

FREEHOLD, NEW JERSEY EXCERPT

MONTHLY PRECIPITATION AND RUNOFF FOR SMALL AGRICULTURAL WATERSHEDS IN THE UNITED STATES

**UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Soil and Water Conservation Research Branch
Washington 25, D.C.**

**In Cooperation with the
STATE AGRICULTURAL EXPERIMENT STATIONS**

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LOCATION: Monmouth Co., N.J.; 1 mi. SW of Freehold; unnamed tributary of Manasquan River.

AREA: 17.5 ac. (15.7 ac to 8-17-38) SHAPE: Roughly, 5-point star, 1,200 to 1,350 ft. across points.

SLOPES: 24% in 0-2% class; 61% in 2-5%; 13% in 5-10%; 2% in 10-15%. Aspect: S-SW.

SOILS: Unconsolidated coastal plain deposits. 1 Freehold sandy loam 91%; 2 Collington loam 9%.

Topsoil - 1 very weak structure; 2 weak; 1, 8 in. av.; 2, 9 in. av.; 1 moderately rapid permeability; 2 moderate. Subsoil - 1 weak medium subangular blocky structure; 2 moderate medium subangular blocky; both moderate permeability. Permeability and av. depth to substratum - 1, very rapid at 23 in.; 2, rapid at 27 in. Internal drainage - 1 rapid; 2 medium.

EROSION: 1 - 35%; 2 - 46%; 3 - 19%.

LAND CAPABILITY: I - 24%; II - 57%; III - 17%; IV - 2%.

SURFACE DRAINAGE: Excellent, except in 9 cropland terrace channels on average of 0.3% grade (total length 5,400 ft.) where small pondage occurs at a few small depressions; principal waterway - 1,605 ft. including 935 ft. of terrace outlet with average slope of 2.7% and 670 ft. of first terrace channel.

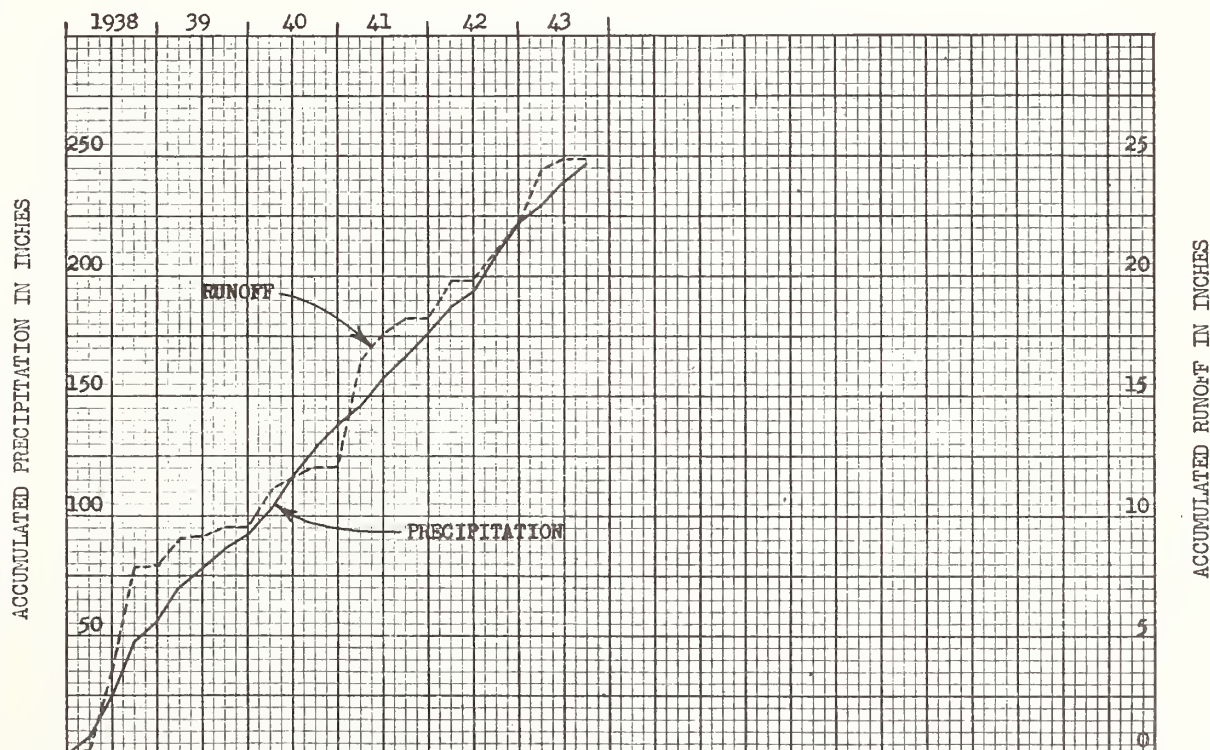
CHARACTER OF FLOW: Ephemeral; continuous.

INSTRUMENTATION: Runoff - 30" broad-crested concrete weir with 3:1 crest slope for 1 ft. depth, and 5:1 crest slope for 1 to 2.5 ft. depth, 6 hr. chart; precipitation - recording gage at runoff station, 12 hr. chart.

WATERSHED CONDITIONS: Prior to 1937, this area had been farmed in truck crops off the contour. In 1937, 9 cropland terraces were constructed to drain into a previously constructed and vegetated terrace outlet channel 16 ft. wide with a capacity of about 60 c.f.s. In Aug. 1938, the drainage area was increased from 15.7 ac. to 17.5 ac. by extending T-8 & 9. Terraces had vertical spacing of 2.4 to 4 ft. with lengths of 165 to 850 ft., average 600 ft.; average height of ridge .9 ft. Planting of truck crops was parallel with ridges. Crops: spinach, kale, beets, lettuce, carrots, turnips, broccoli, collards, chickory, corn, potatoes, etc. Most of area had manure application every two years. Sudan grass in some cases was grown and plowed under between short season crops. Winter cover crop of rye was occasionally grown on some areas, but most of area was generally bare in winter. At times, some vegetable plant residues were left on ground during the winter. Crop yields, good to excellent.

GENERALLY REPRESENTS: Sloping Northern Coastal Plain terraced cropland areas of moderate to very rapid permeabilities, medium to rapid internal drainage, excellent surface drainage and moderate erosion in eastern Maryland, Delaware and southern New Jersey.

ACCUMULATED PRECIPITATION AND RUNOFF



Cooperative Research Project of the USDA and the New Jersey Agricultural Experiment Station.

MONTHLY PRECIPITATION AND RUNOFF (Inches) Freehold, New Jersey Watershed W-I

Month Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1938 P	3.49	2.42	1.65	2.27	3.95	11.18	8.71	3.32	10.09	2.72	3.78	2.30	55.88
Q	.17	T	T	T	T	3.25	1.74	.51	2.19	T	.10	.01	7.97
1939 P	3.78	5.74	4.63	4.24	.29	3.22	.80	5.66	1.09	4.85	1.49	.94	36.73
Q	.40 ^e	.74	T	.05	0	.02	0	.33	0	T	T	0	1.54
1940 P	1.85	2.89	4.18	5.10	6.89	3.36	2.79	7.54	2.09	2.17	4.29	2.72	45.87
Q	.01	.68 ^e	.93	.01	.32	.15	0	.49	T	0	T	T	2.59
1941 P	3.47	2.49	1.89	2.10	2.12	7.86	6.65	2.17	.10	2.22	2.96	3.42	37.45
Q	1.11	1.46	1.80	0	0	1.23	.49	.08	0	0	0	.04	6.21
1942 P	2.79	2.73	6.15	1.43	2.46	2.70	6.57	3.44	5.51	2.83	6.29	4.05	46.95
Q	.23	.93	.38	0	0	0	.61	0	.51	0	.61	.79	4.06
1943 P	2.96	1.44	2.63	2.69	3.07	4.13	2.84	2.17	1.72				23.65
Q	.08	1.31	.70	T	0	.36	0	0	0				2.45
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*Av. P	3.06	2.95	3.52	2.97	3.13	5.41	4.73	4.05	3.43	2.96	3.76	2.69	42.66 [#]
*Av. Q	.33	.85	.64	.01	.05	.83	.47	.24	.45	T	.14	.17	4.18 [#]
Normal P	3.84	3.59	4.44	3.62	3.95	3.65	4.67	4.77	4.14	3.64	4.10	3.59	48.00

Notes: *Averages of all months of record. [#]Sum of monthly averages. Normal P based on average of monthly records at Freehold, N.J. (1874-1955), including 46 complete years, 7 partial years and 29 years of no records. Months of Jan. to Apr. and Oct. to Dec. may include snow and snow melt.

^ePartially estimated. Quality of records: P, excellent; Q, excellent.

LOCATION: Monmouth Co., N. J.; 2.7 mi. WSW of Freehold; Manalapan Brook, South River, Raritan River Basin.

AREA: 32.9 ac. (34.2 ac. to 2-20-39.) **SHAPE:** Roughly fan-shaped, 90° angle, 1200 to 1600 ft. radius.

SLOPES: 23% in 0-2% class; 44% in 2-5%; 31% in 5-10%; 2% in 10-15%. Aspect SW.

SOILS: Unconsolidated coastal plain deposits. 1 Freehold sandy loam 75%; 2 Collington loam 13%; 3 Freehold sandy loam (overwash variant) 12%. Topsoil - all weak structure; 1, 8 in. av.; 2, 11 in. av.; 3, 40 in. av.; 1 & 3 rapid permeability; 2 moderate. Subsoil - 1 weak to moderate, medium subangular blocky structure; 2 moderate medium subangular blocky; 3 weak medium subangular blocky; 1 moderate to rapid permeability; 2 moderate; 3 moderate to rapid. Permeability and average depth to substratum - 1, v. rapid at 27 in.; 2, rapid at 29 in.; 3, v. rapid at 45 in. Internal drainage - **EROSION:** 1 - 24%; 2 - 48%; 3 - 16%; + - 12%. | 1 & 3 rapid; 2 medium.

LAND CAPABILITY: I - 22%; II - 46%; III - 32%.

SURFACE DRAINAGE: Good to excellent, slight pondage above 3 x 6 ft. drop inlet culvert 160 ft. above station, and in township road with sandy dikes each side above culvert; 600 ft. diversion terrace and 550 ft. outlet added in Aug. 1940; principal waterway 1870 ft.; secondary waterway 1100 ft.

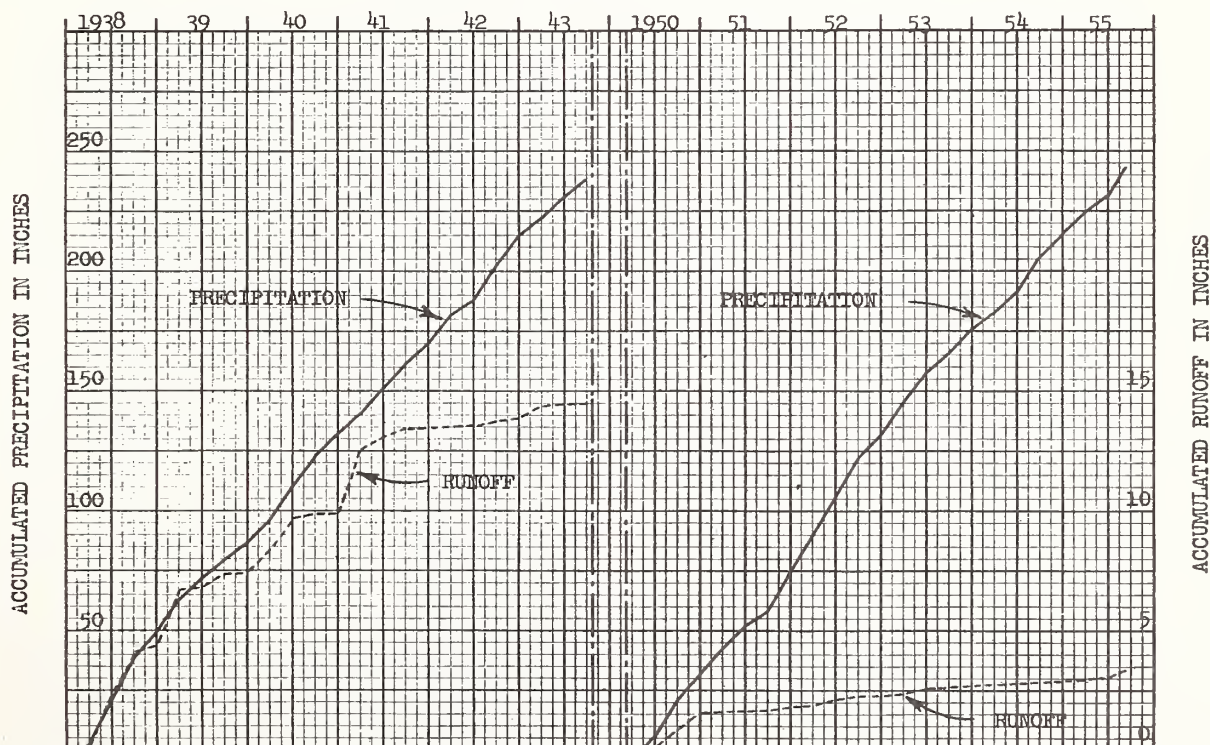
CHARACTER OF FLOW: Ephemeral; continuous.

INSTRUMENTATION: Runoff - 30" broad-crested concrete triangular weir with 2:1 crest slope for 3 ft., 6 hr. chart 1938-43; 24 hr. chart 1950-55; precipitation - 2 recording gages 12 hr. and weekly charts 1938-43, 1 recording gage with weekly chart 1950-53, 24 hr. chart 1953-55.

WATERSHED CONDITIONS: This watershed had always been farmed considerably off contour through 1938. In 1939, 15% of the area was contour stripped in 60 to 90 ft. strips, supplemented by a diversion terrace in 1940. The rest of the area remained unchanged: corn or potatoes were grown continuously on 28 to 77% of the acreage, averaging 56% row crops through 1943. The crop areas had winter cover of rye from November through March. Permanent roads, lanes and buildings comprised 6% of the area. For 1950-55 the whole area was in a peach and apple orchard planted on a rectangular layout, off-contour. Cultivation was up and down the slope between rows and some row crops were grown in 1950-51 between tree rows. In 1952 & 53 there was clean cultivation between rows except 3 ft. strip in tree rows. In 1954 & 55 a rotary cultivator was used leaving small pockets staggered 18 inches each way. It had winter cover of weeds and grass 1950-53, rye 1954-55.

GENERALLY REPRESENTS: Sloping Northern Coastal Plain cultivated areas of moderate to rapid permeabilities, medium to rapid internal drainage, excellent surface drainage, and moderate to severe erosion, in eastern Maryland, Delaware and southern New Jersey.

ACCUMULATED PRECIPITATION AND RUNOFF



Cooperative Research Project of the USDA and the New Jersey Agricultural Experiment Station.

MONTHLY PRECIPITATION AND RUNOFF (Inches)

Freehold, N.J., Watershed W-II

Month Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
1938 P Q			1.69 0	2.46 T	3.99 T	11.56 2.08	7.61 .63	3.36 .45	8.88 .98	2.74 0	4.39 .18	2.39 .01	49.07 4.33
1939 P Q	4.04 .94	5.79 1.33	4.55 .02 ^e	4.11 .11 ^e	.36 0	3.19 .03	.71 0	6.23 .53	1.02 0	4.90 .01	1.43 .01	1.00 0	37.33 2.98
1940 P Q	1.83 .06	2.82 .24	4.51 .70	5.60 .07	7.15 1.22	2.60 .01	2.76 0	7.63 .14	2.33 .06	2.23 0	4.24 .01	2.85 .01	46.55 2.52
1941 P Q	3.41 .82	2.14 .91	1.89 .94	2.03 0	1.87 0	7.86 .54	6.91 .33 ^e	2.03 0	.05 0	2.36 0	3.15 T	3.43 .01	37.13 3.55
1942 P Q	2.69 .01	2.90 .04	6.35 .03	1.40 0	2.24 0	2.08 0	7.23 .15	3.55 0	4.83 .11	3.16 T	5.15 .11	3.96 .06	45.54 .51
1943 P Q	2.67 T	1.42 .42	2.69 .05	2.82 .01	2.99 T	3.86 .10	2.65 .01	2.38 T	1.70 0				23.18 .59
38 to Av. P* 43 Av. Q*	2.93 .37	3.01 .59	3.61 .29	3.07 .03	3.10 .20	5.19 .46	4.65 .19	4.20 .19	3.13 .19	3.08 T	3.67 .06	2.73 .02	42.37# 2.59#
P Q													
P Q													
P Q													
P Q													
P Q													
1950 P Q					3.95 .01	1.63 .03 ^e	5.97 .21	6.65 .71	3.02 T	2.03 0	4.98 .21	3.44 .36	31.67 1.53
1951 P Q	3.52 .01	3.68 .02	4.80 .04	2.77 T	4.36 .03	2.21 0	1.71 0	3.22 .01	1.01 0	5.78 .18 ^e	6.44 .05	5.52 .04	45.02 .38
1952 P Q	6.26 .01	2.52 .01	5.04 .03	6.11 .05	7.78 .10	3.19 .08	4.14 .03	8.02 .09	3.22 .03	.86 T	3.63 .02	3.87 .01	54.64 .46
1953 P Q	4.71 .02	2.87 .02	7.58 .09	5.38 .04	4.80 .04	2.48 .02	2.59 .01	3.77 .02	.99 0	3.35 .02	3.05 .04	3.78 .04	45.35 .36
1954 P Q	1.24 0	1.60 0	3.79 .01	3.36 .01	4.05 .02	1.51 T	1.32 0	6.40 .05	6.69 .09	2.22 .01	3.82 .03	3.90 .03	39.90 .25
1955 P Q	.59 0	2.35 0	5.20 .03	2.28 T	2.01 .01	2.76 T	.16 0	11.79 .31 ^e					27.14 .35 ^e
50 to Av. P* 55 Av. Q*	3.26 .01	2.60 .01	5.28 .04	3.98 .02	4.49 .04	2.30 .02	2.65 .04	6.64 .20	2.99 .02	2.85 .04	4.38 .07	4.10 .10	45.52# .61#
P Q													
Av. P Av. Q													
Normal P	3.84	3.59	4.44	3.62	3.95	3.65	4.67	4.77	4.14	3.64	4.10	3.59	48.00

Notes: * Averages of all months of record. # Sum of monthly averages. Normal P based on monthly records at Freehold, N.J. (1874-1955) including 46 complete years, 7 partial years, and 29 years of no records. Oct. to Apr. may include snow and snow melt. ^e Estimated. Quality of records: P, excellent; Q, excellent, except those estimated, which are fair to good.

FREEHOLD, NEW JERSEY Watershed W-III

LOCATION: Monmouth Co., N.J.; 1.4 mi. SW of Freehold; unnamed tributary of Manasquan River.

AREA: 51.8 ac.

SHAPE: Broad paddle, 850 ft. wide by 2,750 ft. long.

SLOPES: 52% is in 0-2% class; 31% in 2-5%; 15% in 5-10%; 2% in 10-15%. Aspect: S-SE.

SOILS: Unconsolidated coastal plain deposits. 1 Freehold sandy loam 48%; 2 Freehold loam 36%; 3 Colemantown sandy loam and loam 11%; 4 Holmdel sandy loam 5%. Topsoil - all weak structure; 1, 11 in. av.; 2, 13 in. av.; 3, 20 in. av.; 4, 10 in. av.; 1 & 4 moderately rapid permeability; 2 moderate; 3 moderately slow to rapid. Subsoil - 1 weak to moderate subangular blocky structure; 2 mod. med. subangular blocky; 3 mod. med. angular blocky; 4 weak med. subangular blocky; 1, 2 & 4 moderate permeability; 3 slow to very slow. Permeability and av. depth to substratum - 1, rapid to slow at 25 in; 2, mod. rapid at 27 in; 3, very slow at 32 to 35 in.; 4, slow at 29 in. Internal drainage - 1 rapid to slow; 2 medium; 3 & 4 slow.

EROSION: 1 - 49%; 2 - 27%; 3 - 14%; 4 - 10%.

LAND CAPABILITY: I - 48%; II - 21%; III - 29%; IV - 2%.

SURFACE DRAINAGE: Good, except higher flows restricted by two 24 in. circular culverts 740 ft. and 1,870 ft. above gaging station; principal waterway 2,910 ft., average slope 1.4%; narrow, V-shaped channel most of length.

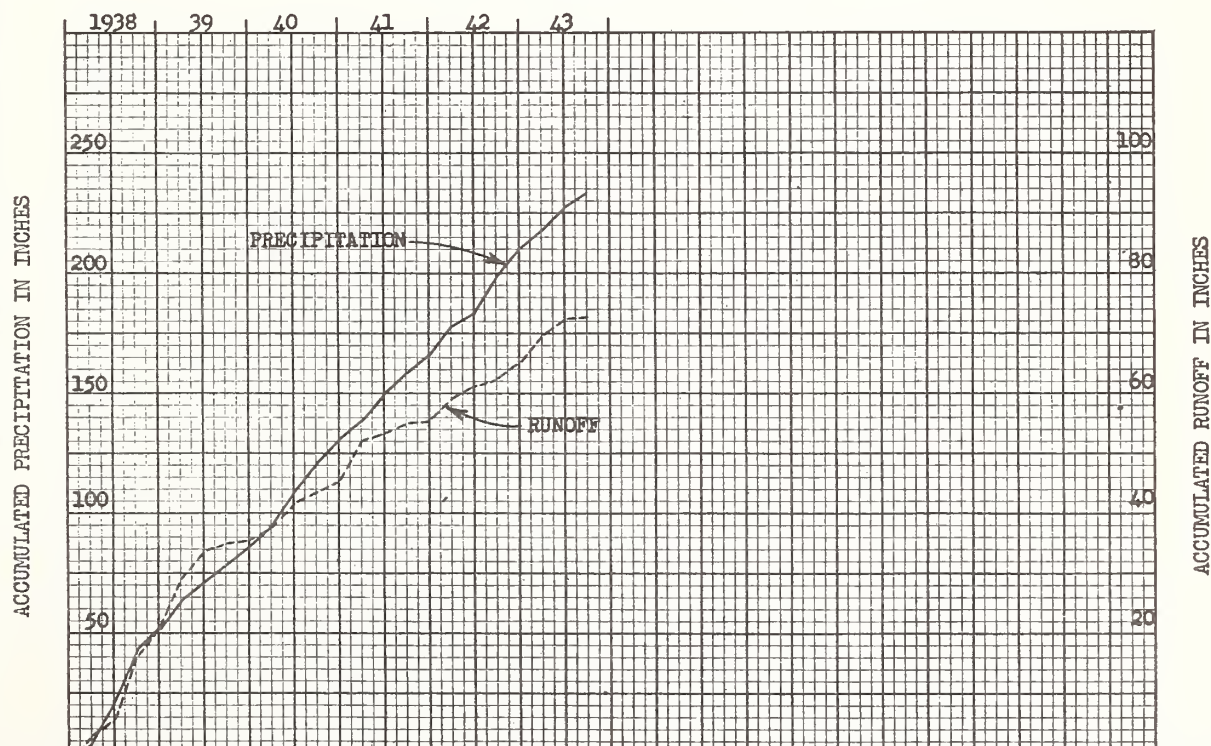
CHARACTER OF FLOW: Perennial; continuous.

INSTRUMENTATION: Runoff - 30" broad-crested V-notch concrete weir with 2:1 crest slope, 6 hr. chart 1938-40, 24 hr. chart 1940-43; precipitation - recording gages at runoff station, weekly chart and 190 ft. W. of center of drainage area, 12 hr. chart.

WATERSHED CONDITIONS: The watershed included parts of 4 farms with cover ranging from permanent pasture heavily grazed (22%), to potato and other fields planted off-contour (average of 33%) with a winter cover of rye. 15% of the area was farmsteads, pavements, roadways, drainage ways, etc. The remaining 30% was generally in strawberries and gardens (6%), hay and alfalfa, grain, corn, soybeans and other miscellaneous crops (22%), with an idle area of brush and weeds (2%). The area of row crops varied from 30% to 49% during the period. Some of the wet Holmdel soil area had been drained with tile. Small amounts of the flow were utilized directly by 40 to 60 dairy cows and for water for crop spraying. Crop yields were good to excellent. Considerable silt from fields and raw stream banks was discharged in times of high flow, particularly in the summer and fall of 1938, including the Sept. 16-21 hurricane.

GENERALLY REPRESENTS: Sloping Northern Coastal Plain dairy and cropland areas with very slow to rapid permeabilities, slow to rapid internal drainage, good surface drainage and moderate to moderately severe erosion in eastern Maryland, Delaware and southern New Jersey.

ACCUMULATED PRECIPITATION AND RUNOFF



Notes: *Averages of all months of record. #Sum of monthly averages. Normal P based on monthly records at Freehold, N.J. (1874-1955) including 46 complete years, 7 partial years, and 29 years of no records. Months of Jan. to Apr. and Oct. to Dec. may include snow and snow melt. ePartially estimated. Quality of records: P, excellent; Q, excellent.