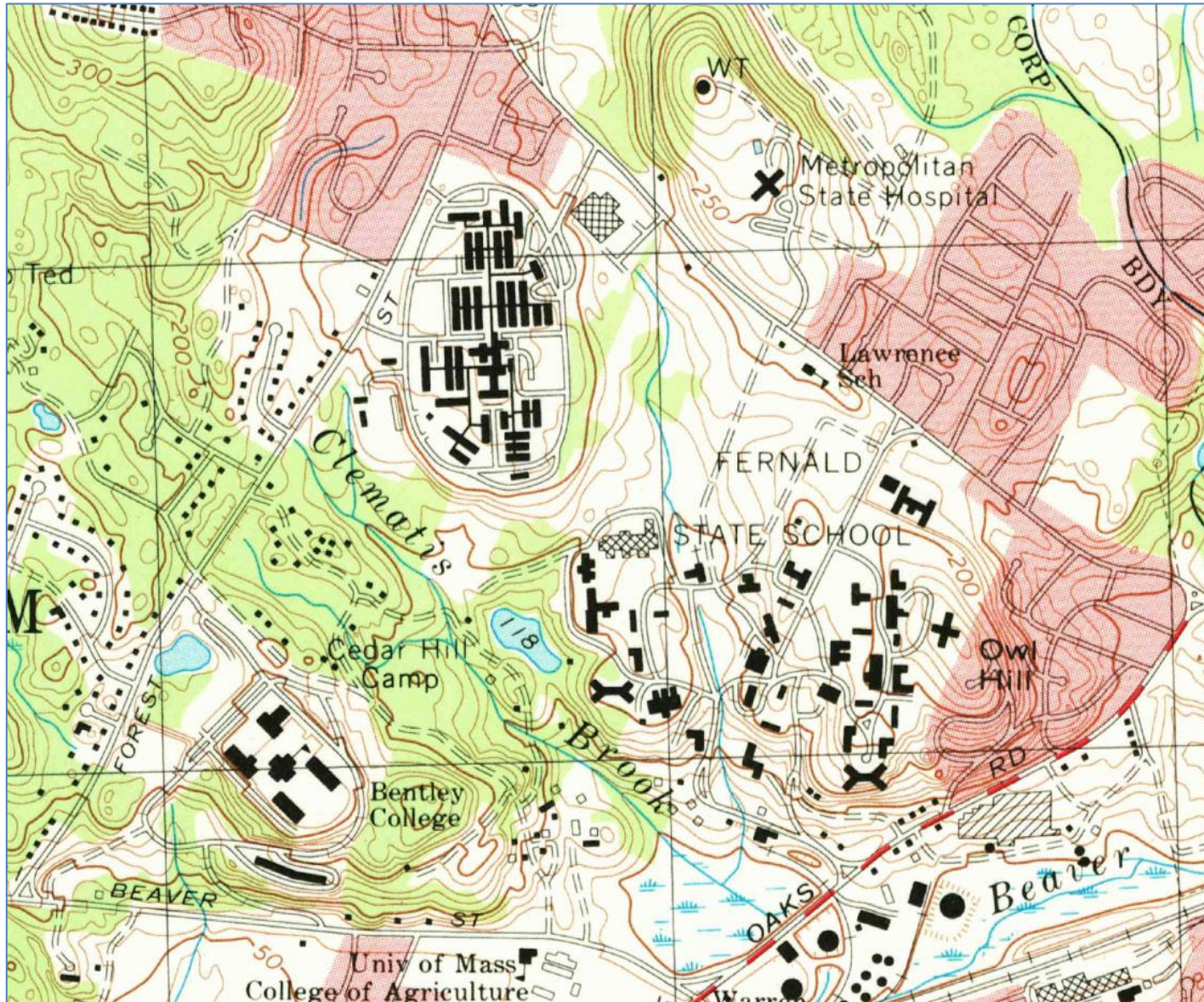


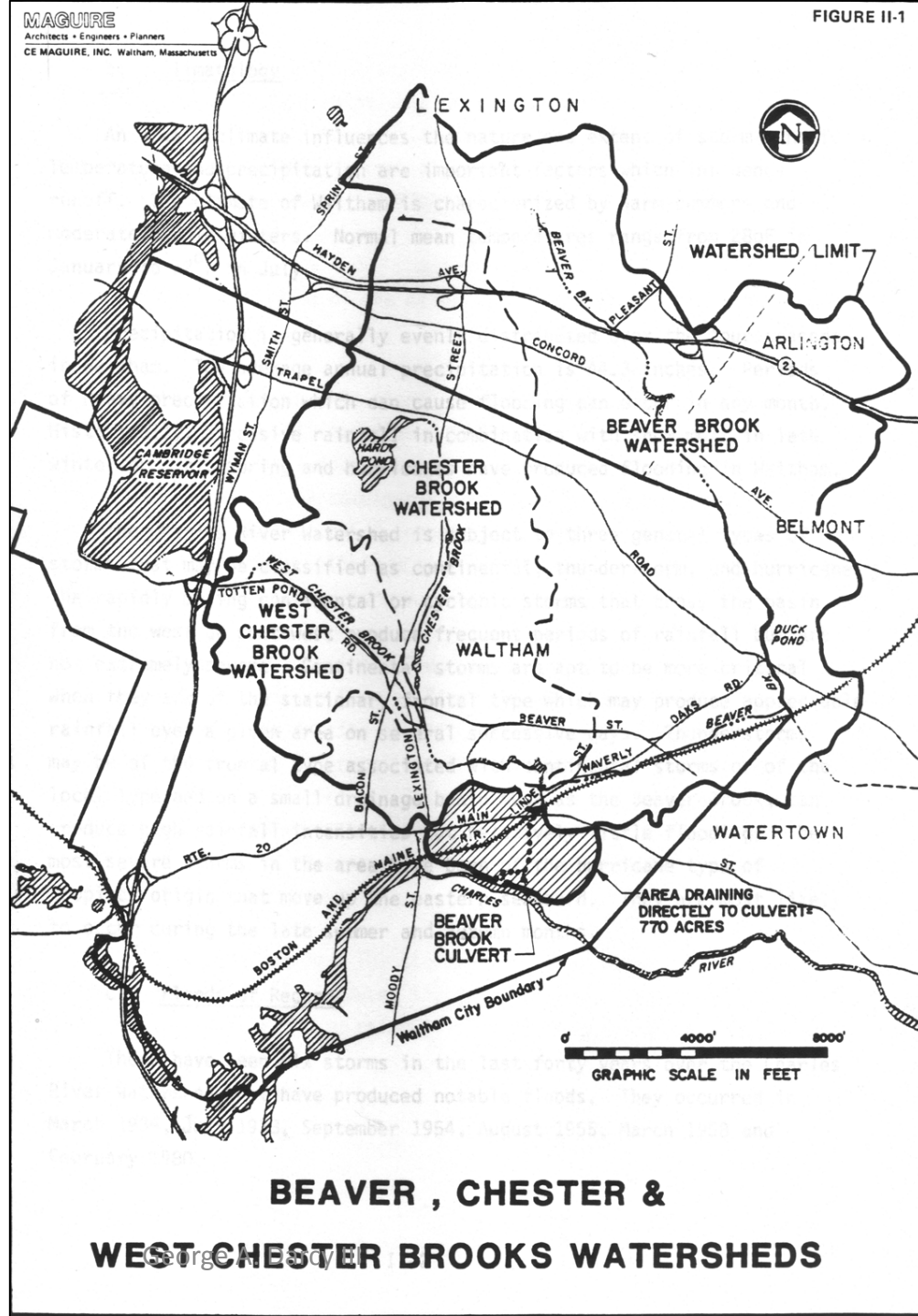
# Fernald Wetland Restoration

George A. Darcy III  
June 9, 2014

# Fernald Site



# Beaver Brook Watershed



# C E Maguire Report

## V. RECOMMENDED FLOOD MITIGATION PROGRAM

### V.4 Recommendations for Upstream Watershed

*“Hydrological and hydraulic analyses revealed that structural and non-structural improvements of the Beaver Brook Culvert and the downstream reach of the Beaver Brook alone cannot provide adequate protection against a 100-year flood event. Unless a considerable investment is being made to install additional capacity to the improved Beaver Brook Culvert, **the only way to extend flood protection up to the 100-year event is to utilize the storage potential of the upstream watershed.** Hence, a combination of major structural actions (River Street, Inlet Bypass, Relief Culvert, etc.) and significant non-structural one (flood mitigation storage) constitute the recommended flood mitigation program.”*

(page V-7 of Beaver Brook Flood Mitigation Program by CE Maguire Inc., dated 2/5/1981)

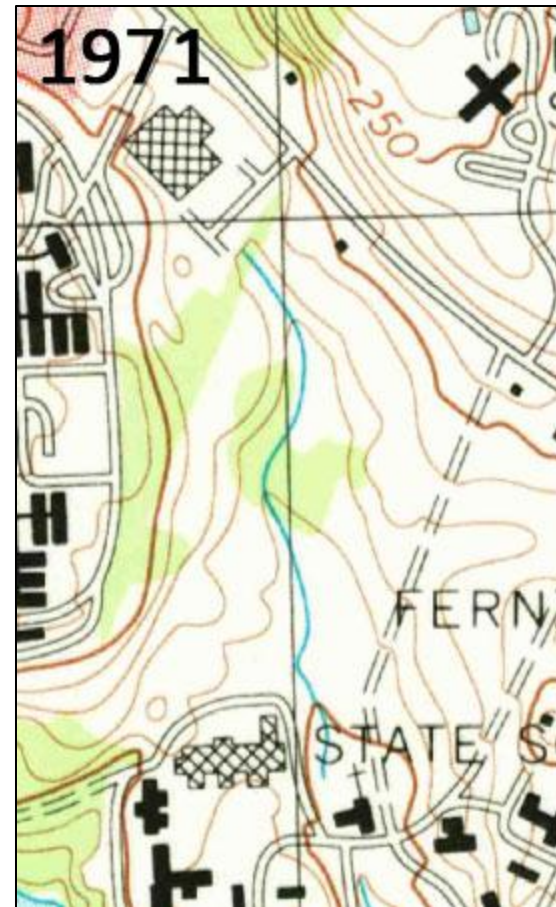
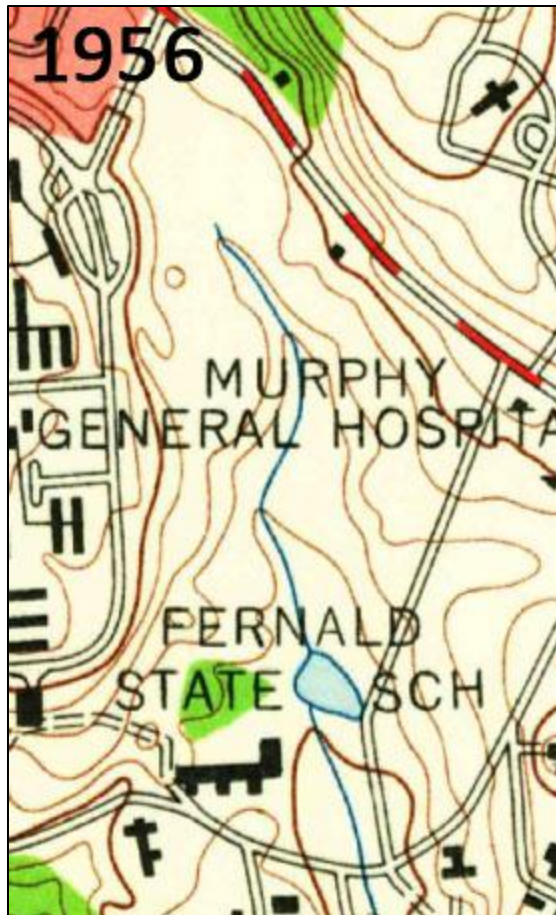
# Investigative Resources

- USGS Topographical Maps
- Federal Government Aerial Photography
- Local resident stories
- On-site conditions

# Former Fernald Wetlands - Triangle Pond

## 1956

## 1971



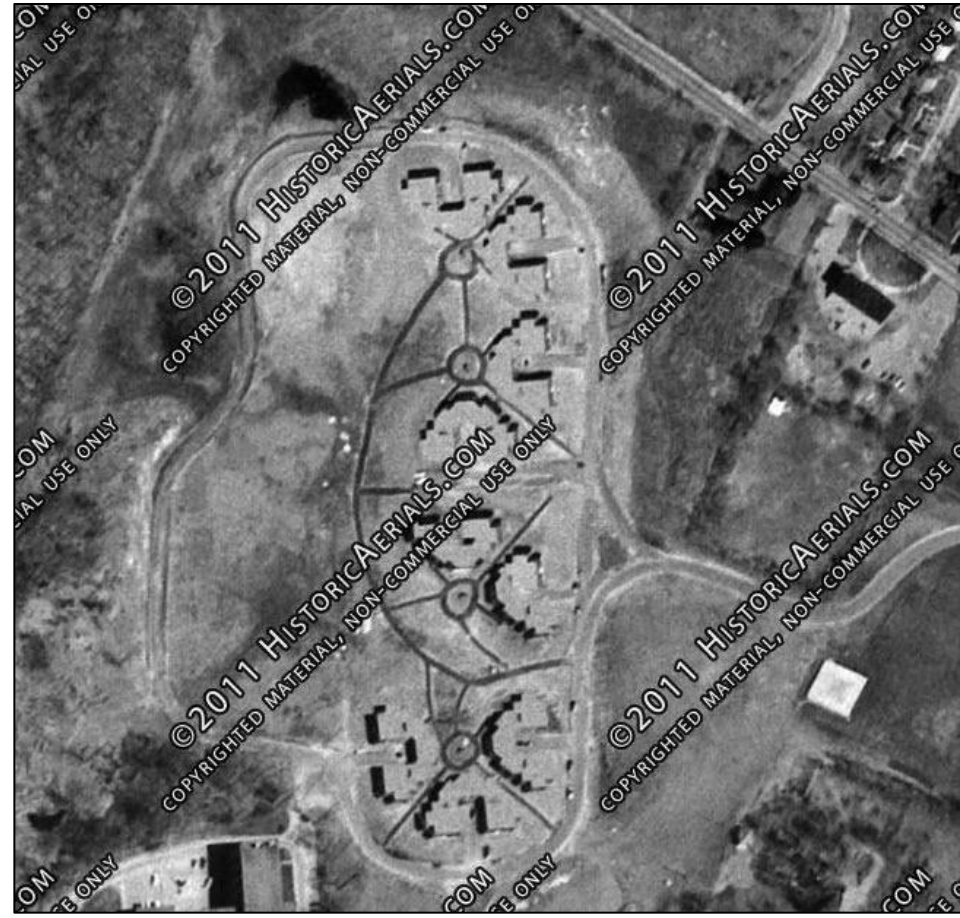
# Former Fernald Wetlands - Stream 1971



# Former Fernald Wetlands - Cigar Pond

## 1971

## 1978



# Potential Flood Storage Volumes

## Cigar Pond

The Upper Pond had an oval shape oriented in the north south direction.

The flood storage potential of an oval shape is defined as below:

$$\text{water volume (gallons)} = (\text{length (feet)} \times 0.5) \times (\text{width (feet)} \times 0.5) \times 3.14 \times \text{depth} \times 7.48 (\text{const})$$

Calculations are shown below for 4 difference pond depths: 1, 2, and 4 feet.

### **Water Volume at 3 depths**

- 1 ft:  $350 \times 0.5 \times 200 \times 0.5 \times 3.14 \times 1 \times 7.48 = 411,026$  gal
- 2 ft:  $350 \times 0.5 \times 200 \times 0.5 \times 3.14 \times 2 \times 7.48 = 822,052$  gal
- 4 ft:  $350 \times 0.5 \times 200 \times 0.5 \times 3.14 \times 4 \times 7.48 = 1,644,104$  gal

## Triangle Pond

The lower pond was shaped like a sideways triangle with lengths of approximately 200 and 250 feet. The water volume in gallons of a triangle is defined as follows:

$$\text{water volume (gallons)} = \text{length (feet)} \times \text{width (feet)} \times 0.5 \times \text{depth (feet)} \times 7.48 (\text{constant}).$$

Calculations are shown below for 4 different pond depths: 1, 2, and 4 feet.

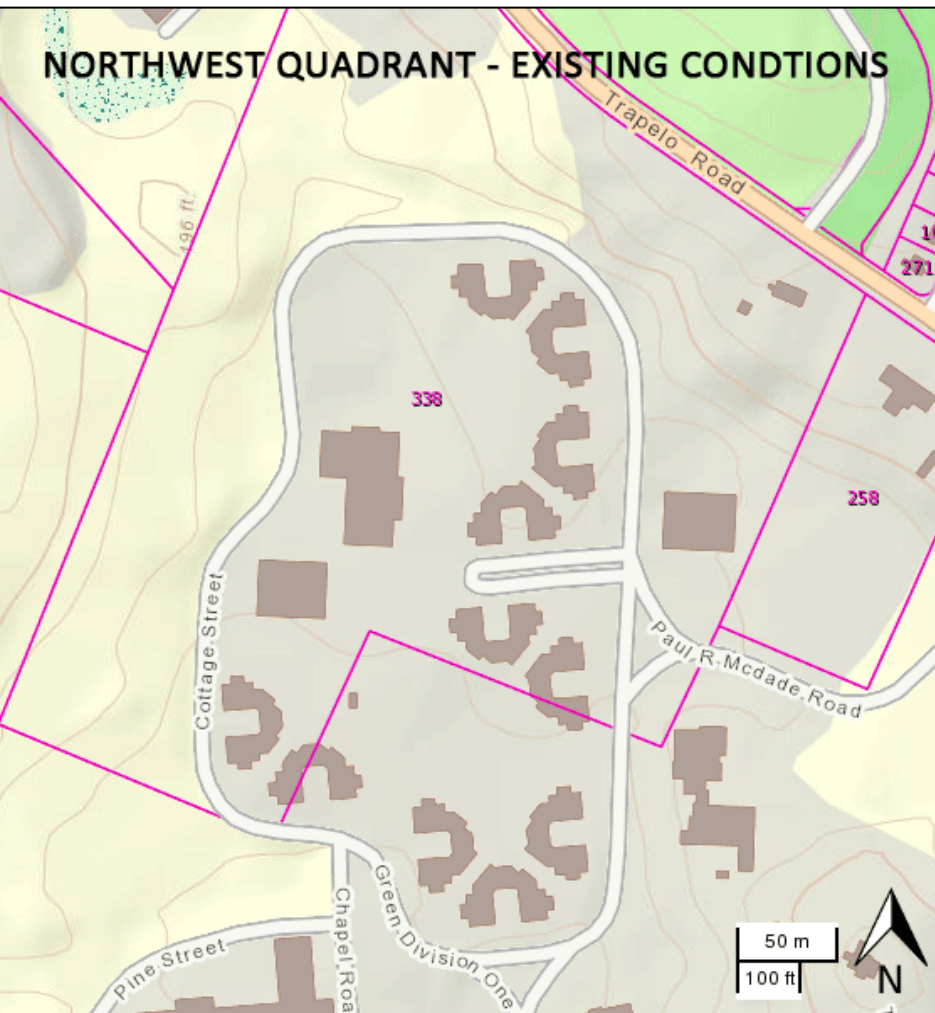
### **Water Volume at 3 depths**

- 1 ft:  $250 \times 200 \times 0.5 \times 1 \times 7.48 = 187,000$  gal
- 2 ft:  $250 \times 200 \times 0.5 \times 2 \times 7.48 = 374,000$  gal
- 4 ft:  $250 \times 200 \times 0.5 \times 4 \times 7.48 = 749,000$  gal

## Combined Flood Storage

The total combined storage ranges from 598,026 to 2,393,104 gallons depending on the chosen depths of the ponds and given sufficient flow.

# Wetland Restoration



6/9/2014

George A. Darcy III



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# Restoration Process

- Demolish 11 cottage structures
- Removal of asphalt roadway
- Excavation and regrading of wetlands areas (Cigar and Triangle Ponds, & associated BVW)
- Daylighting of stream
- Removal of underground culverts
- Reconstruction of hillside

# Public Benefit

Reduced flooding downstream in the Beaver Brook watershed

as well as other secondary benefits such as

- Enhanced habitat for flora and fauna
- Outdoor skating at the triangle pond
- Sledding on the restored hillside
- Cross country skiing
- Farming on the adjacent fields

# Bibliography

- USGS Topographic maps, <http://www.usgs.gov/>.
- Discussions with Lawrence School neighborhood resident Marie Daly.
- “Beaver Brook Flood Mitigation Program”, CE Maguire Inc., 2/5/1981.
- “Restoration, Creation, and Recovery of Wetlands”, Mary E. Kentula, U.S. Environmental Protection Agency,  
[water.usgs.gov/nwsum/WSP2425/restoration.html](http://water.usgs.gov/nwsum/WSP2425/restoration.html) .