

Brodhead Watershed Association  
Monroe County, Pennsylvania

# Paradise Creek Watershed Groundwater Availability Report

August 2005



BRODHEAD WATERSHED ASSOCIATION  
MONROE COUNTY, PENNSYLVANIA

## PARADISE CREEK WATERSHED GROUNDWATER AVAILABILITY REPORT

AUGUST 2005

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# **Paradise Creek Watershed Groundwater Availability Study**

## **Section 1**

### **Introduction**

N.A. Water Systems has evaluated the sustainable groundwater resources available within the Paradise Creek Watershed located in Paradise Township, Monroe County, Pennsylvania. Paradise Creek is a major tributary of Brodhead Creek, which ultimately drains to the Delaware River. This report presents a theoretical analysis of the available groundwater resources based on existing stream base flow data and published reports. This report is intended to assist in determining the sustainable amount of groundwater that is available so that it can be utilized without excessively withdrawing groundwater from the aquifer and adversely impacting stream base flow.

A watershed is defined and delineated as the area that provides both surface water and groundwater recharge to a stream or other water body. Stream flow is composed of both surface water and groundwater, with surface water providing most of the flow during wetter periods (spring and after significant precipitation) and groundwater providing a more constant volume of stream flow year-round (base flow). During drought conditions, the majority of stream flow is derived from groundwater base flow. Watersheds are delineated based on surface topography, which controls the flow direction of surface water to a stream and therefore controls the surface water component of stream discharge. The area providing stream base flow (groundwater recharge) is also delineated using surface topography. Thus, the surface water and groundwater basin limits are generally considered to be the same; however, some differences between the groundwater and surface water basin areas can occur, especially when considering groundwater from deep within an aquifer.

#### **1.1 Watershed Characteristics**

The Paradise Creek Watershed was divided into nine watershed management units based on tributary stream boundaries, including Devil's Hole Run, Cranberry Creek, Tank Creek/Yankee Run, Forest Hills Run, Upper Swiftwater Creek, Lower Swiftwater Creek, Butz Run, Upper Paradise Creek, and Lower Paradise Creek, as shown in Figure 1. Eight municipalities are within the watershed, including Barrett Township, Coolbaugh Township, Mount Pocono Borough, Paradise Township, Pocono Township, Price Township, Stroud Township, and Tobyhanna Township, also shown in Figure 1. The Paradise Creek Watershed is in the Pocono Plateau section of the Appalachian Mountains. The aquifer beneath the Paradise Creek Watershed consists primarily of the Catskill Formation, fractured, sedimentary bedrock comprised of gray sandstone and reddish siltstone that is approximately 7,000 feet thick. Groundwater flow is generally toward the streams and contributes to stream base flow. Additionally, there may be preferential groundwater flow paths parallel to the bedrock's northeast strike. Wells drilled into the Catskill Formation can

provide adequate domestic or municipal supply with typical well yields of greater than 50 gpm; however, some wells may be unproductive. Water quality is generally good, with water being characteristically soft; however, iron and manganese concentrations can be problematic.

Land use within the watershed includes a mixture of residential, commercial, forest, and some industry. Mount Pocono Borough is served by a public water supply that currently consists of one well with an average use of 198,150 gallons per day (gpd). In addition, numerous smaller public water supply wells exist within the area that serve developments, resorts, schools, and commercial and industrial facilities. Seven wastewater treatment plants discharge over 1.1 million gallons per day (MGD) of treated wastewater into the tributaries of the Paradise Creek Watershed, including 820,000 gpd into Forest Hills Run, 188,000 gpd into Swiftwater Creek, and 100,000 gpd into Paradise Creek. In addition, many homes have on-lot septic systems that ultimately return withdrawn groundwater back into the environment as wastewater.

One notable project in the watershed is a proposed two-phase sewer line along Route 611 that will involve pumping fully treated effluent (350,000 gpd) from Sanofi Pasteur to the Mount Pocono Municipal Authority Sewage Treatment Plant (STP) where effluent from both Sanofi Pasteur and the Authority STP would be pumped to Pocono Manor for golf course irrigation on an as-needed basis. On non-spray days, the treated effluent will be discharged to Forest Hills Run for the next three to five years until Phase Two of this project is completed. Phase Two of this project will include the construction of an STP in Pocono Township that will discharge treated effluent to the Brodhead Creek approximately 4 miles away via an underground line. The Pocono Township STP will treat 600,000 to 700,000 gpd (approximately half from Sanofi Pasteur and half from users in Pocono and Hamilton Townships). Sanofi Pasteur will need approximately 600,000 to 700,000 gpd of water from the Stroudsburg Municipal Authority; therefore, a near balance will be achieved by pumping water from the Stroudsburg area and pumping treated effluent back to the Stroudsburg area.

## **Paradise Creek Watershed Groundwater Availability Study**

### **Section 2**

### **Methods**

Each of the nine delineated watershed management areas that are tributary to the Paradise Creek Watershed were considered in this study, along with the eight municipalities within the watershed. For planning purposes, the areal extent of each municipality contained within the Paradise Creek Watershed was used to determine if estimated groundwater withdrawals within each municipality could adversely impact groundwater availability and stream base flow.

When estimating the sustainable groundwater resources available from an aquifer, the groundwater base flow to streams must be factored in so that all of the stream's base flow is not intercepted by wells withdrawing groundwater from the aquifer prior to that water reaching the stream. The fractured bedrock aquifer underlying the watershed can make predictions of groundwater availability fairly complex; therefore, stream base flow estimates were used to estimate the groundwater recharge values in the area. This approach tends to average groundwater availability and focus on the shallower portions of the aquifer that provide base flow in a watershed. It does not account for local variations or deeper portions of the aquifer and is therefore considered to be conservative for estimating total groundwater recharge.

The threshold value typically used by the Delaware River Basin Commission to be protective of stream base flow is 75 percent of the recorded 25-year low stream base flow. In other words, the protective stream base flow value is that portion of stream base flow that should not be intercepted by groundwater pumping to prevent the stream from going dry. In this evaluation, the measured 25-year low base flow recharge values (hereafter referred to as available groundwater) for U.S. Geological Survey Stream Gauge Station 1440500 (Paradise Creek at Henryville) were applied to each of the watershed management areas to estimate the available groundwater within the portion of each municipality contained within the Paradise Creek Watershed. Data from this station were chosen for this evaluation, as it best represents the watershed's characteristics because of its central location within the watershed, its large drainage area (30.2 square miles), and the length of period of record (1965-1991). The amount of groundwater recharge was then estimated within each municipality and compared to the estimated groundwater usage based on each municipality's population within the watershed.

Stream base flow reduction and the potential impact on trout populations were considered based on the "Instream Flow Incremental Method" contained in the Susquehanna River Basin Commission's *Instream Flow Studies of Pennsylvania and Maryland* (May 1998). Although the Commission's report does not specifically address a stream in a glaciated area such as Paradise Creek, it does suggest that

stream base flow losses ranging from 10 to 20 percent can impact brown trout populations. A conservative approach was taken for this evaluation, so that if 10 percent of available groundwater would be withdrawn, then it was assumed that some impact to trout population could be realized.

The population within the portion of each municipality contained within the Paradise Creek Watershed was used to estimate the amount of groundwater use that currently is withdrawn from the aquifer. A standard value for per capita water consumption is 100 gallons per day per person (gpd/p). The Monroe County Planning Commission's population data were used to estimate the amount of groundwater withdrawn from each municipality by multiplying the population by the estimated per capita water use of 100 gpd/p. The groundwater use was then compared to the amount of groundwater available for withdrawal to determine if adverse impacts to groundwater availability and stream base flow could occur. Several scenarios were included in the groundwater availability evaluation, including estimated groundwater use in 2000, 2020, and a full build-out scenario based on current zoning for each municipality. In addition, a full build-out scenario assuming a 10 percent reduction in groundwater recharge due to impervious surface was included since increased development causes reduced recharge.



# **Paradise Creek Watershed Groundwater Availability Study**

## **Section 3**

### **Results**

#### **3.1 Groundwater Recharge Rate Calculation**

U.S. Geological Survey stream gauge data from Station 1440500 (Paradise Creek at Henryville) were utilized to evaluate the available groundwater resources in the Paradise Creek Watershed. USGS personnel (Ron Thompson) analyzed 26 years (1965-1991) of stream flow records from this stream gauge to determine the mean annual total stream flow and stream base flow for Paradise Creek at this station. Based on this analysis, the mean annual base flow (average groundwater recharge rate) is 661 gallons per minute per square mile (gpm/mi<sup>2</sup>) and the 25-year low base flow is estimated to be 479 gpm/mi<sup>2</sup>. Therefore, a 27.5 percent reduction in stream base flow occurs during a 25-year low base flow condition as compared to average stream base flow conditions.

The available groundwater recharge rate is 75 percent of the 25-year low base flow, or 359 gpm/mi<sup>2</sup>, and is referred to hereafter in this report as available groundwater. This recharge rate value accounts for both precipitation deficit and surplus periods that have occurred during this 25-year period, and is therefore considered to be a valid, although conservative, estimate of the long-term groundwater recharge rate. It should be noted that this available groundwater recharge rate will tend to be more protective of stream base flow during drought periods; however, this is an overly conservative value during non-drought periods.

Table 1 provides a summary of the available groundwater recharge rates for each of the municipalities within the Paradise Creek Watershed based on the assumption that the total area of each municipality within the watershed is considered to be available recharge area. As is apparent from the available groundwater values in Table 1, a relatively abundant supply of groundwater exists in the Paradise Creek Watershed.

#### **3.2 Groundwater Use Estimation**

Table 1 summarizes the estimated amount of groundwater use within each municipality for 2000, 2020, a full build-out scenario, and for a full build-out scenario with 10 percent reduced groundwater recharge to account for increased impervious surface. In general, the relatively low population density throughout the watershed and relatively abundant groundwater resources allow a relatively small percentage of the available groundwater resources to be withdrawn. Figures 2, 3, and 4 show the amount of available groundwater that would be withdrawn from each municipality for 2000, 2020, and under a full build-out scenario, respectively. It should be noted that

most homes rely on on-lot septic systems (with the exception of homes in Mt. Pocono Borough) and that much of the withdrawn groundwater is ultimately returned to the aquifer. It is expected that future development outside of Mt. Pocono Borough would continue to rely on on-lot septic systems. Therefore, the groundwater use estimates are very conservative in that they do not account for the return of wastewater to the aquifer.

### **3.3 Comparison of Groundwater Use versus Availability**

The estimated groundwater withdrawals for the years 2000, 2020, and under a full build-out scenario are compared in Table 1 and Figures 2, 3, and 4 for the entire Paradise Creek Watershed. These scenarios for each individual municipality in the watershed are discussed in the following sections.

#### **3.3.1 Paradise Creek Watershed**

The Paradise Creek Watershed has a total area of 43.77 square miles and a year 2000 population of 9,492 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 659 gpm, 2,019 gpm, and 3,917 gpm, respectively, which ranges from 2.3 to 13.5 percent of groundwater during average conditions and 4.2 to 24.9 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that during 25-year low base flow conditions, overall groundwater withdrawal from the Paradise Creek Watershed could impact the available groundwater resources and stream base flow under the 2020 and full build-out scenarios. During average conditions, overall groundwater withdrawal from the watershed could impact the available groundwater resources and stream base flow under the full build-out scenario. If 10 percent impervious surface is added to the full-build out scenario, then groundwater use under average conditions increases from 13.5 to 15 percent, and under 25-year low flow conditions, it increases from 24.9 to 27.6 percent.

It should be noted that homes outside of the Mt. Pocono Borough rely primarily on on-lot septic systems, so nearly all groundwater withdrawn from the aquifer outside of Mt Pocono Borough will be returned back to the aquifer. The amount of groundwater withdrawn from the aquifer in the watershed that is ultimately returned via on-lot septic equates to approximately 1,500 gpm of groundwater in 2020 and 3,200 gpm under a full build-out scenario, assuming that all new development relies on on-lot septic systems.

#### **3.3.2 Barrett Township**

Barrett Township is located in the northern headwaters of the Paradise Creek Watershed spanning Devil's Hole Creek and Cranberry Creek, with a total area of 4.36 square miles and a year 2000 population of 237 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 16 gpm, 43 gpm, and 26

gpm, respectively, which ranges from 0.6 to 1.5 percent of groundwater during average conditions and from 1 to 2.8 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that groundwater withdrawal from the Barrett Township portion of the Paradise Creek Watershed should not significantly impact either the available groundwater resources or stream base flow.

### **3.3.3 Coolbaugh Township**

Coolbaugh Township is located in the northwestern headwaters of the Paradise Creek Watershed spanning Devil's Hole Creek, Tank/Yankee, and Upper Swiftwater Run. The township covers a total area of 4.53 square miles and has a year 2000 population of 1,895 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 132 gpm, 438 gpm, and 364 gpm, respectively, which ranges from 4.4 to 14.6 percent of groundwater during average conditions and from 8.1 to 26.8 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that the Coolbaugh Township portion of the Paradise Creek Watershed could locally impact the available groundwater resources and stream base flow, especially under the year 2020 and full build-out scenarios, for average and 25-year low base flow conditions.

### **3.3.4 Mount Pocono**

Mount Pocono is located in the western headwaters of the Paradise Creek Watershed spanning Forest Hills Run, Tank/Yankee, Upper Swiftwater Run, and a small portion of Upper Paradise Creek, with a total area of 3.12 square miles and a year 2000 population of 2,519 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 175 gpm, 497 gpm, and 710 gpm, respectively, which ranges from 8.5 to 34.4 percent of groundwater during average conditions and 15.6 to 63.2 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that the Mount Pocono portion of the Paradise Creek Watershed could locally impact the available groundwater resources and stream base flow, especially under the year 2020 and full build-out scenarios for average and 25-year low base flow conditions.

### **3.3.5 Paradise Township**

Paradise Township is located in the center of the Paradise Creek Watershed, spanning all of the tributary watersheds with a total area of 20.56 square miles and a year 2000 population of 2,552 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 177 gpm, 530 gpm, and 1,101 gpm, respectively, which ranges from 1.3 to 8.1 percent of groundwater during average conditions and from 2.4 to 14.9 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that the Paradise Township portion of the Paradise Creek Watershed could locally impact the available

groundwater resources and stream base flow under a full build-out scenario for 25-year low base flow conditions.

### **3.3.6 Pocono Township**

Pocono Township is located along the southern edge of the Paradise Creek Watershed spanning Upper Swiftwater Creek, Lower Swiftwater Creek, Butz Run, and Lower Paradise Creek, with a total area of 8.43 square miles and a year 2000 population of 1,627 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 113 gpm, 380 gpm, and 1,562 gpm, respectively, which ranges from 2.0 to 28 percent of groundwater during average conditions and from 3.7 to 51.5 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that the Pocono Township portion of the Paradise Creek Watershed could locally impact the available groundwater resources and stream base flow in 2020 during 25-year low base flow conditions and under a full build-out scenario during both average and 25-year low base flow conditions.

### **3.3.7 Price Township**

Price Township is located along the western edge of the Paradise Creek Watershed in a small portion of Lower Paradise Creek, with a total area of 0.19 square miles and a year 2000 population of 6 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 0.4 gpm, 0.4 gpm, and 3 gpm, respectively, which ranges from 0.3 to 2.5 percent of groundwater during average conditions and from 0.6 to 4.65 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that the Price Township portion of the Paradise Creek Watershed should not impact the available groundwater resources and stream base flow under any scenario.

### **3.3.8 Stroud Township**

Stroud Township is located at the southeastern tip of the Paradise Creek Watershed in a small portion of Lower Paradise Creek, with a total area of 0.10 square miles and a year 2000 population of 3 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 0.2 gpm, 0.6 gpm, and 7.2 gpm, respectively, which ranges from 0.3 to 10.9 percent of groundwater during average conditions and from 0.6 to 19.9 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that the Stroud Township portion of the Paradise Creek Watershed should not have significant impacts since it occupies a relatively small area, has a low population, and would have low groundwater withdrawals.

### **3.3.9 Tobyhanna**

Tobyhanna is located at the western tip of the Paradise Creek Watershed in Upper Swiftwater Creek, with a total area of 2.48 square miles and a year 2000 population

of 653 people. The year 2000, 2020, and full build-out groundwater usage are estimated to be 45 gpm, 129 gpm, and 144 gpm, respectively, which ranges from 2.8 to 8.8 percent of groundwater during average conditions and from 5.1 to 16.2 percent of the available groundwater resources during 25-year low base flow conditions. This indicates that the Tobyhanna portion of the Paradise Creek Watershed could be significantly impacted under 2020 and full build-out scenarios during 25-year low base flow conditions.

## **Paradise Creek Watershed Groundwater Availability Study**

### **Section 4**

### **Discussion**

This evaluation indicates that the Paradise Creek Watershed currently has relatively abundant groundwater resources; however, some localized impacts to groundwater supply and stream base flow could be realized in the future. The future impact that decreased base flow could have on stream habitat loss and trout populations, especially during drought periods, is difficult to predict; therefore, a conservative approach was used in this evaluation.

Under current conditions, approximately 1,000 gpm of additional groundwater could theoretically be withdrawn from the Paradise Creek Watershed while still leaving 90 percent of groundwater for base flow under 25-year low base flow conditions. This level of additional groundwater withdrawal is expected to occur before 2020 using current population projections. This additional 1,000 gpm of available groundwater supply could be accounted for quite rapidly if several industrial or commercial facilities moved into the area, combined with continued population growth. Therefore, the groundwater budget could be significantly changed in a relatively short period of time if significant industrial or commercial development occurs.

This evaluation does not account for the return of water via wastewater treatment plants and on-lot septic systems; however, the quality of such effluent will be somewhat degraded and will likely have some water quality impacts. Groundwater resource management is seldom a straightforward process; however, much can be done to ensure the long-term protection of the groundwater resources and aquatic health of the Paradise Creek Watershed, including the following:

1. Implement stormwater management practices that promote groundwater infiltration.
2. Reuse treated wastewater for irrigation.
3. Implement routine septic system inspections and pump outs.
4. Inventory wells to determine use and construction (well depth, presence of grouted casing to ensure surface contaminants and water-borne pathogens do not enter the aquifer, etc.).
5. Enforce minimum well construction standards and yield testing to ensure that new wells have adequate yield on a perennial basis. Wells should have sufficient casing depth with grout seal, and short term pumping tests should be conducted to prove that the well can sustain a yield greater than 2 gpm.
6. Riparian vegetation buffers can be utilized.

7. Zoning regulations can promote groundwater and stream base flow protection (e.g., avoid large, localized groundwater withdrawals to protect stream base flow, and minimize intensive development with high impervious surfaces).
8. Public education can increase awareness of groundwater protection issues.

## Figures




**Figure 1**  
**Paradise Creek Watershed**  
**With Intersecting Municipalities**  
**And Stream Gauge Locations**

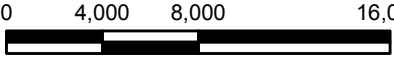
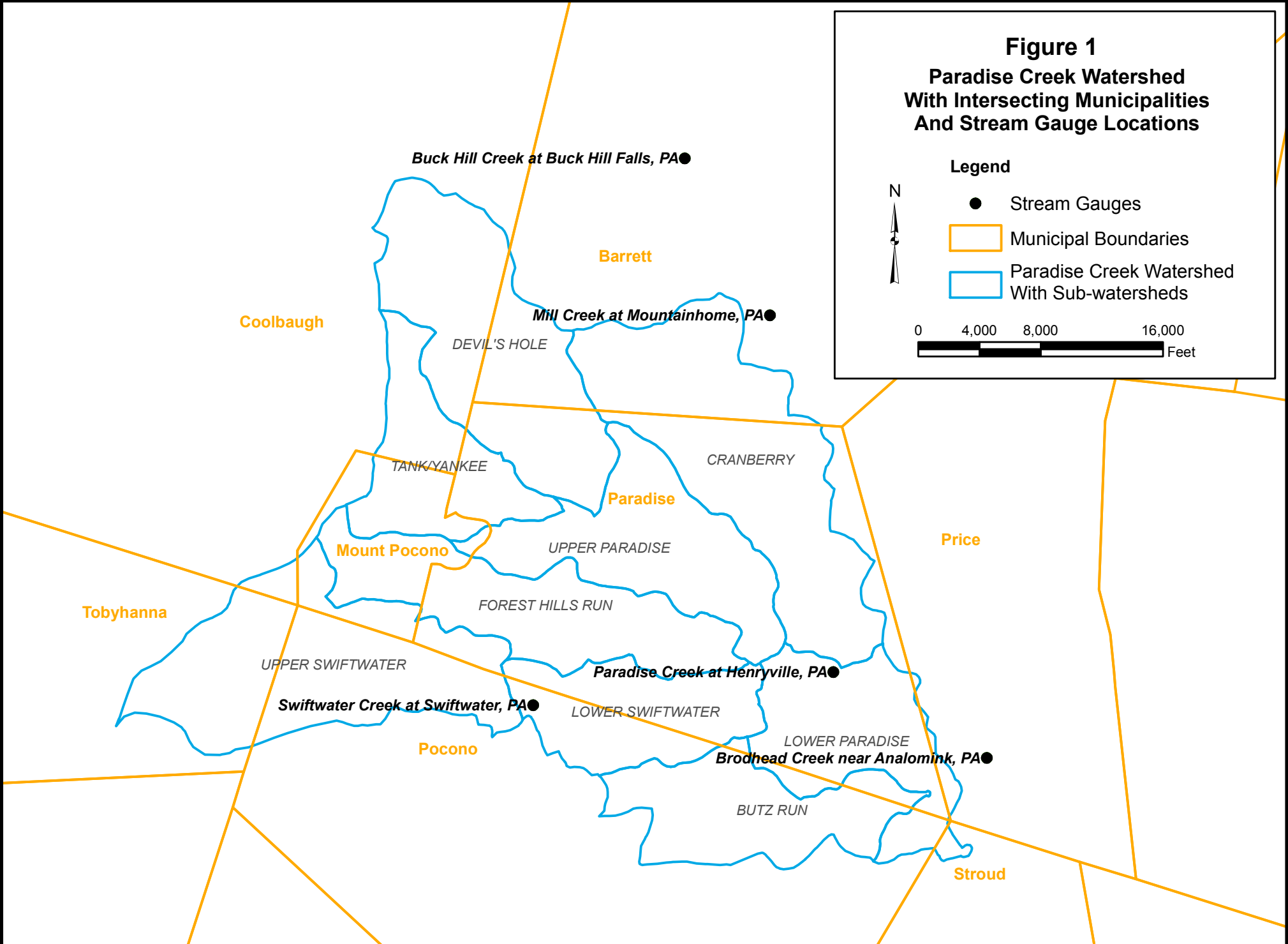
**Legend**

- Stream Gauges
- ▭ Municipal Boundaries
- ▭ Paradise Creek Watershed With Sub-watersheds

N



0 4,000 8,000 16,000 Feet

### Figure 2

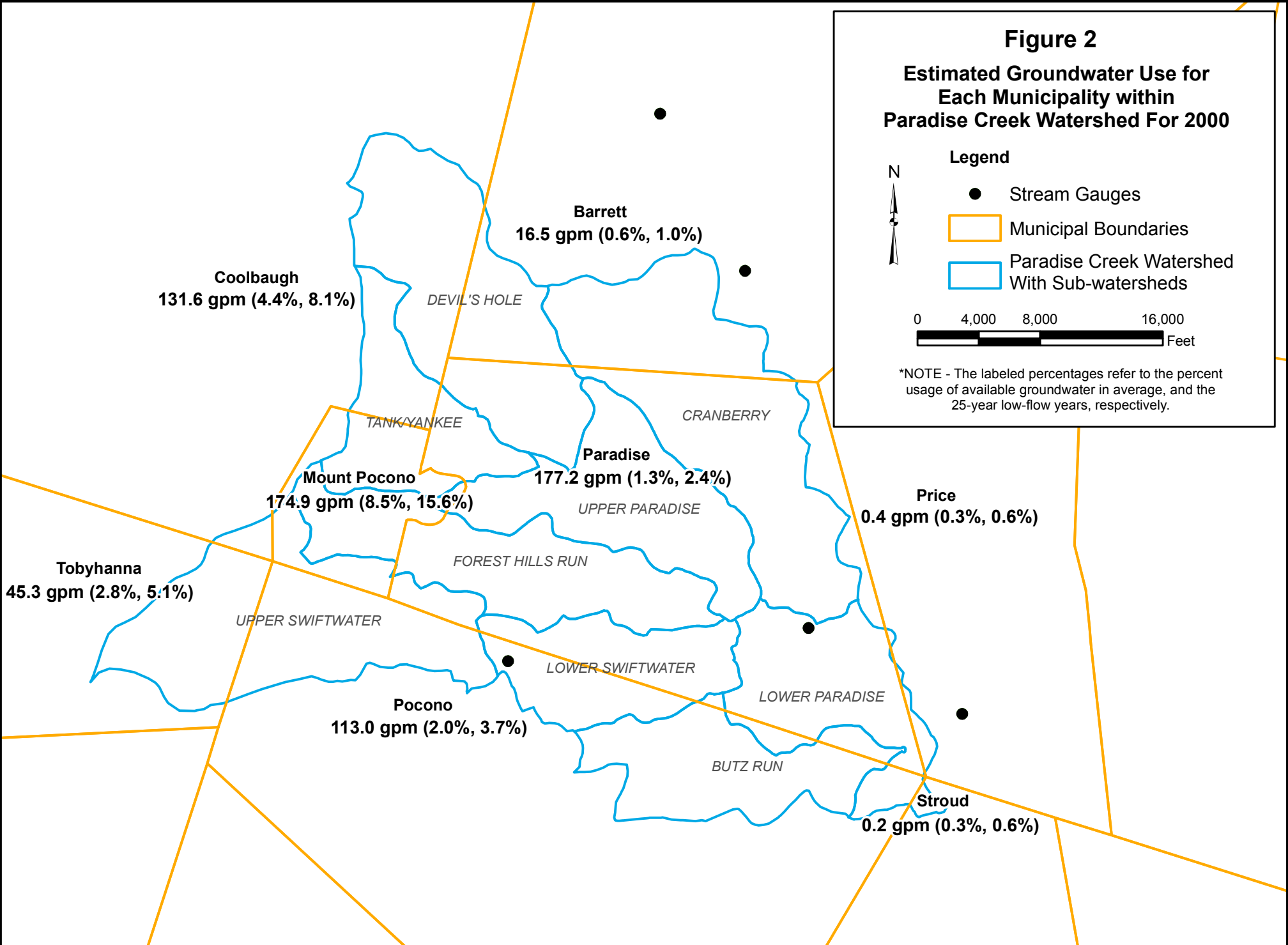
#### Estimated Groundwater Use for Each Municipality within Paradise Creek Watershed For 2000

**Legend**

- Stream Gauges
- ▭ Municipal Boundaries
- ▭ Paradise Creek Watershed With Sub-watersheds

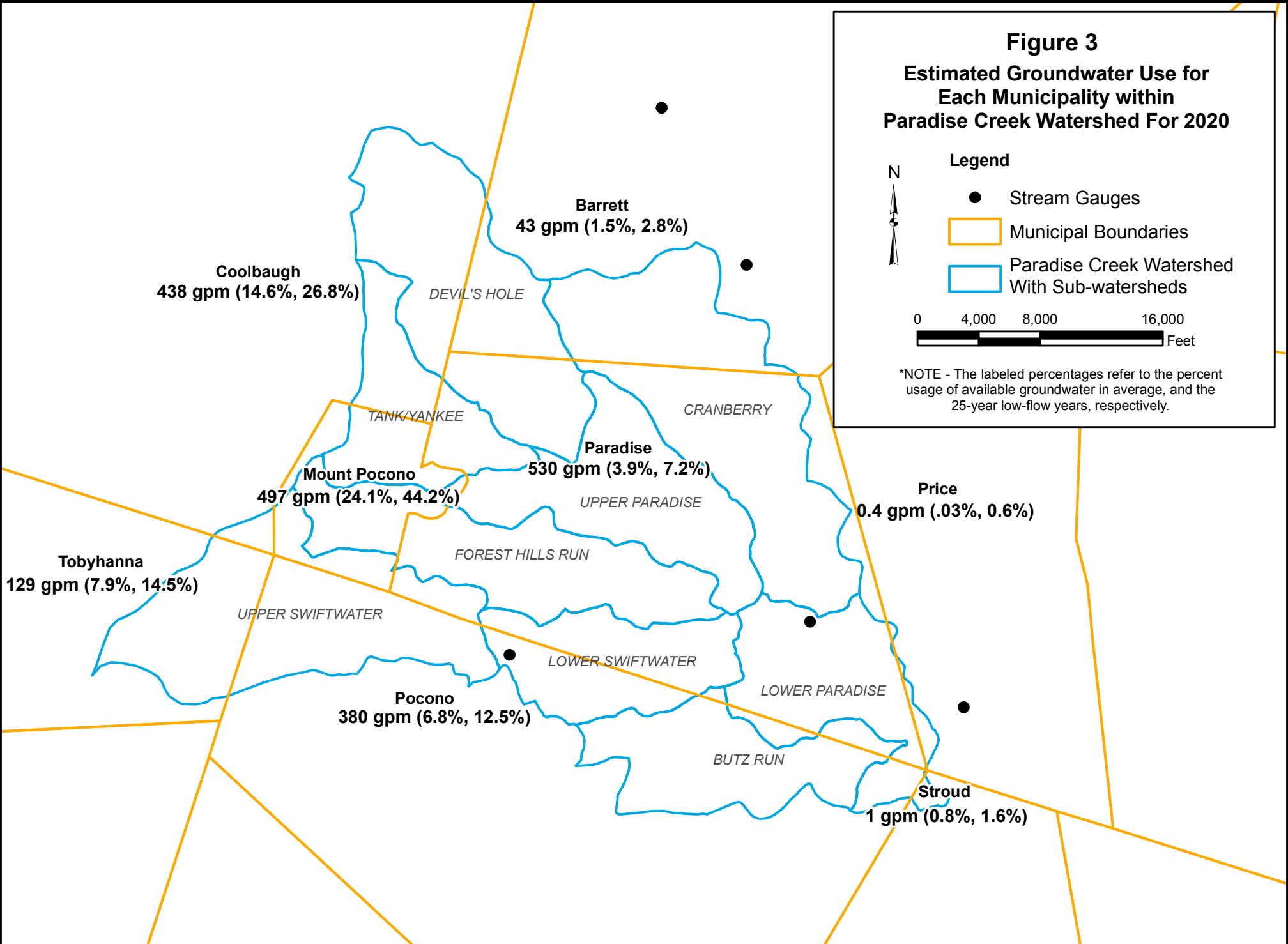
0 4,000 8,000 16,000 Feet

\*NOTE - The labeled percentages refer to the percent usage of available groundwater in average, and the 25-year low-flow years, respectively.



DATE CREATED: July 20, 2005

**Figure 3**  
**Estimated Groundwater Use for**  
**Each Municipality within**  
**Paradise Creek Watershed For 2020**



N

**Legend**

- Stream Gauges
- ▭ Municipal Boundaries
- ▭ Paradise Creek Watershed With Sub-watersheds

0 4,000 8,000 16,000  
 Feet

\*NOTE - The labeled percentages refer to the percent usage of available groundwater in average, and the 25-year low-flow years, respectively.

**Coolbaugh**  
**438 gpm (14.6%, 26.8%)**

**Barrett**  
**43 gpm (1.5%, 2.8%)**

**Mount Pocono**  
**497 gpm (24.1%, 44.2%)**

**Paradise**  
**530 gpm (3.9%, 7.2%)**

**Price**  
**0.4 gpm (.03%, 0.6%)**

**Tobyhanna**  
**129 gpm (7.9%, 14.5%)**

**Pocono**  
**380 gpm (6.8%, 12.5%)**

**Stroud**  
**1 gpm (0.8%, 1.6%)**

DEVIL'S HOLE

CRANBERRY

TANKYANKEE

UPPER PARADISE

FOREST HILLS RUN

UPPER SWIFTWATER

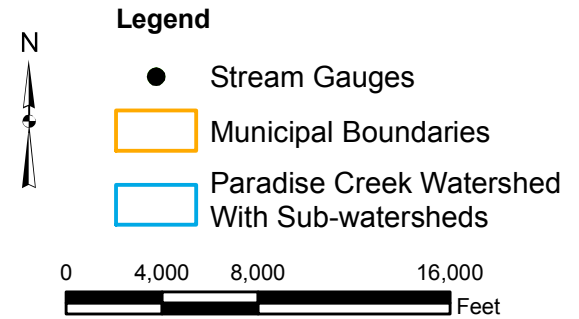
LOWER SWIFTWATER

LOWER PARADISE

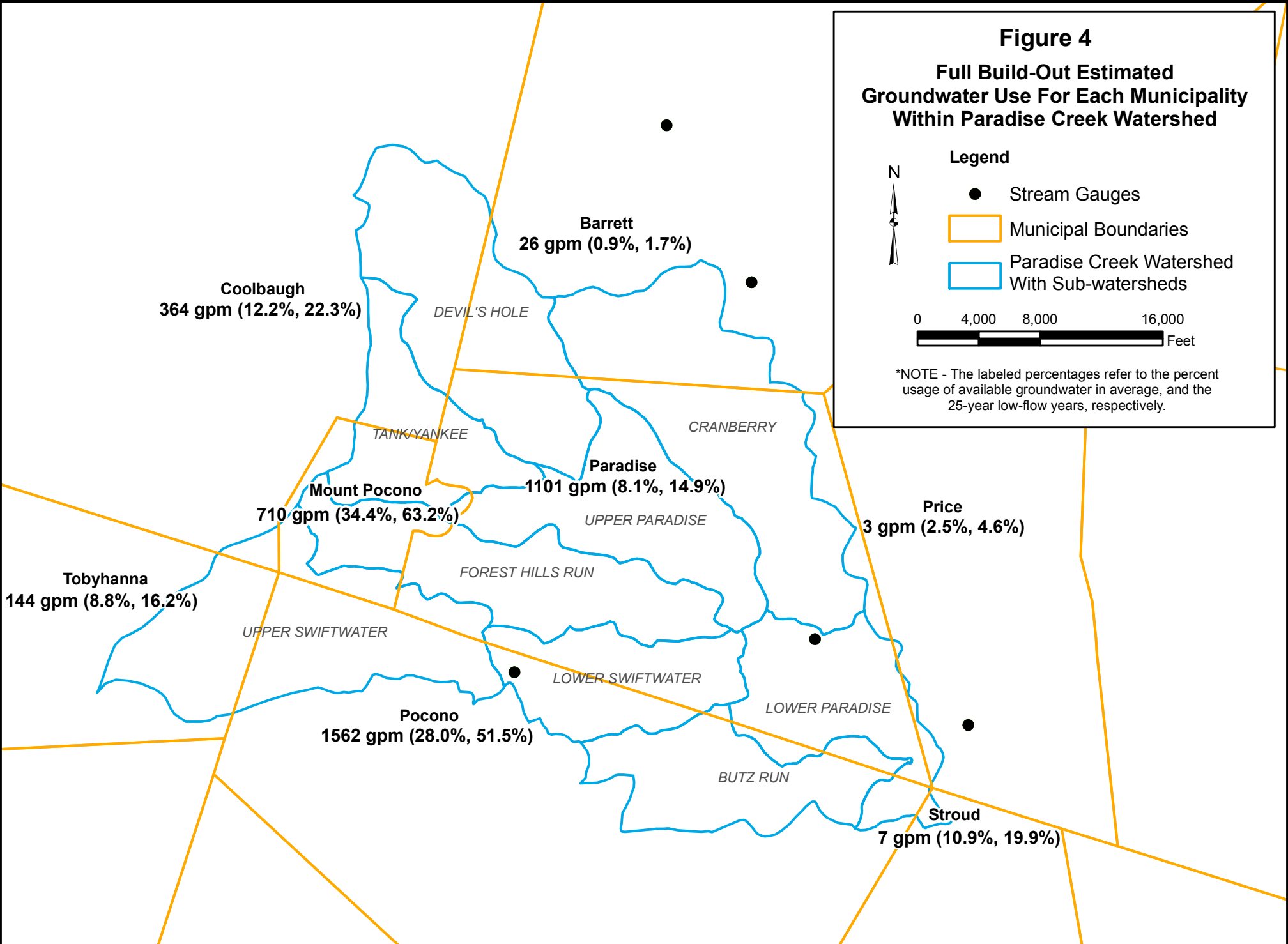
BUTZ RUN

### Figure 4

#### Full Build-Out Estimated Groundwater Use For Each Municipality Within Paradise Creek Watershed



\*NOTE - The labeled percentages refer to the percent usage of available groundwater in average, and the 25-year low-flow years, respectively.



## Tables

Table 1-Paradise Creek Groundwater Availability Analysis

Municipality	Area within Watershed (sq. mi.)	Mean Groundwater Recharge (gpm, assumes recharge rate of 661 gpm/sq. mi.)	Potentially Stressed Groundwater Availability in gpm (75% of 25 yr baseflow=360 gpm/sq.mi.)	Year 2000				Year 2020 Projections				Full Build-Out Projections				Full Build-Out Projections w/10% impervious cover			
				Existing Population in Watershed	Estimated Groundwater Use (gpm, assumes 100 gpd/pp)	Percent mean groundwater use	Percent potentially-stressed groundwater use	Projected Population in Watershed	Estimated Groundwater Use (gpm, assumes 100 gpd/pp)	Percent mean groundwater use	Percent potentially-stressed groundwater use	Build Out Population in Watershed	Estimated Groundwater Use (gpm, assumes 100 gpd/pp)	Percent mean groundwater use	Percent potentially-stressed groundwater use	Build Out Population in Watershed	Estimated Groundwater Use (gpm, assumes 100 gpd/pp)	Percent mean groundwater use	Percent potentially-stressed groundwater use
Barrett	4.36	2882	1570	237	16.5	0.6%	1.0%	625	43.4	1.5%	2.8%	374	25.9	0.9%	1.7%	374	25.9	1.0%	1.8%
Coolbaugh	4.53	2994	1631	1895	131.6	4.4%	8.1%	6303	437.7	14.6%	26.8%	5239	363.8	12.2%	22.3%	5239	363.8	13.5%	24.8%
Mount Pocono	3.12	2062	1123	2519	174.9	8.5%	15.6%	7151	496.6	24.1%	44.2%	10221	709.8	34.4%	63.2%	10221	709.8	38.2%	70.2%
Paradise	20.56	13590	7402	2552	177.2	1.3%	2.4%	7638	530.4	3.9%	7.2%	15853	1100.9	8.1%	14.9%	15853	1100.9	9.0%	16.5%
Pocono	8.43	5572	3035	1627	113.0	2.0%	3.7%	5479	380.5	6.8%	12.5%	22493	1562.0	28.0%	51.5%	22493	1562.0	31.1%	57.2%
Price	0.19	126	68	6	0.4	0.3%	0.6%	6	0.4	0.3%	0.6%	45	3.1	2.5%	4.6%	45	3.1	2.8%	5.1%
Stroud	0.10	66	36	3	0.2	0.3%	0.6%	8	0.6	0.8%	1.6%	103	7.2	10.9%	19.9%	103	7.2	12.1%	22.2%
Tobyhanna	2.48	1639	893	653	45.3	2.8%	5.1%	1862	129.3	7.9%	14.5%	2078	144.3	8.8%	16.2%	2078	144.3	9.8%	18.0%
Watershed	43.77	28932	15757	9492	659	2.3%	4.2%	29071	2019	7.0%	12.8%	56406	3917	13.5%	24.9%	56406	3917	15.0%	27.6%