## 4.4 Three Ponds Brook

An IC method analysis for Rhode Island's Three Ponds Brook watershed was performed to complete a TMDL allocation. The IC method was applied to estimate existing and target % IC in the overall watershed and in each sub-watershed.

### 4.4.1 Watershed Description

The watershed for the Three Ponds Brook is located within Warwick and Cranston town boundaries and is shown on Figure 4-8. The watershed is characterized by wetland, commercial, residential development, and roadways (Table 4-11). The drainage area is 1,075 acres (1.7 sq. miles).

Three Ponds Brook is part of the Pawtuxet River Basin located between Warwick and Cranston Rhode Island. Three Ponds Brook joins the Pawtuxet River, which drains into Providence River. The Providence River is a part of the Narragansett Bay Watershed.

Three Ponds Brook is a Class B stream. Under the Rhode Island Water Quality Classification Descriptions, waters listed as Class B are designated for fish and wildlife habitat and primary and secondary contact recreational activities. They shall be suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses. These waters shall have good aesthetic value (RIDEP, 1997).

Under the Rhode Island Final 2002 List of Impaired Waters List, Three Ponds Brook has been placed on the Clean Water Act 303(d) for the following: Copper, Lead, Dissolved Oxygen / Nutrients (RIDEM, 2003). According to Federal Regulations 40 CFR 131.36 (USEPA, 2000), the criteria for Copper is 17ug/L and 11ug/L for maximum and continuous concentrations, respectively. The criteria for Lead is 65ug/L and 2.5ug/L for maximum and continuous concentrations, respectively. Under the State Water Quality Regulations (RIDEM, 1997), the criteria for nutrients is that the average Total Phosphorus shall not exceed 0.025 mg/l in any lake, pond, kettlehole or reservoir ,and the average Total Phosphorus in tributarie shall not cause exceedances of this criteria in downstream water bodies. The criteria for dissolved oxygen (cold water fish habitat) is the DO (dissolved oxygen) content of not less than 75% saturation, based on daily average, and an instantaneous minimum DO of at least 5 mg/l.

According to the State of Rhode Island Section 305(b), Three Ponds Brook is assessed as not supporting aquatic life use. Also, Three Pond Brook is unassessed for swimming use to to lack of bacteria data (RIDEM, 2002).

**Table 4-11 Three Ponds Brook: Major Landuse Distribution**

| Landuse | Percentage of Watershed |
|---|---|
| Wetland | 27% |
| Commercial/Industrial Mixed | 24% |
| Developed Recreation | 8% |
| Transitional Areas (urban open) | 8% |
| Medium High Density Residential (1/4 to 1/8 acre lots) | 7% |
| Roads (divided highways >200 ft plus related facilities) | 6% |
| Mines, Quarries and Gravel Pits | 6% |
| Vacant Land | 4% |
| Water | 3% |
| Other | 7% |

### 4.4.2 Available Data

The State of Rhode Island provided a PDF with an aerial view map with Three Ponds Brook highlighted. Figure 4-9 provides a landuse map for the Three Ponds Brook watershed. The watershed boundary was delineated by hand from the USGS Quadrangles and landcover was obtained from Rhode Island Geographic Information System (RIGIS). The RIGIS Landuse datalayer has 16 landuse classifications interpreted from 1985 aerial photography.

### 4.4.3 Impervious Cover and Pollutant Load Calculation

To calculate watershed impervious cover, the Three Ponds Brook watershed was digitally intersected with the RIGIS landuse datalayer, and the area of each landuse category calculated. Watershed impervious percentage was then calculated based on the assumed impervious percentages for each landuse as shown in Table 4-12. The assumed percentage of impervious cover for each landuse was derived using recommended percentages in TR-55, Urban Hydrology for Small watersheds (USDA, 1986). The results of this analysis indicate the Three Ponds Brook watershed is 47 percent impervious. The Impervious Cover Model predicts severe degradation of stream quality for greater than 25 percent impervious cover. Thus, the impervious cover model predicts severe water quality degradation in the Three Ponds Brook.

**Table 4-12 Three Ponds Brook: Estimated Percent Impervious Cover by Landcover**

| Landuse | Estimated Percent Impervious Cover |
|---|---|
| Commercial (sale of products and services) | 85% |
| Commercial/Industrial Mixed | 79% |
| High Density Residential (<1/8 acre lots) | 65% |
| Industrial (manufacturing, design, assembly, etc.) | 72% |
| Institutional (schools, hospitals, churches, etc.) | 85% |
| Medium High Density Residential (1/4 to 1/8 acre lots) | 38% |
| Other Transportation (terminals, docks, etc.) | 90% |
| Other | 0% |

Table 4-13 provides estimated existing % IC and target % IC values for the Three Ponds River watershed. For illustrative purposes, estimated annual stormwater runoff volume and estimated annual pollutant loads for selected parameters are also provided, using annual rainfall and estimated event mean concentration of pollutants from (Schueler, 2003). For this watershed, an annual rainfall of 45.53 inches (Providence, NOAA.com) and a fraction of annual rainfall events that produced runoff of 0.9 (Center for Watershed Protection, 2003) were used.

**Table 4-13 Three Ponds Brook: Estimated Existing and Target TMDL Values for Key Parameters**

| Parameter | Estimated Conditions | |
|---|---|---|
| | Existing | TMDL Target |
| | | |
| Impervious Cover | 47% | 9% |
| | | |
| Optional: | | |
| | | |
| Annual Runoff Volume | 1,751 acre-ft | 481 acre-ft |
| | | |
| Total Suspended Solids | 370,000 lbs | 100,000 lbs |
| | | |
| Total P | 1,500 lbs | 420 lbs |
| Soluable P | 610 lbs | 170 lbs |
| Total N | 11,000 lbs | 3,100 lbs |
| TKN | 8,100 lbs | 2,300 lbs |
| Nitrate & Nitrite | 3,100 lbs | 860 lbs |
| Copper | 63 lbs | 17 lbs |
| Lead | 320 lbs | 88 lbs |
| Zinc | 760 lbs | 210 lbs |

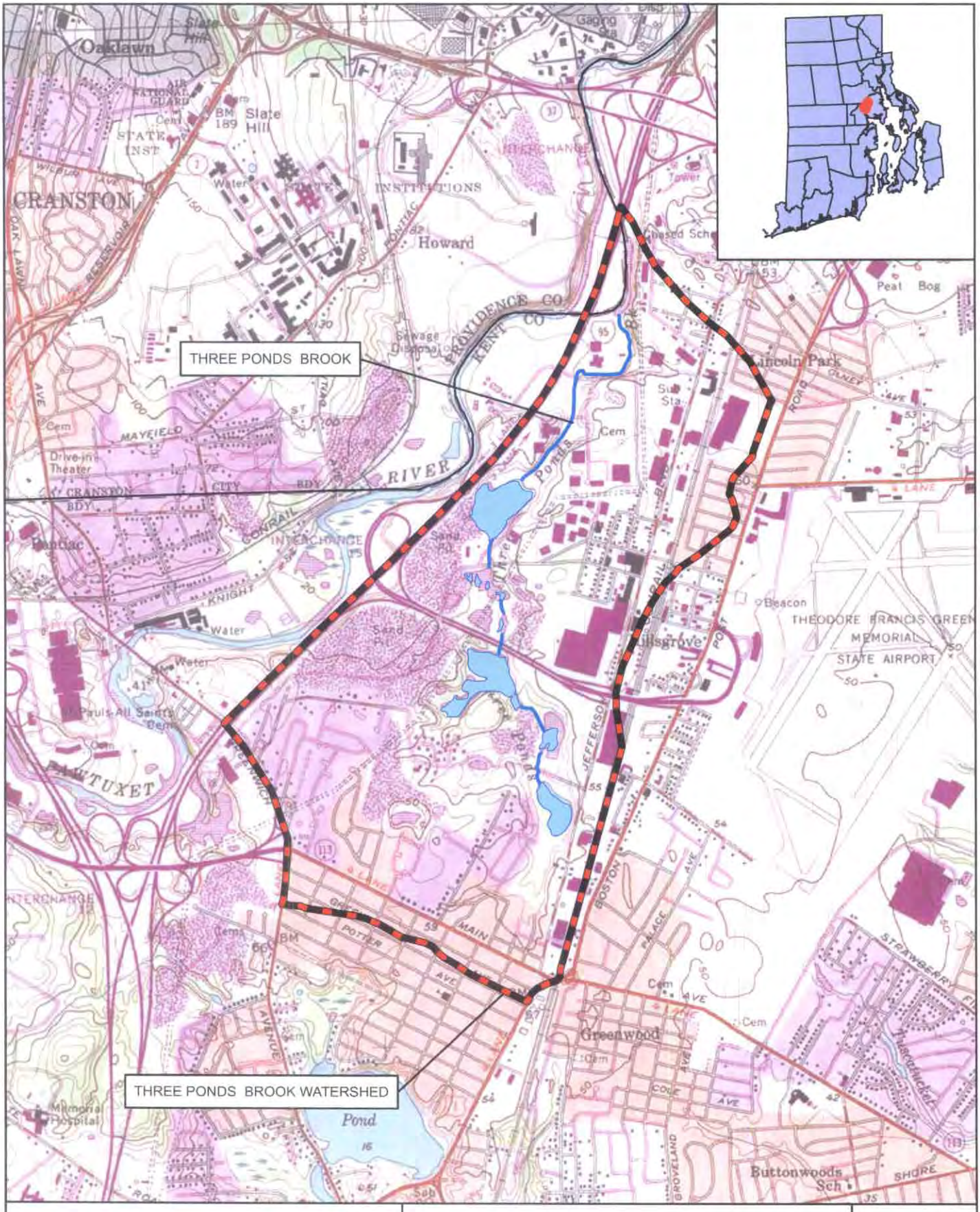
### 4.4.4 Summary and Conclusions

| | |
|---|---|
| Three Ponds Brook, Rhode Island | |
| Section 303(d) listed impairments: | Copper |
| | Lead |
| | Dissolved oxygen |
| | Nutrients (phosphorus) |
| Size of watershed: | 1.7 square miles |
| Percent of IC in watershed: | 47% |

Applicability of IC method to this watershed

There were no problems using available data to calculate the percent IC for this watershed. It is a small watershed and the land cover map provides adequate detail on the types of development and their concentrations in the watershed.

However, the cause of the impairment is specific and known and consequently, EPA would expect specific TMDLs to be developed for copper, lead, dissolved oxygen, and nutrients. Consequently, the IC method is not the appropriate method for TMDL development in this watershed.



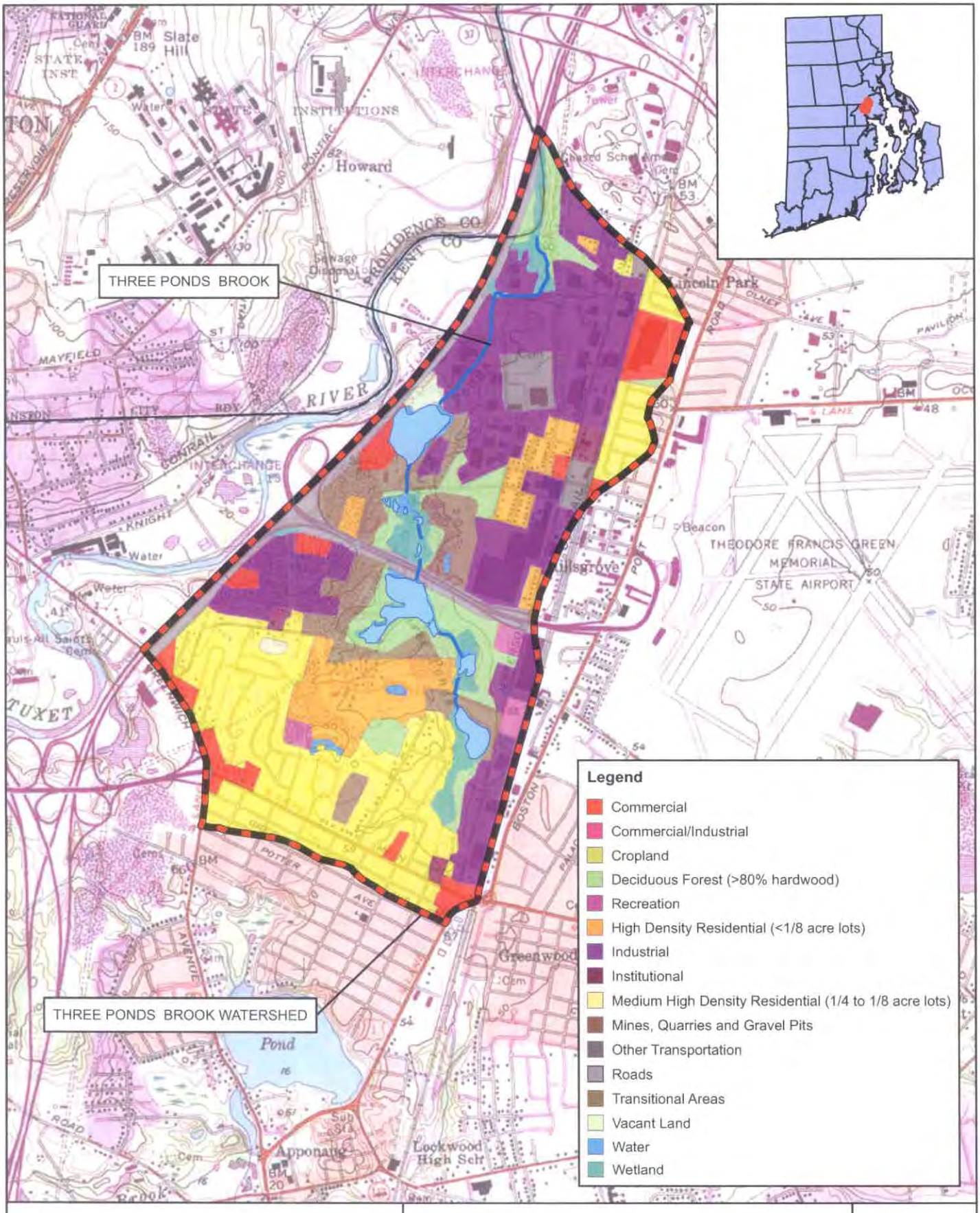

N

0 1,000 2,000 4,000 Feet

1 inch equals 2,000.863674 feet

THREE PONDS BROOK WITH WATERSHED BOUNDARY INDICATED
WARWICK, RHODE ISLAND

FIGURE
4-8




# THREE PONDS BROOK LANDUSE MAP

WARWICK, RHODE ISLAND

FIGURE 4-9