carolina Crops

Table 4-1. Recommended Design Peaks For South Carolina Crops

<u>Cultivated Row Crops</u>	<u>Inches/Day</u>
Corn (includes silage).....	.30
Cotton.....	.30
Soybeans.....	.30
Grain Sorghum.....	.28
Peanuts.....	.25
Tobacco.....	.21
Sunflowers.....	.21
Small Grains.....	.20
 <u>Vegetables</u>	
Onions, Lettuce.....	.13
Cabbage, Turnips, Greens.....	.13
Strawberries.....	.15
Cucumbers, Cantaloupes, Squash, Snap beans, Peppers, Eggplant, Watermelon, Okra.....	.18
Sweet Corn.....	.28
Sweet Potatoes.....	.23
Tomatoes.....	.26
 <u>Orchard Crops¹</u>	
Apples.....	.24
Peaches, Plums.....	.24
Pecans, Walnuts.....	.24
 <u>Hay and Forage Crops</u>	
Alfalfa.....	.30
Pasture Grasses.....	.27
Winter annuals.....	.14

¹For trickle irrigation of these orchard crops, only 2,400 gallons per acre applied daily within the root zone area are recommended for the design peak. This is equivalent to approximately 0.13 inches/day/acre at 70 percent coverage by tree canopy. [i.e., $2,400 / (0.7 \times 27,154) = 0.126$ in/day].

Consumptive Use and Irrigation Water Requirements

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 1

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Corn, Grain	4/1	7/20	April	1.91	1.17	0	0
			May	4.94	1.74	3.19	4.6
			June	7.03	1.99	5.04	7.2
			July	4.44	1.36	3.08	4.4
			Season Totals	18.32	6.26	11.31	16.2
Corn, Silage	4/1	7/20	April	1.81	1.11	0	0
			May	4.47	1.70	2.73	3.9
			June	7.15	2.00	5.15	7.4
			July	4.89	1.41	3.47	5.0
			Season Totals	18.32	6.22	11.35	16.3
Corn, Sweet	4/1	6/30	April	2.05	1.22	.08	.1
			May	5.46	1.80	3.66	5.2
			June	7.03	1.99	5.04	7.2
			Season Totals	14.54	5.00	8.78	12.5
Soybeans, Early	5/10	9/30	May	.97	.60	0	0
			June	2.82	1.52	.93	1.3
			July	5.61	1.96	3.65	5.2
			August	7.60	1.99	5.61	8.0
			September	4.57	1.74	2.83	4.0
Season Totals	21.57	7.81	13.02	18.6			
Soybeans, Late	6/10	10/28	June	1.29	.79	0	0
			July	3.50	1.75	1.50	2.1
			August	5.89	1.81	4.07	5.8
			September	6.31	1.91	4.40	6.3
			October	2.88	1.08	1.08	2.6
Season Totals	19.87	7.35	11.77	16.8			
Small Vegetables	2/20	4/21	February	.21	.13	0	0
			March	2.63	1.61	.35	.5
			April	2.60	1.13	1.48	2.1
			Season Totals	5.44	2.86	1.83	2.6
Small Vegetables	3/20	5/19	March	.42	.26	0	0
			April	3.58	1.60	1.39	2.0
			May	2.68	1.03	1.64	2.3
			Season Totals	6.67	2.89	3.04	4.3
Small Vegetables	4/20	6/19	April	.52	.32	0	0
			May	4.47	1.70	2.22	3.2
			June	2.95	1.10	1.85	2.6
			Season Totals	7.94	3.12	4.07	5.8

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 1

Crop	Date		Month	Consumptive Use	Effective Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Small Vegetables	4/20	7/19	April	.44	.27	0	0
			May	3.70	1.62	1.50	2.1
			June	5.57	1.83	3.74	5.3
			July	2.72	1.13	1.59	2.3
			Season Totals	<u>12.44</u>	<u>4.86</u>	<u>6.83</u>	<u>9.7</u>
Small Vegetables	8/1	10/15	August	3.94	1.58	1.61	2.3
			September	4.42	1.72	2.70	3.9
			October	.97	.54	.43	0.6
			Season Totals	<u>9.32</u>	<u>3.84</u>	<u>4.73</u>	<u>6.8</u>
Tomatoes	5/1	8/2 ⁹	May	2.27	1.30	.22	.3
			June	4.47	1.72	2.74	3.9
			July	6.92	2.11	4.81	6.9
			August	4.93	1.64	3.29	4.7
			Season Totals	<u>18.59</u>	<u>6.77</u>	<u>11.07</u>	<u>15.8</u>
Sorghum	6/1	9/30	June	2.89	1.53	.61	.9
			July	6.96	2.12	4.84	6.9
			August	6.57	1.88	4.68	6.7
			September	3.45	1.63	1.82	2.6
			Season Totals	<u>19.86</u>	<u>7.16</u>	<u>11.95</u>	<u>17.1</u>
Peanuts	5/1	9/18	May	1.06	.65	0	0
			June	4.21	1.70	2.17	3.1
			July	7.87	2.23	5.64	8.1
			August	4.32	1.66	2.66	3.8
			September	.54	.33	.21	.3
			Season Totals	<u>17.99</u>	<u>6.56</u>	<u>10.68</u>	<u>15.3</u>
Wheat	11/1	5/31	November	2.34	1.11	.48	.7
			December	.62	.32	.30	.4
			January	0	0	0	0
			February	.99	.59	0.40	0.6
			March	3.76	2.12	1.30	2.4
			April	5.28	1.76	3.52	5.0
			May	2.56	1.41	1.14	1.6
			Season Totals	<u>15.55</u>	<u>7.32</u>	<u>7.48</u>	<u>10.7</u>
Snap Beans	4/20	6/19	April	.54	.33	0	0
			May	3.61	1.62	1.46	2.1
			June	3.78	1.19	2.59	3.7
			Season Totals	<u>7.94</u>	<u>3.14</u>	<u>4.05</u>	<u>5.8</u>

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 1

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Grapes	4/1	9/15	April	1.38	.84	0	0
			May	2.97	1.55	1.20	1.7
			June	4.20	1.70	2.50	3.6
			July	4.73	1.87	2.86	4.1
			August	4.16	1.64	2.52	3.6
			September	1.35	.82	.52	.7
			Season Totals	<u>18.79</u>	<u>8.43</u>	<u>9.61</u>	<u>13.7</u>
			Pasture Grasses	3/15	9/15	March	.87
April	3.10	1.56				1.14	1.6
May	4.80	1.73				3.07	4.4
June	6.05	1.88				4.17	6.0
July	6.77	2.10				4.68	6.7
August	6.19	1.84				4.34	6.2
September	2.23	1.31				.92	1.3
Season Totals	<u>30.01</u>	<u>10.95</u>				<u>18.32</u>	<u>26.2</u>
Alfalfa	3/15	9/15	March	.91	.56	0	0
			April	3.22	1.57	1.26	1.8
			May	5.18	1.77	3.41	4.9
			June	6.64	1.95	4.69	6.7
			July	7.30	2.16	5.14	7.3
			August	6.50	1.88	4.62	6.6
			September	2.27	1.32	.95	1.4
			Season Totals	<u>32.01</u>	<u>11.19</u>	<u>20.07</u>	<u>28.7</u>
Pecans & Walnuts	4/1	10/10	April	1.35	.83	0	0
			May	3.25	1.59	1.44	2.1
			June	5.37	1.81	3.56	5.1
			July	6.45	2.06	4.39	6.3
			August	5.31	1.76	3.56	5.1
			September	3.13	1.60	1.53	2.2
			October	.46	.28	.18	.3
			Season Totals	<u>25.32</u>	<u>9.92</u>	<u>14.65</u>	<u>20.9</u>
Deciduous Orchards (w/o cover)	3/20	6/15	March	.32	.20	0	0
			April	2.29	1.32	.35	.5
			May	4.63	1.71	2.92	4.2
			June	3.21	1.60	1.60	2.3
			Season Totals	<u>10.45</u>	<u>4.83</u>	<u>4.87</u>	<u>7.0</u>
Deciduous Orchards (w/o cover)	3/20	7/15	March	.28	.17	0	0
			April	2.00	1.22	.13	.2
			May	4.05	1.66	2.39	3.4
			June	5.60	1.84	3.76	5.4
			July	3.01	1.70	1.32	1.9
Season Totals	<u>14.94</u>	<u>6.58</u>	<u>7.60</u>	<u>10.9</u>			

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 1

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Deciduous Orchards (w/o cover)	3/20	8/15	March	.27	.16	0	0
			April	1.89	1.16	.09	.1
			May	3.84	1.64	2.20	3.1
			June	5.31	1.81	3.50	5.0
			July	5.90	2.00	3.91	5.6
			August	2.28	1.31	.97	1.4
			Season Totals	19.49	1/ 8.07	10.67	15.2
			Apples	3/20	9/15	March	.27
April	1.93	1.18	.11	.2			
May	3.91	1.64	2.27	3.2			
June	5.42	1.82	3.60	5.1			
July	6.02	2.01	4.01	5.7			
August	4.81	1.71	3.11	4.4			
September	1.22	.75	.47	.7			
Season Totals	23.59	9.27	13.57	19.4			
Strawberries	3/20	5/19	March	.42	.26	0	0
			April	3.58	1.60	1.39	2.0
			May	2.68	1.03	1.64	2.3
			Season Totals	6.67	2.89	3.04	4.3
Cotton	4/20	9/20	April	.26	.16	0	0
			May	1.62	.99	0	0
			June	4.45	1.72	2.70	3.9
			July	7.15	2.14	5.01	7.2
			August	5.63	1.79	3.84	5.5
			September	1.99	1.06	.93	1.3
			Season Totals	21.09	7.85	12.49	17.9

1/ Use 0.14 inches per day after maturity through September.

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 2

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Corn, Grain	3/20	7/8	March	.44	.27	0	0
			April	2.63	1.26	.79	1.1
			May	5.99	1.77	4.22	6.0
			June	6.98	2.24	4.73	6.8
			July	1.77	.63	1.14	1.6
			Season Totals	17.80	6.18	10.88	15.5
Corn, Silage	3/20	7/8	March	.42	.26	0	0
			April	2.40	1.24	.58	.8
			May	5.64	1.74	3.90	5.6
			June	7.39	2.30	5.09	7.3
			July	1.96	.66	1.30	1.9
			Season Totals	17.80	6.19	10.87	15.5
Corn, Sweet	3/20	6/18	March	.45	.27	0	0
			April	2.99	1.30	1.11	1.6
			May	6.23	1.80	4.43	6.3
			June	4.34	1.37	2.98	4.3
			Season Totals	14.01	4.74	8.52	12.2
Soybeans	5/1	9/20	May	1.59	.97	0	0
			June	3.35	1.83	1.39	2.0
			July	6.63	2.42	4.21	6.0
			August	7.46	2.34	5.12	7.3
			September	2.91	1.11	1.80	2.6
Season Totals	21.93	8.65	12.53	17.9			
Soybeans	6/10	10/28	June	1.31	.80	0	0
			July	3.53	1.96	1.33	1.9
			August	5.92	2.14	3.78	5.4
			September	6.46	1.87	4.59	6.6
			October	3.02	.96	2.06	2.9
Season Totals	20.24	7.73	11.77	16.8			
Small Vegetables	2/20	4/21	February	.22	.14	0	0
			March	2.79	1.62	.51	.7
			April	2.66	.96	1.70	2.4
			Season Totals	5.67	2.71	2.21	3.2
Small Vegetables	3/20	5/19	March	.45	.27	0	0
			April	3.71	1.36	1.78	2.5
			May	2.74	1.00	1.74	2.5
			Season Totals	6.90	2.63	3.52	5.0

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 2

Crop	Date		Month	Consumptive Use	Effective Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Small Vegetables	4/20	6/19	April	.55	.33	0	0
			May	4.61	1.64	2.44	3.5
			June	2.97	1.25	1.72	2.4
			Season Totals	<u>8.14</u>	<u>3.22</u>	<u>4.17</u>	<u>6.0</u>
Small Vegetables	4/20	7/19	April	.47	.28	0	0
			May	3.84	1.57	1.71	2.4
			June	5.65	2.08	3.57	5.1
			July	2.75	1.31	1.43	2.0
			Season Totals	<u>12.71</u>	<u>5.25</u>	<u>6.71</u>	<u>9.6</u>
Small Vegetables	8/1	10/15	August	3.97	1.87	1.34	1.9
			September	4.53	1.68	2.85	4.1
			October	1.01	.48	.54	.8
			Season Totals	<u>9.51</u>	<u>4.03</u>	<u>4.73</u>	<u>6.8</u>
Tomatoes	4/20	8/18	April	.55	.33	0	0
			May	2.69	1.41	.75	1.1
			June	5.59	2.08	3.51	5.0
			July	6.80	2.44	4.36	6.2
			August	2.94	1.19	1.76	2.5
Season Totals	<u>18.57</u>	<u>7.44</u>	<u>10.38</u>	<u>14.8</u>			
Peanuts	4/20	9/7	April	.10	.06	0	0
			May	1.95	1.19	.05	.1
			June	5.46	2.06	3.40	4.9
			July	7.88	2.59	5.29	7.6
			August	2.69	1.62	1.07	1.5
			September	.14	.09	.06	.1
Season Totals	<u>18.23</u>	<u>7.61</u>	<u>9.86</u>	<u>14.1</u>			
Grapes	3/15	8/31	March	.35	.21	0	0
			April	1.57	.94	.02	0
			May	3.21	1.52	1.70	2.4
			June	4.44	1.95	2.49	3.6
			July	4.98	2.20	2.77	4.0
			August	4.36	1.96	2.39	3.4
			Season Totals	<u>18.90</u>	<u>8.78</u>	<u>9.37</u>	<u>13.4</u>
Wheat	11/1	5/31	November	1.95	.87	.33	.5
			December	2.93	1.26	1.67	2.4
			January	2.36	1.31	1.05	1.5
			February	2.69	1.38	1.31	1.9
			March	4.55	1.89	2.67	3.8
			April	4.88	1.45	3.43	4.9
			May	1.97	1.20	.77	1.1
			Season Totals	<u>21.33</u>	<u>9.34</u>	<u>11.23</u>	<u>16.1</u>

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 2

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Snap Beans	4/10	6/9	April	1.32	.78	0	0
			May	4.54	1.63	2.69	3.8
			June	1.91	.65	1.26	1.8
			Season Totals	<u>7.76</u>	<u>3.07</u>	<u>3.94</u>	<u>5.6</u>
Sorghum	5/15	9/15	May	1.01	.61	0	0
			June	4.82	1.99	2.47	3.5
			July	7.71	2.57	5.14	7.3
			August	5.58	2.10	3.48	5.0
			September	1.58	.78	.81	1.2
			Season Totals	<u>20.70</u>	<u>8.05</u>	<u>11.90</u>	<u>17.0</u>
Pasture Grasses	3/15	9/15	March	.96	.58	0	0
			April	3.28	1.33	1.58	2.3
			May	4.99	1.68	3.31	4.7
			June	6.13	2.14	4.00	5.7
			July	6.83	2.44	4.39	6.3
			August	6.22	2.18	4.04	5.8
			September	2.27	1.30	.97	1.4
			Season Totals	<u>30.68</u>	<u>11.65</u>	<u>18.29</u>	<u>26.1</u>
Alfalfa	3/1	8/31	March	1.91	1.16	0	0
			April	3.47	1.34	2.13	3.0
			May	5.49	1.73	3.77	5.4
			June	6.87	2.23	4.64	6.6
			July	7.51	2.54	4.97	7.1
			August	6.66	2.23	4.43	6.3
			Season Totals	<u>31.90</u>	<u>11.23</u>	<u>19.92</u>	<u>28.5</u>
Pecans and Walnuts	3/20	9/30	March	.19	.12	0	0
			April	1.50	.90	0	0
			May	3.44	1.54	1.83	2.6
			June	5.54	2.07	3.47	5.0
			July	6.62	2.42	4.20	6.0
			August	5.43	2.08	3.35	4.8
			September	3.25	1.56	1.69	2.4
			Season Totals	<u>25.97</u>	<u>10.68</u>	<u>14.54</u>	<u>20.8</u>
Deciduous Orchards (w/o cover)	3/10	6/5	March	.76	.46	0	0
			April	2.73	1.27	1.00	1.4
			May	5.44	1.72	3.72	5.3
			June	1.22	0.74	0.48	0.7
			Season Totals	<u>10.15</u>	<u>4.20</u>	<u>5.20</u>	<u>7.4</u>
Deciduous Orchards (w/o cover)	3/10	7/5	March	.63	.38	0	0
			April	2.28	1.22	.55	.8
			May	4.54	1.63	2.90	4.1
			June	6.13	2.14	3.99	5.7
			July	1.09	0.67	0.43	0.6
			Season Totals	<u>14.67</u>	<u>6.04</u>	<u>7.88</u>	<u>11.2</u>

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 2

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Deciduous Orchards (w/o cover)	3/10	8/5	March	.58	.35	0	0
			April	2.08	1.20	.36	.5
			May	4.14	1.60	2.55	3.6
			June	5.60	2.08	3.52	5.0
			July	6.19	2.36	3.83	5.5
			August	0.79	0.48	0.31	0.4
			Season Totals	<u>19.39</u> ^{1/}	<u>8.06</u>	<u>10.57</u>	<u>15.1</u>
Strawberries	3/10	5/10	March	1.21	.74	0	0
			April	4.10	1.39	2.43	3.5
			May	1.13	.46	.68	1.0
			Season Totals	<u>6.44</u>	<u>2.58</u>	<u>3.11</u>	<u>4.4</u>
Cotton	4/20	9/20	April	.27	.17	0	0
			May	1.70	1.03	.02	0
			June	4.54	1.96	2.58	3.7
			July	7.26	2.50	4.75	6.8
			August	5.69	2.11	3.58	5.1
			September	2.04	1.03	1.02	1.5
Season Totals	<u>21.50</u>	<u>8.80</u>	<u>11.95</u>	<u>17.1</u>			
Watermelons	3/25	7/12	March	.23	.14	0	0
			April	2.26	1.22	.38	.5
			May	4.54	1.63	2.91	4.2
			June	5.30	2.04	3.25	4.6
			July	2.90	.87	1.21	1.7
			Season Totals	<u>14.41</u>	<u>5.91</u>	<u>7.75</u>	<u>11.1</u>

^{1/} Use 0.14 inches per day after maturity through September.

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 3

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Corn, Grain	3/10	6/29	March	.94	.58	0	0
			April	3.28	1.16	1.74	2.5
			May	6.36	1.89	4.47	6.4
			June	6.56	2.28	4.28	6.1
			July	0	0	0	0
			Season Totals	17.15	5.91	10.49	15.0
Corn, Silage	3/10	6/29	March	.90	.55	0	0
			April	2.93	1.14	1.39	2.0
			May	6.22	1.87	4.34	6.2
			June	7.10	2.36	4.75	6.8
			Season Totals	17.15	5.91	10.48	15.0
			Corn, Sweet	3/10	6/8	March	1.00
April	3.79	1.19				2.24	3.2
May	6.47	1.90				4.57	6.5
June	1.97	.65				1.32	1.9
Season Totals	13.23	4.35				8.13	11.6
Sorghum	5/15	9/15				April	1.00
			May	4.79	2.11	2.32	3.3
			June	7.64	2.83	4.81	6.9
			July	5.58	2.40	3.17	4.5
			August	1.61	.88	.73	1.0
			Season Totals	20.62	8.83	11.03	15.8
Soybeans	5/1	9/20	May	1.58	.96	0	0
			June	3.32	1.89	1.29	1.8
			July	6.57	2.66	3.90	5.6
			August	7.44	2.66	4.77	6.8
			September	2.95	1.26	1.69	2.4
			Season Totals	21.85	9.44	11.66	16.7
Soybeans, Late	6/10	10/28	June	1.29	.79	0	0
			July	3.47	2.06	1.17	1.7
			August	5.86	2.44	3.42	4.9
			September	6.51	2.12	4.39	6.3
			October	3.12	1.05	2.06	2.9
			Season Totals	20.25	8.46	11.05	15.8
Small Vegetables	9/1	11/15	September	3.52	1.75	1.03	1.5
			October	3.58	1.17	2.40	3.4
			November	.77	.38	.39	.6
			Season Totals	7.88	3.30	3.82	5.5

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 3

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Small Vegetables	2/15	4/16	February	.47	.28	0	0
			March	3.10	1.66	.87	1.2
			April	1.94	.63	1.31	1.9
			Season Totals	<u>5.51</u>	<u>2.58</u>	<u>2.18</u>	<u>3.1</u>
Small Vegetables	2/15	5/16	February	.36	.22	0	0
			March	2.48	1.43	.44	.6
			April	4.22	1.22	3.00	4.3
			May	2.15	.86	1.29	1.8
			Season Totals	<u>9.22</u>	<u>3.73</u>	<u>4.74</u>	<u>6.8</u>
Small Vegetables	2/15	6/15	February	.31	.19	0	0
			March	1.98	1.21	.14	.2
			April	3.90	1.20	2.70	3.9
			May	5.22	1.77	3.44	4.9
			June	2.06	1.02	1.05	1.5
			Season Totals	<u>13.46</u>	<u>5.38</u>	<u>7.33</u>	<u>10.5</u>
Small Vegetables	3/1	4/30	March	2.18	1.29	.14	.2
			April	3.88	1.20	2.68	3.8
			Season Totals	<u>6.05</u>	<u>2.48</u>	<u>2.82</u>	<u>4.0</u>
Small Vegetables	3/1	5/30	March	1.65	1.01	0	0
			April	3.99	1.20	2.67	3.8
			May	4.43	1.65	2.78	4.0
			Season Totals	<u>10.06</u>	<u>3.86</u>	<u>5.45</u>	<u>7.8</u>
Small Vegetables	3/1	6/29	March	1.33	.81	0	0
			April	3.42	1.17	2.02	2.9
			May	5.29	1.78	3.51	5.0
			June	4.48	2.03	2.45	3.5
			Season Totals	<u>14.52</u>	<u>5.79</u>	<u>7.99</u>	<u>11.4</u>
Small Vegetables	8/1	10/15	August	3.93	2.14	1.04	1.5
			September	4.57	1.90	2.66	3.8
			October	1.05	.52	.52	.7
			Season Totals	<u>9.54</u>	<u>4.56</u>	<u>4.23</u>	<u>6.0</u>
Tomatoes	3/1	6/29	March	1.25	.76	0	0
			April	2.97	1.14	1.57	2.2
			May	5.90	1.84	4.06	5.8
			June	5.61	2.16	3.45	4.9
			Season Totals	<u>15.73</u>	<u>5.90</u>	<u>9.08</u>	<u>13.0</u>

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 3

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Tomatoes	4/20	8/18	April	.55	.31	0	0
			May	2.69	1.45	.73	1.0
			June	5.55	2.20	3.35	4.8
			July	6.75	2.69	4.06	5.8
			August	2.94	1.36	1.59	2.3
			Season Totals	18.48	8.01	9.72	13.9
			Peanuts	4/20	9/7	April	.10
May	1.95	1.19				.05	.1
June	5.43	2.19				3.24	4.6
July	7.83	2.86				4.97	7.1
August	2.69	1.64				1.05	1.5
September	.15	.09				.06	.1
Season Totals	18.15	8.03				9.37	13.4
Grapes	3/15	8/31	March	.35	.22	0	0
			April	1.57	.88	.08	.1
			May	3.21	1.58	1.63	2.3
			June	4.41	2.07	2.34	3.3
			July	4.94	2.43	2.51	3.6
			August	4.35	2.24	2.11	3.0
			Season Totals	18.83	9.42	8.67	12.4
Winter Wheat	11/1	5/31	November	1.98	.86	.36	.5
			December	3.03	1.25	1.77	2.5
			January	2.50	1.28	1.22	1.7
			February	2.80	1.37	1.43	2.0
			March	4.58	1.81	2.77	4.0
			April	4.78	1.26	3.52	5.0
			May	1.93	1.18	.75	1.1
			Season Totals	21.59	9.02	11.83	16.9
Snap Beans	4/1	5/31	April	2.21	1.06	.40	.6
			May	5.19	1.77	3.42	4.9
			Season Totals	7.40	2.83	3.82	5.5
Pasture Grasses	3/15	9/15	March	.98	.60	0	0
			April	3.27	1.16	1.74	2.5
			May	4.97	1.75	3.23	4.6
			June	6.09	2.27	3.82	5.5
			July	6.77	2.69	4.08	5.8
			August	6.20	2.49	3.71	5.3
			September	2.31	1.38	.93	1.3
Season Totals	30.60	12.34	17.51	25.0			

Table 4-2. Consumptive Use and Irrigation Water Requirements - Inches
Climatic Zone 3

Crop	Date		Month	Consump- tive Use	Effec- tive Rainfall	Irrigation Requirements	
	Plant	Maturity				Net	Gross
Cotton	4/20	9/20	March	.27	.17	0	0
			April	1.69	1.03	.02	.03
			May	4.50	2.08	2.42	3.5
			June	7.19	2.76	4.44	6.3
			July	5.68	2.42	3.27	4.7
			August	2.08	1.17	.91	1.3
			Season Totals	21.43	9.62	11.06	15.8
Pecans and Walnuts	3/10	9/30	March	.38	.23	0	0
			April	1.54	.86	.08	.1
			May	3.53	1.61	1.92	2.7
			June	5.65	2.22	3.43	4.9
			July	6.74	2.69	4.05	5.8
			August	5.57	2.40	3.17	4.5
			September	3.39	1.78	1.62	2.3
Season Totals	26.80	11.79	14.26	20.4			
Deciduous Orchards (w/o cover)	3/1	5/30	March	1.23	.75	0	0
			April	3.02	1.14	1.60	2.3
			May	5.82	1.83	3.99	5.7
	Season Totals	10.06	3.72	5.59	8.0		
	3/1	6/30	March	.98	.60	0	0
			April	2.42	1.10	.94	1.3
			May	4.81	1.73	3.08	4.4
June			6.46	2.32	4.15	5.9	
Season Totals	14.67	5.75	8.17	11.7			
Strawberries	3/1	4/30	March	2.18	1.29	.14	.2
			April	3.88	1.20	2.68	3.8
			Season Totals	6.05	2.48	2.82	4.0
Watermelons	3/25	7/12	March	.24	.14	0	0
			April	2.25	1.09	.50	.7
			May	4.53	1.70	2.83	4.0
			June	5.26	2.17	3.09	4.4
			July	2.07	.96	1.11	1.6
			Season Totals	14.35	6.07	7.53	10.8

1/ Use 0.14 inches per day after maturity through September.

C

→

C

C