

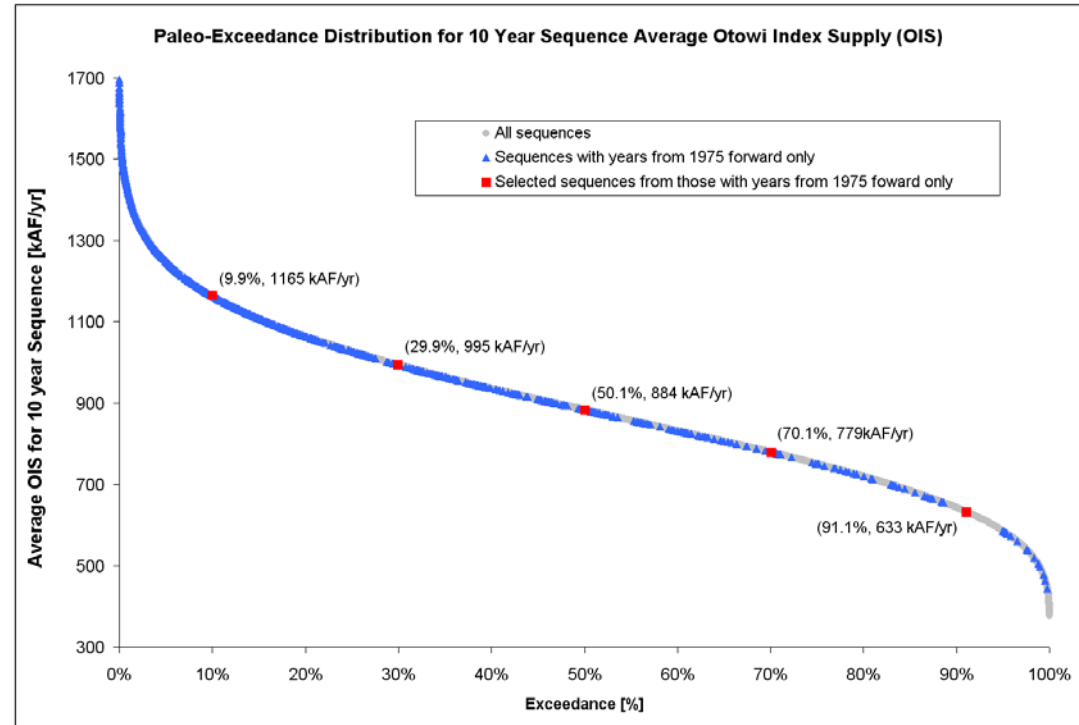
Development of Synthetic Flow Sequences for URGSIM and URGWOM Planning Model Runs



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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.

Steps in synthetic sequence generation

1. Selection of a Palmer Drought Severity Index (PDSI) reconstruction representative of flows at Otowi
2. Development of a transient transition probability matrix
3. Sample 1950-2004 data to develop 1000, 100 year sequences
4. Select 5 ten year sequences from 1000, 100 year sequences for analysis by URGWOM



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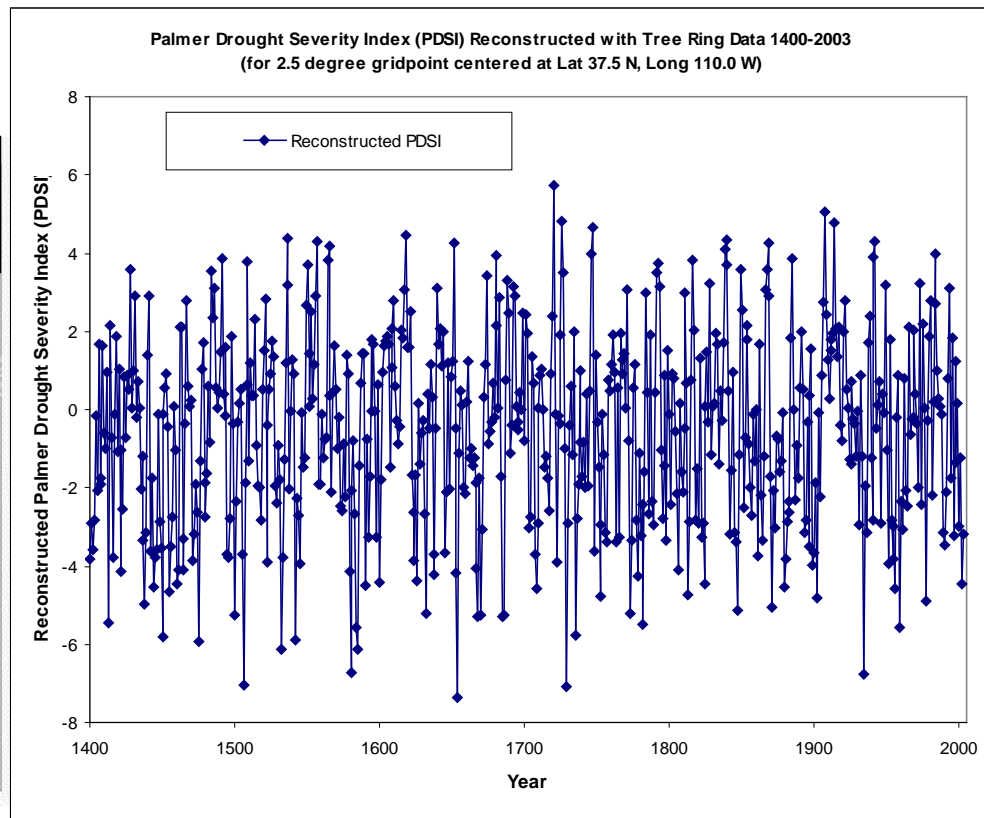
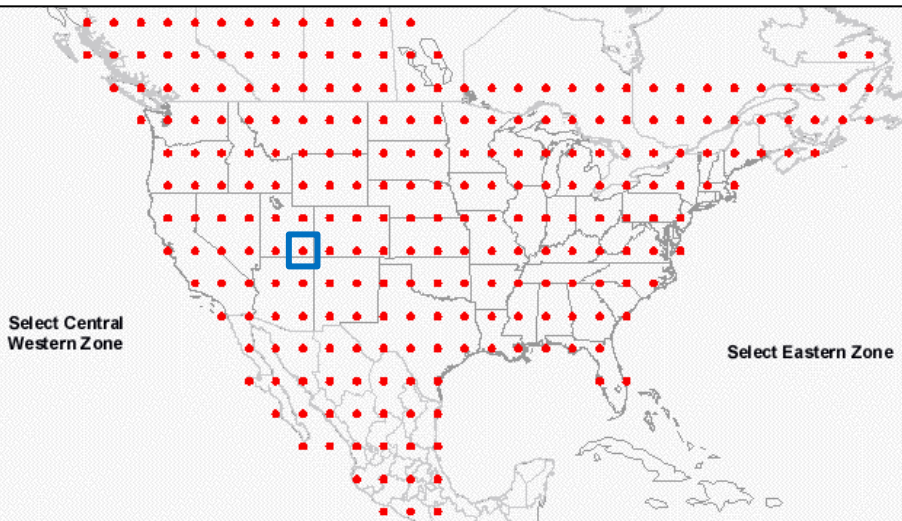


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Selection of PDSI reconstruction

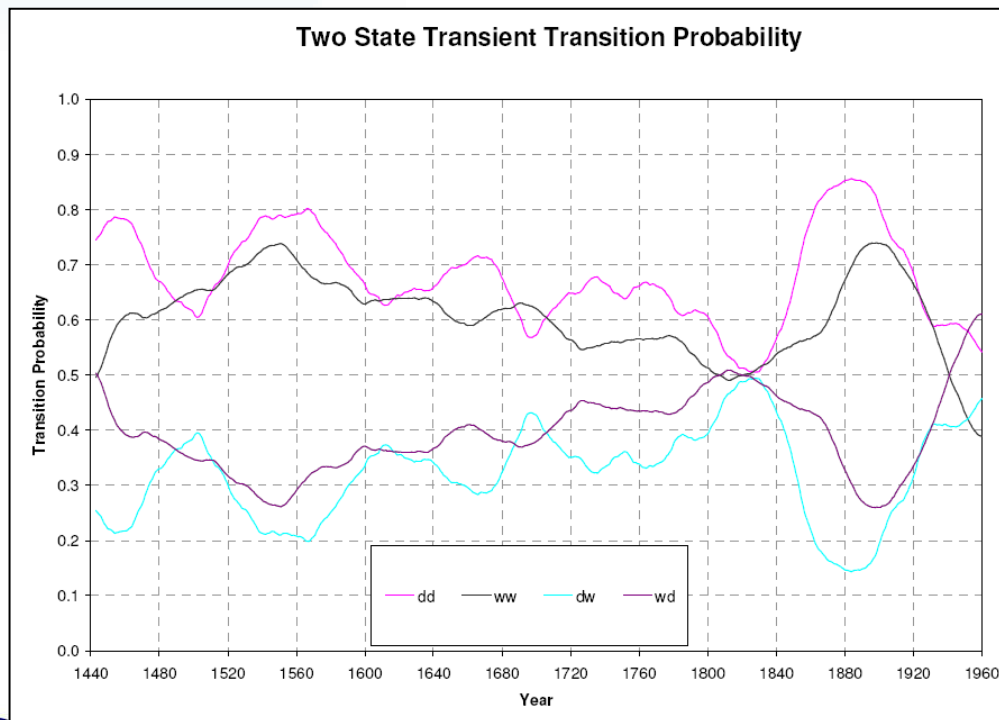
1. Selection of a Palmer Drought Severity Index (PDSI) reconstruction representative of flows at Otowi
 - a) Correlation analysis of 1940-2003 period of overlap between Otowi Index (OI) flows and reconstructed PDSI time series.
 - b) Selection of most representative reconstruction

Gridded time series reconstructions of PDSI available from www.ncdc.noaa.gov/paleo/newpdsi.html (last accessed 10.12.2010)
Each point represents a 2.5 degree square grid



Development of transient transition probability matrix

1. Selection of a Palmer Drought Severity Index (PDSI) reconstruction representative of flows at Otowi
2. Development of a transient transition probability matrix
 - a) Define all PDSI ≤ 0 as “dry”, >0 as “wet”
 - b) Develop transient transitions (probabilities of wet to wet or wet to dry, or dry to wet or dry to dry from 1400-2003)



From Gangopadhyay & Harding,
technical memo to Nabil Shafiqe, June 24, 2008

Sample 1950-2004 data to develop sequences

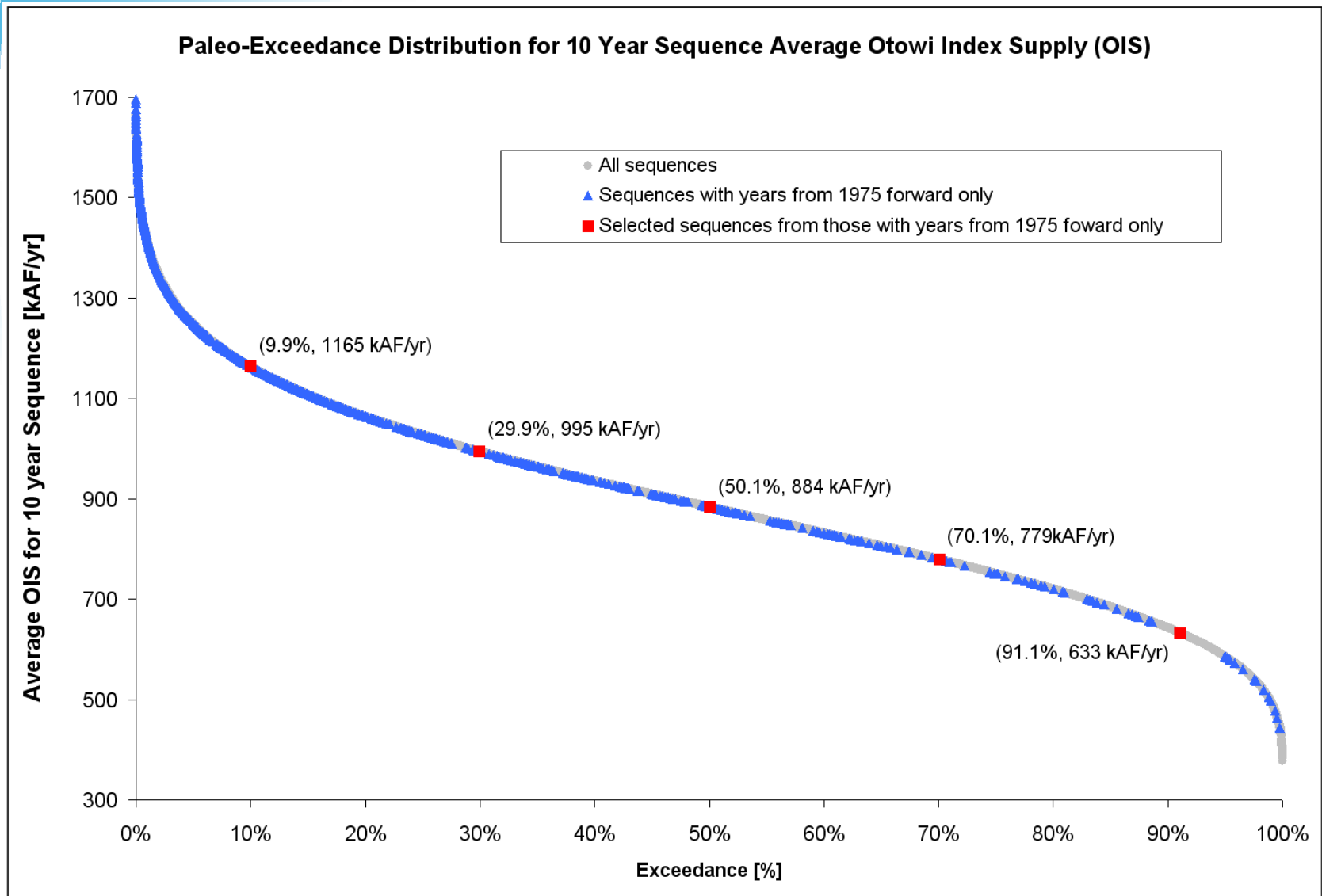
1. Selection of a Palmer Drought Severity Index (PDSI) reconstruction representative of flows at Otowi
2. Development of a transient transition probability matrix
3. Sample 1950-2004 data to develop 1000, 100 year sequences
 - a) Define all years with OI ≤ 833 kaf as “dry”, > 833 kaf as “wet”
 - b) Randomly select 100 year period from 1400-2003
 - c) Randomly select initial state as “dry” or “wet”
 - d) Use a conditional K-nearest neighbor bootstrap to select years

Year\Sequence	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
1	1959	1951	1970	1959	1973	1964	1983	1984	1963	1961	1998	1962	1971	1990	1951	1958	1980	1969	1982	1974	1994	1996	2001	2002	1965	1970	1951	1982	2001	1970	1957	1967	
2	1972	1967	1969	1982	1994	1956	1969	1985	1982	1967	2002	1988	1972	1991	2001	1958	1999	1976	1983	1975	1994	1955	1999	1964	1984	1971	1964	1963	1969	1988	1992	1960	
3	1951	1951	1992	1992	1995	1961	1963	1994	1983	2001	1964	1975	1972	1992	1992	1994	1998	1968	1992	1998	1995	1955	1970	1952	1976	1972	1965	1964	1953	1977	2000	1961	
4	1960	2003	1969	1993	1996	1977	1991	2000	1992	1971	2004	1971	2004	1963	2002	1976	1993	1971	1963	1999	1994	1975	1998	1984	1977	1951	1998	1955	1990	1964	1951	2004	
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7	1960	1954	2000	1962	1952	1984	1963	1970	1978	1991	1962	1982	1960	1958	1968	2001	1994	1951	1985	1970	1988	2004	1956	1958	1956	1999	1986	1998	1993	1994	1954	1993	
8	1962	1951	2001	1993	2002	1984	1982	1993	1967	1992	1993	1995	1955	1963	1969	1969	1995	1952	1985	1999	1989	1967	2003	1974	1968	1998	2000	1963	1958	1976	1960	1981	
9	1993	1978	1987	1969	1982	1988	1963	1974	1972	1958	1994	1992	1991	1960	1958	1995	1987	1999	1980	1999	2001	1990	2004	1955	1971	1971	1982	2004	1994	1978	1961	1956	
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19	1985	1967	1990	1960	1975	1964	1978	1993	1984	1966	1969	1953	1960	1989	1968	1954	1983	1976	1967	1959	1960	1959	1967	1994	1992	1978	1965	1964	1998	1987	1955	1991	

Select 10 yr sequences for evaluation with URGWOM

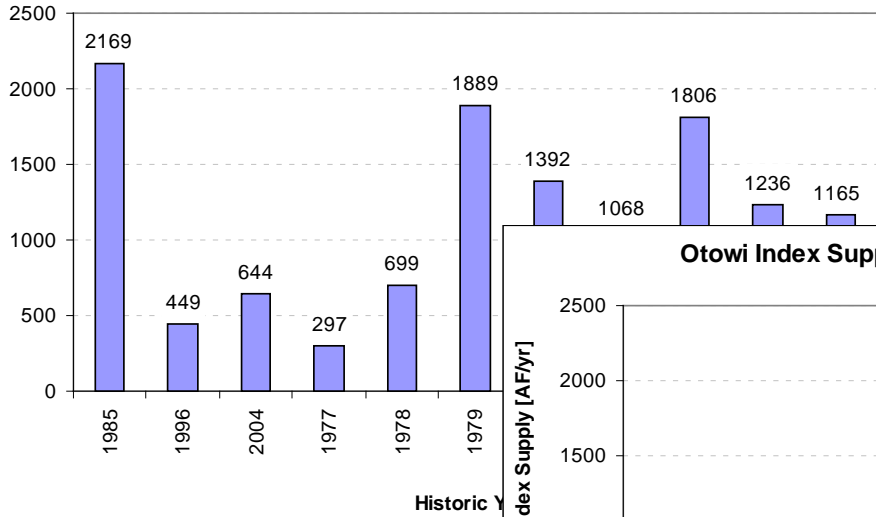
1. Selection of a Palmer Drought Severity Index (PDSI) reconstruction representative of flows at Otowi
2. Development of a transient transition probability matrix
3. Sample 1950-2004 data to develop 1000, 100 year sequences
4. Select 5 ten year sequences from 1000, 100 year sequences for analysis by URGWOM
 - a) Select all 10 year sequences which only use data from 1975 and later (1088 of 91,000 10 year sequences fit this criteria)
 - b) Select sequences from the 1088 possible that are closest to 10%, 30%, 50%, 70%, and 90% 10 year exceedance volumes at Otowi based on all 91,000 10 year sequences represented
 - c) In the case of equal average volumes (10% exceedance sequence), the sequence with higher variability (std dev) was selected.

URGWOM Planning Model Sequences

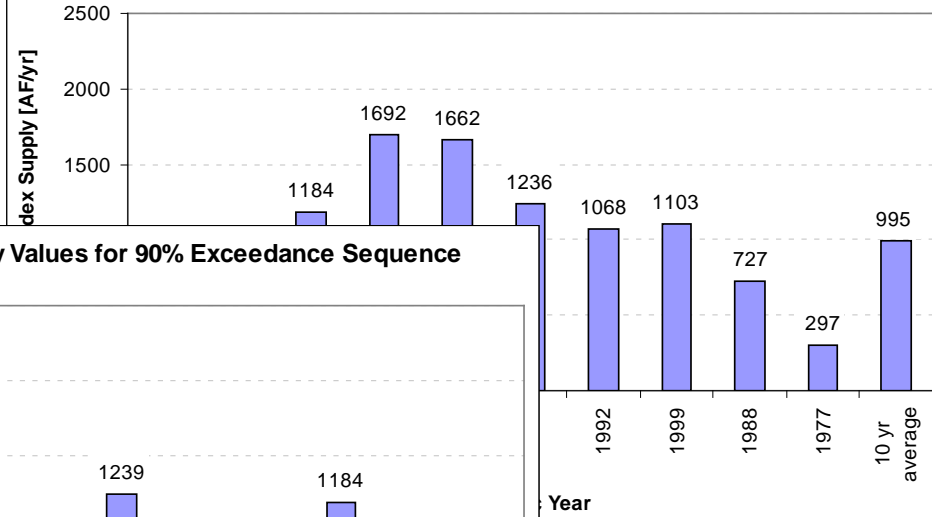


URGWOM Planning Model Sequences

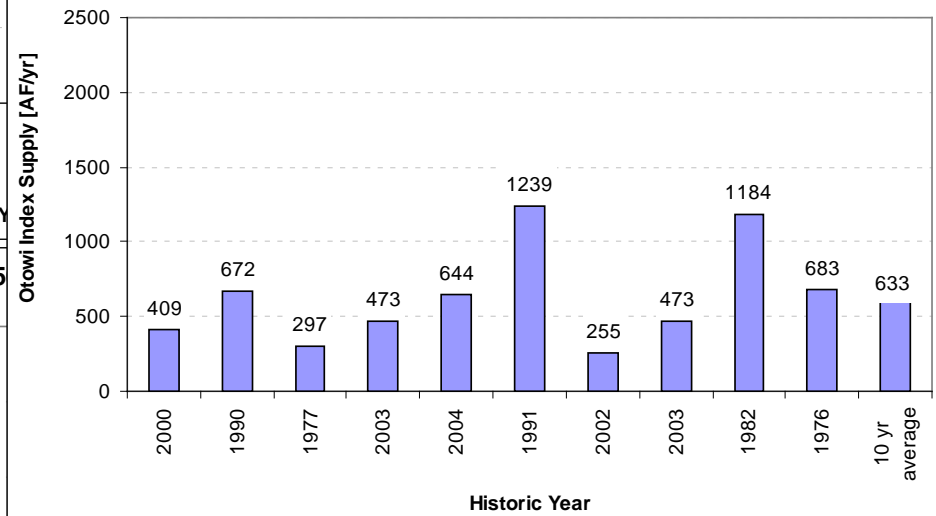
Otowi Index Supply Values for 10% Exceedance Sequence



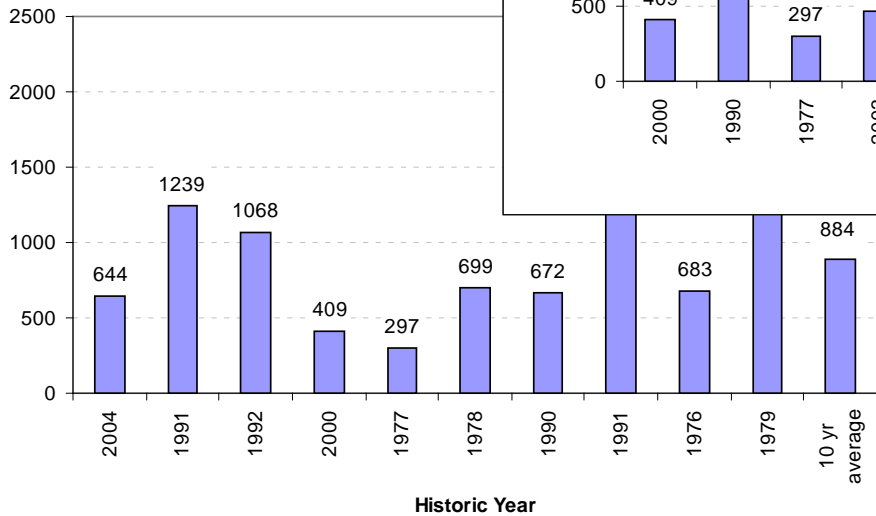
Otowi Index Supply Values for 30% Exceedance Sequence



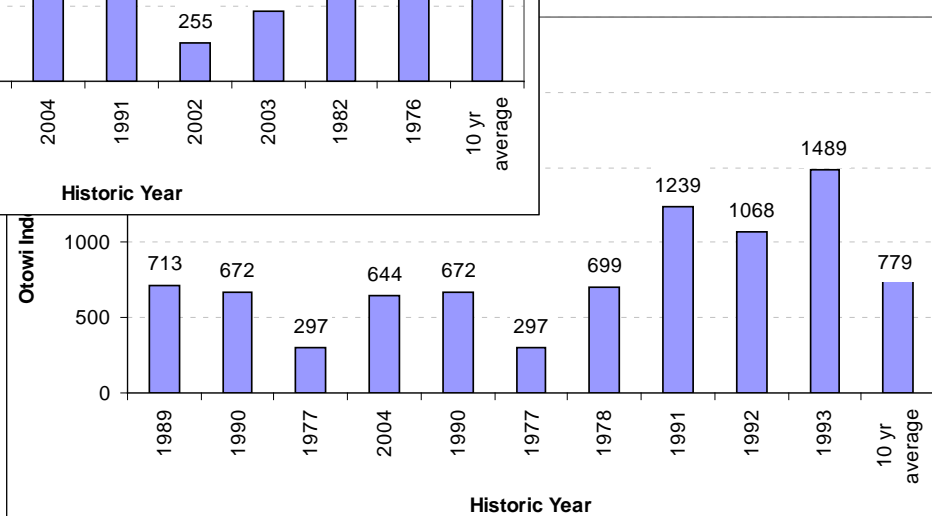
Otowi Index Supply Values for 90% Exceedance Sequence



Otowi Index Supply Values for 50% Exceedance Sequence



Otowi Index Supply Values for 70% Exceedance Sequence



Questions?

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