



Drought Monitoring Criteria and Little Lehigh Creek Watershed Monitoring

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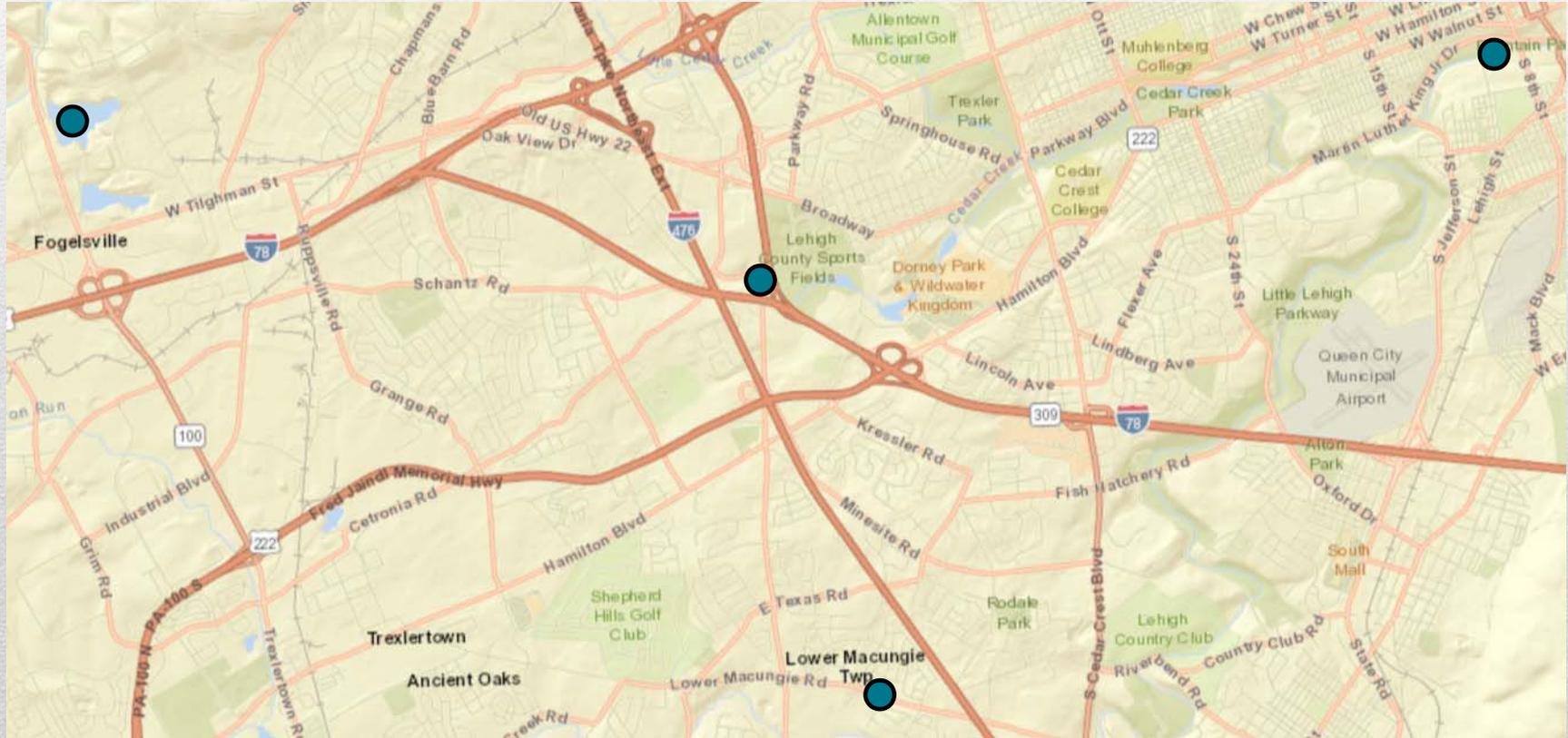


Objectives

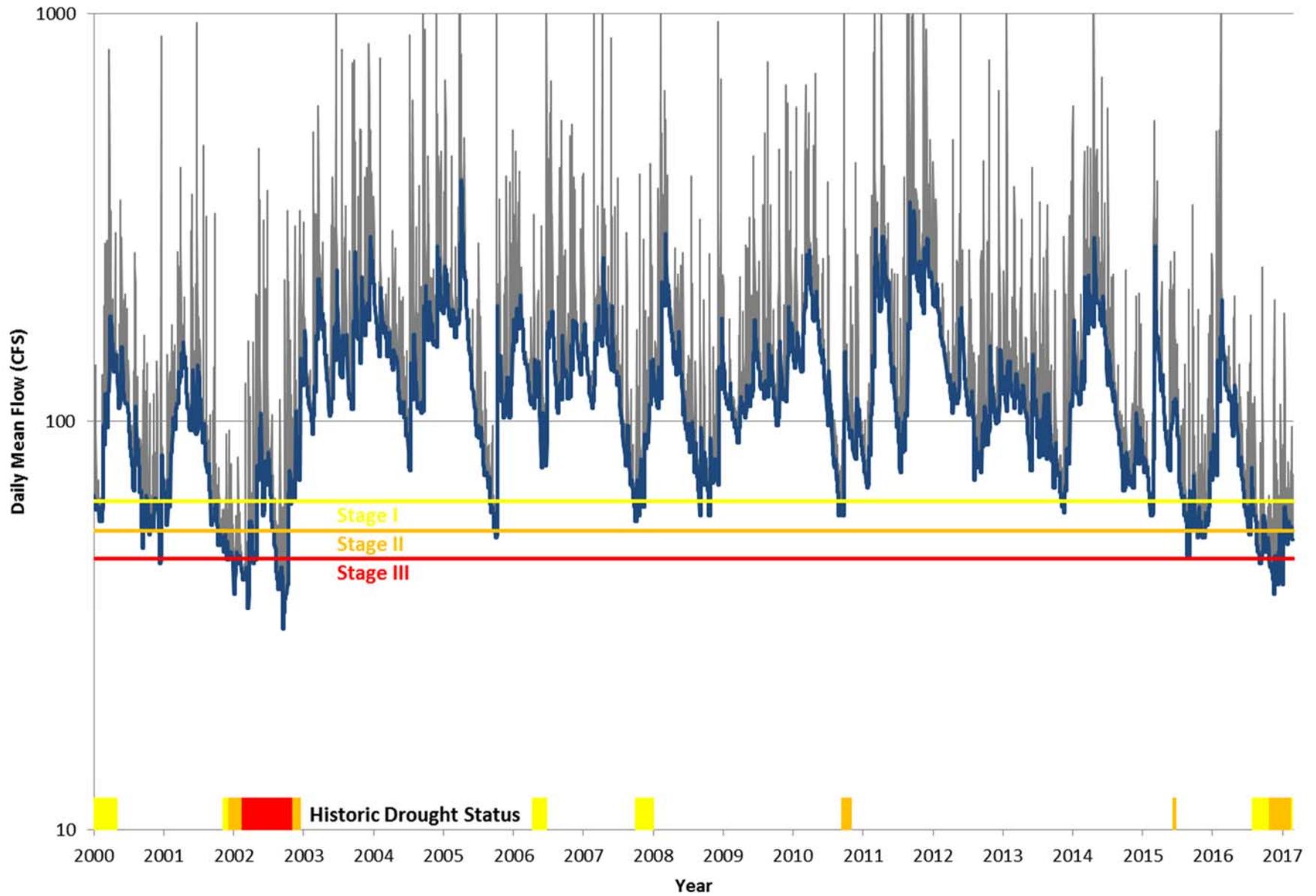
- Establish local drought triggers
 - Groundwater & surface water
 - Four stations proposed
- Characterize relationship between creek flow and well withdrawal
 - Additional stream and groundwater well monitoring stations
 - Detailed water budget analysis

Drought Monitoring Stations

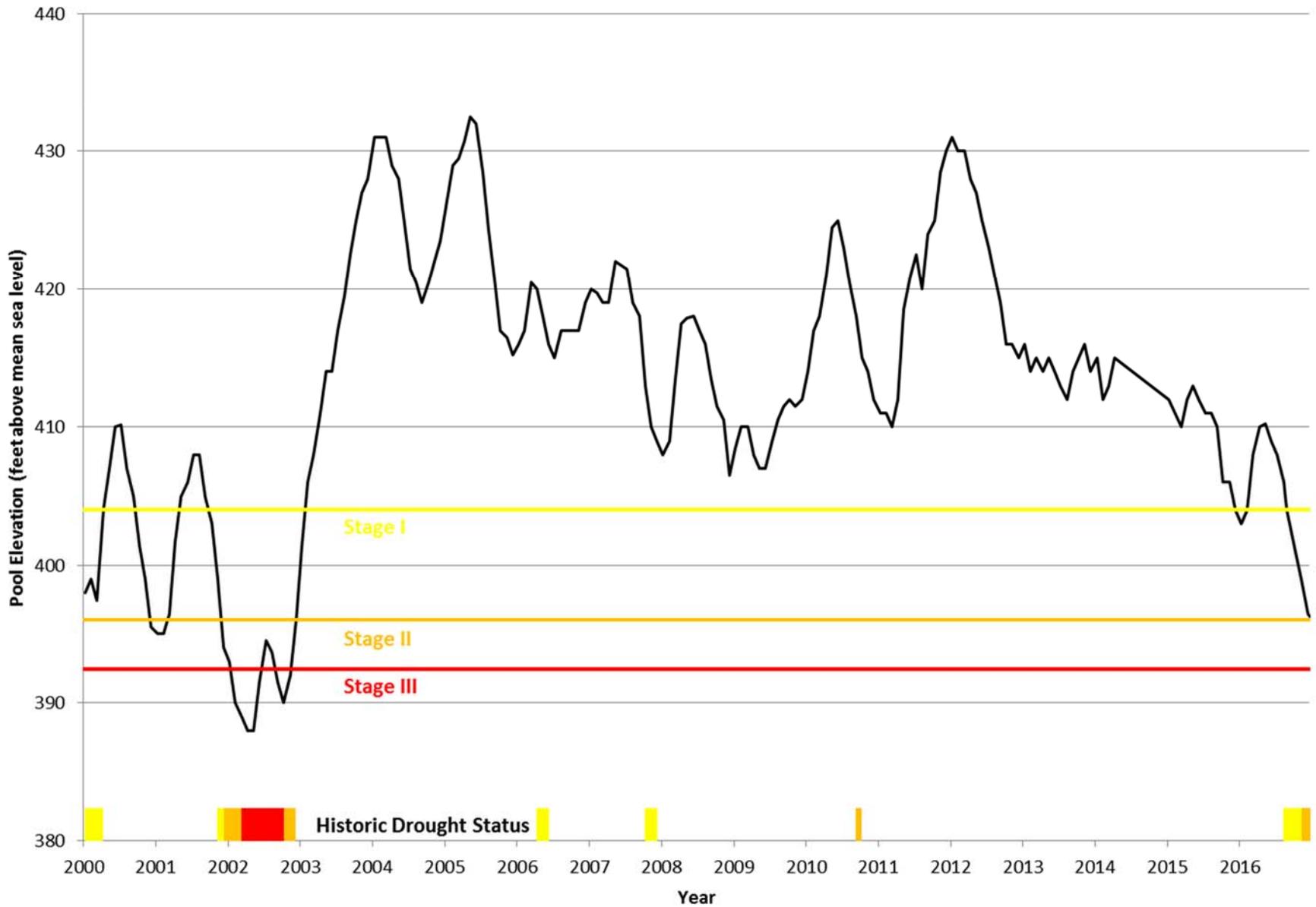
- Little Lehigh Creek intake pass-by flow
- Upper Macungie Park Quarry
- Lower Macungie Road Monitoring Well
- Schantz Spring (future)



Little Lehigh Creek Pass-by Flow



Upper Macungie Park Quarry



4817 Lower Macungie Road Monitoring Well



Drought Status Dashboard

Lehigh County Authority Water Supply Report

Date: 3/2/2017

Monitoring Point	Measurement	Normal Conditions	Drought Declaration Trigger Points			Current Conditions
			Stage 1 Watch	Stage 2 Warning	Stage 3 Emergency	
Upper Macungie Park Quarry	Feet above sea level (<i>lower measure = lower water level</i>)	> 404	404	396	392	396'
Lower Macungie Monitoring Well	Feet below casing top (<i>higher measure = lower water level</i>)	< 39	39	40	41	39.2'
Little Lehigh Creek at USGS Gage-10th St.	Cubic feet per second (cfs) (<i>lower measure = lower stream flow</i>)	> 64	64	54	46	52

Current Conditions: Stage 1 - Drought Watch

Stage 1 - Drought Watch

All three monitoring points are below Stage 1 levels

- OR -

Drought Watch declared by Commonwealth of Pennsylvania or the Delaware River Basin Commission

Stage 2 - Drought Warning

All three monitoring points are below Stage 2 levels

- OR -

Drought Warning declared by Commonwealth of Pennsylvania or the Delaware River Basin Commission

Stage 3 - Drought Emergency

All three monitoring points are below Stage 3 levels

- OR -

Drought Emergency declared by Commonwealth of Pennsylvania or the Delaware River Basin Commission

- OR -

LCA is unable to meet system demand for other reasons (operational / mechanical)

- OR -

Little Lehigh Creek AND Lehigh River pass-by flows are less than required minimums (16 cfs for Little Lehigh; 400 cfs for Lehigh River)

Drought Monitoring Criteria

- Discussion

Little Lehigh Creek Watershed Monitoring

- Why do sections of the stream go completely dry?
- Where does the lost stream flow go?
- Does nearby groundwater extraction contribute to the streamflow losses?
- What can be done to mitigate the risk of drying streams?

Water Resources of Lehigh County, USGS, 1972

- “Wood Study”

Double Mass Curve 1949-68

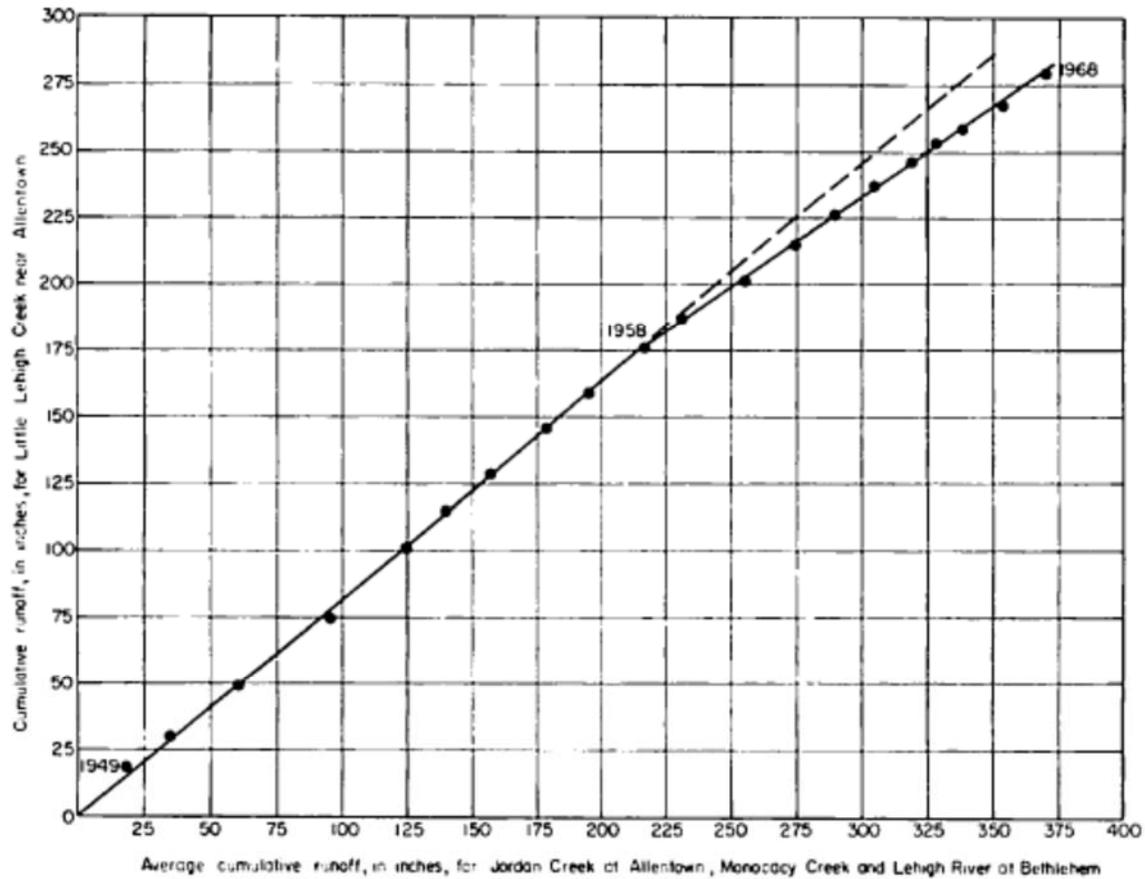
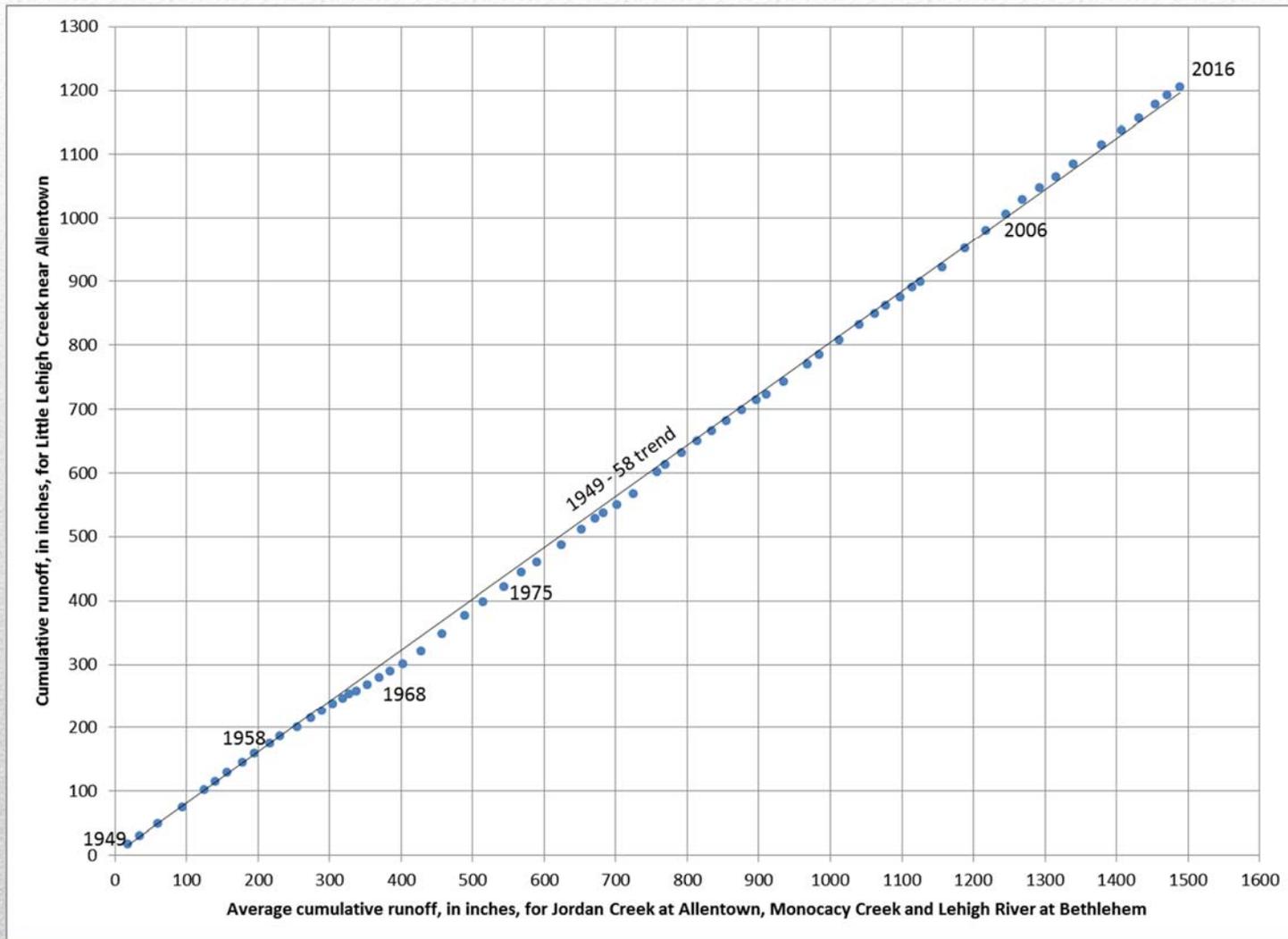


Figure 26. Double-mass curve of annual runoffs for Little Lehigh Creek near Allentown versus three nearby streams, 1949-68.

Double Mass Curve 1949-2016



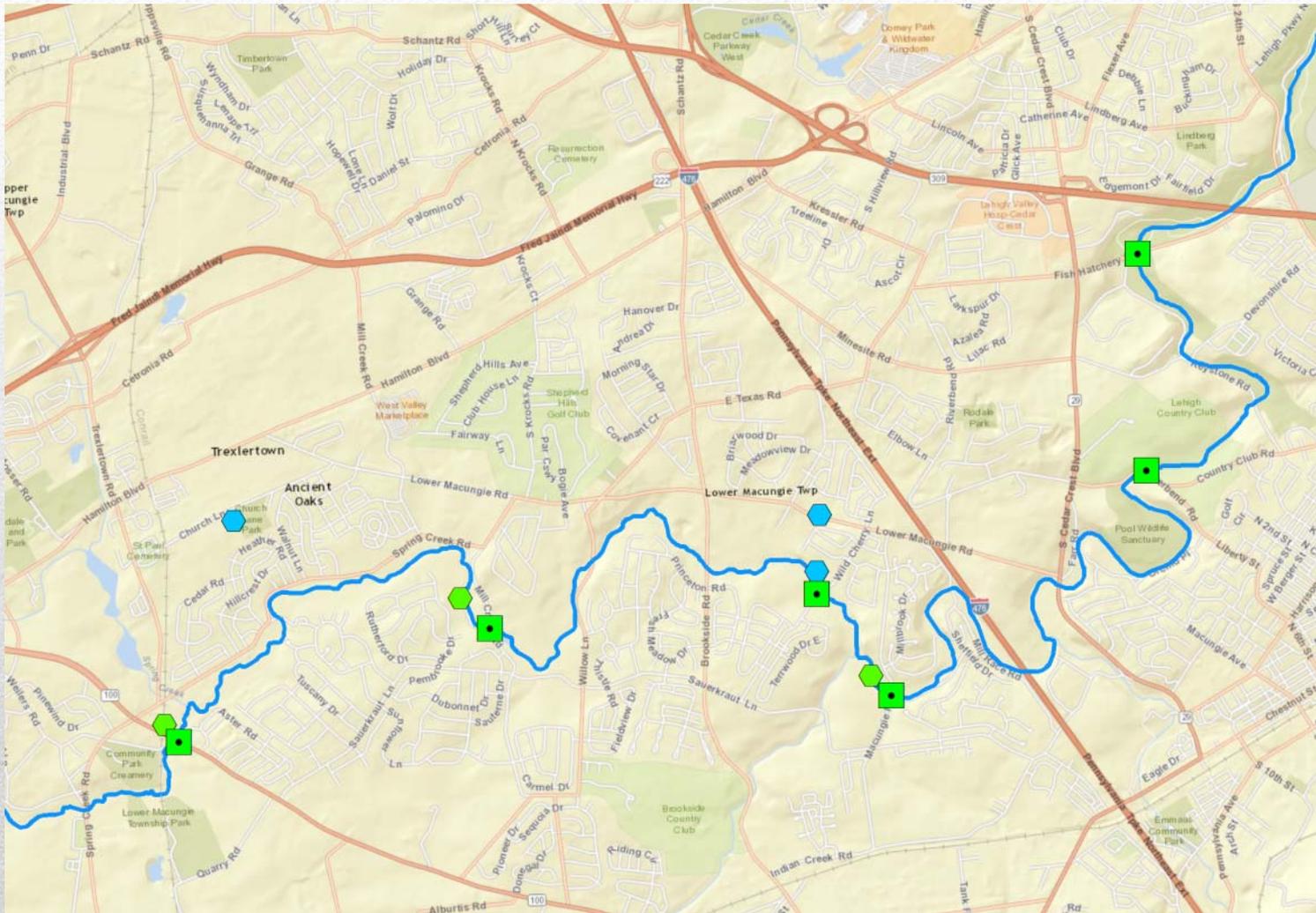
Additional Continuous Monitoring

- Establish 6 additional stream gaging stations on the main stem of the Little Lehigh Creek
- Monitor 3 additional groundwater wells

Label	Bridge	Stream Mile (upstream from LCA intake)	Drainage Area (sq mi)	Historic Site
LL03.8	Fish Hatchery Rd	3.8	80.3	
LL05.6	Riverbend Rd	5.6	75.8	
LL09.4	Macungie Rd	9.4	65.9	Station #4514.6 (USGS, 1972)
LL10.1	Wild Cherry Ln	10.1	53.3	
LL12.6	Mill Creek Rd	12.6	48.9	Station #01451420 (former USGS station)
LL15.2	Route 100	15.2	21.3	Station #4513.8 (USGS, 1972)

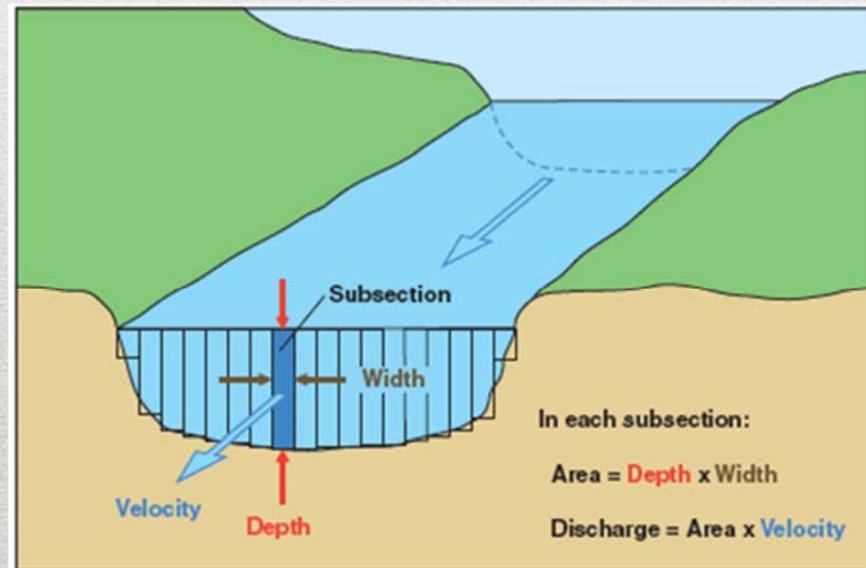
Label	Well Address
Le-860	1905 Pembroke Drive
Le-861	1965 Route 100
Le-862	4958 Macungie Road

Additional Monitoring Points



Stream Gaging Station

- 4 current discharge measurements during first year
- Develop stage-discharge relationship
- Automated stage height data collection
- Periodic maintenance



Stream Gaging

