Inyo County Water Department Annual Report:
2010-11 Soil Water Conditions

Aaron Steinwand

Introduction

The Water Agreement established procedures to determine which LADWP pumping wells can be operated based on soil water and vegetation measurements. The ICWD regularly monitors depth to groundwater (DTW) and soil water content at 25 sites in wellfields and eight sites in control areas. Three of the wellfield sites are not used to determine the operational status of nearby pumping wells but are monitored to continue the data record. Eight sites were in On-status throughout the 2010-11 runoff year. Sites LW1 (July) and LW3 (October) went into Off status, and eight sites went into On–status (LW3, TA3, TA4, TA6, TS2, TS4, IO2, and SS2) during the winter. Monitoring results for available soil water, vegetation water requirement, water table depth, and the On/Off status for all sites are presented in the figures contained in Appendix A.

The purpose for the On/Off procedures is to manage pumping to protect plant communities that require periodic access to the water table for long-term survival. Generally, the sites with On-status have wet soil and shallow water tables, and sites in Off-status have dry soil and deep water tables. Because the On/Off status is a comparison soil water and predicted transpiration needs, it sometimes is not a good indicator of whether groundwater conditions are adequate or whether water table recovery is necessary. To assist the evaluation of LADWP pumping proposals, the Water Department examined the DTW and soil water data to determine whether groundwater is accessible to plants at the permanent monitoring sites at the beginning of the 2011 growing season.

How well plants can access groundwater depends on the vegetation type. In similar soils, a shallower water table is necessary to supply groundwater to grasses than shrubs because of the shallower roots of the grasses. For management purposes in the Water Agreement, shrub-dominated sites are assigned a root zone of 4 m (13.1 ft.); grass-dominated or mixed grass and shrub assemblages are assigned a root zone of 2 m (6.6 ft.). These approximate values are not the actual rooting depth at a particular monitoring site, but they are useful to compare with the soil depth that received recharge from groundwater.

The assessment of groundwater availability proceeded in several steps. First, the soil depths affected by infiltration of rain and melting snow were identified. It is usually possible to discriminate deeper soil affected by groundwater from soil near the surface affected by infiltration based on the depth and timing of the measured soil water recharge. Plant roots can utilize groundwater directly, and if the water table is within the root zone it is reasonable to conclude that groundwater is available. Plant roots can also tap groundwater that is drawn into the soil above the water table by capillarity where it is held in soil pores or adsorbed to soil particles. A rising water table brings shallower soil within reach of capillarity progressively wetting the soil from below (rather than from the surface like infiltration). Finally, plant uptake during the summer depletes soil water, and when transpiration ceases in the fall, water from the moist soil above the water table will replenish the drier soil in the root zone via capillarity even if the water table is stable or declining. This is a slow process and usually provides much less soil water recharge than water table recovery.

Results

Hydrographs for the permanent monitoring sites are presented in Appendix A, and the minimum (shallowest) DTW measured during the fall and winter preceding the 2010 and 2011 growing seasons are presented in Table 1. The minimum DTW is a useful measurement because it is most closely associated with groundwater availability the following growing season when vegetation measurements are made. Usually, the

minimum DTW occurs in the spring. In Big Pine, at the sites BP1, 2, and 3, the water table rises during the summer and reaches a minimum in the fall coinciding with the timing of diversions into the Big Pine canal for irrigation. For these three sites, the amount and depth of soil water recharge during the winter are related to the minimum water table depth in the fall. Water table conditions in 2011 at most permanent monitoring sites differed less than 0.3m (1 foot) from 2010. Exceptions were the water table declines observed at LW2, TA1 &2, IO2, SS1, SS2 and SS3, and the water table rise at IO1.

At most sites it was possible to discriminate groundwater recharge from surface infiltration despite the heavy rains that occurred in mid December, 2010 (Table 2). For some sites with a shallow water table, infiltration and groundwater recharge overlapped and identifying the minimum depth replenished by groundwater was not possible. At LW3, BP4, TS3, and IO1 where groundwater recharge began in October or November, it was possible to identify the maximum depth affected by groundwater, however. As the water table continued to rise during the winter, it is likely that shallower depths than those in Table 2 were replenished with a combination of groundwater and infiltration. For seven sites no conclusive interpretations were possible. Soil at TA5 and BG2 sites is moist at lower depths but relatively unchanging. Soil water recovery when plant uptake ceases in the fall or related to water table fluctuations are not evident, probably due to the relatively stable DTW and low plant cover.

The wellfield monitoring sites were grouped into simple categories to summarize the connection between soil water in the root zone and the water table. Brief descriptions of the three categories are given below:

1. Connected: Water table fluctuations resulted in soil water recharge in the top half of the root zone at most monitoring locations. Seven sites were placed in this category.

2. Partially connected: Water table fluctuations resulted in soil water recharge in the bottom half of the root zone at most monitoring locations. Eight sites occur in this category. Sites TA5, TS3, TS6, SS1, and BG2 have ample soil water stored in the soil profile.

3. Disconnected: No recharge from groundwater is occurring in the root zone. Ten sites occur in this category. Site L2 had retained soil water available to plants but the water table at the beginning of the 2010 growing season is too deep to recharge the root zone. Soil at the other sites is dry.

At the beginning of the 2011 growing season, the water table was capable of supplying water to the root zone at 15 monitoring sites located in wellfields (Figure 1). This is the same number as 2010 reflecting the similar water levels at sites in the connected and partially connected categories. Most sites in these categories had moist soil in all or much of the root zone. The only site that changed status in 2011 was SS3 which changed from connected to partially connected in response to water table drawdown in the Symmes-Shepherd wellfield. Two sites in the disconnected category still retain soil water following water table decline beginning in 2007 (LW2) or because the plant cover is low and the soil is always moist (TA5). The remaining eight sites have dry soil throughout the root zone.

Table 1. Minimum DTW during the fall and winter preceding the growing seasons in 2010 and 2011. Hydrographs for the sites are provided in Appendix A. Depths are below ground surface.

Site	2010 DTW	2011 DTW	DTW Change 2010-11^
	(m)	(m)	(m)
LW1	7.1	7.0	0.1
LW2	6.5	6.9	-0.4
LW3	4.9	4.9	0.0
BP1	4.2	4.0	0.2
BP2	5.6	5.5	-0.1
BP3	4.1	4.0	-0.1
BP4	4.6	4.7	-0.1
TA1&2	1.6	2.0	-0.4
TA3	5.3	5.4	-0.1
TA4	2.4	2.5	-0.1
TA5	4.0	4.0	0.0
TA6	4.0	3.9	0.1
TS1	5.7	5.8	-0.1
TS2	4.0	3.8	0.2
TS3	2.2	2.2	0.0
TS4	2.4	2.1	0.3
TS6	3.0	3.0	0.0
IO1	3.3	2.6	0.7
IO2	6.5	6.9	-0.4
SS1	3.8	4.2	-0.5
SS2	6.3	7.0	-0.7
SS3	3.0	4.0	-1.0
SS4	6.6	6.6	0.0
BG2	4.5	4.5	0.0

^: positive values denote a rise in the water table.

Table 2. Soil depth below ground surface replenished by groundwater in 2010-2011. Values are provided for each monitoring location at a site. Values are not provided if identifying a specific depth or maximum depth was uncertain. DTW was measured in the associated test well and the values have not been corrected for elevation differences between the well and monitoring site.

Site	Dominant plant species	Root Zone	Minimum DTW	Groundwater recharge depth
		(m)	(m)	(m)
LW1	greasewood	4	7.0	>3.9, >3.1, 3.1
LW2	alk. sacaton, greasewood, saltbush	2	6.9	>3.9 at all five locations
LW3	alk. sacaton, saltgrass	2	4.9	<0.7-1.5
BP1	saltbush, greasewood	3	4.0	3.1, <2.1, 1.5, 1.7, 2.7
BP2	saltbush, rabbitbrush	4	5.5	>4.2, >3.7, >3.9
BP3	greasewood, rabbitbrush	4	4.0	3.1, 2.9, 2.5
BP4	saltbush, greasewood	4	4.7	<1.9 at two locations
TA1	alk. sacaton, saltbush	2	2.0	
TA2	alk. sacaton, saltbush, greasewood, rabbitbrush	2		
TA3	saltbush, alk. sacaton, sagebrush	2	5.4	>1.9, 2.5-2.9^^
TA4	rabbitbrush, alk. sacaton	2	2.5	
TA5	greasewood, alk. sacaton	2	4.0	
TA6	saltbush, rabbitbrush	2	3.9	2.9 at all three locations
TS1	weeds, alk. sacaton	2	5.8	>3.9, >3.9, 3.3, >3.9, >3.9
TS2	sagebrush, saltbush, alk. sacaton	2	3.8	2.5, 1.9, >3.3
TS3	saltgrass, alk. sacaton	2	2.2	<1.7, <2.1, <0.7, <2.3 <1.3, <0.7
TS4	greasewood, alk. sacaton, saltbush, saltgrass	2	2.1	
TS6	alk. sacaton, saltbush, saltgrass	2	3.0	
IO1	rabbitbrush, alk. sacaton, saltbush	2	2.6	<1.3, <1.1, <1.1
IO2	saltbush	4	6.9	4.1, >3.9, >3.9
SS1	saltbush, greasewood	4	4.2	3.3, 2.3, 2.1
SS2	saltbush	4	7.0	4.5, >3.9, >3.9
SS3	saltbush	4	4.0	2.3,>3.3, 1.5
SS4	saltbush	4	6.6	3.3, >3.9, 2.5^^
BG2	inkweed, saltbush	4	4.5	

^: Less than symbols (<) denote locations where both infiltration and groundwater recharge contribute to increasing soil water content above the depth indicated.

^^: Soil water content at these depths increases slightly during winter but deeper soil remains approximately constant suggesting that the recharge mechanism is not simple capillary rise above the water table.

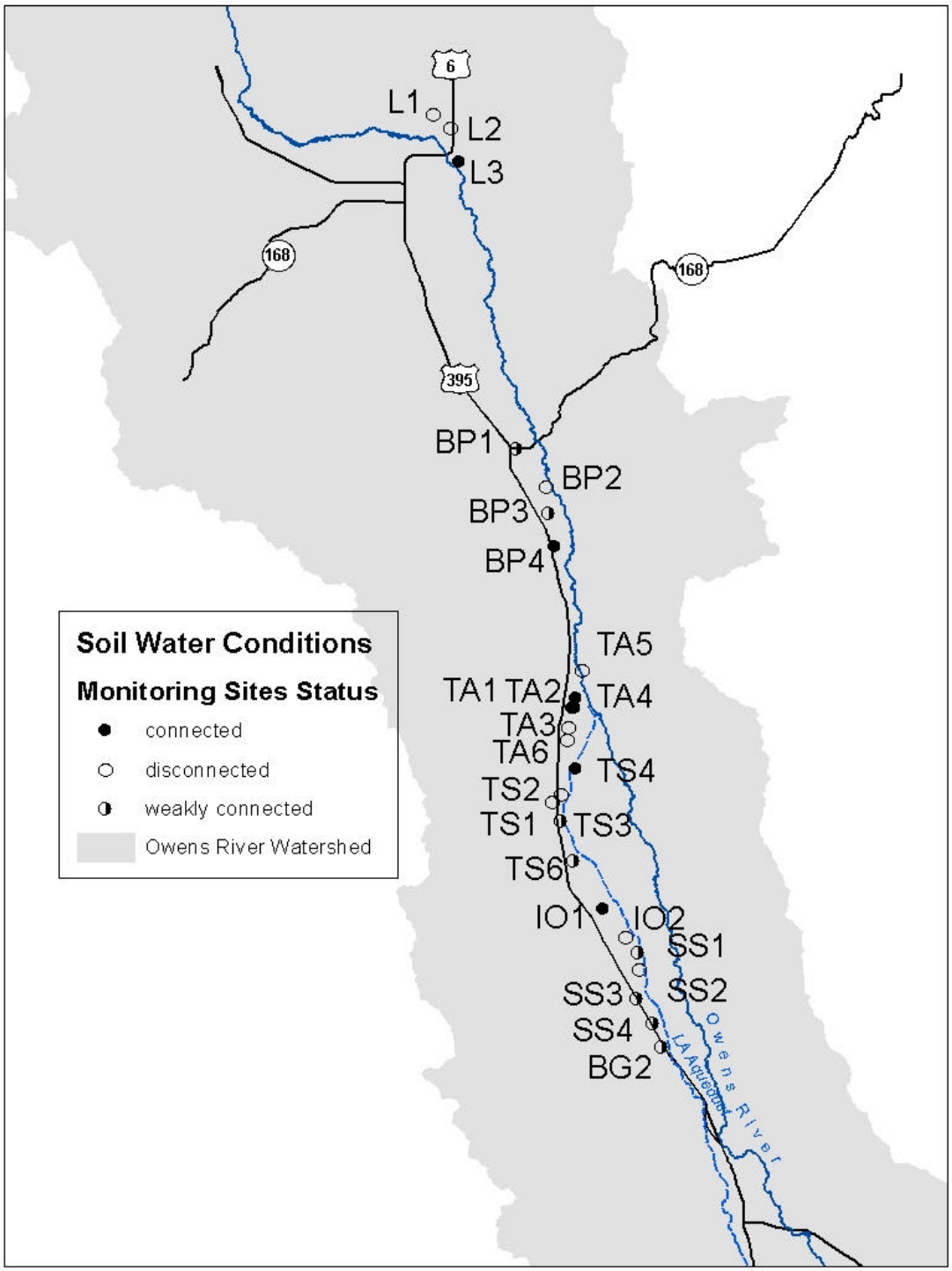


Figure 1. Owens Valley permanent monitoring sites and groundwater recharge classes.

Appendix A. Soil-plant water balance and groundwater data and July 1 and October 1 On/Off calculation tables for the permanent monitoring sites.

June 2010 monitoring site status and July 1, 2010 soil/vegetation water balance calculations according to Green Book, Section III.

Site	June, 2010 Status	July, 2010 Veg. Water Req./ Soil AWC for turn-on	July 2010 soil AWC	July 2010 Status	Soil AWC required. for well turn-on
		(cm)	(cm)		(cm)
L1	ON	8.9/NA	6.8	OFF	15.6, OFF 7-10
L2	ON	7.8/NA	30.2	ON	NA
L3	ON	11.4/NA	12.8	ON	NA
BP1	OFF	12.8/22.9	5.4	OFF	22.9†, OFF 10-97
BP2	OFF	13.6/28.4	2.6	OFF	28.4, OFF 7-98
BP3	ON	6.8/NA	7.7	ON	NA
BP4	ON	11.1/NA	60.1	ON	NA
TA3	OFF	10.0/25.9	7.7	OFF	25.9, OFF 7-98
TA4	OFF	16.3/23.2	18.1	OFF	23.2, OFF 10-98
TA5	ON	4.6/NA	24.4	ON	NA
TA6	OFF	14.9/26.8	12.7	OFF	26.8†, OFF 7-96
TS1	OFF	7.6/20.4	2.2	OFF	20.4†, OFF 10-96
TS2	OFF	10.0/19.5	7.5	OFF	19.5, OFF 7-98
TS3	ON	13.9/NA	24.5	ON	NA
TS4	OFF	18.2/47.9	36.4	OFF	47.9, OFF 10-03
IO1	OFF	34.4/42.2	26.0	OFF	42.2, OFF 10-98
IO2	OFF	9.3/14.8	4.9	OFF	14.8, OFF 7-05
SS1	ON	11.7/NA	38.8	ON	NA
SS2	OFF	7.8/13.4	3.8	OFF	13.4, OFF 7-03
SS3	ON	15.3/NA	40.2	ON	NA
SS4	OFF	9.4/15.9	5.2	OFF	15.9, OFF 7-05
BG2	ON	7.7/NA	29.9	ON	NA

†: These values of soil water required for well turn-on were derived using calculations based on % cover that were routinely performed in the past. The values have not been updated to conform to the Green Book equations in section III.D.2, p. 57-59.

Monitoring site status and soil/vegetation water balance calculations for October 1, 2010 according to Green Book, Section III.

Site	July 1, 2010 Status	October, 2010 Veg. Water Req./Soil AWC for turn-on	October 2010 soil AWC	+50% annual ppt.	October 1 2010 Status	Soil AWC req. for well turn-on
		(cm)	(cm)	(cm)		(cm)
L1	OFF	15.6/15.6	2.3	NA	OFF	15.6, OFF 7-10
L2	ON	14.2/NA	25.5	25.5 + 7.9 = 33.4	ON	NA
L3	ON	21.0/NA	7.7	7.7 + 7.9 = 15.6	OFF	21.0, OFF 10-10
BP1	OFF	23.5/22.9	4.4	NA	OFF	22.9†, OFF 10-97
BP2	OFF	25.1/28.4	1.5	NA	OFF	28.4, OFF 7-98
BP3	ON	12.2/NA	10.3	10.3 + 7.6 = 17.9	ON	NA
BP4	ON	19.9/NA	53.5	53.5 + 8.2 = 61.7	ON	NA
TA3	OFF	18.5/25.9	5.7	NA	OFF	25.9, OFF 7-98
TA4	OFF	30.3/23.2	14.6	NA	OFF	23.2, OFF 10-98
TA5	ON	8.4/NA	21.5	21.5 + 8.2 = 29.7	ON	NA
TA6	OFF	27.7/26.8	9.5	NA	OFF	26.8†, OFF 7-96
TS1	OFF	14.0/20.4	1.3	NA	OFF	20.4†, OFF 10-96
TS2	OFF	18.4/19.5	5.5	NA	OFF	19.5, OFF 7-98
TS3	ON	25.6/NA	19.2	19.2 + 7.3 = 26.5	ON	NA
TS4	OFF	33.0/47.9	26.2	NA	OFF	47.9, OFF 10-03
IO1	OFF	64.0/42.2	22.7	NA	OFF	42.2, OFF 10-98
IO2	OFF	17.3/14.8	3.5	NA	OFF	14.8, OFF 7-05
SS1	ON	21.5/NA	34.8	34.8 + 6.5 = 41.3	ON	NA
SS2	OFF	14.6/13.4	3.0	NA	OFF	13.4, OFF 7-03
SS3	ON	28.4/NA	29.3	29.3 + 6.5 = 35.8	ON	NA
SS4	OFF	18.2/15.9	4.5	NA	OFF	15.9, OFF 7-05
BG2	ON	13.9/NA	28.9	28.9 + 6.5 = 35.4	ON	NA

†: These values of soil water required for well turn-on were derived using calculations based on percent cover that were routinely performed in the past. The values have not been updated to conform with the Greenbook equations in section III.D.2, p. 57-59.

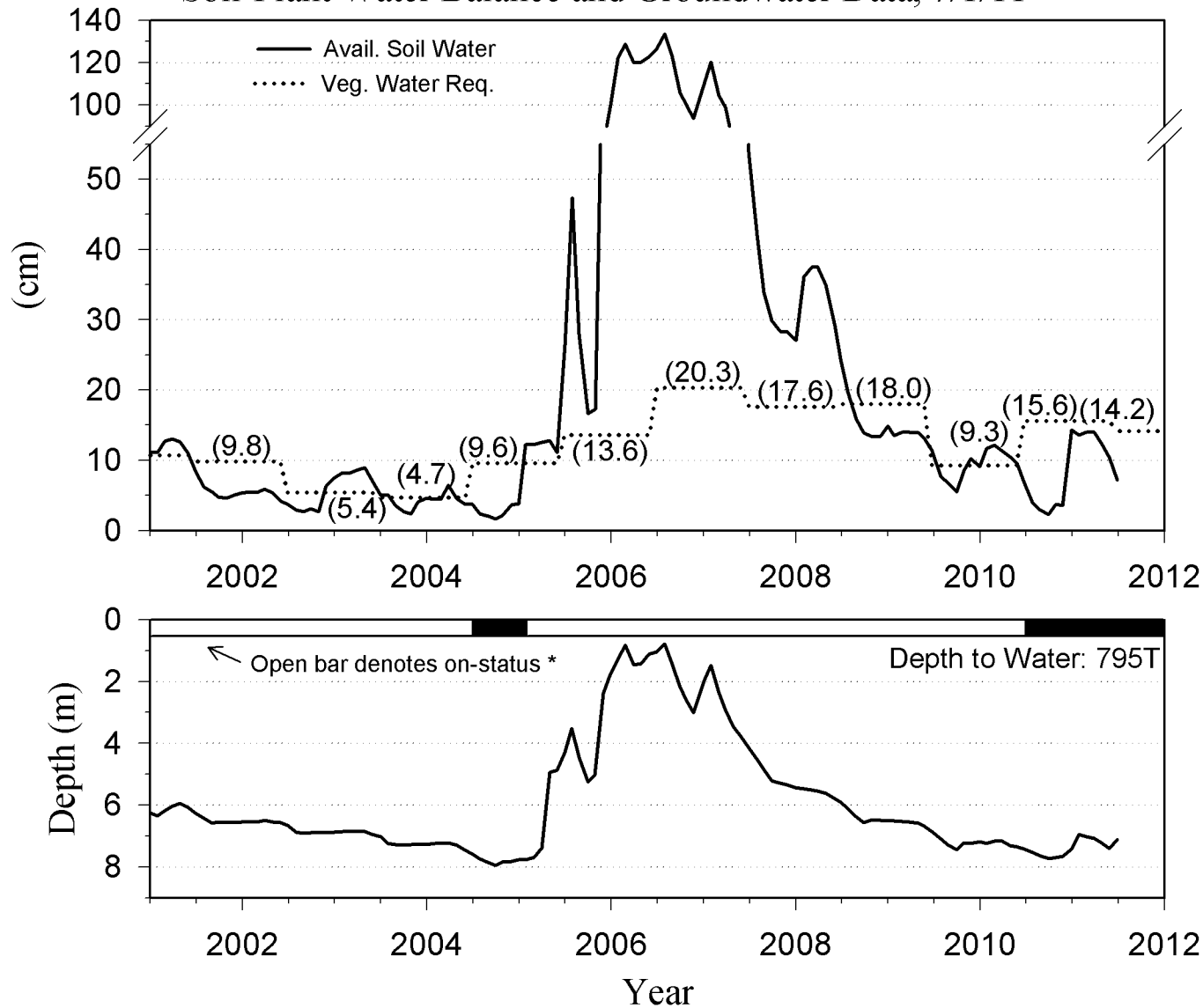
June 2011 monitoring site status and July 1, 2011 soil/vegetation water balance calculations according to Green Book, Section III.

Site	June, 2011 Status	July, 2011 Veg. Water Req./ Soil AWC for turn-on	July 2011 soil AWC	July 2011Status	Soil AWC required. for well turn-on
		(cm)	(cm)		(cm)
L1	OFF	8.1/15.6	7.2	OFF	15.6, OFF 7-10
L2	ON	6.7/NA	28.1	ON	NA
L3	ON	13.7/NA	13.9	ON	NA
BP1	OFF	11.6/22.9	8.2	OFF	22.9†, OFF 10-97
BP2	OFF	15.0/28.4	5.6	OFF	28.4, OFF 7-98
BP3	ON	9.2/NA	16.2	ON	NA
BP4	ON	8.9/NA	63.8	ON	NA
TA3	ON	13.8/NA	16.9	ON	NA
TA4	ON	12.4/NA	16.9	ON	NA
TA5	ON	4.8/NA	26.9	ON	NA
TA6	ON	9.4/NA	17.1	ON	NA
TS1	OFF	4.4/20.4	6.6	OFF	20.4†, OFF 10-96
TS2	ON	7.5/NA	14.1	ON	NA
TS3	ON	16.5/NA	25.1	ON	NA
TS4	ON	30.9/NA	43.9	ON	NA
IO1	OFF	30.0/42.2	37.1	OFF	42.2, OFF 10-98
IO2	ON	10.1/NA	8.0	OFF	18.9, OFF 7-11
SS1	ON	15.0/NA	38.3	ON	NA
SS2	ON	13.8/NA	4.8	OFF	25.6, OFF 7-11
SS3	ON	18.1/NA	28.4	ON	NA
SS4	OFF	12.3/15.9	6.3	OFF	15.9, OFF 7-05
BG2	ON	11.6/NA	31.9	ON	NA

†: These values of soil water required for well turn-on were derived using calculations based on % cover that were routinely performed in the past. The values have not been updated to conform to the Green Book equations in section III.D.2, p. 57-59.

LAWS MONITORING SITE #1

Soil-Plant Water Balance and Groundwater Data, 7/1/11



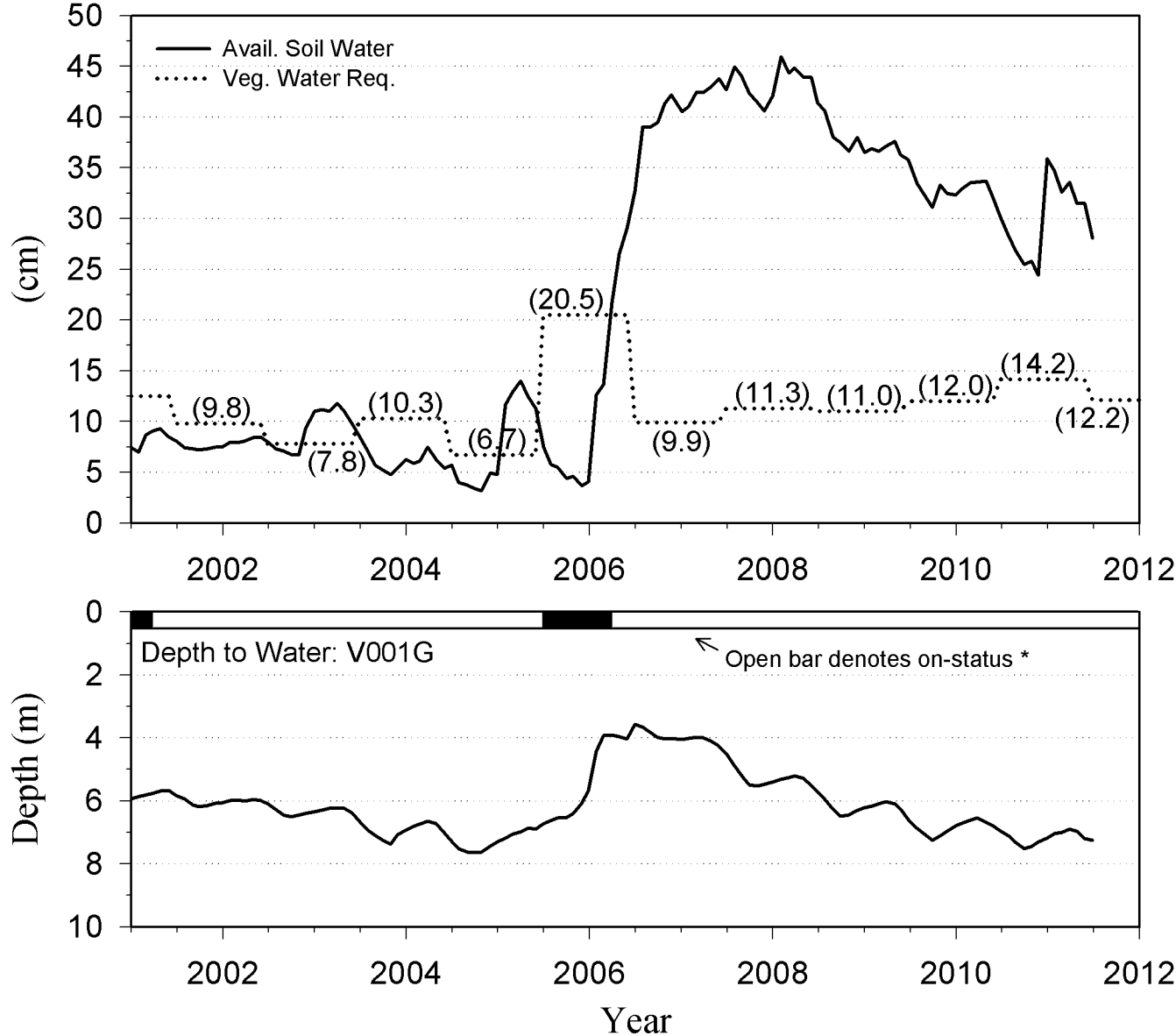
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells- 247, 248, 249, 398

Soil water required for turn on (15.6 cm)

LAWS MONITORING SITE #2

Soil-Plant Water Balance and Groundwater Data, 7/1/11



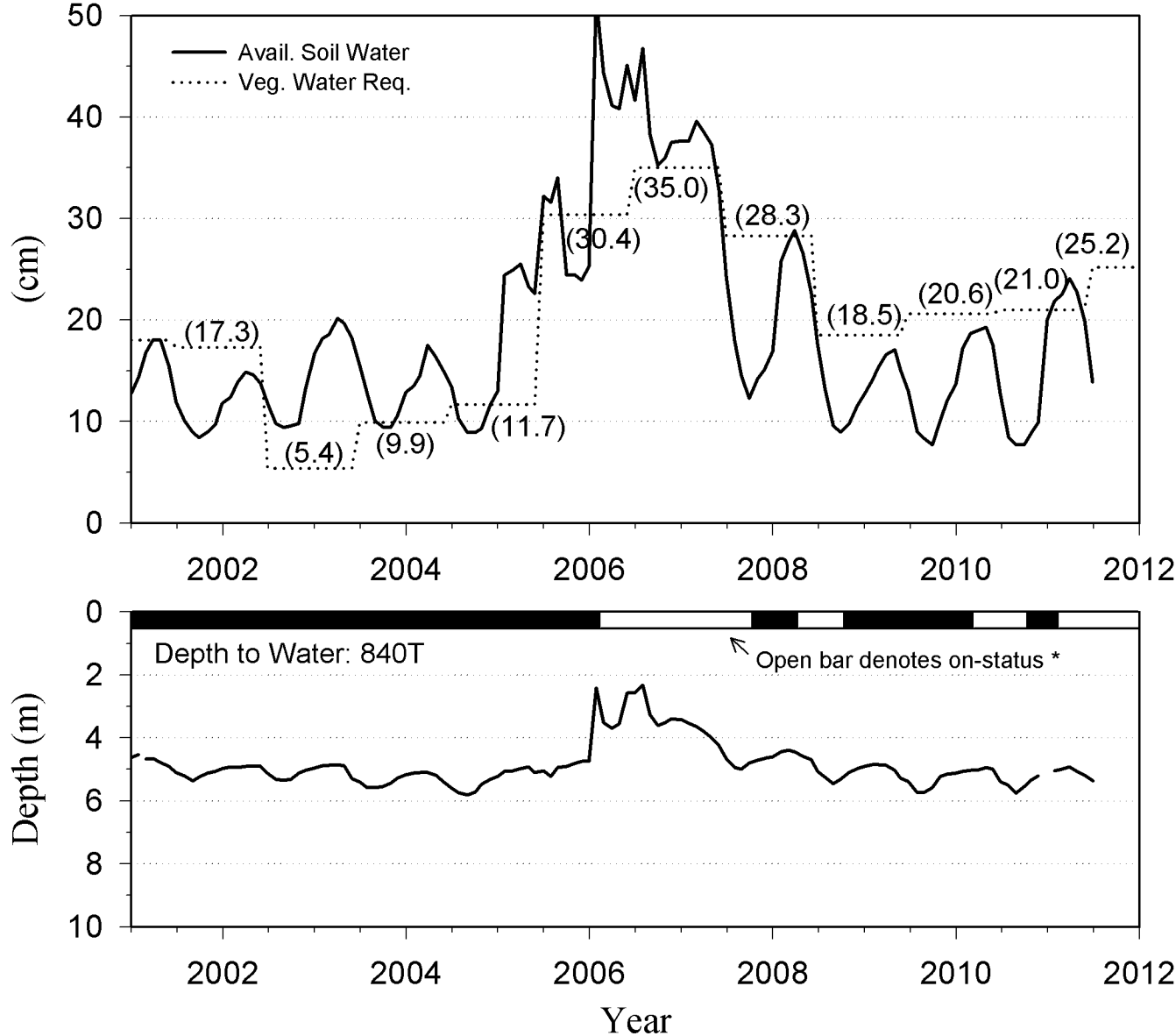
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells - 236, 239, 243, 244

Soil water required for turn on (--)

LAWS MONITORING SITE #3

Soil-Plant Water Balance and Groundwater Data, 7/1/11



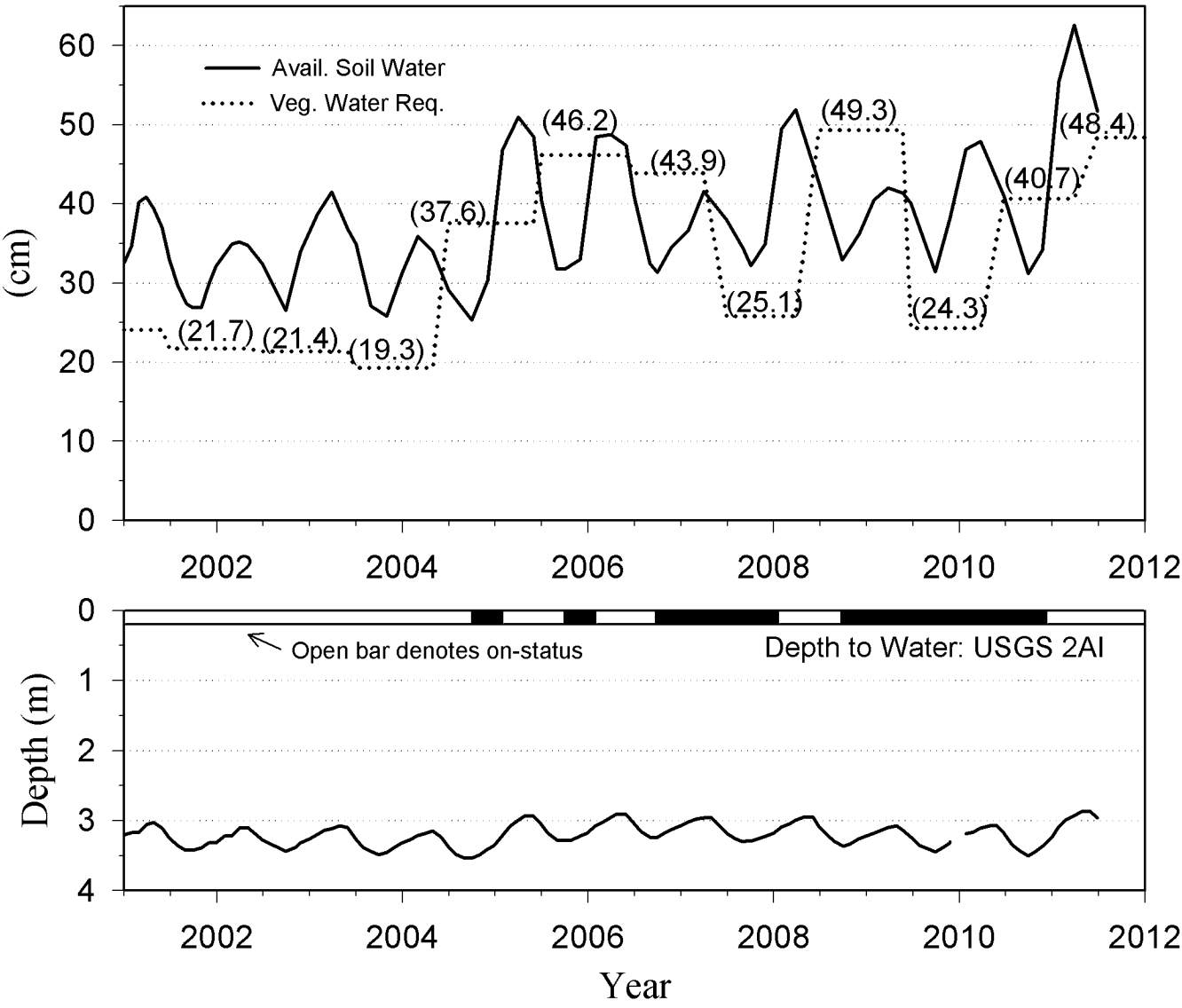
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells - 240, 241, 399, 376, 377

Soil water required for turn on (--)

BISHOP CONTROL SITE #1

Soil-Plant Water Balance and Groundwater Data, 7/1/11

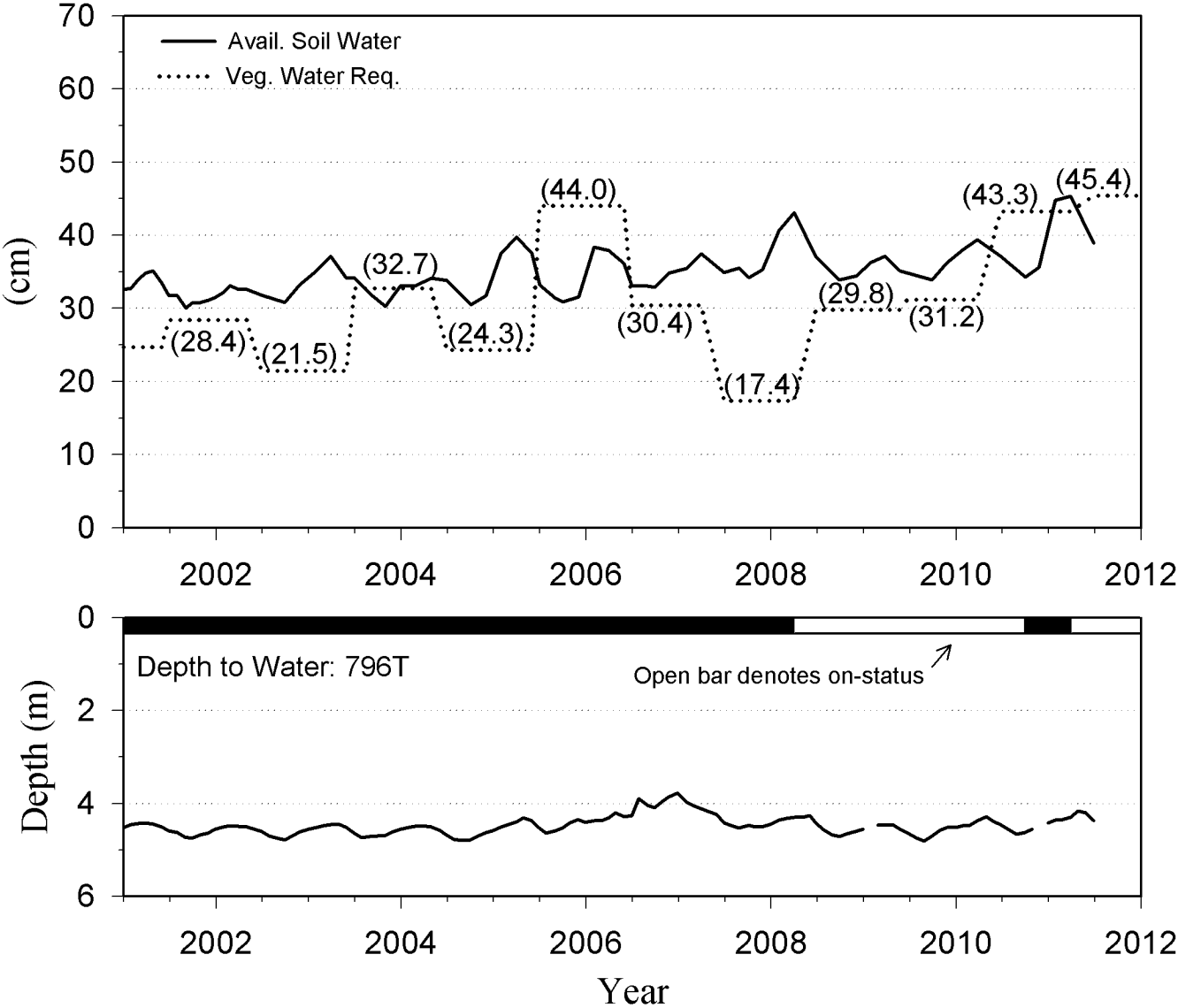


*On/off according to the Green Book Section III values for Veg. Water Req.

Soil water required for turn on (--)

BISHOP CONTROL SITE #2

Soil-Plant Water Balance and Groundwater Data, 7/1/11

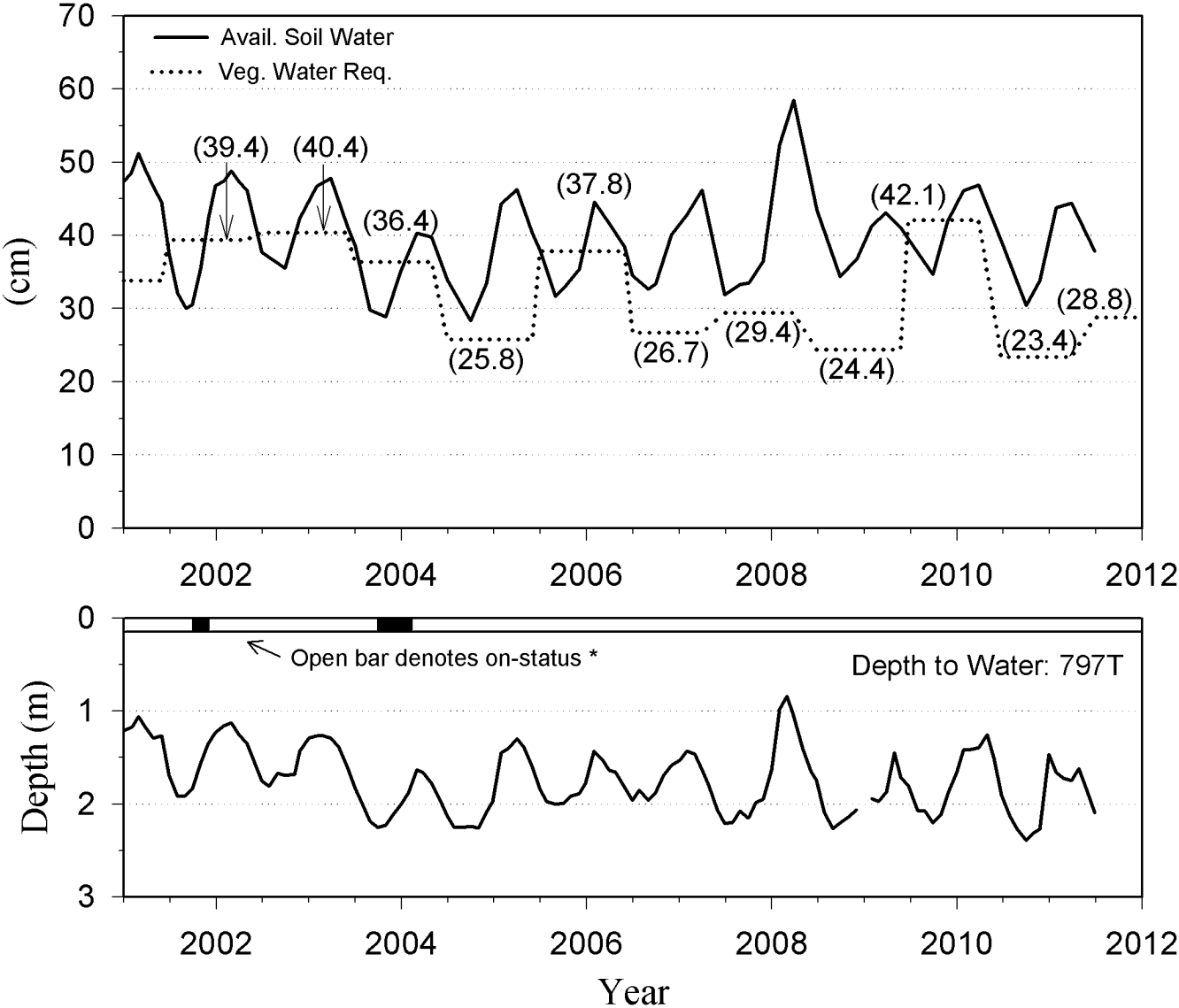


*On/off according to the Green Book Section III values for Veg. Water Req.

Soil water required for turn on (--)

BISHOP CONTROL SITE #3

Soil-Plant Water Balance and Groundwater Data, 7/1/11

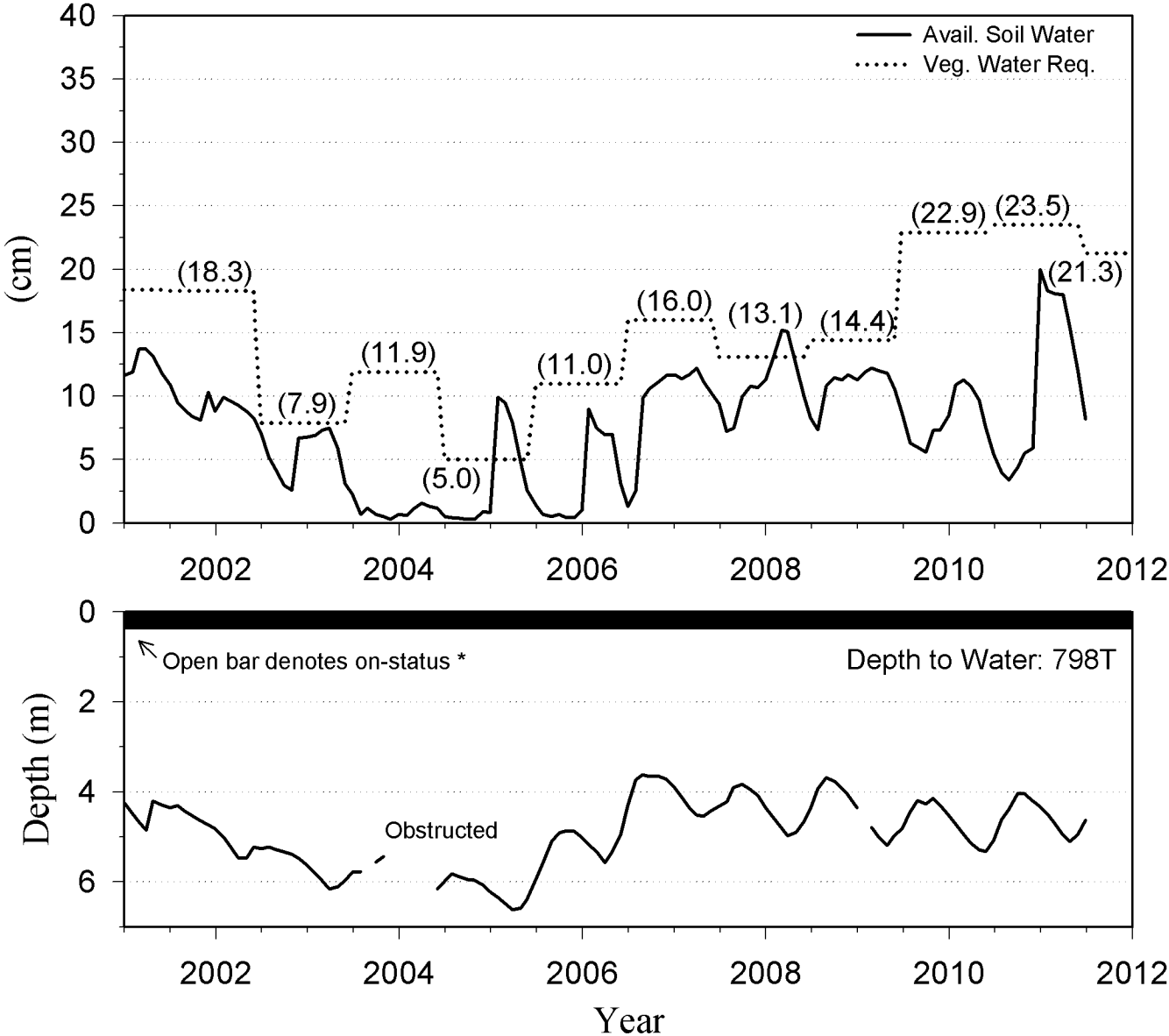


*On/off according to the Green Book Section III values for Veg. Water Req.

Soil water required for turn on (--)

BIG PINE MONITORING SITE #1

Soil-Plant Water Balance and Groundwater Data, 7/1/11



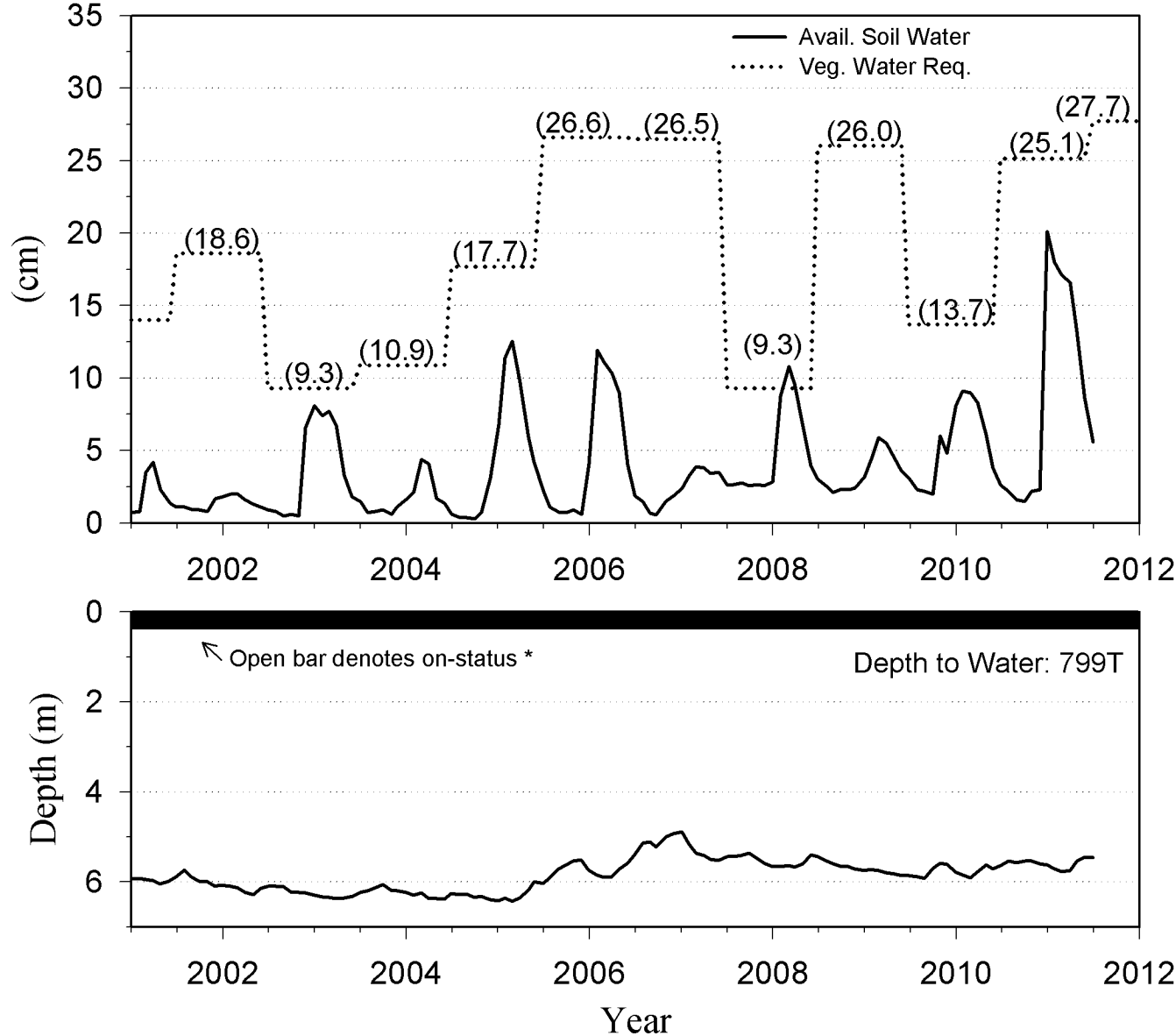
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells - 210, 378, 379, 389

Soil water required for turn on (22.9 cm)

BIG PINE MONITORING SITE #2

Soil-Plant Water Balance and Groundwater Data, 7/1/11



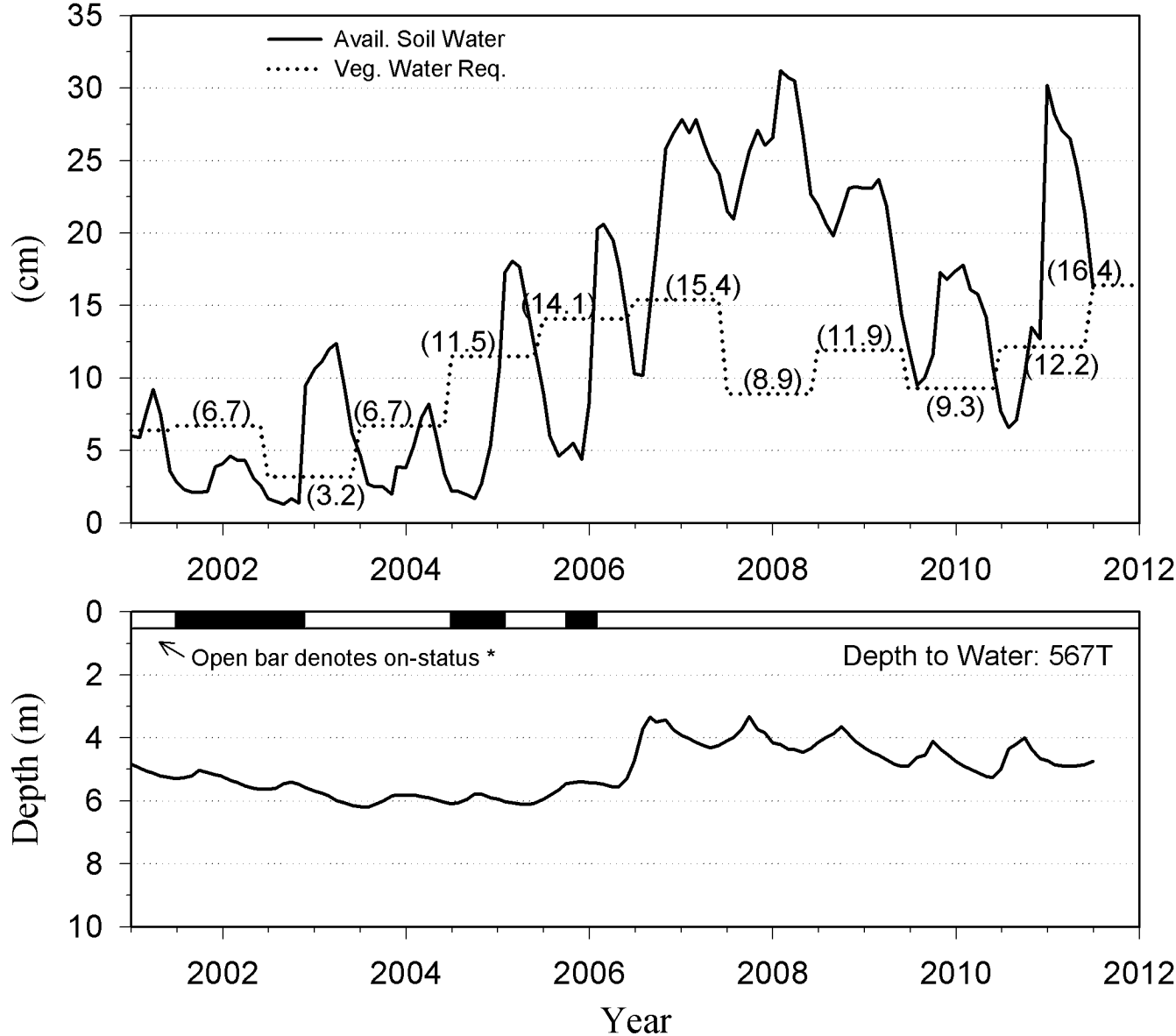
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells - 220, 229, 374, 375

Soil water required for turn on (28.4 cm)

BIG PINE MONITORING SITE #3

Soil-Plant Water Balance and Groundwater Data, 7/1/11



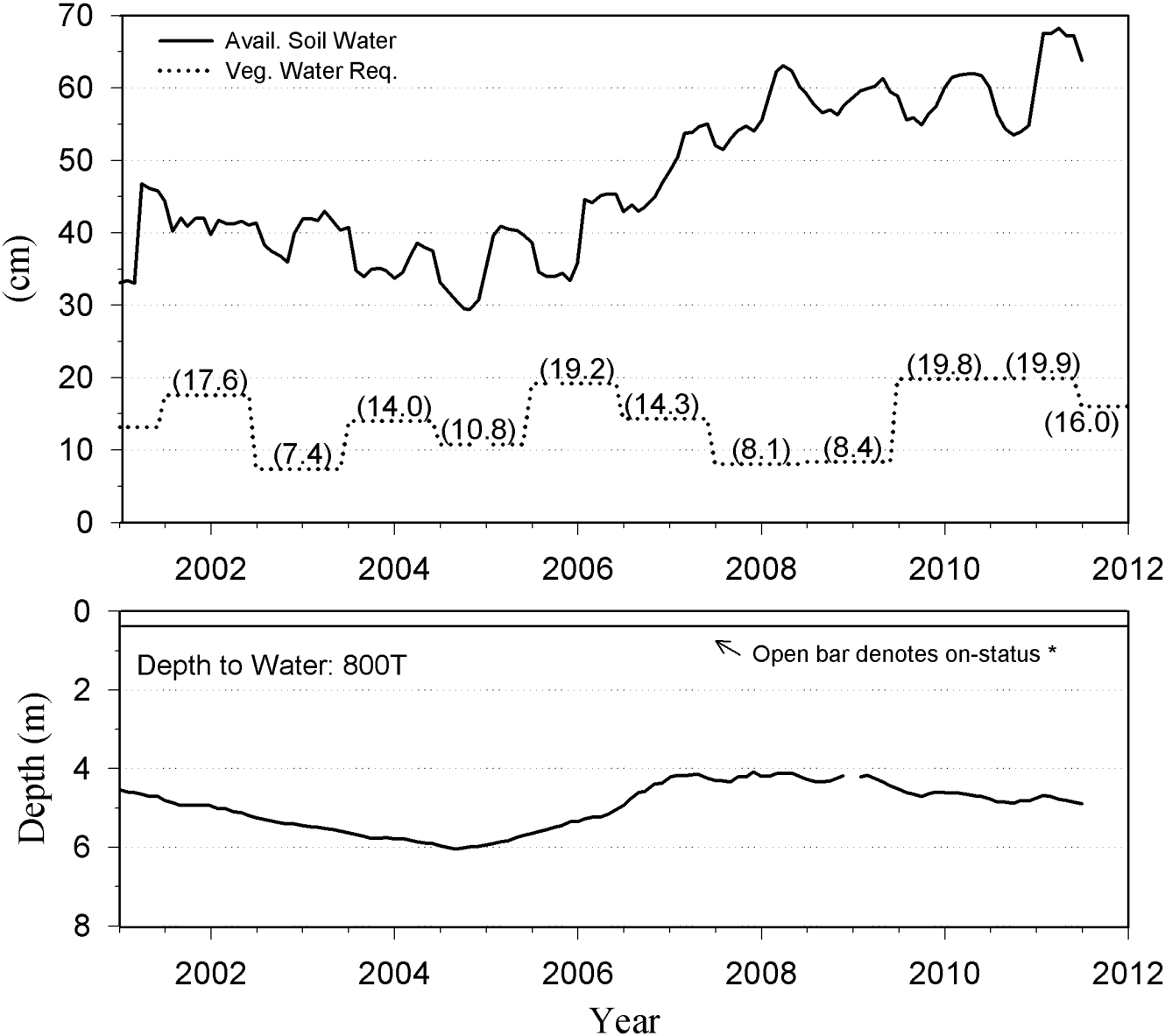
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells - 222, 223, 231, 232

Soil water required for turn on (--)

BIG PINE MONITORING SITE #4

Soil-Plant Water Balance and Groundwater Data, 7/1/11



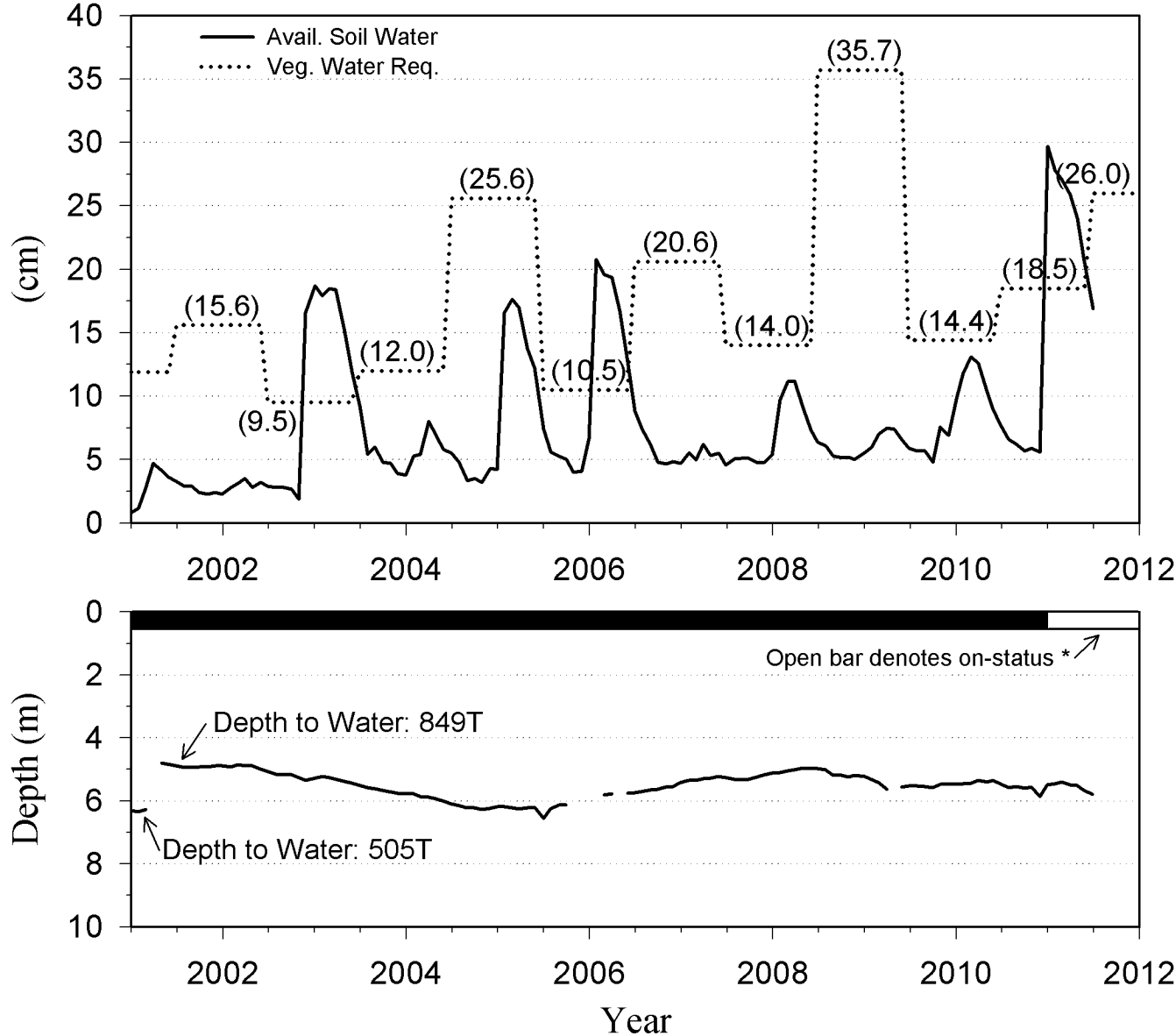
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping well - 331

Soil water required for turn on (--)

TABOOSE/ABERDEEN MONITORING SITE #3

Soil-Plant Water Balance and Groundwater Data, 7/1/11



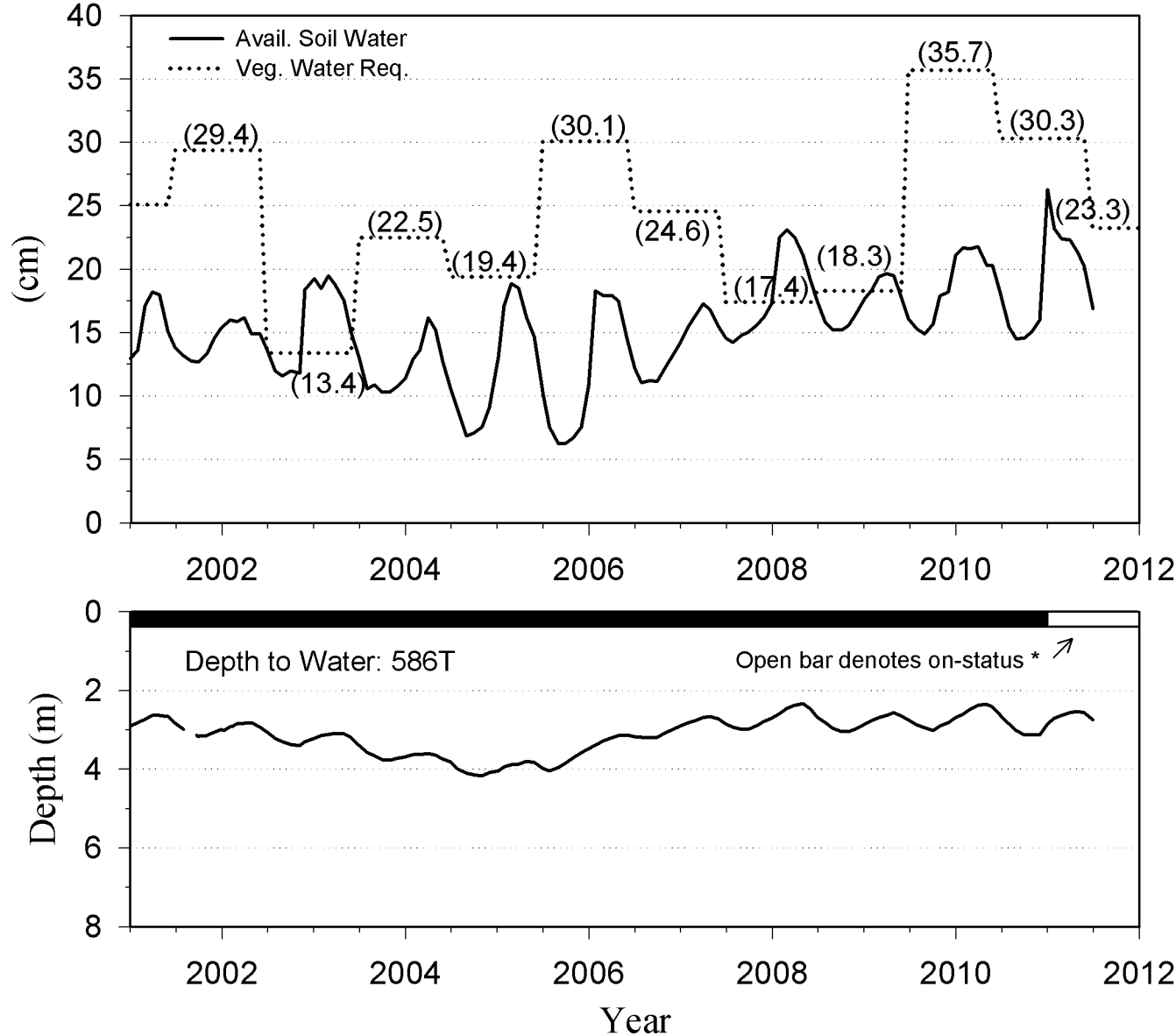
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells - 106, 110, 111, 114

Soil water required for turn on (--)

TABOOSE/ABERDEEN MONITORING SITE #4

Soil-Plant Water Balance and Groundwater Data, 7/1/11



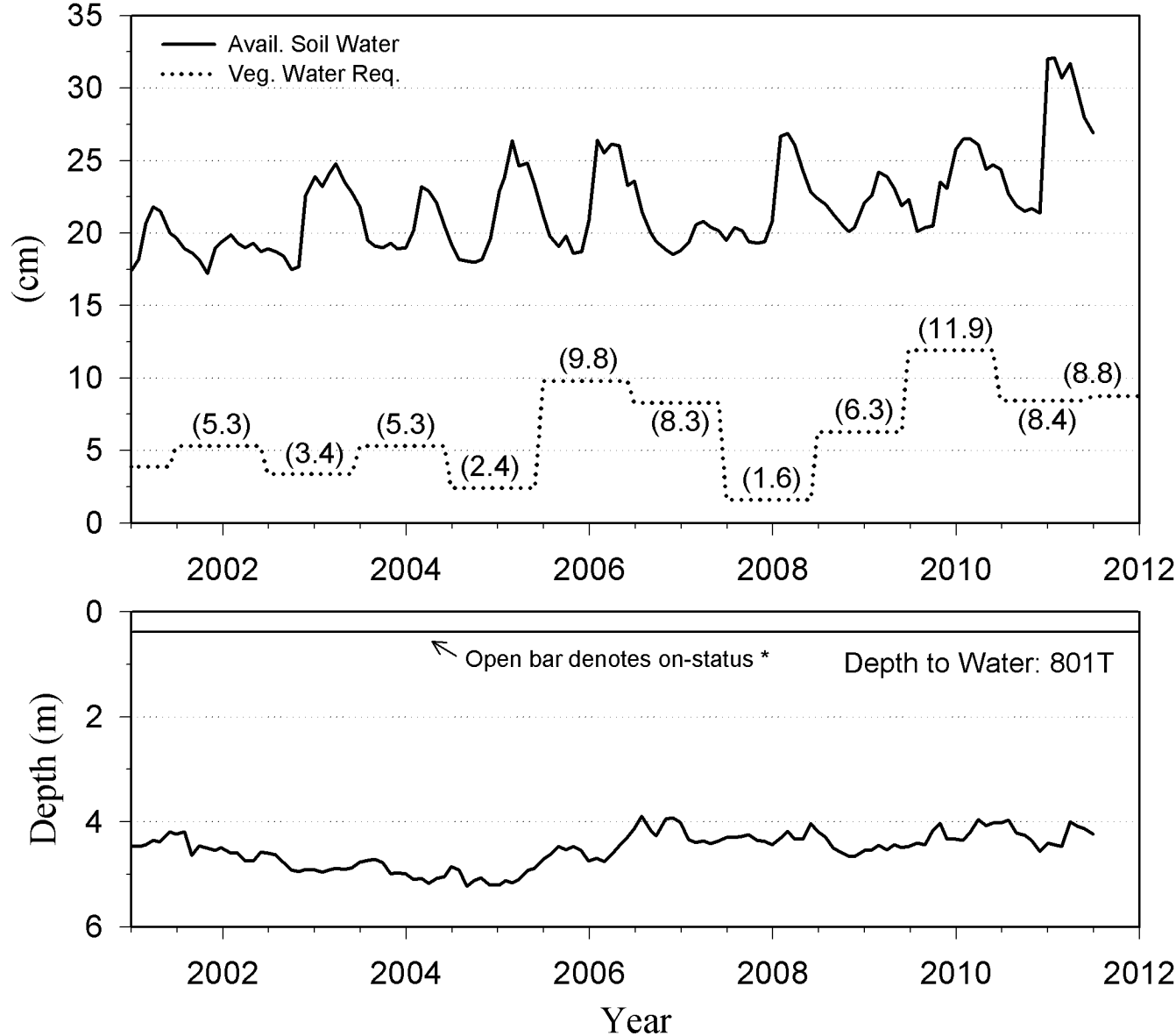
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells - 342, 347

Soil water required for turn on (--)

TABOOSE/ABERDEEN MONITORING SITE #5

Soil-Plant Water Balance and Groundwater Data, 7/1/11



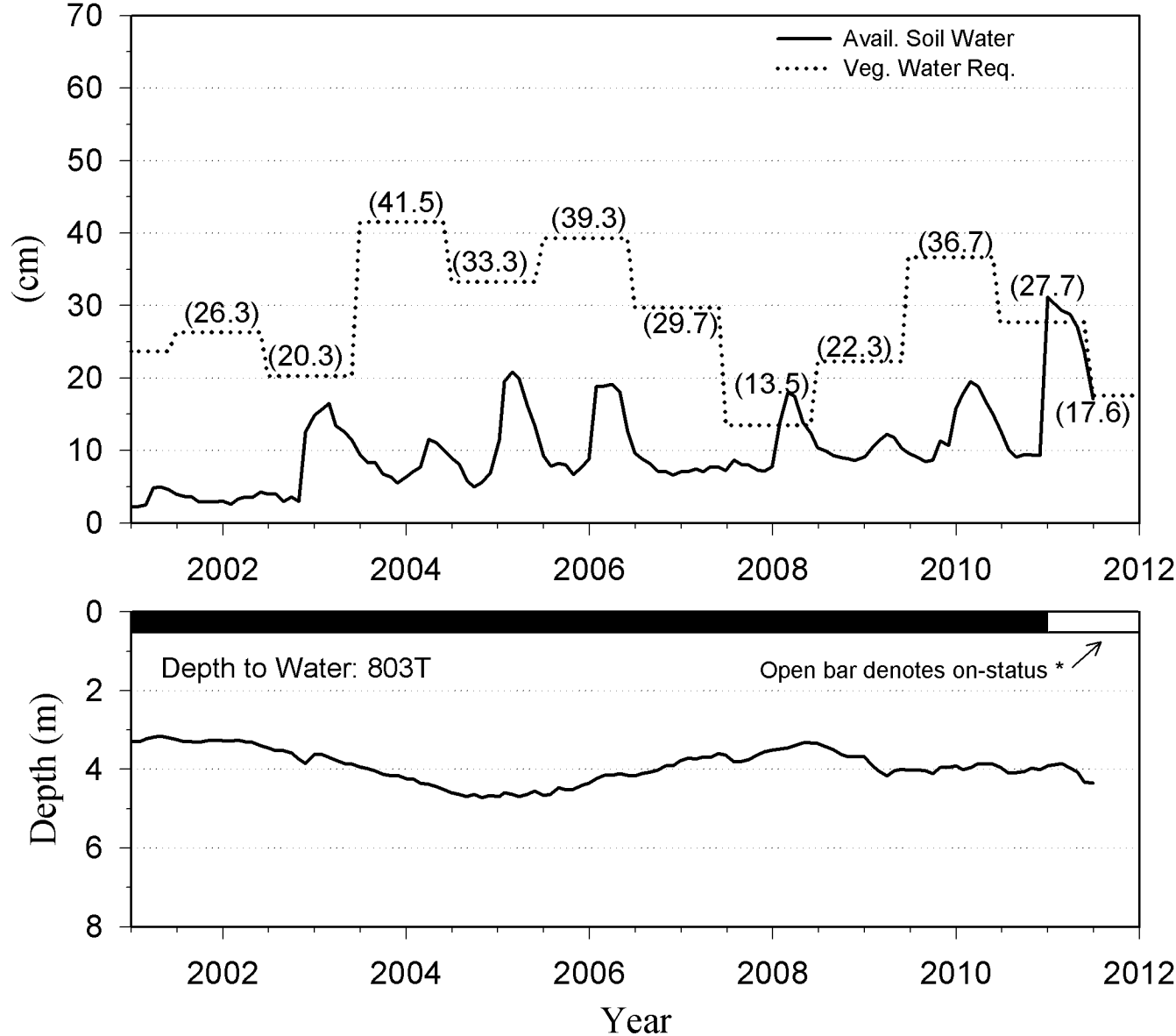
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III value for Veg. Water Req.

Linked pumping well - 349

Soil water required for turn on (--)

TABOOSE/ABERDEEN MONITORING SITE #6

Soil-Plant Water Balance and Groundwater Data, 7/1/11



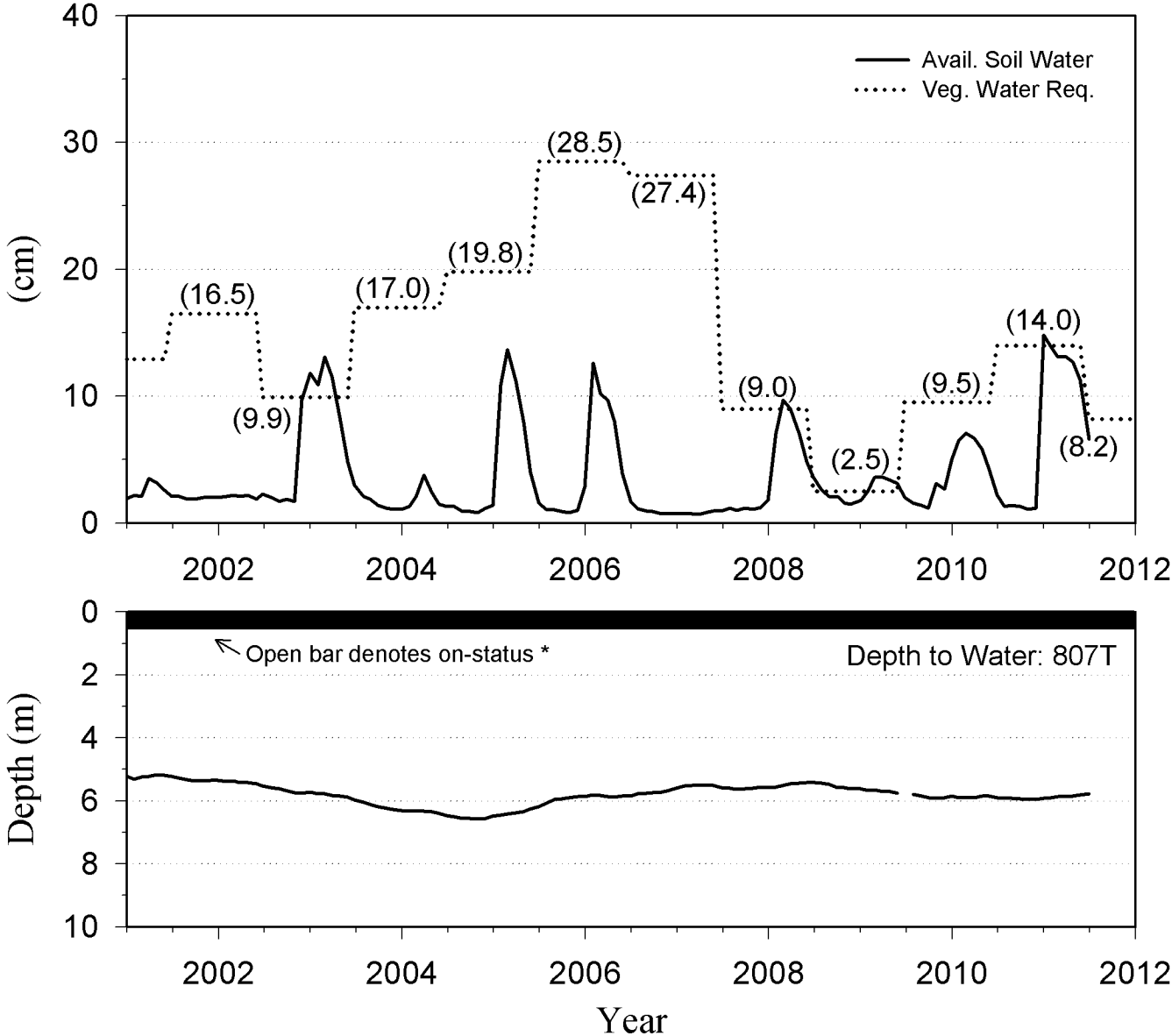
* Wells not necessarily operated when in on-status. On\off according to Green Book Section III values for Veg. Water Req.

Linked pumping wells - 109, 370

Soil water required for turn on (--)

THIBAUT/SAWMILL MONITORING SITE #1

Soil-Plant Water Balance and Groundwater Data, 7/1/11



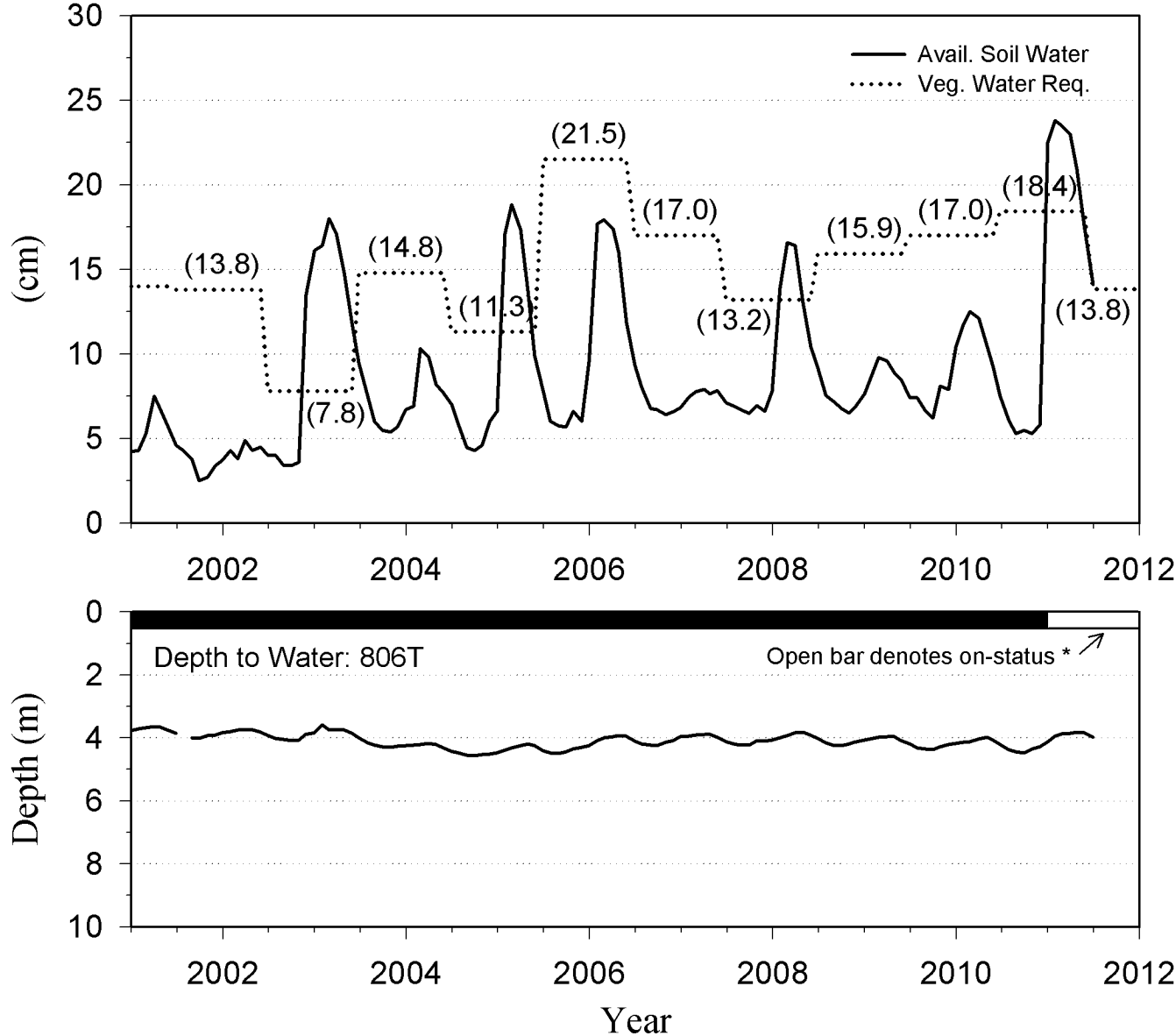
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping well - 159

Soil water required for turn on (20.4 cm)

THIBAUT/SAWMILL MONITORING SITE #2

Soil-Plant Water Balance and Groundwater Data, 7/1/11



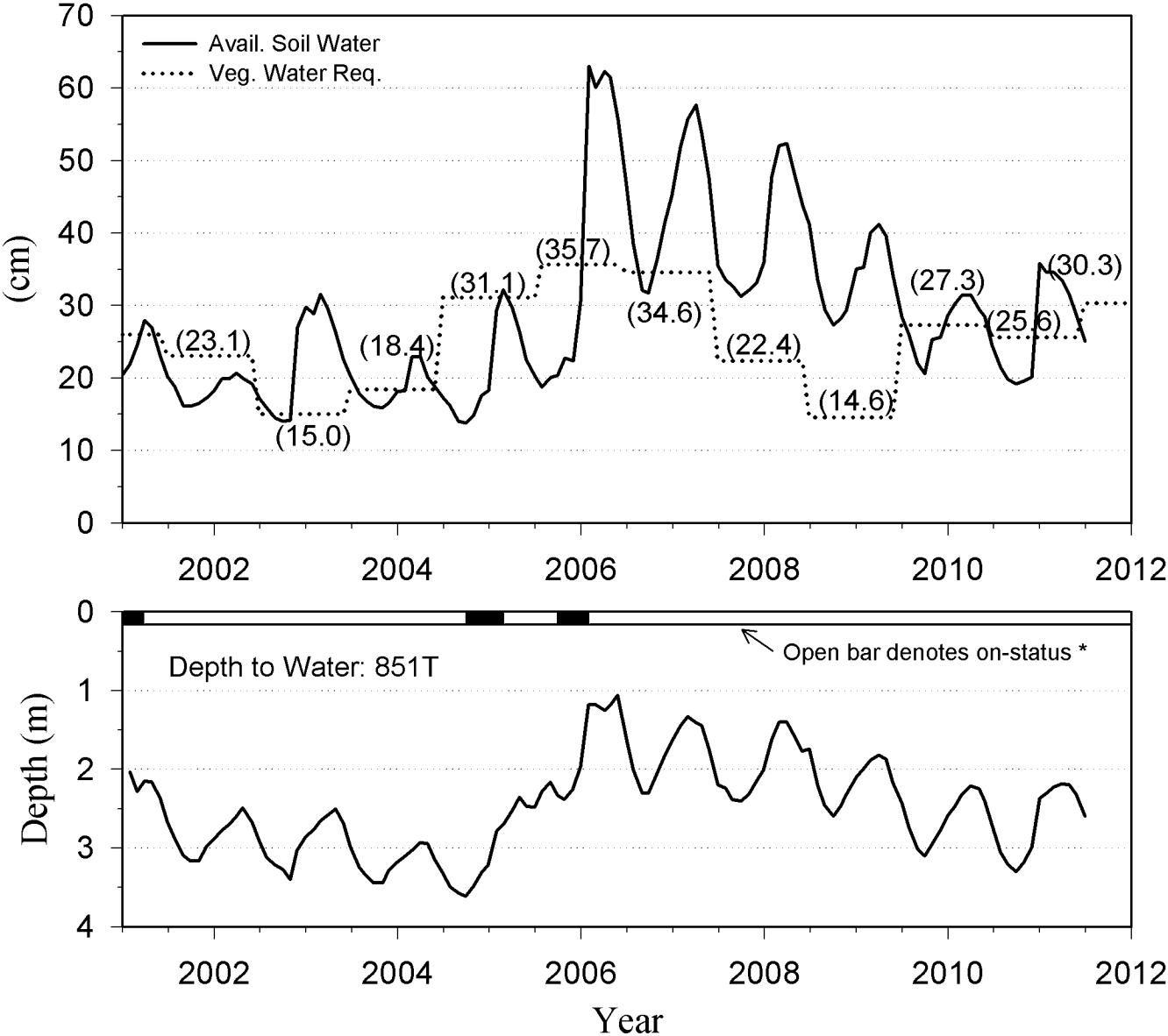
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping well - 155

Soil water required for turn on (--)

THIBAUT/SAWMILL MONITORING SITE #3

Soil-Plant Water Balance and Groundwater Data, 7/1/11



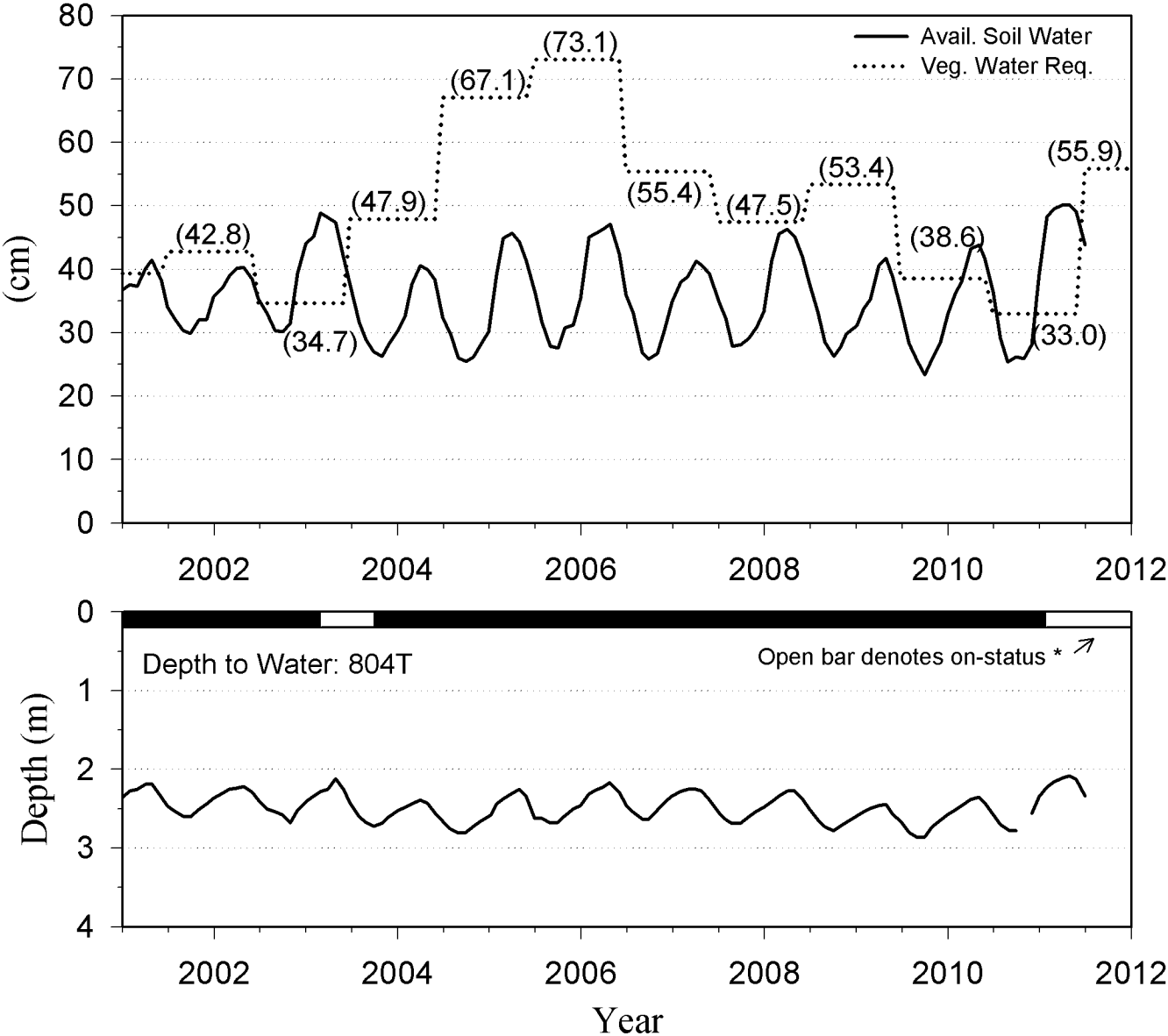
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping wells - 103, 104, 382

Soil water required for turn on (--)

THIBAUT/SAWMILL MONITORING SITE #4

Soil-Plant Water Balance and Groundwater Data, 7/1/11



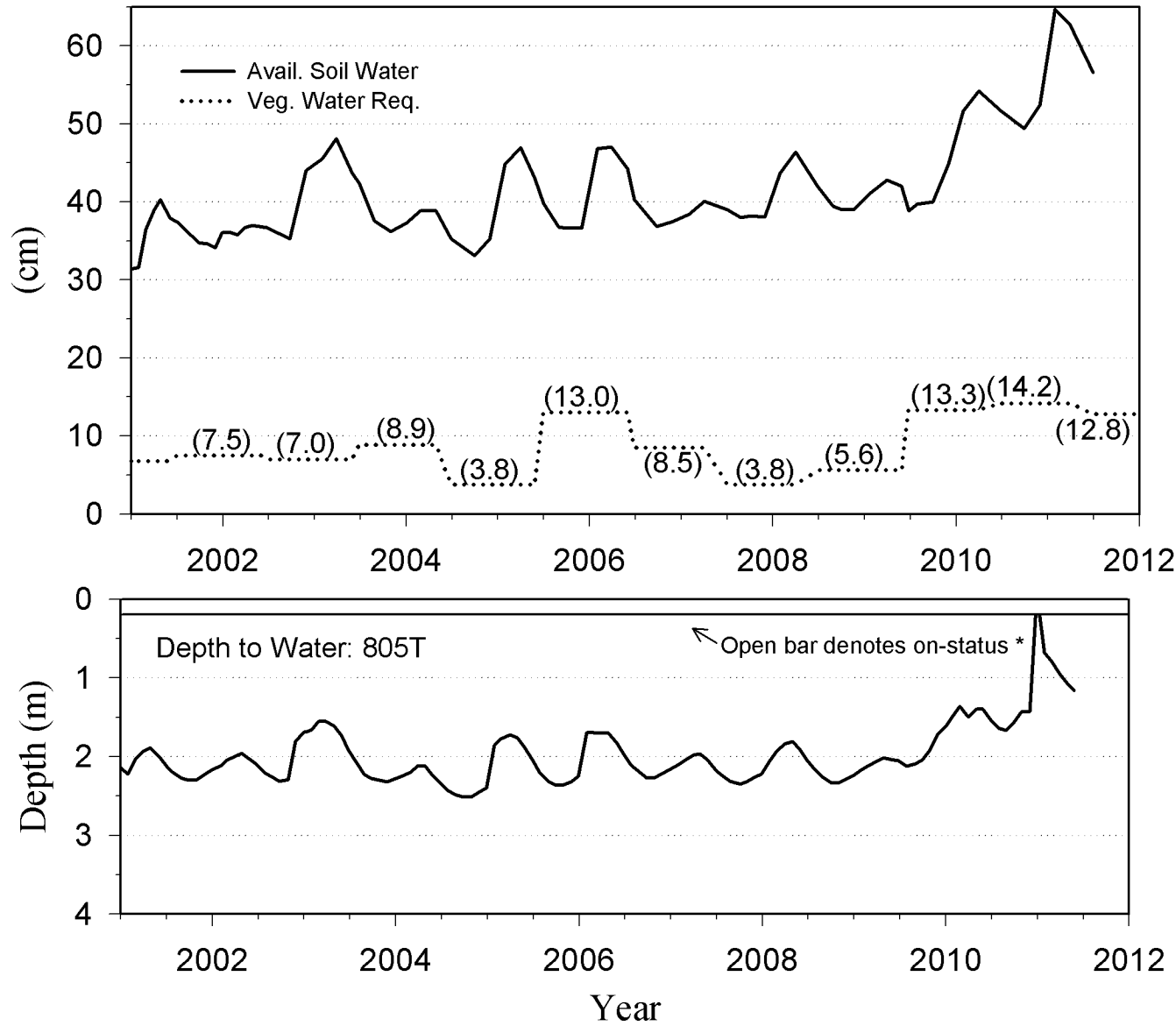
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping wells - 380, 381

Soil water required for turn on (--)

THIBAUT/SAWMILL CONTROL SITE

Soil-Plant Water Balance and Groundwater Data, 7/1/11

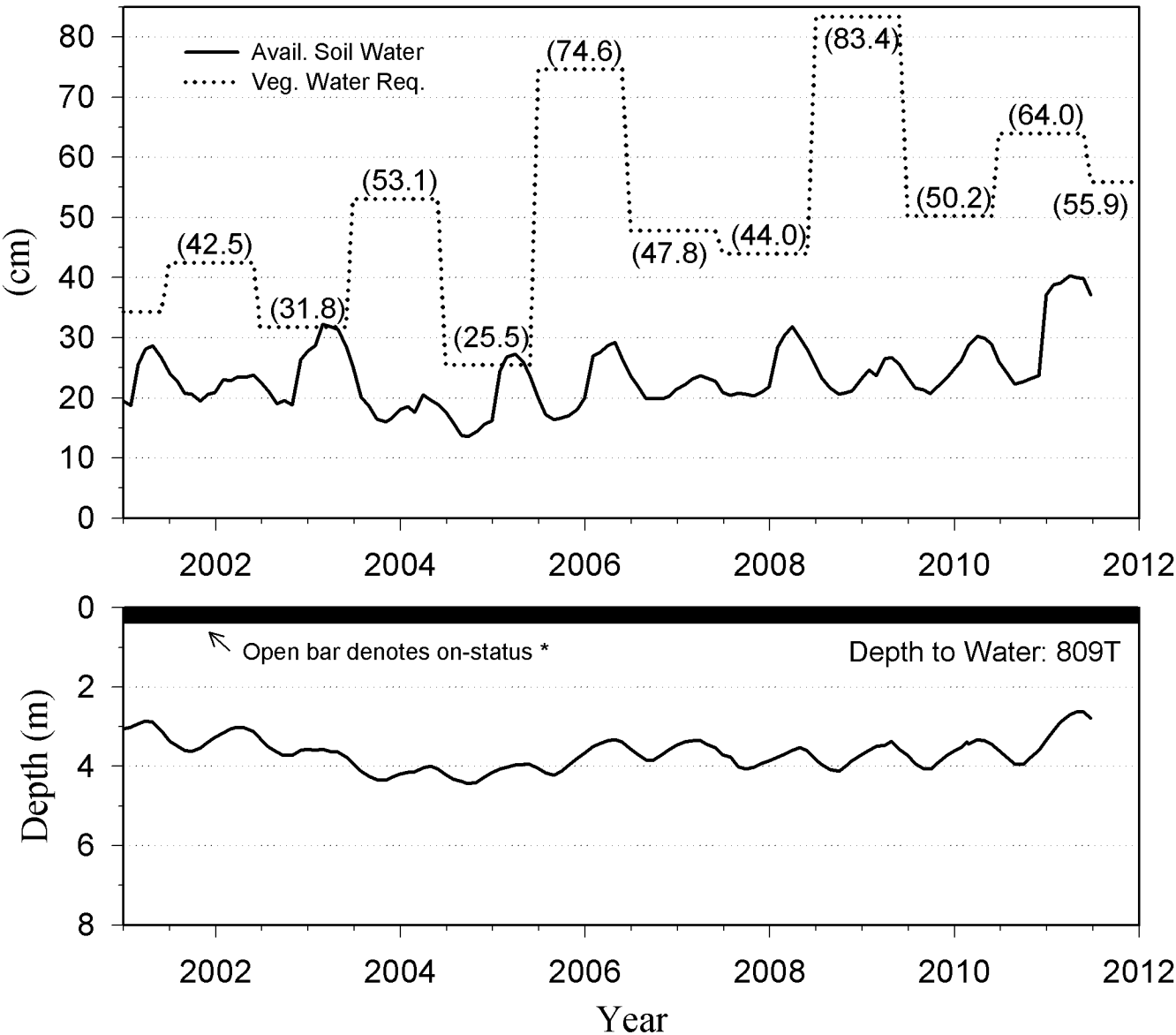


* On\off according to the Green Book Section III values for Veg. Water Req.

Soil water required for turn on (--)

INDEPENDENCE/OAK MONITORING SITE #1

Soil-Plant Water Balance and Groundwater Data, 7/1/11



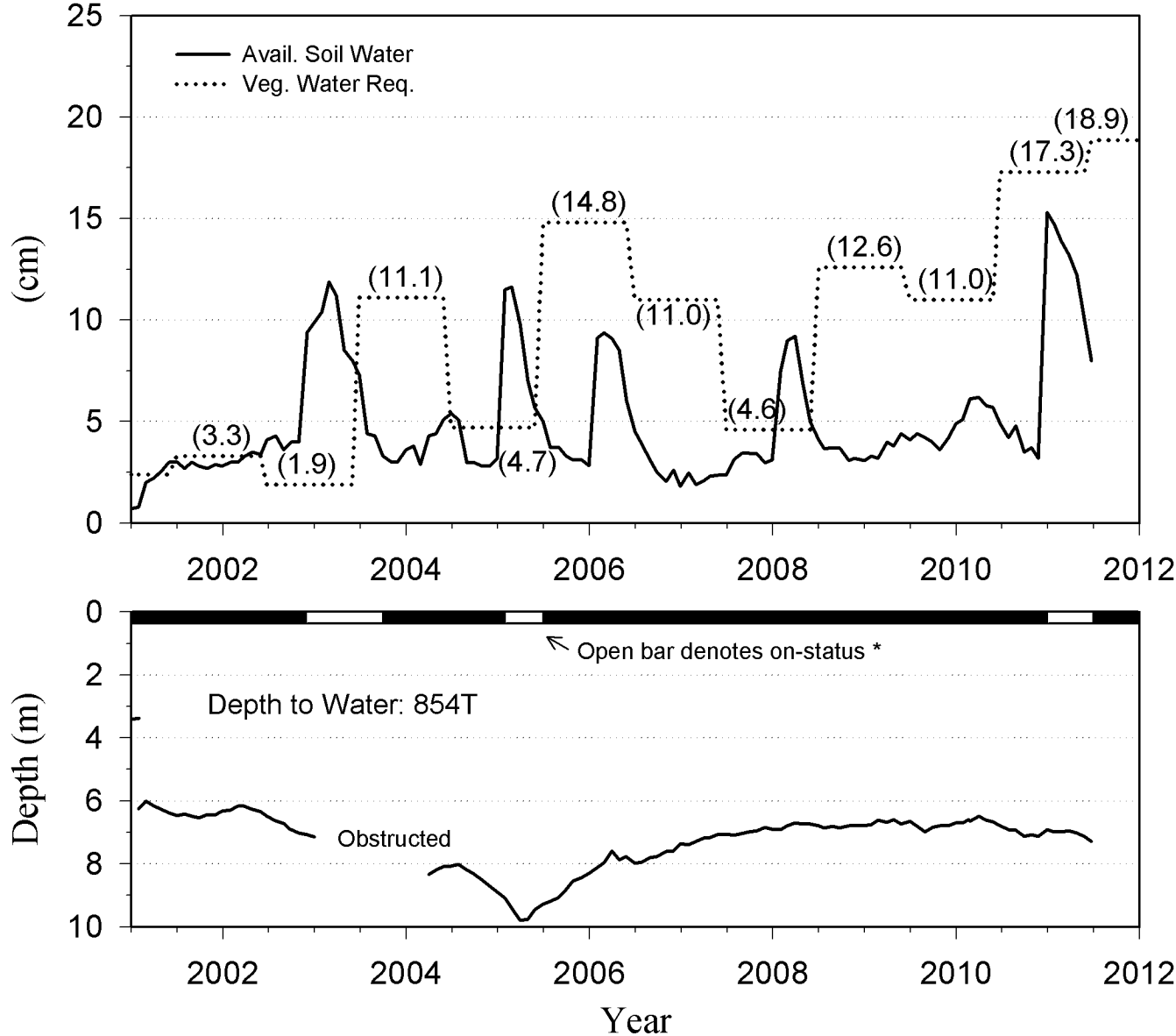
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping wells - 61, 391, 400

Soil water required for turn on (42.2 cm)

INDEPENDENCE/OAK MONITORING SITE #2

Soil-Plant Water Balance and Groundwater Data, 7/1/11



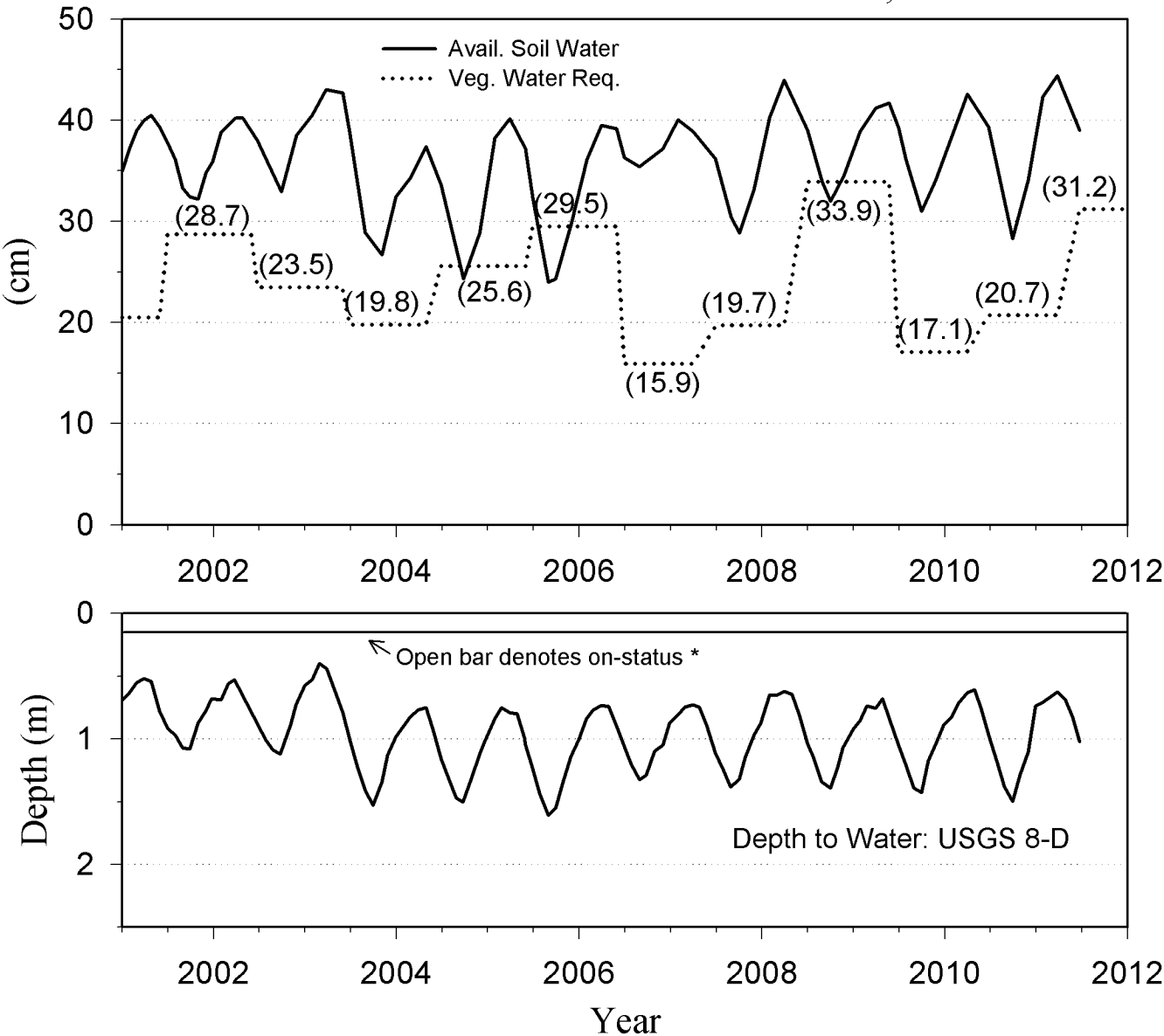
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping well - 63

Soil water required for turn on (18.9 cm)

INDEPENDENCE/OAK CONTROL SITE #1

Soil-Plant Water Balance and Groundwater Data, 7/1/11

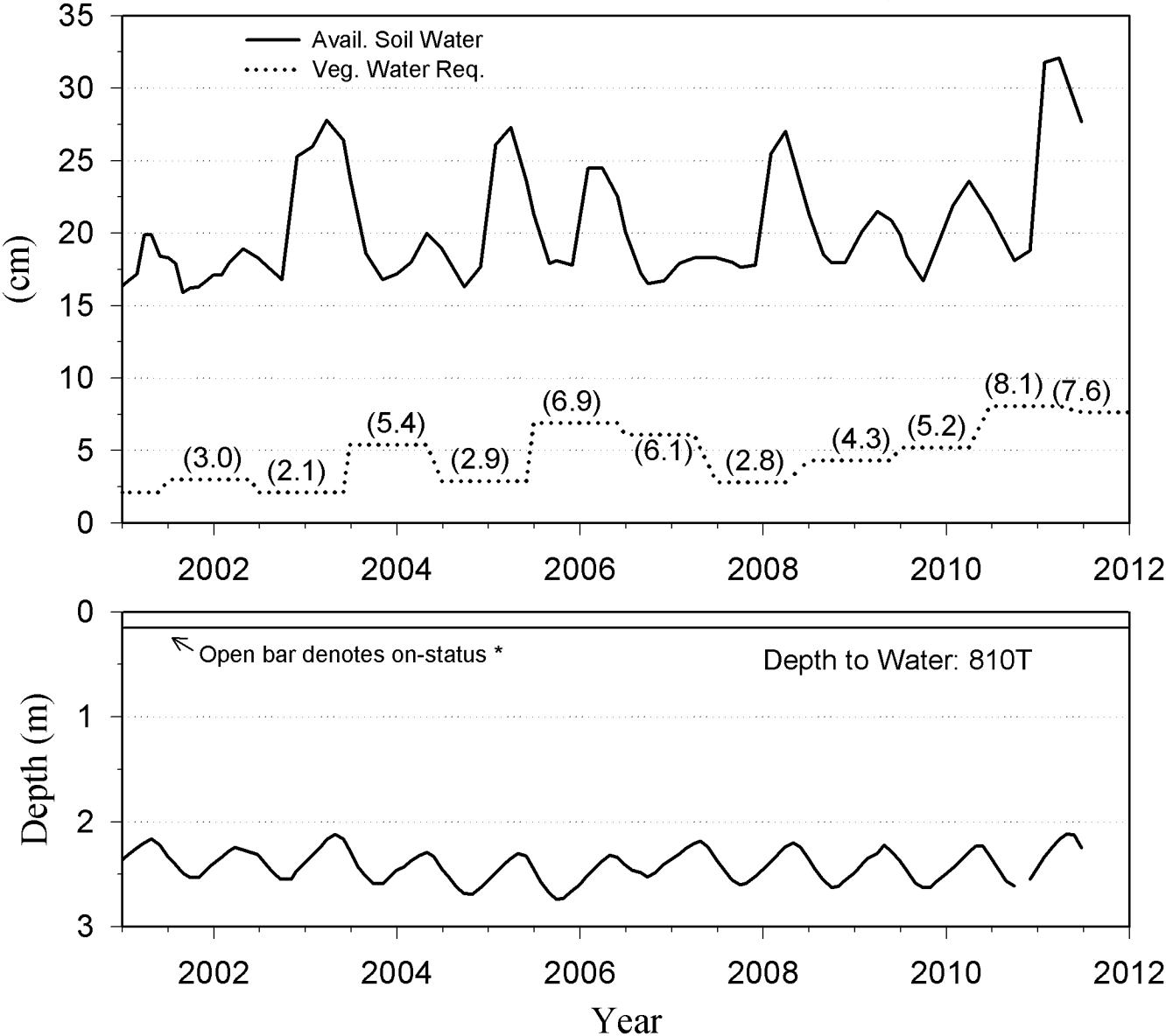


* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Soil water required for turn on (--)

INDEPENDENCE/OAK CONTROL SITE #2

Soil-Plant Water Balance and Groundwater Data, 7/1/11

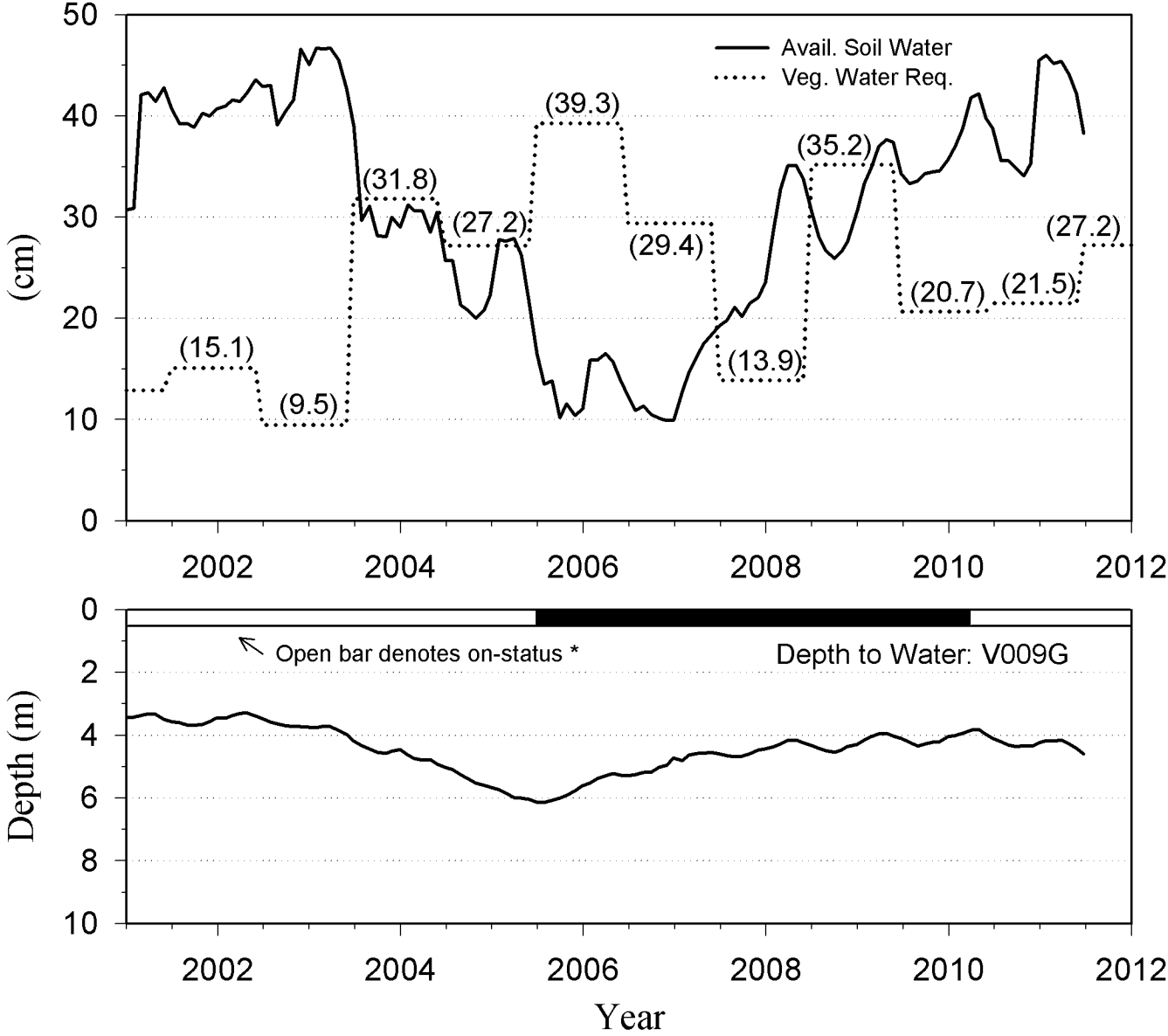


* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Soil water required for turn on (--)

SYMMES/SHEPHERD MONITORING SITE #1

Soil-Plant Water Balance and Groundwater Data, 7/1/11



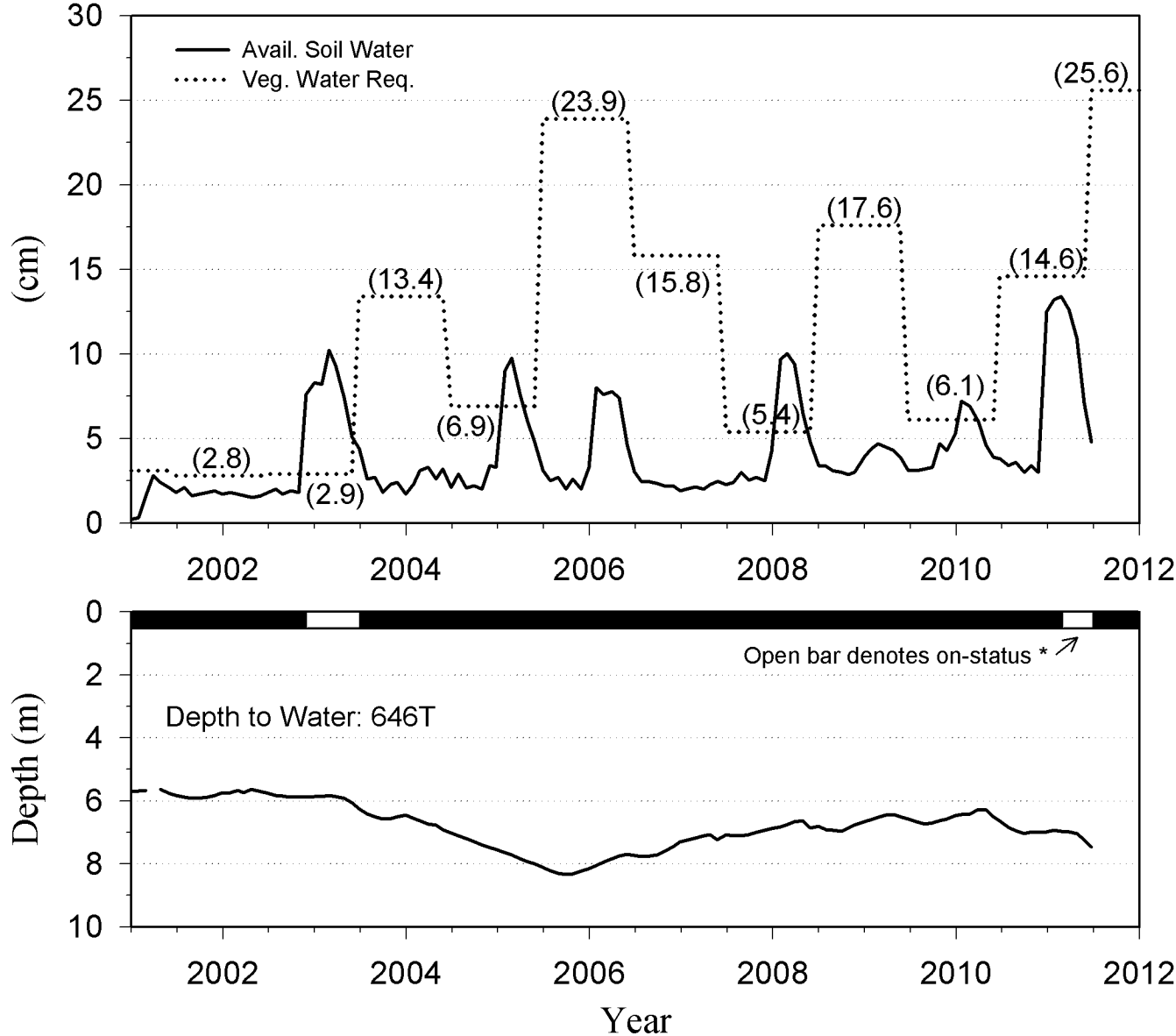
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping wells - 69, 392, 393

Soil water required for turn on (--)

SYMMES/SHEPHERD MONITORING SITE #2

Soil-Plant Water Balance and Groundwater Data, 7/1/11



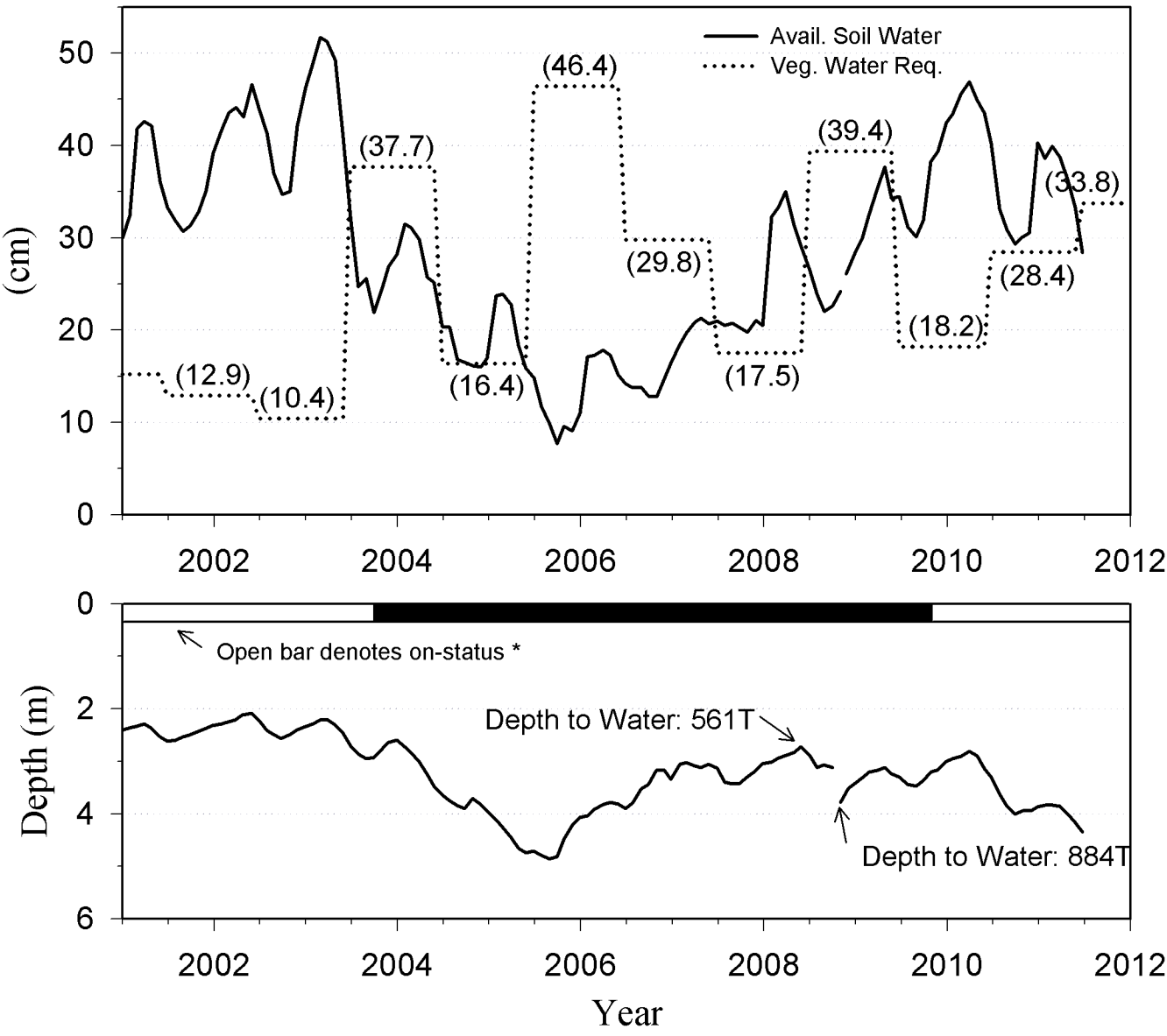
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping wells - 74, 394, 395

Soil water required for turn on (25.6 cm)

SYMMES/SHEPHERD MONITORING SITE #3

Soil-Plant Water Balance and Groundwater Data, 7/1/11



* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

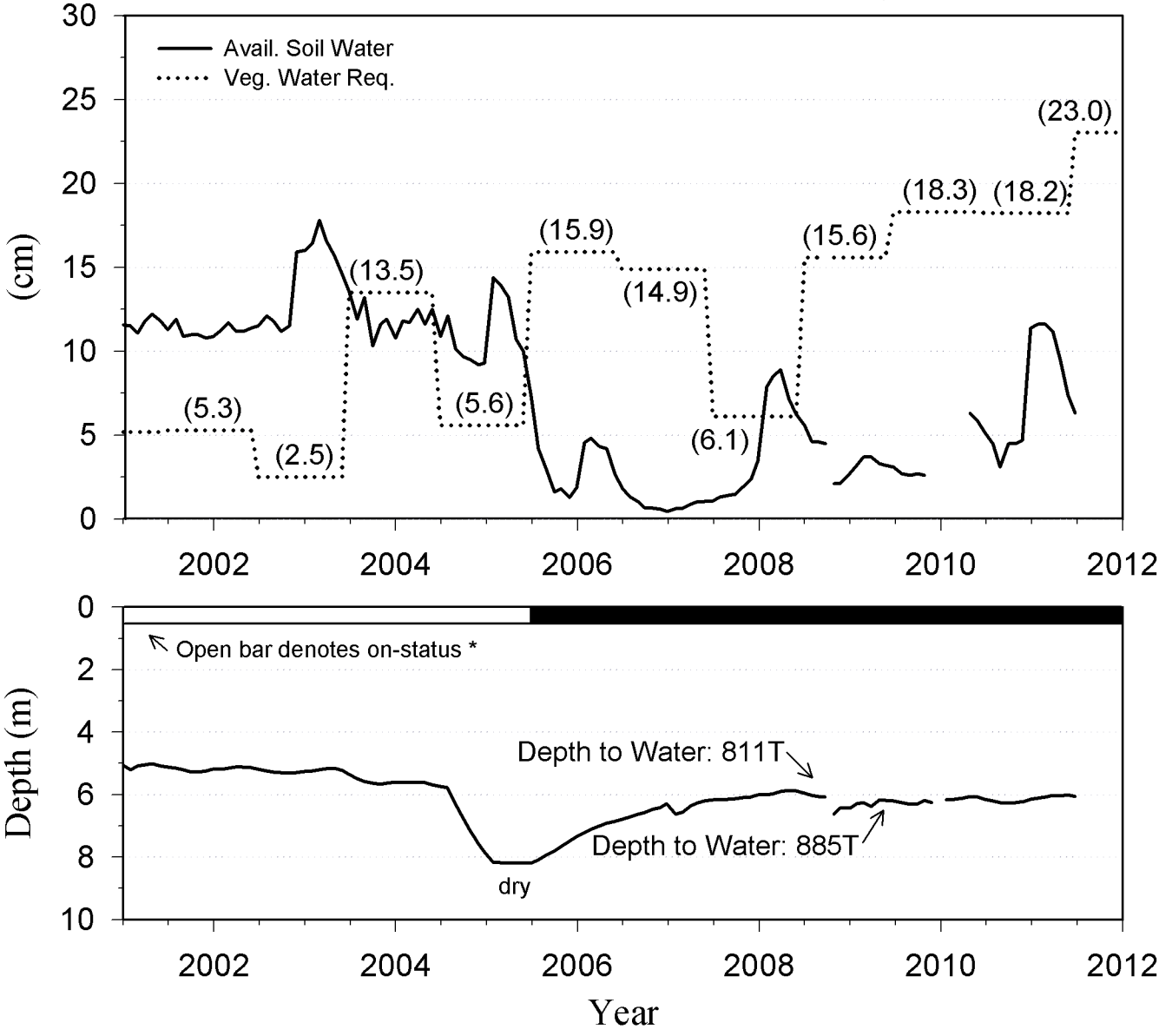
Linked pumping wells - 92, 396

Soil water required for turn on (--)

New soil water monitoring locations established Dec 1, 2008

SYMMES/SHEPHERD MONITORING SITE #4

Soil-Plant Water Balance and Groundwater Data, 7/1/11



* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

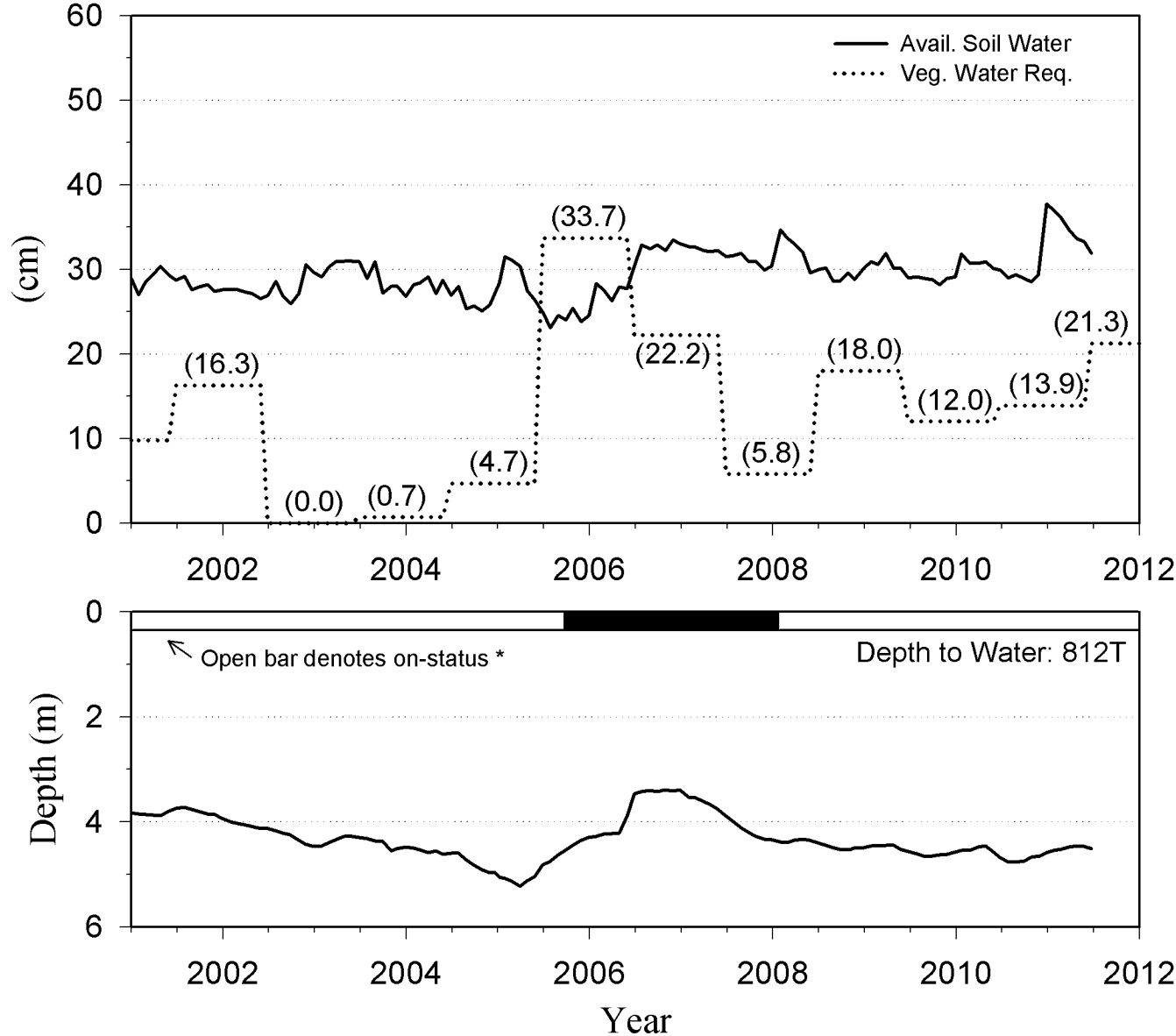
Linked pumping wells - 75, 345

Soil water required for turn on (15.9 cm)

New soil water monitoring locations established Nov 1, 2008 and May 1, 2010

BAIRS GEORGES MONITORING SITE #2

Soil-Plant Water Balance and Groundwater Data, 7/1/11



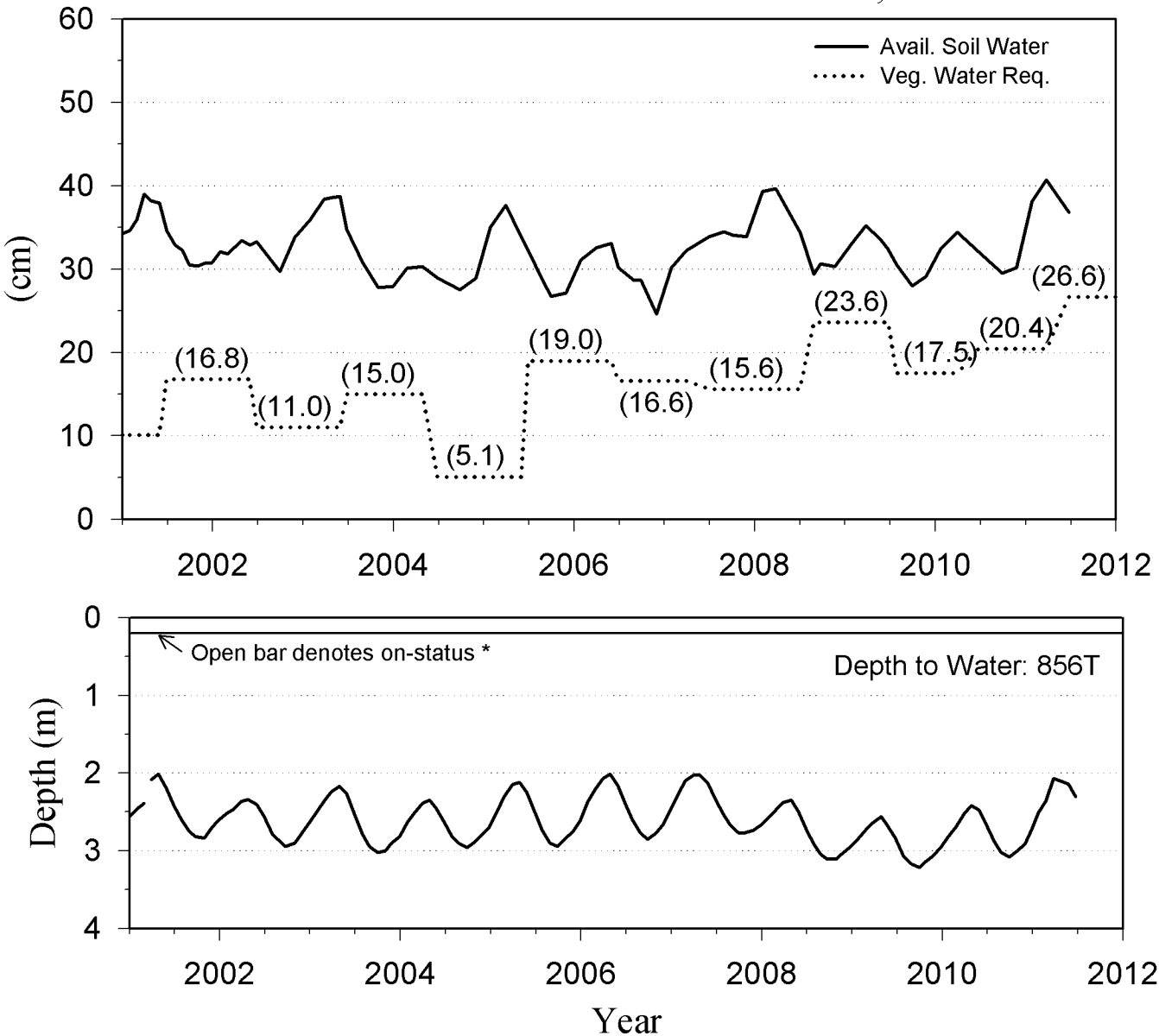
* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Linked pumping wells - 76, 403, 343, 348

Soil water required for turn on (--)

BAIRS/GEORGES CONTROL SITE

Soil-Plant Water Balance and Groundwater Data, 7/1/11



* Wells not necessarily operated when in on-status. On\off according to the Green Book Section III values for Veg. Water Req.

Soil water required for turn on (--)