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Estimated Return Periods for Short Duration Precipitation in Arizona

Paul C. Kangieser

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A western Indian symbol for rain. It also symbolizes man's dependence on weather and environment in the West.

U. S. DEPARTMENT OF COMMERCE
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
WEATHER BUREAU

Weather Bureau Technical Memorandum WR-44

ESTIMATED RETURN PERIODS FOR SHORT-DURATION
PRECIPITATION IN ARIZONA

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WESTERN REGION
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ESTIMATED RETURN PERIODS FOR SHORT-DURATION
PRECIPITATION IN ARIZONA

In March 1967, a set of 12 maps was printed for the state of Arizona [1] giving isohyets for durations of 6 and 24 hours for return periods of 2, 5, 10, 25, 50 and 100 years. Since the maps were released, a need has arisen for data for other durations and it is the purpose of this study to provide such data. It is possible to obtain all of the data contained in the present study by using the charts and diagrams in [2]. It is also possible to accomplish the same thing with a set of algebraic relationships derived from the diagrams in [2], and that procedure is described below for the benefit of those who wish to develop similar data for stations not contained in this study. For a smaller version of the precipitation-frequency maps, see [3].

The following steps were used to produce data for these tables:

1. Using the basic 6- and 24-hour maps, from [1], read data for 2-, 5-, 10-, 25-, 50- and 100-year return periods, employing linear interpolation between isolines. Enter the values in the table. These estimates are for the partial-duration (instead of the annual) series.
2. Convert the values in step 1 to the annual series using the empirical conversion factors in the following table.

<u>Return period</u>	<u>Conversion factor</u>
2-year	0.88
5-year	0.96
10-year	0.99

Plot these converted values on extreme probability paper. Look for large deviations from a straight line and make necessary corrections. Convert the corrected values back to the partial-duration series and use them in the table in place of those obtained in step 1.

3. We should now have all of the values in the 6- and 24-hour rows of the table except the 1-year values. Let P_1, P_2, \dots, P_{100} be the estimated precipitation for return periods of 1, 2, ..., and 100 years, respectively. Then,

$$P_1 = P_2 - .16(P_{100} - P_2)$$

(The above algebraic relationship may be used in place of figure 7 in [2].)

4. We should now have all of the 6- and 24-hour rows filled in. Using these "bearing" values and the relationships given below, the remainder of the table can be completed, working vertically. (The following algebraic relationships may be used in place of figure 2 in [2].) Let X_1, X_2, \dots, X_{24} be the estimated precipitation for durations of 1, 2, ..., 24 hours, respectively. Then, the following steps may be carried out.

A. Compute $X_{12} = X_{24} - .51(X_{24} - X_6)$

- B. Compute $X_1 = 2X_6 - X_{24}$
- C. Check to see that $(X_6 - X_1) = (X_{24} - X_6)$
- D. Compute $X_3 = X_6 - .55(X_6 - X_1)$
- E. Compute $X_2 = X_6 - .77(X_6 - X_1)$
- F. Check to see that $(X_3 - X_2) = .22(X_6 - X_1)$

5. Compute the durations shorter than one hour from the following relationships.

$$X_{30 \text{ min.}} = .79X_1$$

$$X_{15 \text{ min.}} = .57X_1$$

$$X_{10 \text{ min.}} = .45X_1$$

$$X_5 \text{ min.} = .29X_1$$

Much has been written on return periods and their interpretation. The following table yields an estimate of the number of years for given probability levels that an event with various return periods could occur for the first time.

		RETURN PERIOD (years)						
		1	2	5	10	25	50	100
%	5	0.1	0.1	0.3	0.5	1.3	2.6	5.1
	10	0.1	0.2	0.5	1.1	2.6	5.3	10.5
P	20	0.2	0.5	1.1	2.2	5.6	11.2	22.3
R	25	0.3	0.6	1.4	2.9	7.2	14.4	28.8
O	30	0.4	0.7	1.8	3.6	8.9	17.9	35.7
B	40	0.5	1.0	2.6	5.1	12.8	25.6	51.1
A	50	0.7	1.4	3.5	6.9	17.3	34.7	69.3
B	60	0.9	1.8	4.6	9.2	22.9	45.8	91.6
I	70	1.2	2.4	6.0	12.0	30.1	60.2	120.4
L	75	1.4	2.8	6.9	13.9	34.7	69.3	138.6
I	80	1.6	3.2	8.0	16.1	40.2	80.5	160.9
T	90	2.3	4.6	11.5	23.0	57.6	115.2	230.3
Y	95	3.0	6.0	15.0	30.0	74.9	149.8	299.6

For example, the table shows that there is a probability of 50% that an event with a return period of 10 years will occur at least once in 6.9 years. Approximately 1 out of 4 times (25% probability) an event with the same return period will occur at least once in 2.9 years. If used with these interpretations in mind, data in the following tables for 52 Arizona cities may be used in a variety of engineering and scientific problems.

The following is an example for using these tables. Consider a request for the one-hour precipitation amount at Ajo, Arizona, that can be expected once in two years. Turn to page 6, under the column labeled "2" and the row labeled "1 hr" is the amount 1.17 inches. This means that 1.17 inches of rain can be expected in one hour at Ajo, Arizona, once in every two years. This result can be further interpreted with the table on page 3 to show that with a return period of 2 years, the event could occur for the first time in 7 months (.6 yr) with a probability of 25 percent, or within 17 months (1.4 yrs) with a probability of 50 percent, or within 38 months (3.2 yrs) with a probability of 80 percent.

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1. "Precipitation-Frequency Maps for Arizona," Special Study Branch, Office of Hydrology, ESSA Weather Bureau, Washington D. C., March 1967.

2. U. S. Dept. of Commerce, Weather Bureau, "Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years," Technical Paper No. 40, Washington D. C., May 1961.

3. Arizona Highway Department, Bridge Division, Hydrologic Design for Highway Drainage in Arizona, Phoenix, Arizona, December 1, 1968.

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Ajo

Latitude: 32° 22'

Longitude: 112° 52'

Elevation (feet): 1763

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.25	0.34	0.46	0.54	0.66	0.73	0.87
10 min.	0.39	0.53	0.72	0.84	1.03	1.13	1.35
15 min.	0.50	0.67	0.91	1.07	1.30	1.43	1.70
30 min.	0.69	0.92	1.26	1.48	1.80	1.98	2.36
1 hr.	0.87	1.17	1.59	1.87	2.28	2.50	2.99
2 hr.	0.90	1.23	1.68	1.98	2.42	2.68	3.18
3 hr.	0.94	1.28	1.76	2.09	2.56	2.86	3.36
6 hr.	1.02	1.41	1.96	2.36	2.90	3.30	3.82
12 hr.	1.09	1.53	2.14	2.60	3.20	3.69	4.23
24 hr.	1.17	1.65	2.33	2.85	3.52	4.10	4.65

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Alpine

Latitude: 33° 51'

Longitude: 109° 08'

Elevation (feet): 8050

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.30	0.33	0.39	0.44	0.48	0.54	0.57
10 min.	0.46	0.51	0.61	0.68	0.74	0.83	0.88
15 min.	0.58	0.65	0.78	0.86	0.93	1.05	1.11
30 min.	0.81	0.90	1.07	1.19	1.30	1.46	1.54
1 hr.	1.02	1.14	1.36	1.50	1.64	1.85	1.95
2 hr.	1.09	1.24	1.50	1.67	1.87	2.10	2.24
3 hr.	1.15	1.33	1.64	1.84	2.08	2.35	2.51
6 hr.	1.31	1.57	1.98	2.25	2.62	2.95	3.20
12 hr.	1.45	1.78	2.28	2.62	3.10	3.46	3.84
24 hr.	1.60	2.00	2.60	3.00	3.60	4.00	4.50

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Apache Junction

Latitude: 33° 25'

Longitude: 111° 34'

Elevation (feet): 1660

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.20	0.26	0.38	0.45	0.55	0.63	0.70
10 min.	0.31	0.41	0.59	0.70	0.86	0.98	1.09
15 min.	0.39	0.52	0.75	0.88	1.09	1.24	1.38
30 min.	0.54	0.72	1.03	1.22	1.51	1.72	1.91
1 hr.	0.68	0.91	1.31	1.55	1.91	2.18	2.42
2 hr.	0.72	0.97	1.39	1.65	2.03	2.32	2.58
3 hr.	0.75	1.02	1.46	1.74	2.14	2.45	2.73
6 hr.	0.84	1.15	1.65	1.97	2.43	2.79	3.11
12 hr.	0.92	1.27	1.82	2.18	2.68	3.09	3.45
24 hr.	1.00	1.39	1.99	2.39	2.95	3.40	3.80

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Benson

Latitude: 31° 58'

Longitude: 110° 18'

Elevation (feet): 3590

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.25	0.31	0.41	0.47	0.55	0.62	0.68
10 min.	0.39	0.49	0.63	0.73	0.86	0.97	1.06
15 min.	0.50	0.62	0.80	0.93	1.08	1.23	1.34
30 min.	0.69	0.85	1.11	1.29	1.50	1.70	1.86
1 hr.	0.87	1.08	1.40	1.63	1.90	2.15	2.35
2 hr.	0.93	1.15	1.49	1.73	2.03	2.29	2.51
3 hr.	0.98	1.22	1.58	1.83	2.15	2.42	2.67
6 hr.	1.12	1.39	1.79	2.08	2.45	2.75	3.05
12 hr.	1.24	1.54	1.98	2.30	2.72	3.04	3.39
24 hr.	1.37	1.70	2.18	2.53	3.00	3.35	3.75

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Black River Pumps

Latitude: 32° 29'

Longitude: 109° 46'

Elevation (feet): 6040

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.23	0.28	0.35	0.41	0.49	0.55	0.60
10 min.	0.36	0.44	0.54	0.63	0.76	0.85	0.93
15 min.	0.46	0.56	0.68	0.80	0.96	1.07	1.18
30 min.	0.64	0.77	0.94	1.11	1.34	1.49	1.64
1 hr.	0.81	0.98	1.19	1.40	1.69	1.88	2.07
2 hr.	0.89	1.08	1.33	1.56	1.88	2.09	2.31
3 hr.	0.96	1.18	1.46	1.71	2.05	2.30	2.54
6 hr.	1.15	1.42	1.80	2.09	2.50	2.81	3.11
12 hr.	1.32	1.64	2.10	2.43	2.90	3.27	3.62
24 hr.	1.49	1.86	2.41	2.78	3.31	3.74	4.15

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Buckeye

Latitude: 32° 22'

Longitude: 112° 35'

Elevation (feet): 870

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.19	0.27	0.39	0.46	0.57	0.66	0.74
10 min.	0.29	0.41	0.60	0.72	0.89	1.02	1.15
15 min.	0.37	0.52	0.76	0.91	1.13	1.29	1.45
30 min.	0.51	0.73	1.05	1.26	1.56	1.79	2.01
1 hr.	0.65	0.92	1.33	1.59	1.98	2.27	2.55
2 hr.	0.68	0.97	1.41	1.69	2.11	2.42	2.72
3 hr.	0.71	1.02	1.49	1.79	2.23	2.56	2.89
6 hr.	0.79	1.14	1.69	2.04	2.54	2.92	3.30
12 hr.	0.86	1.25	1.87	2.26	2.81	3.24	3.67
24 hr.	0.93	1.36	2.05	2.49	3.10	3.57	4.05

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Carefree

Latitude: 33° 49'

Longitude: 111° 54'

Elevation (feet): 2530

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.26	0.31	0.38	0.44	0.52	0.59	0.64
10 min.	0.41	0.48	0.59	0.68	0.81	0.91	0.99
15 min.	0.51	0.61	0.75	0.86	1.02	1.15	1.25
30 min.	0.71	0.85	1.04	1.19	1.41	1.60	1.74
1 hr.	0.90	1.07	1.32	1.51	1.79	2.02	2.20
2 hr.	0.98	1.18	1.48	1.70	2.02	2.27	2.49
3 hr.	1.06	1.29	1.63	1.87	2.23	2.52	2.77
6 hr.	1.26	1.56	2.01	2.32	2.77	3.12	3.46
12 hr.	1.44	1.80	2.35	2.72	3.25	3.66	4.08
24 hr.	1.62	2.05	2.70	3.13	3.75	4.22	4.72

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Casa Grande

Latitude: 32° 53'

Longitude: 111° 45'

Elevation (feet): 1405

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.24	0.30	0.38	0.44	0.54	0.60	0.68
10 min.	0.37	0.46	0.59	0.69	0.84	0.94	1.06
15 min.	0.47	0.59	0.74	0.87	1.07	1.19	1.34
30 min.	0.66	0.81	1.03	1.21	1.48	1.64	1.86
1 hr.	0.83	1.03	1.30	1.53	1.87	2.08	2.35
2 hr.	0.85	1.08	1.41	1.67	2.05	2.30	2.60
3 hr.	0.87	1.12	1.51	1.80	2.23	2.51	2.85
6 hr.	0.89	1.24	1.77	2.14	2.66	3.04	3.45
12 hr.	0.92	1.34	2.00	2.44	3.05	3.51	3.99
24 hr.	0.95	1.45	2.24	2.75	3.45	4.00	4.55

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Chevelon R.S.

Latitude: 34° 32'

Longitude: 110° 55'

Elevation (feet): 7006

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.24	0.29	0.38	0.43	0.50	0.56	0.63
10 min.	0.37	0.45	0.59	0.67	0.77	0.87	0.97
15 min.	0.47	0.58	0.75	0.84	0.98	1.11	1.23
30 min.	0.66	0.80	1.03	1.17	1.36	1.53	1.71
1 hr.	0.83	1.01	1.31	1.48	1.72	1.94	2.16
2 hr.	0.92	1.12	1.46	1.66	1.94	2.20	2.45
3 hr.	1.00	1.23	1.61	1.84	2.16	2.44	2.72
6 hr.	1.20	1.50	1.97	2.27	2.70	3.05	3.40
12 hr.	1.38	1.74	2.29	2.66	3.18	3.59	4.01
24 hr.	1.57	1.99	2.63	3.06	3.68	4.16	4.64

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Chinle

Latitude: 36° 09'

Longitude: 109° 32'

Elevation (feet): 5538

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.18	0.21	0.27	0.31	0.36	0.39	0.43
10 min.	0.28	0.33	0.42	0.48	0.55	0.60	0.67
15 min.	0.35	0.42	0.53	0.60	0.70	0.76	0.85
30 min.	0.49	0.58	0.73	0.84	0.97	1.06	1.18
1 hr.	0.62	0.73	0.93	1.06	1.23	1.34	1.49
2 hr.	0.66	0.79	1.01	1.16	1.35	1.48	1.65
3 hr.	0.70	0.84	1.09	1.25	1.47	1.62	1.81
6 hr.	0.79	0.98	1.28	1.48	1.76	1.96	2.19
12 hr.	0.87	1.10	1.45	1.69	2.02	2.26	2.53
24 hr.	0.96	1.23	1.63	1.90	2.29	2.58	2.89

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Clifton

Latitude: 33° 03'

Longitude: 109° 17'

Elevation (feet): 3465

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.22	0.28	0.36	0.41	0.49	0.57	0.64
10 min.	0.35	0.44	0.56	0.64	0.77	0.88	0.99
15 min.	0.44	0.55	0.71	0.82	0.97	1.12	1.25
30 min.	0.61	0.77	0.99	1.13	1.34	1.55	1.73
1 hr.	0.77	0.97	1.25	1.43	1.70	1.96	2.19
2 hr.	0.83	1.04	1.35	1.55	1.85	2.13	2.37
3 hr.	0.88	1.11	1.45	1.67	1.99	2.28	2.54
6 hr.	1.02	1.29	1.70	1.97	2.35	2.68	2.97
12 hr.	1.14	1.45	1.92	2.23	2.67	3.03	3.35
24 hr.	1.27	1.61	2.15	2.51	3.00	3.40	3.75

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Cottonwood

Latitude: 34° 45'

Longitude: 112° 02'

Elevation (feet): 3360

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.31	0.35	0.39	0.44	0.49	0.55	0.58
10 min.	0.49	0.54	0.61	0.68	0.76	0.85	0.90
15 min.	0.62	0.68	0.78	0.87	0.96	1.07	1.14
30 min.	0.85	0.95	1.07	1.20	1.33	1.49	1.58
1 hr.	1.08	1.20	1.36	1.52	1.68	1.88	2.00
2 hr.	1.11	1.27	1.48	1.67	1.88	2.11	2.28
3 hr.	1.14	1.33	1.60	1.82	2.08	2.34	2.54
6 hr.	1.22	1.49	1.90	2.19	2.57	2.90	3.20
12 hr.	1.29	1.63	2.16	2.52	3.01	3.40	3.79
24 hr.	1.36	1.78	2.44	2.86	3.46	3.92	4.40

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Douglas

Latitude: 31° 21'

Longitude: 109° 32'

Elevation (feet): 4040

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.26	0.33	0.42	0.50	0.58	0.66	0.73
10 min.	0.41	0.51	0.65	0.77	0.90	1.02	1.13
15 min.	0.52	0.64	0.82	0.97	1.15	1.29	1.43
30 min.	0.72	0.89	1.14	1.35	1.59	1.79	1.98
1 hr.	0.91	1.13	1.44	1.71	2.01	2.26	2.50
2 hr.	0.98	1.21	1.55	1.83	2.15	2.42	2.68
3 hr.	1.04	1.29	1.66	1.94	2.29	2.58	2.86
6 hr.	1.20	1.49	1.92	2.22	2.63	2.96	3.30
12 hr.	1.34	1.67	2.16	2.47	2.93	3.30	3.69
24 hr.	1.49	1.85	2.40	2.73	3.25	3.66	4.10

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Flagstaff WBO

Latitude: 35° 08'

Longitude: 111° 40'

Elevation (feet): 7006

R E T U R N P E R I O D (Y E A R S)

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	1	2	5	10	25	50	100
5 min.	0.29	0.33	0.39	0.41	0.47	0.51	0.57
10 min.	0.45	0.51	0.60	0.64	0.72	0.80	0.89
15 min.	0.57	0.64	0.76	0.81	0.92	1.01	1.13
30 min.	0.79	0.89	1.05	1.12	1.27	1.40	1.56
1 hr.	1.00	1.13	1.33	1.42	1.61	1.77	1.98
2 hr.	1.07	1.24	1.48	1.61	1.85	2.04	2.28
3 hr.	1.14	1.34	1.63	1.79	2.08	2.31	2.57
6 hr.	1.32	1.59	1.99	2.25	2.65	2.96	3.29
12 hr.	1.48	1.82	2.31	2.66	3.16	3.54	3.93
24 hr.	1.64	2.05	2.65	3.08	3.69	4.15	4.60

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Fredonia

Latitude: 36° 57'

Longitude: 112° 32'

Elevation (feet): 4675

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.18	0.23	0.31	0.34	0.41	0.46	0.51
10 min.	0.28	0.35	0.48	0.53	0.63	0.72	0.79
15 min.	0.35	0.44	0.60	0.67	0.80	0.91	1.00
30 min.	0.49	0.62	0.84	0.92	1.11	1.26	1.38
1 hr.	0.62	0.78	1.06	1.17	1.41	1.60	1.75
2 hr.	0.67	0.85	1.15	1.29	1.55	1.76	1.93
3 hr.	0.71	0.91	1.24	1.40	1.69	1.92	2.11
6 hr.	0.83	1.07	1.45	1.67	2.03	2.30	2.55
12 hr.	0.93	1.21	1.64	1.92	2.33	2.64	2.94
24 hr.	1.04	1.36	1.84	2.17	2.65	3.00	3.35

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Gila Bend

Latitude: 32° 57'

Longitude: 112° 43'

Elevation (feet): 737

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.20	0.28	0.42	0.50	0.62	0.72	0.81
10 min.	0.31	0.44	0.66	0.78	0.97	1.11	1.25
15 min.	0.39	0.56	0.83	0.99	1.23	1.41	1.58
30 min.	0.55	0.77	1.15	1.37	1.70	1.95	2.20
1 hr.	0.69	0.98	1.46	1.74	2.15	2.47	2.78
2 hr.	0.72	1.03	1.53	1.83	2.27	2.60	2.93
3 hr.	0.75	1.07	1.60	1.92	2.38	2.73	3.08
6 hr.	0.83	1.19	1.77	2.14	2.65	3.05	3.44
12 hr.	0.90	1.29	1.92	2.34	2.90	3.33	3.76
24 hr.	0.97	1.40	2.08	2.54	3.15	3.63	4.10

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Globe

Latitude: 33° 23'

Longitude: 110° 47'

Elevation (feet): 3540

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.21	0.28	0.39	0.44	0.55	0.61	0.69
10 min.	0.32	0.43	0.60	0.69	0.85	0.95	1.08
15 min.	0.40	0.54	0.76	0.87	1.08	1.21	1.36
30 min.	0.56	0.75	1.05	1.21	1.49	1.67	1.89
1 hr.	0.71	0.95	1.33	1.53	1.89	2.12	2.39
2 hr.	0.82	1.08	1.48	1.70	2.09	2.35	2.64
3 hr.	0.92	1.20	1.62	1.87	2.28	2.57	2.88
6 hr.	1.18	1.50	1.98	2.29	2.76	3.11	3.47
12 hr.	1.41	1.77	2.30	2.66	3.19	3.60	4.00
24 hr.	1.65	2.05	2.63	3.05	3.63	4.10	4.55

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Grand Canyon N.P.

Latitude: 36° 03'

Longitude: 112° 08'

Elevation (feet): 6950

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.14	0.21	0.32	0.41	0.49	0.58	0.64
10 min.	0.22	0.33	0.50	0.63	0.76	0.90	1.00
15 min.	0.27	0.42	0.64	0.80	0.96	1.13	1.27
30 min.	0.38	0.58	0.88	1.11	1.34	1.57	1.75
1 hr.	0.48	0.73	1.12	1.40	1.69	1.99	2.22
2 hr.	0.58	0.84	1.23	1.52	1.82	2.12	2.37
3 hr.	0.68	0.94	1.34	1.63	1.95	2.25	2.51
6 hr.	0.93	1.20	1.61	1.90	2.26	2.57	2.86
12 hr.	1.15	1.43	1.85	2.15	2.54	2.85	3.17
24 hr.	1.38	1.67	2.10	2.40	2.83	3.15	3.50

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Humphreys' Peak

Latitude: 35° 21'

Longitude: 111° 41'

Elevation (feet): 12670

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.19	0.25	0.35	0.40	0.50	0.57	0.62
10 min.	0.30	0.39	0.54	0.62	0.77	0.88	0.96
15 min.	0.38	0.50	0.68	0.79	0.98	1.11	1.22
30 min.	0.53	0.69	0.94	1.09	1.36	1.54	1.69
1 hr.	0.67	0.87	1.19	1.38	1.72	1.95	2.14
2 hr.	0.87	1.09	1.43	1.64	2.01	2.26	2.48
3 hr.	1.05	1.29	1.65	1.89	2.28	2.56	2.81
6 hr.	1.52	1.81	2.22	2.51	2.96	3.30	3.62
12 hr.	1.94	2.27	2.72	3.06	3.57	3.96	4.35
24 hr.	2.37	2.75	3.25	3.64	4.20	4.65	5.10

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Kayenta

Latitude: 36° 44'

Longitude: 110° 16'

Elevation (feet): 5665

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.14	0.18	0.24	0.28	0.35	0.39	0.44
10 min.	0.21	0.27	0.38	0.44	0.54	0.60	0.68
15 min.	0.27	0.35	0.48	0.56	0.68	0.76	0.86
30 min.	0.37	0.48	0.66	0.77	0.95	1.06	1.19
1 hr.	0.47	0.61	0.84	0.98	1.20	1.34	1.51
2 hr.	0.52	0.67	0.92	1.07	1.32	1.47	1.65
3 hr.	0.56	0.73	1.00	1.16	1.43	1.60	1.79
6 hr.	0.68	0.88	1.20	1.39	1.70	1.92	2.14
12 hr.	0.78	1.01	1.38	1.59	1.95	2.20	2.45
24 hr.	0.89	1.15	1.56	1.80	2.20	2.50	2.77

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Keams Canyon

Latitude: 35° 49'

Longitude: 110° 12'

Elevation (feet): 6215

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.17	0.21	0.25	0.29	0.34	0.38	0.41
10 min.	0.27	0.32	0.39	0.45	0.53	0.59	0.63
15 min.	0.34	0.40	0.50	0.57	0.67	0.74	0.80
30 min.	0.47	0.56	0.69	0.79	0.93	1.03	1.11
1 hr.	0.59	0.71	0.87	1.00	1.18	1.30	1.41
2 hr.	0.65	0.78	0.97	1.12	1.32	1.46	1.59
3 hr.	0.70	0.85	1.06	1.23	1.45	1.61	1.76
6 hr.	0.83	1.02	1.30	1.50	1.78	1.99	2.19
12 hr.	0.95	1.17	1.51	1.75	2.07	2.33	2.57
24 hr.	1.07	1.33	1.73	2.00	2.38	2.68	2.97

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Kingman

Latitude: 35° 12'

Longitude: 114° 01'

Elevation (feet): 3539

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.20	0.27	0.37	0.44	0.56	0.63	0.71
10 min.	0.31	0.41	0.58	0.69	0.86	0.98	1.10
15 min.	0.39	0.52	0.74	0.87	1.09	1.24	1.40
30 min.	0.54	0.73	1.02	1.21	1.52	1.72	1.94
1 hr.	0.68	0.92	1.29	1.53	1.92	2.18	2.45
2 hr.	0.73	0.99	1.39	1.66	2.07	2.35	2.65
3 hr.	0.77	1.05	1.49	1.78	2.21	2.51	2.83
6 hr.	0.88	1.21	1.74	2.08	2.57	2.93	3.30
12 hr.	0.98	1.35	1.96	2.35	2.89	3.30	3.72
24 hr.	1.08	1.50	2.19	2.63	3.22	3.68	4.15

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Kitt Peak

Latitude: 31° 58'

Longitude: 111° 36'

Elevation (feet): 6875

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.40	0.48	0.59	0.67	0.78	0.88	0.97
10 min.	0.62	0.74	0.91	1.04	1.22	1.37	1.51
15 min.	0.79	0.94	1.15	1.32	1.54	1.73	1.91
30 min.	1.09	1.30	1.60	1.83	2.13	2.40	2.65
1 hr.	1.38	1.65	2.02	2.32	2.70	3.04	3.35
2 hr.	1.47	1.76	2.16	2.48	2.90	3.26	3.59
3 hr.	1.56	1.87	2.30	2.64	3.09	3.47	3.82
6 hr.	1.77	2.13	2.65	3.03	3.56	3.99	4.40
12 hr.	1.96	2.37	2.96	3.38	3.98	4.46	4.91
24 hr.	2.16	2.61	3.28	3.74	4.42	4.94	5.45

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Littlefield

Latitude: 36° 53'

Longitude: 113° 56'

Elevation (feet): 1800

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.28	0.33	0.41	0.48	0.56	0.64	0.71
10 min.	0.43	0.52	0.63	0.74	0.87	0.99	1.10
15 min.	0.54	0.66	0.80	0.94	1.11	1.25	1.39
30 min.	0.75	0.91	1.11	1.30	1.53	1.74	1.93
1 hr.	0.95	1.15	1.40	1.65	1.94	2.20	2.44
2 hr.	0.98	1.20	1.48	1.74	2.06	2.34	2.60
3 hr.	1.00	1.24	1.56	1.83	2.18	2.47	2.75
6 hr.	1.07	1.35	1.75	2.05	2.47	2.80	3.12
12 hr.	1.13	1.45	1.92	2.25	2.73	3.09	3.45
24 hr.	1.19	1.55	2.10	2.45	3.00	3.40	3.80

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Mc Nary

Latitude: 34° 04'

Longitude: 109° 51'

Elevation (feet): 7320

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.28	0.32	0.39	0.44	0.51	0.56	0.61
10 min.	0.43	0.50	0.60	0.68	0.79	0.87	0.95
15 min.	0.54	0.63	0.76	0.86	1.00	1.10	1.21
30 min.	0.75	0.87	1.06	1.19	1.39	1.52	1.67
1 hr.	0.95	1.10	1.34	1.50	1.76	1.93	2.12
2 hr.	1.03	1.22	1.52	1.72	2.03	2.25	2.47
3 hr.	1.11	1.34	1.70	1.93	2.29	2.55	2.81
6 hr.	1.31	1.63	2.13	2.45	2.93	3.30	3.66
12 hr.	1.49	1.89	2.52	2.92	3.50	3.97	4.41
24 hr.	1.67	2.16	2.92	3.40	4.10	4.67	5.20

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Mt. Baldy

Latitude: 33° 54'

Longitude: 109° 34'

Elevation (feet): 11200

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.29	0.35	0.46	0.52	0.61	0.68	0.76
10 min.	0.45	0.55	0.71	0.81	0.95	1.06	1.18
15 min.	0.57	0.70	0.90	1.03	1.20	1.34	1.49
30 min.	0.79	0.96	1.25	1.42	1.66	1.86	2.07
1 hr.	1.00	1.22	1.58	1.80	2.10	2.35	2.62
2 hr.	1.17	1.44	1.87	2.13	2.50	2.81	3.12
3 hr.	1.34	1.65	2.14	2.45	2.89	3.24	3.61
6 hr.	1.76	2.18	2.82	3.25	3.85	4.33	4.81
12 hr.	2.13	2.65	3.43	3.96	4.71	5.30	5.88
24 hr.	2.52	3.14	4.06	4.70	5.60	6.31	7.00

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Mt. Lemmon

Latitude: 32° 26'

Longitude: 110° 47'

Elevation (feet): 9185

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
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5 min.	0.39	0.45	0.54	0.61	0.71	0.78	0.87
10 min.	0.60	0.70	0.84	0.95	1.10	1.22	1.35
15 min.	0.76	0.89	1.07	1.20	1.39	1.54	1.70
30 min.	1.05	1.23	1.48	1.67	1.93	2.13	2.36
1 hr.	1.33	1.56	1.87	2.11	2.44	2.70	2.99
2 hr.	1.42	1.67	2.01	2.27	2.63	2.92	3.23
3 hr.	1.50	1.77	2.14	2.42	2.81	3.12	3.45
6 hr.	1.70	2.02	2.47	2.80	3.27	3.64	4.02
12 hr.	1.88	2.25	2.76	3.14	3.68	4.10	4.52
24 hr.	2.07	2.48	3.07	3.49	4.10	4.58	5.05

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Nogales

Latitude: 31° 21'

Longitude: 110° 55'

Elevation (feet): 3808

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.24	0.31	0.44	0.52	0.64	0.72	0.75
10 min.	0.38	0.49	0.69	0.80	0.99	1.12	1.17
15 min.	0.48	0.62	0.87	1.01	1.25	1.42	1.48
30 min.	0.66	0.85	1.21	1.41	1.74	1.97	2.05
1 hr.	0.84	1.08	1.53	1.78	2.20	2.49	2.60
2 hr.	0.94	1.20	1.66	1.93	2.36	2.67	2.82
3 hr.	1.04	1.31	1.79	2.07	2.52	2.84	3.03
6 hr.	1.28	1.59	2.10	2.42	2.91	3.27	3.55
12 hr.	1.50	1.84	2.38	2.73	3.26	3.65	4.02
24 hr.	1.72	2.10	2.67	3.06	3.62	4.05	4.50

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Page

Latitude: 36° 56'

Longitude: 111° 27'

Elevation (feet): 4270

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.12	0.16	0.20	0.24	0.30	0.34	0.38
10 min.	0.18	0.24	0.32	0.38	0.47	0.53	0.59
15 min.	0.23	0.31	0.40	0.48	0.60	0.67	0.75
30 min.	0.32	0.43	0.55	0.66	0.83	0.93	1.03
1 hr.	0.41	0.54	0.70	0.84	1.05	1.18	1.31
2 hr.	0.48	0.62	0.79	0.94	1.15	1.30	1.44
3 hr.	0.55	0.69	0.88	1.03	1.25	1.41	1.56
6 hr.	0.71	0.87	1.09	1.26	1.50	1.68	1.86
12 hr.	0.86	1.03	1.28	1.47	1.72	1.93	2.13
24 hr.	1.01	1.20	1.48	1.68	1.95	2.18	2.41

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Parker

Latitude: 34° 10'

Longitude: 114° 17'

Elevation (feet): 425

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.14	0.21	0.31	0.38	0.49	0.57	0.65
10 min.	0.22	0.32	0.49	0.59	0.76	0.88	1.01
15 min.	0.27	0.41	0.62	0.75	0.96	1.11	1.28
30 min.	0.38	0.57	0.85	1.04	1.34	1.54	1.77
1 hr.	0.48	0.72	1.08	1.32	1.69	1.95	2.24
2 hr.	0.51	0.76	1.14	1.40	1.78	2.05	2.35
3 hr.	0.54	0.80	1.20	1.47	1.86	2.15	2.46
6 hr.	0.61	0.90	1.35	1.65	2.07	2.40	2.72
12 hr.	0.67	0.99	1.48	1.81	2.26	2.62	2.96
24 hr.	0.74	1.08	1.62	1.98	2.45	2.85	3.20

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Payson

Latitude: 34° 14'

Longitude: 111° 20'

Elevation (feet): 4913

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.25	0.29	0.35	0.40	0.46	0.50	0.56
10 min.	0.38	0.45	0.54	0.62	0.71	0.78	0.86
15 min.	0.48	0.57	0.68	0.78	0.89	0.99	1.09
30 min.	0.67	0.79	0.95	1.08	1.24	1.37	1.52
1 hr.	0.85	1.00	1.20	1.37	1.57	1.74	1.92
2 hr.	1.00	1.18	1.44	1.64	1.89	2.10	2.32
3 hr.	1.14	1.36	1.66	1.90	2.20	2.45	2.71
6 hr.	1.50	1.80	2.23	2.55	2.90	3.32	3.67
12 hr.	1.82	2.19	2.73	3.13	3.67	4.09	4.53
24 hr.	2.15	2.60	3.26	3.73	4.39	4.90	5.42

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Phoenix WBO

Latitude: 33° 26'

Longitude: 112° 01'

Elevation (feet): 1117

R E T U R N P E R I O D (Y E A R S)

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	1	2	5	10	25	50	100
5 min.	0.17	0.26	0.38	0.47	0.59	0.68	0.77
10 min.	0.27	0.40	0.59	0.72	0.91	1.06	1.20
15 min.	0.34	0.50	0.74	0.92	1.15	1.34	1.52
30 min.	0.47	0.70	1.03	1.27	1.60	1.86	2.10
1 hr.	0.60	0.88	1.30	1.61	2.02	2.35	2.66
2 hr.	0.65	0.94	1.39	1.72	2.15	2.49	2.82
3 hr.	0.69	1.01	1.48	1.82	2.27	2.62	2.97
6 hr.	0.81	1.16	1.70	2.07	2.57	2.96	3.35
12 hr.	0.91	1.30	1.90	2.30	2.84	3.26	3.69
24 hr.	1.02	1.44	2.10	2.53	3.12	3.57	4.04

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Prescott

Latitude: 34° 33'

Longitude: 112° 27'

Elevation (feet): 5410

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.23	0.29	0.37	0.43	0.52	0.58	0.63
10 min.	0.36	0.45	0.58	0.67	0.81	0.90	0.98
15 min.	0.46	0.57	0.74	0.84	1.02	1.15	1.24
30 min.	0.64	0.79	1.02	1.17	1.41	1.59	1.72
1 hr.	0.81	1.00	1.29	1.48	1.79	2.01	2.18
2 hr.	0.91	1.12	1.46	1.67	2.02	2.27	2.47
3 hr.	1.00	1.24	1.61	1.86	2.24	2.51	2.76
6 hr.	1.23	1.54	2.01	2.32	2.78	3.13	3.46
12 hr.	1.44	1.80	2.36	2.73	2.27	3.68	4.09
24 hr.	1.65	2.08	2.73	3.16	3.77	4.25	4.74

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Roosevelt

Latitude: 33° 40'

Longitude: 111° 09'

Elevation (feet): 2205

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100	
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	5 min.	0.21	0.27	0.35	0.41	0.48	0.54	0.61
	10 min.	0.33	0.42	0.54	0.64	0.74	0.84	0.95
	15 min.	0.42	0.53	0.68	0.82	0.94	1.06	1.20
	30 min.	0.58	0.73	0.95	1.13	1.30	1.47	1.66
	1 hr.	0.74	0.93	1.20	1.43	1.65	1.86	2.10
	2 hr.	0.84	1.06	1.38	1.64	1.91	2.16	2.43
	3 hr.	0.93	1.19	1.56	1.84	2.17	2.45	2.75
	6 hr.	1.17	1.50	2.00	2.34	2.80	3.18	3.55
	12 hr.	1.38	1.78	2.39	2.79	3.36	3.83	4.26
	24 hr.	1.60	2.07	2.80	3.25	3.95	4.50	5.00

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Salome

Latitude: 33° 47'

Longitude: 113° 36'

Elevation (feet): 1900

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.25	0.32	0.43	0.49	0.61	0.68	0.75
10 min.	0.39	0.50	0.66	0.77	0.94	1.05	1.16
15 min.	0.50	0.63	0.84	0.97	1.19	1.33	1.47
30 min.	0.69	0.88	1.16	1.34	1.65	1.84	2.04
1 hr.	0.87	1.11	1.47	1.70	2.09	2.33	2.58
2 hr.	0.91	1.17	1.56	1.81	2.22	2.48	2.76
3 hr.	0.94	1.22	1.64	1.91	2.34	2.63	2.93
6 hr.	1.03	1.35	1.85	2.17	2.65	3.00	3.35
12 hr.	1.11	1.47	2.04	2.40	2.92	3.33	3.73
24 hr.	1.19	1.59	2.23	2.64	3.21	3.67	4.12

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Seligman

Latitude: 35° 19'

Longitude: 112° 53'

Elevation (feet): 5235

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.23	0.29	0.39	0.45	0.54	0.61	0.68
10 min.	0.35	0.45	0.60	0.70	0.84	0.95	1.06
15 min.	0.44	0.56	0.76	0.88	1.06	1.21	1.34
30 min.	0.62	0.78	1.05	1.22	1.47	1.67	1.86
1 hr.	0.78	0.99	1.33	1.55	1.86	2.12	2.35
2 hr.	0.84	1.06	1.41	1.64	1.97	2.24	2.48
3 hr.	0.91	1.13	1.49	1.73	2.07	2.35	2.60
6 hr.	1.06	1.31	1.69	1.95	2.32	2.62	2.90
12 hr.	1.20	1.47	1.87	2.15	2.55	2.87	3.17
24 hr.	1.34	1.63	2.05	2.35	2.78	3.12	3.45

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Safford

Latitude: 32° 50'

Longitude: 109° 43'

Elevation (feet): 2900

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.16	0.22	0.32	0.39	0.47	0.53	0.60
10 min.	0.24	0.34	0.50	0.60	0.73	0.83	0.94
15 min.	0.31	0.43	0.64	0.76	0.92	1.05	1.19
30 min.	0.43	0.60	0.88	1.05	1.28	1.45	1.64
1 hr.	0.54	0.76	1.12	1.33	1.62	1.84	2.08
2 hr.	0.59	0.82	1.20	1.42	1.74	1.98	2.23
3 hr.	0.63	0.88	1.27	1.51	1.85	2.11	2.38
6 hr.	0.74	1.02	1.46	1.74	2.13	2.43	2.74
12 hr.	0.84	1.15	1.63	1.94	2.38	2.72	3.06
24 hr.	0.94	1.28	1.80	2.15	2.64	3.02	3.40

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: St. Johns

Latitude: 34° 30'

Longitude: 109° 22'

Elevation (feet): 5730

R E T U R N P E R I O D (Y E A R S)

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	1	2	5	10	25	50	100
5 min.	0.21	0.26	0.31	0.35	0.40	0.45	0.50
10 min.	0.33	0.40	0.49	0.54	0.63	0.70	0.77
15 min.	0.42	0.50	0.62	0.69	0.79	0.89	0.97
30 min.	0.58	0.70	0.85	0.96	1.10	1.23	1.35
1 hr.	0.74	0.88	1.08	1.21	1.39	1.56	1.71
2 hr.	0.79	0.94	1.17	1.32	1.52	1.71	1.88
3 hr.	0.83	1.00	1.25	1.42	1.65	1.85	2.04
6 hr.	0.94	1.15	1.46	1.67	1.97	2.21	2.45
12 hr.	1.04	1.28	1.65	1.90	2.25	2.53	2.81
24 hr.	1.14	1.42	1.84	2.13	2.55	2.86	3.19

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Show Low

Latitude: 34° 15'

Longitude: 110° 02'

Elevation (feet): 6412

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.22	0.28	0.36	0.42	0.51	0.58	0.64
10 min.	0.35	0.43	0.56	0.66	0.79	0.90	0.99
15 min.	0.44	0.55	0.71	0.83	1.00	1.14	1.26
30 min.	0.61	0.76	0.99	1.15	1.38	1.58	1.75
1 hr.	0.77	0.96	1.25	1.46	1.75	2.00	2.21
2 hr.	0.85	1.06	1.39	1.62	1.94	2.21	2.44
3 hr.	0.92	1.16	1.52	1.77	2.11	2.41	2.67
6 hr.	1.11	1.40	1.84	2.14	2.56	2.90	3.23
12 hr.	1.28	1.62	2.13	2.47	2.96	3.34	3.73
24 hr.	1.45	1.84	2.43	2.82	3.37	3.80	4.25

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Springerville

Latitude: 34° 08'

Longitude: 109° 17'

Elevation (feet): 7060

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.20	0.26	0.34	0.40	0.48	0.54	0.60
10 min.	0.32	0.41	0.53	0.62	0.74	0.83	0.94
15 min.	0.40	0.51	0.67	0.79	0.94	1.05	1.19
30 min.	0.55	0.71	0.93	1.09	1.30	1.46	1.64
1 hr.	0.70	0.90	1.18	1.34	1.65	1.85	2.08
2 hr.	0.77	0.98	1.27	1.49	1.77	1.99	2.23
3 hr.	0.84	1.06	1.37	1.59	1.89	2.12	2.37
6 hr.	1.01	1.25	1.60	1.84	2.19	2.45	2.73
12 hr.	1.16	1.42	1.81	2.07	2.45	2.74	3.05
24 hr.	1.32	1.60	2.02	2.30	2.73	3.05	3.38

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Teec Nos Pos

Latitude: 36° 54'

Longitude: 109° 06'

Elevation (feet): 5180

R E T U R N P E R I O D (Y E A R S)

	1	2	5	10	25	50	100
5 min.	0.22	0.25	0.29	0.32	0.37	0.39	0.44
10 min.	0.34	0.39	0.45	0.50	0.57	0.61	0.68
D 15 min.	0.43	0.49	0.57	0.63	0.72	0.78	0.87
U 30 min.	0.59	0.68	0.79	0.87	1.00	1.07	1.20
R 1 hr.	0.75	0.86	1.00	1.10	1.26	1.36	1.52
A 2 hr.	0.79	0.92	1.10	1.23	1.43	1.56	1.74
T 3 hr.	0.82	0.98	1.20	1.36	1.59	1.75	1.96
I 6 hr.	0.91	1.13	1.45	1.67	1.99	2.23	2.49
O 12 hr.	0.99	1.26	1.67	1.95	2.35	2.66	2.97
N 24 hr.	1.07	1.40	1.90	2.24	2.72	3.10	3.46

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Tonto Creek Fish Hatchery

Latitude: 34° 22'

Longitude: 111° 06'

Elevation (feet): 6280

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.27	0.34	0.44	0.50	0.58	0.66	0.73
10 min.	0.42	0.52	0.68	0.77	0.90	1.02	1.13
15 min.	0.54	0.66	0.86	0.98	1.15	1.29	1.43
30 min.	0.74	0.92	1.19	1.36	1.59	1.79	1.98
1 hr.	0.94	1.16	1.51	1.72	2.01	2.27	2.50
2 hr.	1.14	1.41	1.81	2.07	2.42	2.72	3.01
3 hr.	1.34	1.64	2.10	2.40	2.81	3.16	3.49
6 hr.	1.83	2.23	2.82	3.22	3.79	4.25	4.70
12 hr.	2.27	2.75	3.46	3.96	4.66	5.22	5.78
24 hr.	2.72	3.30	4.13	4.72	5.57	6.23	6.90

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Whiteriver

Latitude: 33° 50'

Longitude: 109° 58'

Elevation (feet): 5280

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.23	0.28	0.36	0.42	0.50	0.56	0.62
10 min.	0.36	0.44	0.56	0.65	0.77	0.86	0.96
15 min.	0.45	0.56	0.71	0.83	0.98	1.09	1.21
30 min.	0.62	0.77	0.99	1.15	1.36	1.52	1.68
1 hr.	0.79	0.98	1.25	1.45	1.72	1.92	2.13
2 hr.	0.87	1.08	1.38	1.60	1.90	2.12	2.36
3 hr.	0.94	1.17	1.50	1.74	2.07	2.32	2.58
6 hr.	1.12	1.40	1.81	2.09	2.50	2.81	3.12
12 hr.	1.28	1.61	2.08	2.40	2.88	3.25	3.61
24 hr.	1.45	1.82	2.37	2.73	3.28	3.70	4.11

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Wickenburg

Latitude: 33° 58'

Longitude: 112° 44'

Elevation (feet): 2095

R E T U R N P E R I O D (Y E A R S)

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	1	2	5	10	25	50	100
5 min.	0.26	0.33	0.45	0.52	0.62	0.70	0.78
10 min.	0.41	0.52	0.70	0.80	0.96	1.08	1.21
15 min.	0.51	0.66	0.88	1.01	1.21	1.37	1.53
30 min.	0.71	0.91	1.22	1.41	1.68	1.90	2.13
1 hr.	0.90	1.15	1.55	1.78	2.13	2.40	2.69
2 hr.	0.95	1.21	1.64	1.89	2.27	2.56	2.87
3 hr.	0.99	1.28	1.73	2.00	2.40	2.72	3.04
6 hr.	1.10	1.43	1.94	2.27	2.74	3.10	3.47
12 hr.	1.20	1.57	2.13	2.51	3.04	3.44	3.85
24 hr.	1.30	1.71	2.33	2.76	3.35	3.80	4.25

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Tucson WBO

Latitude: 32° 07'

Longitude: 110° 56'

Elevation (feet): 2584

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.30	0.36	0.44	0.50	0.59	0.66	0.72
10 min.	0.47	0.56	0.68	0.77	0.91	1.03	1.12
15 min.	0.59	0.71	0.87	0.98	1.15	1.30	1.41
30 min.	0.82	0.98	1.20	1.36	1.60	1.80	1.96
1 hr.	1.04	1.24	1.52	1.72	2.02	2.28	2.48
2 hr.	1.09	1.31	1.63	1.86	2.19	2.47	2.70
3 hr.	1.14	1.38	1.74	1.99	2.35	2.65	2.91
6 hr.	1.26	1.56	2.01	2.31	2.76	3.10	3.44
12 hr.	1.37	1.72	2.25	2.60	3.12	3.50	3.91
24 hr.	1.48	1.88	2.50	2.90	3.50	3.92	4.40

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Tuweep

Latitude: 36° 17'

Longitude: 113° 04'

Elevation (feet): 4775

R E T U R N P E R I O D (Y E A R S)

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	1	2	5	10	25	50	100
5 min.	0.17	0.22	0.31	0.37	0.45	0.52	0.57
10 min.	0.26	0.35	0.48	0.57	0.70	0.80	0.88
15 min.	0.33	0.44	0.61	0.72	0.89	1.01	1.12
30 min.	0.46	0.61	0.85	1.00	1.23	1.41	1.55
1 hr.	0.58	0.77	1.07	1.26	1.56	1.78	1.96
2 hr.	0.64	0.84	1.17	1.37	1.69	1.92	2.12
3 hr.	0.70	0.92	1.26	1.48	1.81	2.06	2.28
6 hr.	0.85	1.10	1.49	1.74	2.11	2.40	2.67
12 hr.	0.98	1.26	1.70	1.98	2.38	2.70	3.02
24 hr.	1.12	1.43	1.91	2.22	2.66	3.02	3.38

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Wikieup

Latitude: 34° 44'

Longitude: 113° 37'

Elevation (feet): 2125

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.20	0.27	0.37	0.44	0.57	0.66	0.75
10 min.	0.31	0.42	0.57	0.69	0.89	1.03	1.17
15 min.	0.39	0.54	0.72	0.87	1.12	1.30	1.48
30 min.	0.54	0.74	1.00	1.21	1.56	1.80	2.05
1 hr.	0.68	0.94	1.27	1.53	1.97	2.28	2.59
2 hr.	0.75	1.03	1.37	1.66	2.12	2.45	2.78
3 hr.	0.82	1.11	1.47	1.78	2.26	2.61	2.96
6 hr.	0.99	1.32	1.72	2.08	2.61	3.01	3.41
12 hr.	1.14	1.51	1.94	2.35	2.92	3.37	3.81
24 hr.	1.30	1.70	2.17	2.63	3.25	3.74	4.23

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ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Willcox

Latitude: 32° 15'

Longitude: 109° 50'

Elevation (feet): 4200

R E T U R N P E R I O D (Y E A R S)

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	1	2	5	10	25	50	100
5 min.	0.28	0.35	0.45	0.51	0.61	0.68	0.76
10 min.	0.44	0.54	0.70	0.80	0.95	1.06	1.18
15 min.	0.55	0.68	0.88	1.01	1.20	1.35	1.49
30 min.	0.77	0.94	1.22	1.40	1.66	1.86	2.07
1 hr.	0.97	1.19	1.55	1.77	2.10	2.36	2.62
2 hr.	1.02	1.26	1.64	1.88	2.24	2.52	2.79
3 hr.	1.06	1.32	1.73	1.99	2.37	2.67	2.96
6 hr.	1.18	1.48	1.95	2.25	2.70	3.04	3.38
12 hr.	1.28	1.62	2.14	2.49	2.99	3.37	3.75
24 hr.	1.39	1.77	2.35	2.73	3.30	3.72	4.14

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Willow Beach

Latitude: 35° 52'

Longitude: 114° 39'

Elevation (feet): 800

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.22	0.29	0.40	0.48	0.59	0.67	0.75
10 min.	0.34	0.45	0.62	0.75	0.91	1.04	1.17
15 min.	0.43	0.57	0.79	0.95	1.16	1.32	1.48
30 min.	0.59	0.79	1.09	1.31	1.60	1.82	2.05
1 hr.	0.75	1.00	1.38	1.66	2.03	2.31	2.59
2 hr.	0.78	1.04	1.45	1.74	2.14	2.43	2.73
3 hr.	0.80	1.09	1.52	1.82	2.24	2.55	2.86
6 hr.	0.87	1.19	1.69	2.02	2.49	2.85	3.20
12 hr.	0.93	1.28	1.84	2.20	2.72	3.11	3.50
24 hr.	0.99	1.38	2.00	2.38	2.95	3.39	3.81

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Window Rock

Latitude: 35° 41'

Longitude: 109° 03'

Elevation (feet): 6750

RETURN PERIOD (YEARS)

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	1	2	5	10	25	50	100
5 min.	0.10	0.16	0.25	0.31	0.39	0.44	0.51
10 min.	0.16	0.25	0.39	0.48	0.60	0.68	0.79
15 min.	0.21	0.32	0.50	0.61	0.76	0.87	1.00
30 min.	0.28	0.44	0.69	0.85	1.05	1.20	1.39
1 hr.	0.36	0.56	0.87	1.07	1.33	1.52	1.76
2 hr.	0.44	0.64	0.95	1.15	1.42	1.62	1.86
3 hr.	0.51	0.71	1.03	1.23	1.51	1.71	1.96
6 hr.	0.69	0.90	1.22	1.43	1.73	1.95	2.20
12 hr.	0.85	1.07	1.39	1.61	1.93	2.16	2.42
24 hr.	1.02	1.24	1.57	1.79	2.13	2.38	2.64

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Winslow WBO

Latitude: 35° 01'

Longitude: 110° 44'

Elevation (feet): 4895

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.16	0.18	0.22	0.24	0.28	0.31	0.34
10 min.	0.24	0.28	0.35	0.37	0.44	0.48	0.52
15 min.	0.31	0.35	0.44	0.47	0.56	0.61	0.66
30 min.	0.43	0.49	0.61	0.66	0.77	0.85	0.92
1 hr.	0.54	0.62	0.77	0.83	0.98	1.07	1.16
2 hr.	0.59	0.69	0.86	0.95	1.12	1.24	1.35
3 hr.	0.63	0.75	0.95	1.06	1.26	1.39	1.53
6 hr.	0.74	0.91	1.18	1.34	1.60	1.79	1.98
12 hr.	0.84	1.05	1.38	1.59	1.90	2.14	2.38
24 hr.	0.94	1.20	1.59	1.85	2.22	2.51	2.80

ESTIMATED RETURN PERIODS FOR SHORT-DURATION PRECIPITATION IN ARIZONA
(Inches)

Station: Yuma WBO

Latitude: 32° 40'

Longitude: 114° 36'

Elevation (feet): 194

RETURN PERIOD (YEARS)

	1	2	5	10	25	50	100
5 min.	0.10	0.18	0.31	0.39	0.48	0.57	0.65
10 min.	0.16	0.28	0.49	0.61	0.75	0.88	1.01
15 min.	0.21	0.35	0.62	0.77	0.95	1.12	1.28
30 min.	0.28	0.49	0.85	1.07	1.32	1.55	1.78
1 hr.	0.36	0.62	1.08	1.35	1.67	1.96	2.25
2 hr.	0.38	0.66	1.15	1.45	1.81	2.12	2.43
3 hr.	0.40	0.70	1.22	1.54	1.94	2.28	2.61
6 hr.	0.44	0.80	1.40	1.78	2.26	2.66	3.05
12 hr.	0.48	0.89	1.56	1.99	2.55	3.00	3.44
24 hr.	0.52	0.98	1.72	2.21	2.85	3.36	3.85

Western Region Technical Memoranda: (Continued)

- No. 24 Historical and Climatological Study of Grinnell Glacier, Montana. Richard A. Dightman. July 1967.
- No. 25 Verification of Operational Probability of Precipitation Forecasts, April 1966-March 1967. W. W. Dickey. October 1967.
- No. 26 A Study of Winds in the Lake Mead Recreation Area. R. P. Augulis. January 1968.
- No. 27 Objective Minimum Temperature Forecasting for Helena, Montana. D. E. Olsen. February 1968.
- No. 28** Weather Extremes. R. J. Schmidli. April 1968.
- No. 29 Small-Scale Analysis and Prediction. Philip Williams, Jr. May 1968.
- No. 30 Numerical Weather Prediction and Synoptic Meteorology. Capt. Thomas D. Murphy, U.S.A.F. May 1968.
- No. 31 Probability Forecasting in the Portland Fire Weather District. Harold S. Ayer. July 1968.
- No. 33 Objective Forecasting. Philip Williams, Jr. August 1968.
- No. 34 The WSR-57 Radar Program at Missoula, Montana. R. Granger. Oct. 1968.
- No. 35 Joint ESSA/FAA ARTC Radar Weather Surveillance Program. Herbert P. Benner and DeVon B. Smith. December 1968.
- No. 36 Temperature Trends in Sacramento--Another Heat Island. Anthony D. Lentini. February 1969.
- No. 37 Disposal of Logging Residues Without Damage to Air Quality. Owen P. Cramer. March 1969.
- No. 38 Climate of Phoenix, Arizona. R. J. Schmidli, P. C. Kangieser, and R. S. Ingram. April 1969.
- No. 39 Upper-Air Lows Over Northwestern United States. A. L. Jacobson. April 1969.
- No. 40 The Man-Machine Mix in Applied Weather Forecasting in the 1970s. L. W. Snellman. August 1969.
- No. 41 High Resolution Radiosonde Observations. W. W. Johnson. Aug. 1969.
- No. 42 Analysis of the Southern California Santa Ana of January 15-17, 1966. Barry B. Aronovitch. August 1969.
- No. 43 Forecasting Maximum Temperatures at Helena, Montana. David E. Olsen. October 1969.

**Revised