

CREATING A NEW INDEX: MODIFYING THE PALMER DROUGHT SEVERITY
INDEX FOR TEXAS DROUGHTS BASED ON TEXAS EVAPORATION AND
PRECIPITATION DATA

THESIS

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By

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I. INTRODUCTION

General Introduction. Three climatic regions define Texas. The eastern region as classified by a simplified version of Köppen's classification is humid subtropical (Cfa). This region's climatic characteristics are as follows. The coldest month has an average temperature of under 18°C (64.4°F) but above -3°C (26.6°F); at least one month has an average temperature above 10°C (50°F). Precipitation of the driest month averages more than 3 cm (1.2"). This region is also characteristic of having hot summers, with the warmest month over 22°C (71.6°F).

From the Guadalupe Mountains along the Rio Grande to the Davis Mountains, the climate is subtropical desert (BWh). Characteristically, this climatic region is known for being hot and dry. Evaporation exceeds precipitation on average throughout the year. There is no water surplus; hence, no permanent streams begin in this region of Texas. This region is considered to be desert and always stressed for moisture. The mean annual temperature is over 18°C (64.4°), with annual precipitation of usually less than 40 cm (15.7").

The panhandle area, the southern border region (east of Big Bend National Park), and the region that lies between (north to south) is recognized as the subtropical semi-arid climate (BSh). Just as the desert, evaporation here exceeds precipitation on average throughout the year. In addition, there is no water surplus here. A semi-arid climate characterized by grasslands, it occupies an intermediate position between the

desert climate and the more humid ones. Again, like the desert, the mean annual temperature is over 18°C (64.6°F)

All three of these climatic regions show the characteristics of warm to hot summers and mild to no winters. Each of these regions has a different average precipitation expectation in comparison to the others. The humid subtropical climate, on average, receives more precipitation than the subtropical semi-arid climate, which receives more than the subtropical desert climate. All of these regions experience drought. Figure 1 is a climograph representing the humid subtropical climatic region. It shows the precipitation and temperature that can be expected for the area of Texas classified as Cfa. El Paso, Texas is a subtropical desert climate. Figure 2 shows what can be expected to take place over the year in Texas in the BWh regions. The most identifiable difference between the BSh and BWh climates is the amount of moisture. Notice that in Amarillo (see Figure 3), there are greater amounts of precipitation in the summer months than in El Paso. Austin, Texas, in Travis County, experiences temperatures and precipitation values influenced by the merging climatic regions. See Figure 4 for the climograph.

Problem statement. Texas uses five indices to measure drought. One of these is the Palmer Drought Severity Index (PDSI). Texas uses this index to measure the hydrologic component of drought. This is a problem because the PDSI does not measure just the hydrologic component of drought. The PDSI uses the components of meteorological and hydrologic drought to assess agricultural and socioeconomic drought.

Corpus Christi, Texas (Cfa Example)

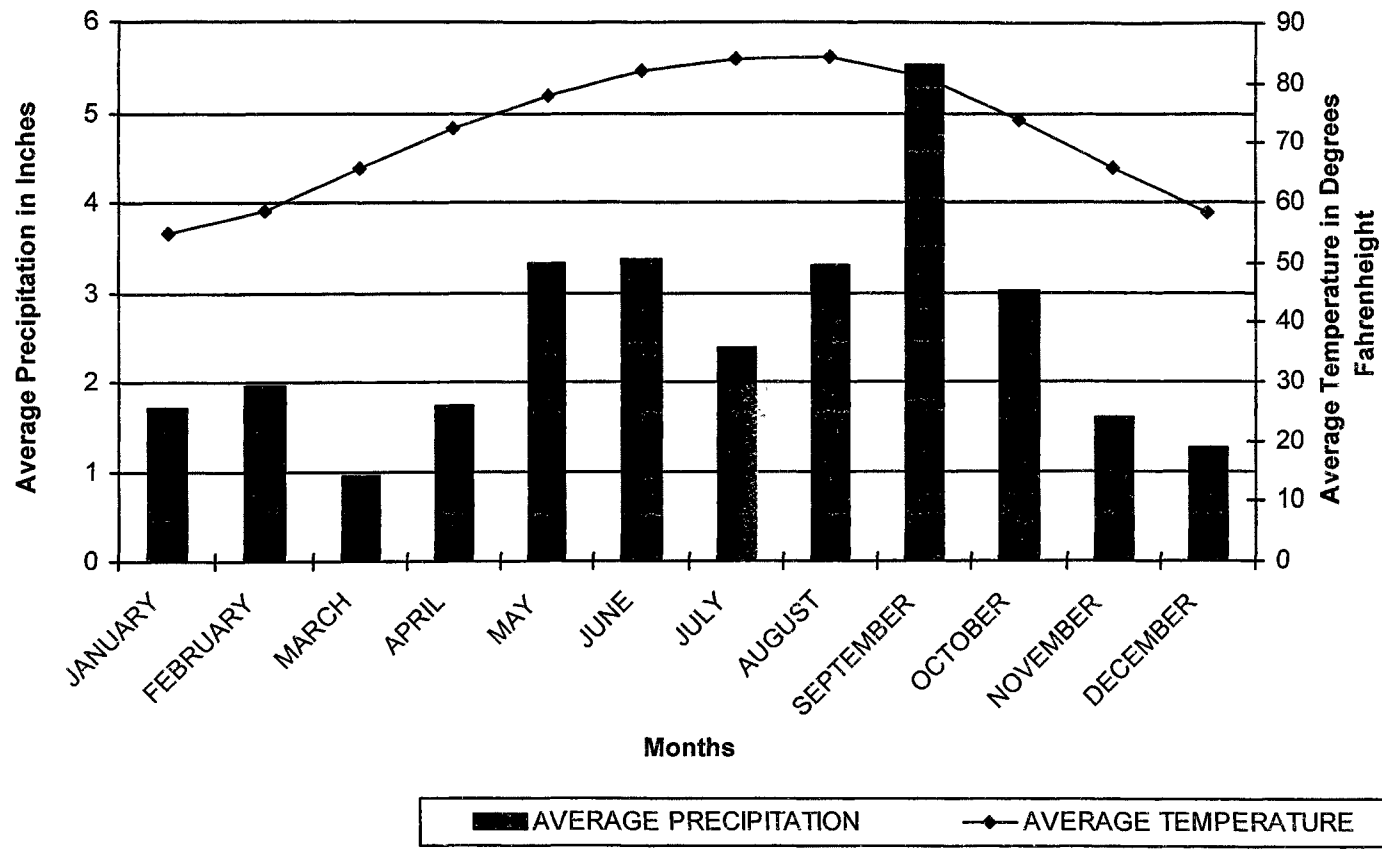


Figure 1.

El Paso, Texas (BWh Example)

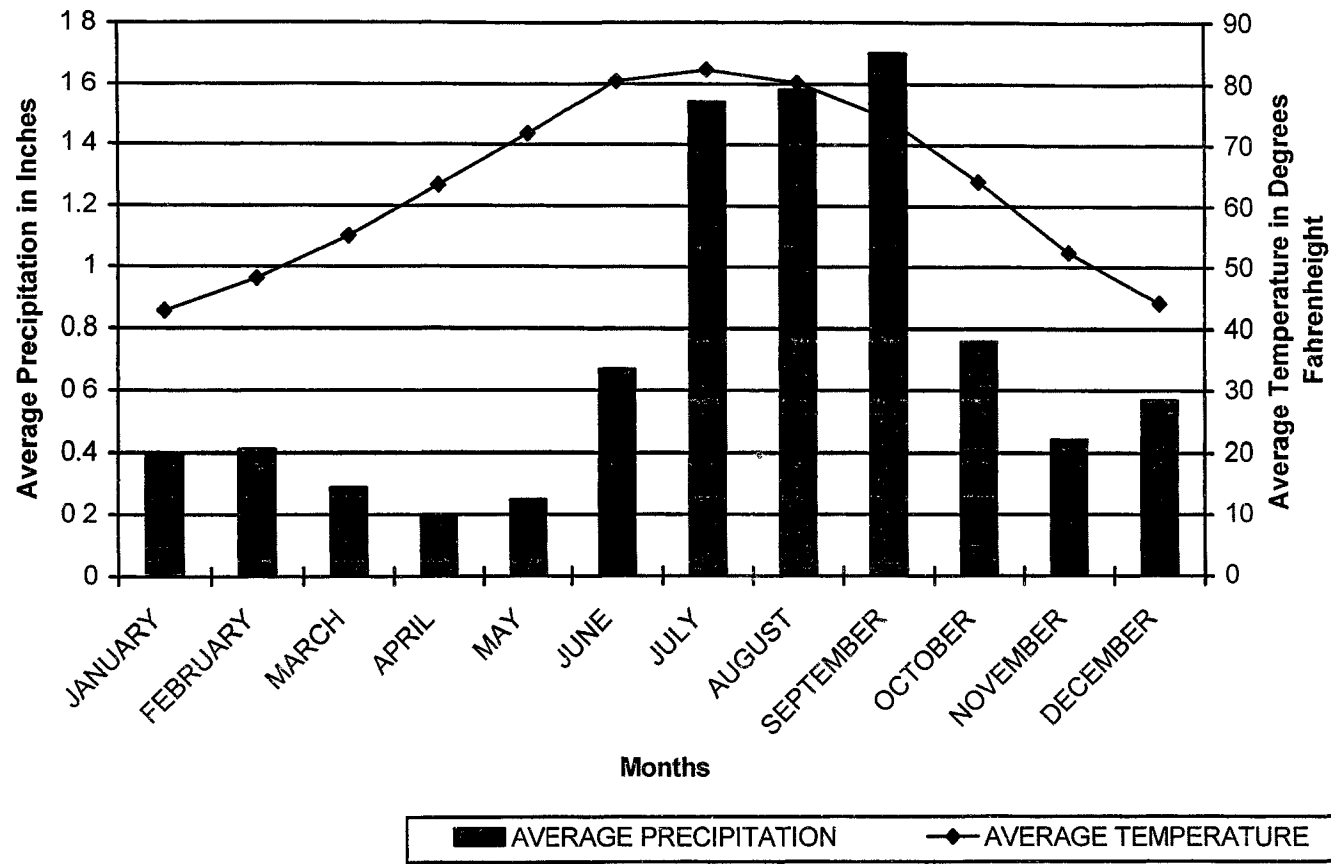


Figure 2.

Amarillo, Texas (BWh Example)

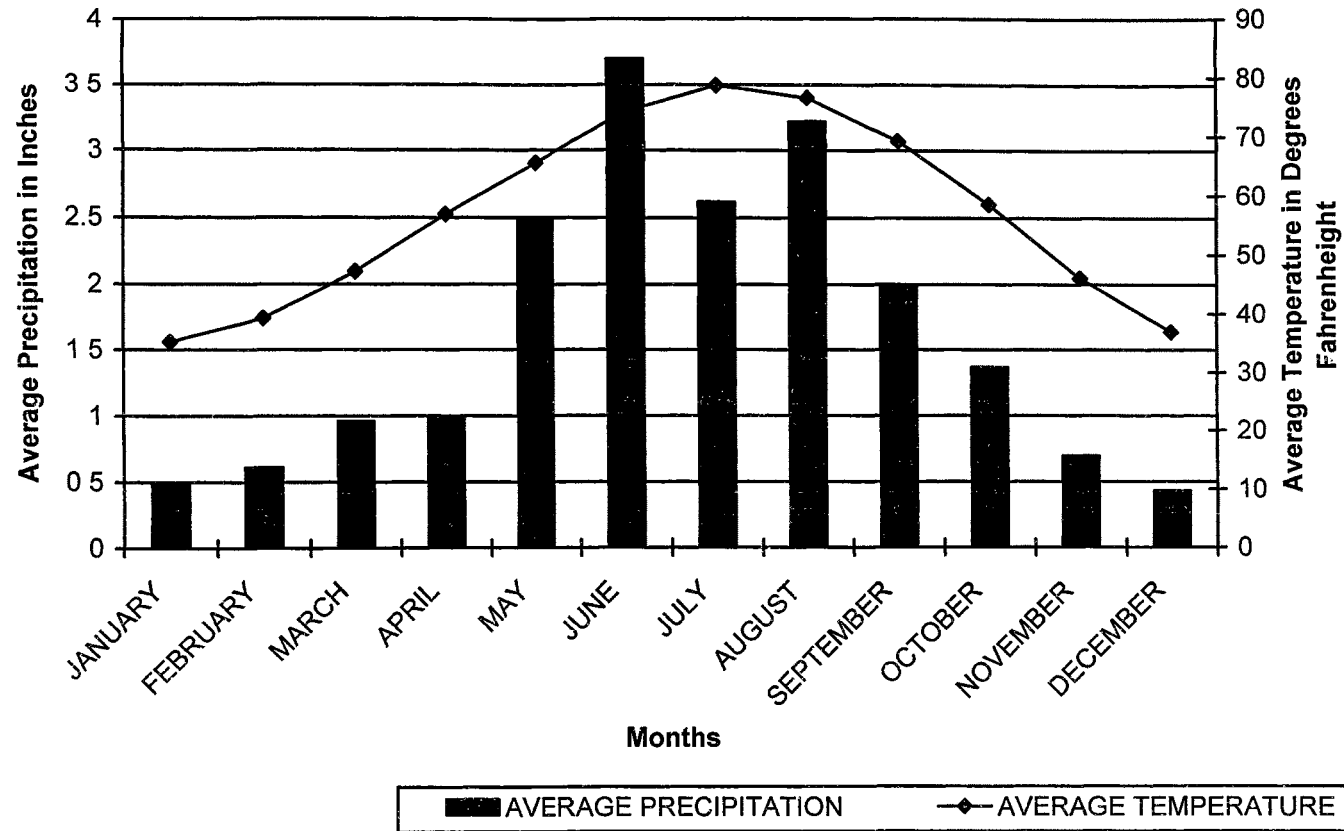


Figure 3.

Austin, Texas (BWh Example)

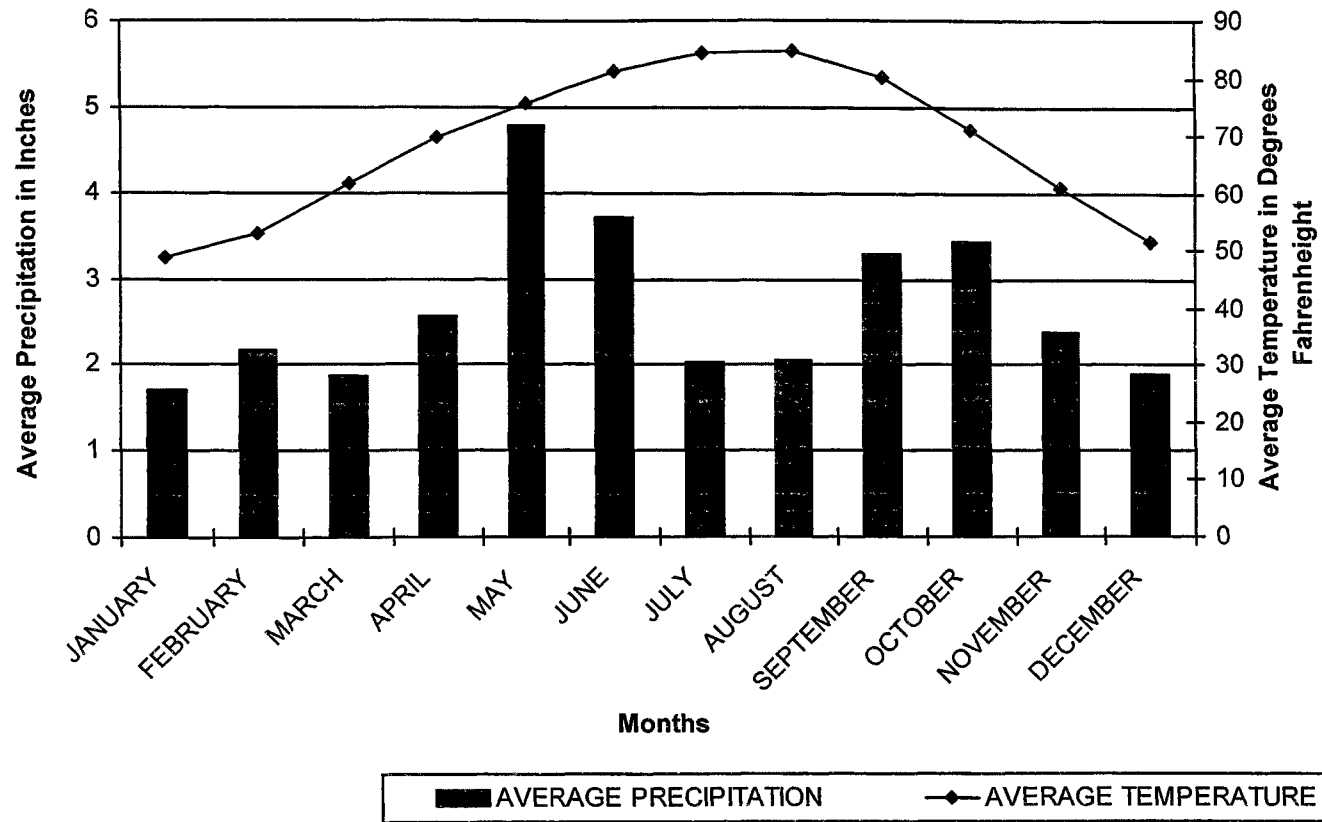


Figure 4.

Objectives. The aim of this research is to create a new hydrologic index and to examine its ability in measuring Texas droughts against the PDSI. In doing so, this research supports the concept of basing hydrologic drought measurements on the hydrological factors that comprise the drought. The research will maintain the theory that the meteorological components of drought apply to and support the hydrologic drought index.

II. LITERATURE REVIEW

Drought. The National Drought Mitigation Center (NDMC) states that, “Drought is a normal recurrent feature of climate, although many erroneously consider it a rare and random event” (NDMC 2000, 1).

There are four disciplinary definitions of drought. They are meteorological drought, hydrologic drought, agricultural drought and socioeconomic drought. Days with less than a set normal amount of precipitation define meteorological drought.

“Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that result in definitions of precipitation are highly variable from region to region” (NDMC 2000, 2).

This variability, the NDMC discusses, is a result of the global water balance and the hydrologic cycle. “In this cycle, water moves from land and ocean to the atmosphere as water vapor and returns as precipitation” (Strahler and Strahler 1996, 89). “Since one planet contains only a fixed amount of water, a global balance must be maintained among flows of water to and from the lands, oceans and atmosphere” (Strahler and Strahler 1996, 90).

Agricultural drought combines components of meteorological drought with agricultural impacts such as lacking crop yields or dehydrated livestock. (NDMC 2000)

The third disciplinary perception of drought is hydrological drought. It is the association between any precipitation shortage and the effects of the shortage on the surface and/or

subsurface water supply. (NDMC 2000) Socioeconomic drought is the fourth type of drought. This form of drought affects both social and economic dealings.

The supply of many economic goods, such as water, forage, food grains, fish and hydroelectric power depends on weather. Because of the natural variability of climate, water supply is ample in some years but unable to meet human and environmental needs in other years. Socioeconomic drought occurs when the demand for an economic good exceeds supply because of a weather-related shortfall in water supply. (NDMC 2000, 4)

Greater concern with defining drought occurs when multiple professions examine drought and its impacts. The National Science Foundation (1979) list four major difficulties in defining drought; discipline specific definitions, definition of drought regions, need for incorporation of stream flow, and uniform terminology.

Drought is a normal occurrence in the state of Texas. It is probable that at any given time of the year, Texas is experiencing some form of drought. (Votteler 2000) The twentieth century recorded drought in every single decade. The drought in the early and mid 1950s was the most severe drought in Texas recorded history. All areas of the state experienced severe to extreme drought. Ironically, the 1930s Dust Bowl era drought, the largest meteorological disaster in American history, was not the worst drought experienced in Texas. This is not to imply that Texas did not feel implications of the Dust Bowl drought, but to emphasize the severe harshness of the drought in the 1950s. (Bomar 1995)

According to Herring (2001), there are three primary contributors to the development of drought. The first is land and sea surface temperatures. The second is atmospheric circulation patterns. The third is the soil moisture content. The extreme event of drought is a cycle of these intricately related factors and their interaction.

Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in the components of the hydrological system as soil moisture, stream flow, and ground water and reservoir levels. As a result, impacts are out of phase with those in other economic sectors because different water use sectors depend on these sources for that water supply. Therefore, competition for water in these storage systems escalates during drought and conflicts between water uses increases. (NDMC 2000)

Land use is a primary concern when considering hydrological drought. Changes in human patterns of land use affect hydrological drought. The most common changes are land degradation and the construction of dams. Altering land characteristics is the main way humans inadvertently exacerbate hydrologic drought. The result is an increase in the frequency of water shortage even when no increase of frequency occurs in the meteorological drought. (NDMC 2000)

Drought initially begins with natural climatic variability. The magnitude of this variability depends on the climatic region. Drought is a normal occurrence in desert and semi-arid climates. In the humid region, drought is very irregular.

Drought indices. Yevjevich, da Cunha, and Vlachos (1983) describe the importance of drought indices. They contend that indices are beneficial due the fact that they allow for impacts of droughts in different areas to be compared to one another. The most widely used drought index in the United States is Palmer's Drought Severity Index, which examines the stochastic behavior of drought (Lohani and Loanathan 1998; U.S. Department of Commerce 1965; Guttman 1999).

The state of Texas Drought Preparedness Council (TDPC) uses five different indices to measure/describe drought. They are the Standard Precipitation Index (SPI), the Keetch Bryam Drought Index (KBDI), the Satellite Vegetation Health Index (VT), the Crop Moisture Index (CMI), and the one this research is concerned with, the Palmer Drought Severity Index (PDSI) (TDPC 2001).

The PDSI is a pseudo-meteorological drought index used to calculate and examine long-term drought. It takes into consideration such factors as precipitation; evaporation; run-off; transpiration; soil moisture; water consumption. The Palmer Hydrological Drought Index (PHDI) is an early form of the PDSI. It excludes such factors as soil moisture and water consumption. The CMI is a modification of the PDSI. It reflects short-term moisture supply in the areas of major crop production. Its design prevents its use to assess long-term drought. (U.S. Department of Commerce 1965; NDMC 2000)

TDPC uses three indices not derived by Palmer. They are the SPI, KBDI, and the VT. The SPI determines the variation from average precipitation over many time scales including days, months, and years. The KBDI measures percent soil moisture based on a field capacity of eight inches of water, and is important when assessing fire danger. The VT characterizes changes in vegetation amounts (0-100, with 0 meaning extremely poor and 100 symbolizing excellent) based on relative moisture. (TDPC 2001)

To create the PDSI, Palmer used the water balance model. The water balance model (Alley 1984) involves many limitations and forces many assumptions into the creation of the index. One of the assumptions is the method that evapotranspiration is calculated. Alley and Palmer agree that there is no accepted method of calculating

evapotranspiration. Palmer uses Thorwaite's method to compute potential evapotranspiration. When using other methods of calculating evapotranspiration (besides Thorwaite's method), the water balance model creates indices with conflicting results from Palmer's index, and is therefore, incompatible for any type of analytical comparisons. The most troublesome feature of Palmer's index is the determination of severity classes. (U.S. Department of Commerce 1965; Alley 1984)

Palmer uses data acquired from central Iowa and Kansas to define a numerical scaling system to classify drought severity. A value of zero refers to normal conditions. Negative numbers identify the different stages of drought severity. Minus two identifies moderate drought; minus three identifies severe drought and minus four (and lower) identifies extreme drought. In the same manner, positive numbers refer to normal to excessive rainfall. These figures when applied to other parts of the United States imply that the defined classes use the terms "severe" and "extreme" rather loosely. Palmer also develops his recommendation for constants in the equation, from the same central Iowa and Kansas data. While three regions of Texas are used as examples for developing monthly weighting factors, they were created using not only the formulas developed from the Kansas and Iowa data, but also using the same constants. In his examination of the spatial variation of drought, Karl (1983) modified Palmer's recommended constants so that he could determine the existence of spatial trends. (U.S. Department of Commerce 1965; Karl 1983; Alley 1984; National Oceanic and Atmospheric Administration 2000)

Palmer's indices take much more into consideration than what defines meteorological drought. By including evapotranspiration, and soil moisture conditions Palmer's indices hint toward a hydrological drought index (Alley 1984, 1100). Palmer

considers the impact of soil moisture – while his use of the phrase “Climatically Appropriate For Existing Conditions (CAFEC)” without identifying normal climate seems more appropriate when assessing estimations and predictions of agricultural drought.

Karl (1986) discusses Palmer’s original design of creating computations for his index using monthly averages. This desensitizes the PDSI from any short-term influences. Karl suggests using the Z-Index as a means of assessing agricultural drought.

Karl and Kascielny (1982) use Principal Components (PC) Analysis to identify the components that account for the variance of the PDSI across the United States. Using state gridded data, every location sampled in Texas experienced drought at one time in all four seasons. They conclude that the geographic location of Texas is the most influential factor in the occurrence of drought.

Palmer designed the PDSI calculations to address the measurement of hydrologic drought in semiarid and dry sub-humid regions. He cautions that any attempt to use these calculations in any other climatic realm may result in unrealistic values and therefore unrealistic interpretations. Texas is an area within the two regions that Palmer identifies as the basis for his calculations and the state experiences more meteorological droughts than any other area. The Fox Index intends to provide information regarding precipitation and evaporation, the main components of drought. The results of the Fox Index apply to the three climatic regions of Texas and are easier to interpret than the PDSI.

Creating a drought index. Palmer used the water balance or hydrologic accounting approach to climatic analysis to create his index. This method of analysis creates a time series of moisture excesses and deficiencies. In hydrologic accounting, the parameters of evaporation and precipitation are critical. To understand the moistness or aridity of a climate, evapotranspiration is compared to precipitation. This comparison allows for ground storage of water and its consumption. (Thornwaite and Mather 1955). This is extremely important because drought is relative. Areas with differing climates have different levels of drought severity. For example, areas of aridity are always under stress of little water, therefore a drought in those areas would constitute much drier conditions than what would be needed to constitute a drought in areas of moister climate.

There are many different indices of drought. Choice of an index depends on the impacts and data parameters relevant to the region to be monitored. This paper uses evaporation and precipitation to develop a meteorological drought index suitable to addressing short-term water supply issues in a large climatically diverse state such as Texas. The following chapter describes, in detail the methodologies in the creation of the Fox Index.

III. METHODOLOGIES

The following sub-sections detail the computation of the Fox Index. Data variables are defined. Sources of data are provided. There is a description of the research design. The means of calculation are identified. Finally, in this section, the process for analysis is given.

Data definitions.

1. Actual climatic weighting factor – the calculated amount of influence climate has on precipitation departures, considering the estimated value.
2. E – reported evaporation amount for a quadrangle.
3. Estimated climatic weighting factor – a calculated estimate of the influence of climate on precipitation departures.
4. Modified Palmer Drought Severity Index (MPDSI) – the adjusted PDSI for real-time.
5. Moisture anomaly – the departure of the precipitation and evaporation measured for the month from the normal values for the month.
6. Moisture demand for a quadrangle – the calculated amount of water needed by a quadrangle.
7. P – reported precipitation amount for a quadrangle.

8. Quadrangle – an area of land defined as one-degree latitude by one-degree longitude.

Data sources. The Texas Water Development Board provided the evaporation and precipitation data for this study. The precipitation and evaporation data are those collected at the weather stations for each quadrangle. These variables are available for every quadrangle in Texas. The reported Palmer Indices are available online from the National Climatic Data Center (NCDC) in Asheville, NC, <http://www.ncdc.noaa.gov/onlineprod/drought>. The data from the TWDB was developed from single stations, whereas the Palmer data was developed from merged data from many stations. TWDB divides Texas into 103 quadrangles (Figure 5). This study is concerned with five quadrangles representative of the climatic regions of the state. The period of record is the fifty years, 1947-1998. Texas divided into the one-degree latitude by one-degree longitude quadrangles defined by the Texas Water Development Board. See Figure 5 for the map.

Research design. This research builds on that of Malstaff (2000) in an attempt to recalculate Palmer's drought series as a continuous function. The idea is to create a new index that is easier to use to monitor drought in Texas. Malstaff's (2000) methodology suggests the calculation of the new index by using Palmer's basic equations, and changing his model for Texas by using data specific to Texas. He suggests that the Fox Index base itself on the Palmer Hydrologic Index without considering Palmer's moisture

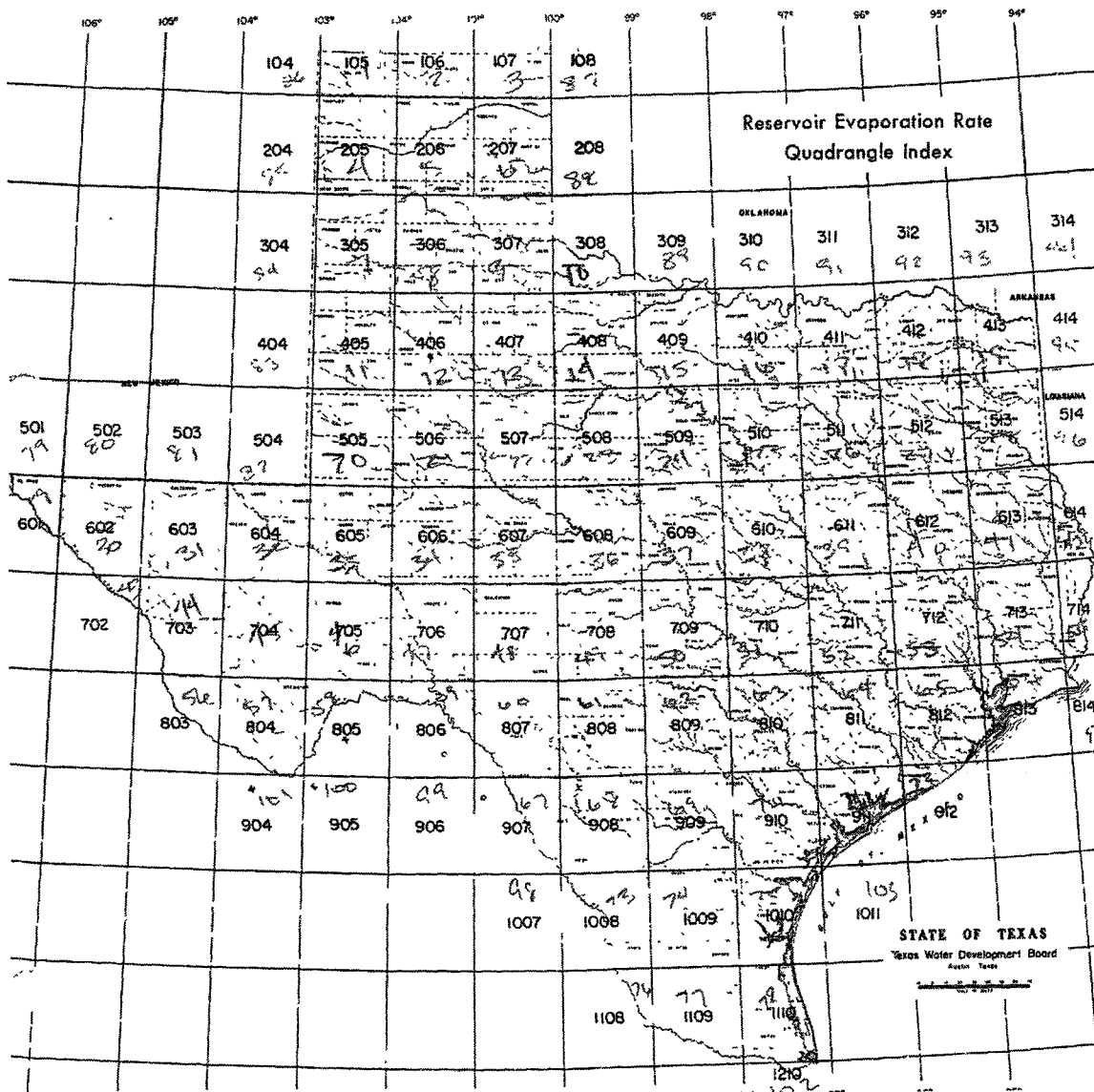


Figure 5.

probability rules. The most dramatic means of changing the model is by Malstaff's recommendation to use actual measurements of evaporation rather than predicted calculations of potential evaporation, and by placing the ground water amount to the demand-side of the equations. This results in the strict use of evaporation and precipitation data. (TWDB 2000)

The Fox Index uses reported evaporation and precipitation data for quadrangles in Palmer's formulas rather than all required components of the PDSI. The data processing and graphical representation take place in a Microsoft Excel Workbook.

In this study, the data processed are those of five quadrangles. The quadrangles represent the three climatic regions in Texas, with the humid subtropical area represented with both continental and maritime influences. The quadrangles used for this research are 206 (includes the Amarillo, Texas weather station), 601 (includes the El Paso, Texas station), 613 (includes the Nacogdoches, Texas station), 1010 (includes the Corpus Christi, Texas station), and quadrangle 710 (includes the Austin, Texas station). The fifth quadrangle, including Austin, Texas, represents the transition area of all three climates in the state.

Calculations of the index. The Fox Index uses the December 1947 reported value for the Palmer Drought Severity Index and the reported evaporation and precipitation data from the respective quadrangles as a seed to calculate index values for the period, 1948-1997. To compare the Fox Index to the Modified Palmer Drought Severity Index and Palmer Hydrologic Drought Index, the research suggests using trend line analysis (TWDB 2000 b). The slopes of these trend lines will be compared using a t-test (Zar 1974). Similar

slopes would imply that both indices are measuring the same fundamental components of drought. If so, the process of monitoring drought in Texas can be simplified by using only precipitation and evaporation data readily available at weather stations.

The following equations create the Fox Index from evaporation and precipitation data.

$$A = ((E/P) + 2.80) / D, \quad [1]$$

where A is the moisture demand for a quadrangle, E/P is the ratio of evaporation to precipitation, and D is the absolute value of precipitation departure for the month.

$$K' = 1.5 * \log (A) + 0.5, \quad [2]$$

where K' is the estimated climatic weighting factor and log (A) is the base ten logarithm of the moisture demand for a quadrangle.

$$K = (17.67 / (D * K_i)) * K' \quad [3]$$

where K is the actual climatic weighting factor, $17.67 / (D * K_i)$ is the ratio of Palmer's constant and the averages of the absolute values (D) for the annual (K_i) precipitation departures, and K' is the estimated climatic weighting factor.

$$z = d * k, \quad [4]$$

where z is the moisture anomaly, d is the average precipitation departure, and k is the climatic weighting factor.

$$FI = 0.897 * PHDI_{(t-1)} + z(t) / 3 \quad [5]$$

or

$$FI = 0.897 * MPDSI_{(t-1)} + z(t) / 3, \quad [6]$$

where FI is the Fox Index, $PHDI_{(t-1)}$ is the reported PHDI for the month before starting the calculations and $MPDSI_{(t-1)}$ is the reported MPDSI for the month before starting the calculations (for this study, both are the reported December 1947 values), and $z(t)$ is the moisture anomaly for the month of calculation.

Each of these equations builds upon the one calculated before it. Therefore, to calculate the Fox Index, evaporation and precipitation data are processed through each equation, in order of its listing here.

IV. RESULTS

The expected result is that the trend lines of the comparative indices will not be the same. The trend lines should differ in the sense that the Fox Index uses a local scale of information (data collected at the single station quadrangle level) as opposed to the Palmer Indices, which use merged data from larger regions. The varying scales of the data, and components of the calculations (variables e.g., precipitation and evaporation data strictly, rather than precipitation, evaporation, soil moisture and water consumption data) determine the differences between the trend lines and their equations. The Palmer Drought Severity Index identifies drought in areas that include many quadrangles while the Fox Index identifies drought severity at the one-degree latitude by one-degree longitude scale. Therefore, independent identifications of the variations from quadrangle to quadrangle take place. This is as opposed to the PDSI “canceling out” the differing quadrangle occurrences.

Comparisons. The results of the calculations are compared by graphic representation. The results are analyzed by means of trend line analysis. Important factors considered are the relationships between the equations of the lines, the similarities of the trends and the differences between the trends. The comparisons analyze the relationships between the indices, if any exist. The most important relationship to notice is that between trends of the time sequence graphs produced by the indices.

The following graphs show the results from the previously mentioned tables. The results of the Fox Index are compared to the Palmer Hydrologic Drought Index and the Modified Palmer Drought Severity Index. Following the direct comparison graphs are the graphs with the trend line analysis. Below are the descriptive results for each quadrangle.

Quadrangle 206. Figure 6 shows that the Fox Hydrologic Drought Index and the Palmer Hydrologic Drought Index track in the same pattern. The Fox Index has a greater range of values than the Palmer Index does. Figure 7 illustrates the linear trends of each of the indices. The equation for the FHDI trend line is $y = -0.0314 (\text{year}) - 0.4474$. The equation for the PHDI trend line is $y = -0.0517 (\text{year}) + 1.3006$. The R^2 value for each equation is 0.10. Figure 8 shows the Fox Drought Severity Index and the Palmer Drought Severity Index tracking along the same general pattern as Figure 6. The linear trends of the drought severity indices are given in Figure 9. The equations of the trend lines are $y = -0.03 (\text{year}) - 0.4718$ and $y = -0.0521 (\text{year}) + 1.2962$ for the FDSI and PDSI respectively. The R^2 values for these trends are 0.13 for the Palmer Index and 0.09 for the Fox. A t-test comparing the slopes of the trend lines (Table 1 and Table 2) shows a statistically significant difference ($t = 9.5$ and $t = 9.1$ respectively) between the slopes for all indices. Appendix A lists the tables created in the calculation of the Fox Drought Severity Index and the Fox Hydrologic Severity Index for Quad 206. Summary tables for the other four quads are presented in Appendix B.

Table 1. Quadrangle 206 Hydrologic Drought Indices Statistical Analysis

H_0 : Slope PHDI = Slope FHDI H_A : Slope PHDI $\neq$ Slope FHDI	
For Sample 1 (FHDI):	For Sample 2 (PHDI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = -1918.28	SUM (xy) = -560.9575
SUM (y^2) = 88.153989	SUM (y^2) = 27.84722025
n = 50	n = 50
b = -0.04469	b = -0.01307
residual SS = 2.427765	residual SS = 20.51645
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 0.23900224$	
$S_{B1-B2} = 0.003337036$	
t = 9.475713312	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Table 2. Quadrangle 206 Drought Severity Indices Statistical Analysis

H_0 : Slope PDSI = Slope FDSI H_A : Slope PDSI $\neq$ Slope FDSI	
For Sample 1 (FDSI):	For Sample 2 (PDSI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = -1889.25	SUM (xy) = -583.7375
SUM (y^2) = 85.854962	SUM (y^2) = 28.31612025
n = 50	n = 50
b = -0.044013861	b = -0.01359901
residual SS = 2.699793752	residual SS = 20.37786821
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 0.240392312$	
$S_{B1-B2} = 0.003346726$	
t = 9.087942425	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Quadrangle 206: Hydrologic Drought Indices Comparisons

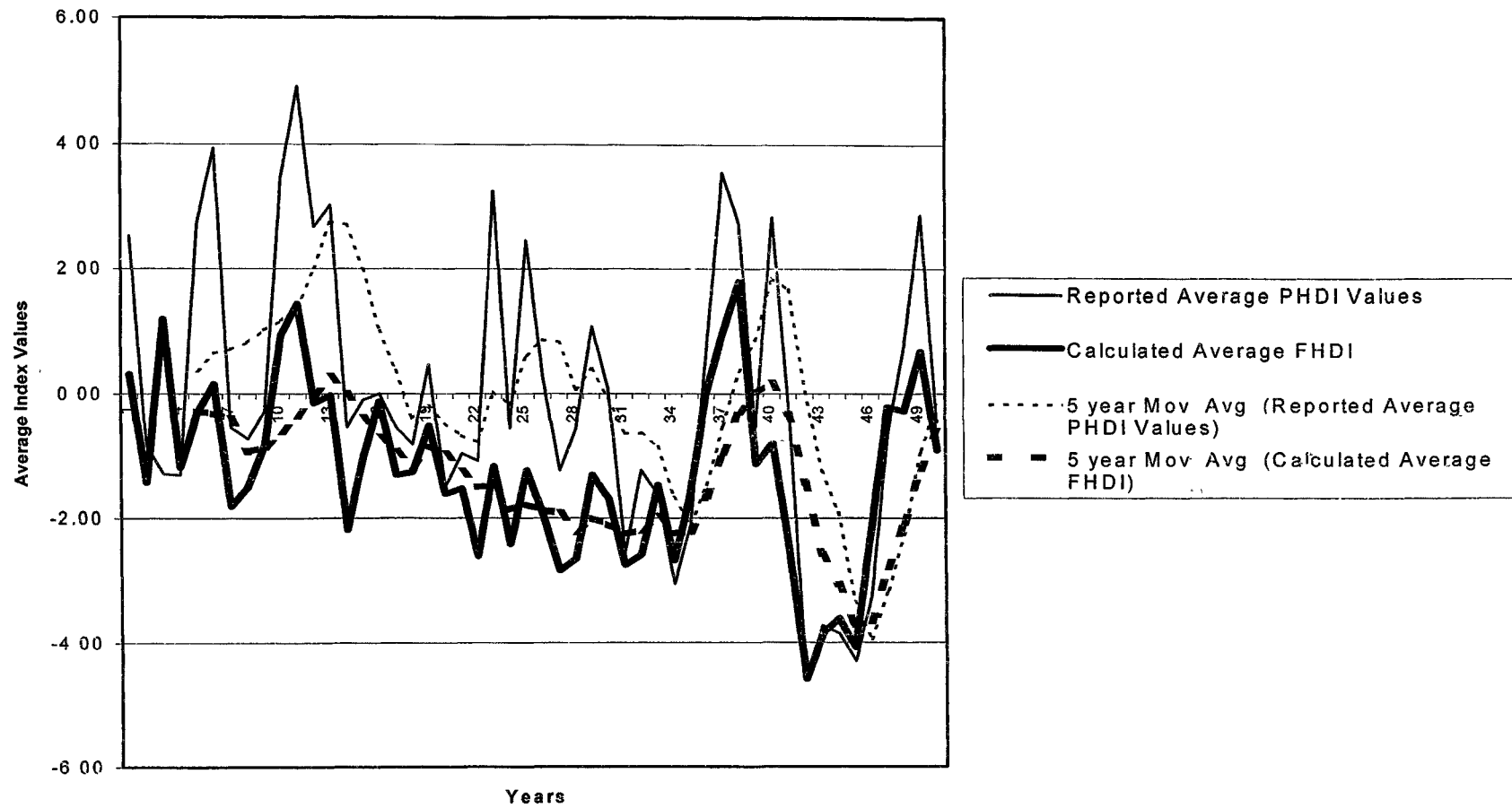


Figure 6.

Quadrangle 206: Hydrologic Drought Indices Linear Comparisons

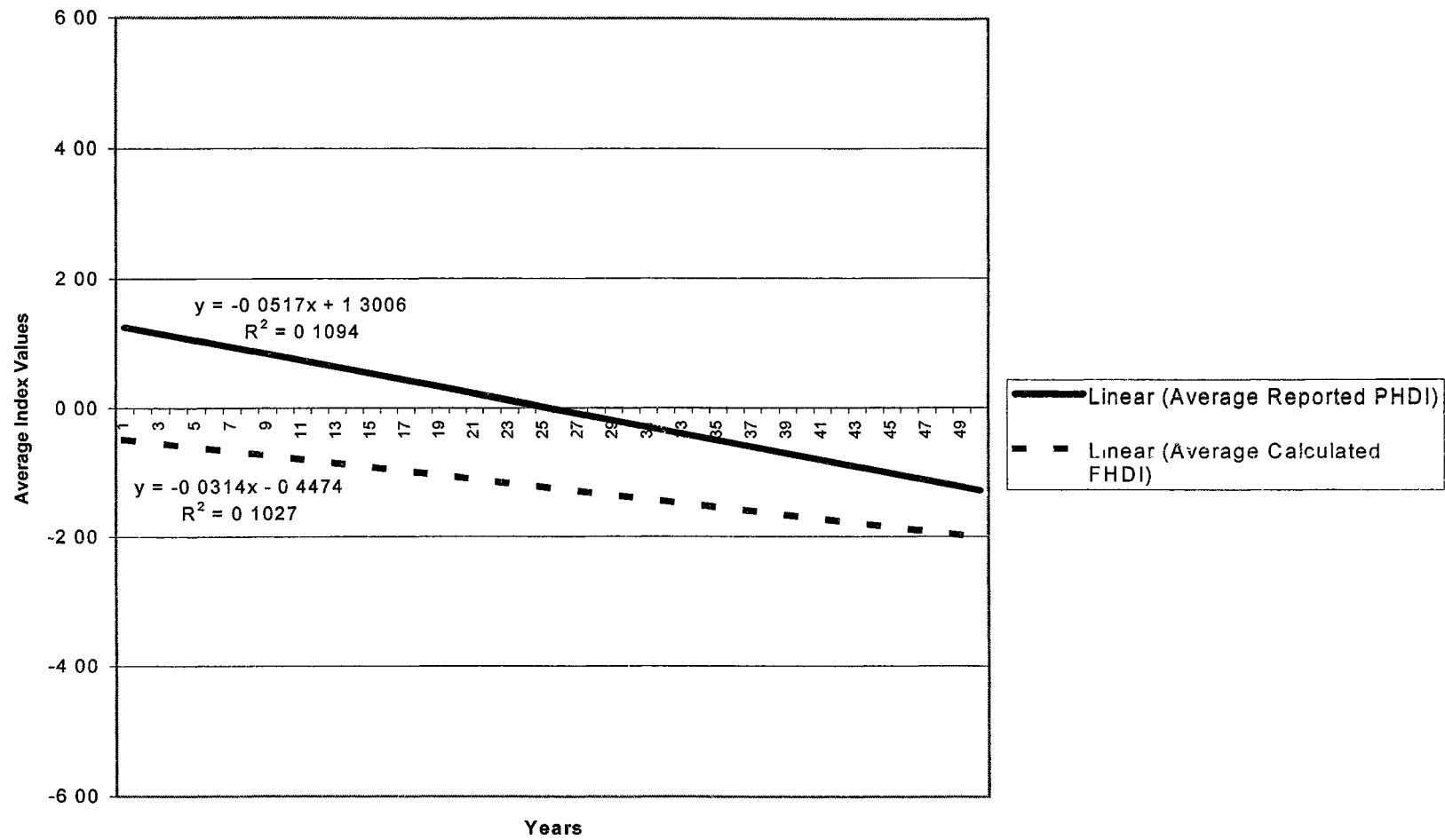


Figure 7.

Quadrangle 206: Drought Severity Indices Comparisons

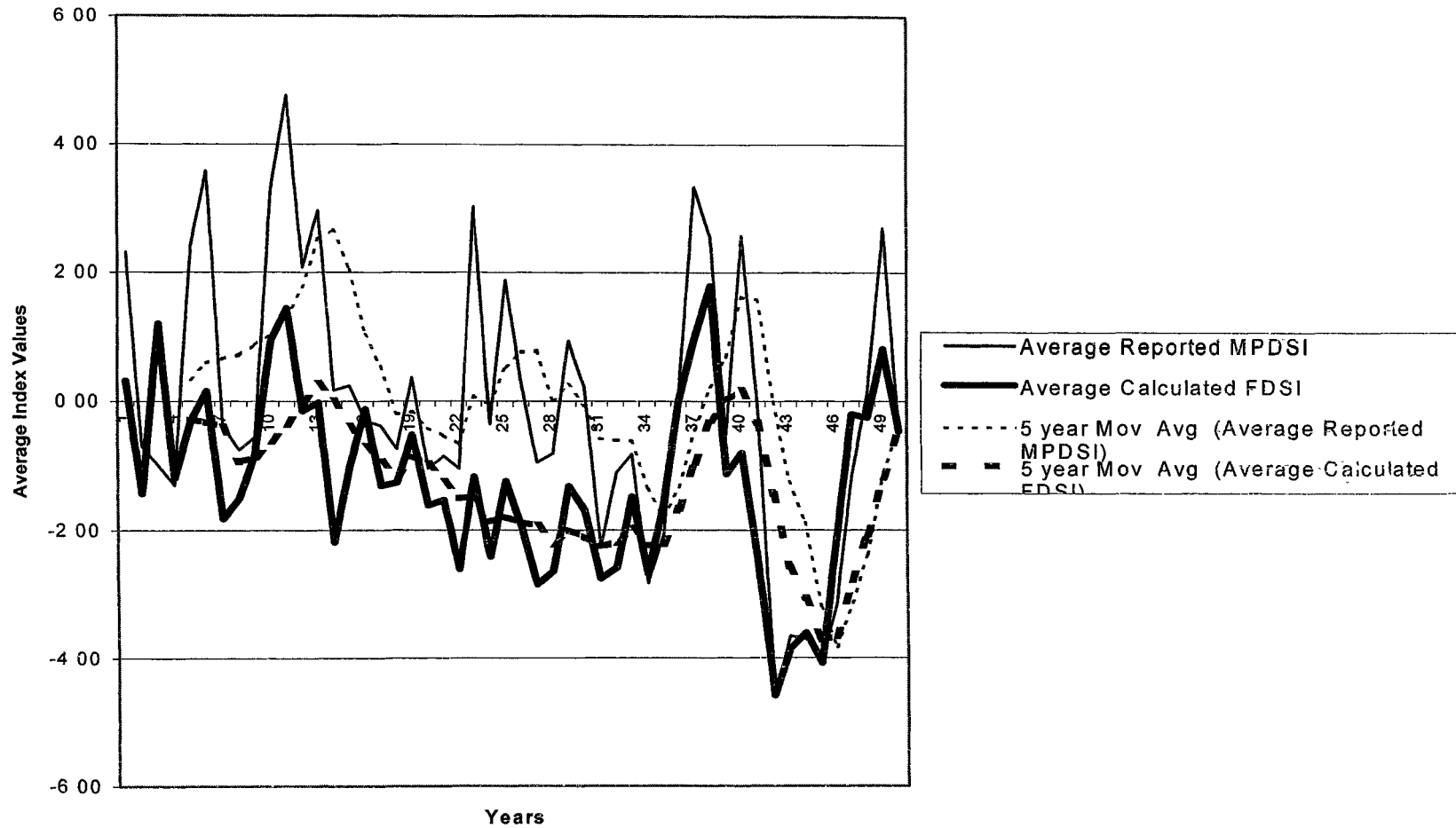


Figure 8.

Quadrangle 206: Drought Severity Indices Linear Comparisons

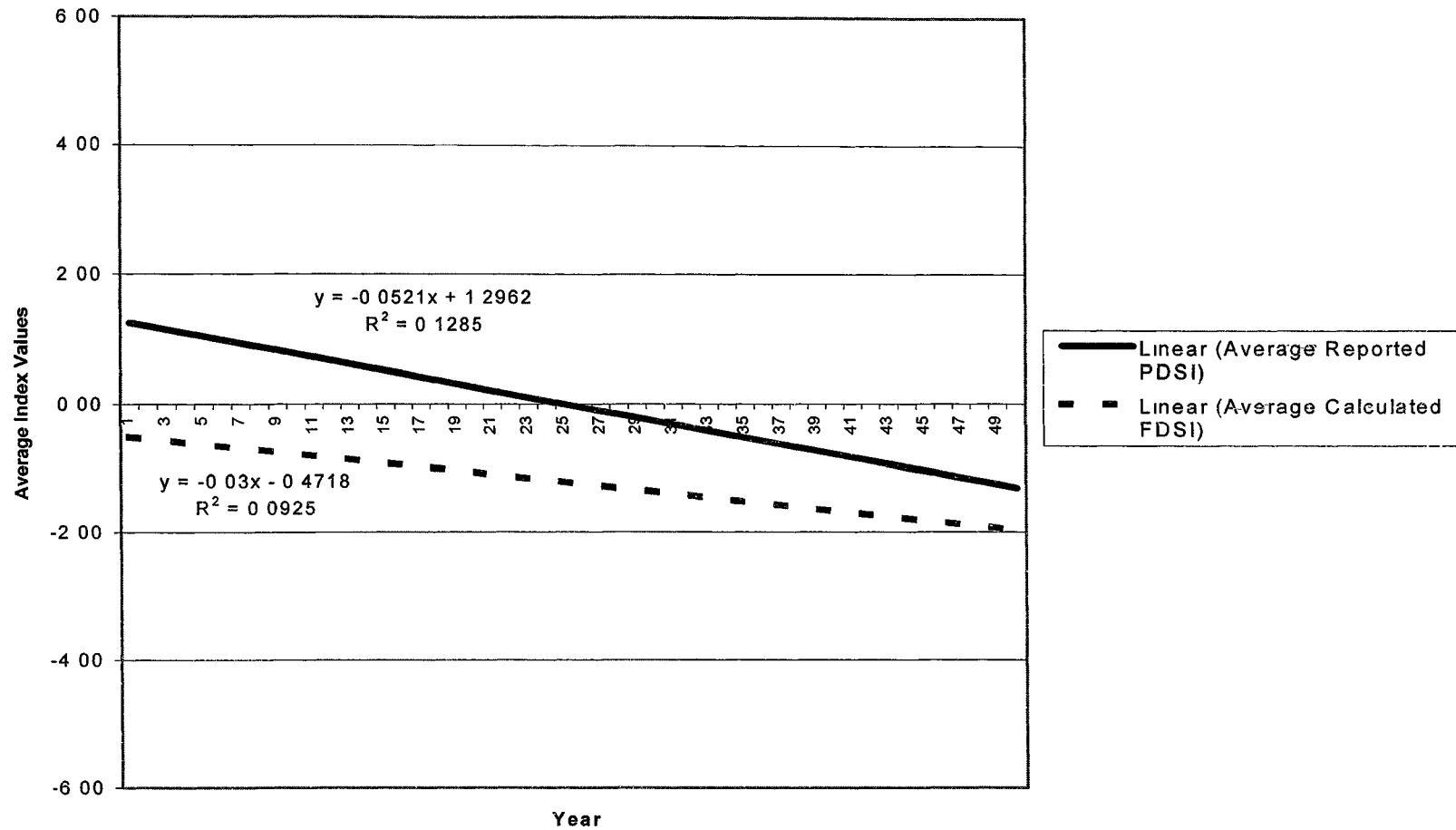


Figure 9.

Quadrangle 601. Figure 10 displays the pattern similarities of the Fox Index and the Palmer Hydrologic Drought Index. This graph displays information from the El Paso, Texas area. This area is classified as BWh. The moisture stressed region has negative values for normal climatic moisture levels. The Fox Index does not generate zero as the normal climate value. This quadrangle identifies that fact visibly. Figure 11 is the graph of the linear trend lines for the FHDI and PHDI for Quadrangle 601. The trend line data for each are as follows. FHDI: $y = -0.028 (\text{year}) - 2.8374$; $R^2 = 0.12$. PHDI: $y = -0.058 (\text{year}) + 1.7596$; $R^2 = 0.18$. Figure 12 illustrates the Fox Index with its moving trend (intervals of five years) and those of the PDSI. Figure 13 illustrates the linear trend lines of those depicted in Figure 12. The equation for the FDSI linear trend line is $y = -0.0272 (\text{year}) - 2.8508$, and the $R^2 = 0.11$. The equation for the PDSI linear trend line is $y = -0.0514 (\text{year}) + 1.513$, and the $R^2 = 0.15$. Tables 3 and 4 show the statistics for this quadrangle illustrating that here, as with Quadrangle 206, the slopes Fox Indices are significantly different than the slopes of the Palmer Indices. The t-test comparing the slopes of the indices for Quadrangle 601 result is t-values of $t_{(hdi)} = 13.15$ and $t_{(dsi)} = 13.46$. See Appendix B for the summary table presented for Quadrangle 601.

Table 3. Quadrangle 601 Hydrologic Drought Indices Statistical Analysis

H_0 : Slope PDHI = Slope FDHI H_A : Slope PDSI $\neq$ Slope FDSI	
For Sample 1 (FHDI):	For Sample 2 (PHDI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = -4819.585	SUM (xy) = -246.16
SUM (y^2) = 638.785498	SUM (y^2) = 38.964468
n = 50	n = 50
b = -4819.585/42925 = -0.11228	b = -246.16/42925 = -0.00573
residual SS = 97.64631	residual SS = 37.55283
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 1.408324$	
$S_{B1 \cdot B2} = 0.0081$	
t = 13.15286	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Table 4. Quadrangle 601 Drought Severity Indices Statistical Analysis

H₀: PDSI = FDSI	
H_A: PDSI <> FDSI	
For Sample 1 (FDSI):	For Sample 2 (PDSI):
SUM (x ²) = 42925	SUM (x ²) = 42925
SUM (xy) = -4802.33	SUM (xy) = -277.27
SUM (y ²) = 635.842152	SUM (y ²) = 29.555673
n = 50	n = 50
b = -0.111877228	b = -0.006459406
residual SS = 98.57058499	residual SS = 27.76467351
residual DF = 48	residual DF = 48
(S ² _{Y*X}) _p = 1.315994359	
S _{B1-B2} = 0.007830453	
t = 13.46254532	
v = 96	
t _{0.05(2),96} = 1.985	
Therefore, reject H ₀ .	
P < 0.001	

Quadrangle 601: Hydrologic Drought Indices Comparisons

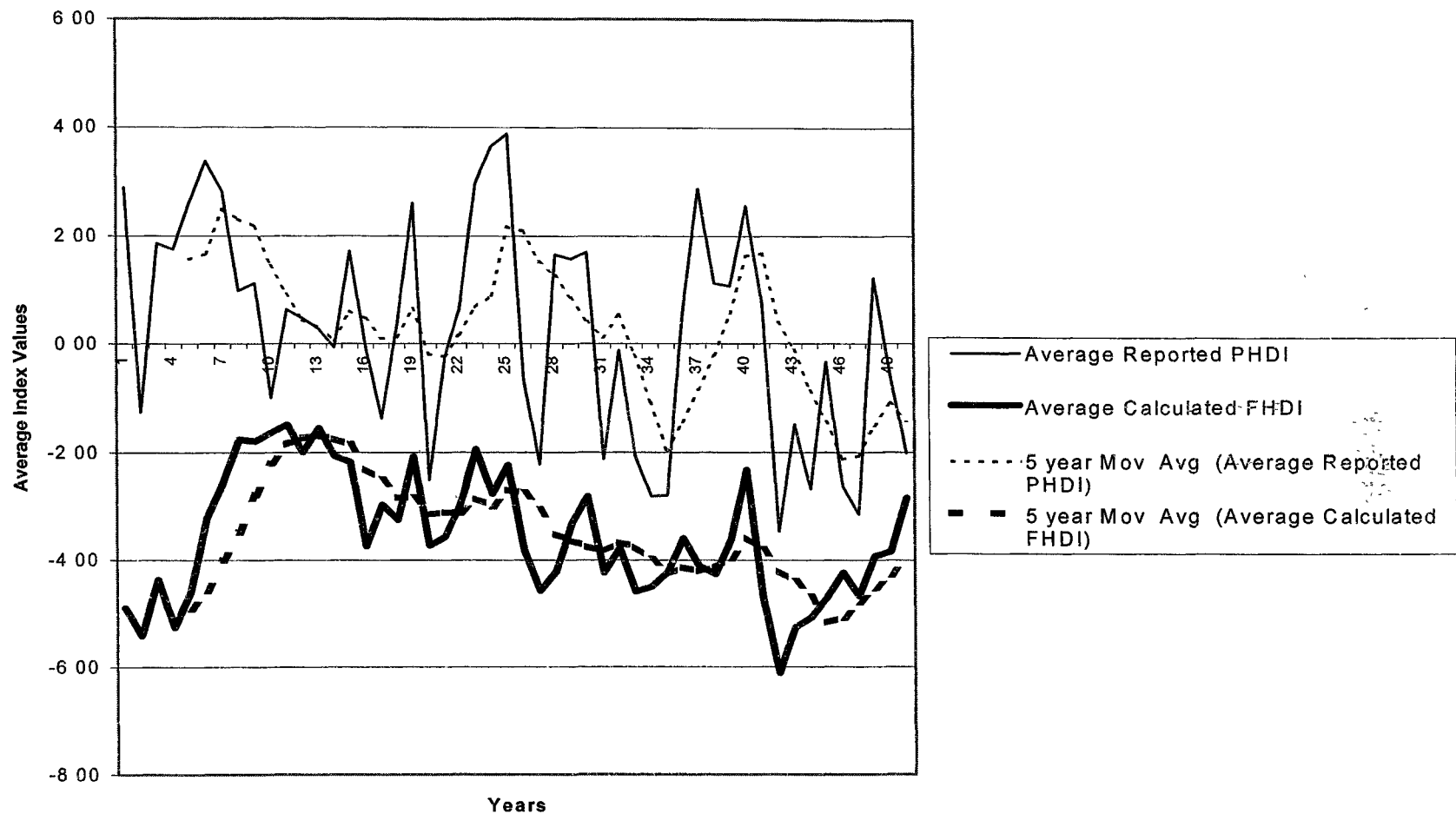


Figure 10.

Quadrangle 601: Hydrologic Drought Indices Linear Comparisons

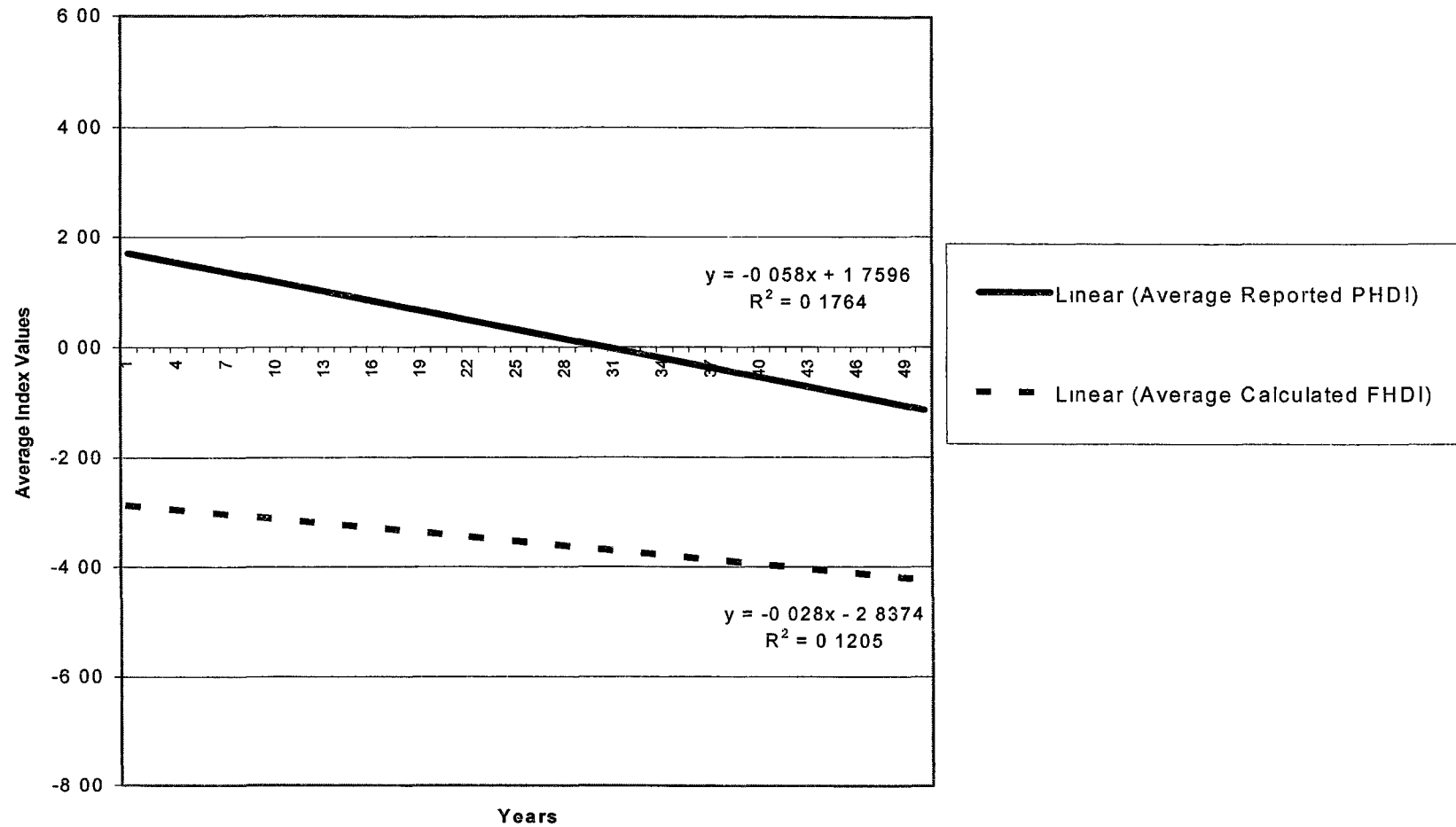


Figure 11.

Quad 601: Drought Severity Indices Comparisons

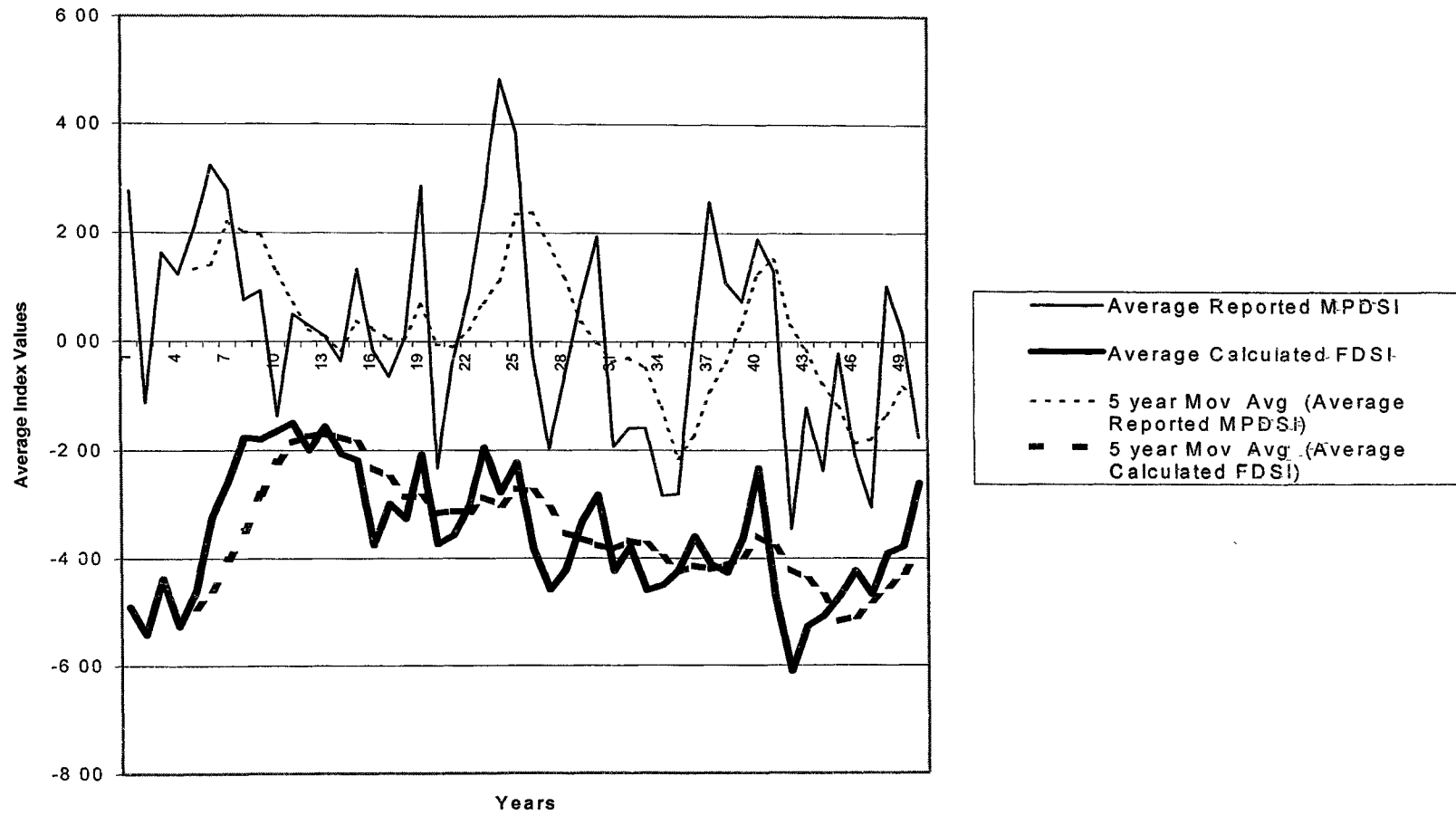


Figure 12.

Quad 601: Drought Severity Indices Linear Comparisons

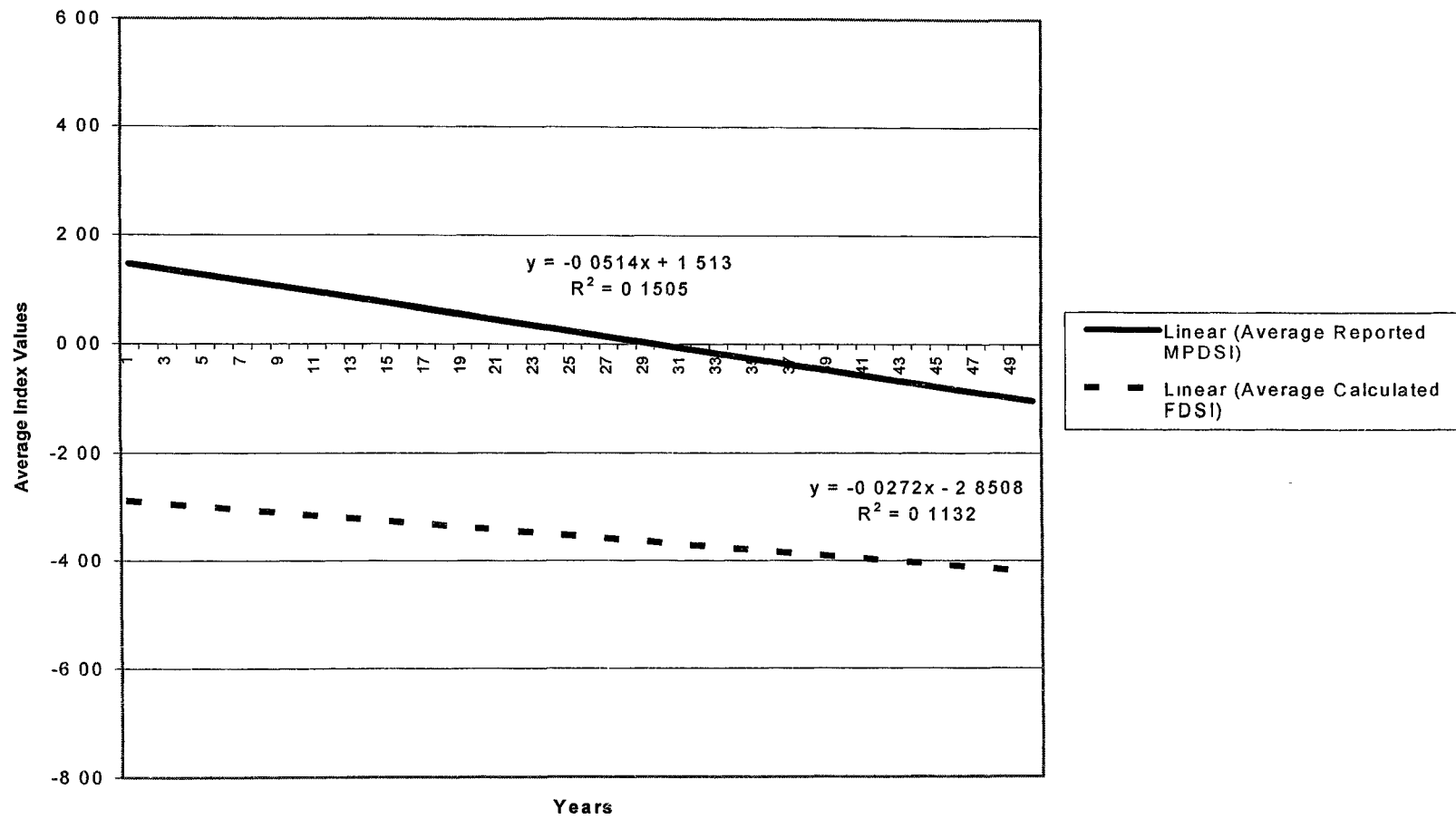


Figure 13.

Quadrangle 613. Figure 14 illustrates the hydrologic drought indices calculated for the Fox and Palmer Indices. Figure 15 shows the linear trend lines for FHDI and PHDI for Quadrangle 613. The equations for the linear trend lines are $y = -0.0405 (\text{year}) + 3.9461$ and $y = -0.0662 (\text{year}) + 1.4652$ for the FHDI and PHDI respectively. The R^2 value equals 0.24 for the FHDI and R^2 value equals 0.17 for the PHDI. Figure 16 is the graph of the PDSI, the five-year interval moving trend line associated with the PDSI, the FDSI and its associated five-year interval moving trend line for Quadrangle 613. Figure 17 illustrates the linear trend lines of the indices represented in Figure 16. The linear trend lines are determined using $y = -0.0393 (\text{year}) + 3.9271$ (FDSI) and $y = -0.0567 (\text{year}) + 1.1779$ (PDSI). R^2 respectively equals 0.24 and 0.15. The t-test comparing the slopes of the trend lines (see Tables 5 and 6) shows that there is a significant difference between the slopes of the trend lines of the indices.

Table 5. Quadrangle 613 Hydrologic Drought Indices Statistical Analysis

H_0 : Slope PDHI = Slope FDHI H_A : Slope PDHI $\neq$ Slope FDHI	
For Sample 1 (FHDI):	For Sample 2 (PHDI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = 3292.815	SUM (xy) = -973.505
SUM (y^2) = 441.4595143	SUM (y^2) = 48.116377
n = 50	n = 50
b = 0.076711	b = -0.02268
residual SS = 188.8647	residual SS = 26.03805
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 2.238571$	
$S_{B1-B2} = 0.010213$	
t = 9.731905	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Table 6. Quadrangle 613. Drought Severity Indices Statistical Analysis

H_0 : Slope PDSI = FDSI H_A : Slope PDSI $\neq$ FDSI	
For Sample 1 (FDSI):	For Sample 2 (PDSI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = 3320.1	SUM (xy) = -970.6575
SUM (y^2) = 443.8486273	SUM (y^2) = 38.7773165
n = 50	n = 50
b = 0.077346535	b = -0.02261287
residual SS = 187.0503975	residual SS = 16.82796339
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 2.123732926$	
$S_{B1-B2} = 0.009947405$	
t = 10.04879231	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Quadrangle 613: Hydrologic Drought Indices Comparisons

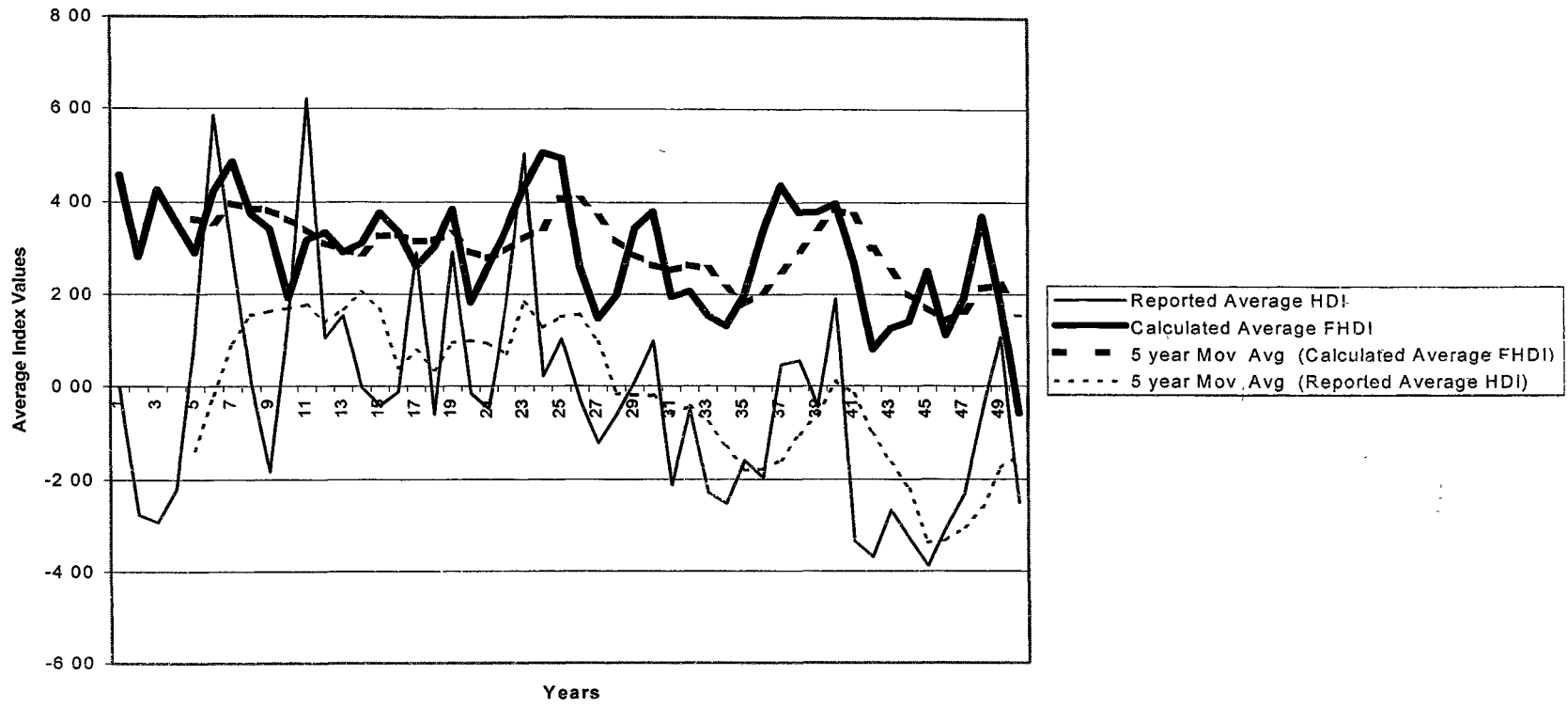


Figure 14.

Quadrangle 613: Hydrologic Drought Indices Linear Comparisons

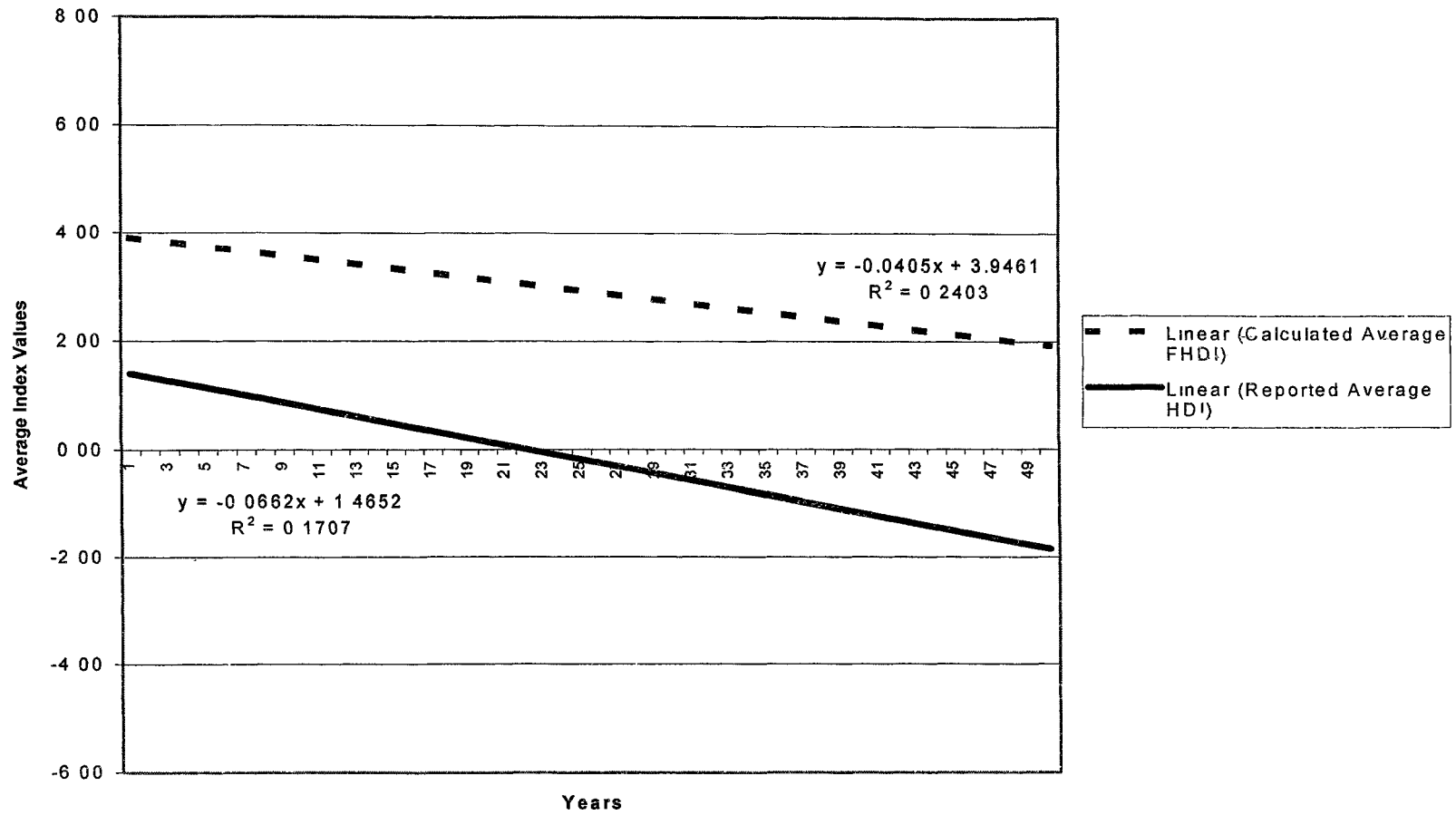


Figure 15.

Quadrangle 613: Drought Severity Indices Comparisons

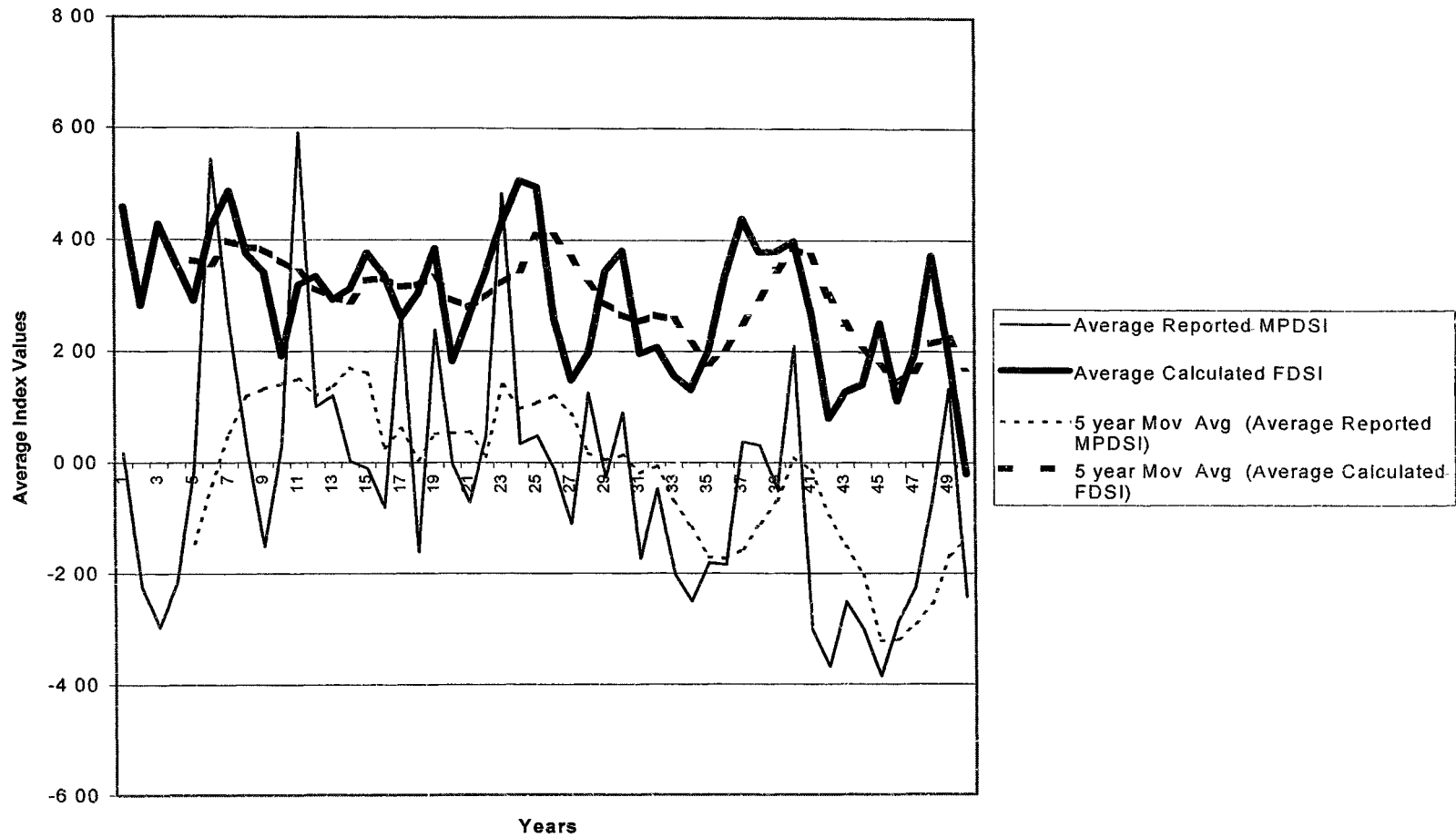


Figure 16.

Quadrangle 613: Drought Severity Indices Linear Comparisons

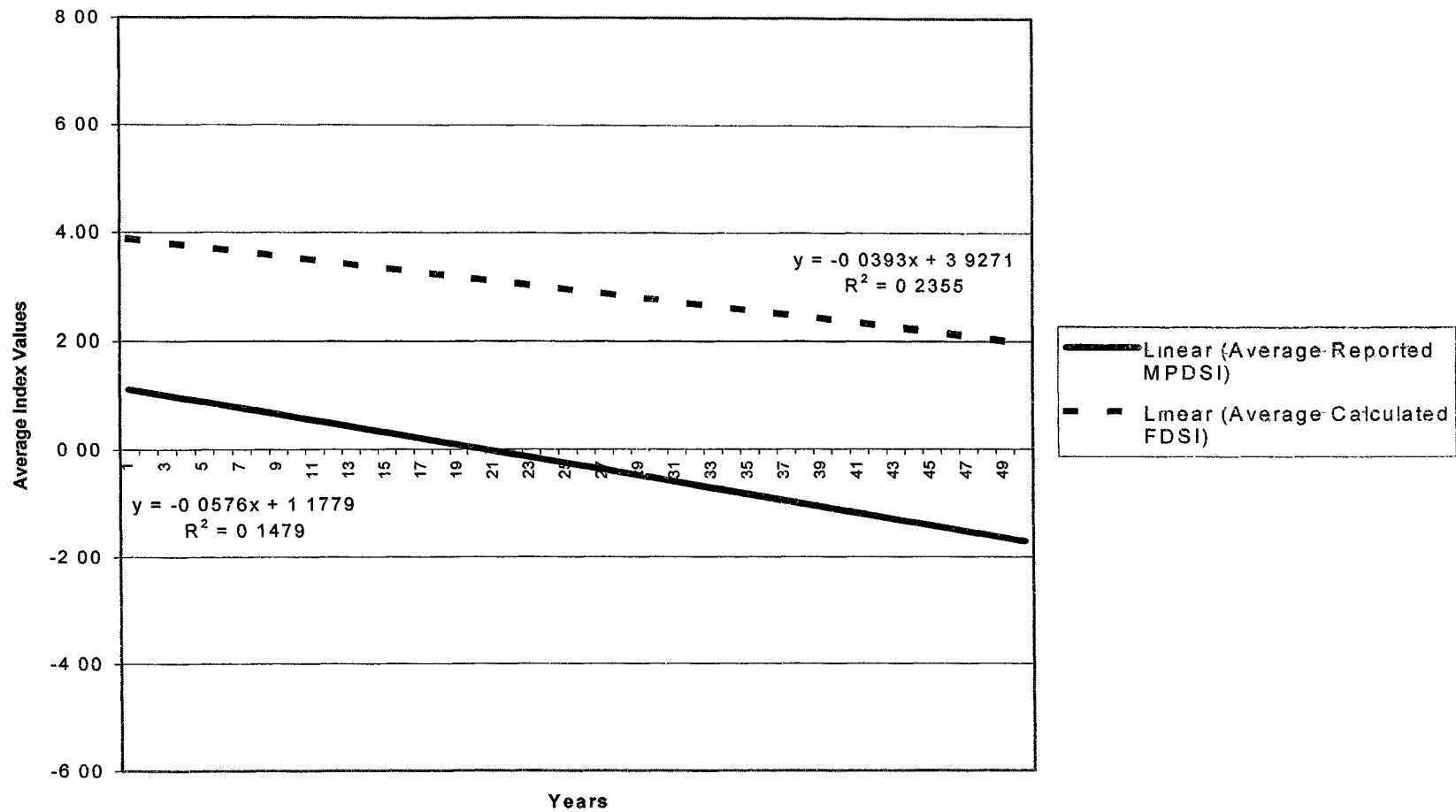


Figure 17.

Quadrangle 710. See Figures 18 – 21. Figure 18 illustrates the hydrologic drought indices with their respective five-year interval moving trend lines. Notice the similarities in the patterns of the indices. The FHDI reports greater variance of index values than the PHDI does. Figure 19 shows the linear trend lines for the PHDI and FHDI for Quadrangle 710. The properties of the linear trend lines are, for the PHDI: $y = -0.0777(\text{year}) + 5.9936$ with $R^2 = 0.16$ and for the FHDI: $y = -0.0625(\text{year}) + 1.6982$ with $R^2 = 0.12$. Figure 20 displays the drought severity indices (PDSI and FDSI) with their respective five-year interval moving trend lines. Figure 21 illustrates the linear trend lines developed for the PDSI and FDSI for Quadrangle 710. The properties of the drought severity linear trend lines of Quadrangle 710 are, for the PDSI: $y = -0.0762(\text{year}) + 5.9692$ with $R^2 = 0.16$; for the FDSI: $y = -0.0567(\text{year}) + 1.4118$ with $R^2 = 0.12$. See the statistics below (Table 7 and Table 8) that display the significant results of the t-test comparisons. They show that the slopes of the PHDI and PDSI are different from the slopes of the FHDI and FDSI.

Table 7. Quadrangle 710 Hydrologic Drought Indices Statistical Analysis

H_0: Slope PHDI = Slope FHDI H_A: Slope PHDI $\neq$ Slope FHDI	
For Sample 1 (FHDI):	For Sample 2 (PHDI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = 4306.5675	SUM (xy) = -517.6075
SUM (y^2) = 867.7707853	SUM (y^2) = 41.21931825
n = 50	n = 50
b = 4306.5675/42925 = 0.100328	b = -517.6075/42925 = -0.01206
residual SS = 435.7027	residual SS = 34.97779
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 4.902922$	
$S_{B1-B2} = 0.015114$	
t = 7.435761	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Table 8. Quadrangle 710 Drought Severity Indices Statistical Analysis

H_0 : Slope PDSI = FDSI H_A : Slope PDSI $\neq$ FDSI	
For Sample 1 (FDSI):	For Sample 2 (PDSI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = 4339.845	SUM (xy) = -633.8025
SUM (y^2) = 870.933617	SUM (y^2) = 33.53301225
n = 50	n = 50
b = 0.10110297	b = -0.01476535
residual SS = 432.1623969	residual SS = 24.1746987
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 4.753511412$	
$S_{B1-B2} = 0.014882199$	
t = 7.785698502	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Quadrangle 710: Hydrologic Drought Indices Comparisons

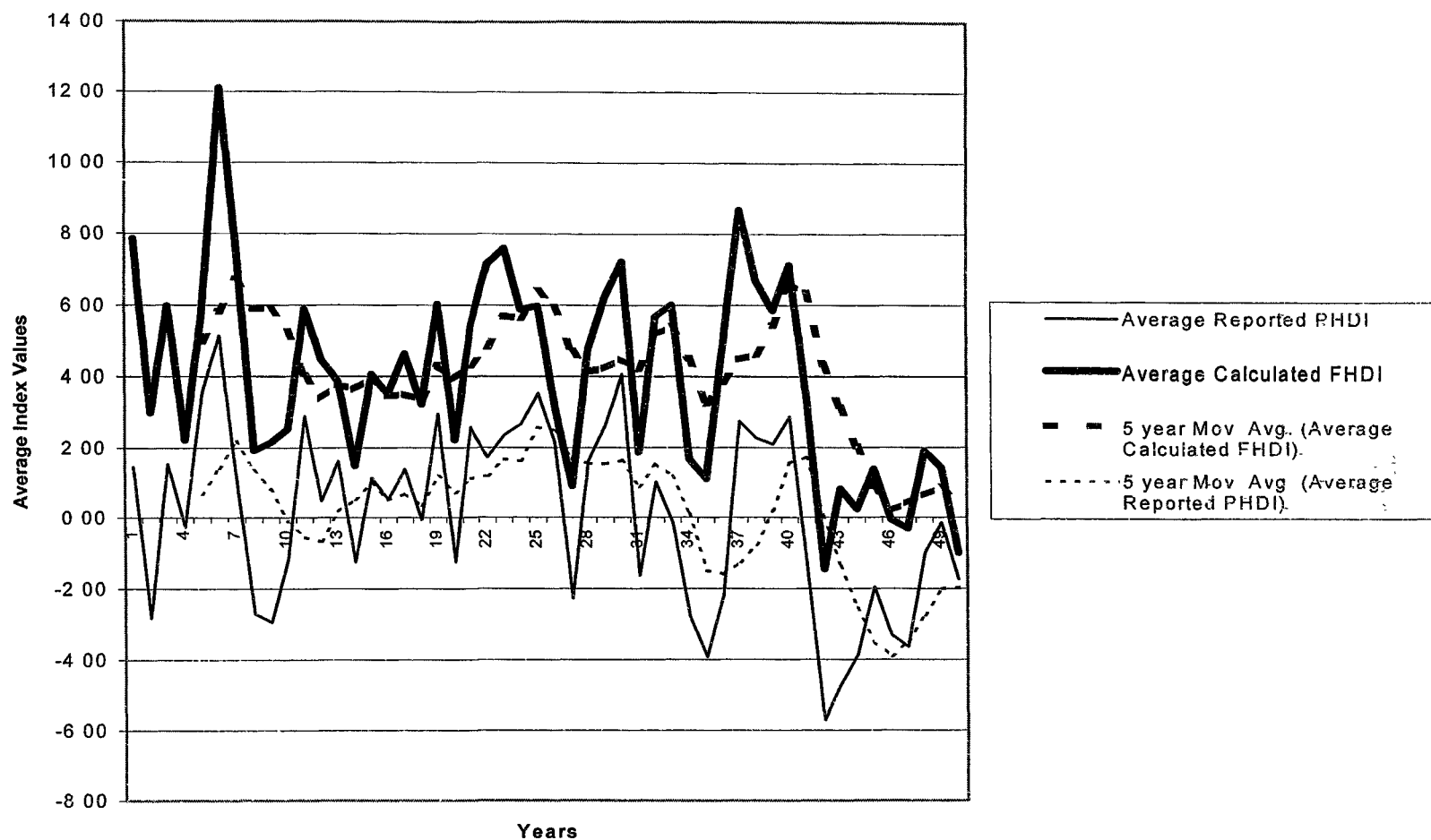


Figure 18.

Quadrangle 710: Hydrologic Drought Indices Linear Comparisons

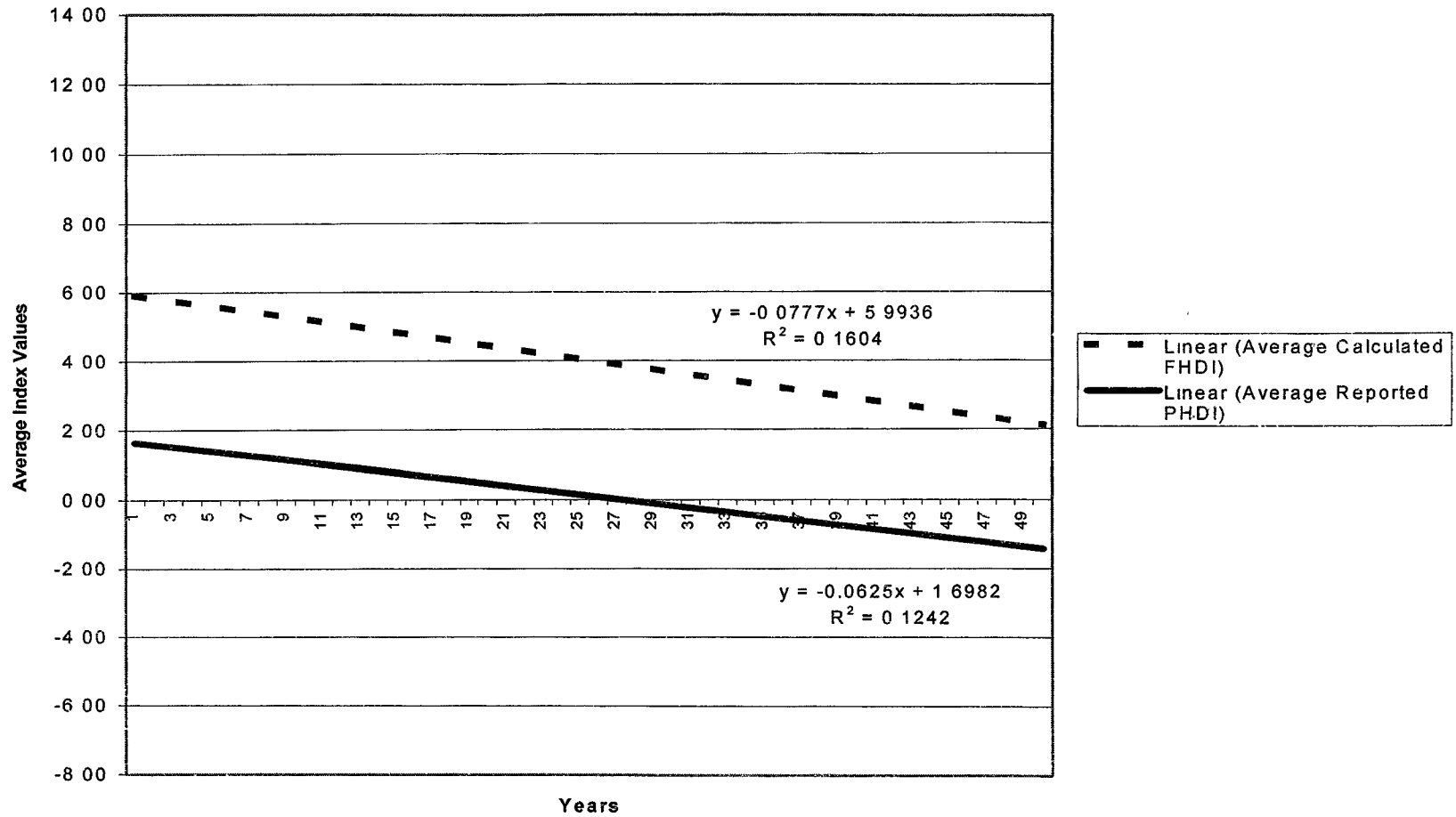


Figure 19.

Quadrangle 710: Drought Severity Indices Comparisons

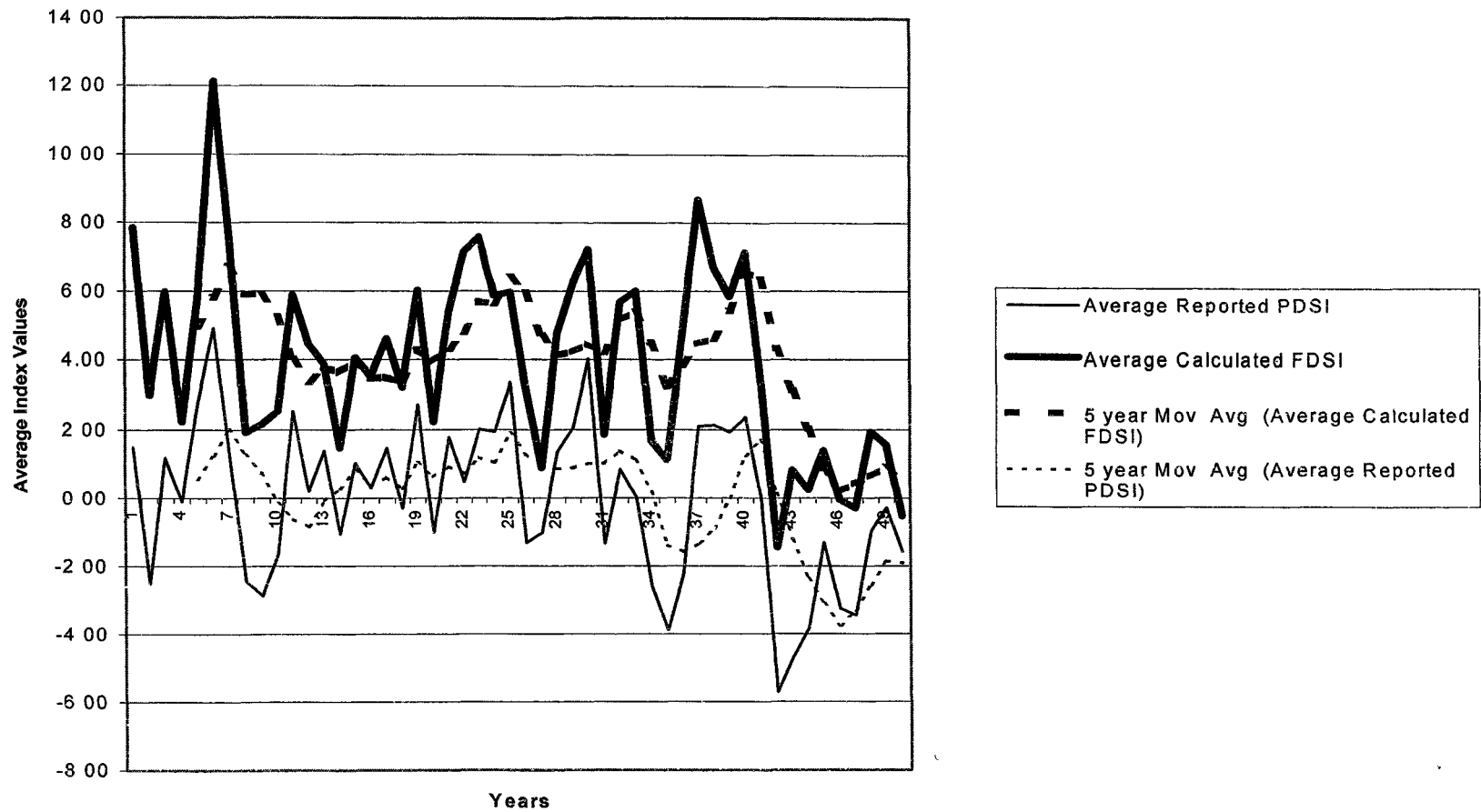


Figure 20.

Quadrangle 710: Drought Severity Indices Linear Comparisons

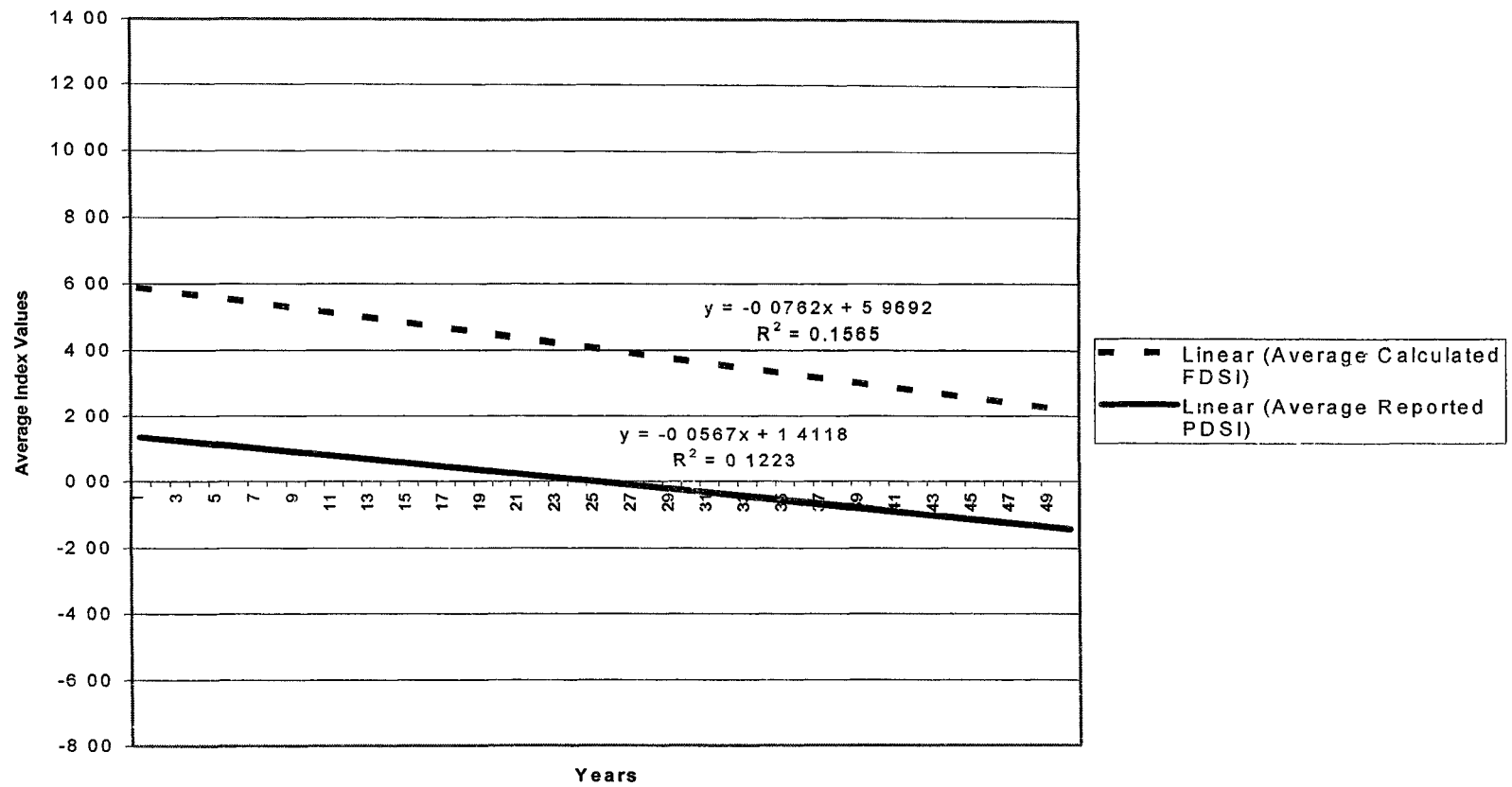


Figure 21.

Quadrangle 1010. This analysis refers to Figures 22 – 25. Figure 22 illustrates the Fox Hydrologic Drought Index, the Palmer Hydrologic Index, and their respective five-year interval moving trend lines for Quadrangle 1010. Figure 23 illustrates the linear trend lines for the FHDI and the PHDI for the quad. The equation of the linear trend line of the FHDI is $y = -0.0534 (\text{year}) + 2$. The R^2 value equals 0.35. The equation of the linear trend line of the PHDI is $y = -0.0625 (\text{year}) + 1.6982$. The R^2 value equals 0.12. Figure 24 shows the drought severity indices, of both the Fox and Palmer, with their five-year interval moving trend lines. Figure 25 illustrates the linear trend lines of the FDSI and the PDSI for Quadrangle 1010. The linear trend line of the FDSI is calculated using the equation $y = -0.0527 (\text{year}) + 1.9867$. The value of R^2 is 0.34. The linear trend line of the PDSI is calculated using the equation $y = -0.567 (\text{year}) + 1.4118$. The value of R^2 is 0.12. Table 9 and Table 10 are the summaries of the t-tests calculated that show the slopes to be significantly different from one another ($t = 13.15$ and $t = 13.46$ for the HDI and DSI analyses respectively).

Table 9. Hydrologic Drought Indices Statistical Analysis

H_0 : Slope PHDI = Slope FHDI H_A : Slope PHDI $\neq$ Slope FHDI	
For Sample 1 (FHDI):	For Sample 2 (PHDI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = -4819.585	SUM (xy) = -246.16
SUM (y^2) = 638.785498	SUM (y^2) = 38.964468
n = 50	n = 50
b = -0.11228	b = -0.00573
residual SS = 97.64631	residual SS = 37.55283
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 1.408324$	
$S_{B1-B2} = 0.0081$	
t = 13.15286	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Table 10. Drought Severity Indices Statistical Analysis

H_0 : Slope PDSI = Slope FDSI H_A : Slope PDSI $\neq$ Slope FDSI	
For Sample 1 (FDSI):	For Sample 2 (PDSI):
SUM (x^2) = 42925	SUM (x^2) = 42925
SUM (xy) = -4802.33	SUM (xy) = -277.27
SUM (y^2) = 635.842152	SUM (y^2) = 29.555673
n = 50	n = 50
b = -0.111877228	b = -0.006459406
residual SS = 98.57058499	residual SS = 27.76467351
residual DF = 48	residual DF = 48
$(S^2_{Y \cdot X})_p = 1.315994359$	
$S_{B1-B2} = 0.007830453$	
t = 13.46254532	
v = 96	
$t_{0.05(2),96} = 1.985$	
Therefore, reject H_0 .	
P < 0.001	

Quadrangle 1010: Hydrologic Drought Indices Comparisons

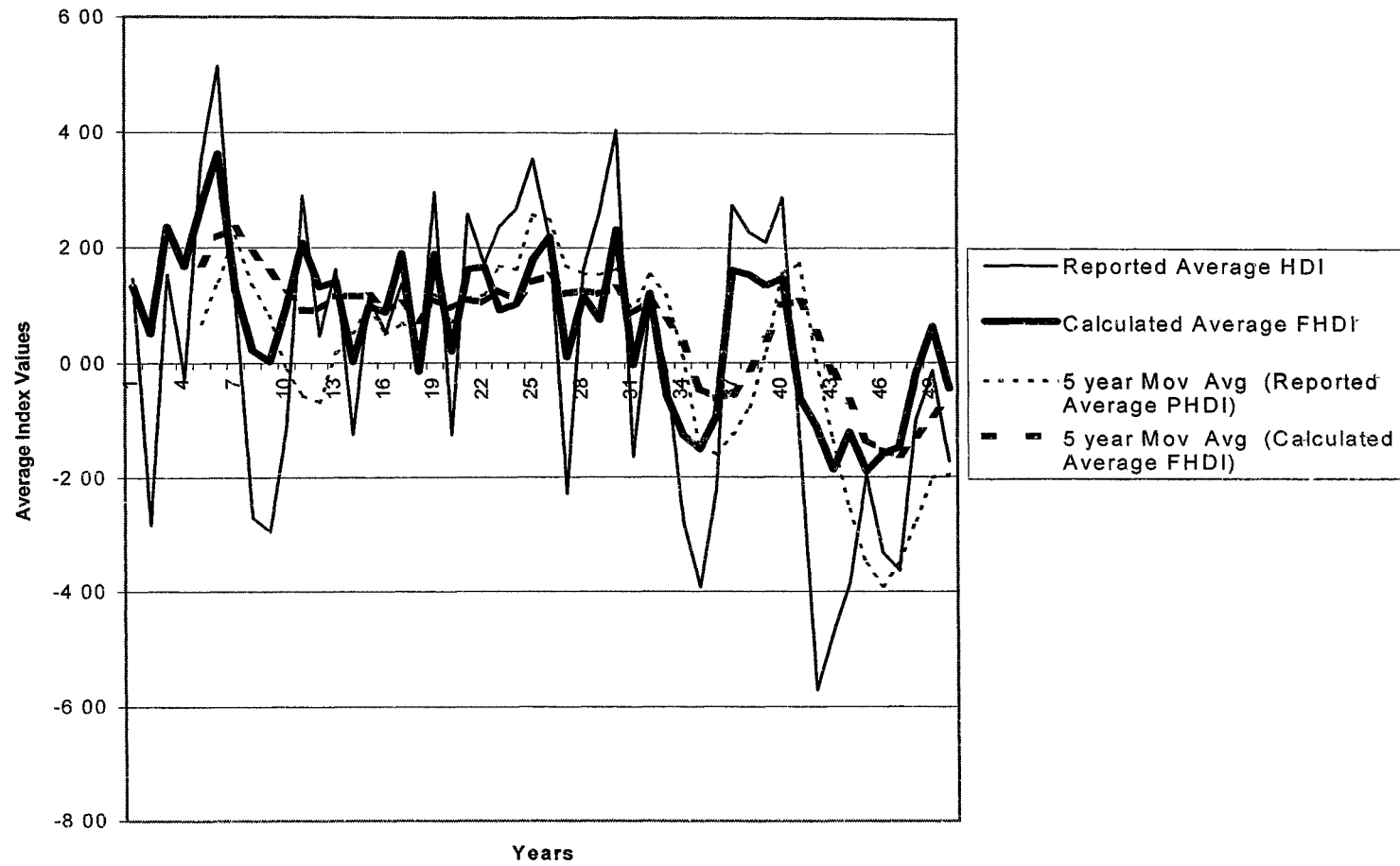


Figure 22.

Quadrangle 1010: Hydrologic Drought Indices Linear Comparisons

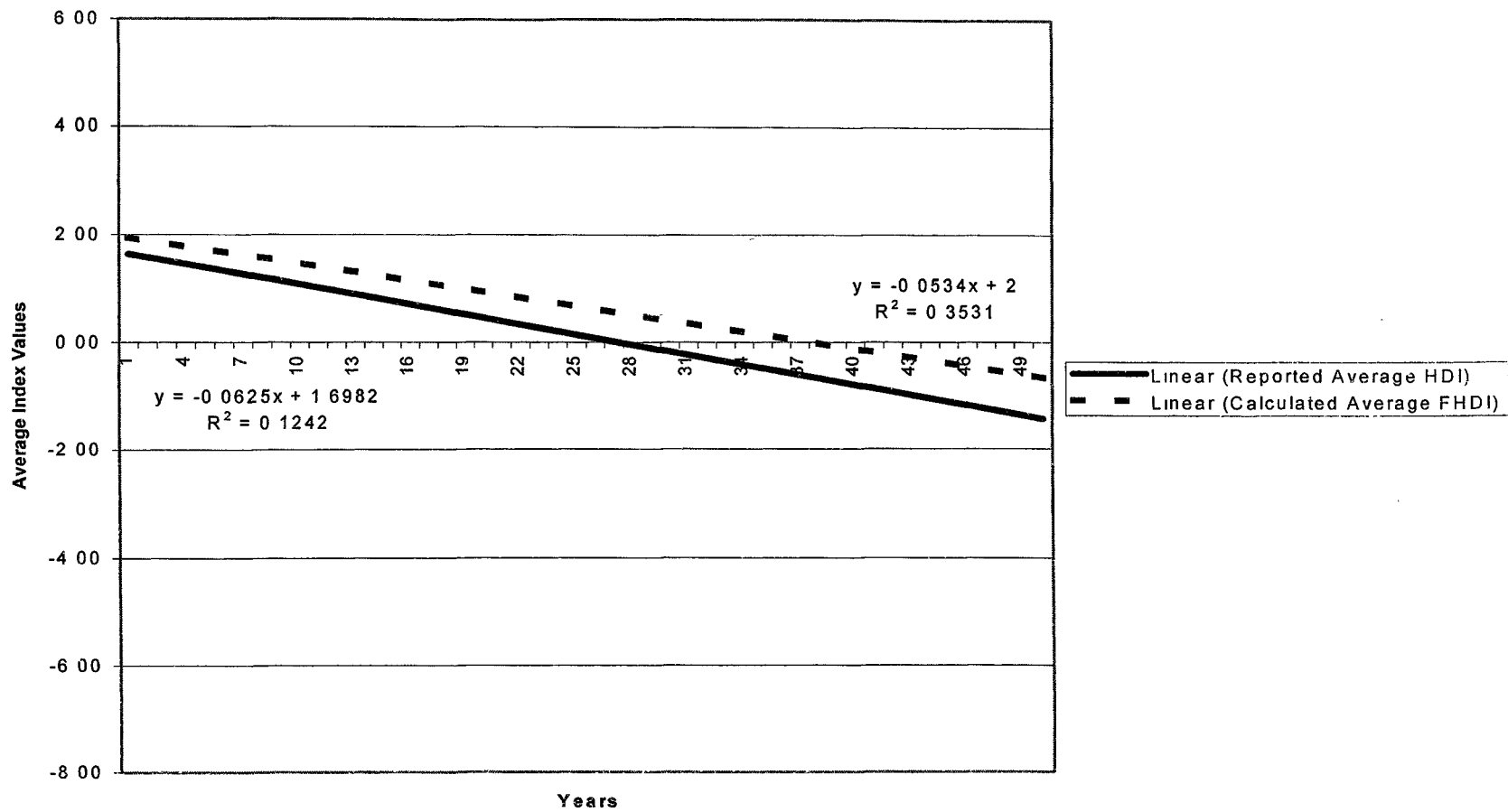


Figure 23.

Quadrangle 1010: Drought Severity Indices Comparisons

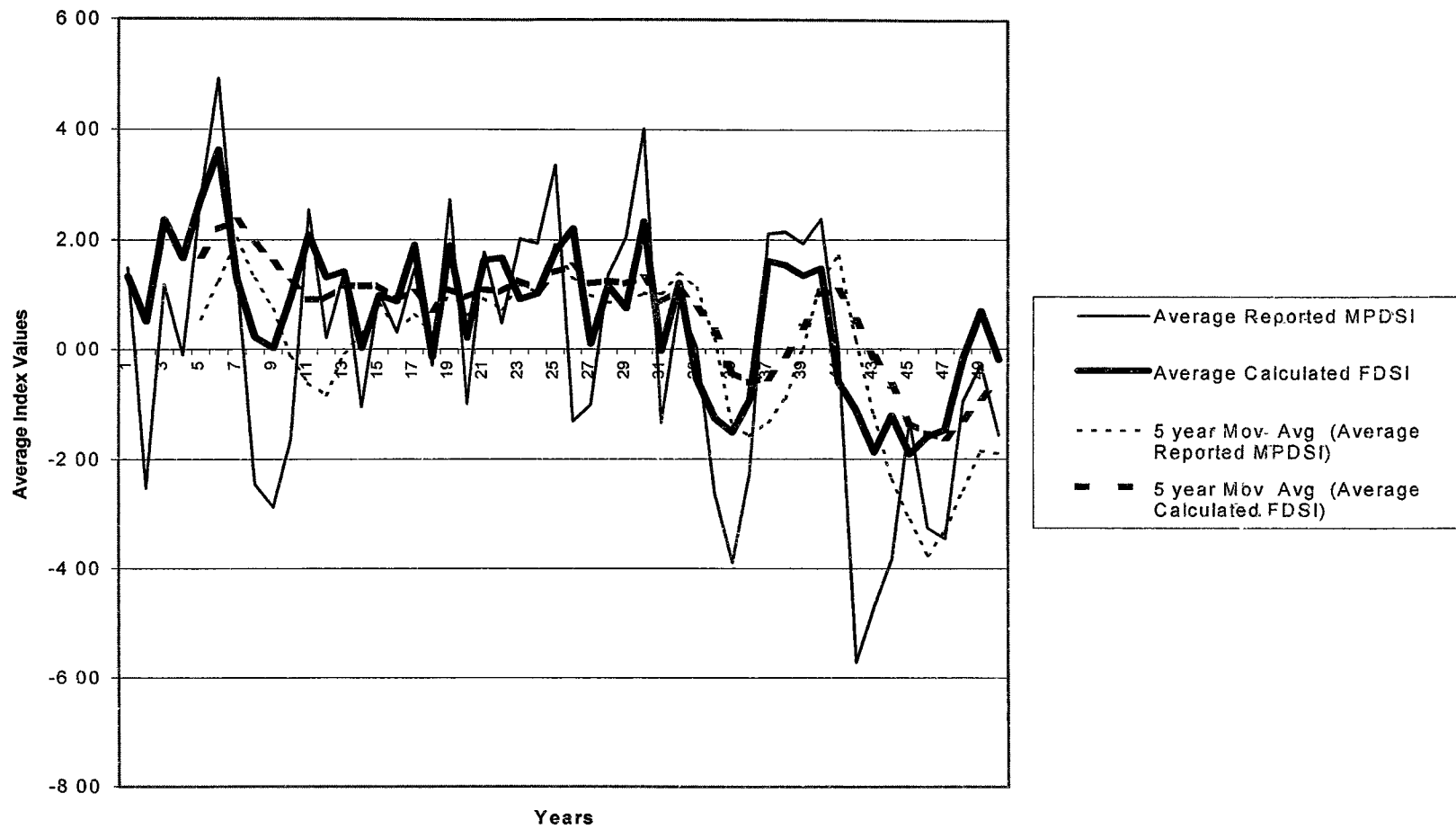


Figure 24.

Quadrangle 1010: Drought Severity Indices Linear Comparisons

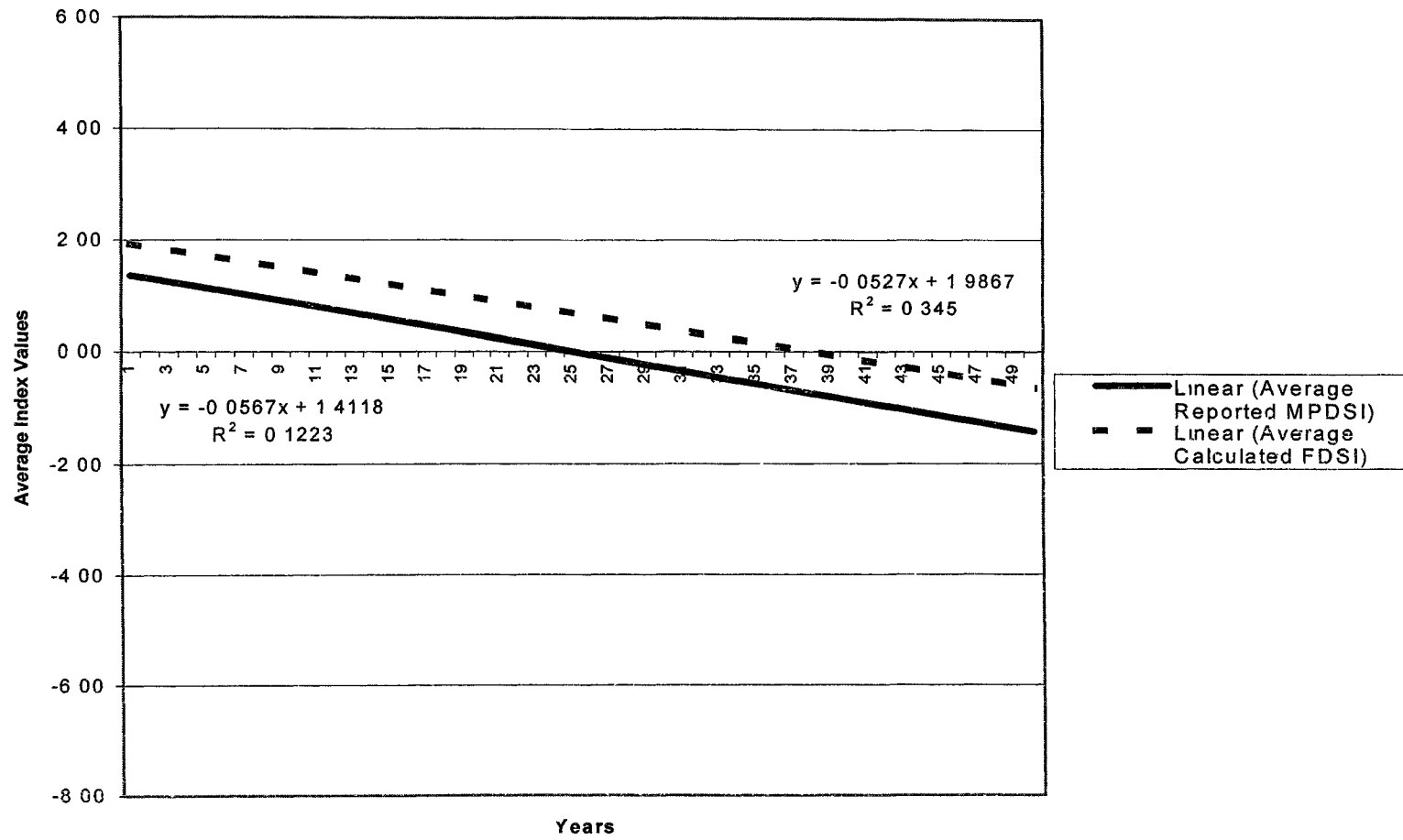


Figure 25.

V. CONCLUSIONS

The aim of this research has been to provide an index to monitor hydrologic drought in Texas using only evaporation and precipitation. This research has shown that aim has not been met. Using individual month's values of precipitation and evaporation, for determining the water balance yields some discrepancies. It is inevitable to have some errors, due to the inexactness of measuring evaporation (or evapotranspiration). The best means of reducing error is to use daily values. The most errors occur with the use of annual averages. Due to the constraints of data collection, this research uses monthly values for both evaporation and precipitation. The errors occur due to the average monthly values combining both the monthly surplus and deficiencies in its value. This is the limitation of the water balance method.

The results of the two-tailed t test prove that the Fox Indices do not measure the same characteristics that the Palmer Indices measure. The Fox Indices measure drought at the single station quadrangle scale. The Palmer Indices measure drought over larger areas, using data combined from multiple stations. Therefore, the Fox Indices will not be adequate substitutes for the Palmer Indices. They will however offer a supplement to the Palmer Indices with simplistic explanations.

Future research suggestions include applying the Fox Indices to the remaining 98 quadrangles in Texas, applying the Fox Indices to the other fifty states, to determine their usefulness as an additional drought index throughout the rest of the United States, and utilizing the Fox Indices as a resource for forecasting drought.

APPENDIX A

Table A1. Quadrangle 206 Evaporation Data (inches)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	2.67	2.81	7.3	6.06	5.86	7.03	9.94	7.11	6.87	5.29	3.32	1.74	66
1996	3.09	3.91	5.62	8.23	5.37	8.31	8.72	6.85	4.78	6	3.85	4.88	69.62
1995	3.11	3.77	5.74	5.83	6.15	7.73	8.49	8.21	5.57	6.76	4.77	4.44	70.56
1994	2.89	2.53	5.21	7.19	6.31	11.23	11.95	10.26	8.5	6.85	4.96	3.14	81.02
1993	2.1	2.52	4.94	6.65	7.37	9.77	11.57	10	9.08	6.71	4.05	2.78	77.53
1992	1.72	3.41	5.21	5.26	5.8	6.59	9.1	6.93	7.37	5.96	3.8	2.51	63.66
1991	2.09	3.48	5.92	7.35	8.91	9.97	11.17	9.83	7.14	7.98	3.21	3.64	80.7
1990	2.61	2.49	3.26	4.28	6.24	10.97	10.63	10.23	7.48	5.01	2.8	2.2	72.51
1989	3.24	1.9	5.88	5.8	5.68	5.87	8.53	6.43	6.23	6.46	5.54	2.48	68.05
1988	1.68	2.71	4.29	6.16	6.62	8.43	7.92	8.11	6.47	4.91	4.68	3.46	65.44
1987	2.23	2.31	4	6.35	4.99	6.59	10.33	7.64	5.26	5.2	3.46	2.32	60.67
1986	3.11	4.22	6.29	6.94	6.83	6.87	11.29	7.78	5.93	3.66	2.64	1.88	67.42
1985	1.5	3.34	5.09	6.83	6.37	8.33	10.33	8.55	7.14	4.13	2.51	0	64.12
1984	2.04	4.92	3.21	7.02	7.55	8.81	9.17	7.43	7.55	4.99	3.87	1.94	68.5
1983	2.04	1.73	3.59	5.17	6.05	7.24	11.62	9.8	8.58	5.25	3.66	1.66	66.38
1982	2.39	2.91	5.76	6.64	5.82	6.77	8.68	7.7	7.67	5.88	4.02	2.06	66.31
1981	2.26	3.38	4.45	6.91	6.48	10.18	9.42	7.32	5.51	3.97	3.82	2.55	66.26
1980	2.23	3.11	5.66	6.29	5.23	9.69	13.02	10.21	7.51	6.38	3.23	2.65	75.22
1979	1.67	1.74	4.2	5.27	5.42	7.44	9.12	7.54	7.01	7.69	2.77	2.8	62.66
1978	1.35	1.79	4.94	8.03	6.23	8.26	10.89	9.21	6.75	5.36	1.84	2.9	67.55
1977	1.7	3.71	5.96	5.42	5.67	9.1	10.73	8.02	7.38	5.49	4.27	3.1	70.55
1976	3.1	4.8	5.87	5.95	6.04	9.33	8.46	9.55	5.65	4.71	2.85	3.03	69.35
1975	0.82	1.45	3.18	5.63	5.34	7.84	7.43	8.38	3.37	7.44	2.67	2.22	55.77
1974	2.68	4.64	4.47	8.59	7.15	9.49	10.78	7.2	4.21	4.08	3	1.66	67.95
1973	1.76	1.89	2.94	3.78	5.3	7.92	8.58	8.79	5.59	5.4	3.4	3.22	58.58
1972	2.31	3.2	5.92	6.64	5.26	7.37	7.95	7.62	5.35	4.1	1.74	2.95	60.42
1971	3.06	3	4.13	6.01	6.8	7.23	8.27	6.94	5.88	5.11	3.03	1.83	61.3
1970	1.1	1.65	2.21	4.6	7.63	8.26	8.64	8.44	6.6	3.71	2.13	1.46	56.43
1969	0.85	1.48	2.13	5.72	5.41	7.49	7.63	7.72	4.67	3.89	2.24	0.71	49.93
1968	0.74	0.66	3.43	5.49	5.08	7.98	7.28	7.31	7.08	5.96	2.89	0.83	54.74
1967	1.19	1.78	6.01	6.49	6.69	6.38	7.23	7.16	5.87	7.66	3.12	1.71	61.29
1966	1.12	0.55	5.42	5.44	6.5	8.34	9.91	6.74	5.11	5.89	5.42	1.84	62.28
1965	1.54	1.99	1.87	6.04	6.26	5.65	8.31	6.83	5.61	4.62	3.48	1.95	54.15
1964	0.76	1.6	3.8	7.37	7.79	8.84	10.72	8.98	5.73	5.55	3.02	1.84	66
1963	0.77	2.46	5.78	8.33	6.91	7.41	9.8	6.65	5.56	5.89	3.88	1.03	64.45
1962	0.8	2.74	4.52	5.01	7.49	6.72	7.41	7.92	4.65	5.18	3.12	1.71	57.27
1961	0.9	1.11	3.39	5.27	6.28	6.55	7.15	6.91	6.2	5.46	1.43	2.17	52.83
1960	1.01	1.66	3.12	5.82	6	6.93	5.78	6.71	4.86	3.45	3.05	2.32	50.7
1959	2.15	2.51	4.86	5.47	5.72	7.32	7.48	7.43	7.22	3.97	2.67	1.49	58.28
1958	1.18	1.43	1.11	4.25	4.51	7.97	8.52	7.5	5.99	4.4	2.83	1.91	51.6
1957	2.41	2.53	3.12	4.03	4.15	7.16	10.4	6.79	5.86	3.57	1.95	3.12	55.09
1956	2.17	1.6	6.18	7.13	8.65	8.94	8.71	8.75	8.79	6.18	3.83	3.07	73.99
1955	1.82	2.82	5.29	7.75	5.96	7.62	9.1	7.7	6.23	5.53	4.28	2.95	67.06
1954	1.8	4.27	4.98	5.89	4.47	8.66	9.42	8.59	8.65	5.24	4.14	3.33	69.43
1953	3.5	3.4	6.5	7.7	9.7	11.1	12.5	9.6	11.5	7.2	4	1.3	88
1952	3.2	3.9	4.9	5.9	6.9	11.5	11.4	12.9	11.1	9.8	5.4	3.1	90
1951	1.9	2.8	4.4	5.9	5.8	7.5	11.5	12.3	11	8.5	4.2	3.2	79
1950	3.3	2.6	5	5.7	7.8	8.5	7.1	7.6	5.7	5.7	3.8	3.2	66
1949	2.9	2.5	4.7	4.5	6.4	7.5	8.5	7.8	6.4	5.5	4	2.3	63
1948	1.7	2	3.8	6.7	7	8.1	9.2	8.5	8.1	5.5	4	4.4	69

Table A2. Quadrangle 206 Precipitation Data (inches)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	0.52	0.79	0	7.64	2.82	2.5	3.1	3.74	1.85	0.91	1	2.08	26.96
1996	0.02	0.23	0.13	0	1.34	3.34	6.54	4.74	4.37	1.47	0.47	0.48	23.14
1995	3.11	3.77	1.02	1.04	5.04	3.5	3.66	1.96	2.83	0.7	0.04	0.79	27.46
1994	0.78	0.1	1.17	1.8	1.75	1.55	4.21	2.69	1.53	1.34	0.81	0.52	18.24
1993	1.05	0.78	1.37	0.82	2.38	4.04	3.61	3.3	1.71	0.48	0.68	0.52	20.74
1992	0.61	0.41	1.16	2.07	3.58	6.22	2.59	3.93	0.39	0.13	1.46	0.89	23.44
1991	0.78	0	0.63	0.11	4.42	3.69	3.86	2.67	2.02	0.96	1.33	2.92	23.38
1990	1.24	1.44	1.74	1.61	1.56	0.5	2.67	3.01	3.35	0.55	0.74	0.29	18.7
1989	0.39	0.58	0.74	0.38	3.74	5.88	2.18	3.05	1.97	0.53	0.01	0.49	19.93
1988	0.57	0.04	1.76	2.94	4	2.95	3.06	2.79	3.21	0.45	0.29	0.13	22.19
1987	1	1.21	1.92	0.43	4.99	4.07	1.91	3.67	3.72	1.11	0.59	1.6	26.22
1986	0.01	1.14	0.39	0.69	3.27	2.96	2.04	4.88	3.27	2.82	2.1	0.65	24.22
1985	0.72	1.05	2.33	2.85	1.51	3.62	1.53	2.01	5.02	3.27	0.56	0.19	24.67
1984	0.46	0.54	1.55	1.33	0.56	4.14	1.01	3.17	0.9	2.99	0.96	1.46	19.07
1983	1.26	1.87	1.16	1.27	2.63	2.9	0.55	1.02	0.75	2.47	0.57	0.64	17.1
1982	0.14	0.9	0.74	0.63	4.28	4.72	6.43	1.41	1.71	0.5	0.75	0.99	23.19
1981	0.06	0.15	2	1.43	2.44	2.91	3.55	4.47	2.68	2.9	1.37	0.11	24.06
1980	1.1	0.78	1.86	1.51	4.06	1.97	0.55	2.27	0.99	0.36	0.92	0.61	16.97
1979	1.11	0.34	1.81	1.62	3.62	3.89	3.06	3.52	1.01	1.96	0.43	0.14	22.51
1978	0.54	1.12	0.22	0.53	6.02	4.96	1.39	1.41	2.84	0.88	0.63	0.26	20.8
1977	0.45	0.8	0.4	3.56	5.68	1.78	2.38	5.42	0.86	0.29	0.33	0.1	22.06
1976	0	0.11	0.88	1.98	1.97	1.76	1.62	2.07	3.44	0.91	0.34	0	15.09
1975	0.47	1.29	0.6	1.27	3.57	3.2	5.31	2.37	0.76	0.06	1.42	0.16	20.45
1974	0.32	0.27	1.38	0.18	2.12	2.27	0.51	6.13	1.75	3.49	0.32	0.43	19.16
1973	0.59	0.5	4.58	2.7	1.49	0.42	4.21	1.48	2.34	0.89	0.32	0.37	19.88
1972	0.14	0.08	0.06	0.14	3.34	3.87	2.72	1.93	1	1.63	1.8	0.33	17.03
1971	0.18	1.75	0.08	0.89	0.73	2.38	2.8	2.33	4.32	2.86	3.03	0.85	22.2
1970	0.01	0.01	1.38	1.42	0.38	1.52	1.74	2.39	0.94	1.11	0.49	0	11.39
1969	0.02	1.14	1.47	0.26	4.09	3.5	2.57	2.74	3.52	2.61	0.33	0.54	22.78
1968	1.53	0.78	0.57	1.08	3.51	2.19	2.68	3.6	0.63	1.54	1	0.17	19.27
1967	0.02	0.25	0.37	1.93	1.74	3.88	3.74	2.38	1.25	1.05	0.28	0.39	17.3
1966	0.47	0.77	0.02	0.89	0.46	3.76	1.92	3.82	1.94	0.45	0.11	0.19	14.78
1965	0.48	0.39	0.89	0.59	2.72	9.47	1.53	2.33	1.49	1.19	0.09	0.57	21.74
1964	0.06	2.05	0.11	0.15	1.97	2.78	1.36	1.93	2.58	0.4	1.79	0.79	15.97
1963	0.03	0.67	0.1	0.55	2.62	3.29	2.17	3.24	1.75	0.85	0.28	0.42	15.97
1962	0.62	0.28	0.44	1.3	1.11	5.87	5.65	2.83	2.19	0.97	0.54	0.42	22.22
1961	0.08	0.5	3.15	0.24	1.51	4.65	4.93	2.9	1.68	1.16	1.96	0.2	22.97
1960	1.25	1.34	1.09	0.97	1.33	6.35	5.65	3.51	4.22	4.74	0.01	0.83	31.28
1959	0.41	0.17	0.4	1.24	4.87	2.28	4.14	2.89	1.23	2.32	0.19	4.37	24.5
1958	0.91	0.58	2.07	2.2	3.52	2.58	7.99	1.08	2.17	0.1	0.62	0.47	24.3
1957	0.55	0.97	3.14	3.43	5.03	1.22	0.96	3.76	0.83	2.5	1.07	0.02	23.48
1956	0.09	0.99	0.07	0.14	2.66	1.75	2.94	1	0.55	0.38	0	0.03	10.6
1955	0.24	0.09	0.11	0.85	5.43	2.59	2.02	1.3	2.23	0.15	0.08	0.06	15.13
1954	0.24	0.03	0.14	1.73	4.67	2.01	1.49	2.53	0.47	1.04	0	0.22	14.56
1953	0.52	0.35	0.47	0.79	0.81	0.31	3.77	2.48	0.21	3.87	0.44	0.57	14.6
1952	0.33	0.33	0.6	2.46	1.26	2.43	1.99	2.12	0.48	0	0.98	0.55	13.52
1951	0.59	1.11	0.56	0.74	8.53	3.97	1.65	1.73	1.39	1.44	0.42	0.41	22.54
1950	0	0.26	0.09	1.15	2.08	4.82	8.87	4.41	4.45	0.29	0.04	0.13	26.59
1949	2.25	0.77	0.82	1.62	5.44	3.82	4.7	2.6	2.03	1.95	0.02	0.48	26.5
1948	0.34	2.1	0.79	0.75	2.59	2.55	3.04	5.39	0.51	1.02	2.42	0.07	21.57

Table A3. Quadrangle 206 Evaporation/Precipitation (inches)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	5 13	3 56	730 00	0 79	2 08	2 81	3 21	1 90	3 71	5 81	3 32	0 84	2 45
1996	154 5	17 00	43 23	823 00	4 01	2 49	1 33	1 45	1 09	4 08	8 19	10 17	3 01
1995	1 00	1 00	5 63	5 61	1 22	2 21	2 32	4 19	1 97	9 66	119 25	5 62	2 57
1994	3 71	25 30	4 45	3 99	3 61	7 25	2 84	3 81	5 56	5 11	6 12	6 04	4 44
1993	2 00	3 23	3 61	8 11	3 10	2 42	3 20	3 03	5 31	13 98	5 96	5 35	3 74
1992	2 82	8 32	4 49	2 54	1 62	1 06	3 51	1 76	18 90	45 85	2 60	2 82	2 72
1991	2 68	348 0	9 40	66 82	2 02	2 70	2 89	3 68	3 53	8 31	2 41	1 25	3 45
1990	2 10	1 73	1 87	2 66	4 00	21 94	3 98	3 40	2 23	9 11	3 78	7 59	3 88
1989	8 31	3 28	7 95	15 26	1 52	1 00	3 91	2 11	3 16	12 19	554 00	5 06	3 41
1988	2 95	67 75	2 44	2 10	1 66	2 86	2 59	2 91	2 02	10 91	16 14	26 62	2 95
1987	2 23	1 91	2 08	14 77	1 00	1 62	5 41	2 08	1 41	4 68	5 86	1 45	2 31
1986	311 0	3 70	16 13	10 06	2 09	2 32	5 53	1 59	1 81	1 30	1 26	2 89	2 78
1985	2 08	3 18	2 18	2 40	4 22	2 30	6 75	4 25	1 42	1 26	4 48	0 05	2 60
1984	4 43	9 11	2 07	5 28	13 48	2 13	9 08	2 34	8 39	1 67	4 03	1 33	3 59
1983	1 62	0 93	3 09	4 07	2 30	2 50	21 13	9 61	11 44	2 13	6 42	2 59	3 88
1982	17 07	3 23	7 78	10 54	1 36	1 43	1 35	5 46	4 49	11 76	5 36	2 08	2 86
1981	37 67	22 53	2 23	4 83	2 66	3 50	2 65	1 64	2 06	1 37	2 79	23 18	2 75
1980	2 03	3 99	3 04	4 17	1 29	4 92	23 67	4 50	7 59	17 72	3 51	4 34	4 43
1979	1 50	5 12	2 32	3 25	1 50	1 91	2 98	2 14	6 94	3 92	6 44	20 00	2 78
1978	2 50	1 60	22 45	15 15	1 03	1 67	7 83	6 53	2 38	6 09	2 92	11 15	3 25
1977	3 78	4 64	14 90	1 52	1 00	5 11	4 51	1 48	8 58	18 93	12 94	31 00	3 20
1976	310 0	43 64	6 67	3 01	3 07	5 30	5 22	4 61	1 64	5 18	8 38	303 0	4 60
1975	1 74	1 12	5 30	4 43	1 50	2 45	1 40	3 54	4 43	124 0	1 88	13 88	2 73
1974	8 38	17 19	3 24	47 72	3 37	4 18	21 14	1 17	2 41	1 17	9 38	3 86	3 55
1973	2 98	3 78	0 64	1 40	3 56	18 86	2 04	5 94	2 39	6 07	10 63	8 70	2 95
1972	16 50	40 00	98 67	47 43	1 57	1 90	2 92	3 95	5 35	2 52	0 97	8 94	3 55
1971	17 00	1 71	51 63	6 75	9 32	3 04	2 95	2 98	1 36	1 79	1 00	2 15	2 76
1970	110 0	165 0	1 60	3 24	20 08	5 43	4 97	3 53	7 02	3 34	4 35	146 0	4 95
1969	42 50	1 30	1 45	22 00	1 32	2 14	2 97	2 82	1 33	1 49	6 79	1 31	2 19
1968	0 48	0 85	6 02	5 08	1 45	3 64	2 72	2 03	11 24	3 87	2 89	4 88	2 84
1967	59 50	7 12	16 24	3 36	3 84	1 64	1 93	3 01	4 70	7 30	11 14	4 38	3 54
1966	2 38	0 71	271 00	6 11	14 13	2 22	5 16	1 76	2 63	13 09	49 27	9 68	4 21
1965	3 21	5 10	2 10	10 24	2 30	0 60	5 43	2 93	3 77	3 88	38 67	3 42	2 49
1964	12 67	0 78	34 55	49 13	3 95	3 18	7 88	4 65	2 22	13 88	1 69	2 33	4 13
1963	25 67	3 67	57 80	15 15	2 64	2 25	4 52	2 05	3 18	6 93	13 86	2 45	4 04
1962	1 29	9 79	10 27	3 85	6 75	1 14	1 31	2 80	2 12	5 34	5 78	4 07	2 58
1961	11 25	2 22	1 08	21 96	4 16	1 41	1 45	2 38	3 69	4 71	0 73	10 85	2 30
1960	0 81	1 24	2 86	6 00	4 51	1 09	1 02	1 91	1 15	0 73	305 00	2 80	1 62
1959	5 24	14 76	12 15	4 41	1 17	3 21	1 81	2 57	5 87	1 71	14 05	0 34	2 38
1958	1 30	2 47	0 54	1 93	1 28	3 09	1 07	6 94	2 76	44 00	4 56	4 06	2 12
1957	4 38	2 61	0 99	1 17	0 83	5 87	10 83	1 81	7 06	1 43	1 82	156 0	2 35
1956	24 11	1 62	88 29	50 93	3 25	5 11	2 96	8 75	15 98	16 26	383 00	102 3	6 98
1955	7 58	31 33	48 09	9 12	1 10	2 94	4 50	5 92	2 79	36 87	53 50	49 17	4 43
1954	7 50	142 3	35 57	3 40	0 96	4 31	6 32	3 40	18 40	5 04	414 00	15 14	4 77
1953	6 73	9 71	13 83	9 75	11 98	35 81	3 32	3 87	54 76	1 86	9 09	2 28	6 03
1952	9 70	11 82	8 17	2 40	5 48	4 73	5 73	6 08	23 13	980 0	5 51	5 64	6 66
1951	3 22	2 52	7 86	7 97	0 68	1 89	6 97	7 11	7 91	5 90	10 00	7 80	3 50
1950	330 0	10 00	55 56	4 96	3 75	1 76	0 80	1 72	1 28	19 66	95 00	24 62	2 48
1949	1 29	3 25	5 73	2 78	1 18	1 96	1 81	3 00	3 15	2 82	200 00	4 79	2 38
1948	5 00	0 95	4 81	8 93	2 70	3 18	3 03	1 58	15 88	5 39	1 65	62 86	3 20

Table A4. Quadrangle 206 Average Precipitation Per Month (inches)

Year	Amt.
1997	2.25
1996	1.93
1995	2.29
1994	1.52
1993	1.73
1992	1.95
1991	1.95
1990	1.56
1989	1.66
1988	1.85
1987	2.19
1986	2.02
1985	2.06
1984	1.59
1983	1.43
1982	1.93
1981	2.01
1980	1.41
1979	1.88
1978	1.73
1977	1.84
1976	1.26
1975	1.70
1974	1.60
1973	1.66
1972	1.42
1971	1.85
1970	0.95
1969	1.90
1968	1.61
1967	1.44
1966	1.23
1965	1.81
1964	1.33
1963	1.33
1962	1.85
1961	1.91
1960	2.61
1959	2.04
1958	2.03
1957	1.96
1956	0.88
1955	1.26
1954	1.21
1953	1.22
1952	1.13
1951	1.88
1950	2.22
1949	2.21
1948	1.80

Table A5. Quadrangle 206 Monthly Precipitation Departures

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	-0.06	0.06	-0.95	6.22	-0.23	-0.76	0.13	0.93	-0.13	-0.67	0.24	1.41	24.71
1996	-0.56	-0.50	-0.83	-1.41	-1.71	0.08	3.57	1.93	1.39	-0.11	-0.29	-0.19	21.21
1995	2.53	3.04	0.06	-0.38	1.99	0.24	0.69	-0.85	0.85	-0.88	-0.72	0.12	25.17
1994	0.20	-0.63	0.21	0.38	-1.30	-1.71	1.24	-0.12	-1.45	-0.24	0.05	-0.15	16.72
1993	0.47	0.05	0.41	-0.60	-0.67	0.78	0.64	0.49	-0.27	-1.10	-0.08	-0.15	19.01
1992	0.03	-0.32	0.20	0.65	0.53	2.96	-0.38	1.12	-2.59	-1.45	0.70	0.22	21.49
1991	0.20	-0.72	-0.33	-1.31	1.37	0.43	0.89	-0.14	0.04	-0.62	0.57	2.25	21.43
1990	0.66	0.71	0.78	0.19	-1.49	-2.76	-0.30	0.20	0.37	-1.03	-0.02	-0.38	17.14
1989	-0.19	-0.15	-0.22	-1.04	0.69	2.62	-0.79	0.24	-0.01	-1.05	-0.75	-0.18	18.27
1988	-0.01	-0.69	0.80	1.52	0.95	-0.31	0.09	-0.02	0.23	-1.13	-0.47	-0.54	20.34
1987	0.42	0.48	0.96	-0.99	1.94	0.81	-1.06	0.86	1.74	-0.47	-0.17	0.93	24.04
1986	-0.57	0.41	-0.57	-0.73	0.22	-0.30	-0.93	2.07	0.29	1.24	1.34	-0.02	22.20
1985	0.14	0.32	1.37	1.43	-1.54	0.36	-1.44	-0.80	3.04	1.69	-0.20	-0.48	22.61
1984	-0.12	-0.19	0.59	-0.09	-2.49	0.88	-1.96	0.36	-2.08	1.41	0.20	0.79	17.48
1983	0.68	1.14	0.20	-0.15	-0.42	-0.36	-2.42	-1.79	-1.23	0.89	-0.19	-0.03	15.68
1982	-0.44	0.17	-0.22	-0.79	1.23	1.46	3.46	-1.40	-1.27	-1.08	-0.01	0.32	21.26
1981	-0.52	-0.58	1.04	0.01	-0.61	-0.35	0.58	1.66	0.70	1.32	0.61	-0.56	22.06
1980	0.52	0.05	0.90	0.09	1.01	-1.29	-2.42	-0.54	-1.99	-1.22	0.16	-0.06	15.56
1979	0.53	-0.39	0.85	0.20	0.57	0.63	0.09	0.71	-0.97	0.38	-0.33	-0.53	20.63
1978	-0.04	0.39	-0.74	-0.89	2.97	1.70	-1.58	-1.40	-0.14	-0.70	-0.13	-0.41	19.07
1977	-0.13	0.07	-0.56	2.14	2.63	-1.48	-0.59	2.61	-1.12	-1.29	-0.43	-0.57	20.22
1976	-0.57	-0.62	-0.08	0.56	-1.08	-1.50	-1.35	-0.74	0.46	-0.67	-0.42	-0.66	13.83
1975	-0.11	0.56	-0.36	-0.15	0.52	-0.06	2.34	-0.44	-1.22	-1.52	0.66	-0.51	18.75
1974	-0.26	-0.46	0.42	-1.24	-0.93	-0.99	-2.46	3.32	-1.23	1.91	-0.44	-0.24	17.56
1973	0.01	-0.23	3.62	1.28	-1.56	-2.84	1.24	-1.33	0.36	-0.69	-0.44	-0.30	18.22
1972	-0.44	-0.65	-0.90	-1.28	0.29	0.61	-0.25	-0.88	-1.98	0.05	1.04	-0.34	15.61
1971	-0.40	1.02	-0.88	-0.53	-2.32	-0.88	-0.17	-0.48	2.34	1.28	2.27	0.18	20.35
1970	-0.57	-0.72	0.42	0.00	-2.67	-1.74	-1.23	-0.42	-2.04	-0.47	-0.27	-0.66	10.44
1969	-0.56	0.41	0.51	-1.16	1.04	0.24	-0.40	-0.07	1.54	1.03	-0.43	-0.13	20.88
1968	0.95	0.05	-0.39	-0.34	0.46	-1.07	-0.29	0.79	-2.35	-0.04	0.24	-0.50	17.66
1967	-0.56	-0.48	-0.59	0.51	-1.31	0.62	0.77	-0.43	-0.73	-0.53	-0.48	-0.28	15.86
1966	-0.11	0.04	-0.94	-0.53	-2.59	0.50	-1.05	1.01	-1.04	-1.13	-0.65	-0.48	13.55
1965	-0.10	-0.34	-0.07	-0.83	-0.33	6.21	-1.44	-0.48	-0.49	-0.39	-0.67	-0.10	19.93
1964	-0.52	1.32	-0.85	-1.27	-1.08	-0.48	-1.61	-0.88	-0.40	-1.18	1.03	0.12	14.64
1963	-0.55	-0.06	-0.86	-0.87	-0.43	0.03	-0.80	0.43	-0.23	-0.73	-0.48	-0.25	14.64
1962	0.04	-0.45	-0.52	-0.12	-1.94	2.61	2.68	0.02	-0.79	-0.61	-0.22	-0.25	20.37
1961	-0.50	-0.23	2.19	-1.18	-1.54	1.39	1.96	0.09	-0.30	-0.42	1.20	-0.47	21.06
1960	0.67	0.61	0.13	-0.45	-1.72	3.09	2.68	0.70	1.24	3.16	-0.75	0.16	28.67
1959	-0.17	-0.56	-0.56	-0.18	1.82	-0.98	1.17	0.08	-0.75	0.74	-0.57	3.70	22.46
1958	0.33	-0.15	1.11	0.78	0.47	-0.68	5.02	-1.73	-0.81	-1.48	-0.14	-0.20	22.28
1957	-0.03	0.24	2.18	2.01	1.98	-2.04	-2.01	0.95	-1.15	0.92	0.31	-0.65	21.52
1956	-0.49	0.26	-0.89	-1.28	-0.39	-1.51	-0.03	-1.81	-2.43	-1.20	-0.75	-0.64	9.72
1955	-0.34	-0.64	-0.85	-0.57	2.38	-0.67	-0.95	-1.51	0.25	-1.43	-0.68	-0.61	13.87
1954	-0.34	-0.70	-0.82	0.31	1.62	-1.25	-1.48	-0.28	-2.51	-0.54	-0.75	-0.45	13.35
1953	-0.06	-0.38	-0.49	-0.63	-2.24	-2.95	0.80	-0.33	-1.77	2.29	-0.32	-0.10	13.38
1952	-0.25	-0.40	-0.36	1.04	-1.79	-0.83	-0.98	-0.69	-2.50	-1.57	0.22	-0.12	12.39
1951	0.01	0.38	-0.40	-0.68	5.48	0.71	-1.32	-1.08	-0.59	-0.14	-0.34	-0.26	20.66
1950	-0.57	-0.47	-0.87	-0.27	-0.97	1.56	5.90	1.60	1.47	-1.29	-0.72	-0.54	24.37
1949	1.67	0.04	-0.14	0.20	2.39	0.56	1.73	-0.21	0.05	0.37	-0.74	-0.19	24.29
1948	-0.24	1.37	-0.17	-0.67	-0.46	-0.71	0.07	2.58	-2.47	-0.56	1.66	-0.60	19.77

Table A6. Quadrangle 206 Absolute Values for Monthly Departures

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	0 06	0 06	0 95	6 22	0 23	0 76	0 13	0 93	0 13	0 67	0 24	1 41	24 71
1996	0 56	0 50	0 83	1 41	1 71	0 08	3 57	1 93	1 39	0 11	0 29	0 19	21 21
1995	2 53	3 04	0 06	0 38	1 99	0 24	0 69	0 85	0 85	0 88	0 72	0 12	25 17
1994	0 20	0 63	0 21	0 38	1 30	1 71	1 24	0 12	1 45	0 24	0 05	0 15	16 72
1993	0 47	0 05	0 41	0 60	0 67	0 78	0 64	0 49	0 27	1 10	0 08	0 15	19 01
1992	0 03	0 32	0 20	0 65	0 53	2 96	0 38	1 12	2 59	1 45	0 70	0 22	21 49
1991	0 20	0 72	0 33	1 31	1 37	0 43	0 89	0 14	0 04	0 62	0 57	2 25	21 43
1990	0 66	0 71	0 78	0 19	1 49	2 76	0 30	0 20	0 37	1 03	0 02	0 38	17 14
1989	0 19	0 15	0 22	1 04	0 69	2 62	0 79	0 24	0 01	1 05	0 75	0 18	18 27
1988	0 01	0 69	0 80	1 52	0 95	0 31	0 09	0 02	0 23	1 13	0 47	0 54	20 34
1987	0 42	0 48	0 96	0 99	1 94	0 81	1 06	0 86	1 74	0 47	0 17	0 93	24 04
1986	0 57	0 41	0 57	0 73	0 22	0 30	0 93	2 07	0 29	1 24	1 34	0 02	22 20
1985	0 14	0 32	1 37	1 43	1 54	0 36	1 44	0 80	3 04	1 69	0 20	0 48	22 61
1984	0 12	0 19	0 59	0 09	2 49	0 88	1 96	0 36	2 08	1 41	0 20	0 79	17 48
1983	0 68	1 14	0 20	0 15	0 42	0 36	2 42	1 79	1 23	0 89	0 19	0 03	15 68
1982	0 44	0 17	0 22	0 79	1 23	1 46	3 46	1 40	1 27	1 08	0 01	0 32	21 26
1981	0 52	0 58	1 04	0 01	0 61	0 35	0 58	1 66	0 70	1 32	0 61	0 56	22 06
1980	0 52	0 05	0 90	0 09	1 01	1 29	2 42	0 54	1 99	1 22	0 16	0 06	15 56
1979	0 53	0 39	0 85	0 20	0 57	0 63	0 09	0 71	0 97	0 38	0 33	0 53	20 63
1978	0 04	0 39	0 74	0 89	2 97	1 70	1 58	1 40	0 14	0 70	0 13	0 41	19 07
1977	0 13	0 07	0 56	2 14	2 63	1 48	0 59	2 61	1 12	1 29	0 43	0 57	20 22
1976	0 57	0 62	0 08	0 56	1 08	1 50	1 35	0 74	0 46	0 67	0 42	0 66	13 83
1975	0 11	0 56	0 36	0 15	0 52	0 06	2 34	0 44	1 22	1 52	0 66	0 51	18 75
1974	0 26	0 46	0 42	1 24	0 93	0 99	2 46	3 32	1 23	1 91	0 44	0 24	17 56
1973	0 01	0 23	3 62	1 28	1 56	2 84	1 24	1 33	0 36	0 69	0 44	0 30	18 22
1972	0 44	0 65	0 90	1 28	0 29	0 61	0 25	0 88	1 98	0 05	1 04	0 34	15 61
1971	0 40	1 02	0 88	0 53	2 32	0 88	0 17	0 48	2 34	1 28	2 27	0 18	20 35
1970	0 57	0 72	0 42	0 00	2 67	1 74	1 23	0 42	2 04	0 47	0 27	0 66	10 44
1969	0 56	0 41	0 51	1 16	1 04	0 24	0 40	0 07	1 54	1 03	0 43	0 13	20 88
1968	0 95	0 05	0 39	0 34	0 46	1 07	0 29	0 79	2 35	0 04	0 24	0 50	17 66
1967	0 56	0 48	0 59	0 51	1 31	0 62	0 77	0 43	0 73	0 53	0 48	0 28	15 86
1966	0 11	0 04	0 94	0 53	2 59	0 50	1 05	1 01	1 04	1 13	0 65	0 48	13 55
1965	0 10	0 34	0 07	0 83	0 33	6 21	1 44	0 48	0 49	0 39	0 67	0 10	19 93
1964	0 52	1 32	0 85	1 27	1 08	0 48	1 61	0 88	0 40	1 18	1 03	0 12	14 64
1963	0 55	0 06	0 86	0 87	0 43	0 03	0 80	0 43	0 23	0 73	0 48	0 25	14 64
1962	0 04	0 45	0 52	0 12	1 94	2 61	2 68	0 02	0 79	0 61	0 22	0 25	20 37
1961	0 50	0 23	2 19	1 18	1 54	1 39	1 96	0 09	0 30	0 42	1 20	0 47	21 06
1960	0 67	0 61	0 13	0 45	1 72	3 09	2 68	0 70	1 24	3 16	0 75	0 16	28 67
1959	0 17	0 56	0 56	0 18	1 82	0 98	1 17	0 08	0 75	0 74	0 57	3 70	22 46
1958	0 33	0 15	1 11	0 78	0 47	0 68	5 02	1 73	0 81	1 48	0 14	0 20	22 28
1957	0 03	0 24	2 18	2 01	1 98	2 04	2 01	0 95	1 15	0 92	0 31	0 65	21 52
1956	0 49	0 26	0 89	1 28	0 39	1 51	0 03	1 81	2 43	1 20	0 75	0 64	9 72
1955	0 34	0 64	0 85	0 57	2 38	0 67	0 95	1 51	0 25	1 43	0 68	0 61	13 87
1954	0 34	0 70	0 82	0 31	1 62	1 25	1 48	0 28	2 51	0 54	0 75	0 45	13 35
1953	0 06	0 38	0 49	0 63	2 24	2 95	0 80	0 33	1 77	2 29	0 32	0 10	13 38
1952	0 25	0 40	0 36	1 04	1 79	0 83	0 98	0 69	2 50	1 57	0 22	0 12	12 39
1951	0 01	0 38	0 40	0 68	5 48	0 71	1 32	1 08	0 59	0 14	0 34	0 26	20 66
1950	0 57	0 47	0 87	0 27	0 97	1 56	5 90	1 60	1 47	1 29	0 72	0 54	24 37
1949	1 67	0 04	0 14	0 20	2 39	0 56	1 73	0 21	0 05	0 37	0 74	0 19	24 29
1948	0 24	1 37	0 17	0 67	0 46	0 71	0 07	2 58	2 47	0 56	1 66	0 60	19 77

Table A7. Quadrangle 206 Average D Values

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
0.40	0.48	0.68	0.81	1.42	1.25	1.40	0.86	1.16	1.16	0.57	0.51	19.03

Table A8. Quadrangle 206 Formula 1

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
1997	19 60	13 35	1070 8	4.45	3 44	4 49	4 30	5 44	5 63	7 41	10 76	7 19	0 28
1996	161 4	41 59	67 26	1022.6	4 81	4 23	2 96	4 91	3 36	5 92	19 33	25 64	0 31
1995	9 39	7 98	12 31	10.41	2 84	4 01	3 66	8 08	4 12	10 72	214 7	16 65	0 28
1994	10 62	59 03	10 60	8.41	4 52	8 04	4 04	7 65	7 22	6 81	15 70	17 48	0 38
1993	11 85	12 67	9 36	13.51	4 16	4 18	4 30	6 74	7 01	14 43	15 40	16 11	0 34
1992	9 73	23 35	10 65	6.61	3 12	3 09	4 52	5 28	18 75	41 85	9 50	11 11	0 29
1991	13 53	736 9	17 82	86.21	3 40	4 40	4 08	7 50	5 47	9 56	9 17	8 00	0 33
1990	9 02	9 51	6 83	6.76	4 80	19 79	4 85	7 17	4 35	10 25	11 58	20 54	0 35
1989	27 43	12 76	15 70	22.37	3 05	3 04	4 80	5 68	5 15	12 89	979 4	15 54	0 33
1988	9 86	148 2	7 65	6.06	3 14	4 53	3 86	6 60	4 16	11 80	33 31	58 16	0 30
1987	12 42	9 89	7 14	21.75	2 68	3 54	5 88	5 65	3 64	6 44	15 24	8 40	0 27
1986	317 9	13 66	27 66	15.92	3 45	4 10	5 97	5 08	3 99	3 53	7 14	11 26	0 29
1985	12 06	12 56	7 28	6.44	4 95	4 08	6 84	8 16	3 65	3 50	12 81	5 64	0 28
1984	11 35	25 02	7 12	10.00	11 49	3 94	8 50	5 95	9 67	3 84	12 02	8 16	0 34
1983	10 91	7 82	8 61	8.51	3 60	4 24	17 13	14 35	12 30	4 24	16 22	10 66	0 35
1982	23 99	12 67	15 47	16.52	2 94	3 39	2 97	9 56	6 30	12 53	14 35	9 65	0 30
1981	99 94	53 21	7 34	9.45	3 85	5 04	3 90	5 13	4 20	3 59	9 83	51 37	0 29
1980	8 94	14 26	8 54	8.63	2 89	6 18	18 95	8 44	8 97	17 66	11 10	14 13	0 38
1979	10 63	16 63	7 48	7.50	3 03	3 77	4 14	5 72	8 42	5 78	16 26	45 08	0 29
1978	9 42	9 24	36 90	22.23	2 71	3 57	7 61	10 79	4 47	7 65	10 06	27 59	0 32
1977	16 25	15 62	25 86	5.35	2 68	6 33	5 23	4 95	9 83	18 69	27 68	66 83	0 32
1976	316 9	97 54	13 84	7.19	4 14	6 48	5 74	8 58	3 84	6 86	19 67	604 6	0 39
1975	11 22	8 24	11 84	8.96	3 03	4 20	3 01	7 33	6 25	109 1	8 23	32 97	0 29
1974	15 29	41 98	8 82	62.57	4 36	5 58	17 13	4 60	4 50	3 41	21 41	13 17	0 33
1973	14 28	13 82	5 03	5.20	4 49	17 33	3 46	10 11	4 48	7 63	23 61	22 74	0 30
1972	23 42	89 91	148 26	62.20	3 09	3 76	4 10	7 81	7 04	4 57	6 63	23.21	0 33
1971	48 90	9 48	79 53	11.83	8 55	4 67	4 12	6 68	3 60	3 95	6 68	9 79	0 29
1970	116 9	352 5	6 43	7.48	16 15	6 59	5 56	7 32	8 49	5 28	12 57	294 2	0 41
1969	111 9	8 61	6 21	30.71	2 91	3 95	4 13	6 50	3 57	3 69	16 86	8 14	0 26
1968	7 40	7 66	12 88	9.76	3 00	5 16	3 95	5 59	12 13	5 74	10 01	15 19	0 30
1967	153 9	20 84	27 83	7.63	4 69	3 56	3 39	6 72	6 48	8 68	24 52	14 21	0 33
1966	9 30	7 38	400 08	11.04	11 95	4 01	5 70	5 28	4 70	13 67	91 59	24 68	0 37
1965	14 84	16 60	7 16	16.14	3 60	2 72	5 89	6 63	5 67	5 75	72 94	12 30	0 28
1964	19 58	7 52	54 57	64.31	4 77	4 78	7 65	8 62	4 34	14 35	7 89	10 14	0 36
1963	70 31	13 59	88 55	22.22	3 84	4 04	5 24	5 61	5 16	8 37	29 30	10 39	0 36
1962	8 21	26 44	19 10	8.24	6 74	3 16	2 94	6 48	4 25	7 00	15 09	13 59	0 28
1961	34 70	10 54	5 66	30.66	4 91	3 37	3 04	5 99	5 61	6 46	6 21	26 99	0 27
1960	7 72	8 48	8.27	10.90	5 16	3 11	2 74	5 45	3 41	3 03	541 4	11 06	0 23
1959	19 87	36 90	21 85	8.93	2 81	4 81	3 30	6 21	7 49	3 88	29 64	6 21	0 27
1958	8 21	11 06	4 87	5.86	2 88	4 71	2 77	11 27	4 80	40 26	12 95	13.57	0 26
1957	17 74	11 36	5 54	4.92	2 56	6 94	9 76	5 33	8 52	3 64	8 13	313 9	0 27
1956	31 03	9 28	133 10	66.54	4 27	6 33	4 12	13 36	16 23	16 40	678 6	207 9	0 51
1955	25 64	71 70	74 36	14.76	2 75	4 59	5 23	10 09	4 83	34 12	99 03	102 8	0 38
1954	14 42	304 9	56 07	7.68	2 65	5 69	6 53	7 17	18 32	6 74	733 1	35 46	0 40
1953	23 54	26 29	24 30	15.54	10 43	30 89	4 38	7 72	49 74	4 01	20 91	10 05	0 46
1952	16 61	30 71	16 02	6.44	5 84	6 03	6 10	10 28	22 40	845 5	14 62	16 68	0 50
1951	14 87	11 18	15 57	13.34	2 46	3 75	6 99	11 46	9 26	7 49	22 51	20 97	0 33
1950	336 9	26 89	85 27	9.61	4 62	3 65	2 58	5 23	3 53	19 32	172 0	54 21	0 28
1949	10 10	12 70	12 47	6.91	2 81	3 81	3 30	6 71	5 14	4 84	356 7	15 01	0 27
1948	11 92	7 88	11 12	14.53	3 88	4 78	4 17	5 06	16 14	7 05	7 83	129 8	0 32

Table A9. Quadrangle 206 Formula 2

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	2 44	2 19	5 04	1 47	1 31	1 48	1 45	1 60	1 63	1 80	2 05	1 79	-0 34
1996	3 81	2 93	3 24	5 01	1 52	1 44	1 21	1 54	1 29	1 66	2 43	2 61	-0 27
1995	1 96	1 85	2 14	2 03	1 18	1 40	1 35	1 86	1 42	2 05	4 00	2 33	-0 32
1994	2 04	3 16	2 04	1 89	1 48	1 86	1 41	1 83	1 79	1 75	2 29	2 36	-0 13
1993	2 11	2 15	1 96	2 20	1 43	1 43	1 45	1 74	1 77	2 24	2 28	2 31	-0 20
1992	1 98	2 55	2 04	1 73	1 24	1 23	1 48	1 58	2 41	2 93	1 97	2 07	-0 31
1991	2 20	4 80	2 38	3 40	1 30	1 47	1 42	1 81	1 61	1 97	1 94	1 85	-0 23
1990	1 93	1 97	1 75	1 74	1 52	2 44	1 53	1 78	1 46	2 02	2 10	2 47	-0 18
1989	2 66	2 16	2 29	2 52	1 23	1 22	1 52	1 63	1 57	2 17	4 99	2 29	-0 23
1988	1 99	3 76	1 83	1 67	1 25	1 48	1 38	1 73	1 43	2 11	2 78	3 15	-0 28
1987	2 14	1 99	1 78	2 51	1 14	1 32	1 65	1 63	1 34	1 71	2 27	1 89	-0 36
1986	4 25	2 20	2 66	2 30	1 31	1 42	1 66	1 56	1 40	1 32	1 78	2 08	-0 30
1985	2 12	2 15	1 79	1 71	1 54	1 42	1 75	1 87	1 34	1 32	2 16	1 63	-0 32
1984	2 08	2 60	1 78	2 00	2 09	1 39	1 89	1 66	1 98	1 38	2 12	1 87	-0 21
1983	2 06	1 84	1 90	1 89	1 33	1 44	2 35	2 24	2 14	1 44	2 32	2 04	-0 18
1982	2 57	2 15	2 28	2 33	1 20	1 29	1 21	1 97	1 70	2 15	2 24	1 98	-0 29
1981	3 50	3 09	1 80	1 96	1 38	1 55	1 39	1 57	1 43	1 33	1 99	3 07	-0 30
1980	1 93	2 23	1 90	1 90	1 19	1 69	2 42	1 89	1 93	2 37	2 07	2 23	-0 13
1979	2 04	2 33	1 81	1 81	1 22	1 36	1 43	1 64	1 89	1 64	2 32	2 98	-0 30
1978	1 96	1 95	2 85	2 52	1 15	1 33	1 82	2 05	1 48	1 83	2 00	2 66	-0 25
1977	2 32	2 29	2 62	1 59	1 14	1 70	1 58	1 54	1 99	2 41	2 66	3 24	-0 25
1976	4 25	3 48	2 21	1 78	1 43	1 72	1 64	1 90	1 38	1 75	2 44	4 67	-0 12
1975	2 08	1 87	2 11	1 93	1 22	1 43	1 22	1 80	1 69	3 56	1 87	2 78	-0 31
1974	2 28	2 93	1 92	3 19	1 46	1 62	2 35	1 49	1 48	1 30	2 50	2 18	-0 22
1973	2 23	2 21	1 55	1 57	1 48	2 36	1 31	2 01	1 48	1 82	2 56	2 54	-0 28
1972	2 55	3 43	3 76	3 19	1 23	1 36	1 42	1 84	1 77	1 49	1 73	2 55	-0 22
1971	3 03	1 97	3 35	2 11	1 90	1 50	1 42	1 74	1 33	1 39	1 74	1 99	-0 30
1970	3 60	4 32	1 71	1 81	2 31	1 73	1 62	1 80	1 89	1 58	2 15	4 20	-0 08
1969	3 57	1 90	1 69	2 73	1 20	1 40	1 42	1 72	1 33	1 35	2 34	1 87	-0 37
1968	1 80	1 83	2 17	1 98	1 22	1 57	1 39	1 62	2 13	1 64	2 00	2 27	-0 29
1967	3 78	2 48	2 67	1 82	1 51	1 33	1 29	1 74	1 72	1 91	2 58	2 23	-0 22
1966	1 95	1 80	4 40	2 06	2 12	1 41	1 63	1 58	1 51	2 20	3 44	2 59	-0 15
1965	2 26	2 33	1 78	2 31	1 33	1 15	1 66	1 73	1 63	1 64	3 29	2 13	-0 33
1964	2 44	1 81	3 11	3 21	1 52	1 52	1 83	1 90	1 46	2 24	1 85	2 01	-0 16
1963	3 27	2 20	3 42	2 52	1 38	1 41	1 58	1 62	1 57	1 88	2 70	2 02	-0 17
1962	1 87	2 63	2 42	1 87	1 74	1 25	1 20	1 72	1 44	1 77	2 27	2 20	-0 32
1961	2 81	2 03	1 63	2 73	1 54	1 29	1 22	1 67	1 62	1 72	1 69	2 65	-0 36
1960	1 83	1 89	1 88	2 06	1 57	1 24	1 16	1 60	1 30	1 22	4 60	2 07	-0 45
1959	2 45	2 85	2 51	1 93	1 17	1 52	1 28	1 69	1 81	1 38	2 71	1 69	-0 35
1958	1 87	2 07	1 53	1 65	1 19	1 51	1 16	2 08	1 52	2 91	2 17	2 20	-0 38
1957	2 37	2 08	1 62	1 54	1 11	1 76	1 98	1 59	1 90	1 34	1 87	4 25	-0 35
1956	2 74	1 95	3 69	3 23	1 45	1 70	1 42	2 19	2 32	2 32	4 75	3 98	0 07
1955	2 61	3 28	3 31	2 25	1 16	1 49	1 58	2 01	1 53	2 80	3 49	3 52	-0 13
1954	2 24	4 23	3 12	1 83	1 14	1 63	1 72	1 78	2 39	1 74	4 80	2 82	-0 10
1953	2 56	2 63	2 58	2 29	2 03	2 73	1 46	1 83	3 05	1 40	2 48	2 00	-0 00
1952	2 33	2 73	2 31	1 71	1 65	1 67	1 68	2 02	2 53	4 89	2 25	2 33	0 04
1951	2 26	2 07	2 29	2 19	1 09	1 36	1 77	2 09	1 95	1 81	2 53	2 48	-0 22
1950	4 29	2 64	3 40	1 97	1 50	1 34	1 12	1 58	1 32	2 43	3 85	3 10	-0 34
1949	2 01	2 16	2 14	1 76	1 17	1 37	1 28	1 74	1 57	1 53	4 33	2 26	-0 35
1948	2 11	1 84	2 07	2 24	1 38	1 52	1 43	1 56	2 31	1 77	1 84	3 67	-0 25

Table A10. Quadrangle 206 (Table A7)*(Table A6)

Year	Value
1997	19 83
1996	22 30
1995	19 16
1994	19 82
1993	19 45
1992	19 92
1991	20 96
1990	19 69
1989	20 84
1988	19 51
1987	17 84
1986	18 97
1985	17 64
1984	19 74
1983	19 94
1982	18 95
1981	18 78
1980	20 77
1979	18 40
1978	19 63
1977	20 64
1976	21 81
1975	20 08
1974	20 62
1973	19 46
1972	20 89
1971	19 37
1970	22 78
1969	18 01
1968	18 37
1967	19 92
1966	22 31
1965	19 00
1964	21 16
1963	20 63
1962	18 50
1961	18 54
1960	17 95
1959	18 53
1958	18 60
1957	19 18
1956	25 32
1955	22 94
1954	23 08
1953	23 39
1952	24 78
1951	19 80
1950	21 75
1949	18 58
1948	19 80

Table A11. Quadrangle 206 (Table A7)*(Table A10)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	0.99	1.04	3.45	1.19	1.85	1.85	2.03	1.39	1.88	2.10	1.16	0.90	-6.46
1996	1.54	1.39	2.22	4.05	2.16	1.80	1.69	1.33	1.49	1.93	1.38	1.32	-5.20
1995	0.79	0.88	1.46	1.64	1.67	1.76	1.88	1.61	1.65	2.38	2.27	1.18	-6.17
1994	0.83	1.50	1.39	1.52	2.10	2.32	1.97	1.58	2.07	2.03	1.30	1.20	-2.46
1993	0.85	1.03	1.34	1.77	2.02	1.79	2.03	1.51	2.05	2.60	1.30	1.17	-3.73
1992	0.80	1.22	1.40	1.40	1.76	1.54	2.07	1.37	2.79	3.41	1.12	1.05	-5.84
1991	0.89	2.29	1.63	2.75	1.84	1.83	1.98	1.57	1.86	2.29	1.10	0.94	-4.29
1990	0.78	0.94	1.20	1.41	2.16	3.06	2.14	1.54	1.69	2.34	1.19	1.25	-3.47
1989	1.08	1.03	1.57	2.04	1.74	1.53	2.13	1.41	1.81	2.52	2.83	1.16	-4.36
1988	0.81	1.79	1.25	1.35	1.77	1.85	1.93	1.50	1.65	2.45	1.58	1.59	-5.33
1987	0.87	0.95	1.22	2.02	1.62	1.65	2.31	1.41	1.55	1.99	1.29	0.95	-6.78
1986	1.72	1.05	1.82	1.86	1.85	1.77	2.32	1.35	1.62	1.54	1.01	1.05	-5.69
1985	0.86	1.02	1.23	1.38	2.19	1.77	2.45	1.61	1.55	1.53	1.23	0.82	-6.11
1984	0.84	1.24	1.22	1.62	2.96	1.74	2.65	1.44	2.29	1.60	1.21	0.94	-4.01
1983	0.83	0.88	1.30	1.53	1.89	1.80	3.28	1.93	2.47	1.67	1.32	1.03	-3.46
1982	1.04	1.03	1.56	1.88	1.70	1.62	1.69	1.70	1.97	2.50	1.27	1.00	-5.52
1981	1.42	1.47	1.23	1.59	1.95	1.94	1.94	1.35	1.66	1.55	1.13	1.55	-5.75
1980	0.78	1.06	1.30	1.54	1.69	2.11	3.38	1.63	2.23	2.76	1.18	1.12	-2.48
1979	0.83	1.11	1.24	1.46	1.73	1.71	1.99	1.41	2.18	1.91	1.32	1.51	-5.69
1978	0.79	0.93	1.95	2.04	1.63	1.66	2.55	1.77	1.71	2.12	1.14	1.35	-4.70
1977	0.94	1.09	1.79	1.29	1.62	2.13	2.20	1.33	2.30	2.80	1.51	1.64	-4.80
1976	1.72	1.66	1.51	1.44	2.02	2.15	2.29	1.64	1.59	2.04	1.39	2.36	-2.20
1975	0.84	0.89	1.44	1.56	1.73	1.79	1.70	1.55	1.96	4.13	1.07	1.40	-5.81
1974	0.92	1.40	1.31	2.58	2.07	2.03	3.28	1.29	1.71	1.51	1.42	1.10	-4.10
1973	0.90	1.05	1.06	1.27	2.09	2.95	1.83	1.74	1.71	2.12	1.46	1.28	-5.33
1972	1.03	1.63	2.57	2.58	1.75	1.70	1.98	1.59	2.05	1.73	0.98	1.29	-4.10
1971	1.23	0.94	2.29	1.70	2.69	1.88	1.99	1.50	1.54	1.62	0.99	1.00	-5.74
1970	1.46	2.06	1.17	1.46	3.28	2.16	2.26	1.55	2.19	1.84	1.22	2.12	-1.62
1969	1.45	0.91	1.16	2.21	1.69	1.74	1.99	1.49	1.54	1.57	1.33	0.94	-7.08
1968	0.73	0.87	1.48	1.60	1.72	1.96	1.95	1.40	2.46	1.90	1.14	1.15	-5.56
1967	1.53	1.18	1.82	1.47	2.13	1.66	1.81	1.51	1.99	2.22	1.47	1.13	-4.11
1966	0.79	0.86	3.01	1.67	3.00	1.76	2.28	1.37	1.74	2.56	1.96	1.31	-2.86
1965	0.91	1.11	1.22	1.87	1.89	1.44	2.31	1.50	1.89	1.91	1.87	1.08	-6.36
1964	0.99	0.86	2.13	2.59	2.15	1.90	2.55	1.65	1.69	2.60	1.05	1.02	-3.01
1963	1.32	1.05	2.34	2.04	1.95	1.76	2.21	1.40	1.82	2.19	1.54	1.02	-3.18
1962	0.76	1.25	1.66	1.51	2.47	1.56	1.68	1.48	1.67	2.06	1.29	1.11	-6.15
1961	1.14	0.97	1.12	2.20	2.18	1.61	1.71	1.44	1.88	1.99	0.96	1.34	-6.81
1960	0.74	0.90	1.28	1.66	2.22	1.55	1.61	1.39	1.50	1.42	2.62	1.04	-8.58
1959	0.99	1.36	1.72	1.56	1.66	1.90	1.78	1.46	2.10	1.61	1.54	0.85	-6.62
1958	0.76	0.98	1.05	1.33	1.68	1.89	1.62	1.80	1.76	3.38	1.23	1.11	-7.25
1957	0.96	0.99	1.11	1.24	1.58	2.20	2.77	1.37	2.19	1.56	1.06	2.15	-6.70
1956	1.11	0.93	2.52	2.61	2.05	2.13	1.99	1.89	2.68	2.70	2.70	2.01	1.26
1955	1.06	1.56	2.26	1.82	1.64	1.87	2.20	1.73	1.77	3.25	1.99	1.78	-2.48
1954	0.91	2.01	2.14	1.48	1.61	2.04	2.41	1.54	2.77	2.03	2.73	1.43	-1.92
1953	1.04	1.25	1.76	1.85	2.87	3.42	2.04	1.58	3.52	1.63	1.41	1.01	-0.01
1952	0.94	1.30	1.58	1.38	2.34	2.09	2.34	1.74	2.92	5.68	1.28	1.18	0.84
1951	0.91	0.99	1.57	1.77	1.54	1.70	2.47	1.81	2.26	2.11	1.44	1.26	-4.18
1950	1.74	1.26	2.32	1.59	2.12	1.68	1.56	1.36	1.53	2.82	2.19	1.57	-6.38
1949	0.81	1.03	1.47	1.42	1.66	1.71	1.78	1.50	1.81	1.77	2.46	1.14	-6.63
1948	0.86	0.88	1.42	1.81	1.96	1.90	2.00	1.35	2.68	2.06	1.05	1.86	-4.80

Table A12. Quadrangle 206 Formula 3

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	2 17	1 95	4 50	1 31	1 16	1 32	1 29	1 43	1 45	1 61	1 83	1 59	21 61
1996	3 02	2 32	2 57	3 97	1 21	1 14	0 96	1 22	1 02	1 31	1 93	2 07	22 74
1995	1 81	1 71	1 97	1 87	1 09	1 29	1 24	1 72	1 31	1 89	3 69	2 15	21 73
1994	1 82	2 81	1 82	1 68	1 32	1 66	1 26	1 63	1 59	1 56	2 05	2 11	21 30
1993	1 92	1 96	1 78	1 99	1 30	1 30	1 32	1 58	1 61	2 03	2 07	2 10	20 96
1992	1 76	2 26	1 81	1 54	1 10	1 10	1 32	1 41	2 14	2 60	1 75	1 84	20 61
1991	1 85	4 05	2 00	2 87	1 09	1 24	1 19	1 53	1 36	1 66	1 64	1 56	22 04
1990	1 73	1 77	1 57	1 57	1 37	2 19	1 37	1 60	1 31	1 81	1 88	2 22	20 39
1989	2 25	1 83	1 95	2 14	1 04	1 04	1 29	1 38	1 33	1 84	4 23	1 94	22 25
1988	1 80	3 40	1 65	1 52	1 13	1 34	1 25	1 57	1 29	1 91	2 52	2 85	22 23
1987	2 12	1 97	1 76	2 48	1 13	1 31	1 64	1 61	1 33	1 70	2 25	1 87	21 18
1986	3 96	2 05	2 48	2 15	1 22	1 32	1 55	1 45	1 30	1 23	1 66	1 93	22 31
1985	2 13	2 15	1 80	1 72	1 54	1 42	1 75	1 87	1 35	1 32	2 16	1 63	20 83
1984	1 86	2 33	1 59	1 79	1 87	1 25	1 70	1 49	1 77	1 23	1 90	1 67	20 45
1983	1 82	1 63	1 69	1 68	1 18	1 28	2 08	1 98	1 89	1 28	2 05	1 81	20 37
1982	2 40	2 01	2 13	2 17	1 12	1 21	1 13	1 84	1 58	2 00	2 08	1 84	21 51
1981	3 29	2 91	1 69	1 85	1 30	1 46	1 31	1 47	1 35	1 25	1 87	2 89	22 64
1980	1 64	1 90	1 61	1 62	1 01	1 43	2 06	1 61	1 64	2 02	1 76	1 89	20 19
1979	1 96	2 24	1 74	1 74	1 17	1 31	1 37	1 57	1 81	1 58	2 22	2 86	21 58
1978	1 77	1 75	2 57	2 27	1 03	1 20	1 64	1 85	1 33	1 64	1 80	2 40	21 24
1977	1 98	1 96	2 24	1 36	0 98	1 46	1 35	1 32	1 70	2 06	2 28	2 77	21 47
1976	3 44	2 82	1 79	1 45	1 15	1 39	1 33	1 54	1 11	1 42	1 98	3 78	23 21
1975	1 83	1 65	1 86	1 70	1 08	1 26	1 07	1 58	1 49	3 13	1 65	2 44	20 74
1974	1 95	2 51	1 64	2 74	1 25	1 39	2 01	1 28	1 27	1 11	2 14	1 87	21 17
1973	2 03	2 01	1 41	1 43	1 34	2 14	1 19	1 82	1 34	1 66	2 32	2 30	20 99
1972	2 16	2 90	3 18	2 70	1 04	1 15	1 20	1 55	1 50	1 26	1 46	2 16	22 27
1971	2 77	1 79	3 06	1 92	1 73	1 37	1 30	1 58	1 22	1 27	1 58	1 81	21 41
1970	2 79	3 35	1 33	1 40	1 79	1 34	1 25	1 39	1 47	1 23	1 67	3 26	22 29
1969	3 51	1 87	1 66	2 68	1 17	1 37	1 40	1 69	1 30	1 33	2 30	1 83	22 09
1968	1 74	1 76	2 08	1 91	1 17	1 51	1 34	1 56	2 05	1 58	1 92	2 19	20 80
1967	3 35	2 20	2 37	1 62	1 34	1 18	1 15	1 54	1 52	1 69	2 29	1 98	22 23
1966	1 55	1 43	3 49	1 64	1 68	1 11	1 29	1 25	1 19	1 75	2 73	2 05	21 15
1965	2 10	2 17	1 66	2 15	1 24	1 07	1 54	1 61	1 52	1 52	3 06	1 99	21 63
1964	2 04	1 51	2 59	2 68	1 27	1 27	1 52	1 59	1 22	1 87	1 54	1 68	20 78
1963	2 80	1 88	2 93	2 16	1 18	1 21	1 35	1 39	1 34	1 61	2 31	1 73	21 90
1962	1 79	2 51	2 31	1 79	1 66	1 19	1 15	1 64	1 38	1 69	2 17	2 10	21 38
1961	2 68	1 94	1 55	2 60	1 46	1 23	1 17	1 59	1 55	1 63	1 61	2 52	21 54
1960	1 80	1 86	1 85	2 02	1 54	1 22	1 14	1 58	1 28	1 20	4 53	2 03	22 07
1959	2 33	2 72	2 39	1 84	1 12	1 45	1 22	1 61	1 73	1 32	2 58	1 61	21 92
1958	1 78	1 96	1 46	1 57	1 13	1 43	1 10	1 97	1 45	2 76	2 06	2 09	20 76
1957	2 19	1 92	1 49	1 42	1 02	1 62	1 83	1 46	1 75	1 24	1 72	3 91	21 56
1956	1 91	1 36	2 57	2 26	1 01	1 19	0 99	1 53	1 62	1 62	3 31	2 78	22 15
1955	2 01	2 53	2 55	1 74	0 89	1 15	1 22	1 55	1 18	2 16	2 69	2 71	22 36
1954	1 71	3 24	2 39	1 40	0 87	1 25	1 32	1 36	1 83	1 33	3 67	2 16	22 54
1953	1 93	1 99	1 95	1 73	1 53	2 07	1 10	1 38	2 30	1 06	1 87	1 51	20 42
1952	1 66	1 95	1 64	1 22	1 18	1 19	1 20	1 44	1 80	3 49	1 60	1 66	20 03
1951	2 02	1 85	2 04	1 95	0 97	1 21	1 58	1 86	1 74	1 62	2 26	2 22	21 31
1950	3 49	2 15	2 76	1 60	1 22	1 09	0 91	1 28	1 07	1 97	3 13	2 52	23 19
1949	1 91	2 05	2 04	1 67	1 11	1 30	1 21	1 65	1 49	1 45	4 12	2 15	22 17
1948	1 89	1 65	1 85	2 00	1 23	1 36	1 28	1 39	2 06	1 58	1 64	3 27	21 20

Table A13. Quadrangle 206 Formula 4

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	-0.12	0.13	-4.27	8.16	-0.26	-1.00	0.17	1.33	-0.19	-1.08	0.43	2.24
1996	-1.68	-1.15	-2.13	-5.60	-2.06	0.09	3.42	2.35	1.42	-0.15	-0.56	-0.40
1995	4.58	5.20	0.12	-0.71	2.17	0.31	0.86	-1.46	1.11	-1.66	-2.67	0.25
1994	0.37	-1.76	0.38	0.64	-1.71	-2.83	1.56	-0.20	-2.32	-0.38	0.10	-0.32
1993	0.91	0.11	0.73	-1.20	-0.87	1.01	0.85	0.78	-0.44	-2.24	-0.17	-0.32
1992	0.06	-0.71	0.36	1.00	0.59	3.24	-0.50	1.57	-5.54	-3.78	1.22	0.40
1991	0.38	-2.90	-0.66	-3.76	1.50	0.53	1.07	-0.21	0.05	-1.03	0.93	3.52
1990	1.15	1.26	1.23	0.30	-2.03	-6.06	-0.41	0.32	0.48	-1.87	-0.04	-0.85
1989	-0.42	-0.27	-0.43	-2.23	0.72	2.72	-1.02	0.33	-0.02	-1.93	-3.19	-0.35
1988	-0.01	-2.33	1.32	2.30	1.08	-0.42	0.12	-0.03	0.29	-2.16	-1.19	-1.54
1987	0.90	0.96	1.69	-2.46	2.20	1.06	-1.73	1.39	2.31	-0.80	-0.39	1.73
1986	-2.25	0.85	-1.41	-1.57	0.27	-0.40	-1.44	3.01	0.38	1.52	2.22	-0.04
1985	0.30	0.70	2.46	2.45	-2.37	0.51	-2.52	-1.50	4.09	2.22	-0.44	-0.79
1984	-0.22	-0.43	0.94	-0.16	-4.65	1.10	-3.32	0.54	-3.69	1.74	0.37	1.32
1983	1.25	1.87	0.34	-0.25	-0.49	-0.46	-5.03	-3.55	-2.33	1.13	-0.40	-0.06
1982	-1.05	0.35	-0.47	-1.71	1.38	1.76	3.90	-2.57	-2.01	-2.17	-0.03	0.59
1981	-1.70	-1.67	1.76	0.02	-0.79	-0.51	0.76	2.44	0.94	1.65	1.14	-1.62
1980	0.86	0.10	1.45	0.15	1.03	-1.85	-4.97	-0.87	-3.27	-2.46	0.28	-0.12
1979	1.04	-0.86	1.48	0.35	0.67	0.82	0.13	1.11	-1.76	0.60	-0.74	-1.52
1978	-0.06	0.69	-1.90	-2.02	3.07	2.03	-2.59	-2.58	-0.19	-1.15	-0.24	-0.99
1977	-0.25	0.15	-1.25	2.92	2.58	-2.16	-0.79	3.44	-1.91	-2.66	-0.99	-1.59
1976	-1.95	-1.74	-0.14	0.81	-1.24	-2.09	-1.79	-1.14	0.51	-0.96	-0.84	-2.51
1975	-0.19	0.93	-0.67	-0.25	0.56	-0.08	2.51	-0.70	-1.82	-4.77	1.08	-1.25
1974	-0.50	-1.14	0.69	-3.39	-1.16	-1.38	-4.95	4.25	-1.56	2.12	-0.95	-0.45
1973	0.03	-0.45	5.10	1.83	-2.09	-6.08	1.48	-2.42	0.48	-1.15	-1.03	-0.70
1972	-0.94	-1.87	-2.86	-3.45	0.31	0.70	-0.30	-1.37	-2.97	0.06	1.52	-0.74
1971	-1.10	1.84	-2.69	-1.02	-4.01	-1.21	-0.22	-0.76	2.84	1.62	3.59	0.32
1970	-1.58	-2.40	0.56	0.00	-4.78	-2.33	-1.54	-0.59	-3.00	-0.58	-0.46	-2.16
1969	-1.95	0.77	0.85	-3.11	1.22	0.33	-0.56	-0.12	2.00	1.36	-1.00	-0.24
1968	1.65	0.10	-0.81	-0.65	0.54	-1.62	-0.39	1.23	-4.81	-0.07	0.46	-1.10
1967	-1.87	-1.05	-1.39	0.83	-1.75	0.73	0.89	-0.66	-1.12	-0.90	-1.11	-0.56
1966	-0.17	0.06	-3.27	-0.87	-4.34	0.56	-1.36	1.27	-1.24	-1.98	-1.78	-0.99
1965	-0.20	-0.73	-0.11	-1.78	-0.41	6.65	-2.21	-0.77	-0.75	-0.60	-2.06	-0.20
1964	-1.05	2.01	-2.20	-3.41	-1.36	-0.61	-2.45	-1.40	-0.49	-2.21	1.58	0.20
1963	-1.53	-0.10	-2.52	-1.88	-0.50	0.04	-1.08	0.60	-0.31	-1.18	-1.12	-0.44
1962	0.08	-1.12	-1.20	-0.21	-3.22	3.11	3.08	0.03	-1.09	-1.03	-0.48	-0.53
1961	-1.33	-0.44	3.40	-3.07	-2.25	1.71	2.29	0.14	-0.47	-0.69	1.93	-1.19
1960	1.21	1.15	0.24	-0.91	-2.65	3.77	3.05	1.11	1.58	3.80	-3.41	0.32
1959	-0.39	-1.51	-1.34	-0.33	2.04	-1.42	1.43	0.13	-1.30	0.97	-1.48	5.96
1958	0.59	-0.29	1.62	1.22	0.53	-0.98	5.55	-3.42	-1.17	-4.09	-0.30	-0.42
1957	-0.06	0.47	3.25	2.85	2.03	-3.31	-3.67	1.39	-2.01	1.13	0.53	-2.55
1956	-0.93	0.36	-2.29	-2.89	-0.39	-1.79	-0.03	-2.77	-3.93	-1.95	-2.50	-1.78
1955	-0.68	-1.61	-2.16	-0.99	2.13	-0.77	-1.15	-2.33	0.29	-3.09	-1.84	-1.66
1954	-0.58	-2.25	-1.96	0.43	1.41	-1.56	-1.95	-0.38	-4.61	-0.72	-2.77	-0.98
1953	-0.11	-0.75	-0.95	-1.09	-3.43	-6.10	0.89	-0.46	-4.08	2.43	-0.61	-0.15
1952	-0.41	-0.77	-0.59	1.27	-2.10	-0.99	-1.17	-0.99	-4.51	-5.48	0.35	-0.20
1951	0.03	0.71	-0.81	-1.33	5.31	0.86	-2.08	-2.01	-1.03	-0.23	-0.77	-0.58
1950	-1.98	-1.00	-2.40	-0.43	-1.18	1.70	5.35	2.05	1.57	-2.55	-2.26	-1.37
1949	3.19	0.09	-0.28	0.34	2.67	0.73	2.10	-0.35	0.07	0.53	-3.06	-0.41

Table A14. Quadrangle 206 Fox Hydrologic Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	-0.49	-0.40	-1.78	1.12	0.92	0.49	0.50	0.89	0.73	0.30	0.41	1.11	0.32
1996	-0.63	-0.95	-1.56	-3.27	-3.62	-3.21	-1.74	-0.78	-0.23	-0.25	-0.42	-0.51	-1.43
1995	0.23	1.94	1.78	1.36	1.94	1.85	1.94	1.26	1.50	0.79	-0.18	-0.08	1.19
1994	-0.48	-1.02	-0.79	-0.49	-1.01	-1.85	-1.14	-1.09	-1.75	-1.70	-1.49	-1.44	-1.19
1993	-0.40	-0.32	-0.05	-0.44	-0.68	-0.28	0.03	0.29	0.11	-0.65	-0.64	-0.68	-0.31
1992	0.21	-0.05	0.08	0.40	0.56	1.58	1.25	1.65	-0.37	-1.59	-1.02	-0.78	0.16
1991	-1.74	-2.52	-2.48	-3.48	-2.62	-2.17	-1.59	-1.50	-1.33	-1.54	-1.07	0.21	-1.82
1990	-1.17	-0.63	-0.15	-0.04	-0.71	-2.66	-2.52	-2.15	-1.77	-2.21	-2.00	-2.08	-1.51
1989	-0.67	-0.69	-0.76	-1.43	-1.04	-0.03	-0.36	-0.22	-0.20	-0.82	-1.80	-1.73	-0.81
1988	1.48	0.55	0.94	1.61	1.80	1.48	1.36	1.21	1.18	0.34	-0.09	-0.60	0.94
1987	1.28	1.46	1.88	0.86	1.51	1.71	0.95	1.32	1.95	1.48	1.20	1.65	1.44
1986	-0.34	-0.02	-0.49	-0.96	-0.77	-0.83	-1.22	-0.09	0.04	0.55	1.23	1.09	-0.15
1985	-1.22	-0.86	0.05	0.86	-0.02	0.15	-0.70	-1.13	0.35	1.05	0.80	0.45	-0.02
1984	-1.94	-1.89	-1.38	-1.29	-2.71	-2.06	-2.96	-2.47	-3.45	-2.51	-2.13	-1.47	-2.19
1983	-0.03	0.59	0.65	0.50	0.28	0.10	-1.59	-2.61	-3.12	-2.42	-2.30	-2.08	-1.00
1982	-0.27	-0.13	-0.27	-0.81	-0.27	0.35	1.61	0.59	-0.14	-0.85	-0.77	-0.50	-0.12
1981	-2.92	-3.18	-2.26	-2.02	-2.08	-2.03	-1.57	-0.59	-0.22	0.35	0.70	0.08	-1.31
1980	-0.41	-0.33	0.19	0.22	0.54	-0.14	-1.78	-1.88	-2.78	-3.32	-2.88	-2.62	-1.27
1979	-1.42	-1.56	-0.91	-0.70	-0.40	-0.09	-0.04	0.34	-0.28	-0.06	-0.30	-0.77	-0.52
1978	-1.82	-1.40	-1.89	-2.37	-1.10	-0.31	-1.14	-1.88	-1.75	-1.96	-1.83	-1.97	-1.62
1977	-2.94	-2.59	-2.74	-1.49	-0.47	-1.14	-1.29	-0.01	-0.65	-1.47	-1.65	-2.00	-1.54
1976	-2.38	-2.71	-2.48	-1.95	-2.17	-2.64	-2.96	-3.04	-2.56	-2.61	-2.62	-3.19	-2.61
1975	-1.69	-1.21	-1.30	-1.25	-0.94	-0.87	0.06	-0.18	-0.77	-2.28	-1.68	-1.93	-1.17
1974	-1.97	-2.15	-1.70	-2.65	-2.76	-2.94	-4.29	-2.43	-2.70	-1.71	-1.85	-1.81	-2.41
1973	-1.66	-1.64	0.23	0.82	0.04	-1.99	-1.30	-1.97	-1.61	-1.82	-1.98	-2.01	-1.24
1972	-0.45	-1.03	-1.87	-2.83	-2.44	-1.95	-1.85	-2.12	-2.89	-2.57	-1.80	-1.86	-1.97
1971	-3.76	-2.76	-3.37	-3.36	-4.35	-4.31	-3.94	-3.78	-2.45	-1.65	-0.29	-0.15	-2.85
1970	-0.90	-1.61	-1.26	-1.13	-2.60	-3.11	-3.31	-3.16	-3.84	-3.63	-3.41	-3.78	-2.64
1969	-2.51	-1.99	-1.50	-2.39	-1.73	-1.44	-1.48	-1.37	-0.56	-0.05	-0.37	-0.42	-1.32
1968	-1.59	-1.39	-1.52	-1.58	-1.23	-1.65	-1.61	-1.03	-2.53	-2.29	-1.90	-2.07	-1.70
1967	-3.51	-3.50	-3.60	-2.96	-3.23	-2.66	-2.09	-2.09	-2.25	-2.32	-2.45	-2.38	-2.75
1966	-1.44	-1.27	-2.23	-2.29	-3.50	-2.96	-3.10	-2.36	-2.53	-2.93	-3.22	-3.22	-2.59
1965	-2.22	-2.24	-2.04	-2.43	-2.31	0.14	-0.61	-0.81	-0.97	-1.07	-1.65	-1.55	-1.48
1964	-2.02	-1.14	-1.76	-2.71	-2.89	-2.79	-3.32	-3.45	-3.25	-3.65	-2.75	-2.40	-2.68
1963	-0.82	-0.77	-1.53	-1.99	-1.96	-1.74	-1.92	-1.53	-1.47	-1.71	-1.91	-1.86	-1.60
1962	0.61	0.18	-0.24	-0.29	-1.33	-0.16	0.89	0.81	0.36	-0.02	-0.18	-0.34	0.02
1961	1.34	1.06	2.08	0.85	0.01	0.58	1.28	1.20	0.92	0.59	1.17	0.66	0.98
1960	1.32	1.57	1.48	1.03	0.04	1.29	2.18	2.32	2.61	3.61	2.10	1.99	1.79
1959	-1.53	-1.88	-2.13	-2.02	-1.13	-1.49	-0.86	-0.73	-1.09	-0.65	-1.08	1.02	-1.13
1958	-1.80	-1.71	-1.00	-0.49	-0.26	-0.56	1.35	0.07	-0.33	-1.66	-1.59	-1.56	-0.79
1957	-5.11	-4.43	-2.89	-1.64	-0.80	-1.82	-2.85	-2.10	-2.55	-1.91	-1.54	-2.23	-2.49
1956	-4.12	-3.57	-3.97	-4.52	-4.19	-4.35	-3.91	-4.43	-5.29	-5.39	-5.67	-5.68	-4.59
1955	-4.17	-4.28	-4.56	-4.42	-3.26	-3.18	-3.23	-3.68	-3.20	-3.90	-4.11	-4.24	-3.85
1954	-3.30	-3.71	-3.98	-3.42	-2.60	-2.85	-3.21	-3.01	-4.23	-4.04	-4.54	-4.40	-3.61
1953	-3.39	-3.29	-3.27	-3.29	-4.10	-5.71	-4.82	-4.48	-5.38	-4.01	-3.80	-3.46	-4.08
1952	-0.98	-1.13	-1.21	-0.67	-1.30	-1.49	-1.73	-1.88	-3.19	-4.69	-4.09	-3.74	-2.18
1951	-0.45	-0.17	-0.42	-0.82	1.03	1.21	0.40	-0.32	-0.63	-0.64	-0.83	-0.94	-0.21
1950	-0.65	0.91	-1.62	-1.60	-1.82	-1.07	0.83	1.43	1.80	0.77	-0.07	-0.51	-0.29
1949	0.03	0.06	-0.04	0.08	0.96	1.10	1.69	1.40	1.28	1.33	0.17	0.01	0.67
1948	-1.33	-0.44	-0.50	-0.90	-0.99	-1.21	-1.05	0.25	-1.48	-1.62	-0.55	-1.15	-0.91

Table A15. Quadrangle 206 Fox Drought Severity Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	-0.49	-0.40	-1.78	1.12	0.92	0.49	0.50	0.89	0.73	0.30	0.41	1.11	0.32
1996	-0.63	-0.95	-1.56	-3.27	-3.62	-3.21	-1.74	-0.78	-0.23	-0.25	-0.42	-0.51	-1.43
1995	0.23	1.94	1.78	1.36	1.94	1.85	1.94	1.26	1.50	0.79	-0.18	-0.08	1.19
1994	-0.48	-1.02	-0.79	-0.49	-1.01	-1.85	-1.14	-1.09	-1.75	-1.70	-1.49	-1.44	-1.19
1993	-0.40	-0.32	-0.05	-0.44	-0.68	-0.28	0.03	0.29	0.11	-0.65	-0.64	-0.68	-0.31
1992	0.21	-0.05	0.08	0.40	0.56	1.58	1.25	1.65	-0.37	-1.59	-1.02	-0.78	0.16
1991	-1.74	-2.52	-2.48	-3.48	-2.62	-2.17	-1.59	-1.50	-1.33	-1.54	-1.07	0.21	-1.82
1990	-1.17	-0.63	-0.15	-0.04	-0.71	-2.66	-2.52	-2.15	-1.77	-2.21	-2.00	-2.08	-1.51
1989	-0.67	-0.69	-0.76	-1.43	-1.04	-0.03	-0.36	-0.22	-0.20	-0.82	-1.80	-1.73	-0.81
1988	1.48	0.55	0.94	1.61	1.80	1.48	1.36	1.21	1.18	0.34	-0.09	-0.60	0.94
1987	1.28	1.46	1.88	0.86	1.51	1.71	0.95	1.32	1.95	1.48	1.20	1.65	1.44
1986	-0.34	-0.02	-0.49	-0.96	-0.77	-0.83	-1.22	-0.09	0.04	0.55	1.23	1.09	-0.15
1985	-1.22	-0.86	0.05	0.86	-0.02	0.15	-0.70	-1.13	0.35	1.05	0.80	0.45	-0.02
1984	-1.94	-1.89	-1.38	-1.29	-2.71	-2.06	-2.96	-2.47	-3.45	-2.51	-2.13	-1.47	-2.19
1983	-0.03	0.59	0.65	0.50	0.28	0.10	-1.59	-2.61	-3.12	-2.42	-2.30	-2.08	-1.00
1982	-0.27	-0.13	-0.27	-0.81	-0.27	0.35	1.61	0.59	-0.14	-0.85	-0.77	-0.50	-0.12
1981	-2.92	-3.18	-2.26	-2.02	-2.08	-2.03	-1.57	-0.59	-0.22	0.35	0.70	0.08	-1.31
1980	-0.41	-0.33	0.19	0.22	0.54	-0.14	-1.78	-1.88	-2.78	-3.32	-2.88	-2.62	-1.27
1979	-1.42	-1.56	-0.91	-0.70	-0.40	-0.09	-0.04	0.34	-0.28	-0.06	-0.30	-0.77	-0.52
1978	-1.82	-1.40	-1.89	-2.37	-1.10	-0.31	-1.14	-1.88	-1.75	-1.96	-1.83	-1.97	-1.62
1977	-2.94	-2.59	-2.74	-1.49	-0.47	-1.14	-1.29	-0.01	-0.65	-1.47	-1.65	-2.00	-1.54
1976	-2.38	-2.71	-2.48	-1.95	-2.17	-2.64	-2.96	-3.04	-2.56	-2.61	-2.62	-3.19	-2.61
1975	-1.69	-1.21	-1.30	-1.25	-0.94	-0.87	0.06	-0.18	-0.77	-2.28	-1.68	-1.93	-1.17
1974	-1.97	-2.15	-1.70	-2.65	-2.76	-2.94	-4.29	-2.43	-2.70	-1.71	-1.85	-1.81	-2.41
1973	-1.66	-1.64	0.23	0.82	0.04	-1.99	-1.30	-1.97	-1.61	-1.82	-1.98	-2.01	-1.24
1972	-0.45	-1.03	-1.87	-2.83	-2.44	-1.95	-1.85	-2.12	-2.89	-2.57	-1.80	-1.86	-1.97
1971	-3.76	-2.76	-3.37	-3.36	-4.35	-4.31	-3.94	-3.78	-2.45	-1.65	-0.29	-0.15	-2.85
1970	-0.90	-1.61	-1.26	-1.13	-2.60	-3.11	-3.31	-3.16	-3.84	-3.63	-3.41	-3.78	-2.64
1969	-2.51	-1.99	-1.50	-2.39	-1.73	-1.44	-1.48	-1.37	-0.56	-0.05	-0.37	-0.42	-1.32
1968	-1.59	-1.39	-1.52	-1.58	-1.23	-1.65	-1.61	-1.03	-2.53	-2.29	-1.90	-2.07	-1.70
1967	-3.51	-3.50	-3.60	-2.96	-3.23	-2.66	-2.09	-2.09	-2.25	-2.32	-2.45	-2.38	-2.75
1966	-1.44	-1.27	-2.23	-2.29	-3.50	-2.96	-3.10	-2.36	-2.53	-2.93	-3.22	-3.22	-2.59
1965	-2.22	-2.24	-2.04	-2.43	-2.31	0.14	-0.61	-0.81	-0.97	-1.07	-1.65	-1.55	-1.48
1964	-2.02	-1.14	-1.76	-2.71	-2.89	-2.79	-3.32	-3.45	-3.25	-3.65	-2.75	-2.40	-2.68
1963	-0.82	-0.77	-1.53	-1.99	-1.96	-1.74	-1.92	-1.53	-1.47	-1.71	-1.91	-1.86	-1.60
1962	0.61	0.18	-0.24	-0.29	-1.33	-0.16	0.89	0.81	0.36	-0.02	-0.18	-0.34	0.02
1961	1.34	1.06	2.08	0.85	0.01	0.58	1.28	1.20	0.92	0.59	1.17	0.66	0.98
1960	1.32	1.57	1.48	1.03	0.04	1.29	2.18	2.32	2.61	3.61	2.10	1.99	1.79
1959	-1.53	-1.88	-2.13	-2.02	-1.13	-1.49	-0.86	-0.73	-1.09	-0.65	-1.08	1.02	-1.13
1958	-1.80	-1.71	-1.00	-0.49	-0.26	-0.56	1.35	0.07	-0.33	-1.66	-1.59	-1.56	-0.79
1957	-5.11	-4.43	-2.89	-1.64	-0.80	-1.82	-2.85	-2.10	-2.55	-1.91	-1.54	-2.23	-2.49
1956	-4.12	-3.57	-3.97	-4.52	-4.19	-4.35	-3.91	-4.43	-5.29	-5.39	-5.67	-5.68	-4.59
1955	-4.17	-4.28	-4.56	-4.42	-3.26	-3.18	-3.23	-3.68	-3.20	-3.90	-4.11	-4.24	-3.85
1954	-3.30	-3.71	-3.98	-3.42	-2.60	-2.85	-3.21	-3.01	-4.23	-4.04	-4.54	-4.40	-3.61
1953	-3.39	-3.29	-3.27	-3.29	-4.09	-5.70	-4.82	-4.48	-5.38	-4.01	-3.80	-3.46	-4.08
1952	-0.97	-1.13	-1.21	-0.66	-1.30	-1.49	-1.73	-1.88	-3.19	-4.69	-4.09	-3.74	-2.17
1951	-0.44	-0.16	-0.41	-0.81	1.04	1.22	0.40	-0.31	-0.62	-0.63	-0.83	-0.93	-0.21
1950	-0.59	-0.86	-1.57	-1.55	-1.79	-1.04	0.86	1.45	1.83	0.79	-0.05	-0.50	-0.25
1949	0.24	0.25	0.13	0.23	1.09	1.22	1.80	1.50	1.37	1.40	0.24	0.08	0.80
1948	-0.56	0.25	0.12	-0.34	-0.49	-0.76	-0.65	0.61	-1.15	-1.33	-0.29	-0.91	-0.46

Table A16. Quadrangle 206 Average Annual Reported Palmer Hydrologic Drought

Index

Year	Division 1
1997	2.52
1996	-0.83
1995	-1.29
1994	-1.31
1993	2.76
1992	3.94
1991	-0.55
1990	-0.73
1989	-0.29
1988	3.46
1987	4.91
1986	2.67
1985	3.03
1984	-0.54
1983	-0.10
1982	0.01
1981	-0.54
1980	-0.82
1979	0.47
1978	-1.51
1977	-0.97
1976	-1.08
1975	3.25
1974	-0.55
1973	2.45
1972	0.27
1971	-1.24
1970	-0.57
1969	1.08
1968	0.08
1967	-2.55
1966	-1.24
1965	-1.63
1964	-3.05
1963	-2.10
1962	0.67
1961	3.55
1960	2.72
1959	-0.54
1958	2.83
1957	-0.24
1956	-4.59
1955	-3.72
1954	-3.85
1953	-4.30
1952	-3.27
1951	-0.66
1950	0.76
1949	2.86
1948	-0.46

Table A17. Quadrangle 206 Average Annual Reported Modified Palmer Drought

Severity Index

Year	Division 1
1997	2.31
1996	-0.70
1995	-1.00
1994	-1.30
1993	2.39
1992	3.58
1991	-0.37
1990	-0.74
1989	-0.55
1988	3.28
1987	4.76
1986	2.08
1985	2.95
1984	0.17
1983	0.24
1982	-0.30
1981	-0.38
1980	-0.74
1979	0.36
1978	-1.05
1977	-0.85
1976	-1.05
1975	3.02
1974	-0.35
1973	1.88
1972	0.27
1971	-0.95
1970	-0.81
1969	0.92
1968	0.23
1967	-2.26
1966	-1.10
1965	-0.82
1964	-2.83
1963	-2.06
1962	0.15
1961	3.33
1960	2.54
1959	-0.52
1958	2.56
1957	-0.05
1956	-4.56
1955	-3.66
1954	-3.71
1953	-4.04
1952	-3.16
1951	-1.15
1950	0.12
1949	2.67
1948	-0.42

APPENDIX B

Table B1. Quadrangle 601 Fox Hydrologic Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	-4 85	-4 57	-4 46	-4 58	-5 10	-5 34	-5 30	-5.39	-5 02	-5 41	-4 87	-3 85	-4 90
1996	-4 62	-4 52	-4 90	-4 82	-6 68	-6 27	-5 93	-5.66	-5 40	-5 53	-5 30	-5 30	-5 41
1995	-3 88	-2 45	-2 46	-3 40	-4 45	-4 67	-5 23	-5.73	-4 99	-5 29	-4 96	-4 91	-4 37
1994	-4 43	-4 23	-4 08	-4 48	-4 51	-5 24	-5 51	-6.27	-6 79	-6 49	-5 95	-5 12	-5 26
1993	-3 21	-3 06	-3 64	-4.21	-5 11	-5 56	-5 63	-5.08	-5 21	-5 26	-4 89	-4 49	-4 61
1992	-1 36	-1 59	-1 65	-2 19	-2 07	-3 33	-4 06	-4.28	-4 81	-4 87	-4 60	-3 98	-3 23
1991	-0 65	-0 63	-1 23	-2 12	-3 17	-4 34	-4 06	-3.42	-2 79	-3 34	-3 12	-1 96	-2 57
1990	-1 56	-1 28	-0 97	-1 08	-1 63	-2 78	-2 67	-2 53	-2 12	-2 23	-1 44	-0 90	-1 77
1989	-1 17	-0 73	-0 63	-1 57	-1 75	-2 02	-2 10	-1.98	-2 18	-2 52	-2 56	-2 33	-1 80
1988	-0 38	-0 31	-0 30	-0 55	-1 91	-3 01	-2 49	-2.23	-2 44	-2 42	-2 03	-1.65	-1 64
1987	-0 60	-0 01	-0 24	-1 04	-1 77	-1 55	-2 33	-2.66	-2 60	-2 77	-1 98	-0 39	-1 50
1986	-1 66	-1 51	-1 73	-1 99	-2 55	-2 09	-2 19	-2.36	-3 04	-2 77	-1 39	-0 69	-2 00
1985	-0 58	-0 26	0 12	-0 22	-1 61	-2 58	-2 80	-3.11	-2 59	-1 92	-1 63	-1 52	-1 56
1984	-1 27	-1 11	-1 02	-1 61	-2 35	-2 56	-3 44	-2.98	-3 57	-2 29	-1 63	-1 02	-2 07
1983	-1 88	-1 37	-1 08	-0 94	-1 45	-2 25	-3 34	-3.79	-3 44	-2 99	-2 07	-1 60	-2 18
1982	-2 79	-2 60	-2 75	-2 97	-3 61	-4 06	-4 75	-5.41	-5 16	-4 66	-3 94	-2 32	-3 75
1981	-2 87	-2 68	-2 57	-2 48	-2 74	-3 46	-3 71	-3.31	-3 16	-2 90	-2 90	-3 02	-2 98
1980	-2 19	-1 79	-1 67	-1 59	-3 06	-4 02	-4 78	-4.71	-4 15	-4 03	-3 61	-3 57	-3 26
1979	-1 56	-1 04	-1 14	-1 28	-1 64	-2 62	-2 67	-2.21	-2 41	-3 03	-2 79	-2 48	-2 07
1978	-3 00	-2 68	-2 94	-3 49	-3 71	-4 27	-5 41	-5.22	-4 48	-3 87	-3 13	-2 61	-3 73
1977	-2 32	-2 33	-2 23	-2 44	-3 88	-4 57	-4 62	-4.70	-4 64	-3 95	-3 72	-3 47	-3 57
1976	-2 28	-2 17	-2 19	-2 60	-2 79	-3 27	-3 11	-3 96	-4 04	-3 70	-3 18	-2 76	-3 00
1975	-0 94	-0 50	-0 59	-1 05	-1 37	-2 46	-2 30	-2 90	-2 68	-3 06	-2 99	-2 55	-1 95
1974	-2 23	-2 20	-2 75	-3 02	-3 45	-4 33	-4 15	-3.97	-2 39	-1 92	-1 60	-1 25	-2 77
1973	-1 61	-0 91	-0 79	-1 13	-1 93	-2 60	-1 89	-2.89	-3 35	-3 44	-3 29	-2 98	-2 23
1972	-3 14	-3 34	-3 39	-4 01	-4 78	-4 78	-5 05	-4 52	-4 02	-3 43	-2 90	-2 52	-3 82
1971	-3 85	-3 64	-3 78	-4 11	-4 66	-5 95	-5 42	-5 26	-5 31	-4 86	-4 39	-3 74	-4 58
1970	-3 25	-2 98	-2 96	-4 13	-4 83	-5 01	-4 87	-4 71	-4 91	-4 49	-4 33	-4 08	-4 21
1969	-2 36	-2 15	-2 09	-2 38	-2 90	-4 11	-4 17	-4.67	-4 33	-4 24	-3 45	-3 12	-3 33
1968	-3 06	-2 40	-2 07	-2 15	-2 74	-3 92	-3 21	-2 61	-3 14	-3 69	-2 69	-2 22	-2 82
1967	-3 84	-3 53	-3 79	-4 22	-4 41	-4 42	-4 25	-4 56	-4 66	-4 88	-4 53	-3 75	-4 24
1966	-3 72	-3 29	-3 52	-3 17	-3 94	-3 57	-4 16	-3 57	-3 94	-4 24	-4 28	-3 94	-3 78
1965	-4 26	-3 62	-3 47	-4 09	-4 42	-4 96	-5 63	-5 47	-4 82	-5 16	-4 99	-4 26	-4 60
1964	-3 51	-3 38	-2 92	-2 81	-3 50	-5 56	-5 91	-5 52	-5 51	-5 54	-5 22	-4 64	-4 50
1963	-3 33	-3 07	-3 48	-3 64	-4 59	-5 27	-5 11	-4 97	-4 68	-4 66	-4 09	-3 85	-4 23
1962	-2 90	-2 46	-2 53	-2 67	-3 72	-4 20	-3 78	-5 02	-4 46	-4 13	-3 80	-3 48	-3 60
1961	-3 16	-3 07	-2 79	-3 40	-4 46	-4 66	-5 04	-5 16	-4 87	-5 14	-4 15	-3 43	-4 11
1960	-3 30	-2 87	-2 91	-3 53	-4 61	-4 86	-4 48	-4 77	-5 78	-5 37	-4 96	-3 78	-4 27
1959	-2 38	-2 26	-2 32	-2 47	-3 18	-3 66	-4 38	-4 40	-5 05	-4 87	-4 48	-3 98	-3 62
1958	-2 63	-2 07	-1 35	-1 56	-2 12	-2 49	-3 00	-3 35	-2 54	-2 22	-2 14	-2 45	-2 33
1957	-5 15	-4 57	-4 30	-4 17	-4 81	-5 58	-5 61	-5 38	-5 52	-4.61	-3 36	-3 25	-4 69
1956	-4 82	-4 42	-4 74	-5 34	-6 90	-6 85	-6 91	-6 82	-7 17	-7 05	-6 52	-5 85	-6 12
1955	-4 45	-4 10	-3 91	-4 71	-5 43	-6 50	-5 80	-5 81	-6 09	-5 60	-5 41	-5 29	-5 26
1954	-4 23	-4 28	-4 30	-4 33	-4 48	-5 62	-6 12	-5 56	-5 93	-5 65	-5 38	-5 03	-5 08
1953	-4 76	-4 18	-4 14	-3 72	-3 88	-4 96	-4 48	-5 04	-5 76	-5 63	-5 25	-4 68	-4 71
1952	-4 01	-3 53	-3 20	-2 85	-3 22	-3 50	-3 78	-4 05	-5 29	-6 40	-5 81	-5 16	-4 23
1951	-3 92	-3 43	-3 14	-3 60	-5 09	-5 71	-5 77	-5 65	-5 57	-5 12	-4 72	-4 35	-4 67
1950	-3 04	-2 85	-3 00	-3 25	-3 90	-4 69	-4 01	-4 45	-4 51	-4 51	-4 45	-4 41	-3 92
1949	-3 17	-2 84	-2 93	-3 13	-3 70	-4 37	-4 54	-5 21	-4 77	-3 86	-4 12	-3 49	-3 84
1948	-1 08	-0 69	-1 04	-1 29	-1 96	-2 55	-3 03	-3 35	-4 77	-4 83	-5 11	-4 49	-2 85

Table B2. Quadrangle 601 Fox Drought Severity Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	-4.85	-4.57	-4.46	-4.58	-5.10	-5.34	-5.30	-5.39	-5.02	-5.41	-4.87	-3.85	-4.90
1996	-4.62	-4.52	-4.90	-4.82	-6.68	-6.27	-5.93	-5.66	-5.40	-5.53	-5.30	-5.30	-5.41
1995	-3.88	-2.45	-2.46	-3.40	-4.45	-4.67	-5.23	-5.73	-4.99	-5.29	-4.96	-4.91	-4.37
1994	-4.43	-4.23	-4.08	-4.48	-4.51	-5.24	-5.51	-6.27	-6.79	-6.49	-5.95	-5.12	-5.26
1993	-3.21	-3.06	-3.64	-4.21	-5.11	-5.56	-6.63	-5.08	-5.21	-5.26	-4.89	-4.49	-4.61
1992	-1.36	-1.59	-1.65	-2.19	-2.07	-3.33	-4.06	-4.28	-4.81	-4.87	-4.60	-3.98	-3.23
1991	-0.65	-0.63	-1.23	-2.12	-3.17	-4.34	-4.06	-3.42	-2.79	-3.34	-3.12	-1.96	-2.57
1990	-1.56	-1.28	-0.97	-1.08	-1.63	-2.78	-2.67	-2.53	-2.12	-2.23	-1.44	-0.90	-1.77
1989	-1.17	-0.73	-0.63	-1.57	-1.75	-2.02	-2.10	-1.98	-2.18	-2.52	-2.56	-2.33	-1.80
1988	-0.38	-0.31	-0.30	-0.55	-1.91	-3.01	-2.49	-2.23	-2.44	-2.42	-2.03	-1.65	-1.64
1987	-0.60	-0.01	-0.24	-1.04	-1.77	-1.55	-2.33	-2.66	-2.60	-2.77	-1.98	-0.39	-1.50
1986	-1.66	-1.51	-1.73	-1.99	-2.55	-2.09	-2.19	-2.36	-3.04	-2.77	-1.39	-0.69	-2.00
1985	-0.58	-0.26	0.12	-0.22	-1.61	-2.58	-2.80	-3.11	-2.59	-1.92	-1.63	-1.52	-1.56
1984	-1.27	-1.11	-1.02	-1.61	-2.35	-2.56	-3.44	-2.98	-3.57	-2.29	-1.63	-1.02	-2.07
1983	-1.88	-1.37	-1.08	-0.94	-1.45	-2.25	-3.34	-3.79	-3.44	-2.99	-2.07	-1.60	-2.18
1982	-2.79	-2.60	-2.75	-2.97	-3.61	-4.06	-4.75	-5.41	-5.16	-4.66	-3.94	-2.32	-3.75
1981	-2.87	-2.68	-2.57	-2.48	-2.74	-3.46	-3.71	-3.31	-3.16	-2.90	-2.90	-3.02	-2.98
1980	-2.19	-1.79	-1.67	-1.59	-3.06	-4.02	-4.78	-4.71	-4.15	-4.03	-3.61	-3.57	-3.26
1979	-1.56	-1.04	-1.14	-1.28	-1.64	-2.62	-2.67	-2.21	-2.41	-3.03	-2.79	-2.48	-2.07
1978	-3.00	-2.68	-2.94	-3.49	-3.71	-4.27	-5.41	-5.22	-4.48	-3.87	-3.13	-2.61	-3.73
1977	-2.32	-2.33	-2.23	-2.44	-3.88	-4.57	-4.62	-4.70	-4.64	-3.95	-3.72	-3.47	-3.57
1976	-2.28	-2.17	-2.19	-2.60	-2.79	-3.27	-3.11	-3.96	-4.04	-3.70	-3.18	-2.76	-3.00
1975	-0.94	-0.50	-0.59	-1.05	-1.37	-2.46	-2.30	-2.90	-2.68	-3.06	-2.99	-2.55	-1.95
1974	-2.23	-2.20	-2.75	-3.02	-3.45	-4.33	-4.15	-3.97	-2.39	-1.92	-1.60	-1.25	-2.77
1973	-1.61	-0.91	-0.79	-1.13	-1.93	-2.60	-1.89	-2.89	-3.35	-3.44	-3.29	-2.98	-2.23
1972	-3.14	-3.34	-3.39	-4.01	-4.78	-4.78	-5.05	-4.52	-4.02	-3.43	-2.90	-2.52	-3.82
1971	-3.85	-3.64	-3.78	-4.11	-4.66	-5.95	-5.42	-5.26	-5.31	-4.86	-4.39	-3.74	-4.58
1970	-3.25	-2.98	-2.96	-4.13	-4.83	-5.01	-4.87	-4.71	-4.91	-4.49	-4.33	-4.08	-4.21
1969	-2.36	-2.15	-2.09	-2.38	-2.90	-4.11	-4.17	-4.67	-4.33	-4.24	-3.45	-3.12	-3.33
1968	-3.06	-2.40	-2.07	-2.15	-2.74	-3.92	-3.21	-2.81	-3.14	-3.69	-2.69	-2.22	-2.82
1967	-3.84	-3.53	-3.79	-4.22	-4.41	-4.42	-4.25	-4.56	-4.66	-4.88	-4.53	-3.75	-4.24
1966	-3.72	-3.29	-3.52	-3.17	-3.94	-3.57	-4.16	-3.57	-3.94	-4.24	-4.28	-3.94	-3.78
1965	-4.26	-3.62	-3.47	-4.09	-4.42	-4.96	-5.63	-5.47	-4.82	-5.16	-4.99	-4.26	-4.60
1964	-3.51	-3.38	-2.92	-2.81	-3.50	-5.56	-5.91	-5.52	-5.51	-5.54	-5.22	-4.64	-4.50
1963	-3.33	-3.07	-3.48	-3.64	-4.59	-5.27	-5.11	-4.97	-4.68	-4.66	-4.09	-3.85	-4.23
1962	-2.90	-2.46	-2.53	-2.67	-3.72	-4.20	-3.78	-5.02	-4.46	-4.13	-3.80	-3.48	-3.60
1961	-3.16	-3.07	-2.79	-3.40	-4.46	-4.66	-5.04	-5.16	-4.87	-5.14	-4.15	-3.43	-4.11
1960	-3.30	-2.87	-2.91	-3.53	-4.61	-4.86	-4.48	-4.77	-5.78	-5.37	-4.96	-3.78	-4.27
1959	-2.38	-2.26	-2.32	-2.47	-3.18	-3.66	-4.38	-4.40	-5.05	-4.87	-4.48	-3.98	-3.62
1958	-2.63	-2.07	-1.35	-1.56	-2.12	-2.49	-3.00	-3.35	-2.54	-2.22	-2.14	-2.45	-2.33
1957	-5.15	-4.57	-4.30	-4.17	-4.81	-5.58	-5.61	-5.38	-5.52	-4.61	-3.36	-3.25	-4.69
1956	-4.82	-4.42	-4.74	-5.34	-6.90	-6.85	-6.91	-6.82	-7.17	-7.05	-6.52	-5.85	-6.12
1955	-4.45	-4.10	-3.91	-4.71	-5.43	-6.50	-5.80	-5.81	-6.09	-5.60	-5.41	-5.29	-5.26
1954	-4.23	-4.28	-4.30	-4.33	-4.48	-5.62	-6.12	-5.56	-5.93	-5.65	-5.38	-5.03	-5.08
1953	-4.76	-4.18	-4.14	-3.72	-3.88	-4.96	-4.48	-5.04	-5.76	-5.63	-5.25	-4.68	-4.71
1952	-4.01	-3.52	-3.20	-2.85	-3.22	-3.50	-3.78	-4.05	-5.29	-6.39	-5.81	-5.16	-4.23
1951	-3.91	-3.43	-3.13	-3.59	-5.08	-5.71	-5.76	-5.65	-5.57	-5.12	-4.72	-4.35	-4.67
1950	-3.01	-2.83	-2.98	-3.23	-3.88	-4.68	-3.99	-4.44	-4.50	-4.50	-4.44	-4.41	-3.91
1949	-3.06	-2.73	-2.83	-3.05	-3.63	-4.31	-4.48	-5.16	-4.72	-3.82	-4.08	-3.45	-3.78
1948	-0.65	-0.31	-0.70	-0.98	-1.69	-2.30	-2.81	-3.15	-4.59	-4.67	-4.97	-4.36	-2.60

Table B3. Quadrangle 601 Average Annual Reported Palmer Hydrologic Drought Index

Year	Division 4
1997	2.89
1996	-1.25
1995	1.86
1994	1.76
1993	2.61
1992	3.37
1991	2.82
1990	0.98
1989	1.12
1988	-0.99
1987	0.63
1986	0.47
1985	0.28
1984	-0.07
1983	1.72
1982	-0.05
1981	-1.38
1980	0.39
1979	2.59
1978	-2.52
1977	-0.26
1976	0.64
1975	2.96
1974	3.65
1973	3.88
1972	-0.64
1971	-2.23
1970	1.65
1969	1.58
1968	1.70
1967	-2.12
1966	-0.12
1965	-2.07
1964	-2.82
1963	-2.80
1962	0.56
1961	2.87
1960	1.12
1959	1.07
1958	2.55
1957	0.77
1956	-3.47
1955	-1.50
1954	-2.68
1953	-0.34
1952	-2.64
1951	-3.16
1950	1.22
1949	-0.58
1948	-2.01

Table B4. Quadrangle 601 Average Annual Reported Modified Palmer Drought Severity

Index

Year	Division 4
1997	2.76
1996	-1.13
1995	1.63
1994	1.23
1993	2.11
1992	3.24
1991	2.77
1990	0.76
1989	0.93
1988	-1.37
1987	0.50
1986	0.31
1985	0.10
1984	-0.36
1983	1.32
1982	-0.16
1981	-0.65
1980	0.08
1979	2.85
1978	-2.32
1977	-0.39
1976	0.87
1975	2.57
1974	4.83
1973	3.83
1972	-0.21
1971	-1.97
1970	-0.61
1969	0.74
1968	1.93
1967	-1.93
1966	-1.59
1965	-1.59
1964	-2.84
1963	-2.80
1962	0.08
1961	2.57
1960	1.09
1959	0.74
1958	1.90
1957	1.29
1956	-3.46
1955	-1.22
1954	-2.37
1953	-0.21
1952	-2.10
1951	-3.06
1950	1.02
1949	0.17
1948	-1.76

Table B5. Quadrangle 613 Fox Hydrologic Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	3.33	3.93	4.39	4.79	4.59	4.43	3.93	5.07	4.90	5.21	5.15	5.15	4.58
1996	3.29	2.89	2.68	2.81	2.06	2.06	1.94	2.85	3.48	3.20	3.26	3.23	2.81
1995	4.89	4.61	4.99	5.35	4.97	4.37	4.32	3.69	3.76	3.46	3.33	3.50	4.27
1994	2.39	2.90	2.97	3.07	3.39	3.02	2.56	3.63	3.57	5.31	4.95	5.21	3.58
1993	3.48	3.36	3.82	3.95	4.01	4.52	2.43	1.61	1.37	1.94	2.12	2.25	2.90
1992	5.28	5.74	5.89	5.62	5.24	4.47	3.52	3.17	2.72	2.69	3.03	3.30	4.22
1991	3.80	4.12	3.96	4.77	5.04	5.04	4.49	5.78	5.59	5.24	5.20	5.25	4.86
1990	3.82	3.95	4.30	4.24	4.86	4.48	4.07	3.28	2.85	2.87	3.09	3.11	3.74
1989	2.18	2.24	2.74	2.45	3.02	4.80	4.82	4.04	4.06	3.76	3.53	3.36	3.42
1988	3.00	2.88	3.11	2.92	1.84	1.10	1.42	1.42	1.06	1.27	1.35	1.56	1.91
1987	3.74	4.02	3.84	3.17	3.06	3.30	3.13	2.56	2.81	2.50	2.98	3.15	3.19
1986	3.00	2.98	2.61	2.85	3.44	4.27	3.20	3.03	3.18	3.52	4.02	3.98	3.34
1985	3.29	3.53	3.67	3.67	3.36	2.17	2.23	1.40	1.87	3.10	3.40	3.29	2.92
1984	3.50	3.77	3.84	3.48	3.38	2.89	2.38	1.96	1.96	3.42	3.43	3.32	3.11
1983	3.65	3.89	4.12	3.52	4.22	4.29	3.43	3.79	3.84	3.34	3.44	3.64	3.76
1982	3.26	3.17	3.31	3.95	3.81	4.31	3.66	2.59	2.03	3.00	3.45	3.87	3.37
1981	1.64	1.80	1.99	1.81	2.13	2.77	2.99	2.70	3.30	3.54	3.43	3.16	2.61
1980	4.22	4.02	4.24	4.29	4.52	3.41	2.87	1.99	1.71	1.67	1.78	1.63	3.03
1979	2.46	2.90	3.53	3.73	4.22	3.67	4.07	3.78	4.50	4.48	4.43	4.34	3.84
1978	2.58	2.60	2.51	2.29	1.93	1.54	1.04	1.05	1.58	1.29	1.62	1.78	1.82
1977	3.12	3.10	3.35	3.37	2.68	2.47	2.05	2.48	2.47	2.13	2.25	2.25	2.64
1976	3.23	3.17	3.52	3.44	3.65	3.85	4.34	3.30	3.23	3.14	3.04	3.11	3.42
1975	4.84	5.03	4.96	5.01	5.23	5.06	4.57	3.68	3.28	3.45	3.51	3.36	4.33
1974	6.53	6.06	5.74	5.51	5.21	4.24	3.79	4.08	4.80	4.76	5.05	4.96	5.06
1973	3.46	3.41	3.99	4.45	4.02	5.03	5.14	4.99	5.85	6.40	6.29	6.24	4.94
1972	2.33	2.16	2.50	2.65	2.33	2.16	2.66	2.42	2.49	3.04	3.11	3.14	2.58
1971	1.66	1.76	1.60	1.37	1.55	1.07	1.11	1.09	1.32	1.49	1.68	1.96	1.47
1970	2.17	2.37	2.65	2.64	2.65	1.97	1.35	1.07	1.05	1.93	1.90	1.86	1.97
1969	4.24	4.33	4.81	4.98	5.22	4.01	3.25	2.14	1.89	2.06	2.13	2.25	3.44
1968	2.15	2.26	2.50	3.48	3.85	4.66	4.90	4.02	4.45	4.28	4.52	4.59	3.80
1967	1.88	1.98	1.98	2.13	2.45	2.28	2.43	1.91	1.66	1.56	1.46	1.70	1.95
1966	2.00	2.36	2.19	2.74	2.74	1.69	1.35	1.99	1.77	2.09	1.94	1.98	2.07
1965	1.07	1.56	1.96	1.67	2.26	1.87	1.13	0.93	1.71	1.23	1.34	1.75	1.54
1964	1.54	1.62	2.01	2.53	2.30	1.35	0.68	0.74	0.85	0.54	0.70	0.89	1.31
1963	2.77	2.75	2.47	2.51	2.14	2.26	2.24	1.52	1.66	0.98	1.26	1.35	1.99
1962	4.30	4.02	3.76	3.96	3.61	3.87	3.00	2.52	2.81	2.68	2.86	2.94	3.36
1961	4.50	4.51	4.90	4.44	3.78	4.13	4.63	3.83	4.77	4.29	4.27	4.39	4.37
1960	3.93	4.08	3.90	3.83	2.81	3.62	3.27	3.87	3.72	3.98	4.09	4.28	3.78
1959	3.61	3.75	3.59	3.91	3.49	3.26	4.44	4.08	3.67	3.96	3.87	3.95	3.80
1958	4.29	4.13	4.00	4.02	3.60	3.64	2.85	3.39	5.10	4.51	4.31	3.93	3.98
1957	0.32	0.69	1.51	2.92	2.73	3.47	2.81	2.32	2.86	3.82	4.48	4.28	2.68
1956	1.30	1.64	1.70	1.96	1.89	1.66	0.85	0.49	-0.75	-0.65	-0.33	-0.14	0.80
1955	0.89	1.28	1.43	1.81	2.01	1.15	0.96	1.46	1.03	1.04	1.04	1.09	1.27
1954	2.79	2.58	2.40	2.51	2.75	1.49	0.98	0.28	-0.37	0.24	0.51	0.63	1.40
1953	0.42	0.90	1.70	2.45	3.71	3.44	3.63	3.22	2.69	2.55	2.57	2.85	2.51
1952	1.56	1.80	1.97	2.26	2.47	1.57	1.75	0.94	0.17	-0.88	-0.31	0.07	1.11
1951	2.80	2.83	3.02	2.67	2.18	2.18	1.81	0.45	1.29	1.03	1.24	1.51	1.92
1950	3.53	3.95	3.93	4.00	4.63	4.75	4.32	3.32	3.36	2.96	2.87	2.77	3.70
1949	0.27	0.65	1.28	1.68	1.51	1.62	1.71	1.70	1.82	3.32	2.97	3.16	1.81
1948	-1.09	-0.50	-0.23	0.21	0.46	-0.20	-0.38	-0.98	-1.47	-1.48	-0.72	-0.41	-0.57

Table B6. Quadrangle 613 Fox Drought Severity Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	3.33	3.93	4.39	4.79	4.59	4.43	3.93	5.07	4.90	5.21	5.15	5.15	4.58
1996	3.29	2.89	2.68	2.81	2.06	2.06	1.94	2.85	3.48	3.20	3.26	3.23	2.81
1995	4.89	4.61	4.99	5.35	4.97	4.37	4.32	3.69	3.76	3.46	3.33	3.50	4.27
1994	2.39	2.90	2.97	3.07	3.39	3.02	2.56	3.63	3.57	5.31	4.95	5.21	3.58
1993	3.48	3.36	3.82	3.95	4.01	4.52	2.43	1.61	1.37	1.94	2.12	2.25	2.90
1992	5.28	5.74	5.89	5.62	5.24	4.47	3.52	3.17	2.72	2.69	3.03	3.30	4.22
1991	3.80	4.12	3.96	4.77	5.04	5.04	4.49	5.78	5.59	5.24	5.20	5.25	4.86
1990	3.82	3.95	4.30	4.24	4.86	4.48	4.07	3.28	2.85	2.87	3.09	3.11	3.74
1989	2.18	2.24	2.74	2.45	3.02	4.80	4.82	4.04	4.06	3.76	3.53	3.36	3.42
1988	3.00	2.88	3.11	2.92	1.84	1.10	1.42	1.42	1.06	1.27	1.35	1.56	1.91
1987	3.74	4.02	3.84	3.17	3.06	3.30	3.13	2.56	2.81	2.50	2.98	3.15	3.19
1986	3.00	2.98	2.61	2.85	3.44	4.27	3.20	3.03	3.18	3.52	4.02	3.98	3.34
1985	3.29	3.53	3.67	3.67	3.36	2.17	2.23	1.40	1.87	3.10	3.40	3.29	2.92
1984	3.50	3.77	3.84	3.48	3.38	2.89	2.38	1.96	1.96	3.42	3.43	3.32	3.11
1983	3.65	3.89	4.12	3.52	4.22	4.29	3.43	3.79	3.84	3.34	3.44	3.64	3.76
1982	3.26	3.17	3.31	3.95	3.81	4.31	3.66	2.59	2.03	3.00	3.45	3.87	3.37
1981	1.64	1.80	1.99	1.81	2.13	2.77	2.99	2.70	3.30	3.54	3.43	3.16	2.61
1980	4.22	4.02	4.24	4.29	4.52	3.41	2.87	1.99	1.71	1.67	1.78	1.63	3.03
1979	2.46	2.90	3.53	3.73	4.22	3.67	4.07	3.78	4.50	4.48	4.43	4.34	3.84
1978	2.58	2.60	2.51	2.29	1.93	1.54	1.04	1.05	1.58	1.29	1.62	1.78	1.82
1977	3.12	3.10	3.35	3.37	2.68	2.47	2.05	2.48	2.47	2.13	2.25	2.25	2.64
1976	3.23	3.17	3.52	3.44	3.65	3.85	4.34	3.30	3.23	3.14	3.04	3.11	3.42
1975	4.84	5.03	4.96	5.01	5.23	5.06	4.57	3.68	3.28	3.45	3.51	3.36	4.33
1974	6.53	6.06	5.74	5.51	5.21	4.24	3.79	4.08	4.80	4.76	5.05	4.96	5.06
1973	3.46	3.41	3.99	4.45	4.02	5.03	5.14	4.99	5.85	6.40	6.29	6.24	4.94
1972	2.33	2.16	2.50	2.65	2.33	2.16	2.66	2.42	2.49	3.04	3.11	3.14	2.58
1971	1.66	1.76	1.60	1.37	1.55	1.07	1.11	1.09	1.32	1.49	1.68	1.96	1.47
1970	2.17	2.37	2.65	2.64	2.65	1.97	1.35	1.07	1.05	1.93	1.90	1.86	1.97
1969	4.24	4.33	4.81	4.98	5.22	4.01	3.25	2.14	1.89	2.06	2.13	2.25	3.44
1968	2.15	2.26	2.50	3.48	3.85	4.66	4.90	4.02	4.45	4.28	4.52	4.59	3.80
1967	1.88	1.98	1.98	2.13	2.45	2.28	2.43	1.91	1.66	1.56	1.46	1.70	1.95
1966	2.00	2.36	2.19	2.74	2.74	1.69	1.35	1.99	1.77	2.09	1.94	1.98	2.07
1965	1.07	1.56	1.96	1.67	2.26	1.87	1.13	0.93	1.71	1.23	1.34	1.75	1.54
1964	1.54	1.62	2.01	2.53	2.30	1.35	0.68	0.74	0.85	0.54	0.70	0.89	1.31
1963	2.77	2.75	2.47	2.51	2.14	2.26	2.24	1.52	1.66	0.98	1.26	1.35	1.99
1962	4.30	4.02	3.76	3.96	3.61	3.87	3.00	2.52	2.81	2.68	2.86	2.94	3.36
1961	4.50	4.51	4.90	4.44	3.78	4.13	4.63	3.83	4.77	4.29	4.27	4.39	4.37
1960	3.93	4.08	3.90	3.83	2.81	3.62	3.27	3.87	3.72	3.98	4.09	4.28	3.78
1959	3.61	3.75	3.59	3.91	3.49	3.26	4.44	4.08	3.67	3.96	3.87	3.95	3.80
1958	4.29	4.13	4.00	4.02	3.60	3.64	2.85	3.39	5.10	4.51	4.31	3.93	3.98
1957	0.32	0.69	1.51	2.92	2.73	3.47	2.81	2.32	2.86	3.82	4.48	4.28	2.68
1956	1.30	1.64	1.70	1.96	1.89	1.66	0.85	0.49	-0.75	-0.65	-0.33	-0.14	0.80
1955	0.89	1.28	1.43	1.81	2.01	1.15	0.96	1.46	1.03	1.04	1.04	1.09	1.27
1954	2.79	2.59	2.40	2.51	2.75	1.49	0.98	0.28	-0.37	0.24	0.51	0.63	1.40
1953	0.42	0.90	1.70	2.45	3.71	3.44	3.63	3.22	2.69	2.55	2.57	2.85	2.51
1952	1.56	1.80	1.97	2.26	2.47	1.57	1.75	0.94	0.17	-0.88	-0.31	0.07	1.11
1951	2.81	2.84	3.03	2.68	2.18	2.19	1.81	0.45	1.30	1.03	1.24	1.51	1.92
1950	3.57	3.99	3.97	4.03	4.66	4.78	4.34	3.34	3.38	2.97	2.89	2.78	3.73
1949	0.43	0.80	1.41	1.80	1.61	1.71	1.80	1.78	1.88	3.38	3.02	3.21	1.90
1948	-0.49	0.04	0.25	0.64	0.85	0.15	-0.07	-0.70	-1.22	-1.26	-0.52	-0.23	-0.21

Table B7. Quadrangle 613 Average Annual Reported Palmer Hydrologic Drought Index

Year	Division 5
1997	-0.02
1996	-2.75
1995	-2.91
1994	-2.21
1993	1.09
1992	5.86
1991	2.89
1990	0.08
1989	-1.82
1988	1.44
1987	6.21
1986	1.05
1985	1.53
1984	-0.03
1983	-0.40
1982	-0.13
1981	2.91
1980	-0.58
1979	2.92
1978	-0.16
1977	-0.48
1976	1.77
1975	5.04
1974	0.22
1973	1.03
1972	-0.28
1971	-1.21
1970	-0.60
1969	0.11
1968	0.98
1967	-2.12
1966	-0.48
1965	-2.29
1964	-2.52
1963	-1.59
1962	-1.97
1961	0.47
1960	0.56
1959	-0.43
1958	1.91
1957	-3.34
1956	-3.69
1955	-2.67
1954	-3.28
1953	-3.88
1952	-3.05
1951	-2.32
1950	-0.54
1949	1.07
1948	-2.50

Table B8. Quadrangle 613 Average Annual Reported Modified Palmer Drought Severity

Index

Year	Division 5
1997	0.18
1996	-2.24
1995	-2.97
1994	-2.15
1993	-0.11
1992	5.43
1991	2.53
1990	0.27
1989	-1.51
1988	0.29
1987	5.91
1986	1.02
1985	1.21
1984	0.02
1983	-0.11
1982	-0.81
1981	2.75
1980	-1.62
1979	2.39
1978	-0.03
1977	-0.73
1976	0.48
1975	4.83
1974	0.34
1973	0.49
1972	-0.11
1971	-1.11
1970	1.25
1969	-0.27
1968	0.90
1967	-1.73
1966	-0.48
1965	-2.02
1964	-2.50
1963	-1.81
1962	-1.84
1961	0.37
1960	0.31
1959	-0.48
1958	2.09
1957	-3.01
1956	-3.68
1955	-2.51
1954	-3.00
1953	-3.86
1952	-2.86
1951	-2.26
1950	-0.72
1949	1.33
1948	-2.43

Table B9. Quadrangle 710 Fox Hydrologic Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	6.54	8.19	8.17	9.87	9.84	10.38	8.31	6.41	5.19	5.82	6.93	8.55	7.85
1996	3.83	3.00	2.95	2.81	1.97	1.73	0.01	1.38	2.69	3.71	5.39	6.46	3.00
1995	6.00	6.25	6.88	7.31	8.12	7.61	5.68	5.14	4.93	4.02	5.10	4.82	5.99
1994	2.23	2.70	2.86	2.85	3.25	2.06	-0.96	0.14	0.02	2.84	3.17	5.59	2.23
1993	9.81	9.59	9.86	9.65	9.31	8.80	4.23	1.24	1.14	1.76	1.89	2.16	5.79
1992	13.58	16.15	16.08	14.76	15.18	14.10	12.04	9.73	8.42	7.26	8.74	9.41	12.12
1991	7.40	7.92	7.50	8.58	8.36	7.79	6.42	5.93	6.09	6.25	5.97	12.05	7.52
1990	1.02	2.19	3.21	4.16	3.87	1.66	1.69	-0.06	0.19	0.88	2.14	2.09	1.92
1989	2.73	2.95	3.58	3.11	3.68	3.61	2.27	1.50	0.49	0.64	0.87	0.48	2.16
1988	4.66	4.23	4.49	4.16	3.74	3.40	2.72	1.51	0.41	0.31	0.18	0.66	2.54
1987	6.82	7.72	7.10	5.95	6.51	7.70	6.54	4.48	4.61	3.36	4.78	5.19	5.90
1986	5.06	5.96	5.14	4.34	5.01	4.82	2.41	1.74	2.39	4.24	5.04	7.32	4.46
1985	3.55	4.45	5.13	5.28	4.76	4.31	2.94	0.75	1.59	2.92	5.30	5.41	3.87
1984	3.47	3.20	3.38	2.08	1.22	0.85	0.30	-1.04	-1.86	1.22	1.71	3.19	1.48
1983	3.76	4.98	6.40	4.48	5.15	4.28	3.43	3.34	3.11	2.98	3.45	3.26	4.05
1982	4.89	4.67	4.61	5.25	5.51	4.93	2.97	1.66	0.78	1.16	2.69	3.24	3.53
1981	2.34	2.77	3.73	3.74	4.10	6.51	5.42	4.60	4.93	6.27	5.92	5.07	4.62
1980	5.19	5.39	5.77	5.72	5.94	3.55	1.53	0.11	0.91	0.80	1.90	1.93	3.23
1979	4.98	5.96	7.31	7.70	8.22	6.67	7.27	5.79	5.17	4.32	3.99	4.97	6.03
1978	2.46	3.35	3.39	3.26	3.22	2.69	0.99	0.12	0.48	0.06	3.01	3.69	2.23
1977	8.33	8.59	8.33	9.93	8.26	6.63	4.25	2.38	2.03	1.72	2.51	1.96	5.41
1976	6.01	5.49	5.91	9.06	8.98	7.97	7.86	5.90	5.85	7.05	7.37	8.39	7.15
1975	7.48	8.13	7.26	7.74	8.98	9.04	7.93	7.52	7.23	7.04	6.31	6.46	7.59
1974	7.48	6.45	6.18	5.71	5.88	4.29	2.77	5.02	5.33	5.74	7.79	7.83	5.87
1973	5.58	6.19	6.86	7.14	6.05	5.91	5.42	3.22	4.56	7.12	7.15	6.53	5.98
1972	4.30	3.66	2.97	2.98	3.51	3.29	2.72	2.53	1.78	2.88	3.70	3.48	3.15
1971	0.76	1.13	0.61	0.64	0.34	-0.54	-0.75	0.06	0.62	1.35	2.44	4.06	0.89
1970	6.56	7.97	8.18	7.59	7.90	5.31	3.11	1.57	2.51	3.14	1.92	1.57	4.78
1969	6.12	7.08	7.74	8.90	7.91	6.49	4.53	4.82	4.33	5.10	5.18	6.54	6.23
1968	8.35	8.44	8.36	8.45	8.75	8.52	7.45	5.12	5.65	4.59	6.45	6.54	7.22
1967	2.28	2.43	2.23	2.87	3.34	0.42	-0.69	-0.77	0.97	1.97	3.20	3.94	1.85
1966	7.80	8.56	7.54	8.50	8.04	6.22	3.76	4.06	4.58	3.72	2.68	2.77	5.68
1965	4.85	7.38	6.87	7.11	8.23	6.58	4.63	3.35	4.38	4.79	6.16	7.79	6.01
1964	1.52	1.97	2.57	2.47	1.76	1.95	0.15	-0.16	1.38	1.44	2.50	2.57	1.68
1963	3.54	4.06	3.45	3.59	2.32	1.29	-0.19	-1.69	-1.26	-1.51	-0.45	0.14	1.11
1962	7.97	7.39	6.54	7.05	5.79	5.92	3.69	1.57	1.96	2.57	3.24	4.13	4.82
1961	9.64	11.04	10.06	9.01	7.21	8.34	8.81	7.07	8.25	7.96	8.31	8.40	8.67
1960	7.94	8.43	7.85	8.06	6.17	6.12	5.01	4.35	3.10	6.65	7.43	9.25	6.70
1959	5.66	6.38	5.11	6.21	5.36	4.96	4.27	5.32	5.18	6.91	6.98	7.78	5.84
1958	6.88	9.10	8.86	8.58	7.58	7.33	6.10	5.03	6.47	6.79	6.49	6.39	7.13
1957	-1.35	-0.29	1.15	5.03	5.10	5.13	3.05	1.41	2.98	5.46	6.55	6.33	3.38
1956	0.65	1.24	0.65	-0.02	-0.43	-1.41	-2.25	-2.72	-4.24	-4.04	-2.96	-1.91	-1.45
1955	-0.47	1.37	1.38	1.48	2.01	1.94	1.02	1.00	0.53	-0.32	-0.18	0.13	0.83
1954	3.97	3.29	2.42	2.37	1.77	-0.08	-0.98	-1.89	-2.51	-2.27	-1.64	-1.57	0.24
1953	0.55	1.14	1.41	2.34	2.12	0.55	-0.33	-0.08	0.28	2.27	2.28	4.17	1.39
1952	-0.90	-0.04	0.53	2.03	2.31	1.40	0.72	-1.26	-1.51	-3.34	-1.05	0.42	-0.06
1951	-0.88	0.16	1.11	0.87	0.96	0.68	-0.66	-2.23	-0.79	-1.14	-0.88	-0.92	-0.31
1950	1.86	3.26	2.80	3.86	3.42	2.73	2.57	0.88	1.25	0.77	0.18	-0.78	1.90
1949	0.10	1.02	1.70	3.80	2.30	2.41	1.56	0.60	0.25	1.24	0.34	1.89	1.43
1948	-0.76	0.30	0.56	0.83	0.82	0.13	-0.81	-2.16	-3.08	-3.00	-2.73	-2.01	-0.99

Table B10. Quadrangle 710 Fox Drought Severity Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	6.54	8.19	8.17	9.87	9.84	10.38	8.31	6.41	5.19	5.82	6.93	8.55	7.85
1996	3.83	3.00	2.95	2.81	1.97	1.73	0.01	1.38	2.69	3.71	5.39	6.46	3.00
1995	6.00	6.25	6.88	7.31	8.12	7.61	5.68	5.14	4.93	4.02	5.10	4.82	5.99
1994	2.23	2.70	2.86	2.85	3.25	2.06	-0.96	0.14	0.02	2.84	3.17	5.59	2.23
1993	9.81	9.59	9.86	9.65	9.31	8.80	4.23	1.24	1.14	1.76	1.89	2.16	5.79
1992	13.58	16.15	16.08	14.76	15.18	14.10	12.04	9.73	8.42	7.26	8.74	9.41	12.12
1991	7.40	7.92	7.50	8.58	8.36	7.79	6.42	5.93	6.09	6.25	5.97	12.05	7.52
1990	1.02	2.19	3.21	4.16	3.87	1.66	1.69	-0.06	0.19	0.88	2.14	2.09	1.92
1989	2.73	2.95	3.58	3.11	3.68	3.61	2.27	1.50	0.49	0.64	0.87	0.48	2.16
1988	4.66	4.23	4.49	4.16	3.74	3.40	2.72	1.51	0.41	0.31	0.18	0.66	2.54
1987	6.82	7.72	7.10	5.95	6.51	7.70	6.54	4.48	4.61	3.36	4.78	5.19	5.90
1986	5.06	5.96	5.14	4.34	5.01	4.82	2.41	1.74	2.39	4.24	5.04	7.32	4.46
1985	3.55	4.45	5.13	5.28	4.76	4.31	2.94	0.75	1.59	2.92	5.30	5.41	3.87
1984	3.47	3.20	3.38	2.08	1.22	0.85	0.30	-1.04	-1.86	1.22	1.71	3.19	1.48
1983	3.76	4.98	6.40	4.48	5.15	4.28	3.43	3.34	3.11	2.98	3.45	3.26	4.05
1982	4.89	4.67	4.61	5.25	5.51	4.93	2.97	1.66	0.78	1.16	2.69	3.24	3.53
1981	2.34	2.77	3.73	3.74	4.10	6.51	5.42	4.60	4.93	6.27	5.92	5.07	4.62
1980	5.19	5.39	5.77	5.72	5.94	3.55	1.53	0.11	0.91	0.80	1.90	1.93	3.23
1979	4.98	5.96	7.31	7.70	8.22	6.67	7.27	5.79	5.17	4.32	3.99	4.97	6.03
1978	2.46	3.35	3.39	3.26	3.22	2.69	0.99	0.12	0.48	0.06	3.01	3.69	2.23
1977	8.33	8.59	8.33	9.93	8.26	6.63	4.25	2.38	2.03	1.72	2.51	1.96	5.41
1976	6.01	5.49	5.91	9.06	8.98	7.97	7.86	5.90	5.85	7.05	7.37	8.39	7.15
1975	7.48	8.13	7.26	7.74	8.98	9.04	7.93	7.52	7.23	7.04	6.31	6.46	7.59
1974	7.48	6.45	6.18	5.71	5.88	4.29	2.77	5.02	5.33	5.74	7.79	7.83	5.87
1973	5.58	6.19	6.86	7.14	6.05	5.91	5.42	3.22	4.56	7.12	7.15	6.53	5.98
1972	4.30	3.66	2.97	2.98	3.51	3.29	2.72	2.53	1.78	2.88	3.70	3.48	3.15
1971	0.76	1.13	0.61	0.64	0.34	-0.54	-0.75	0.06	0.62	1.35	2.44	4.06	0.89
1970	6.56	7.97	8.18	7.59	7.90	5.31	3.11	1.57	2.51	3.14	1.92	1.57	4.78
1969	6.12	7.08	7.74	8.90	7.91	6.49	4.53	4.82	4.33	5.10	5.18	6.54	6.23
1968	8.35	8.44	8.36	8.45	8.75	8.52	7.45	5.12	5.65	4.59	6.45	6.54	7.22
1967	2.28	2.43	2.23	2.87	3.34	0.42	-0.69	-0.77	0.97	1.97	3.20	3.94	1.85
1966	7.80	8.56	7.54	8.50	8.04	6.22	3.76	4.06	4.58	3.72	2.68	2.77	5.68
1965	4.85	7.38	6.87	7.11	8.23	6.58	4.63	3.35	4.38	4.79	6.16	7.79	6.01
1964	1.52	1.97	2.57	2.47	1.76	1.95	0.15	-0.16	1.38	1.44	2.50	2.57	1.68
1963	3.54	4.06	3.45	3.59	2.32	1.29	-0.19	-1.69	-1.26	-1.51	-0.45	0.14	1.11
1962	7.97	7.39	6.54	7.05	5.79	5.92	3.69	1.57	1.96	2.57	3.24	4.13	4.82
1961	9.64	11.04	10.06	9.01	7.21	8.34	8.81	7.07	8.25	7.96	8.31	8.40	8.67
1960	7.94	8.43	7.85	8.06	6.17	6.12	5.01	4.35	3.10	6.65	7.43	9.25	6.70
1959	5.66	6.38	5.11	6.21	5.36	4.96	4.27	5.32	5.18	6.91	6.98	7.78	5.84
1958	6.88	9.10	8.86	8.58	7.58	7.33	6.10	5.03	6.47	6.79	6.49	6.39	7.13
1957	-1.35	-0.29	1.15	5.03	5.10	5.13	3.05	1.41	2.98	5.46	6.55	6.33	3.38
1956	0.65	1.24	0.65	-0.02	-0.43	-1.41	-2.25	-2.72	-4.24	-4.04	-2.96	-1.91	-1.45
1955	-0.47	1.37	1.38	1.48	2.01	1.94	1.02	1.00	0.53	-0.32	-0.18	0.13	0.83
1954	3.97	3.29	2.42	2.37	1.77	-0.08	-0.98	-1.89	-2.51	-2.27	-1.64	-1.57	0.24
1953	0.55	1.14	1.41	2.34	2.12	0.55	-0.33	-0.08	0.28	2.27	2.28	4.17	1.39
1952	-0.89	-0.04	0.53	2.03	2.31	1.41	0.73	-1.26	-1.50	-3.34	-1.05	0.42	-0.05
1951	-0.87	0.18	1.12	0.88	0.97	0.69	-0.65	-2.22	-0.78	-1.14	-0.88	-0.91	-0.30
1950	1.91	3.31	2.84	3.90	3.46	2.76	2.60	0.90	1.28	0.79	0.20	-0.76	1.93
1949	0.31	1.21	1.87	3.95	2.43	2.53	1.67	0.70	0.34	1.32	0.41	1.95	1.56
1948	0.01	0.99	1.18	1.39	1.32	0.58	-0.41	-1.80	-2.75	-2.71	-2.47	-1.78	-0.54

Table B11. Quadrangle 710 Average Annual Reported Palmer Hydrologic Drought

Index

Year	Division 7
1997	1.46
1996	-2.83
1995	1.54
1994	-0.27
1993	3.51
1992	5.14
1991	1.07
1990	-2.70
1989	-2.94
1988	-1.14
1987	2.90
1986	0.47
1985	1.62
1984	-1.25
1983	1.14
1982	0.52
1981	1.39
1980	-0.07
1979	2.96
1978	-1.26
1977	2.59
1976	1.72
1975	2.37
1974	2.68
1973	3.54
1972	2.16
1971	-2.28
1970	1.62
1969	2.63
1968	4.05
1967	-1.64
1966	1.02
1965	-0.13
1964	-2.78
1963	-3.92
1962	-2.20
1961	2.75
1960	2.28
1959	2.10
1958	2.88
1957	-1.38
1956	-5.71
1955	-4.71
1954	-3.86
1953	-1.96
1952	-3.31
1951	-3.64
1950	-0.99
1949	-0.14
1948	-1.73

Table B12. Quadrangle 710 Average Annual Reported Modified Palmer Drought

Severity Index

Year	Division 7
1997	1.49
1996	-2.52
1995	1.19
1994	-0.11
1993	2.78
1992	4.92
1991	1.32
1990	-2.45
1989	-2.88
1988	-1.65
1987	2.54
1986	0.21
1985	1.39
1984	-1.06
1983	1.03
1982	0.31
1981	1.47
1980	-0.30
1979	2.72
1978	-1.01
1977	1.77
1976	0.48
1975	2.01
1974	1.94
1973	3.36
1972	-1.32
1971	-1.02
1970	1.36
1969	2.06
1968	4.02
1967	-1.34
1966	0.85
1965	0.02
1964	-2.63
1963	-3.89
1962	-2.24
1961	2.10
1960	2.13
1959	1.93
1958	2.36
1957	-0.00
1956	-5.71
1955	-4.69
1954	-3.82
1953	-1.30
1952	-3.26
1951	-3.45
1950	-0.96
1949	-0.30
1948	-1.57

Table B13. Quadrangle 1010 Fox Hydrologic Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	1 21	1 28	1 99	2 61	2 87	2 30	-0 11	-0 83	-0 36	1 61	1 95	1 51	1 34
1996	2 37	1 81	1 34	1 15	0 24	0 00	-1 53	-0 89	-0 66	0 41	0 80	1 14	0 51
1995	2 39	2 77	3 65	2 90	2 17	1 70	0 64	1 31	1 74	2 52	3 37	3 12	2 36
1994	2 12	1 88	2 87	2 79	2 19	1 95	1 10	0 54	0 59	1 30	0 81	1 91	1 67
1993	2 47	2 90	3 55	3 63	4 18	4 89	2 68	1 81	1 48	1 62	1 46	2 24	2 74
1992	3 53	4 21	4 59	4 80	5 38	4 86	3 43	2 85	2 54	2 20	2 61	2 54	3 63
1991	0 15	0 49	0 70	1 16	1 52	2 20	1 37	0 61	1 40	1 74	1 32	2 59	1 27
1990	0 00	0 74	1 70	1 88	1 44	0 04	-0 24	-0 95	-0 79	-0 58	-0 34	-0 28	0 22
1989	0 85	0 71	0 44	0 74	-0 24	-0 28	-0 26	-0 47	-0 21	-0 62	-0 30	-0 10	0 02
1988	1 89	2 06	2 16	1 72	0 78	0 07	0 07	0 14	0 66	0 70	0 63	0 56	0 95
1987	2 03	2 82	2 48	2 00	2 17	2 75	2 45	1 60	1 38	1 52	1 90	1 90	2 08
1986	2 39	2 39	1 94	1 69	1 87	1 78	0 11	0 15	-0 13	0 61	1 04	1 91	1 31
1985	0 76	1 16	1 44	1 66	1 65	1 71	0 65	0 18	1 16	1 95	2 36	2 35	1 42
1984	2 38	2 07	1 45	0 06	-0 15	-0 81	-1 01	-1 38	-1 29	-0 69	-0 49	0 09	0 02
1983	0 24	1 16	1 15	0 19	-0 05	0 31	1 15	0 85	1 42	1 56	1 96	1 82	0 98
1982	1 75	2 74	2 16	1 87	1 85	1 13	0 03	0 08	-0 70	-0 55	-0 08	0 23	0 88
1981	0 53	0 76	1 08	1 05	1 95	2 57	2 34	2 65	2 14	2 87	2 54	2 32	1 90
1980	1 30	1 26	0 92	0 02	0 14	-1 96	-2 33	-0 56	-0 33	-0 48	0 21	0 03	-0 15
1979	1 75	1 58	1 60	2 47	2 12	2 20	2 17	1 89	2 68	1 63	1 33	1 33	1 90
1978	0 66	0 76	-0 16	0 04	-0 83	-0 11	-0 31	-0 62	0 39	0 57	0 83	1 22	0 20
1977	3 31	3 19	2 72	3 04	2 42	2 25	0 90	0 09	0 12	0 40	0 80	0 30	1 63
1976	1 38	0 58	0 31	1 64	1 77	0 97	2 08	1 46	1 45	2 26	2 98	3 17	1 67
1975	1 32	1 12	0 50	-0 20	0 59	0 25	0 33	1 04	1 53	1 50	1 48	1 51	0 91
1974	2 13	1 55	2 28	1 47	1 41	1 22	0 19	-0 14	0 15	0 34	0 82	0 82	1 02
1973	2 08	2 20	1 49	1 41	0 36	1 97	0 94	1 28	1 98	3 14	2 69	2 04	1 80
1972	1 72	2 29	2 18	2 32	2 49	2 74	2 57	2 24	2 33	1 69	2 12	1 67	2 20
1971	0 52	0 26	-0 64	-0 39	-0 47	-0 88	-1 86	-0 36	0 96	1 26	1 14	1 66	0 10
1970	1 45	1 39	1 44	0 83	1 41	1 09	0 49	0 79	1 32	1 55	1 29	0 90	1 16
1969	1 79	2 22	1 92	1 90	1 74	0 23	-1 05	-0 93	-0 63	-0 21	0 99	1 03	0 75
1968	1 66	2 06	1 85	1 64	2 36	3 24	3 18	2 36	2 53	2 62	2 36	1 98	2 32
1967	0 62	0 86	0 24	-0 51	-0 63	-1 63	-2 30	-1 42	0 98	1 20	1 01	1 12	-0 04
1966	1 29	1 34	0 97	1 43	2 54	2 37	1 48	1 08	0 88	0 82	0 28	0 09	1 21
1965	-1 04	-0 30	-0 34	-0 69	-0 25	-0 54	-1 62	-1 50	-0 88	-0 44	-0 02	0 84	-0 56
1964	-0 62	-0 29	-0 43	-0 83	-0 66	-1 47	-1 34	-2 41	-1 86	-2 01	-1 93	-1 33	-1 26
1963	-0 97	-0 68	-1 25	-1 54	-1 82	-1 75	-2 13	-2 47	-1 98	-1 58	-1 12	-0 88	-1 51
1962	0 53	0 08	0 06	0 06	-0 76	-0 36	-1 84	-2 30	-2 10	-1 99	-1 64	-0 93	-0 93
1961	3 96	3 89	2 62	2 54	0 87	1 01	0 96	0 68	1 08	0 51	0 66	0 57	1 61
1960	1 58	1 67	1 58	1 73	1 03	1 05	-0 08	0 54	0 48	2 13	2 55	4 16	1 53
1959	1 62	2 34	1 49	1 46	1 18	1 47	0 54	1 06	0 84	1 30	1 33	1 45	1 34
1958	2 50	3 42	3 06	2 12	1 49	0 77	0 26	-0 64	0 42	1 36	1 32	1 66	1 48
1957	-1 55	-0 74	-0 16	0 17	0 48	0 62	-1 44	-1 75	-1 27	-1 21	-0 24	-0 30	-0 62
1956	-0 83	-0 75	-0 91	0 16	0 05	-0 70	-1 63	-1 74	-2 14	-1 69	-1 63	-1 52	-1 11
1955	-1 03	-0 86	-1 33	-1 93	-2 33	-3 22	-3 40	-3 28	-1 75	-1 50	-0 99	-0 88	-1 87
1954	-0 86	-1 19	-1 19	-0 46	-0 84	-0 82	-1 68	-2 00	-1 83	-1 23	-1 20	-1 30	-1 22
1953	-1 78	-1 44	-1 63	-1 79	-2 12	-3 53	-3 75	-1 72	-1 77	-1 21	-1 23	-0 90	-1 91
1952	-1 22	-1 18	-1 21	-1 05	-0 90	-1 33	-1 28	-2 29	-1 97	-2 79	-2 09	-1 87	-1 60
1951	-1 72	-1 60	-0 82	-0 97	-1 19	-1 25	-2 26	-2 93	-1 44	-1 33	-1 07	-1 18	-1 48
1950	0 70	0 76	0 64	0 60	0 87	0 46	-0 04	-0 78	-0 82	-1 46	-1 44	-1 78	-0 19
1949	0 15	0 65	0 75	1 66	0 84	0 24	0 50	0 02	0 35	1 28	0 46	0 70	0 63
1948	-1 02	-0 49	-0 07	-0 23	-0 42	-0 48	-1 20	-0 97	-0 22	-0 08	-0 06	-0 16	-0 45

Table B14. Quadrangle 1010 Fox Drought Severity Index

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1997	1.21	1.28	1.99	2.61	2.87	2.30	-0.11	-0.83	-0.36	1.61	1.95	1.51	1.34
1996	2.37	1.81	1.34	1.15	0.24	0.00	-1.53	-0.89	-0.66	0.41	0.80	1.14	0.51
1995	2.39	2.77	3.65	2.90	2.17	1.70	0.64	1.31	1.74	2.52	3.37	3.12	2.36
1994	2.12	1.88	2.87	2.79	2.19	1.95	1.10	0.54	0.59	1.30	0.81	1.91	1.67
1993	2.47	2.90	3.55	3.63	4.18	4.89	2.68	1.81	1.48	1.62	1.46	2.24	2.74
1992	3.53	4.21	4.59	4.80	5.38	4.86	3.43	2.85	2.54	2.20	2.61	2.54	3.63
1991	0.15	0.49	0.70	1.16	1.52	2.20	1.37	0.61	1.40	1.74	1.32	2.59	1.27
1990	0.00	0.74	1.70	1.88	1.44	0.04	-0.24	-0.95	-0.79	-0.58	-0.34	-0.28	0.22
1989	0.85	0.71	0.44	0.74	-0.24	-0.28	-0.26	-0.47	-0.21	-0.62	-0.30	-0.10	0.02
1988	1.89	2.06	2.16	1.72	0.78	0.07	0.07	0.14	0.66	0.70	0.63	0.56	0.95
1987	2.03	2.82	2.48	2.00	2.17	2.75	2.45	1.60	1.38	1.52	1.90	1.90	2.08
1986	2.39	2.39	1.94	1.69	1.87	1.78	0.11	0.15	-0.13	0.61	1.04	1.91	1.31
1985	0.76	1.16	1.44	1.66	1.65	1.71	0.65	0.18	1.16	1.95	2.36	2.35	1.42
1984	2.38	2.07	1.45	0.06	-0.15	-0.81	-1.01	-1.38	-1.29	-0.69	-0.49	0.09	0.02
1983	0.24	1.16	1.15	0.19	-0.05	0.31	1.15	0.85	1.42	1.56	1.96	1.82	0.98
1982	1.75	2.74	2.16	1.87	1.85	1.13	0.03	0.08	-0.70	-0.55	-0.08	0.23	0.88
1981	0.53	0.76	1.08	1.05	1.95	2.57	2.34	2.65	2.14	2.87	2.54	2.32	1.90
1980	1.30	1.26	0.92	0.02	0.14	-1.96	-2.33	-0.56	-0.33	-0.48	0.21	0.03	-0.15
1979	1.75	1.58	1.60	2.47	2.12	2.20	2.17	1.89	2.68	1.63	1.33	1.33	1.90
1978	0.66	0.76	-0.16	0.04	-0.83	-0.11	-0.31	-0.62	0.39	0.57	0.83	1.22	0.20
1977	3.31	3.19	2.72	3.04	2.42	2.25	0.90	0.09	0.12	0.40	0.80	0.30	1.63
1976	1.38	0.58	0.31	1.64	1.77	0.97	2.08	1.46	1.45	2.26	2.98	3.17	1.67
1975	1.32	1.12	0.50	-0.20	0.59	0.25	0.33	1.04	1.53	1.50	1.48	1.51	0.91
1974	2.13	1.55	2.28	1.47	1.41	1.22	0.19	-0.14	0.15	0.34	0.82	0.82	1.02
1973	2.08	2.20	1.49	1.41	0.36	1.97	0.94	1.28	1.98	3.14	2.69	2.04	1.80
1972	1.72	2.29	2.18	2.32	2.49	2.74	2.57	2.24	2.33	1.69	2.12	1.67	2.20
1971	0.52	0.26	-0.64	-0.39	-0.47	-0.88	-1.86	-0.36	0.96	1.26	1.14	1.66	0.10
1970	1.45	1.39	1.44	0.83	1.41	1.09	0.49	0.79	1.32	1.55	1.29	0.90	1.16
1969	1.79	2.22	1.92	1.90	1.74	0.23	-1.05	-0.93	-0.63	-0.21	0.99	1.03	0.75
1968	1.66	2.06	1.85	1.64	2.36	3.24	3.18	2.36	2.53	2.62	2.36	1.98	2.32
1967	0.62	0.86	0.24	-0.51	-0.63	-1.63	-2.30	-1.42	0.98	1.20	1.01	1.12	-0.04
1966	1.29	1.34	0.97	1.43	2.54	2.37	1.48	1.08	0.88	0.82	0.28	0.09	1.21
1965	-1.04	-0.30	-0.34	-0.69	-0.25	-0.54	-1.62	-1.50	-0.88	-0.44	-0.02	0.84	-0.56
1964	-0.62	-0.29	-0.43	-0.83	-0.66	-1.47	-1.34	-2.41	-1.86	-2.01	-1.93	-1.33	-1.26
1963	-0.97	-0.68	-1.25	-1.54	-1.82	-1.75	-2.13	-2.47	-1.98	-1.58	-1.12	-0.88	-1.51
1962	0.53	0.08	0.06	0.06	-0.76	-0.36	-1.84	-2.30	-2.10	-1.99	-1.64	-0.93	-0.93
1961	3.96	3.89	2.62	2.54	0.87	1.01	0.96	0.68	1.08	0.51	0.66	0.57	1.61
1960	1.58	1.67	1.58	1.73	1.03	1.05	-0.08	0.54	0.48	2.13	2.55	4.16	1.53
1959	1.62	2.34	1.49	1.46	1.18	1.47	0.54	1.06	0.84	1.30	1.33	1.45	1.34
1958	2.50	3.42	3.06	2.12	1.49	0.77	0.26	-0.64	0.42	1.36	1.32	1.66	1.48
1957	-1.55	-0.74	-0.16	0.17	0.48	0.62	-1.44	-1.75	-1.27	-1.21	-0.24	-0.30	-0.62
1956	-0.83	-0.75	-0.91	0.16	0.05	-0.70	-1.63	-1.74	-2.14	-1.69	-1.63	-1.52	-1.11
1955	-1.03	-0.86	-1.33	-1.93	-2.33	-3.22	-3.40	-3.28	-1.75	-1.50	-0.99	-0.88	-1.87
1954	-0.86	-1.19	-1.19	-0.46	-0.84	-0.82	-1.68	-2.00	-1.83	-1.23	-1.20	-1.30	-1.22
1953	-1.78	-1.44	-1.63	-1.79	-2.12	-3.53	-3.75	-1.72	-1.77	-1.21	-1.23	-0.90	-1.91
1952	-1.22	-1.18	-1.21	-1.05	-0.90	-1.32	-1.28	-2.28	-1.97	-2.79	-2.09	-1.87	-1.60
1951	-1.71	-1.59	-0.82	-0.97	-1.19	-1.24	-2.25	-2.93	-1.44	-1.32	-1.07	-1.18	-1.48
1950	0.73	0.79	0.67	0.62	0.89	0.48	-0.02	-0.76	-0.81	-1.45	-1.43	-1.78	-0.17
1949	0.27	0.75	0.84	1.74	0.91	0.30	0.56	0.08	0.40	1.32	0.50	0.73	0.70
1948	-0.60	-0.11	0.27	0.08	-0.15	-0.24	-0.98	-0.77	-0.04	0.08	0.08	-0.03	-0.20

Table B14. Quadrangle 1010 Average Annual Reported Palmer Hydrologic Index

Year	Division 7
1997	1.46
1996	-2.83
1995	1.54
1994	-0.27
1993	3.51
1992	5.14
1991	1.07
1990	-2.70
1989	-2.94
1988	-1.14
1987	2.90
1986	0.47
1985	1.62
1984	-1.25
1983	1.14
1982	0.52
1981	1.39
1980	-0.07
1979	2.96
1978	-1.26
1977	2.59
1976	1.72
1975	2.37
1974	2.68
1973	3.54
1972	2.16
1971	-2.28
1970	1.62
1969	2.63
1968	4.05
1967	-1.64
1966	1.02
1965	-0.13
1964	-2.78
1963	-3.92
1962	-2.20
1961	2.75
1960	2.28
1959	2.10
1958	2.88
1957	-1.38
1956	-5.71
1955	-4.71
1954	-3.86
1953	-1.96
1952	-3.31
1951	-3.64
1950	-0.99
1949	-0.14
1948	-1.73

Table B15. Quadrangle 1010 Average Annual Reported Modified Palmer Drought

Severity Index

Year	Division 7
1997	1.49
1996	-2.52
1995	1.19
1994	-0.11
1993	2.78
1992	4.92
1991	1.32
1990	-2.45
1989	-2.88
1988	-1.65
1987	2.54
1986	0.21
1985	1.39
1984	-1.06
1983	1.03
1982	0.31
1981	1.47
1980	-0.30
1979	2.72
1978	-1.01
1977	1.77
1976	0.48
1975	2.01
1974	1.94
1973	3.36
1972	-1.32
1971	-1.02
1970	1.36
1969	2.06
1968	4.02
1967	-1.34
1966	0.85
1965	0.02
1964	-2.63
1963	-3.89
1962	-2.24
1961	2.10
1960	2.13
1959	1.93
1958	2.36
1957	-0.00
1956	-5.71
1955	-4.69
1954	-3.82
1953	-1.30
1952	-3.26
1951	-3.45
1950	-0.96
1949	-0.30
1948	-1.57

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