Juniper Bay Wetland Mitigation Site
Robeson County, NC

2008 Annual Monitoring Report
Year 3 of 5

NCEEP Project Number 201

Submitted To:
NCDENR/Ecosystem Enhancement Program
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Executive Summary

The Juniper Bay Mitigation Site (JBMS) is a Carolina bay located in Robeson County, North Carolina comprising 728.5 acres. The site was constructed by the North Carolina Department of Transportation (NCDOT) and is managed by the North Carolina Ecosystem Enhancement Program (EEP) in order to provide compensatory wetland mitigation credits in the Lumber River Basin. The site was previously used for agricultural production with a drainage ditch network constructed to drain the site. The goal of the mitigation plan is to restore the hydrologic functions and establish wetland forest vegetation within the site. The two community types planned for establishment are Peatland Atlantic White Cedar Forest/Bay Forest and Pond Pine Woodland/Bay Forest.

The site is monitored for two primary wetland parameters: hydrology and vegetation. Forty-three automated groundwater monitoring gauges are installed across the site. The hydrologic success criterion requires the soil to be ponded, flooded, or saturated within 12 inches of the surface for a least 12.5% of the growing season during years with normal precipitation. The growing season extends from March 25th to November 4th in Robeson County (225 days). Vegetation success criterion is monitored using 20 (10 meter X 10 meter) vegetative plots. Species composition and density are noted during the monitoring events. The minimum survival rates for vegetative success are as follows: 320 stems/acre of target species at the end of Year 3, 290 stems/acre at the end of Year 4, and 260 stems/acre at the end of Year 5.

In 2008, 12 of the 20 plots (60.0%) did not meet the 320 stems/acre success criterion required for Year 3 monitoring. The high rate of unsuccessful vegetation plots is potentially the result of lack of uniform planting as opposed to unfavorable conditions. The baseline stem counts conducted during the 2006 monitoring event indicate nine of the unsuccessful plots could not have met the success criteria for year three with 100 percent survival rates due to existing low stem counts. The lack of damaged or dead stems found in these plots indicates the initial planting rates in these plots were likely too low to meet the success criteria. The average vegetation success rate for all plots was 314 stems/acre.

During the 2008 monitoring period, 37 of the 43 monitoring gauges met the hydrology success criterion (Table VI.), an 86 % success rate. However, based on the JBMS Mitigation Plan, there are 13 gauges located adjacent to the perimeter ditch, an area not expected to be restored to jurisdictional status. However, nine of the 13 perimeter gauges met jurisdictional hydrology. Multiple beaver dams within the perimeter ditch have raised the water levels along the perimeter potentially resulting in higher than expected success rates for the perimeter gauges. Of the remaining 30 interior gauges, 28 met the hydrology success criterion, a 93.3% success rate.

I. Project Background

1.0 Project Objectives

The goal of the JBMS is to restore natural wetland functions, processes, structure, and species composition to the site. The purpose of this restoration is to achieve compensatory wetland mitigation for highway construction impacts in the Lumber River Basin. The objectives entail restoring the predicted conditions which existed within the site prior to human disturbance. The mitigation plan is accomplished by the elimination of the drainage ditch network, the grading of the land surface to eliminate field crowns and promote microtopography, and the establishment of wetland forest vegetation on site. The pre-disturbance site conditions are based upon reference system analysis, hydrology monitoring and modeling, soil investigations, and published literature.

2.0 Project Structure, Restoration Type, and Approach

The 728.5 acre site was constructed to provide compensatory mitigation for Transportation Improvement Projects (TIP) in the Lumber River Basin (Hydrologic Unit 03040203) including, but not limited to, R-513, R-2593, and R-3333. Initially, only 1.6 percent of the Juniper Bay property was jurisdictional due to the extensive drainage. Therefore, the majority of the compensatory mitigation will qualify as nonriverine wetland restoration.

The site was originally cleared and ditched over a period of 15 years beginning between 1966 and 1972 to facilitate agricultural production. A drainage ditch network running in a north-south direction was initially established. This system was established along the western third of the site. As of 1981, the entire site had been cleared, and the current northwest to southeast ditch network had been established. Additionally, another drainage ditch runs along the entire perimeter of the site. In 1994, longleaf pine was planted in three large fields in the southern portion of the property. The site was used for agricultural production until being purchased by the NCDOT in January 2000. The site was constructed by the NCDOT in 2006 and is managed by the EEP.

The site is a Carolina bay comprising 728.5 acres. The mitigation component in which jurisdictional hydrology is to be enhanced or restored comprises 567.7 acres. The remaining 160.8 acres are considered to be non-restorable areas due to the perimeter ditch that has been left open in order to avoid hydrologic trespass issues. Mitigative measures are not expected to return jurisdictional hydrology to these non-restorable areas. These non-restorable areas will effectively serve as an upland buffer.

The hydrologic restoration plan involves systematically plugging and backfilling the interior ditch network to increase surface and subsurface water storage capacity and to increase the water retention onsite. The wetland vegetation restoration plan is to establish two natural community types: Peatland Atlantic White Cedar Forest/Bay Forest and Pond Pine Woodland/Bay Forest. The Peatland Atlantic White Cedar Forest/Bay Forest community was planted in low lying areas dominated by organic soils and the Pond Pine Woodland/Bay Forest community was planted in areas with higher elevation dominated by sandy soils.

Table I lists the estimated wetland acreage by community type to be restored or enhanced in the JBMS. The proposed mitigation plan provides for the restoration and enhancement of 567.7 acres of nonriverine wetlands.

Table I. Project Restoration Components Juniper Bay Wetland Mitigation Site-EEP # 201		
Community Type	**Mitigation Type**	**Acreage**
Peatland Atlantic White Cedar Forest	Restoration	264.8
Peatland Atlantic White Cedar Forest	Enhancement	11.8
Pond Pine Woodland	Restoration	291.1
	Total	**567.7**
Non-restorable areas	**Total**	**160.8**
Juniper Bay Mitigation Site	**Total**	**728.5**

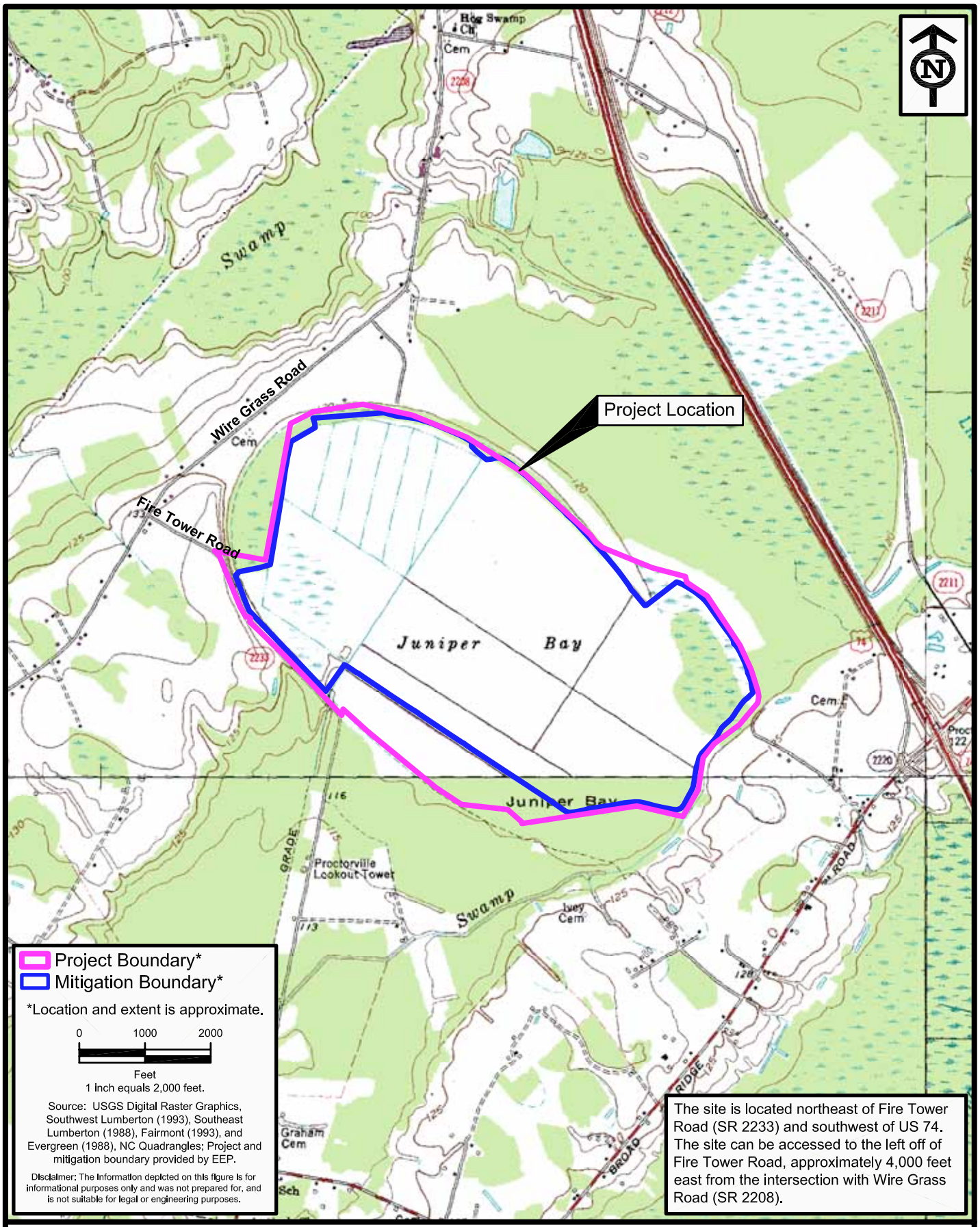
In order to demonstrate successful mitigation, hydrologic and vegetation monitoring will be conducted for a minimum of five years. Relic hydric soils are present at the site negating the necessity for soil monitoring. Successful hydrological criterion requires the soil be ponded, flooded, or saturated within 12 inches of the surface for at least 12.5% of the growing season during a year with normal precipitation levels. The growing season for Robeson County is from March 25th to November 4th (225 days). Therefore, in order to demonstrate hydrologic success, a gauge must have saturated conditions for a minimum of 28 consecutive days during the growing season.

According to the JBMS Mitigation Plan, the appropriate species mix was planted at a rate of 680 stems/acre. Success criterion for vegetation restoration states there must be a minimum of 320 stems/acre of target species at the end of the third year of monitoring, 290 stems/acre at the end of Year 4, and 260 stems/acre at the end of Year 5. Using the CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al. 2006), the vegetation plots will be monitored for success criterion a minimum of five years. Photographs of the vegetation plots from the same viewpoints annually will provide a visual record of plot growth. Vegetative data will be correlated with the appropriate hydrologic data from the groundwater monitoring gauges to determine if success criteria are being met.

Planted seedlings and natural recruitment of the target species are included in the vegetation survival criterion. Survival and density of planted tree stock and natural recruitment will be reported and evaluated relative to the success criterion. At least six different representative tree species should be present on the entire site. If the vegetation success criterion is not met, the reasons for failure will be examined and appropriate corrective action will be taken.

3.0 Location and Setting

The JBMS is located in eastern Robeson County, North Carolina. The site is approximately 7.5 miles south of Lumberton, North Carolina and 4.5 miles east of Fairmont, North Carolina in the Coastal Plain physiographic region. The JBMS is located in an interstream divide between two streams, Hog Swamp and Big Branch. The surrounding land use consists primarily of managed forest and agricultural production. Few residential properties are located along Wiregrass Road and Fire Tower Road.



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Ecosystem Enhancement

Composite Vicinity Map
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 3

Project:	ER07008.00
Date:	Nov 2008
Drwn/Chkd:	AJS/GT
Figure:	1

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4.0 Project History and Background

Table II provides the timeline for data collection completion and for actual completion of various construction and monitoring milestones of the JBMS. The dates for several of these activities were unavailable at the time of report submission.

Table II. Project Activity and Reporting History
Juniper Bay Wetland Mitigation Site-EEP # 201

Activity or Report	Data Collection Complete	Actual Completion
Restoration Plan	N/A	N/A
Final Design-90%	N/A	N/A
Construction	N/A	Phase I Feb 2004; Phase II Jan 2006
Temporary S&E mix applied to entire site	N/A	N/A
Permanent Seed mix applied	N/A	N/A
Mitigation Plan/ As-built (Year 0 Monitoring- baseline)	N/A	Feb 2006
Year 1 Monitoring	Nov 2006	Dec 2006
Year 2 Monitoring	Nov 2007	Dec 2007
Year 3 Monitoring	Sept 2008	Oct 2008
Year 4 Monitoring	N/A	N/A
Year 5 Monitoring	N/A	N/A

The point of contact for various phases and monitoring of the JBMS are provided in Table III.

Table III. Project Contacts
Juniper Bay Wetland Mitigation Site-EEP # 201

Designer Primary project design POC	N.C. Department of Transportation Natural Environment Unit Arcadis
Construction Contractor Construction contractor POC	NCDOT Division 6 Robeson County Maintenance Eugene McKeithan, Highway Maintenance Engineer
Planting Contractor Planting contractor POC	Professional Consolidated, LLC Henry Rozo
Seeding Contractor Seeding contractor POC	NCDOT Division 6 Roadside Environmental Unit James Barnes, Division Roadside Environmental Engineer
Nursery Stock Suppliers	NC Forestry Service (hardwoods); Coastal Plain Conservation Nursery (bays); Hillis Nursery (bays)
Monitoring Performers Wetland and Vegetation POC	Environmental Services, Inc. 524 S. New Hope Road Raleigh, North Carolina 27610 Todd Milam (919) 212-1760

Relevant project background information for the JBMS is provided in Table IV. The Cowardin classification is based upon a typical Carolina Bay system. The current U.S. Fish and Wildlife Service National Wetlands Inventory mapping for the site is based upon the previous drained status of the site. The North Carolina Division of Water Quality (NCDWQ) classification for Project and Reference was unavailable at the time of report submission.

Table IV. Project Background Juniper Bay Wetland Mitigation Site-EEP # 201	
Project County	Robeson County
Drainage Area	904 Acres; 756 acres within the site perimeter
Drainage impervious cover estimate (%)	1%
Physiographic Region	Coastal Plain
Ecoregion	651 Atlantic Southern Loam Plain
Cowardin Classification	PFOB4/6
Dominant soil types	Ponzer muck, Leon sand, Rutledge loamy sand, Pantego fine sandy loam
Reference site ID	Tatum Millpond Bay, Bladen County, NC
USGS HUC for Project and Reference	03040203
NCDWQ Sub-basin for Project and Reference	03-07-54
NCDWQ classification for Project and Reference	N/A
Any portion of the project 303d listed?	No
Any upstream portion 303d listed?	No
% of project easement fenced	Gate at access road

5.0 Monitoring Plan View

In 2006, hydrologic monitoring was initiated across the site. Environmental Services, Inc. installed 43 groundwater gauges. Gauges GW-15 and GW-22 were not installed due to high water conditions. There are 30 gauges installed within the Pond Pine Woodland/ Bay Forest community, and 13 gauges installed within the Peatland Atlantic White Cedar Forest/Bay Forest community. Groundwater monitoring is conducted onsite to determine if the hydrologic success criterion for a wetland mitigation site is being met.

One rain gauge is installed onsite. This precipitation data will be compared to data from the National Oceanic & Atmospheric Administration (NOAA) gauge station in Lumberton, North Carolina to determine the reliability of the onsite data.

The vegetation monitoring is conducted using 20 plots as representative samples of the entire site. The vegetation plots are 10 meters x 10 meters. For each plot, species composition and density are recorded to determine if the vegetative success criterion is met.

Figures 2A-D provide plan views of the site showing the location of all monitoring features including groundwater gauges, vegetation plots, photo points, and the rain gauge.

- Project Boundary*
- Mitigation Boundary*
- Non-Restorable Area*
- Pond Pine Woodland / Bay Forest*
- Peatland Atlantic White Cedar Forest / Bay Forest*
- Longleaf Pine Stand*
- Ditch*
- Vegetation Plot*
- Photo Location*
- Monitoring Well - Installed*
- Monitoring Well - Not Installed*
- Rain Gauge*

*Location and extent is approximate.

0 400 800
Feet
1 inch equals 800 feet.

Source: Ecosystem Enhancement Program.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

Project:	ER07008.00
Date:	Nov 2008
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Figure:	2a

Monitoring Plan View - Monitoring Gauges and Vegetation Plots

Juniper Bay

Robeson County, North Carolina
Monitoring Report Year 3

Ecosystem Enhancement Program

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Project Boundary*
Mitigation Boundary*
NRCS Soil Boundary*
NRCS Water Boundary*
Ditch*
5' Contour*
1'Contour*

Soil Mapping Units

Hydric Soils

- Le Leon sand
- Pg Pantego fine sandy loam
- Pm Plummer and Osier soils
- Pr Ponzer muck
- Ra Rains
- Ru Rutlege loamy sand

Non-Hydric Soils

- LaB Lakeland sand, 0-6% slopes
- NoA Norfolk loamy sand, 0-2% slopes
- NoB Norfolk loamy sand, 2-6% slopes
- Pa Pactolus loamy sand
- PoB Pocalla Loamy sand, 0-3% slopes
- WkB Wakulla sand, 0-6% slopes

*Location and extent is approximate.

0 400 800
Feet
1 inch equals 800 feet.

Source: Ecosystem Enhancement Program; NRCS Soil Survey of Robeson County, NC.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

Project:	ER07008.00
Date:	Nov 2008
Drwn/Chkd:	AJS/GT
Figure:	2b

Monitoring Plan View - NRCS Soils and Contours
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 3

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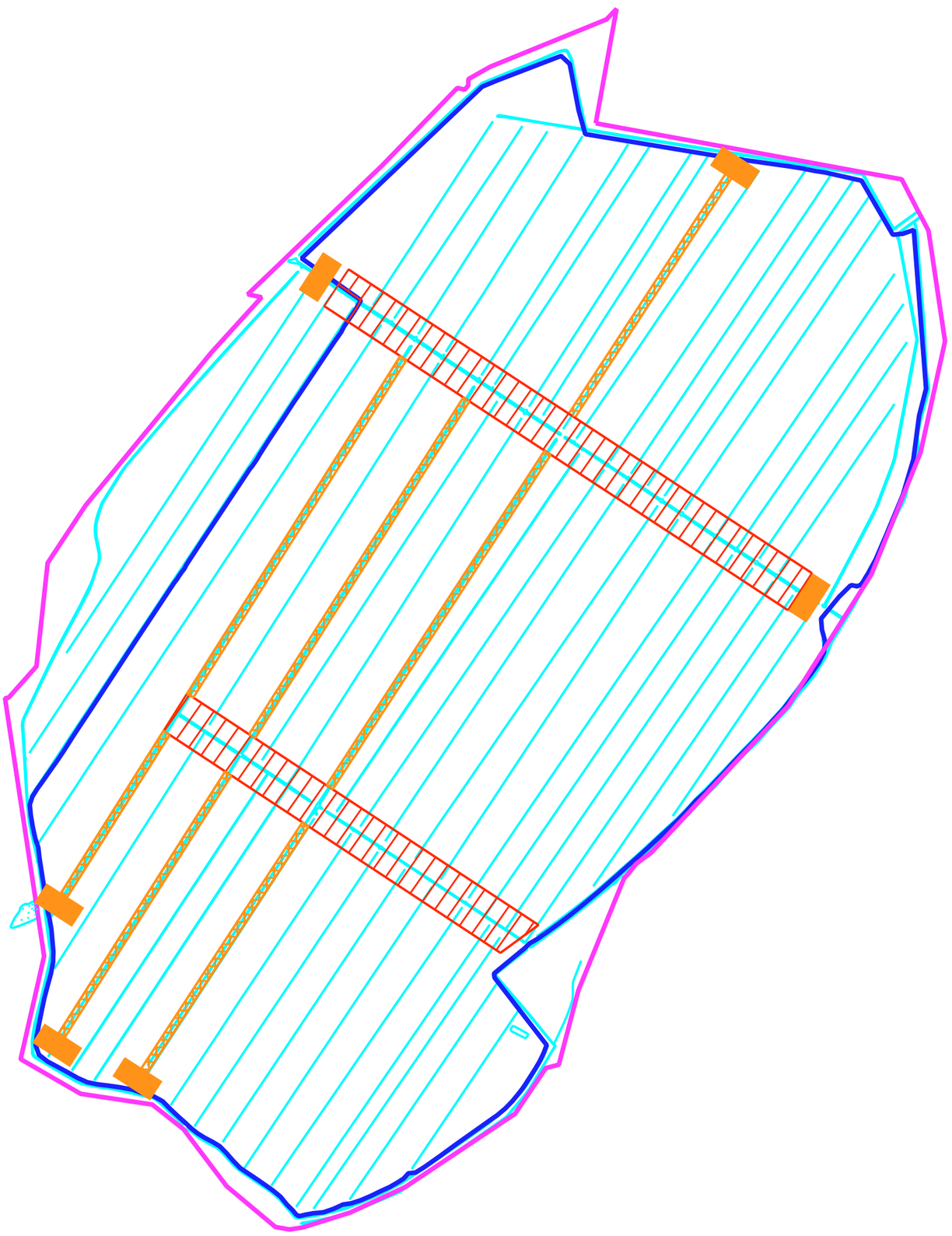

Project Boundary*
Mitigation Boundary*
Ditch Backfilling*
Grading Area*
Ditch Plug*
Ditch*

*Location and extent is approximate.

0 400 800
Feet

1 inch equals 800 feet.

Source: Ecosystem Enhancement Program.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended to be verified by a professional Land Surveyor prior to regulatory review.

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Monitoring Plan View - Ditch Network and Application
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 3

Project:	ER07008.00
Date:	Nov 2008
Drwn/Chkd:	AJS/GT
Figure:	2c

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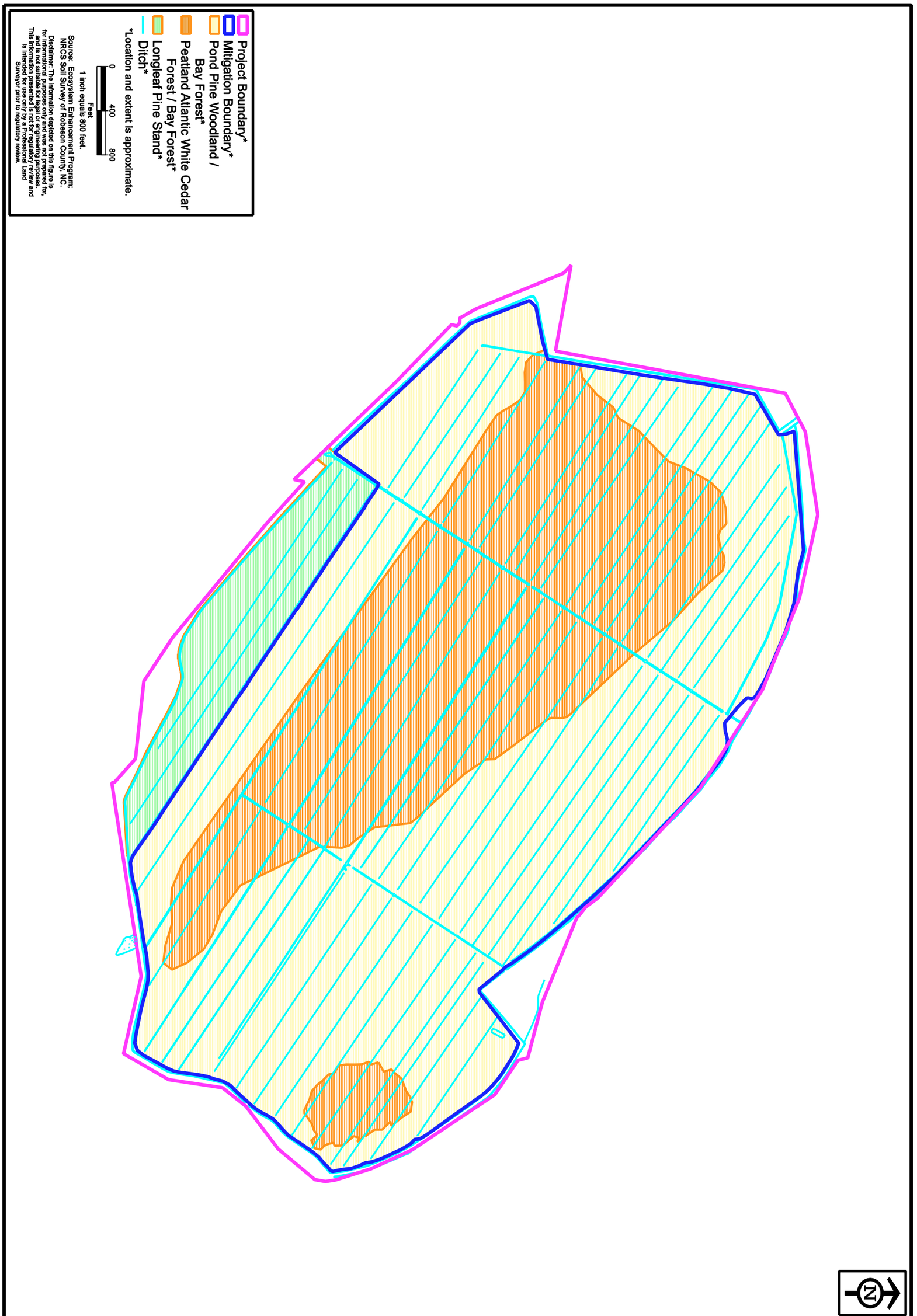

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Monitoring Plan View - Plant Communities
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 3

Project:	ER07008.00
Date:	Nov 2008
Drwn/Chkd:	AJS/GT
Figure:	**2d**

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II. Project Condition and Monitoring Results

1.0 Vegetation Assessment

The vegetation success criteria were developed in accordance with Environmental Protection Agency guidelines detailed in Mitigation Site Type documentation and U.S. Army Corps of Engineers Compensatory Hardwood Mitigation Guidelines. Two community types were planned at the site: Peatland Atlantic White Cedar Forest/Bay Forest and Pond Pine Woodland/Bay Forest. The target species are based on the Tatum Millpond Bay reference site and North Carolina Natural Heritage Program (NCNHP) community descriptions. The appropriate species mix was planted in the two specified communities at a reported rate of 680 stems/acre (Table V).

Table V. Species for Each Community Type		
Peatland Atlantic White Cedar Forest/ Bay Forest		
Atlantic white cedar	*Chamaecypari thyoides*	OBL
Loblolly bay	*Gordonia lasianthus*	FACW
Swamp tupelo	*Nyssa sylvatica* var. *biflora*	OBL
Bald cypress	*Taxodium distichum*	OBL
Sweetbay	*Magnolia virginiana*	FACW+
Pond pine	*Pinus serotina*	FACW+
Swamp red bay	*Persea palustris*	FACW
Pond Pine Woodland/ Bay Forest		
Pond pine	*Pinus serotina*	FACW+
Loblolly bay	*Gordonia lasianthus*	FACW
Sweetbay	*Magnolia virginiana*	FACW+
Atlantic white cedar	*Chamaecyparis thyoides*	OBL
Loblolly pine	*Pinus taeda*	FAC
Swamp red bay	*Persea palustris*	FACW
Overcup oak	*Quercus lyrata*	OBL

Using the CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al. 2006), 20 (10 meter X 10 meter) plots were designated across the site based on proximity to groundwater gauges and representative conditions for the site as a whole. Stem counts by species were conducted for each plot, including vigor and damage estimates. Stem counts were limited to planted woody stems. Natural recruits were not included in the stem counts. The 2008 monitoring event for the JBMS represents the third year of monitoring. The third year success criterion is 320 stems/acre of target species. Therefore, any plots with stem counts less than 320 stems/acre will not have met the vegetative success criterion.

1.1 Vegetation Plot Results

Eight of the 20 (40.0%) vegetation plots met the Year 3 success criterion of 320 stems/acre. Two of the 9 (22.2%) plots in the Peatland Atlantic White Cedar Forest/ Bay Forest community met the vegetative success criterion. Six of the 11 (54.5%) plots in the Pond Pine Woodland/ Bay Forest community met the vegetative success criterion (Table VI).

It is assumed for monitoring purposes that the appropriate species mix was planted in the two specified communities at a rate of 680 stems/acre. However, due to the low numbers of damaged or dead trees found in the plots not meeting the success criterion, there is a possibility that the original planting distribution may not have been 680 stems/acre across the entire site. The high rate of unsuccessful vegetation plots appears to be due to the lack of uniform planting as opposed to unfavorable conditions.

Plots 7, 9, 13, 14, 16, and 19 did not meet the Year 3 success criterion of 320 stems/acre. However, these plots had 100 percent survival rates for the Year 3 monitoring event. These plots would not have met the success criteria for monitoring years three and four even with a 100 percent stem survival rate from the baseline stem counts. This demonstrates the initial planting rates were too low from the beginning as evidenced by the lack of damaged or dead stems. Plots 9 and 19 cannot meet the Year 5 survival criterion of 260 stems/acres with 100 percent stem survival rates.

Plot 4 did not meet the Year 3 success criterion of 320 stems/acre. Plot 4 had one dead stem for the 2008 monitoring event. However, even with 100 percent survival, Plot 4 would not have met the Year 3 success criterion. Plot 4 is located in an area of the site with the highest water levels, often exceeding 12 inches, which potentially contributed to the sapling mortality. Plot 4 is located in a topographic depression underlain by a clayey subsoil and is located too far from a primary ditch outlet to receive complete drainage.

Plot 11 and Plot 12 each had one dead stem during the 2008 monitoring event. These two plots experience consistent high water levels due to their location in the center of the site. Water levels during the 2008 growing season were significantly higher than in 2007, a year which experienced significant drought conditions late in the growing season. This transition between drought conditions late in 2007 and high water levels early in 2008 may have contributed to the sapling death.

Plot 5, although successful in meeting the 320 stems/acre criterion, experienced a significant loss of stems. Twenty of the 42 stems were recorded as missing during the 2007 monitoring event. The 20 stems were updated to dead status during the 2008 monitoring event. The bald cypress stems are the only species which have survived in this plot. The swamp tupelo (8), overcup oak (5), and swamp red bay (7) stems did not survive in this plot. Plot 5 is located on the edge of one of the graded southwest to northeast ditches. It appears that low water levels due to drought conditions late in the growing season of 2007 allowed vehicular traffic to travel through this area potentially contributing to the high stem mortality rate. The vehicular traffic issue through this plot was resolved prior to the 2008 growing season with perimeter flagging and instructions to others on-site to avoid this area. The remaining bald cypress stems survived the 2008 growing season with the majority in good condition.

The stress from the drought conditions late in the growing season of 2007 may have contributed to sapling deaths in Plots 1 and 6. Each plot experienced one stem death and there were no other discernable causes. Plot 1 met the 320 stems/acre criterion, but Plot 6 did not.

Herbaceous competition and vine strangulation in Plots 12 and 15 were noted as potential issues during the 2007 monitoring event. Climbing hempweed (*Mikania scandens*) had blanketed areas of these plots. However, it appears the higher water levels early in the 2008 growing season may have inhibited the climbing hempweed's growth significantly. The climbing hempweed is still present in these plots, although vine strangulation was not evident. Therefore these plots should continue to be monitored for this issue throughout the 2009 monitoring season. Plot 15 did have one stem death due to beaver.

Plot 20 had one stem death noted during the 2007 monitoring event. There are no other stems surviving in this plot.

The vegetation success rate is low when examined at an individual plot scale and is not expected to increase in future monitoring years. However, the anomalies in specific plots not meeting the vegetation success rate do not accurately reflect the overall vegetation success for the entire site. An overall examination of the plots within the entire site demonstrates an average of 314 stems/acre, which is slightly below the Year 3 vegetation success criterion of 320 stems/acre. However, based upon the stem deaths within the plots during the 2008 monitoring year, it appears the mortality rate for the surviving stems within the plots has stabilized. Therefore, meeting the Year 4 and Year 5 vegetation success rate for the entire site is a high possibility, pending no unforeseen problems contributing to stem mortality.

1.2 Vegetation Plot Results Plan View

Figure 3A in Appendix A provides an overview of all vegetative plot results with regard to the scale and layout of the entire project. Figure 3B in Appendix A provides an overview of the planting plan with regard to the scale and layout of the entire project.

Refer to Appendix A for additional vegetation related data and information.

2.0 Wetland Assessment

In accordance with federal guidelines for wetland mitigation, the success criterion for hydrologic restoration states that the soil must be ponded, flooded, or saturated within 12 inches of the surface for at least 12.5% of the growing season during years with normal precipitation. The growing season for this site extends from March 25th to November 4th (225 days). Therefore, in order to demonstrate success, a gauge must have saturated conditions within 12 inches of the surface for a minimum of 28 consecutive days during the growing season.

There are a total of 43 automated groundwater monitoring gauges installed across the site. The gauges are installed in each community type in accordance with federal guidelines. Precipitation data was collected by an onsite rain gauge. For comparative purposes, precipitation data is also obtained from a NOAA gauge station in Lumberton, North Carolina.

2.1 Wetland Problem Areas

During the 2008 monitoring period, 37 of the 43 monitoring gauges met the hydrologic success criterion (Table VI.), an 86 % success rate. However, based on the JBMS Mitigation Plan, there are 13 gauges located adjacent to the perimeter ditch, in an area not expected to be restored to jurisdictional status. Nine of the 13 perimeter gauges met the jurisdictional hydrology criterion. Of the remaining 30 interior gauges, 28 met the hydrologic success criterion, a 93.3% success rate. Hydrographs for the individual monitoring gauges can be found in Appendix B.

There are 13 perimeter gauges that are located adjacent to the perimeter ditch in the Pond Pine Woodland/ Bay Forest community. The perimeter ditch remains open in order to avoid hydrologic trespass issues. The location of these 13 gauges represents portions of the site which are not expected to meet the wetland criterion due to the zone of influence exerted by the ditch. Additionally, Carolina Bay topography is somewhat bowl shaped. The center of the mitigation site has a low elevation which slopes outward to a drier sand ridge, which

encloses the bay. These 13 gauges are all located in this drier sand ridge area. Four of the 13 perimeter gauges did not meet the hydrologic success criterion. This higher than expected success rate for the perimeter gauges reflect higher than expected water levels potentially due to multiple beaver dams within the perimeter ditch.

Of the 17 remaining gauges in the Pond Pine Woodland/ Bay Forest community; 15 (88.2%) met the hydrological success criterion. Gauges GW-10 and GW-34 did not meet the hydrologic success criterion. The soils within this community type are sandy with higher infiltration rates than those in the Peatland Atlantic White Cedar Forest/ Bay Forest community. The hydrographs for GW-10 and GW-34 reflect the high infiltration rate for these soils. Water levels peak after a rain event and quickly drop within days of the event preventing the necessary consecutive day saturation of the soil.

Of the 13 gauges in the Peatland Atlantic White Cedar Forest/ Bay Forest community, 13 (100%) met the hydrologic success criterion. The Peatland Atlantic White Cedar Forest/ Bay Forest community was designated for areas of the site with the lowest elevations and often wetter conditions. The soils in this community type are primarily poorly drained organic soils.

Gauges GW-3, GW-11, GW-12, GW-28, GW-33, and GW-42 malfunctioned for short periods of the growing season and were replaced. Gauges GW-3, GW-28, and GW-42 met the hydrologic success criterion regardless of the periods of missing data. The missing data for GW-42 did not affect the longest consecutive hydroperiod. Gauges GW-11 and GW-33 did not meet the hydrologic success criterion. The missing data from GW-11 and GW-33 was extrapolated by examining the periods before and after the missing data along with the hydrologic data of the gauges adjacent to the malfunctioning gauges. Using this extrapoloated data, it can be assumed that GW-11 and GW-33 would not have met the hydrologic success criterion. GW-3 recorded 72 consecutive days of jurisdictional hydrology after one initial data gap. Using adjacent data points to extrapolate missing data, it can be assumed that GW-3 would have met the jurisdictional hydrology criterion for 79 consecutive days or 35.1% of the growing season. Gauge GW-12 recorded 12 consecutive days of jurisdictional hydrology after one data gap. Using adjacent data points to extrapolate the missing data, it can be assumed that GW-12 would have made jurisdictional hydrology for 30 consecutive days or 13.3% of the growing season.

Early in the growing season, the 2008 hydrographs consistently displayed water levels sufficient to meet the hydrologic success criterion for many of the gauges. The consistent higher water levels experienced early in the growing season of 2008 enabled many gauges to achieve the necessary 28 consecutive days of saturation within 12 inches of the surface.

2.2. Monitoring Gauge Results View (Wetland)

Figure 4 in Appendix B provides an overview of all monitoring gauge results with regard to the scale and layout of the entire project.

Refer to Appendix A for additional vegetation related data and information. Gauges are identified in terms of meeting hydrologic success criterion.

Table VI. Wetland Criteria Attainment by Community Type Juniper Bay Wetland Mitigation Site-EEP# 201					
Peatland Atlantic White Cedar Forest/ Bay Forest					
Gauge	**Hydrology Success Met**	**Community Type Mean**	**Vegetation Plot**	**Vegetative Success Met**	**Community Type Mean**
GW-6	Y	100%	Veg-4	N	22.2%
GW-7	Y		Veg-11	N	
GW-8	Y		Veg-12	Y	
GW-9	Y		Veg-13	N	
GW-13	Y		Veg-15	N	
GW-14	Y		Veg-17	Y	
GW-15	Not Installed		Veg-18	N	
GW-16	Y		Veg-19	N	
GW-22	Not Installed		Veg-20	N	
GW-23	Y				
GW-24	Y				
GW-27	Y				
GW-28	Y				
GW-29	Y				
GW-43	Y				

Table VI. (continues)

Table VI. (concluded) Pond Pine Woodland/Bay Forest					
Perimeter Gauges					
Gauge	**Hydrology Success Met**	**Community Type Mean**	**Vegetation Plot**	**Vegetative Success Met**	**Community Type Mean**
GW-1	N	69.2%			N/A
GW-4	Y				
GW-11	N				
GW-12	Y[1]				
GW-18	Y				
GW-25	Y				
GW-26	Y				
GW-32	Y				
GW-33	N				
GW-38	Y				
GW-39	Y				
GW-44	N				
GW-45	Y				
Wetland Criteria Attainment by Community Type Juniper Bay Wetland Mitigation Site-EEP# 201					
Pond Pine Woodland/Bay Forest					
Interior Ditches					
Gauge	**Hydrology Success Met**	**Community Type Mean**	**Vegetation Plot**	**Vegetative Success Met**	**Community Type Mean**
GW-2	Y	88.2%	Veg-1	Y	54.5%
GW-3	Y		Veg-2	Y	
GW-5	Y		Veg-3	Y	
GW-10	N		Veg-5	Y	
GW-17	Y		Veg-6	N	
GW-19	Y		Veg-7	N	
GW-20	Y		Veg-8	Y	
GW-21	Y		Veg-9	N	
GW-30	Y		Veg-10	Y	
GW-31	Y		Veg-14	N	
GW-34	N		Veg-16	N	
GW-35	Y				
GW-36	Y				
GW-37	Y				
GW-40	Y				
GW-41	Y				
GW-42	Y				

1-Hydrologic Success interpreted from missing gauge data extrapolation

III. Methodology Section

The third year of monitoring for JBMS occurred in 2008. Using the CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al. 2006), 20 (10 meter X 10 meter) plots were designated across the site based on proximity to groundwater gauges and representative conditions for the site as a whole. Stem counts by species were conducted for each plot, including vigor and damage estimates. The stem counts were limited to planted woody stems. Natural recruits were not included in the stem counts. The taxonomic standard for vegetation that was applied was the Manual of the Vascular Flora of the Carolinas (Radford 1968). No deviations regarding sampling procedures occurred.

IV. References

Lee, Michael T., Peet, Robert K., Roberts, Steven D., Wentworth, Thomas R. 2006. CVS-EEP Protocol for Recording Vegetation Version 4.0. Retrieved September 1 2008, from: http://cvs.bio.unc.edu/methods.htm.

Radford, Albert E., H.E. Ahles, and C.R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. The University of North Carolina Press, Chapel Hill, NC. 1183 pp.

Appendix A

Vegetation Data Tables

Vegetation Photos

1. Vegetation Data Tables

Table 1. Vegetation Metadata

Report Prepared By	Todd Milam
Date Prepared	10/22/2008 16:39
database name	ESI-2008-201A.mdb
database location	P:\Projects\2007\ER07-008\2008 Monitoring\CVS
computer name	ES01043

DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------

Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
ALL Stems by Plot and spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.

PROJECT SUMMARY----------

Project Code	201
project Name	Juniper Bay
Description	A Carolina Bay mitigation site
River Basin	Lumber River Basin
area (sq m)	2948134.9 sq.m
Sampled Plots	20

Table 2. Vegetation Vigor by Species							
	Species	**4**	**3**	**2**	**1**	**0**	**Missing**
	Chamaecyparis thyoides	1	1				
	Nyssa aquatica		5	1		8	
	Persea palustris					7	
	Pinus serotina	5	9	1			2
	Pinus taeda	40	9			2	
	Quercus lyrata	9	9	3		6	
	Taxodium distichum	18	33	3		1	
	Magnolia virginiana	1	7				
Tot:	**8**	**74**	**73**	**8**	**0**	**24**	**2**

Table 3. Vegetation Damage by Species									
	Species	**All Damage Categories**	**No damage**	**Drought**	**Deer**	**Beaver**	**Flood**	**Insect**	**Unknown**
	Chamaecyparis thyoides	2	1		1				
	Magnolia virginiana	8	6					2	
	Nyssa aquatica	14	12	1	1				
	Persea palustris	7	7						
	Pinus serotina	17	16				1		
	Pinus taeda	51	50			1			
	Quercus lyrata	27	22	2	2			1	
	Taxodium distichum	55	51	2	1				1
Tot:	**8**	**181**	**165**	**5**	**5**	**1**	**1**	**3**	**1**

Table 4. Vegetation Damage by Plot									
	Plot	**All Damage Categories**	**No damage**	**Drought**	**Deer**	**Beaver**	**Flood**	**Insect**	**Unknown**
	00201-01-0001-year:3	10	6	2	2				
	00201-01-0002-year:3	9	9						
	00201-01-0003-year:3	15	13	1				1	
	00201-01-0004-year:3	6	5				1		
	00201-01-0005-year:3	39	37	1					1
	00201-01-0006-year:3	8	7	1					
	00201-01-0007-year:3	7	6		1				
	00201-01-0008-year:3	9	9						
	00201-01-0009-year:3	4	4				1		
	00201-01-0010-year:3	10	10						
	00201-01-0011-year:3	7	7						
	00201-01-0012-year:3	9	9						
	00201-01-0013-year:3	7	7						
	00201-01-0014-year:3	7	7						
	00201-01-0015-year:3	6	5			1			
	00201-01-0016-year:3	7	6		1				
	00201-01-0017-year:3	11	10		1				
	00201-01-0018-year:3	6	4					2	
	00201-01-0019-year:3	4	4						
	00201-01-0020-year:3								
Tot:	**20**	**181**	**165**	**5**	**5**	**1**	**2**	**3**	**1**

Table 5. Stem Count by Plot and Species

	Species	Total Planted Stems	# Plots	Avg# stems	plot 00201-01-0001-year:3	plot 00201-01-0002-year:3	plot 00201-01-0003-year:3	plot 00201-01-0004-year:3	plot 00201-01-0005-year:3	plot 00201-01-0006-year:3	plot 00201-01-0007-year:3	plot 00201-01-0008-year:3	plot 00201-01-0009-year:3	plot 00201-01-0010-year:3	plot 00201-01-0011-year:3	plot 00201-01-0012-year:3	plot 00201-01-0013-year:3	plot 00201-01-0014-year:3	plot 00201-01-0015-year:3	plot 00201-01-0016-year:3	plot 00201-01-0017-year:3	plot 00201-01-0018-year:3	plot 00201-01-0019-year:3
	Chamaecyparis thyoides	2	1	2.0																2			
	Magnolia virginiana	8	3	2.7														2	3			3	
	Nyssa aquatica	6	4	1.5				1			1									1		3	
	Pinus serotina	15	4	3.8				3							4					1	7		
	Pinus taeda	49	10	4.9	6	5				2	5	2	3	10		4	7	5					
	Quercus lyrata	21	6	3.5	2		12			1		2	1							3			
	Taxodium distichum	54	13	4.2	1	4	3	1	19	4	1	5			2	4			2		4		4
Tot:	7	**155**	**7**		**9**	**9**	**15**	**5**	**19**	**7**	**7**	**9**	**4**	**10**	**6**	**8**	**7**	**7**	**5**	**7**	**11**	**6**	**4**

Veg-9
Veg-10
Veg-11
Veg-8
Veg-12
Veg-13
Veg-20
Veg-7
Veg-6
Veg-19
Veg-14
Veg-15
Veg-5
Veg-3
Veg-4
Veg-18
Veg-16
Veg-17
Veg-2
Veg-1

Project Boundary*
Mitigation Boundary*
Pond Pine Woodland / Bay Forest*
Peatland Atlantic White Cedar Forest / Bay Forest*
Longleaf Pine Stand*
Ditch*
Vegetation Plot - Successful*
Vegetation Plot - Unsuccessful*
*Location and extent is approximate.

0 400 800
Feet
1 inch equals 800 feet.

Source: Ecosystem Enhancement Program; USGS 1998 Color Infrared Image.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

N

Project:	ER07008.00
Date:	Nov 2008
Drwn/Chkd:	KT/GT
Figure:	3a

Vegetation Plot Results
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 3

ENVIRONMENTAL SERVICES, INC.
524 S. New Hope Road
Raleigh, North Carolina 27610
(919) 212-1760
(919) 212-1707 FAX
www.environmentalservicesinc.com

P:\GeoGrel\Projects\ER08040\MSI\Figs_2008and\Fig_success_v05.dgn; 11/14/08; 9:00 AM

Project Boundary*
Mitigation Boundary*
Pond Pine Woodland / Bay Forest*
Peatland Atlantic White Cedar Forest / Bay Forest*
Longleaf Pine Stand*
Wetland Species*
Ditch*

*Location and extent is approximate.

0 400 800
Feet
1 inch equals 800 feet.

Source: Ecosystem Enhancement Program; USGS 1998 Color Infrared Image.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

Project:	ER07008.00
Date:	Nov 2008
Drwn/Chkd:	KT/GT
Figure:	3b

Planting Plan
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 3

ENVIRONMENTAL SERVICES, INC.
524 S. New Hope Road
Raleigh, North Carolina 27610
(919) 212-1760
(919) 212-1707 FAX
www.environmentalservicesinc.com

P:\GeoGrel\Projects\ER08040\MSI\Fig_2008EndFig_success_v05.dgn; 11/14/08; 8:00 AM

2. Vegetation Monitoring Plot Photos

PLOT 1

2006 Photo Taken 9/19/06

2007 Photo Taken 9/11/07

2008 Photo Taken 10/21/08

PLOT 2

2006 Photo Taken 9/19/06

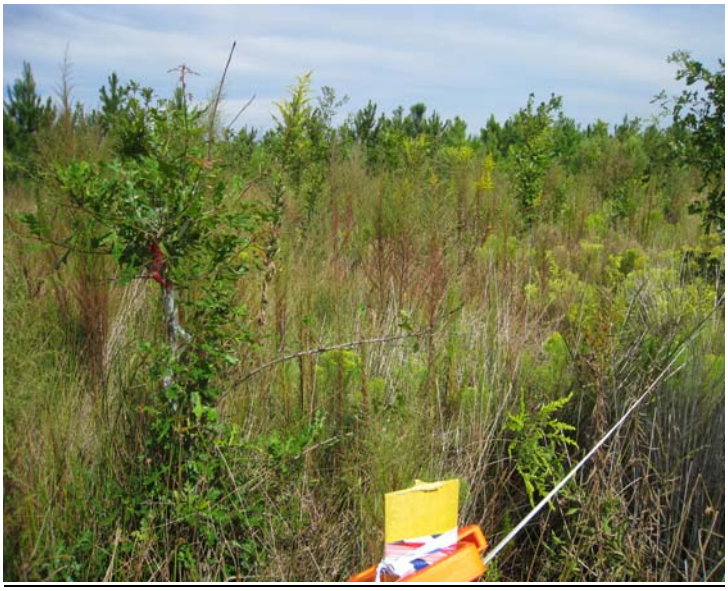
2007 Photo Taken 9/11/07

2008 Photo Taken 9/21/2008

PLOT 3

2006 Photo Taken 9/19/06

2007 Photo Taken 9/10/07

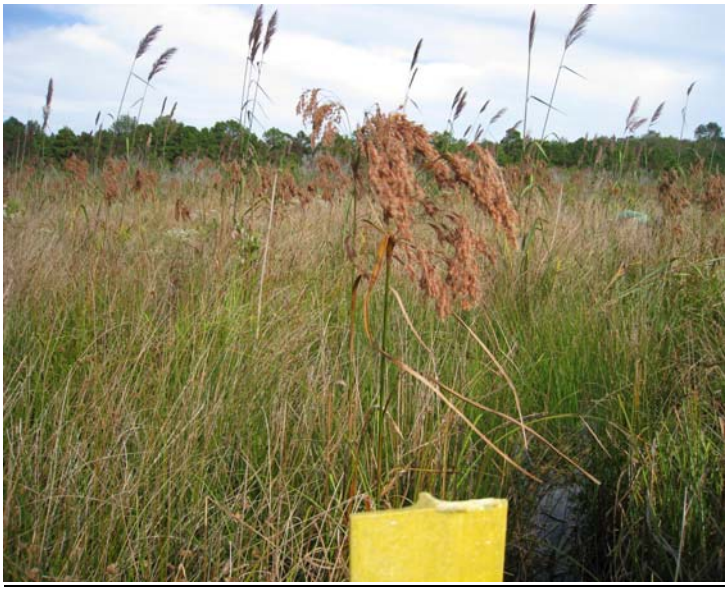


2008 Photo Taken 9/22/2008

PLOT 4

2006 Photo Taken 9/21/06

2007 Photo Taken 9/10/07



2008 Photo Taken 9/22/08

PLOT 5

2006 Photo Taken 9/19/06

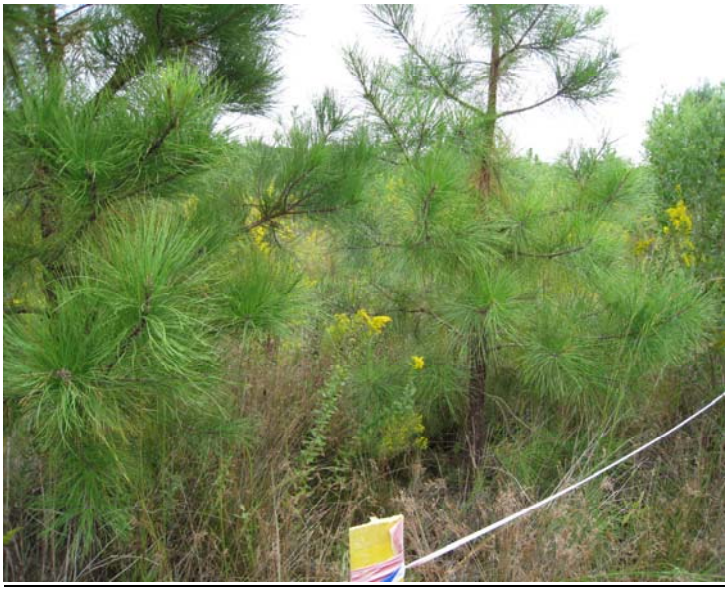
2007 Photo Taken 9/11/07

2008 Photo Taken 9/21/08

PLOT 6

2006 Photo Taken 9/19/06

2007 Photo Taken 9/11/07



2008 Photo Taken 9/21/08

PLOT 7

2006 Photo Taken 9/19/06

2007 Photo Taken 9/11/07

2008 Photo Taken 9/22/08

PLOT 8

2006 Photo Taken 9/19/06

2007 Photo Taken 9/11/07

2008 Photo Taken 9/21/08

PLOT 9

2006 Photo Taken 9/18/06

2007 Photo Taken 9/12/07

2008 Photo Taken 9/22/2008

PLOT 10

2006 Photo Taken 9/18/06

2007 Photo Taken 9/12/07

2008 Photo Taken 9/21/08

PLOT 11

2006 Photo Taken 9/18/06

2007 Photo Taken 9/12/07

2008 Photo Taken 9/21/08

PLOT 12

2006 Photo Taken 9/18/06

2007 Photo Taken 9/12/07

2008 Photo Taken 9/22/08

PLOT 13

2006 Photo Taken 9/18/06

2007 Photo Taken 9/12/07

2008 Photo Taken 9/22/08

PLOT 14

2006 Photo Taken 9/18/06

2007 Photo Taken 9/12/07

2008 Photo Taken 9/21/08

PLOT 15

2006 Photo Taken 9/20/06

2007 Photo Taken 9/11/07

2008 Photo Taken 9/22/08

PLOT 16

2006 Photo Taken 9/20/06

2007 Photo Taken 9/10/07

2008 Photo Taken 9/21/08

PLOT 17

2006 Photo Taken 9/20/06

2007 Photo Taken 9/11/07

2008 Photo Taken 9/21/08

PLOT 18

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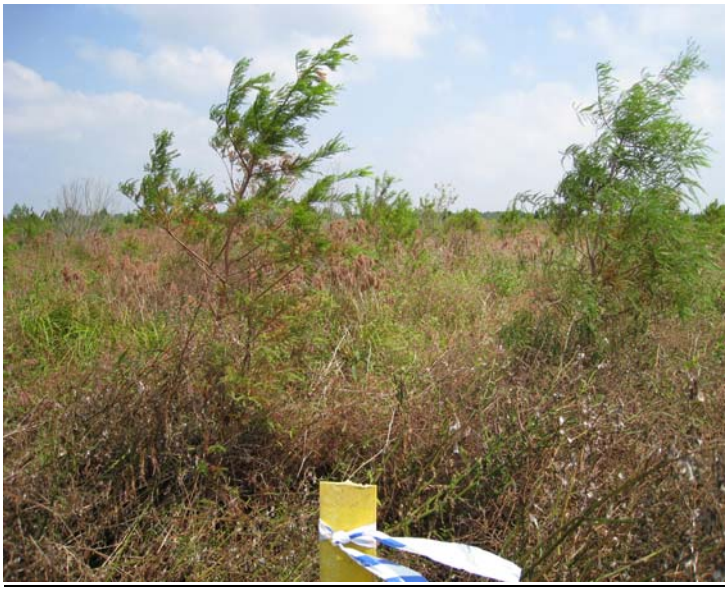
2008 Photo Taken 9/22/08

PLOT 19

2006 Photo Taken 9/20/06

2007 Photo Taken 9/11/07



2008 Photo Taken 9/22/08

PLOT 20

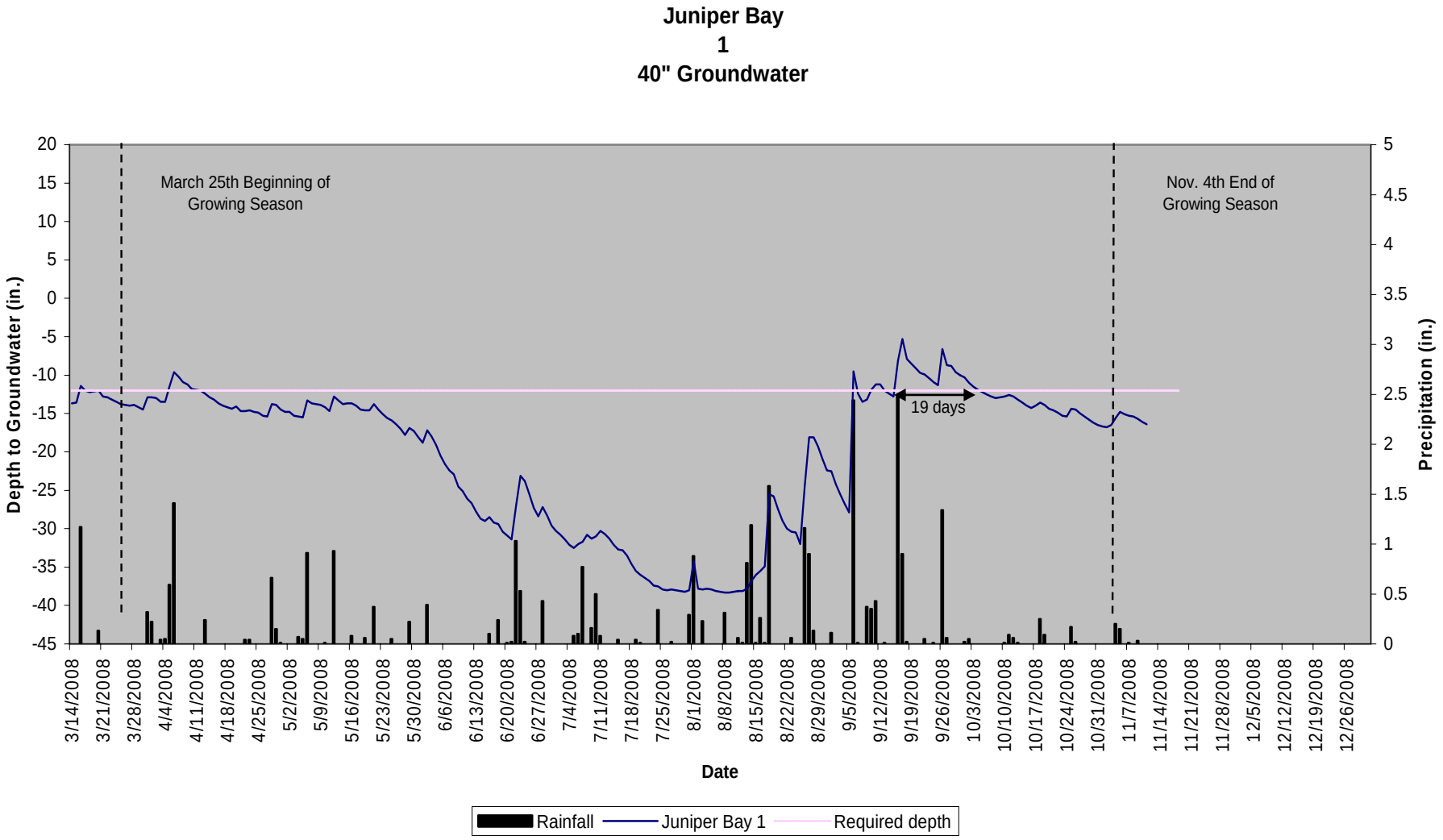
2006 Photo Taken 9/21/06

2007 Photo Taken 9/11/07

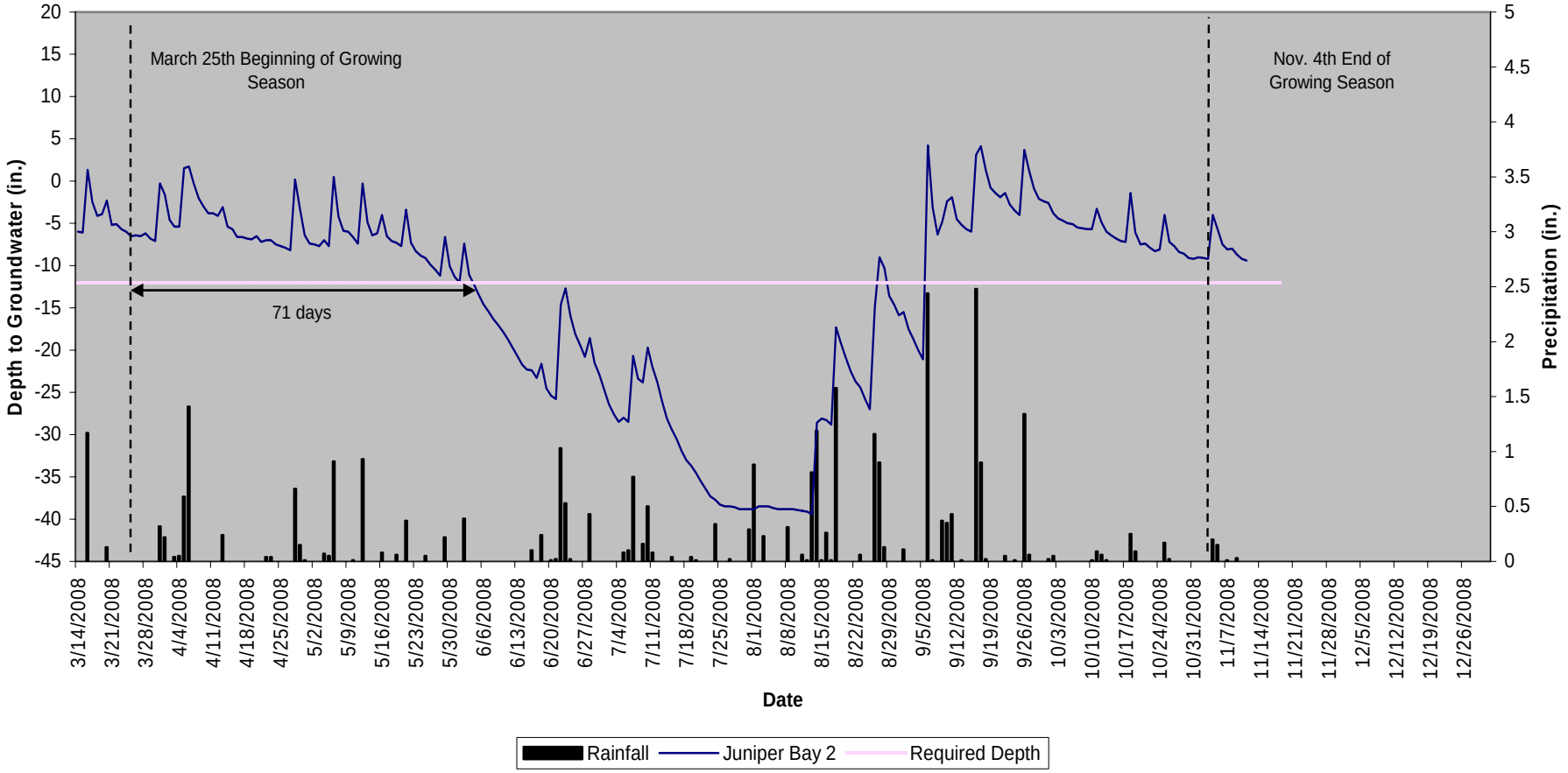
***No Photo for Plot 20**-No stem survival after Year 2

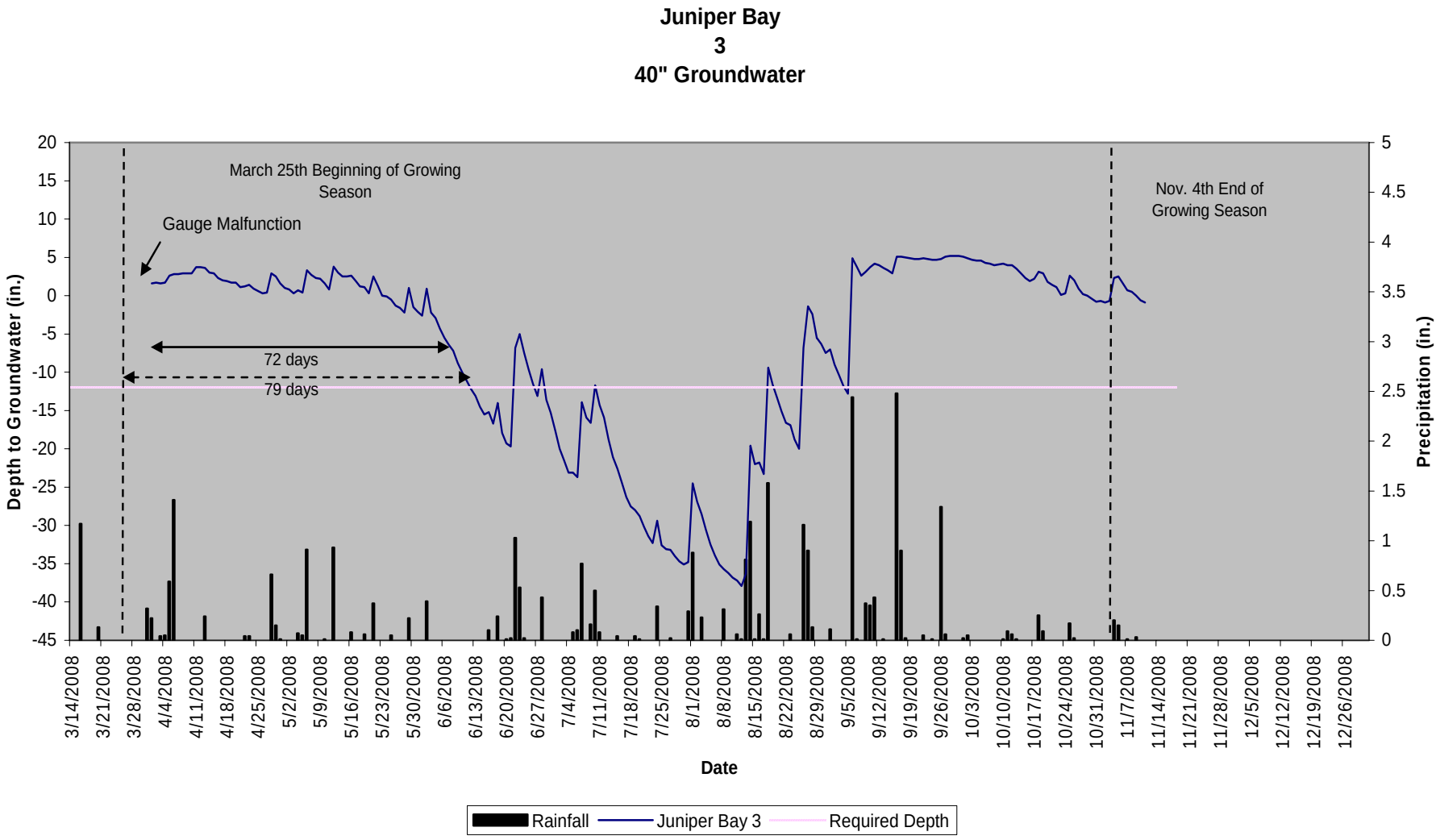
Appendix B

Data Tables for Hydrological Data

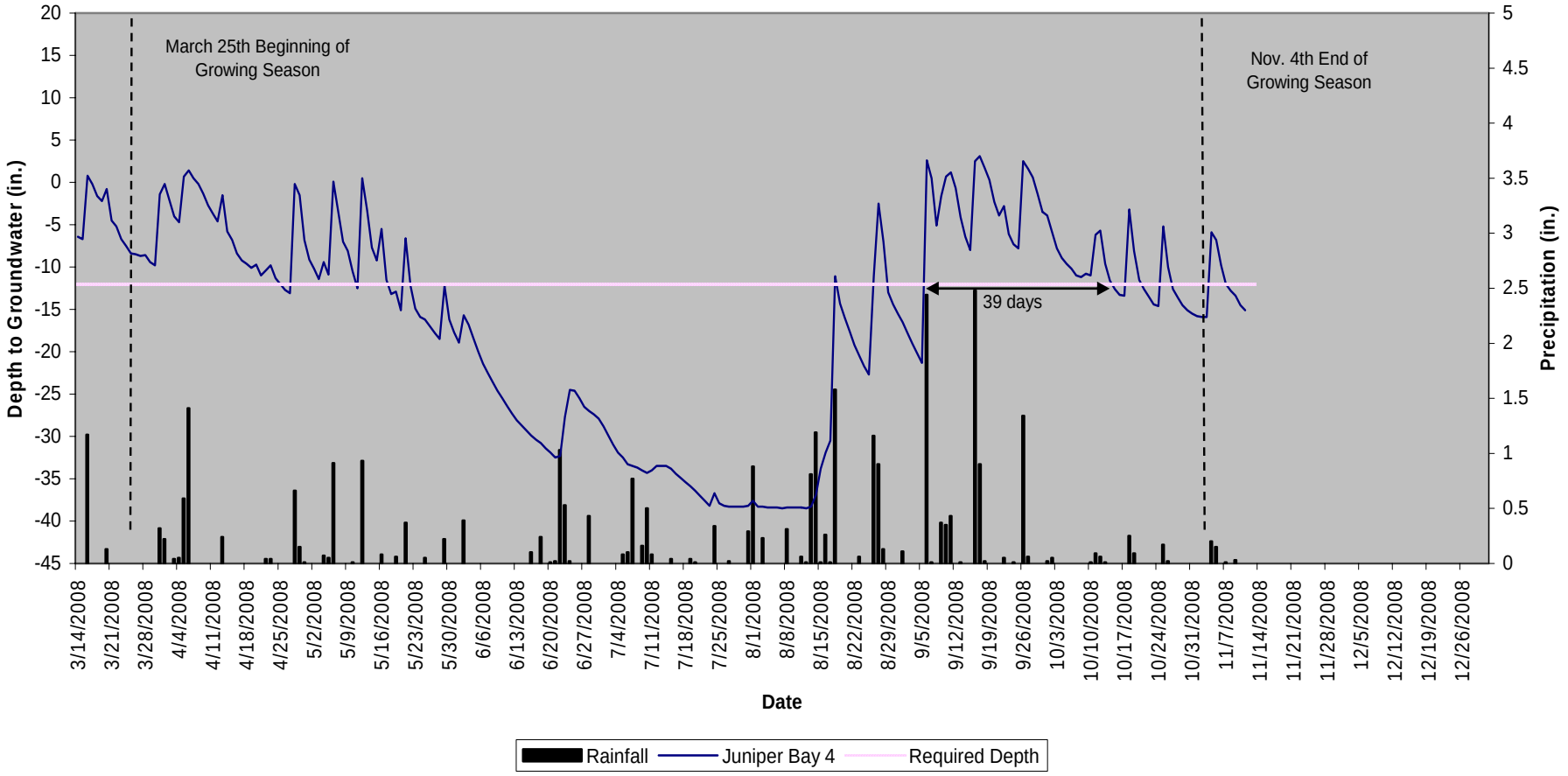

Juniper Bay
1
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
19 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 1
Required depth

Juinper Bay
2
40" Groundwater

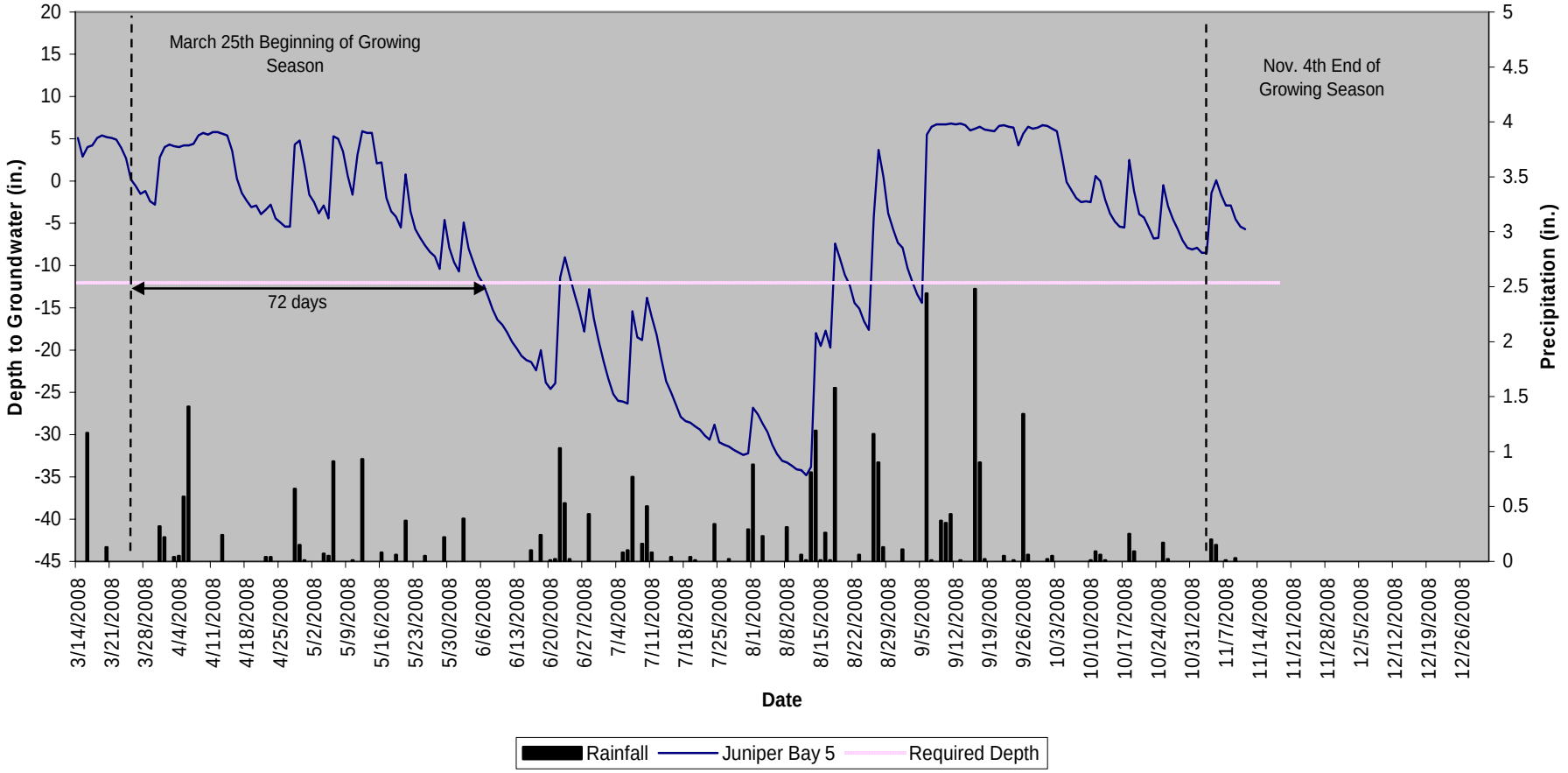



Juniper Bay
3
40" Groundwater
March 25th Beginning of Growing Season
Gauge Malfunction
Nov. 4th End of Growing Season
72 days
79 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 3
Required Depth

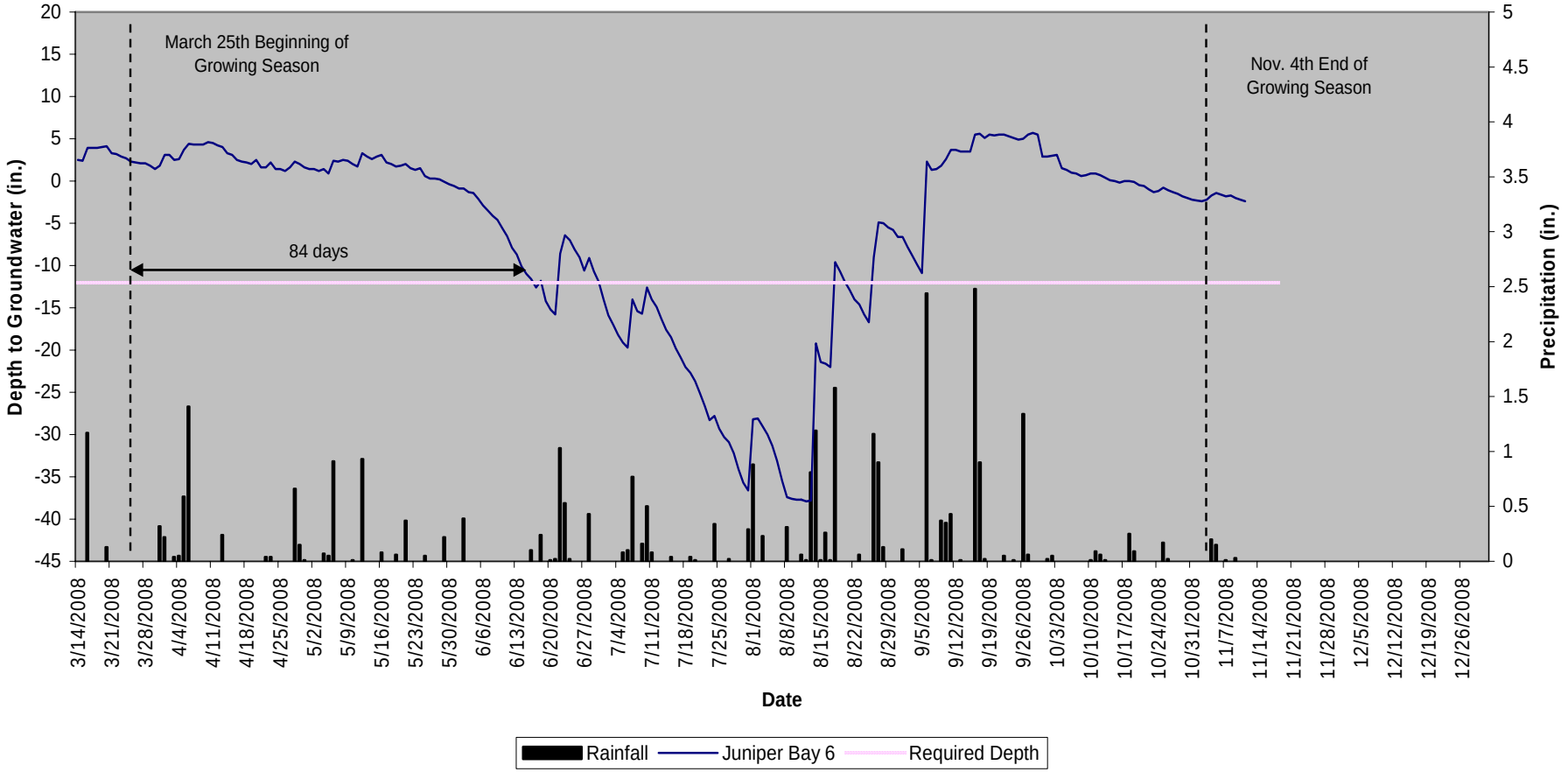
Juniper Bay
4
40" Groundwater



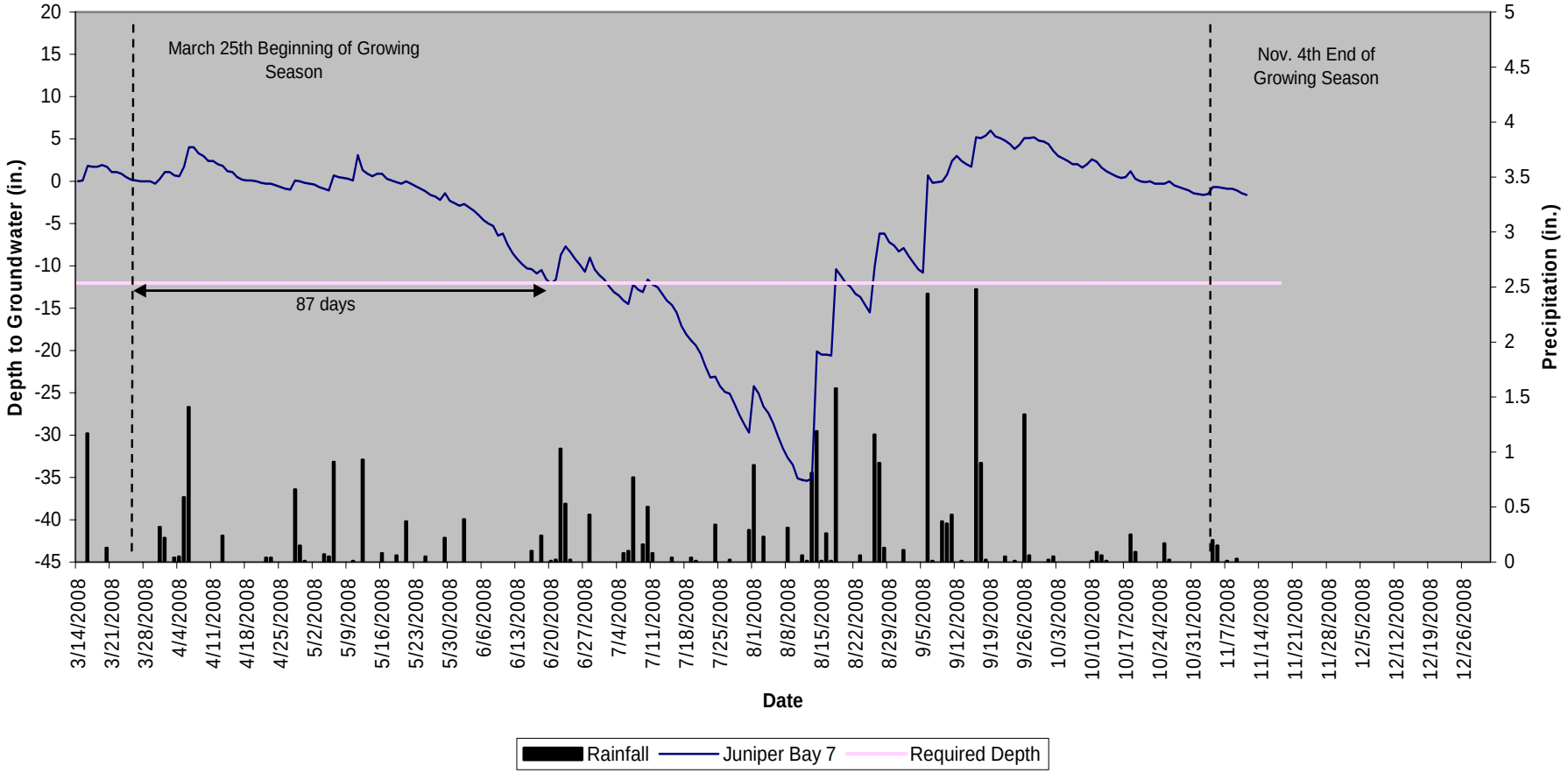
Juniper Bay
5
40" Groundwater



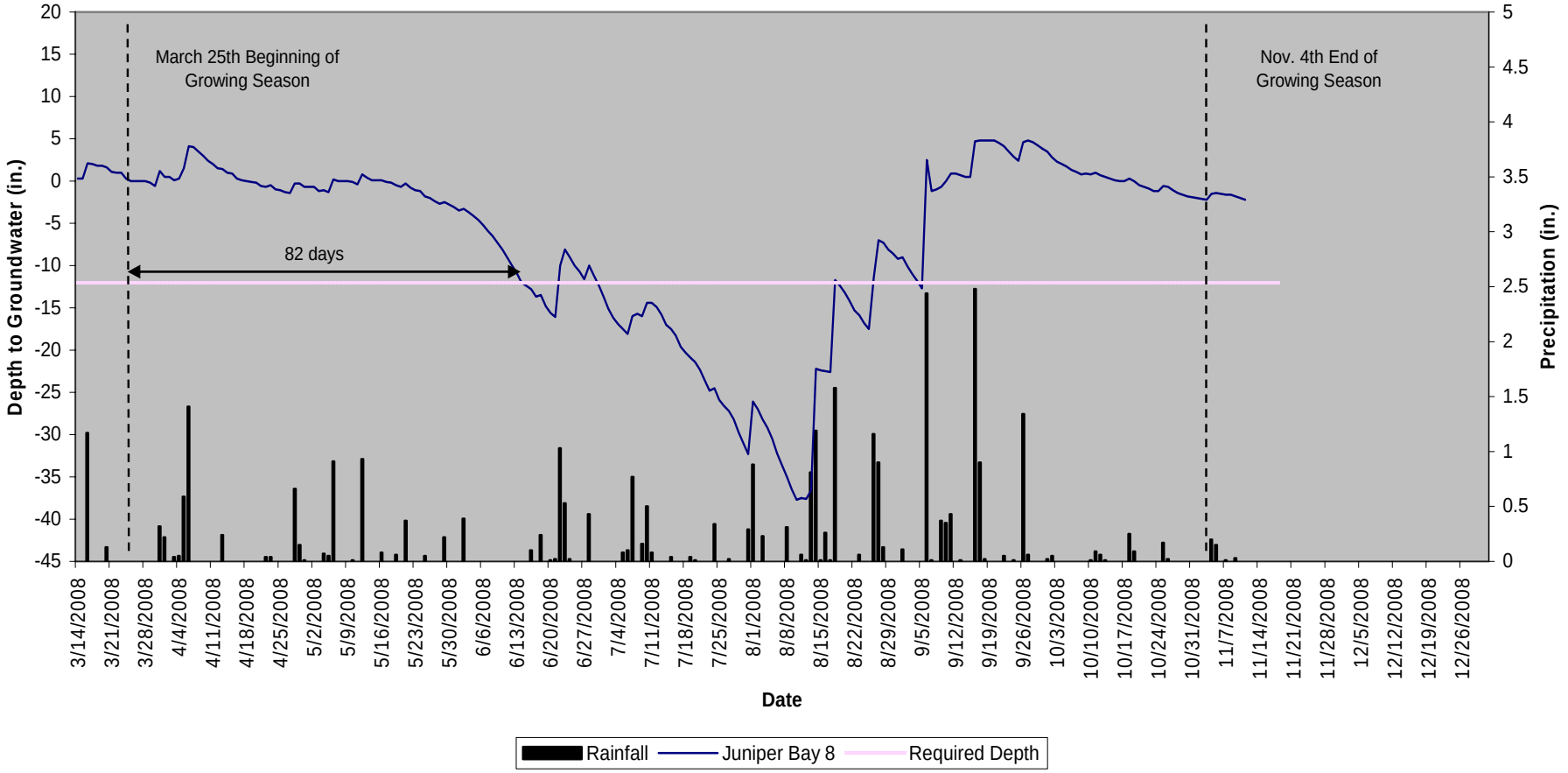
Juniper Bay
6
40" Groundwater



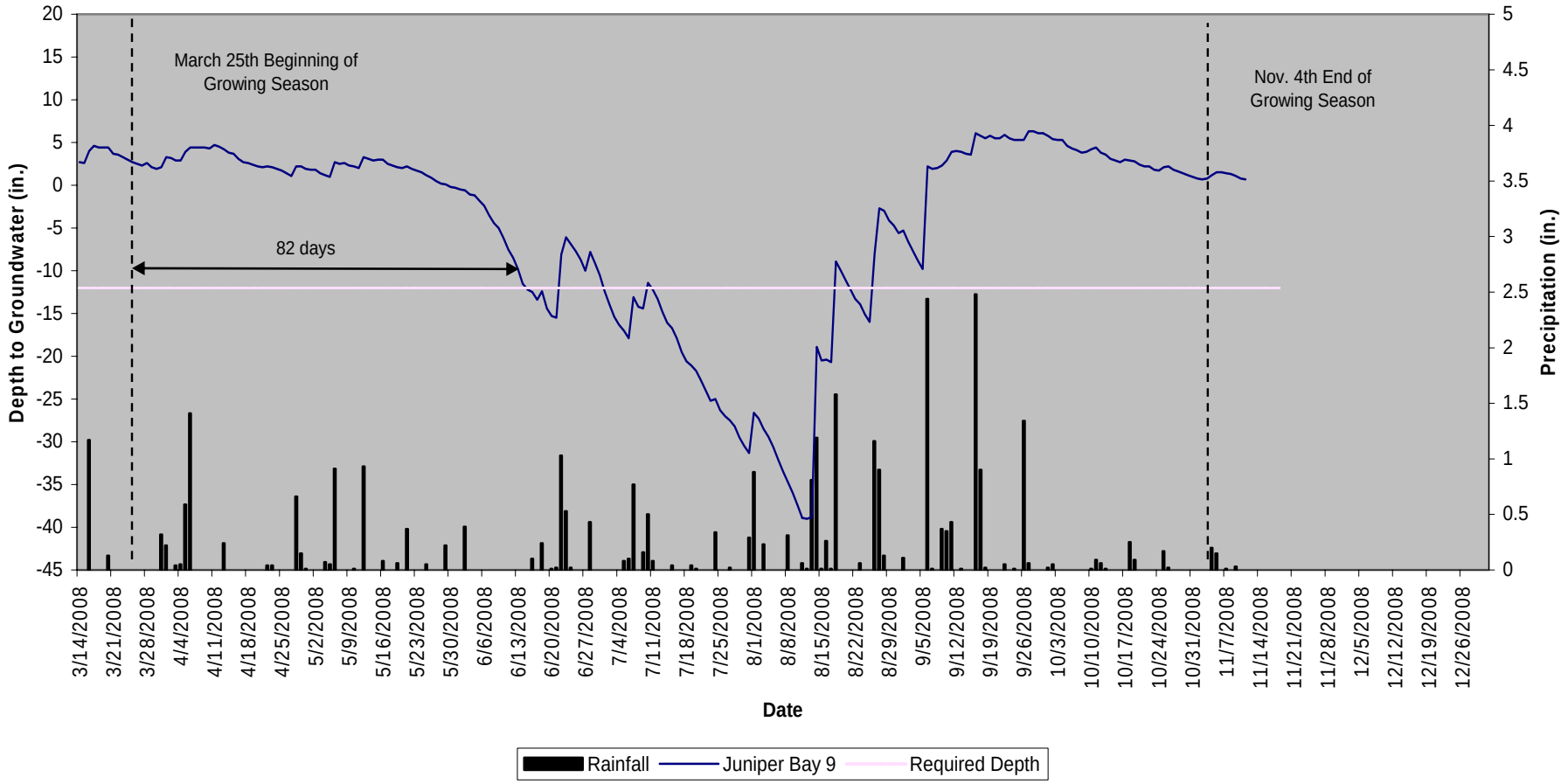
Juniper Bay
7
40" Groundwater



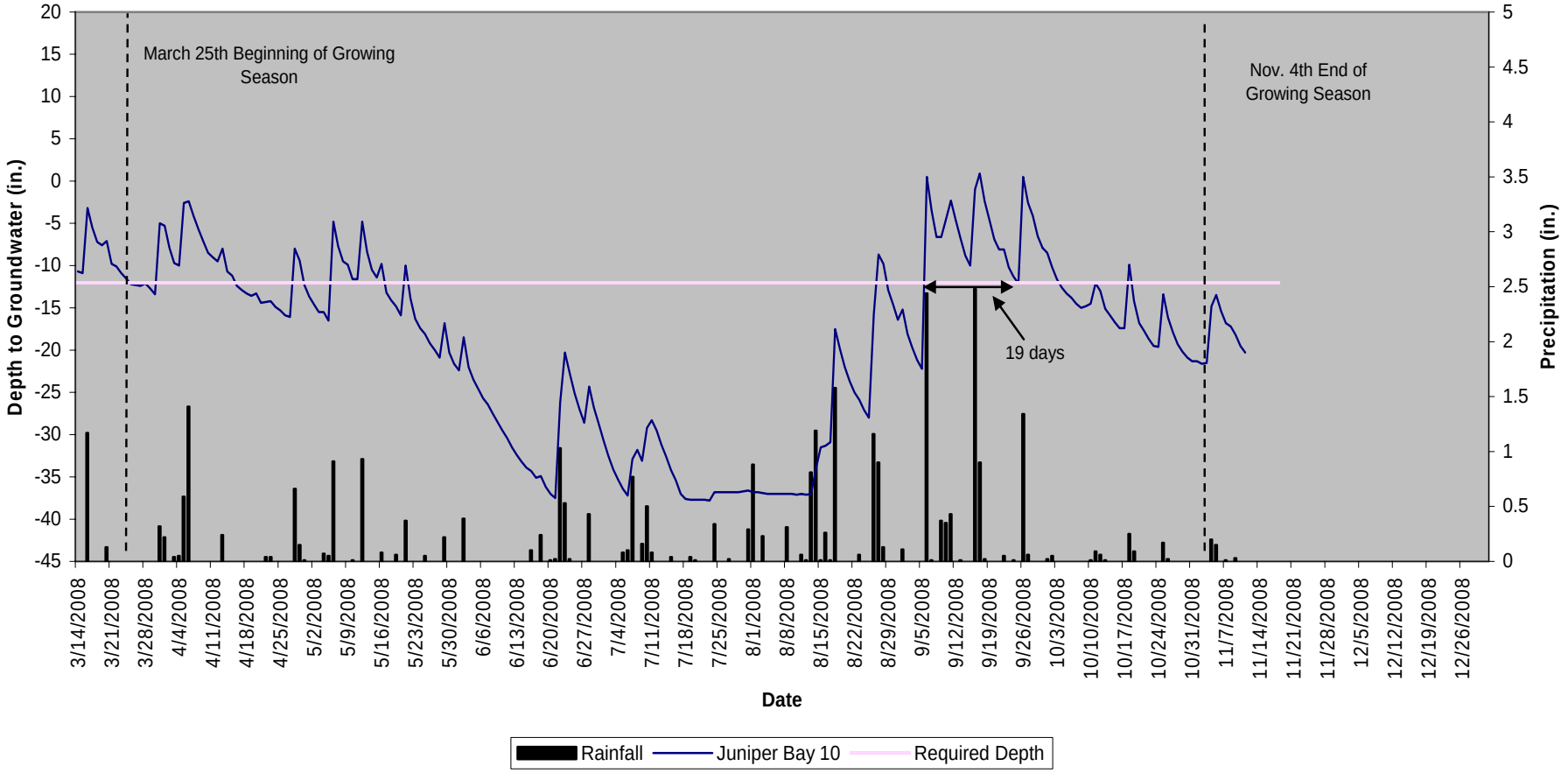
Juniper Bay
8
40" Groundwater



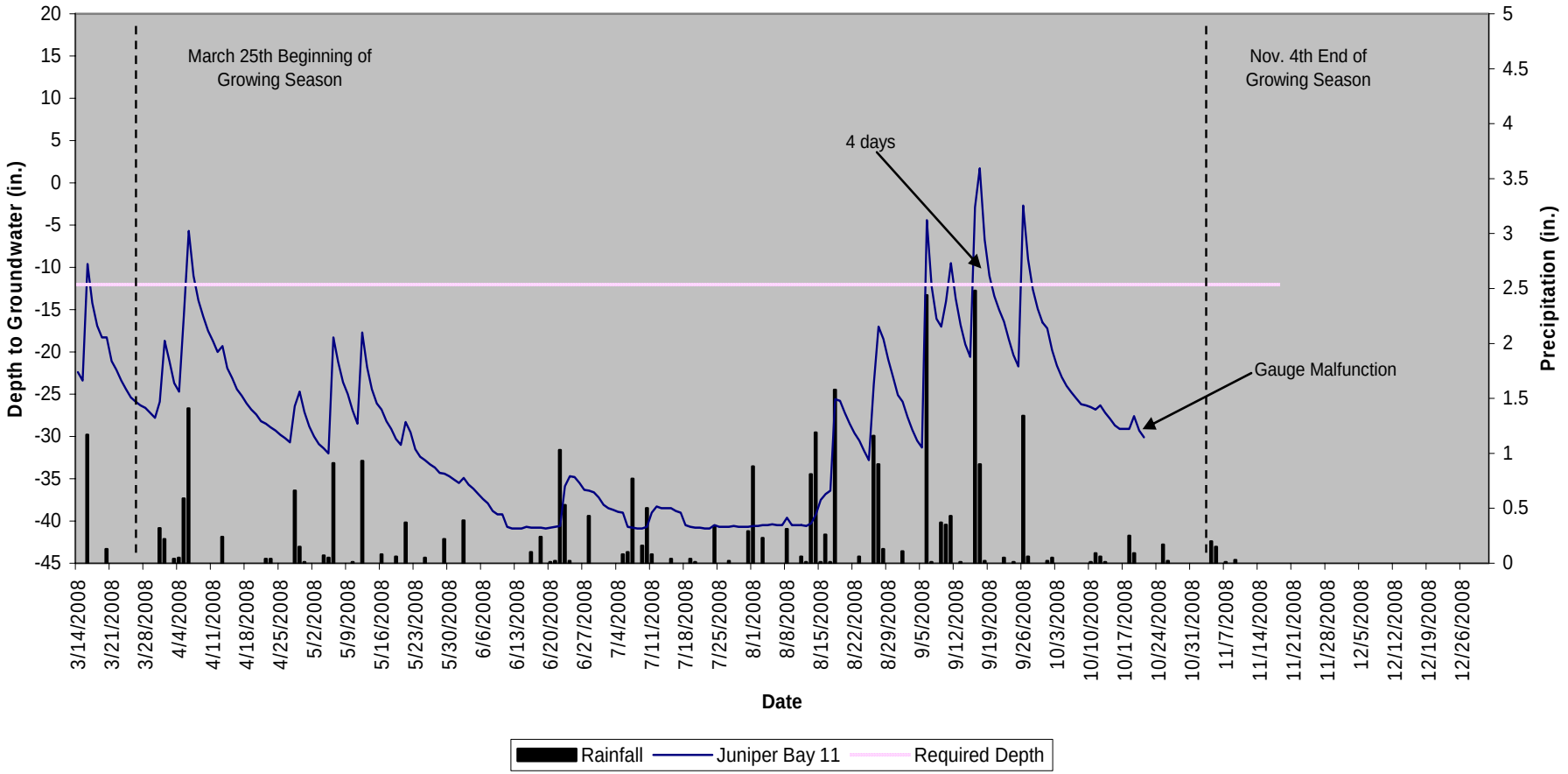
Juniper Bay
9
40" Groundwater

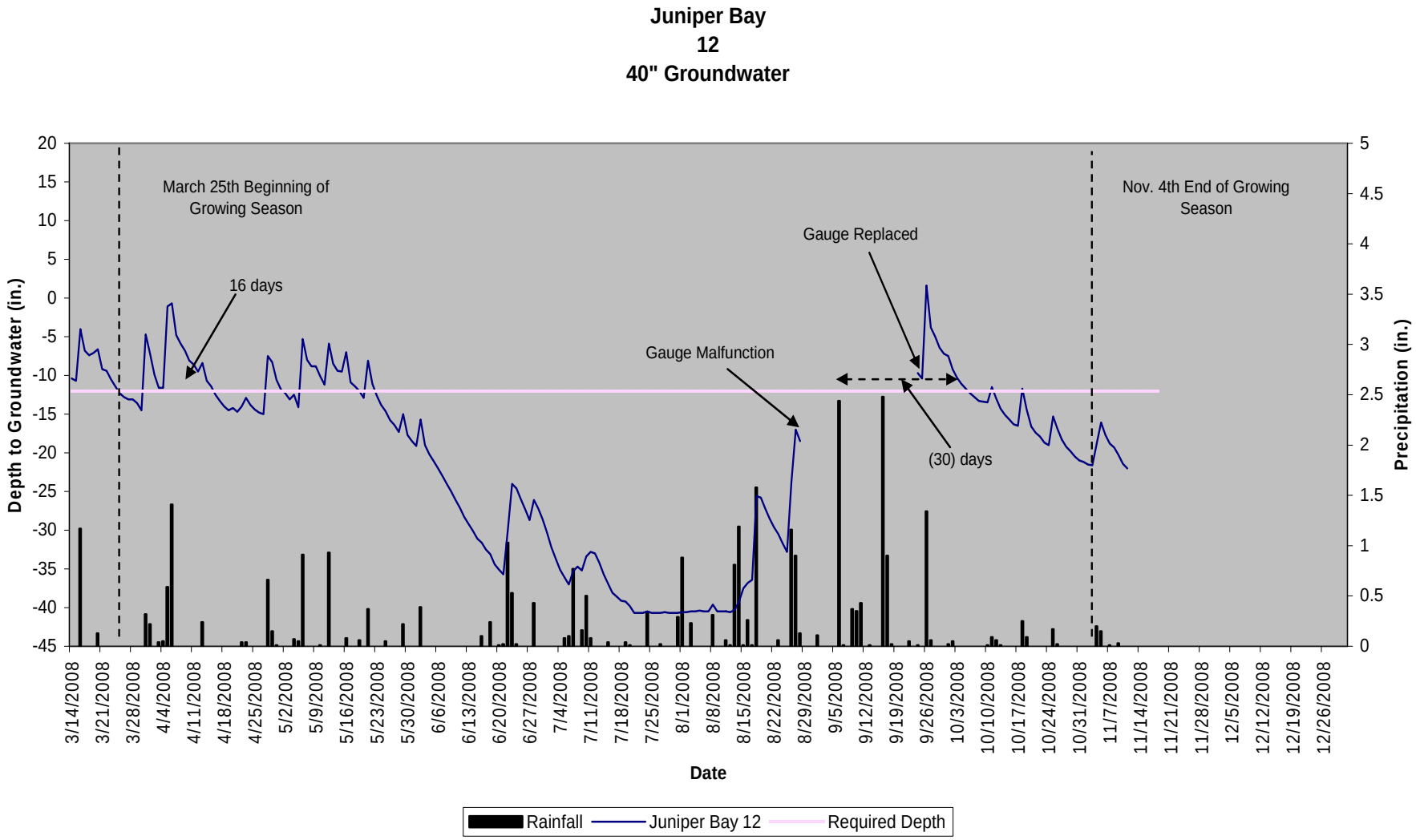


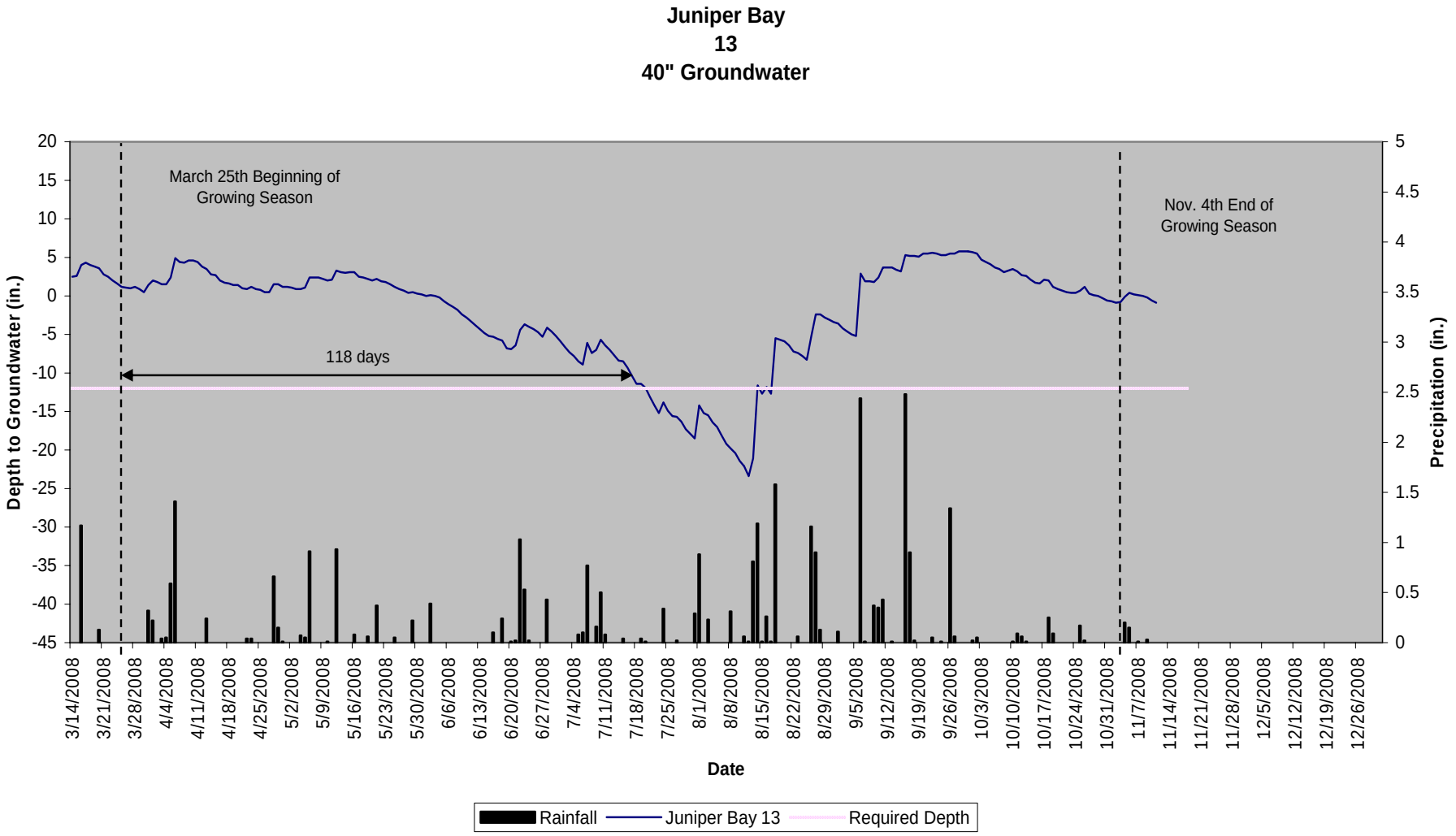
Juniper Bay
10
40" Groundwater



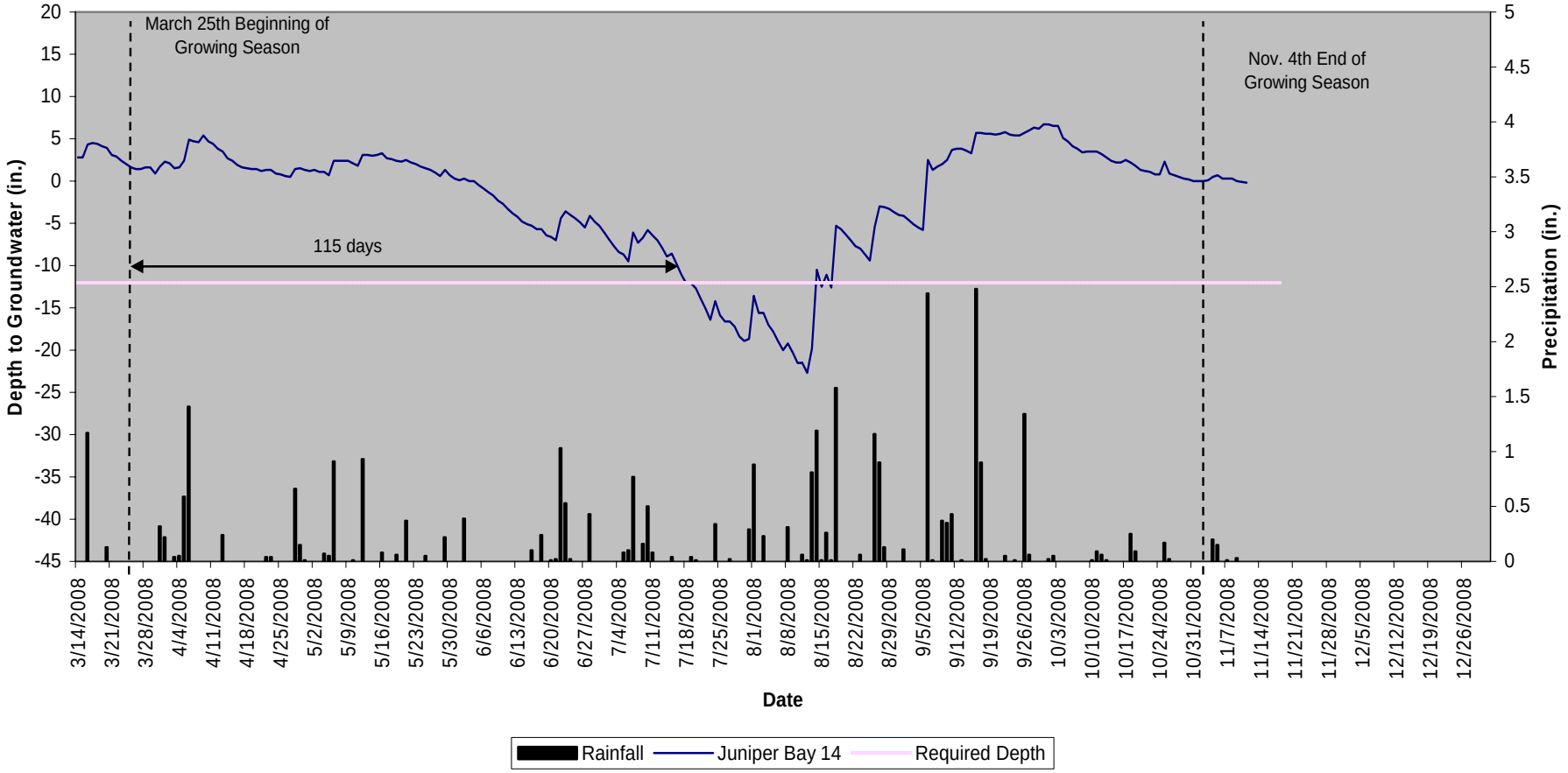
Juniper Bay
11
40" Groundwater

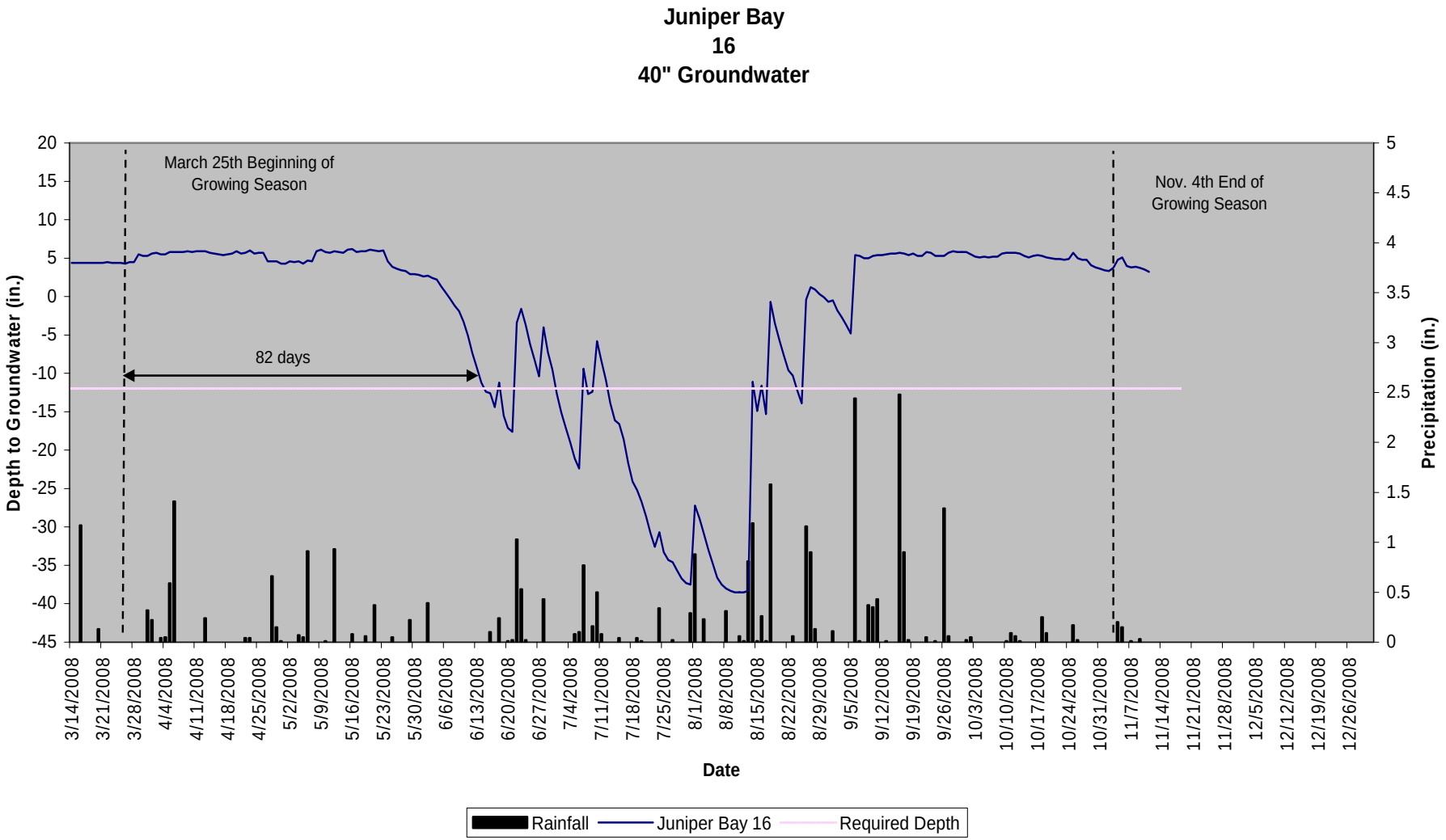



Juniper Bay
12
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
16 days
Gauge Replaced
Gauge Malfunction
(30) days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 12
Required Depth

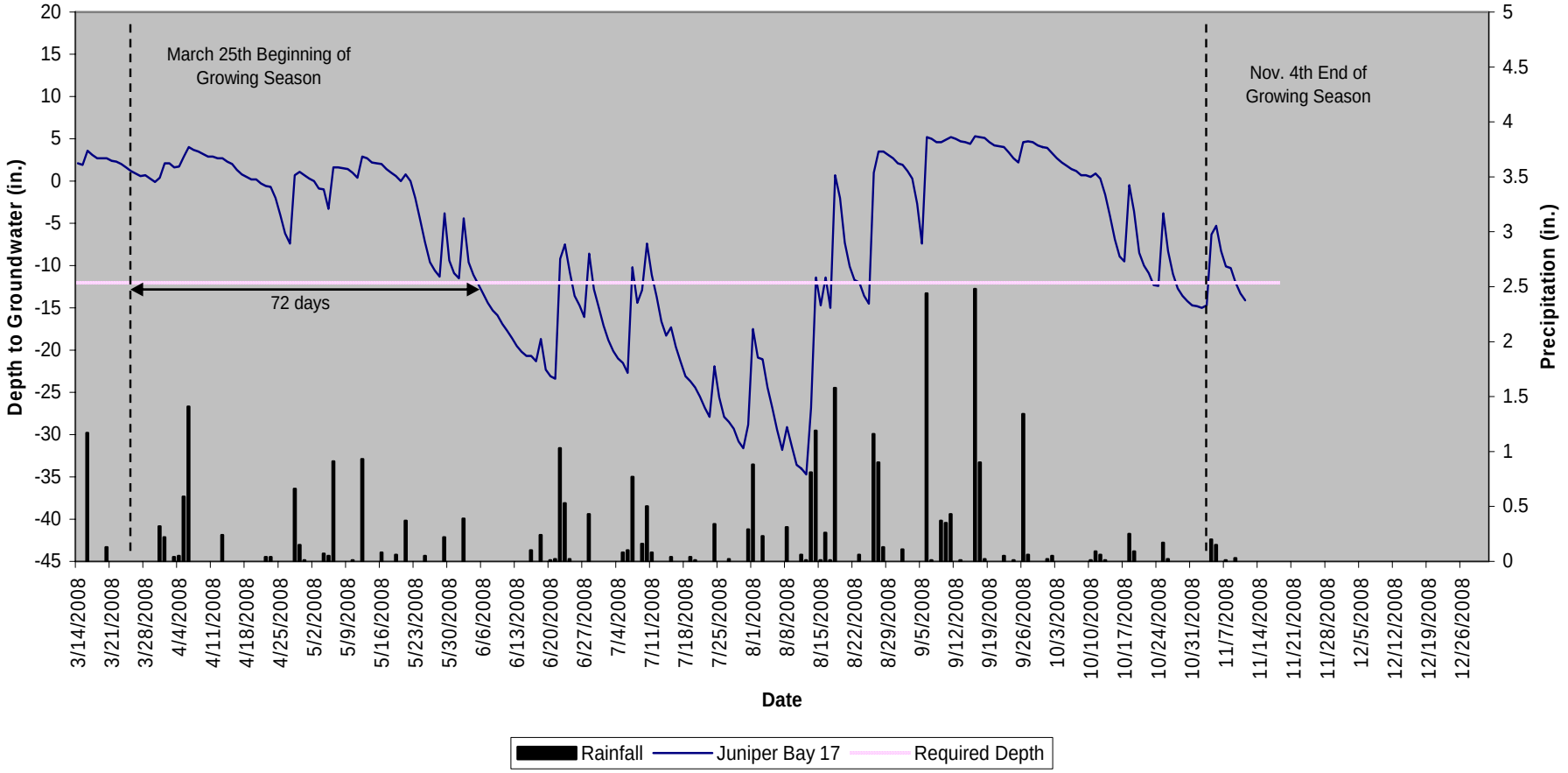

Juniper Bay
13
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
118 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 13
Required Depth

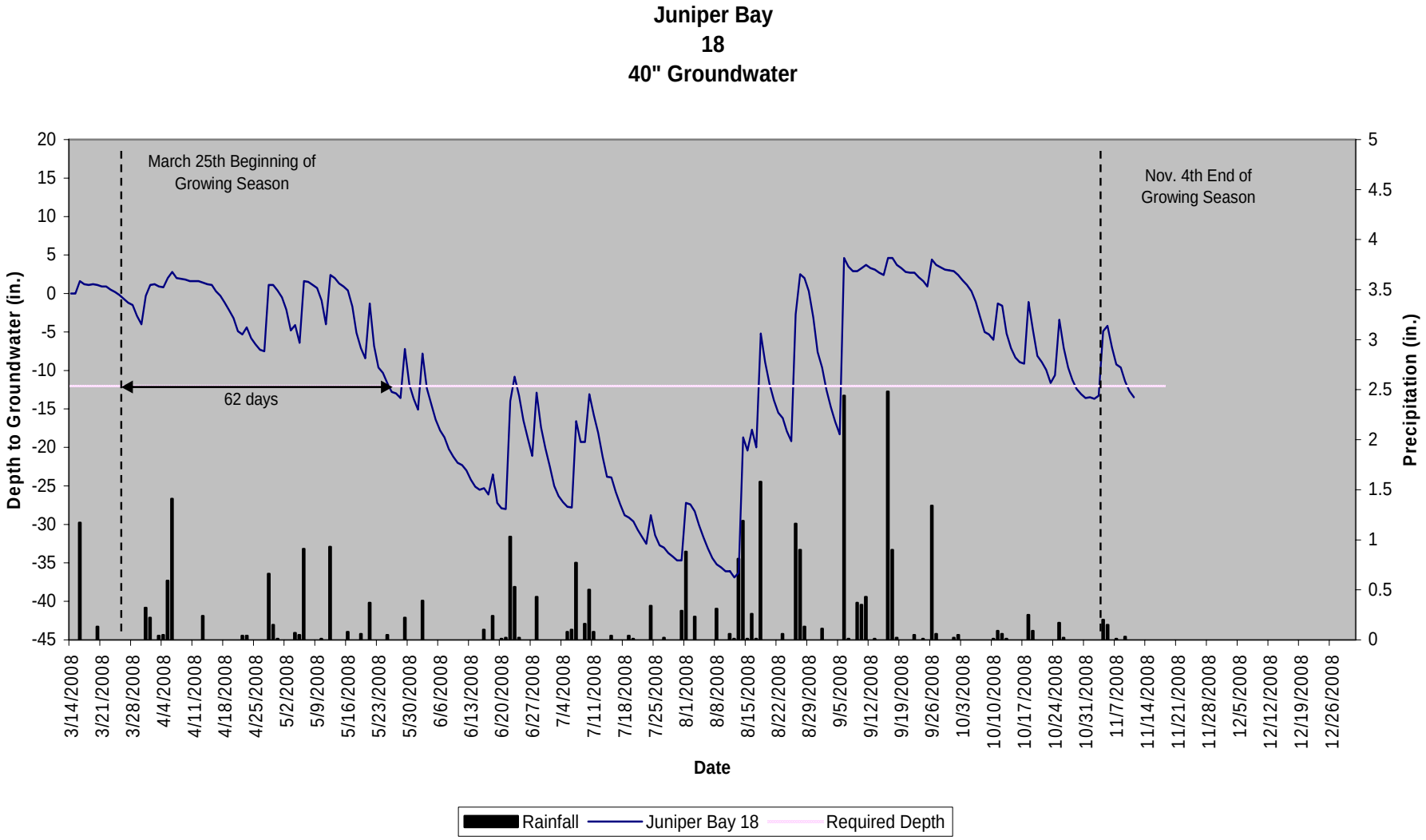
Juniper Bay
14
40" Groundwater



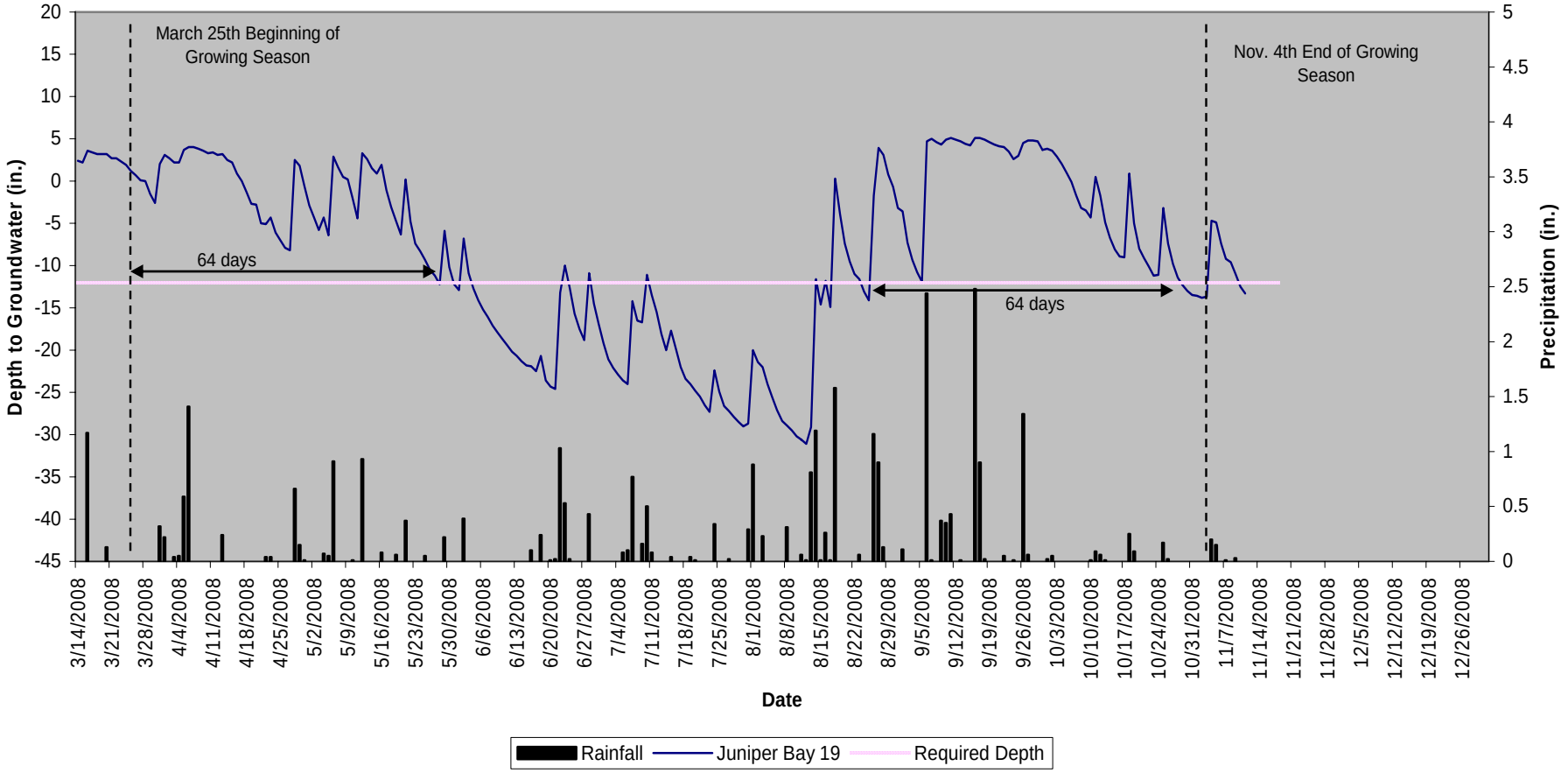

Juniper Bay
16
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
82 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 16
Required Depth

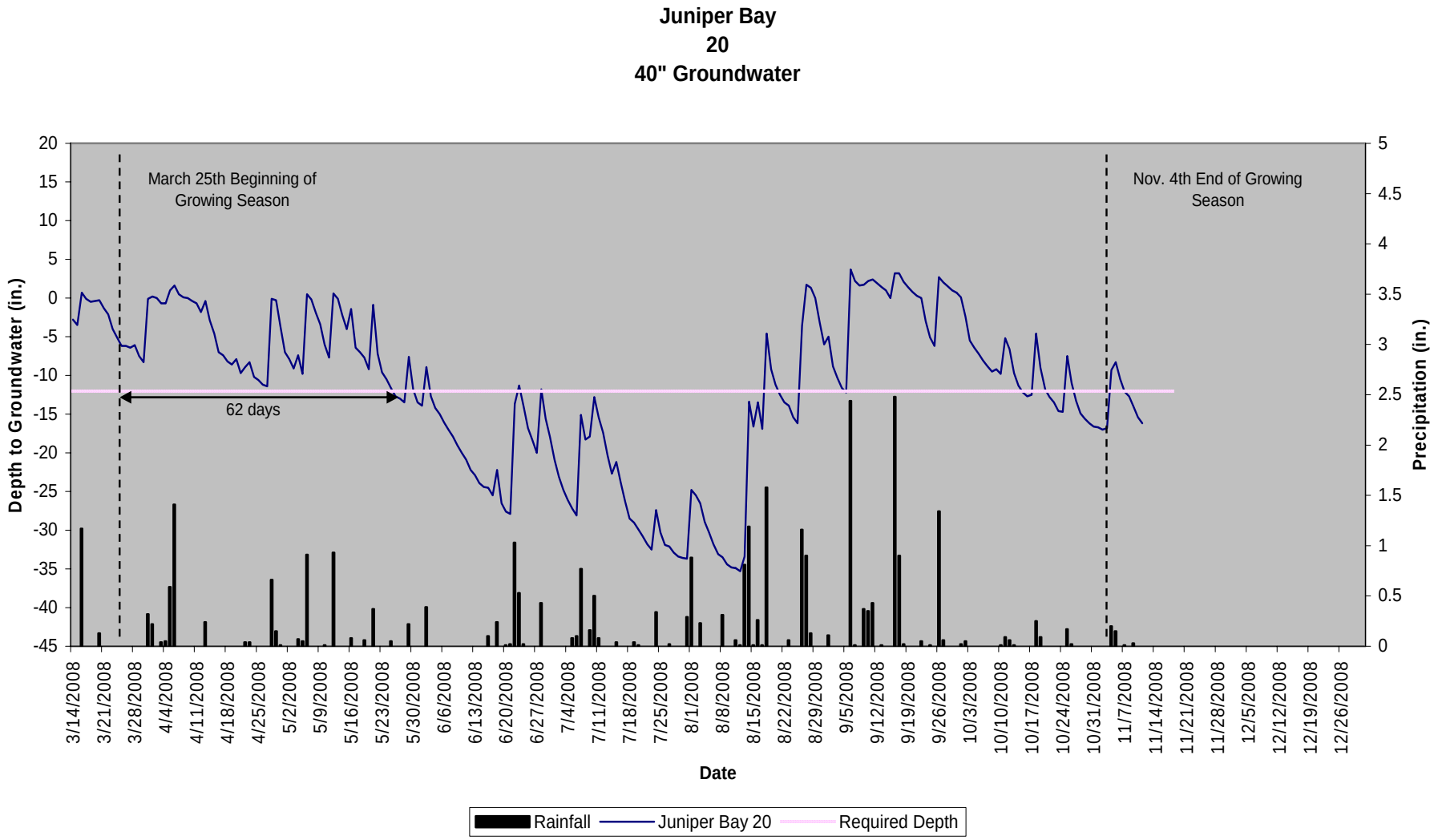
Juniper Bay
17
40" Groundwater

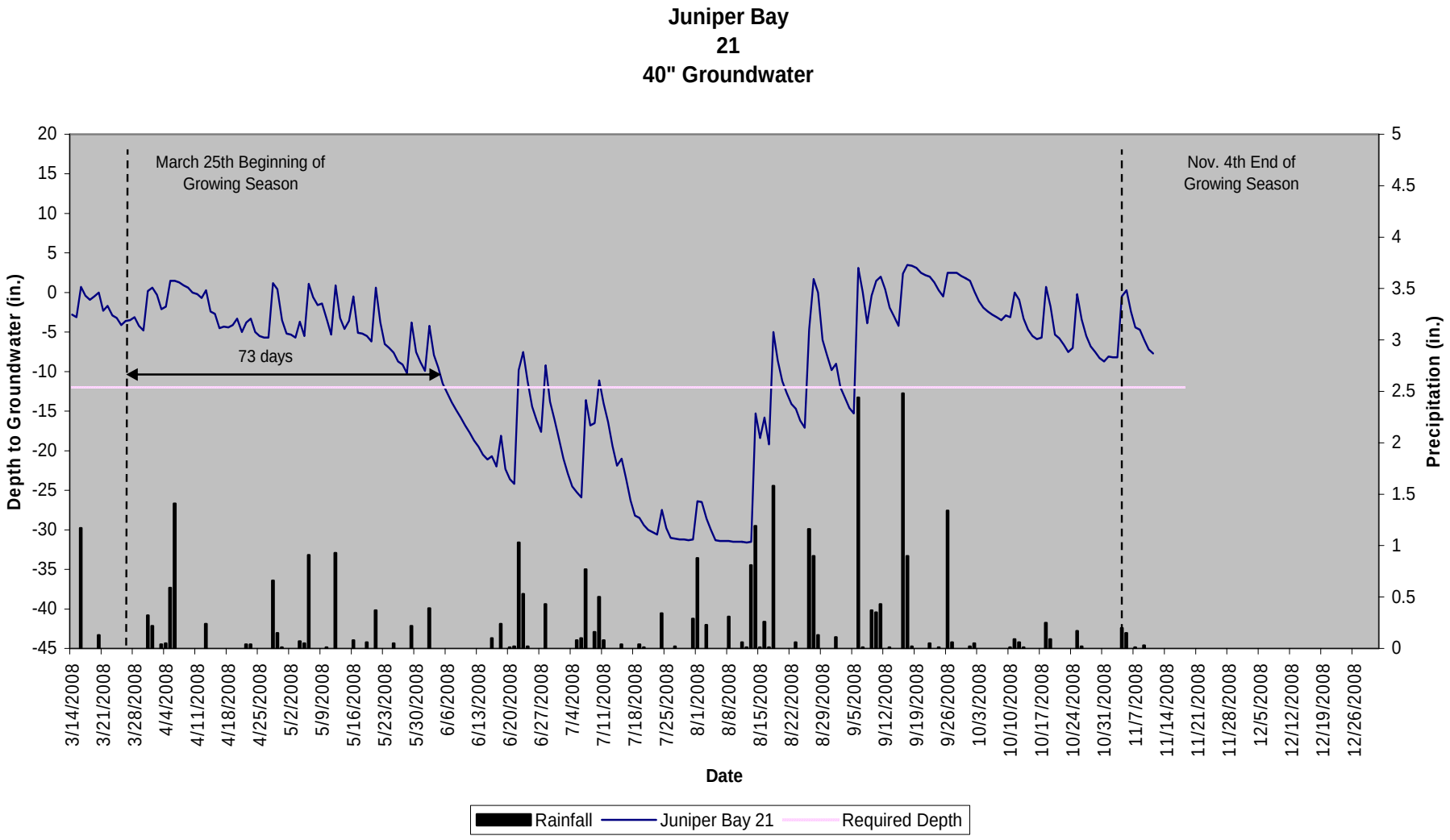



Juniper Bay
18
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
62 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 18
Required Depth

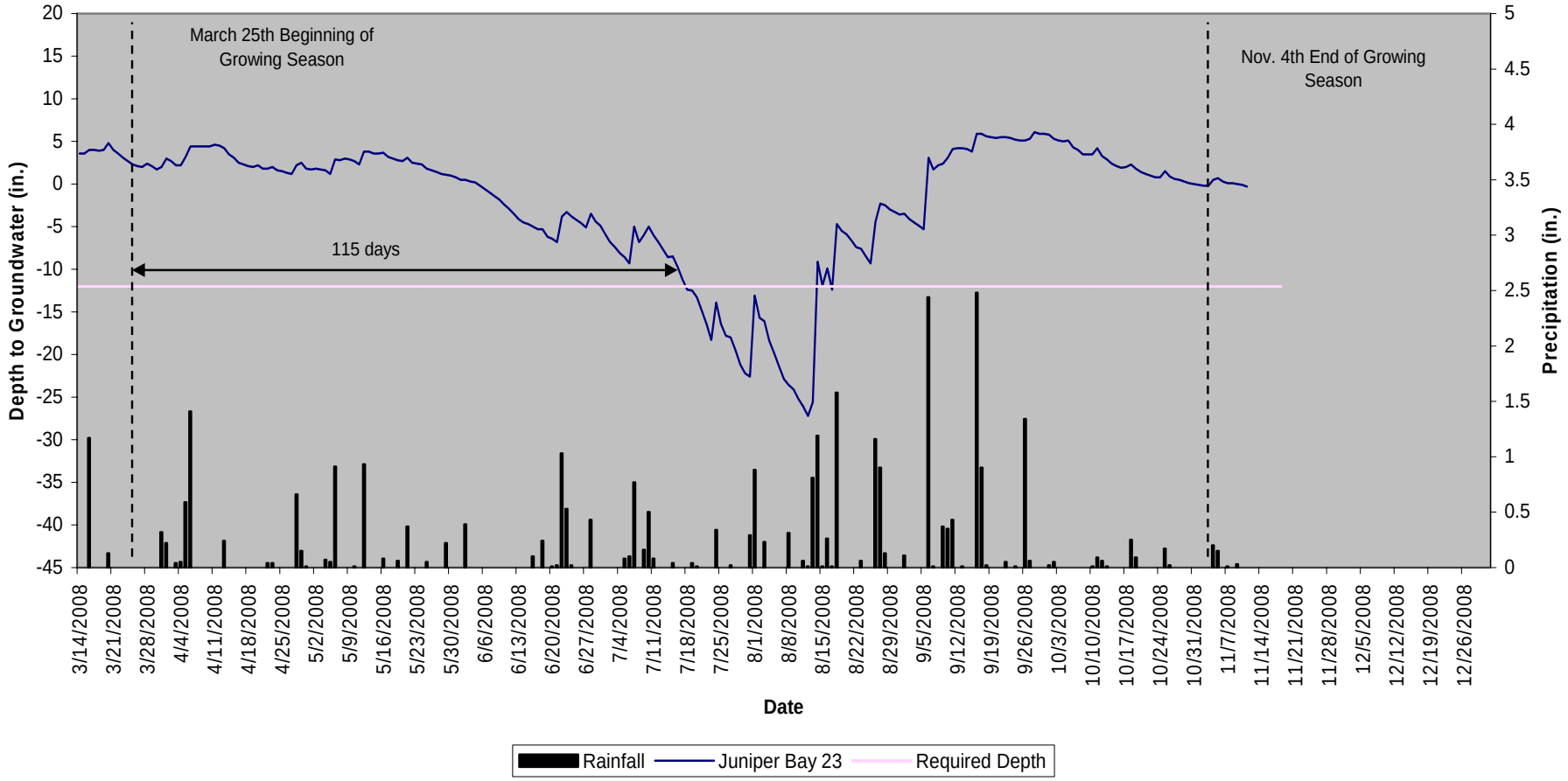
Juniper Bay
19
40" Groundwater

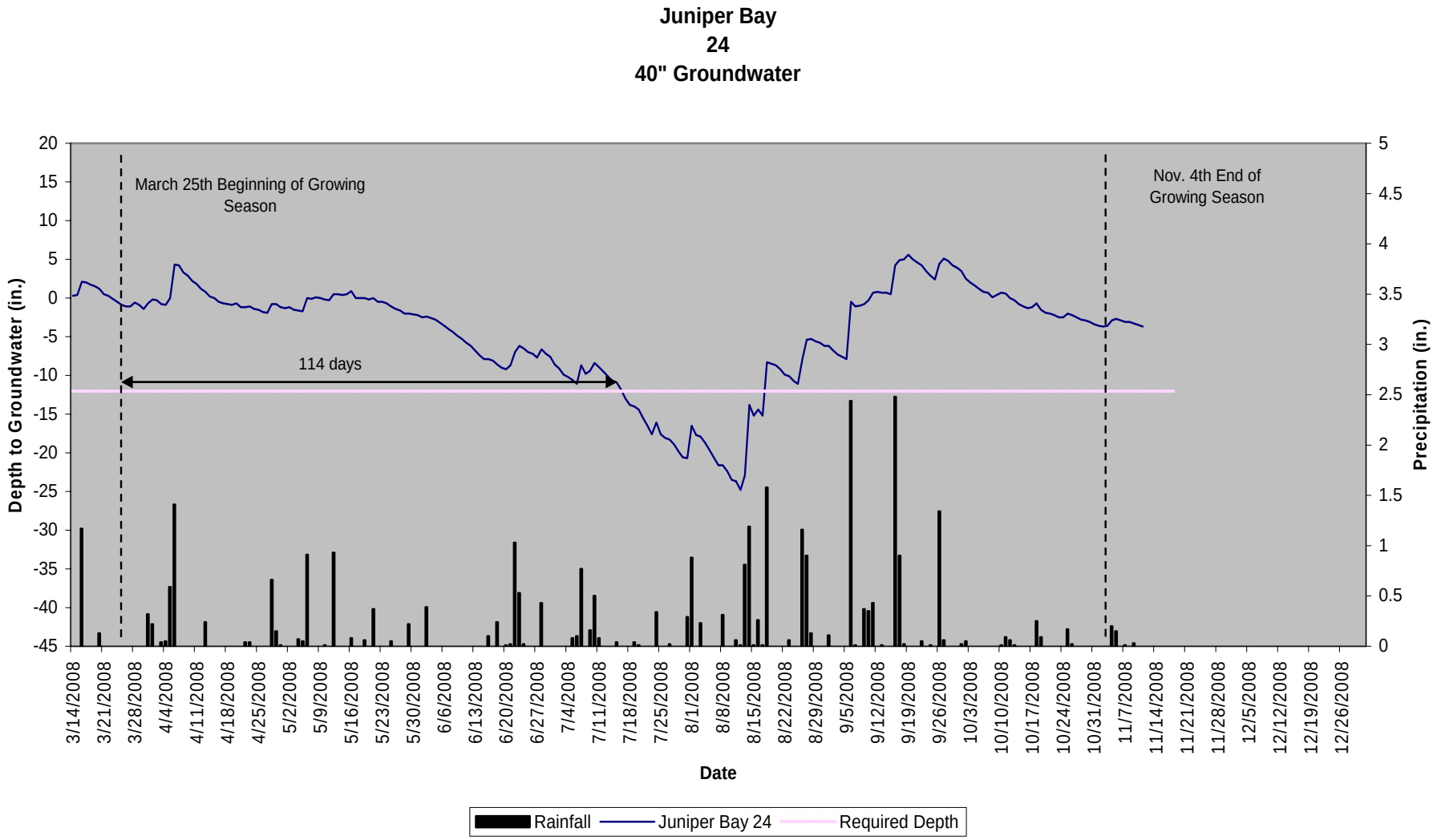


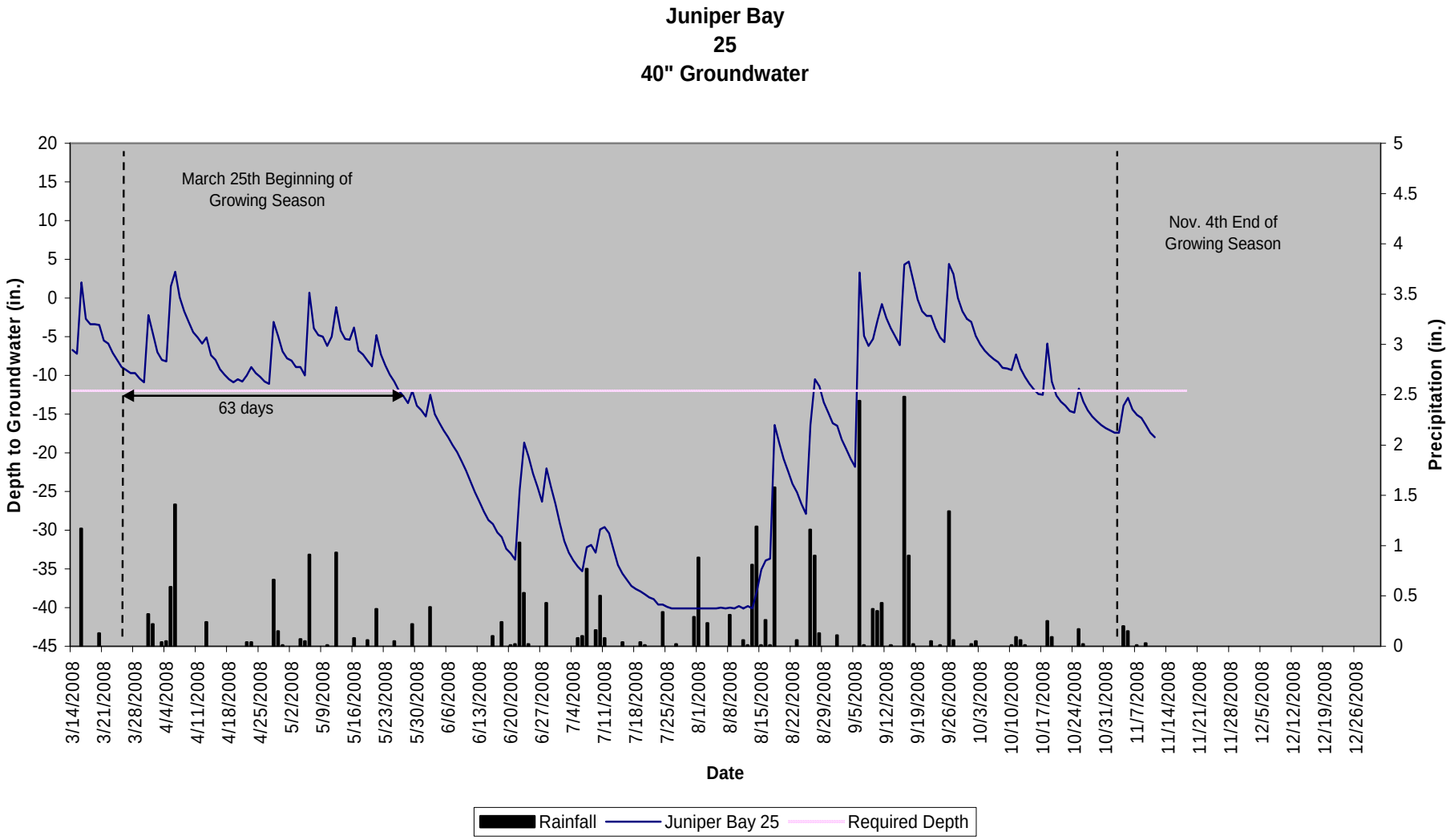

Juniper Bay
20
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
62 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 20
Required Depth


Juniper Bay
21
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
73 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 21
Required Depth

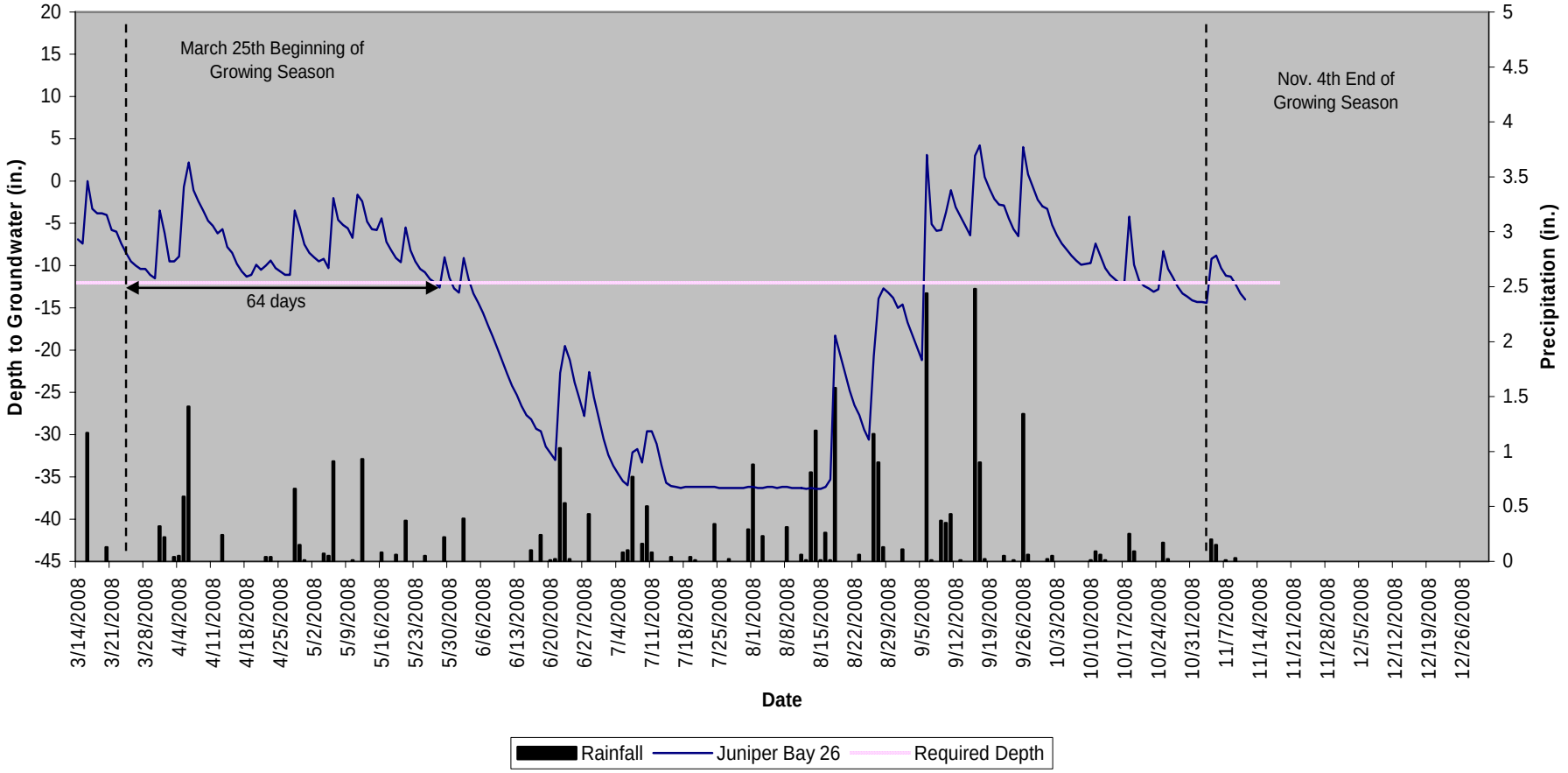
Juniper Bay
23
40" Groundwater



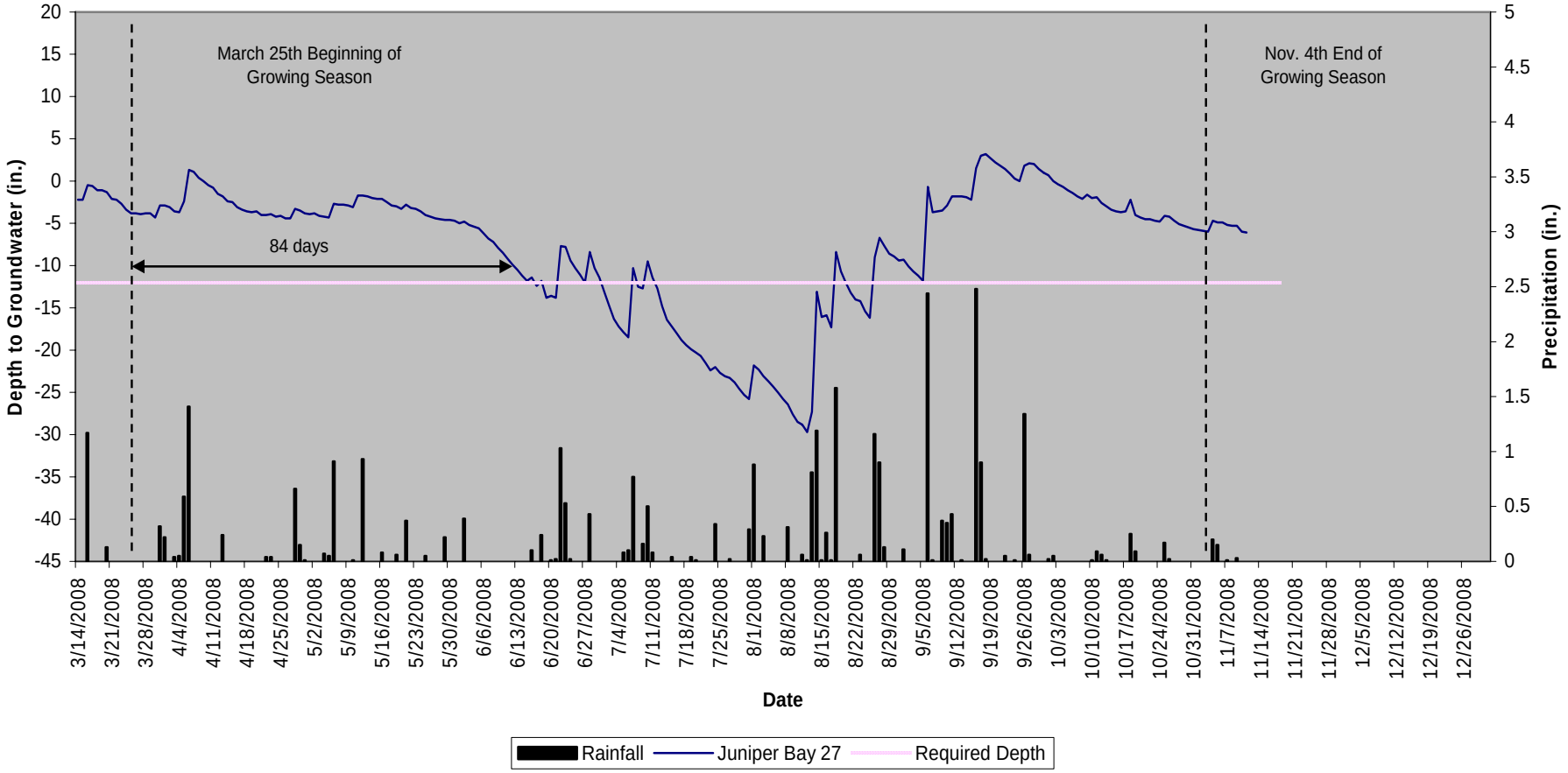

Juniper Bay
24
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
114 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 24
Required Depth

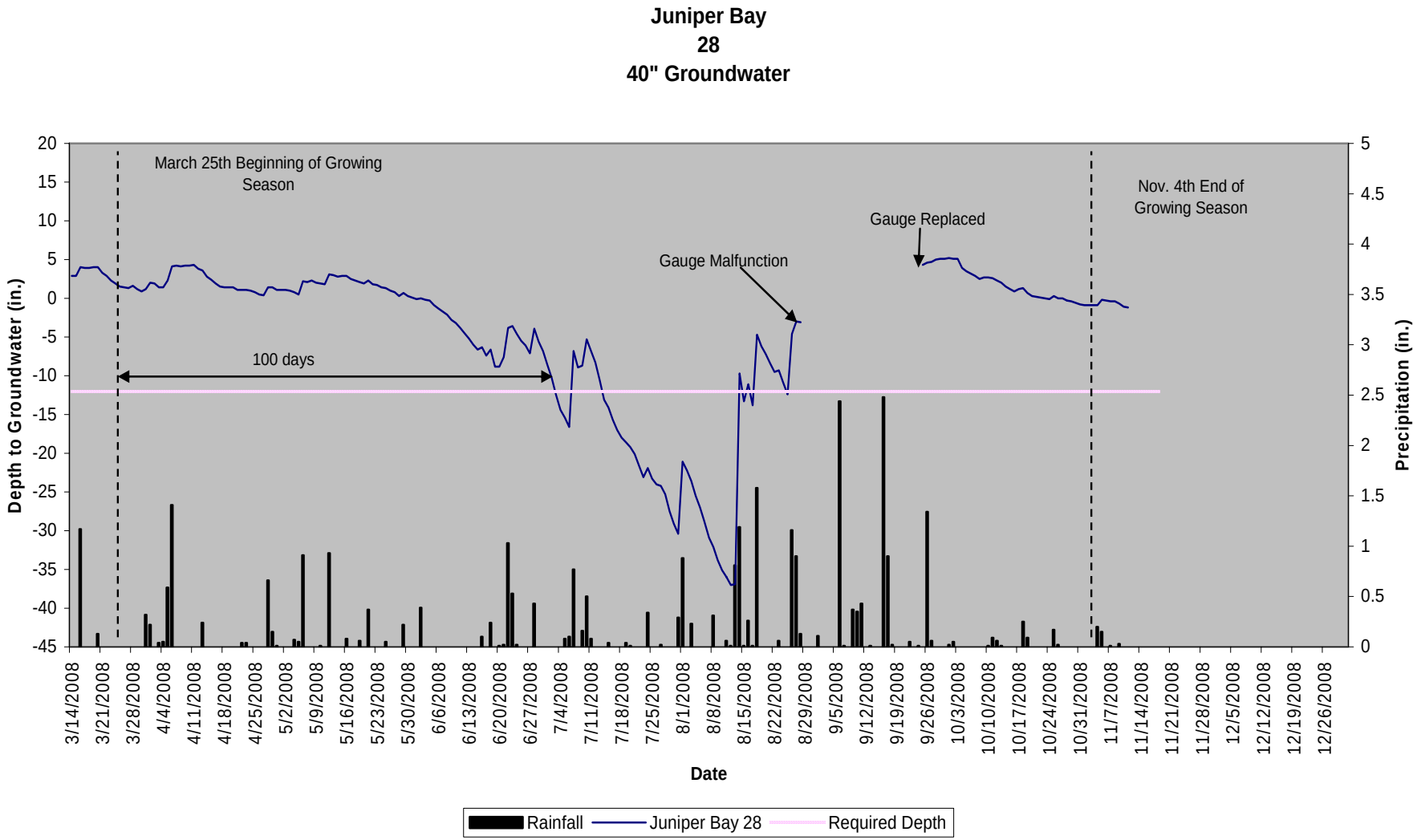

Juniper Bay
25
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
63 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 25
Required Depth

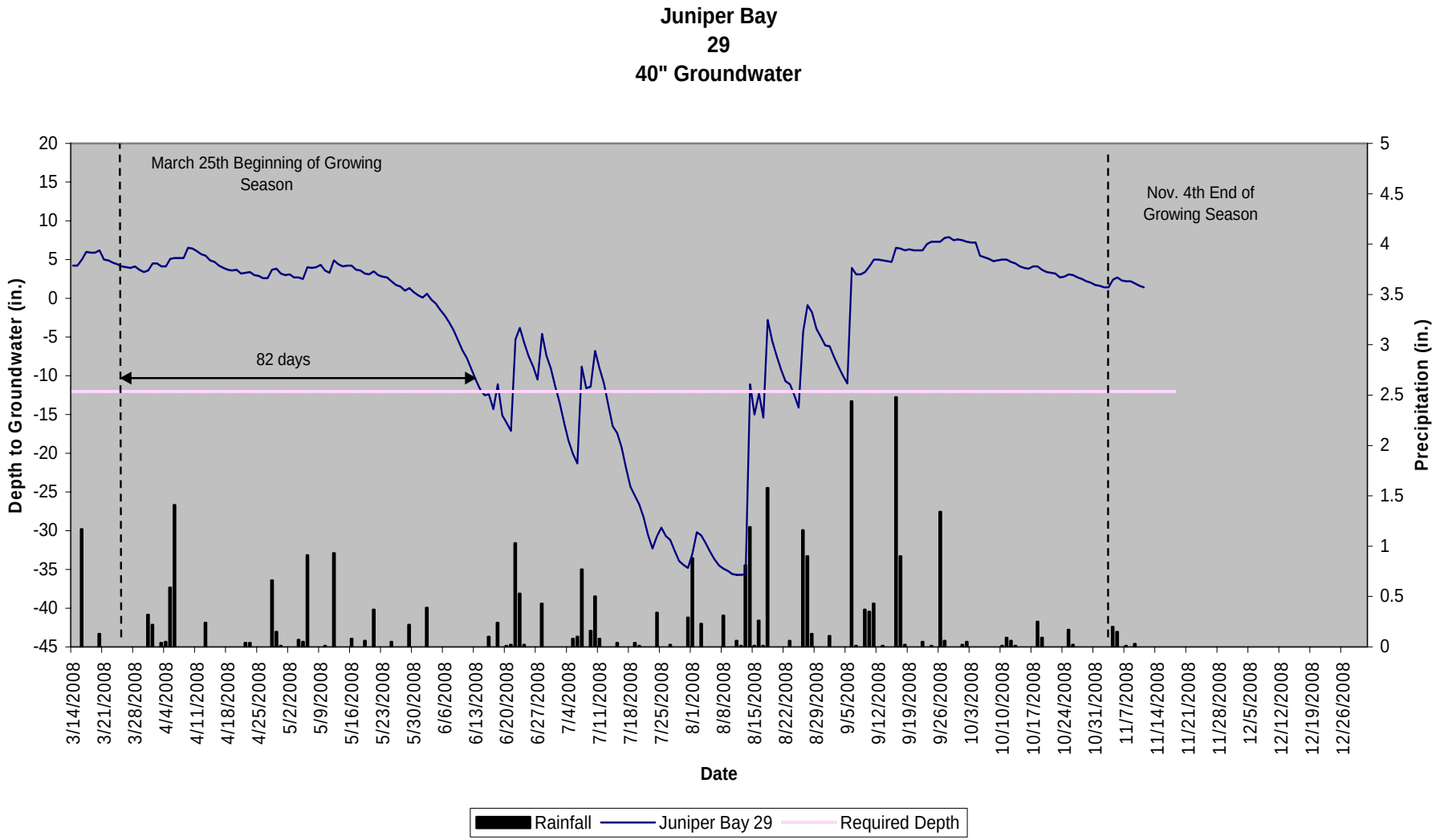
Juniper Bay
26
40" Groundwater



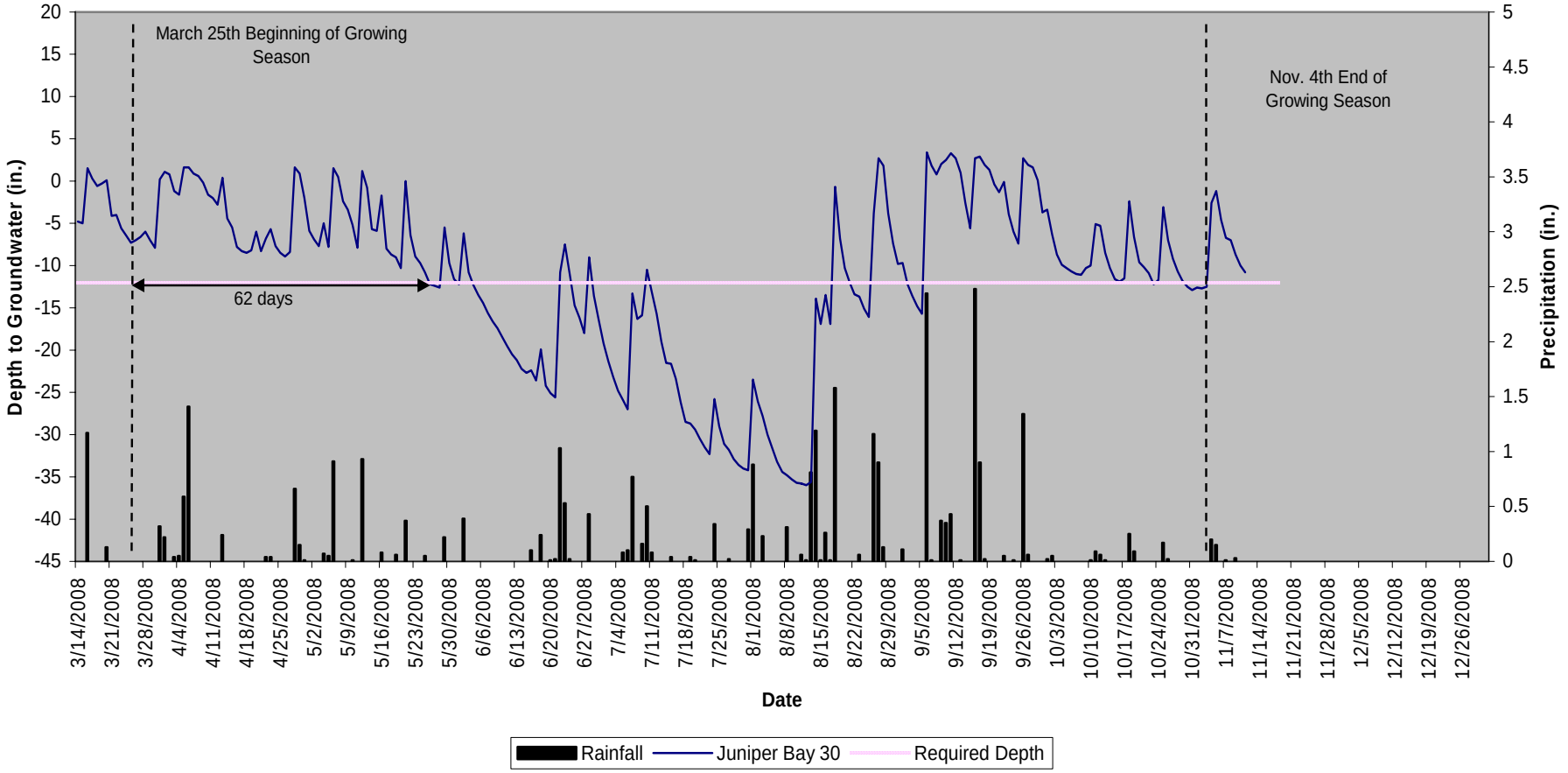
Juniper Bay
27
40" Groundwater



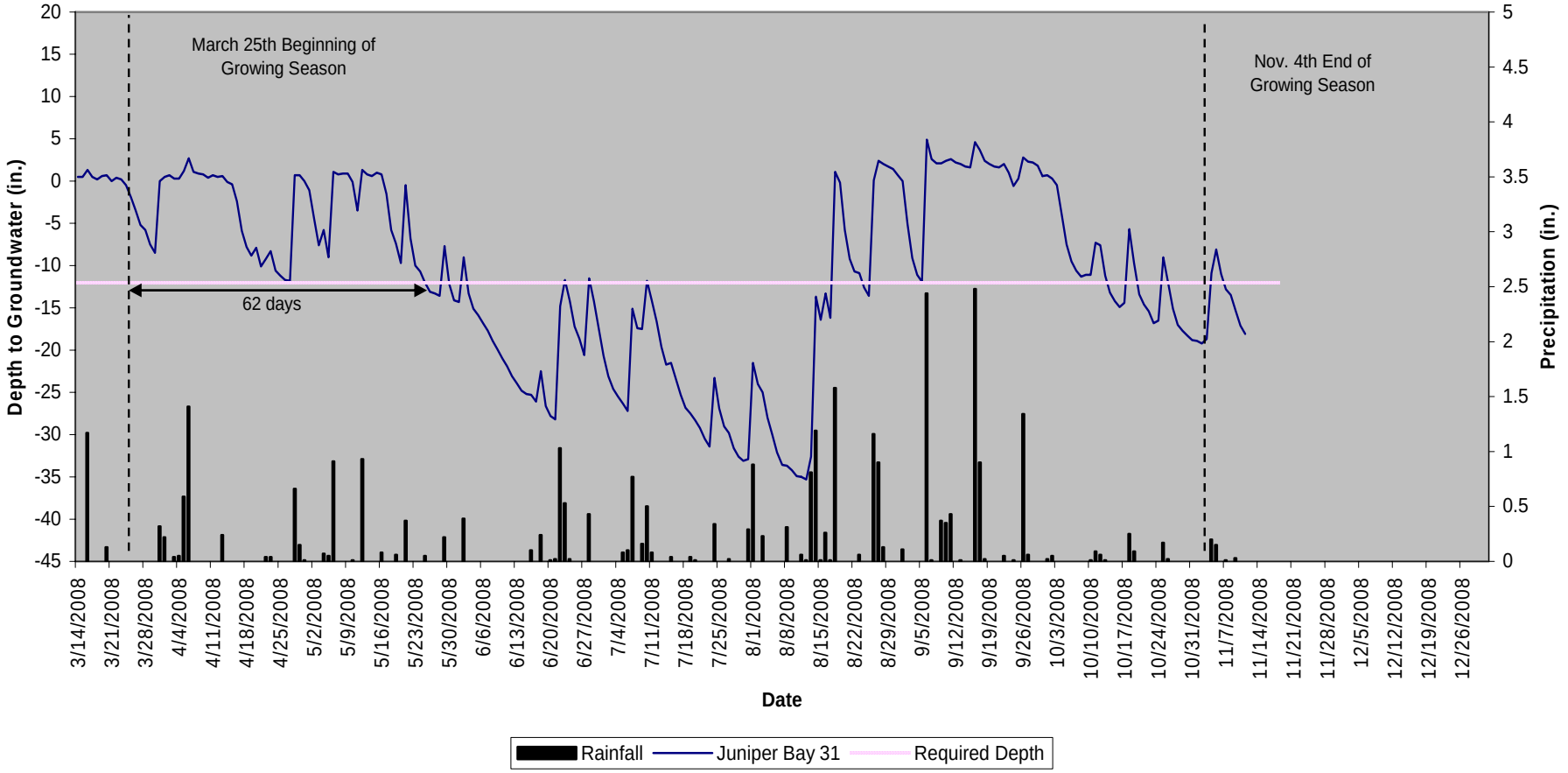

Juniper Bay
28
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
Gauge Replaced
Gauge Malfunction
100 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 28
Required Depth


Juniper Bay
29
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
82 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 29
Required Depth

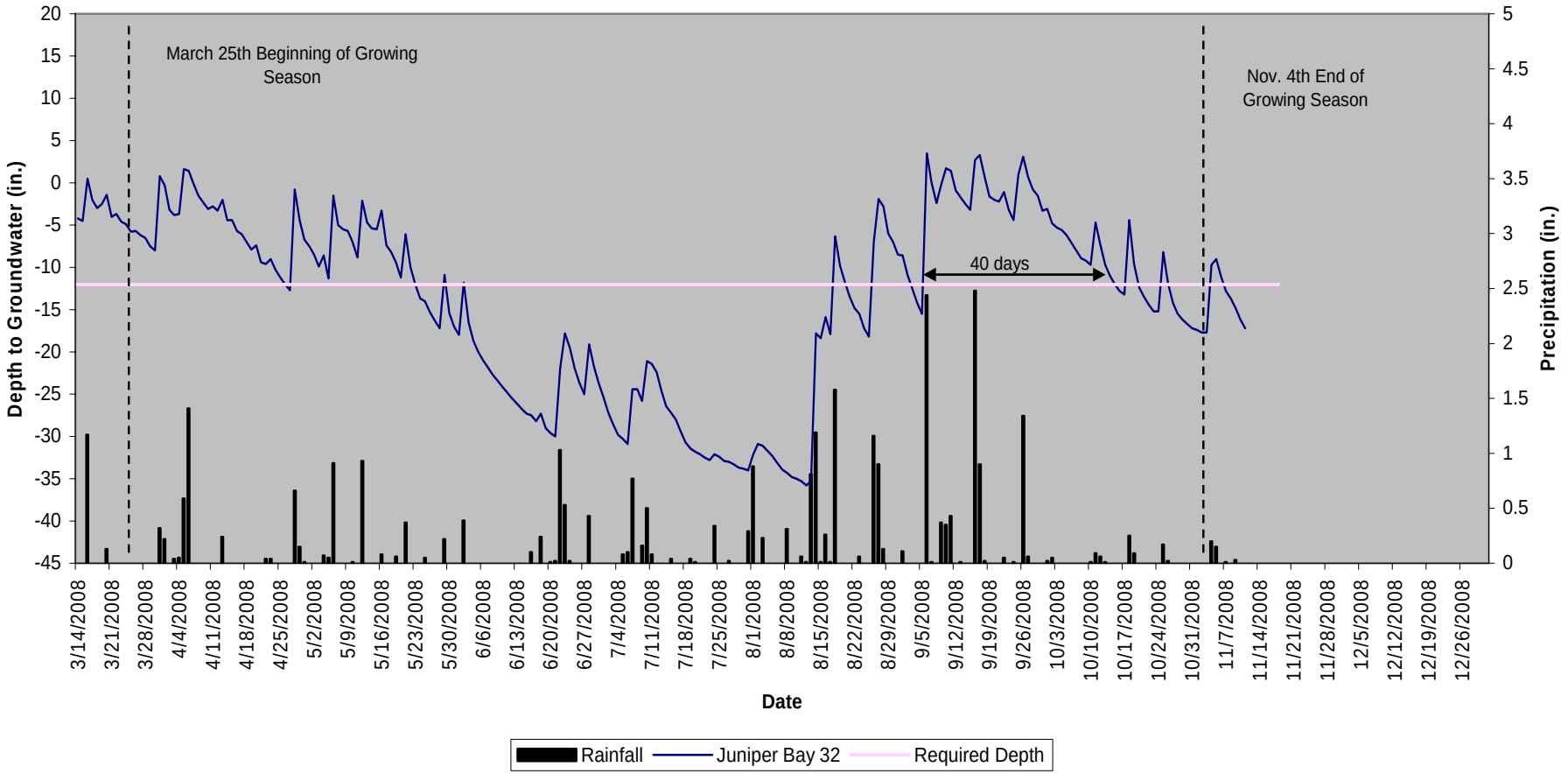
Juniper Bay
30
40" Groundwater

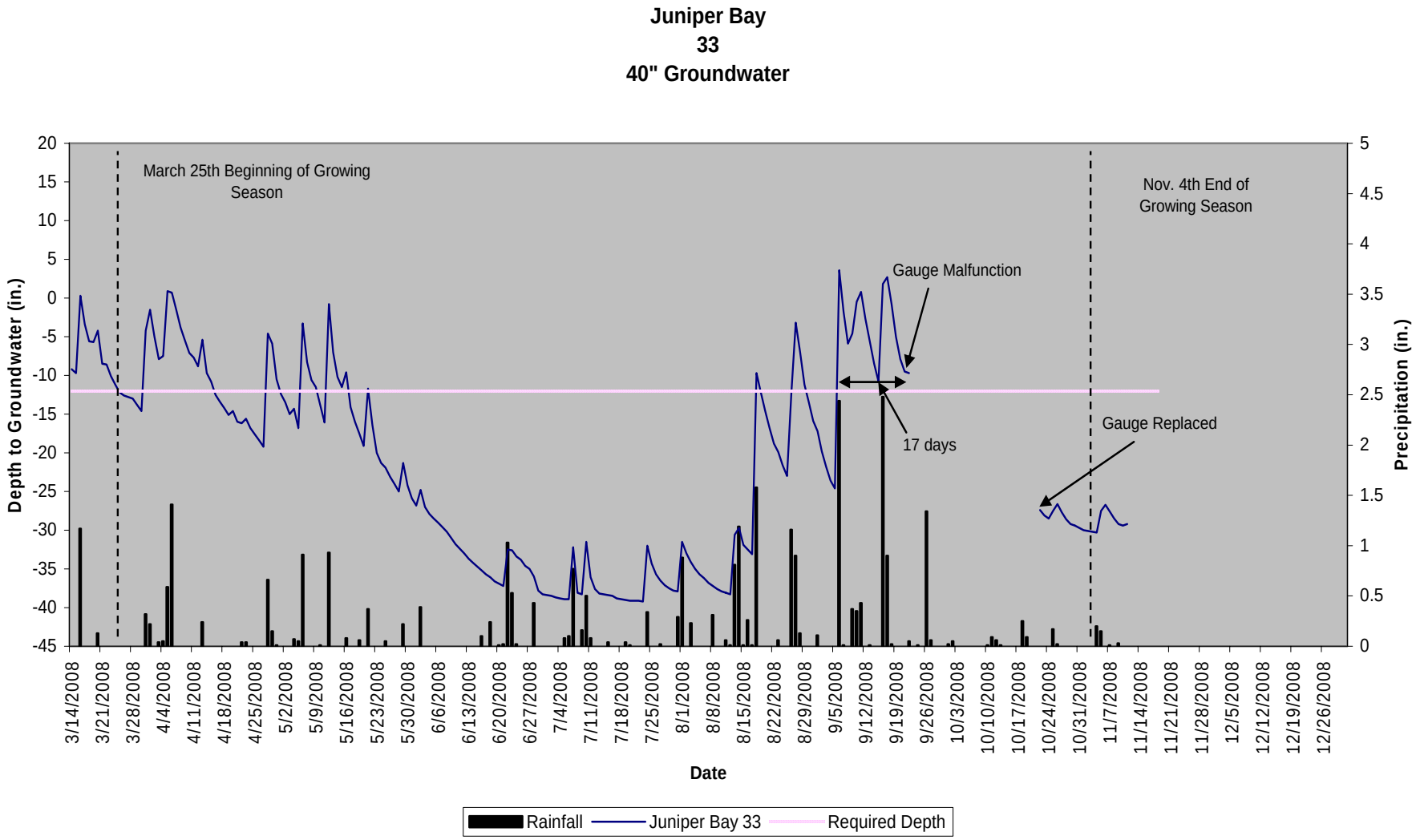


Juniper Bay
31
40" Groundwater

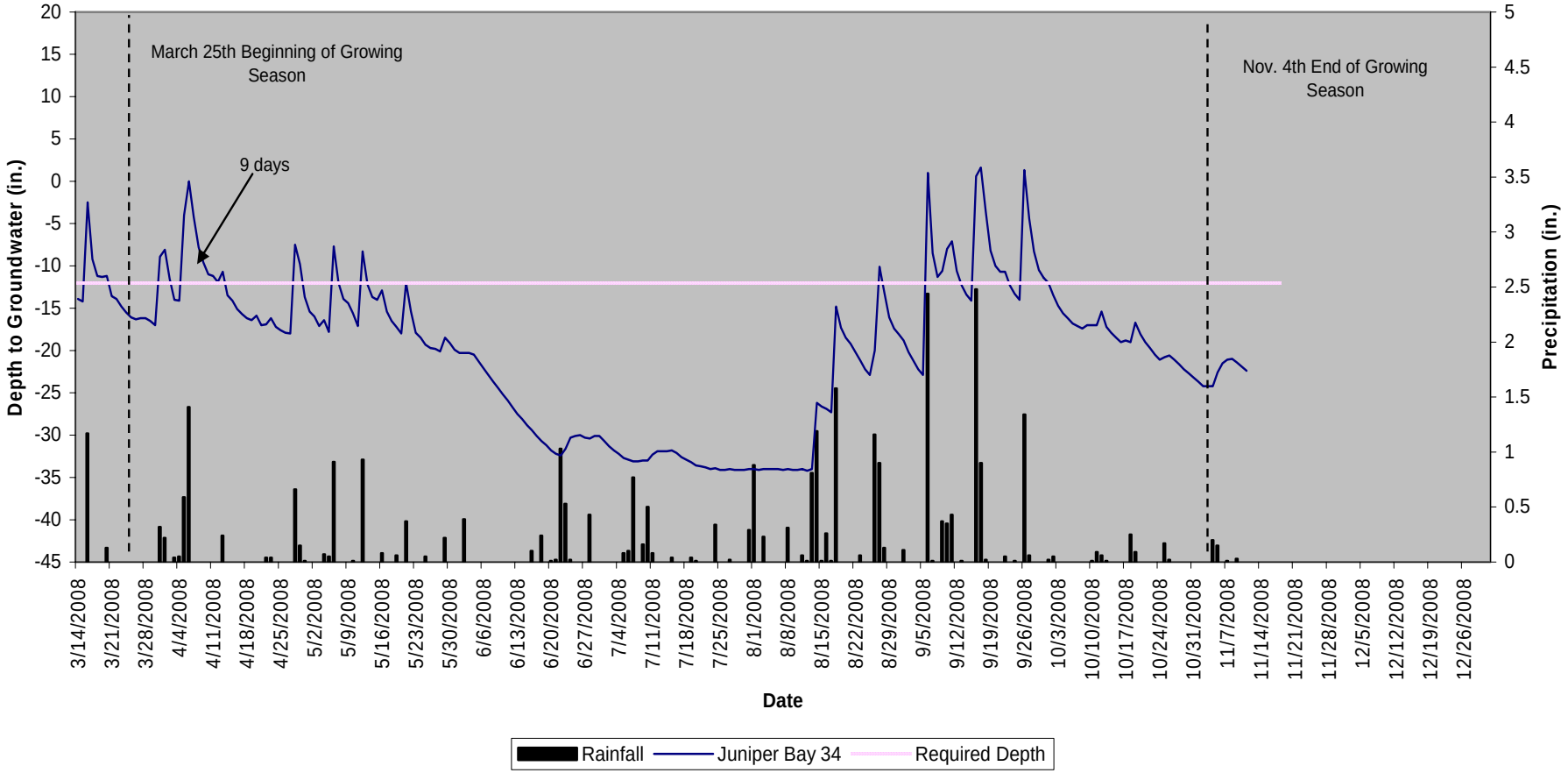


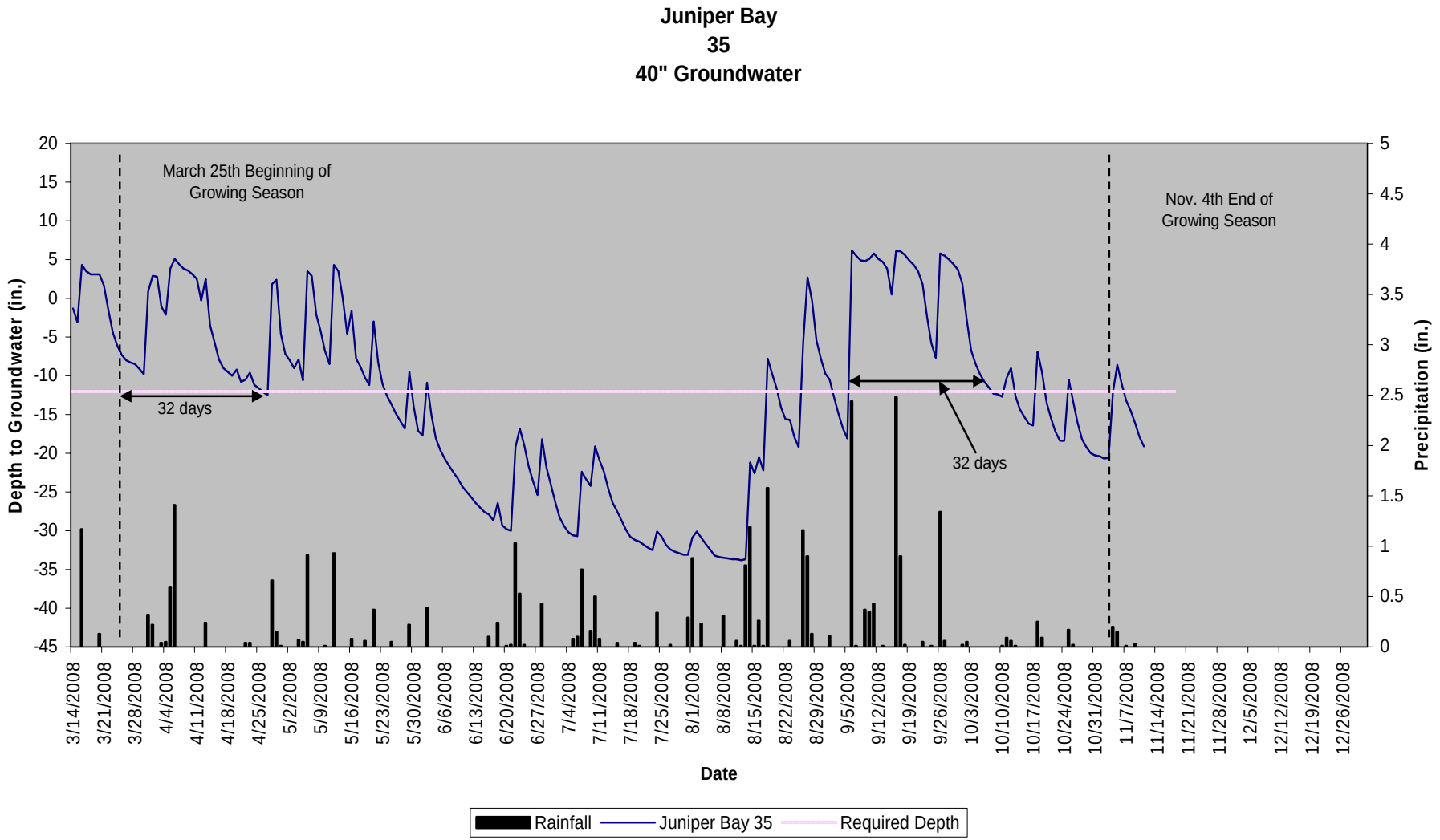
Juniper Bay
32
40" Groundwater

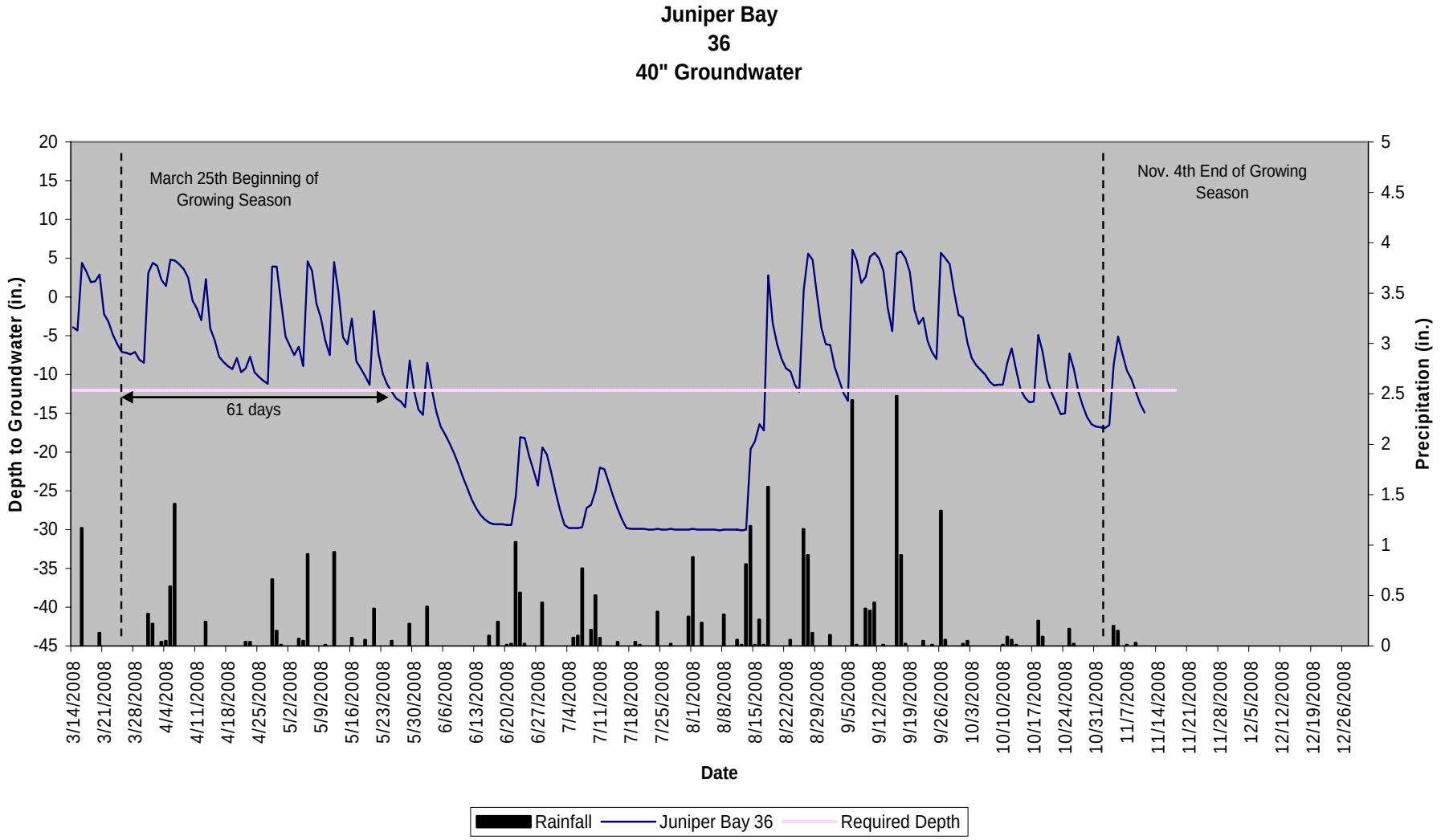


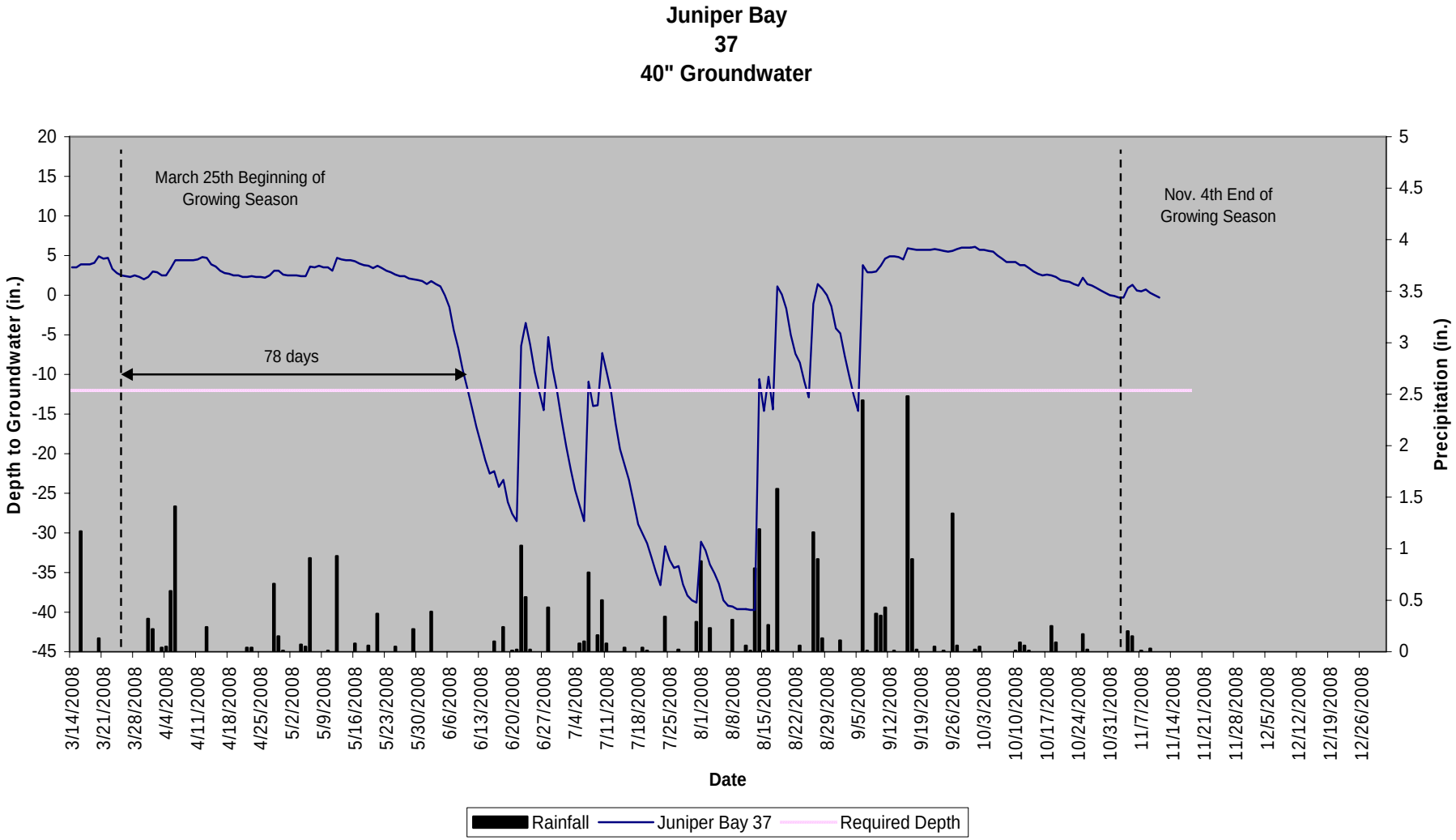

Juniper Bay
33
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
Gauge Malfunction
17 days
Gauge Replaced
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 33
Required Depth

Juniper Bay
34
40" Groundwater

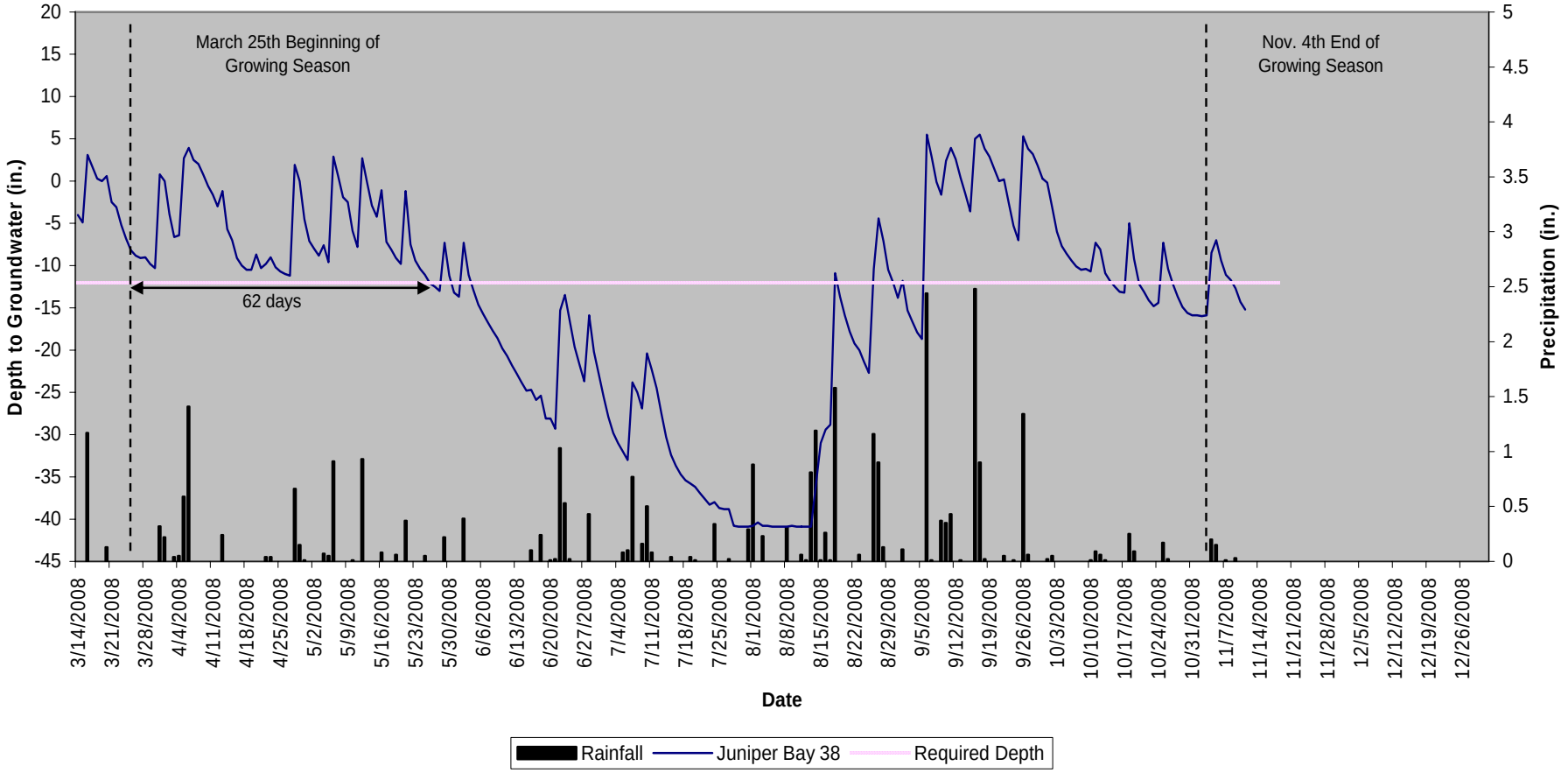


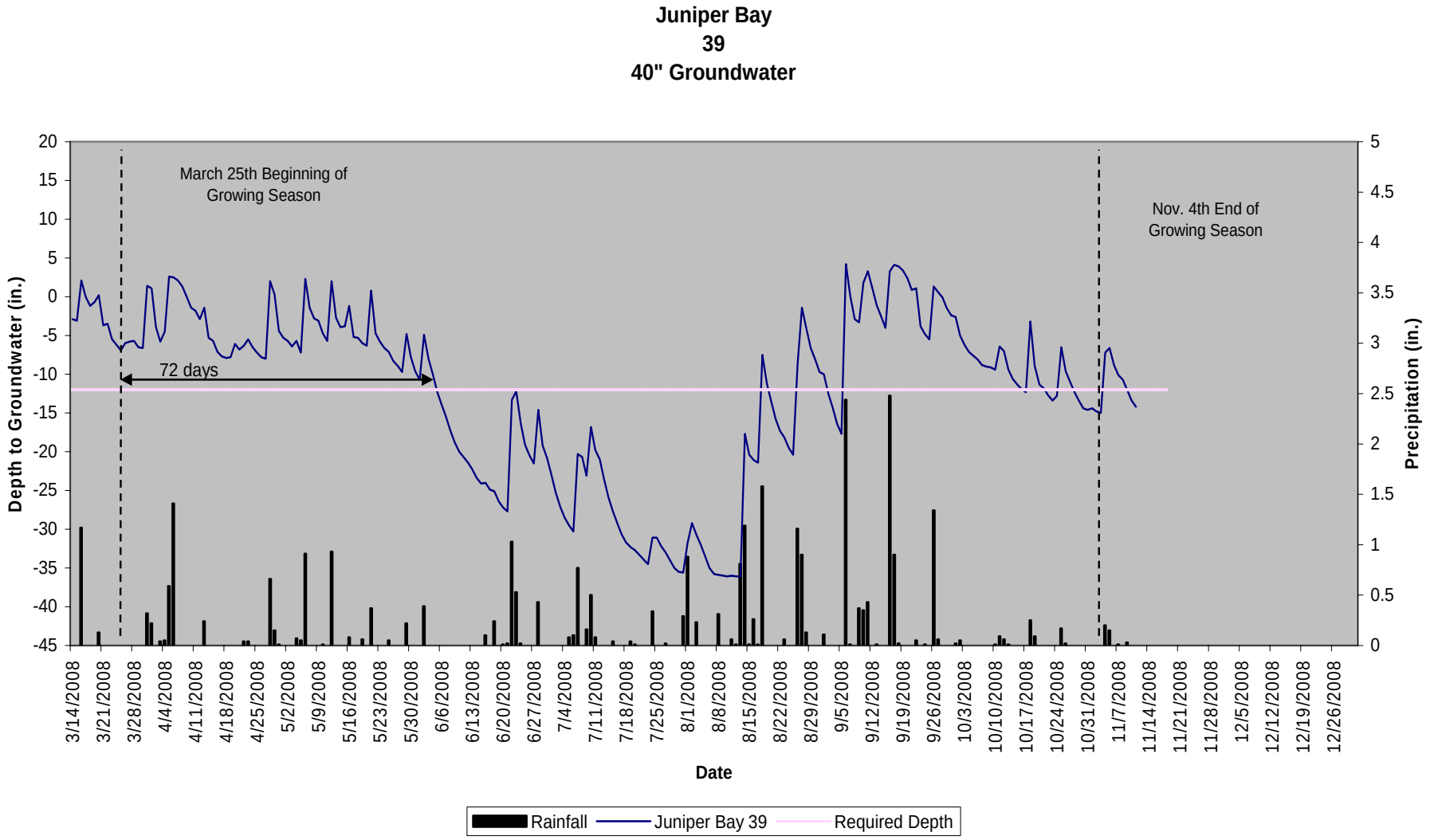

Juniper Bay
35
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
32 days
32 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 35
Required Depth


Juniper Bay
36
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
61 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 36
Required Depth

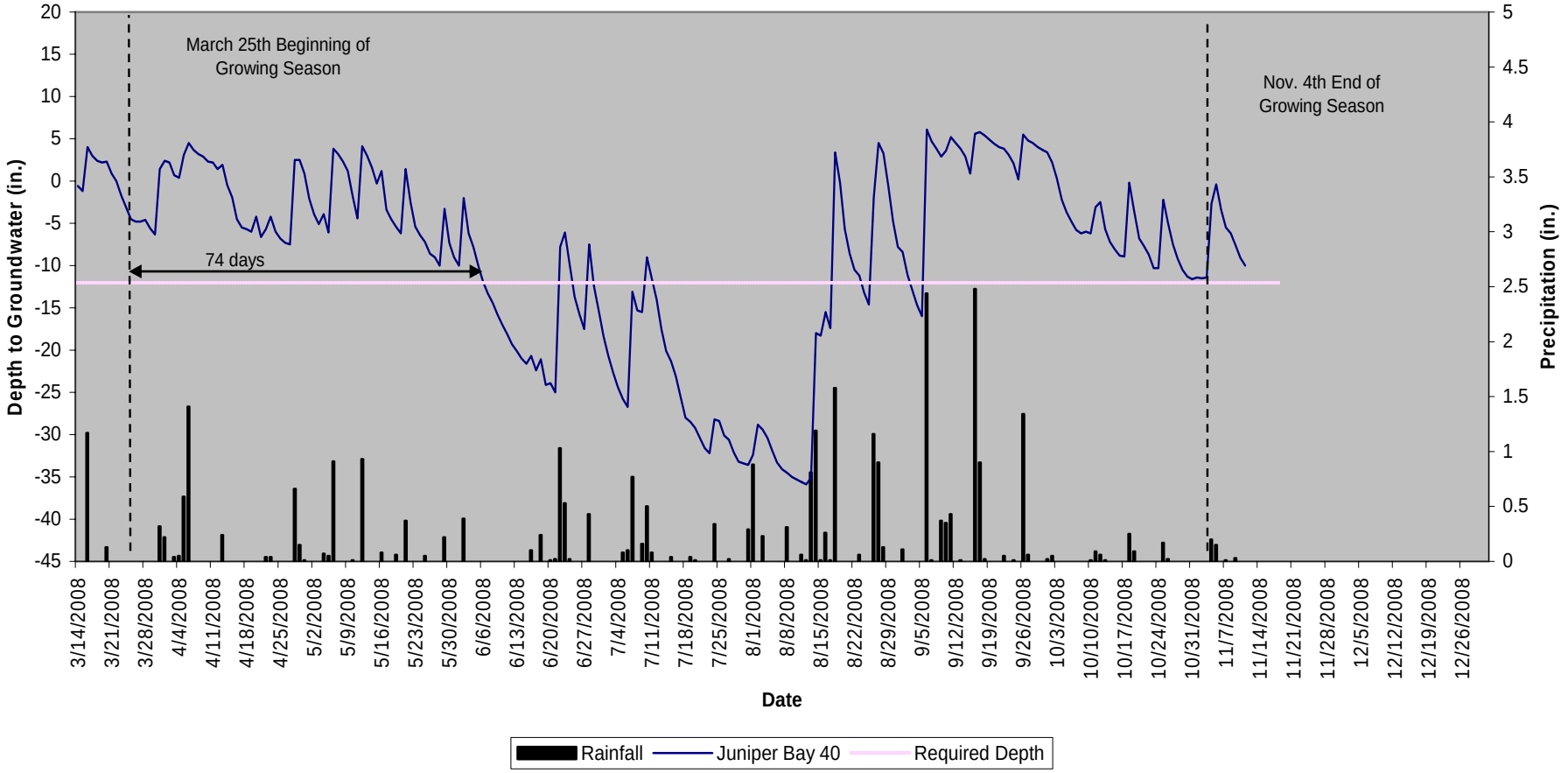

Juniper Bay
37
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
78 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 37
Required Depth

Juniper Bay
38
40" Groundwater

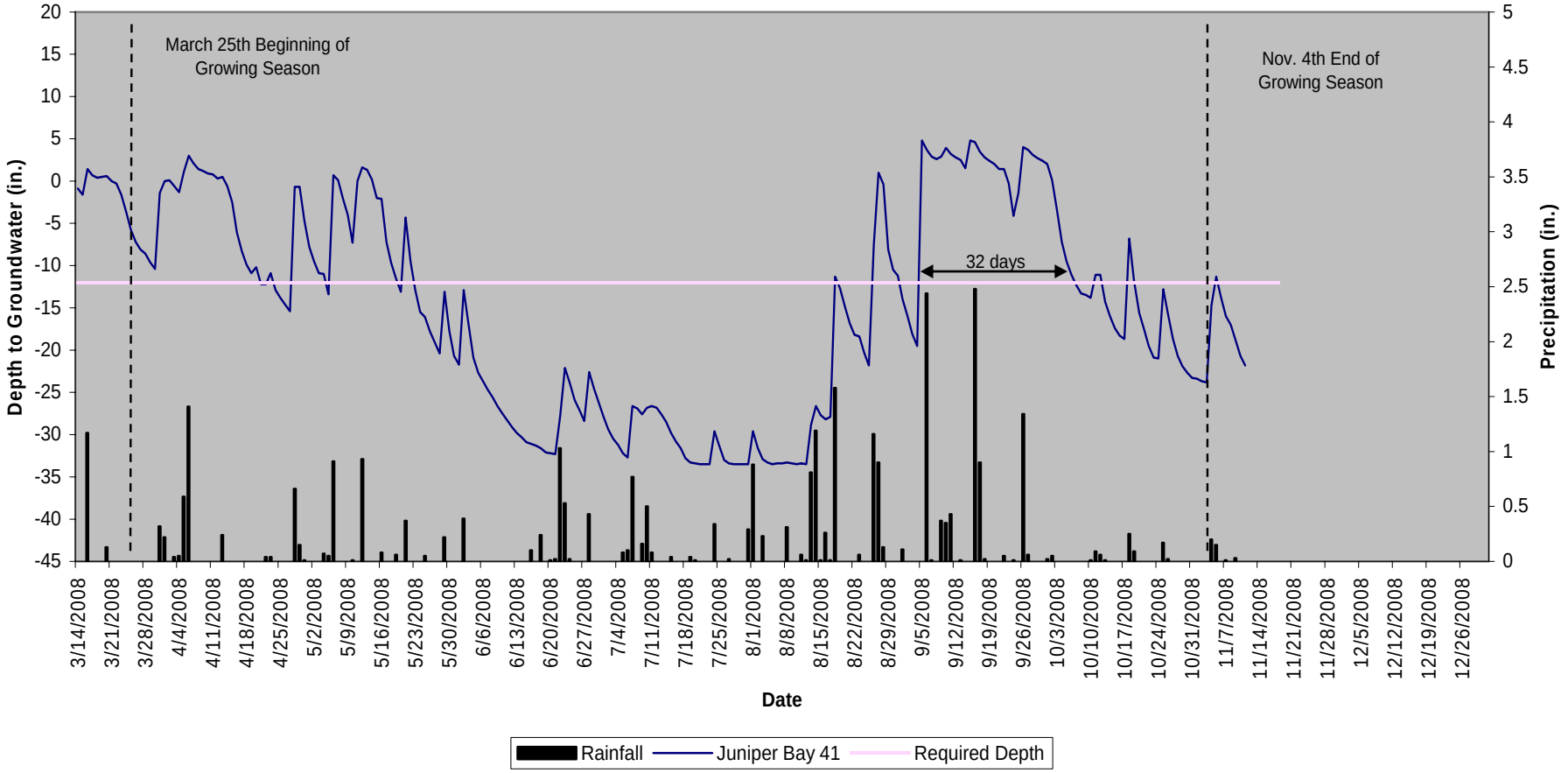


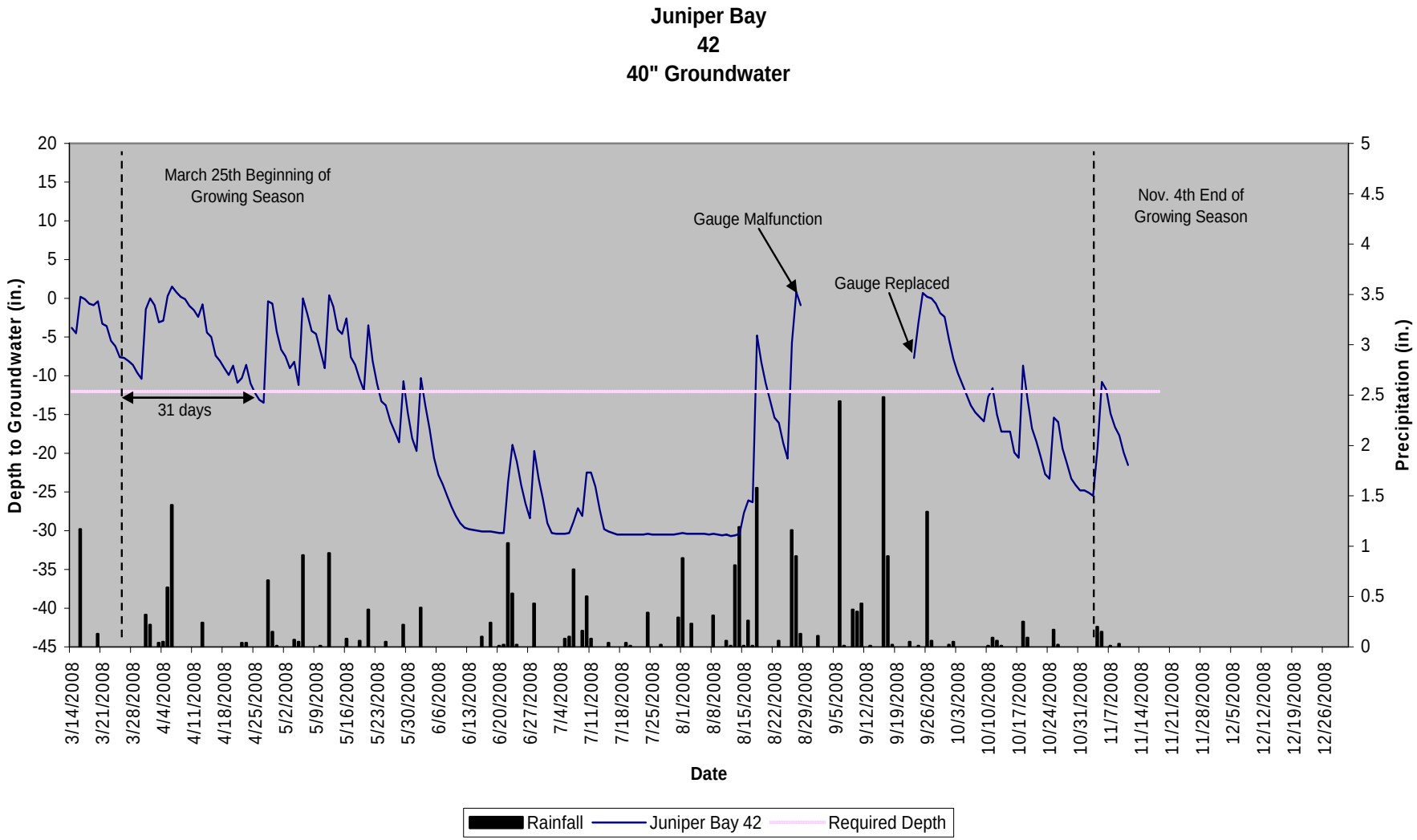

Juniper Bay
39
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
72 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 39
Required Depth

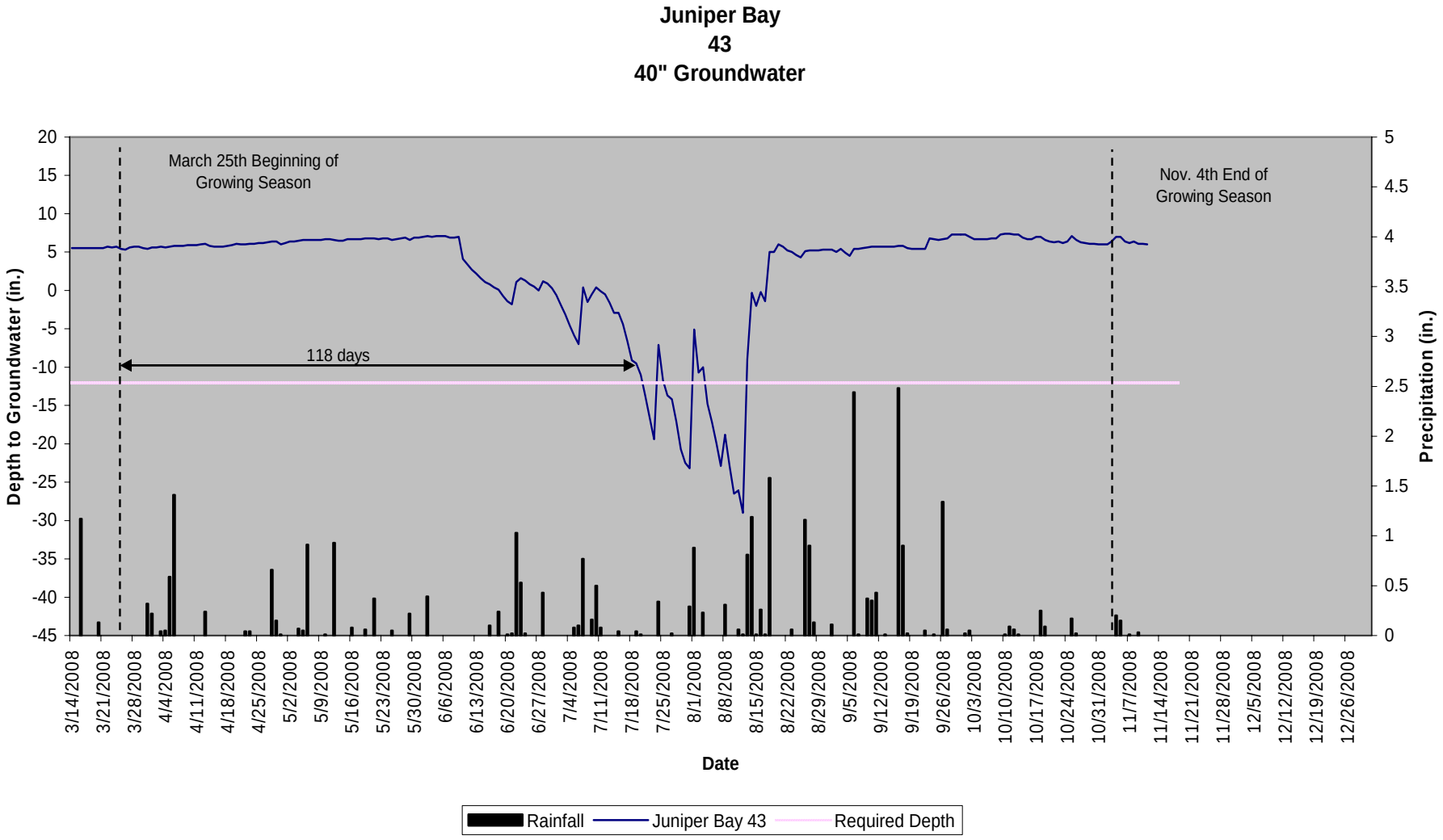
Juniper Bay
40
40" Groundwater

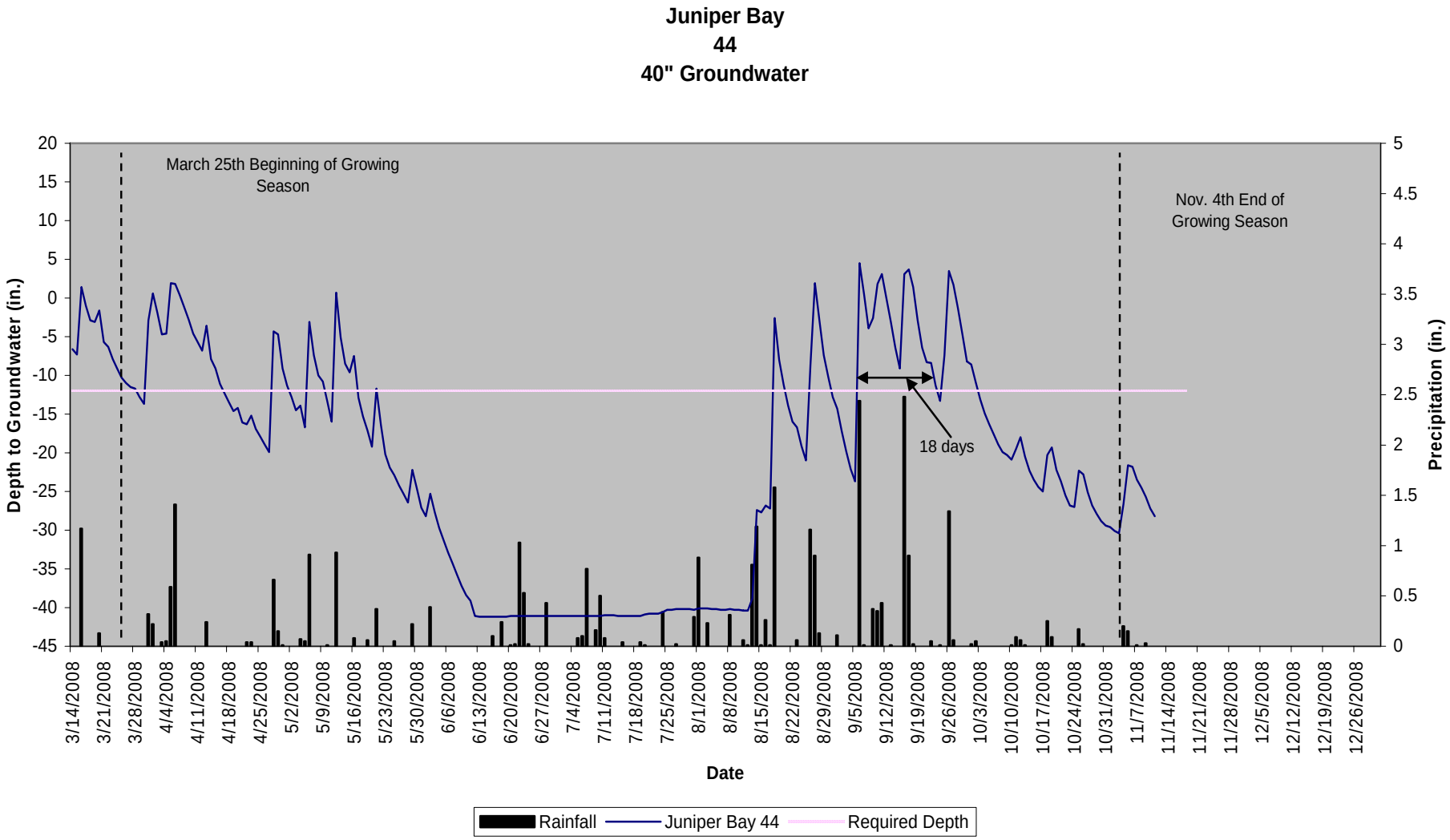


Juniper Bay
41
40" Groundwater




Juniper Bay
42
40" Groundwater
March 25th Beginning of Growing Season
Gauge Malfunction
Gauge Replaced
Nov. 4th End of Growing Season
31 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 42
Required Depth


Juniper Bay
43
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
118 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 43
Required Depth


Juniper Bay
44
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
18 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 44
Required Depth

Juniper Bay
45
40" Groundwater

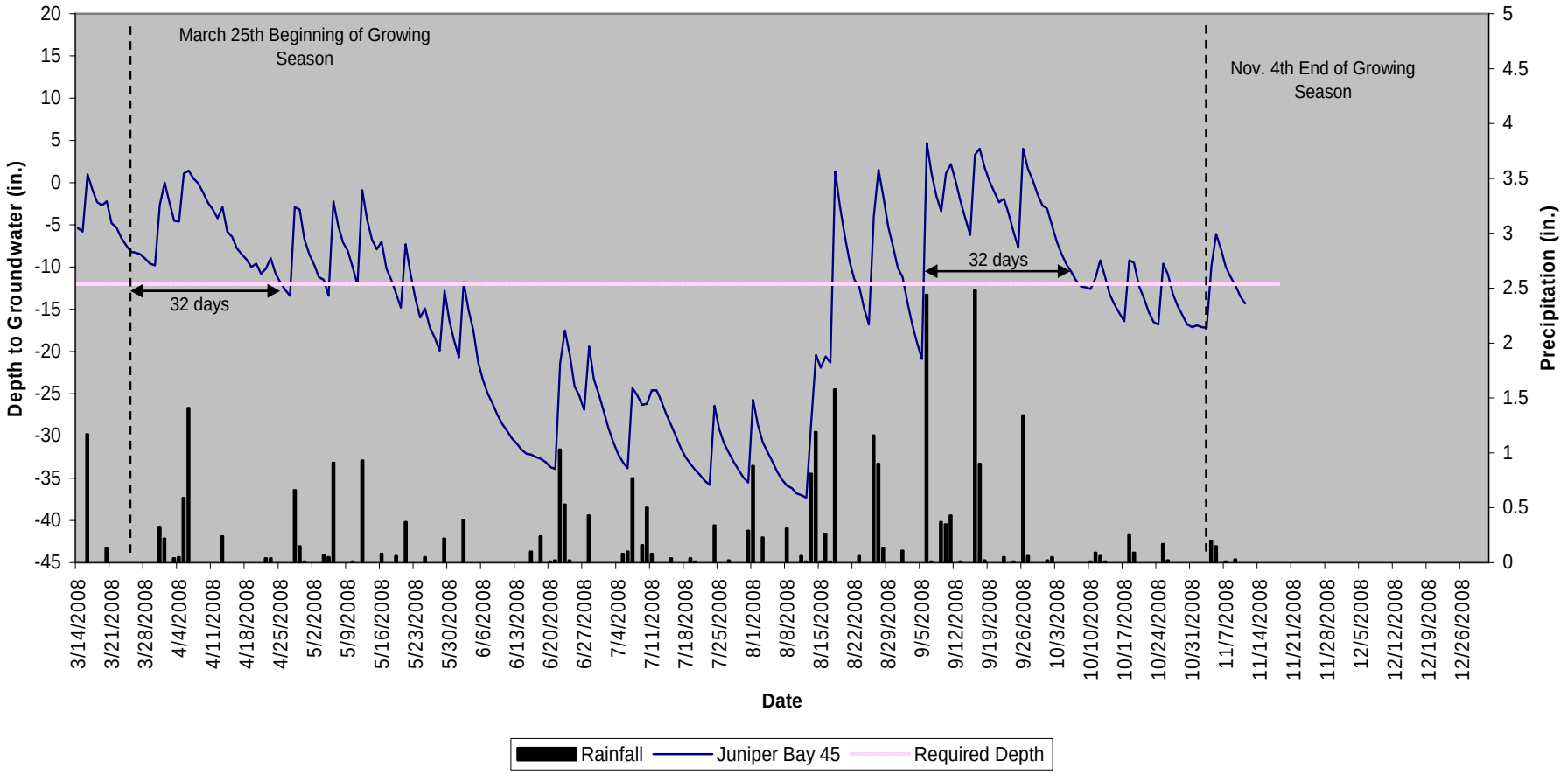


Table B-1. 2008 Hydrologic Monitoring Results				
Gauge	Community Type[a]	Status % of Growing Season	No. Days <12" March 25-November 4	Hydrologic Success
GW-1[d]	PPW/BF	5-12.5%	19	**No**
GW-2	PPW/BF	>12.5%	71	**Yes**
GW-3	PPW/BF	>12.5%	72(79)[c]	**Yes**
GW-4[d]	PPW/BF	>12.5%	39	**Yes**
GW-5	PPW/BF	>12.5%	72	**Yes**
GW-6	PAWCF/BF	>12.5%	84	**Yes**
GW-7	PAWCF/BF	>12.5%	87	**Yes**
GW-8	PAWCF/BF	>12.5%	82	**Yes**
GW-9	PAWCF/BF	>12.5%	82	**Yes**
GW-10	PPW/BF	5-12.5%	19	**No**
GW-11[d]	PPW/BF	<5%	4	**No**
GW-12[d]	PPW/BF	>12.5%	16(30)[c]	**Yes**
GW-13	PAWCF/BF	>12.5%	118	**Yes**
GW-14	PAWCF/BF	>12.5%	115	**Yes**
GW-15	PAWCF/BF	N/A	Not Installed	**N/A**
GW-16	PAWCF/BF	>12.5%	82	**Yes**
GW-17	PPW/BF	>12.5%	72	**Yes**
GW-18[d]	PPW/BF	>12.5%	62	**Yes**
GW-19	PPW/BF	>12.5%	64	**Yes**
GW-20	PPW/BF	>12.5%	62	**Yes**
GW-21	PPW/BF	>12.5%	73	**Yes**
GW-22	PAWCF/BF	N/A	Not Installed	**N/A**
GW-23	PAWCF/BF	>12.5%	115	**Yes**
GW-24	PAWCF/BF	>12.5%	114	**Yes**
GW-25[d]	PPW/BF	>12.5%	63	**Yes**
GW-26[d]	PPW/BF	>12.5%	64	**Yes**
GW-27	PAWCF/BF	>12.5%	84	**Yes**
GW-28	PAWCF/BF	>12.5%	100	**Yes**
GW-29	PAWCF/BF	>12.5%	82	**Yes**
GW-30	PPW/BF	>12.5%	62	**Yes**
GW-31	PPW/BF	>12.5%	62	**Yes**
GW-32[d]	PPW/BF	>12.5%	40	**Yes**
GW-33[d]	PPW/BF	5-12.5%	17	**No**
GW-34	PPW/BF	<5%	9	**No**
GW-35	PPW/BF	>12.5%	32	**Yes**
GW-36	PPW/BF	>12.5%	61	**Yes**
GW-37	PPW/BF	>12.5%	78	**Yes**
GW-38[d]	PPW/BF	>12.5%	62	**Yes**
GW-39[d]	PPW/BF	>12.5%	72	**Yes**
GW-40	PPW/BF	>12.5%	74	**Yes**
GW-41	PPW/BF	>12.5%	32	**Yes**

Table B-1 continues.

Table B-1 concluded.

Gauge	Community Type[a]	Status % of Growing Season	No. Days <12" March 25-November 4[b]	Hydrologic Success
GW-42	PPW/BF	>12.5%	31	**Yes**
GW-43	PAWCF/BF	>12.5%	118	**Yes**
GW-44[d]	PPW/BF	5-12.5%	18	**No**
GW-45[d]	PPW/BF	>12.5%	32	**Yes**

[a] Community Types: PPW/BF-Pine Pond Woodland/Bay Forest, PAWCF/BF- Peatland Atlantic White Cedar Forest/Bay Forest.
[b] Missing data: data does not affect longest hydroperiod.
[C] Missing data: status shown in parenthesis was extrapolated from comparable gauges.
[d] Gauges originally not expected to meet the jurisdictional hydrologic success criterion due to proximity to perimeter ditch

GW-1
GW-2
GW-3
GW-4
RG
GW-5
GW-6
GW-7
GW-8
GW-9
GW-10
GW-11
GW-12
GW-13
GW-14
GW-15
GW-16
GW-17
GW-18
GW-19
GW-20
GW-21
GW-22
GW-23
GW-24
GW-25
GW-26
GW-27
GW-28
GW-29
GW-30
GW-31
GW-32
GW-33
GW-34
GW-35
GW-36
GW-37
GW-38
GW-39
GW-40
GW-41
GW-42
GW-43
GW-44
GW-45

Project Boundary*
Mitigation Boundary*
Non-Restorable Area*
Pond Pine Woodland / Bay Forest*
Peatland Atlantic White Cedar Forest / Bay Forest*
Longleaf Pine Stand*
Ditch*
Monitoring Gauge - Successful*
Monitoring Gauge - Unsuccessful*
Monitoring Gauge - Not Installed*

*Location and extent is approximate.

0 400 800
Feet
1 inch equals 800 feet.

Source: Ecosystem Enhancement Program; USGS 1998 Color Infrared Image.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

Project:	ER07008.00
Date:	Nov 2008
Drwn/Chkd:	KT/GT
Figure:	4

Hydrologic Monitoring Results
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 3

ENVIRONMENTAL SERVICES, INC.
524 S. New Hope Road
Raleigh, North Carolina 27610
(919) 212-1760
(919) 212-1707 FAX
www.environmentalservicesinc.com

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Appendix C

Integrated Overview

GW-1 GW-2 GW-3 GW-4 RG GW-5 GW-6 GW-7 GW-8 GW-9 GW-10 GW-11 GW-12 GW-13 GW-14 GW-15 GW-16 GW-17 GW-18 GW-19 GW-20 GW-21 GW-22 GW-23 GW-24 GW-25 GW-26 GW-27 GW-28 GW-29 GW-30 GW-31 GW-32 GW-33 GW-34 GW-35 GW-36 GW-37 GW-38 GW-39 GW-40 GW-41 GW-42 GW-43 GW-44 GW-45

Veg-1 Veg-2 Veg-3 Veg-4 Veg-5 Veg-6 Veg-7 Veg-8 Veg-9 Veg-10 Veg-11 Veg-12 Veg-13 Veg-14 Veg-15 Veg-16 Veg-17 Veg-18 Veg-19 Veg-20

- Project Boundary*
- Mitigation Boundary*
- Non-Restorable Area*
- Pond Pine Woodland / Bay Forest*
- Peatland Atlantic White Cedar Forest / Bay Forest*
- Longleaf Pine Stand*
- Ditch*
- Vegetation Plot - Successful*
- Vegetation Plot - Unsuccessful*
- Monitoring Gauge - Successful*
- Monitoring Gauge - Unsuccessful*
- Monitoring Gauge - Not Installed*

*Location and extent is approximate.

0 400 800
Feet
1 inch equals 800 feet.

Source: Ecosystem Enhancement Program; USGS 1998 Color Infrared Image.

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N

Project:	ER07008.00
Date:	Nov 2008
Drwn/Chkd:	KT/GT
Figure:	5

Hydrologic and Vegetation Results
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 3

Ecosystem Enhancement Program

ENVIRONMENTAL SERVICES, INC.
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Raleigh, North Carolina 27610
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(919) 212-1707 FAX
www.environmentalservicesinc.com

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