GROUNDWATER PROTECTION PLAN

for the

TOWN OF ANCRAM
COLUMBIA COUNTY, NEW YORK

February 2008

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Prepared for:

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and

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(24x36-inch maps located in back of plan)

EXECUTIVE SUMMARY

The New York Rural Water Association (NYRWA) has prepared this Groundwater Protection Plan in cooperation with Community Planning & Environmental Associates of Berne, NY and the Town of Ancram Comprehensive Planning Committee. The plan maps the groundwater resources and aquifers of Ancram, identifies potential sources of contamination, evaluates the susceptibility to contamination and future growth, and outlines potential protection strategies.

Ancram straddles two distinct physiographic regions. The western two-thirds of Ancram is located in the Hudson Valley section of the Valley and Ridge physiographic province and is drained principally by the Roeliff Jansen Kill and its tributaries. The eastern one-third of Ancram lies within the more rugged Taconic section of the New England physiographic province. A significant portion of this area is part of the Tenmile River watershed.

Over ninety percent of residences and businesses in Ancram utilize bedrock wells. These wells have a median depth of 259 feet and a median depth of casing of 28 feet. Nearly one-half of all Ancram bedrock wells (46%) yield less than the 5 gallons per minute, the minimum well yield necessary for Federal Housing Administration (FHA) insured loans for new construction.

Most low-yielding wells are found in areas underlain by the Walloomsac Formation (see Executive Figure 1). This formation consists largely of black slate, and underlies the majority of the upland areas of Town (particularly in the Hudson Valley physiographic section). The median well yield in the Walloomac Formation is only 3.75 gallons per minute, and approximately one-quarter of residents in Ancram that have wells completed in the Walloomsac Formation report that they have insufficient water. Similarly, 27.5 percent of all wells drilled in the Walloomsac yield one gallon per minute or less and would be deemed unsuitable for four bedroom homes according to New York State Department of Health guidelines (see Executive Figure 1). Many residents relying upon the Walloomsac Formation extend the depth of their wells or provide supplemental storage tank(s) in an attempt to meet peak demand periods.

The other major bedrock unit in Ancram, referred to as the Wappinger-Stockbridge Group carbonates, has a median well yield of 8 gallons per minute. This rock type is found across much of the lower elevations in Ancram such as in the valleys of the Roeliff Jansen Kill, Punch Brook, and the Noster Kill (see Executive Figure 1). Only 5 to 10 percent of residents with wells in the carbonate rocks report water quantity problems and/or yields of one gallon per minute or less. Higher yields are found in the carbonate rocks due to the presence of enlarged openings along fractures, joints, and bedding planes. Documented yields of at least 65 gallons per minute have been found in the Wappinger-Stockbridge Group carbonates in Ancram.

Over 70 percent of households in Ancram report water quality problems, largely the nuisance of hard water. Hard water is particularly common in wells tapping the carbonate rocks. Odor problems are more commonly associated with the Walloomsac Formation. This is likely from sulfide minerals associated with the rock type.

NYRWA has mapped a number of unconsolidated (sand and gravel) aquifers in Ancram (see Executive Figure 2). Although these aquifers are not being widely utilized for water supply purposes, there are two areas where shallow wells are commonly used: near the Lower Rhoda Pond-Long Lake area and in and around Ancramdale (Executive Figure 2). Wells in these areas

produce high quantities of water (in excess of 30 gallons per minute), but are vulnerable to contamination. Deeper sand and gravel aquifer deposits have been documented in the hamlet of Ancram and a few other areas. These deposits are better protected from contamination due to the presence of overlying silt and clay. Subsurface data is lacking in many areas to fully characterize the water-bearing properties of the sand and gravel aquifers. It is apparent that very high yielding wells can be constructed in many of the unconsolidated aquifers if screens are properly installed and developed.

Although the Town of Ancram does not currently own or operate any municipal water system, there are public water systems in Town. These privately-owned systems serve residents in the Long Lake community, as well as employees, patrons, and guests at several other establishments. No health-based violations have been reported at the nine active public water supply systems in Town. It is important to recognize that public water systems do exist in Ancram and the potential impacts on these water systems should be considered when making land use decisions.

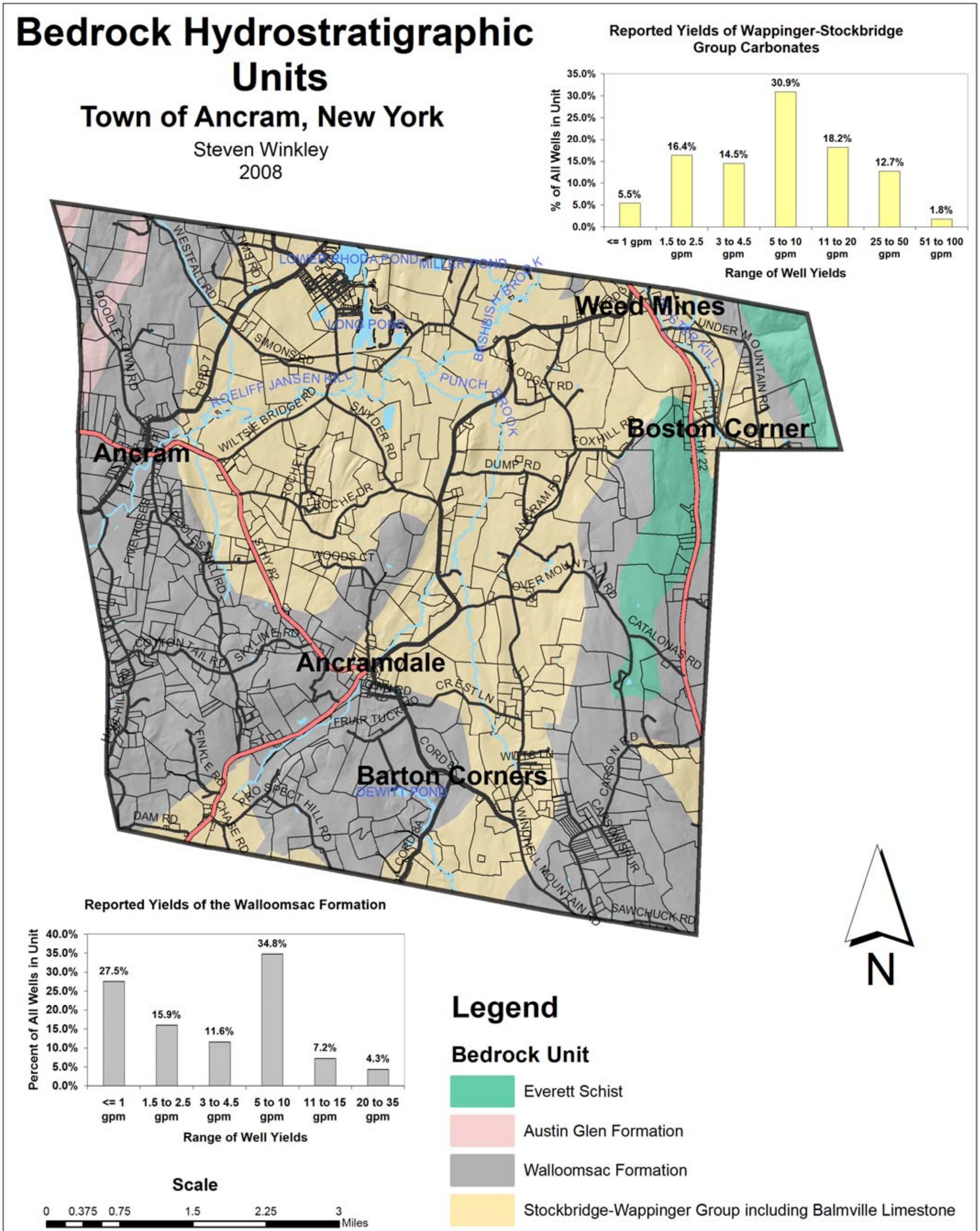
Groundwater resources are susceptible to contamination from a variety of manmade sources that can be associated with present or future land uses. An inventory of regulated facilities and higher risk land uses revealed a number of regulated wastewater discharges in the Roeliff Jansen Kill watershed in Town. In addition, there are several past and present sand and gravel mining operations in Ancram.

Development involves a number of potential groundwater resource issues such as water supply, wastewater treatment, impervious surfaces and storm water systems, and improper waste disposal and spills. Based upon estimated recharge rates, NYRWA recommends that the density of equivalent single family residential septic systems should not exceed an average of one per 3.5 acres. In addition, the distance between on-site water wells and septic systems should be closely observed to ensure adherence with New York State standards and to protect water quality.

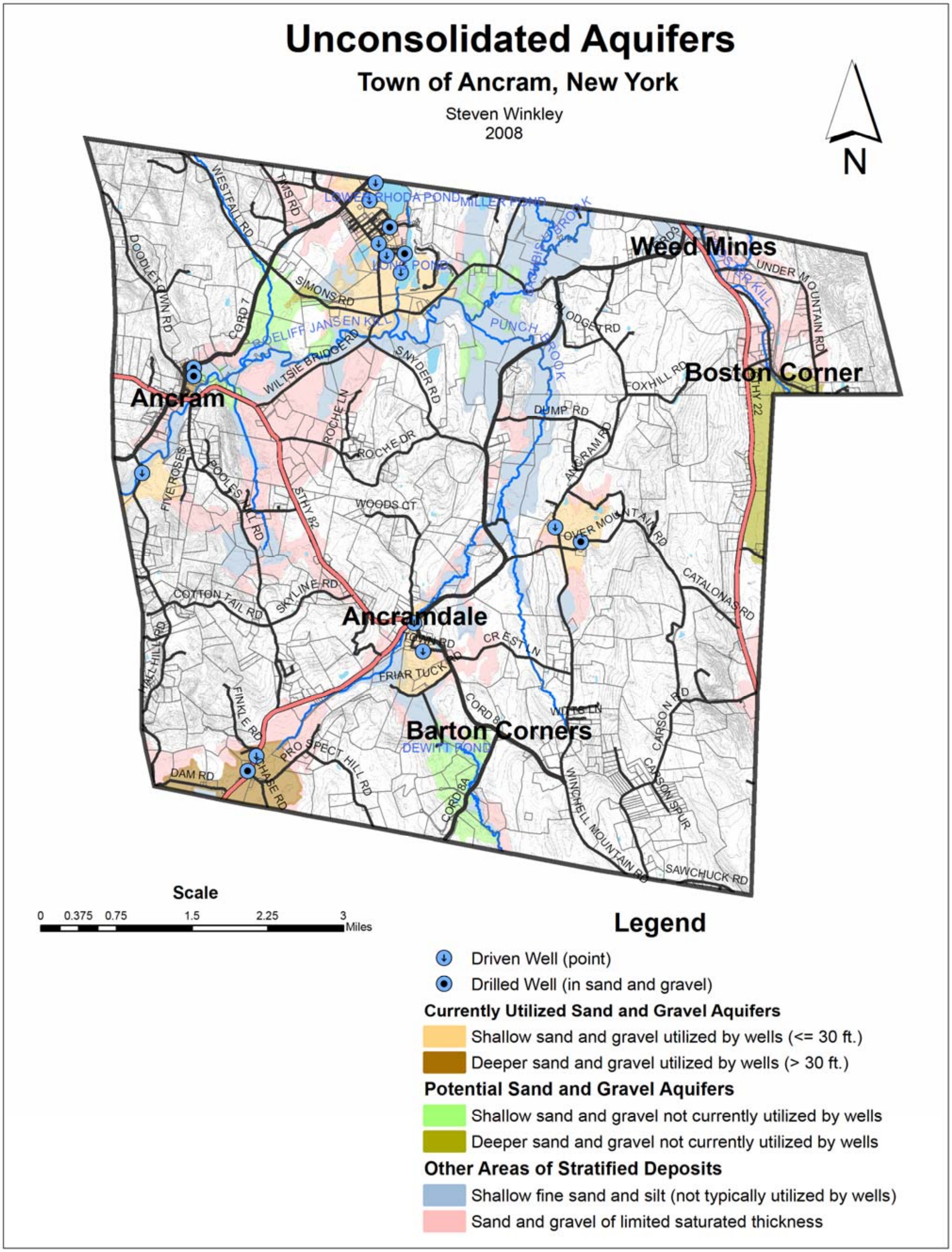
NYRWA delineated areas in Ancram where ground water could be easily and quickly impacted by surface activities (areas with high hydrogeologic sensitivity) (see Executive Figure 3). In order to prioritize subsequent protection efforts, NYRWA further identified privately-held, undeveloped parcels that had areas of high to very high hydrogeologic sensitivity. These areas are at the highest risk of water quality impacts from new development.

The issue of groundwater supply availability and impact should be addressed early in the land development process. NYRWA recommends that the location, yield, and quality of wells should be considered prior to approval of a new subdivision. Relatively large subdivisions, as well as most subdivisions in the Walloomsac Formation, should have a hydrogeological report completed prior to approval. Another possible approach is to use zoning regulations to require a hydrogeological study and minimum standards for some forms of development. For example, any development that uses at least 1,000 gallons per day of water could trigger more technical review. Ancram may also wish to enact an aquifer and/or groundwater protection overlay to limit high-risk uses, etc.

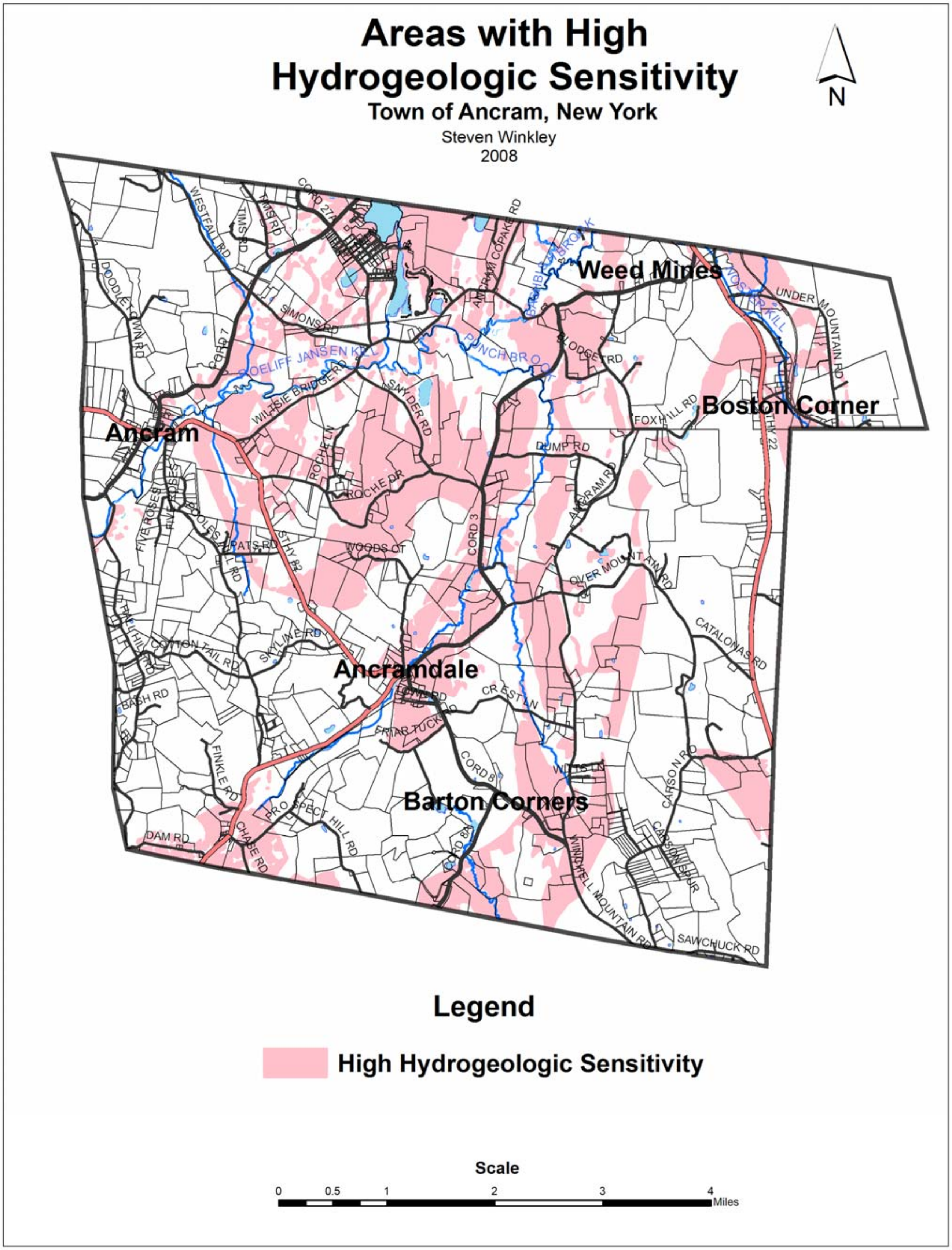
Finally, there are other non-regulatory actions that Ancram can take to protect ground water. These include declaration of Critical Environmental Areas (CEAs), purchase of land or conservation easements, further study of some at-risk areas (including possible well testing), and public education activities.



Executive Figure 1. Bedrock Hydrostratigraphic Units.



Executive Figure 2. Unconsolidated Aquifers.



Executive Figure 3. Areas with High Hydrogeologic Sensitivity.

1.0 INTRODUCTION

1.1 Goals and Objectives

Ground water is a valuable resource in the Town of Ancram. All residents and businesses rely upon wells for their source of supply. In addition, ground water contributes a significant portion of water to local streams, wetlands, and ponds. Unfortunately, groundwater contamination can and does occur as a consequence of a variety of land use activities. In addition, ground water can become depleted if withdrawal rates exceed natural replenishment rates.

In order to preserve the groundwater resources of Ancram for today and the future, the following Groundwater Protection Plan has been prepared by the New York Rural Water Association (NYRWA). This plan maps the groundwater resources and aquifers of Ancram, identifies potential sources of contamination, evaluates the susceptibility to contamination and future growth, and outlines potential protection strategies.

1.2 Scope and Methods

New York Rural Water Association has utilized a variety of published and unpublished data sources for this plan. All data were inputted into a Geographical Information System (GIS). This is a computer system that allows one to visualize, manipulate, analyze, and display geographic (spatial) data.

Well data was collected from a variety sources, including the United States Geological Survey's Water Data Site Inventory System, the New York State Department of Environmental Conservation's Water Well Program, Eastern States Well Drillers of Millerton, the New York State Department of Health, the Columbia County Health Department, and from a survey of Town of Ancram residents. In all, data on 241 wells were documented (185 from Ancram residents, 29 from the New York State Department of Environmental Conservation, 11 from the United States Geological Survey, 9 from Eastern States Well Drillers, and 7 from the Health Department). In addition, NYRWA collected data from 8 test borings completed by the New York State Department of Transportation and the Columbia County Highway Department. The sources of well and test boring data are indicated on Figure 1. Specific details from these locations (depth of well, yield, etc.) are summarized on Plate 1.

A number of published and unpublished geologic maps were reviewed. A digital version of the Columbia County Soil Survey and the New York State Geologic Map were utilized for analyses and mapping. In addition, elevation data for Ancram were taken from digital elevation models (DEMs). This information was then used to derive slope data and hillshading images. Land use information was taken from 2006 real property data from the New York State Office of Real Property Services. Parcel mapping was provided by Community Planning and Environmental Associates. Other digital data on wetlands, floodplains, surface waters, roads, regulated facilities, aerial photography, etc. were downloaded from the New York State GIS Clearinghouse and the Cornell University Geospatial Information Repository.

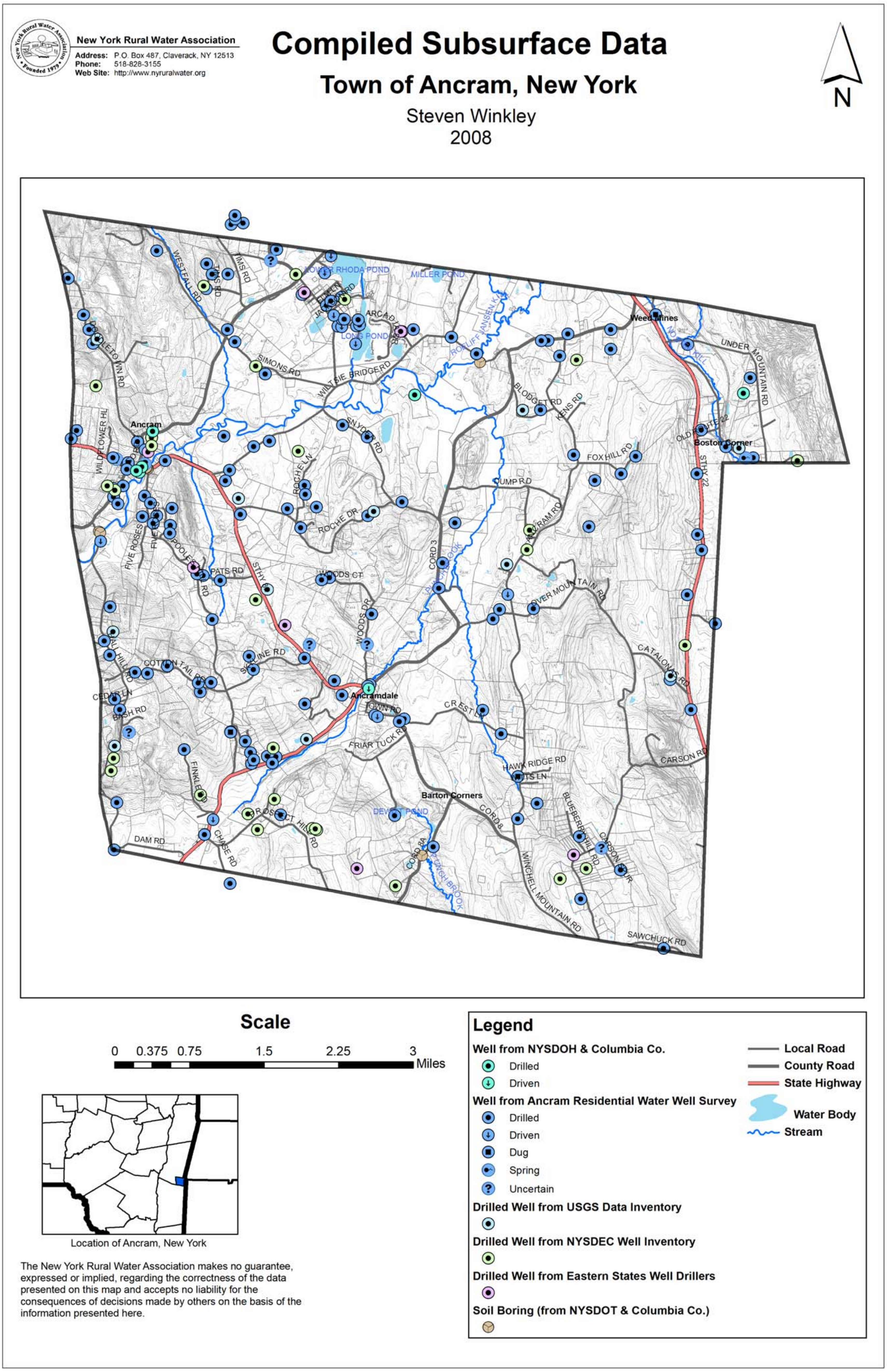


Figure 1. Compiled Subsurface Data.

Finally, New York Rural Water Association conducted on-site activities in Ancram to map surficial geology and unconsolidated aquifers, and to also document the location of public water supply wells, potential contaminant sources, etc. A global positioning system (GPS) device was used to capture the geospatial coordinates of such features.

2.0 SETTING

2.1 Physiography and Drainage

The Town of Ancram is located in southeastern Columbia County, New York (Figure 2). As illustrated on Figure 2, Ancram spans two different physiographic regions. Each of these physiographic regions has distinctive topographic relief, landforms, and geology.

The western two-thirds of Ancram is situated in the Hudson Valley section of the Valley and Ridge physiographic province (Figures 2 and 3). This area consists of rolling topography with summit elevations as high as 890 to 1,080 feet above sea-level and valley elevations as low as 480 feet above sea-level along the Roeliff Jansen Kill. In contrast, the eastern one-third of Ancram lies within the Taconic section of the New England physiographic province (Figures 2 and 3). This area includes the western flanks of the Taconic Mountains, with elevations exceeding 1,900 feet above sea-level. Fox Hill (elevation 1,346 feet above sea-level) is a long, isolated ridge that is geologically related to the nearby Taconic Mountains and is included in the Taconic physiographic region.

The Roeliff Jansen Kill drains the vast majority of Ancram (Figure 3). This river has three major tributaries in Town: Punch Brook, Bash Bish Brook, and the Noster Kill. NYRWA delineated the watersheds for each of these streams separately on Figure 3. The southwestern portion of Ancram is contained within the Shekomeko Creek Watershed, while the extreme northwestern tip of the Town is located within the watershed for Taghkanic Creek. The Roeliff Jansen Kill, Shekomeko Creek, and Taghkanic Creek Watersheds are all located within the Mid Hudson River Basin. In contrast, the southeastern portion of the Town of Ancram drains towards Webatuck Creek. This stream is a tributary of Tenmile River, which ultimately discharges to the Housatonic River located in Massachusetts and Connecticut.

2.2 Bedrock Geology

Ancram's bedrock geology is the result of ancient geologic history that occurred between 550 and 460 million years ago. Initially, the area was covered by a shallow sea referred to as the Iapetus Ocean. Marine sediments were deposited on the floor of this ocean. Eventually, these deposits were consolidated into limestone and dolostone. Collectively these are called carbonate rocks since they are composed chiefly of the mineral calcium carbonate. The rock formations that resulted from the sediments of this time period are known as the Wappinger Group. They are also referred to as the Stockbridge Group, particularly in Massachusetts and Connecticut. The area of Ancram that is underlain by the Wappinger-Stockbridge Group carbonates is depicted on Figure 4 and Plate 4.

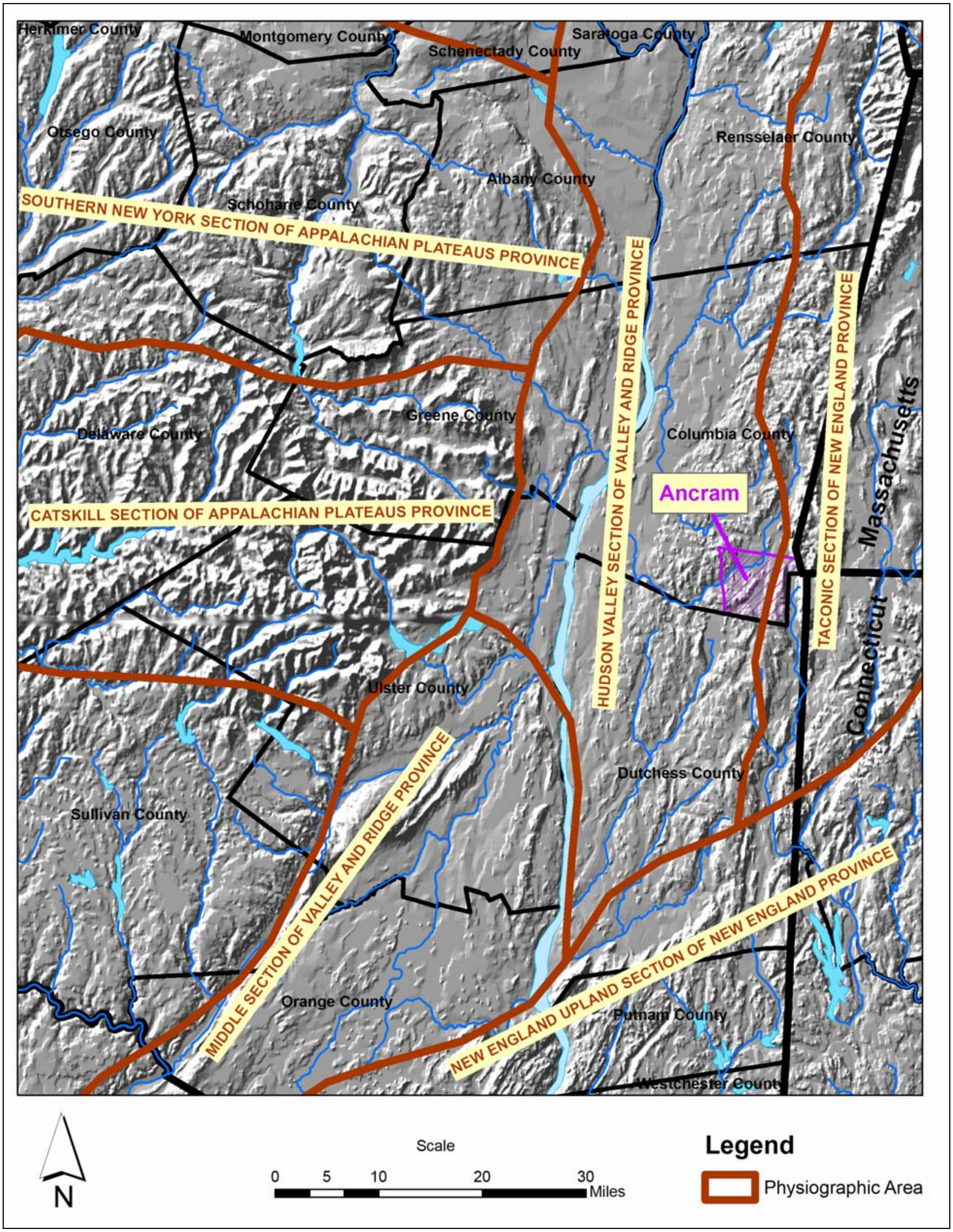


Figure 2. Regional Location.

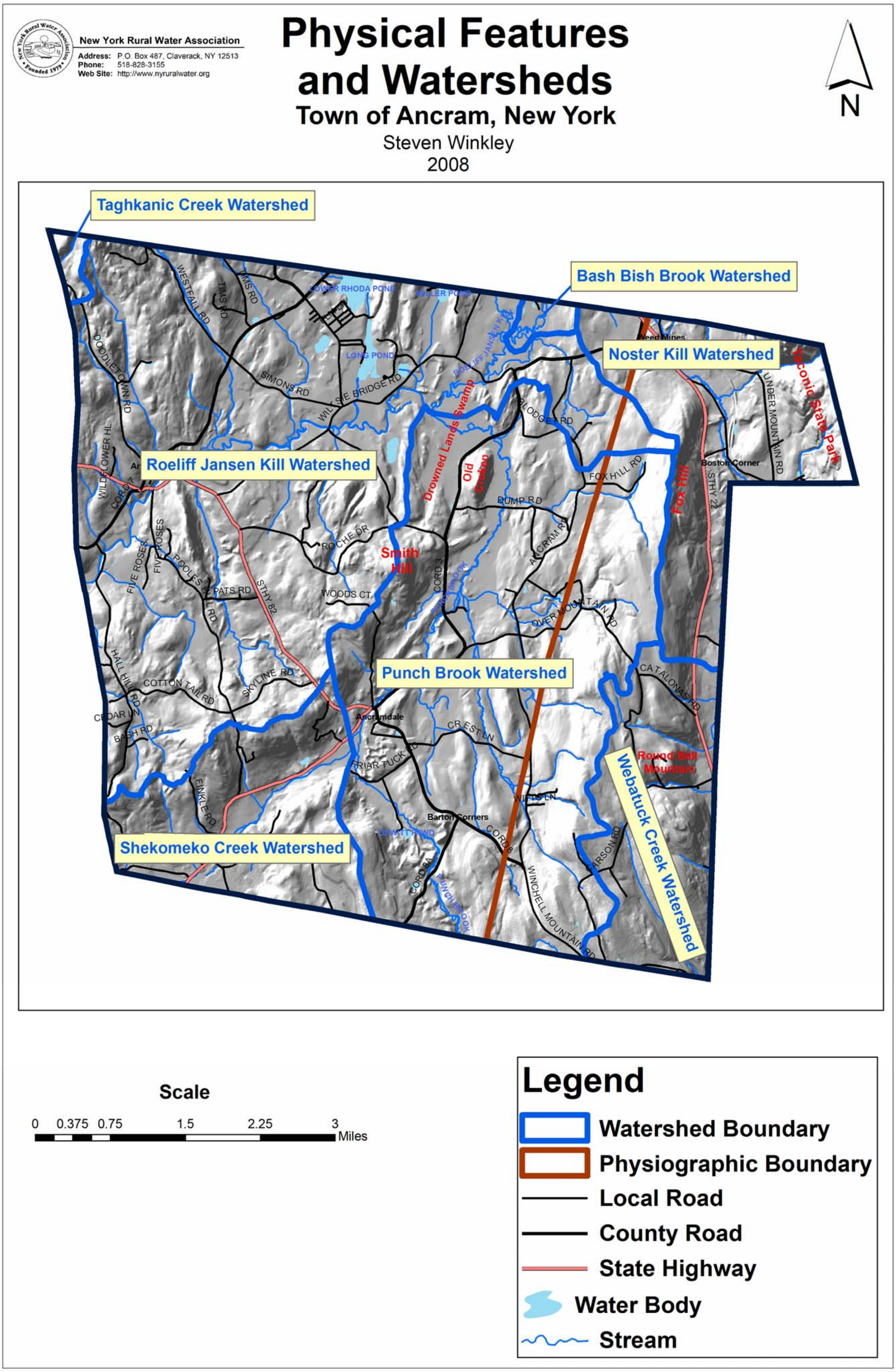


Figure 3. Physical Features and Watersheds.

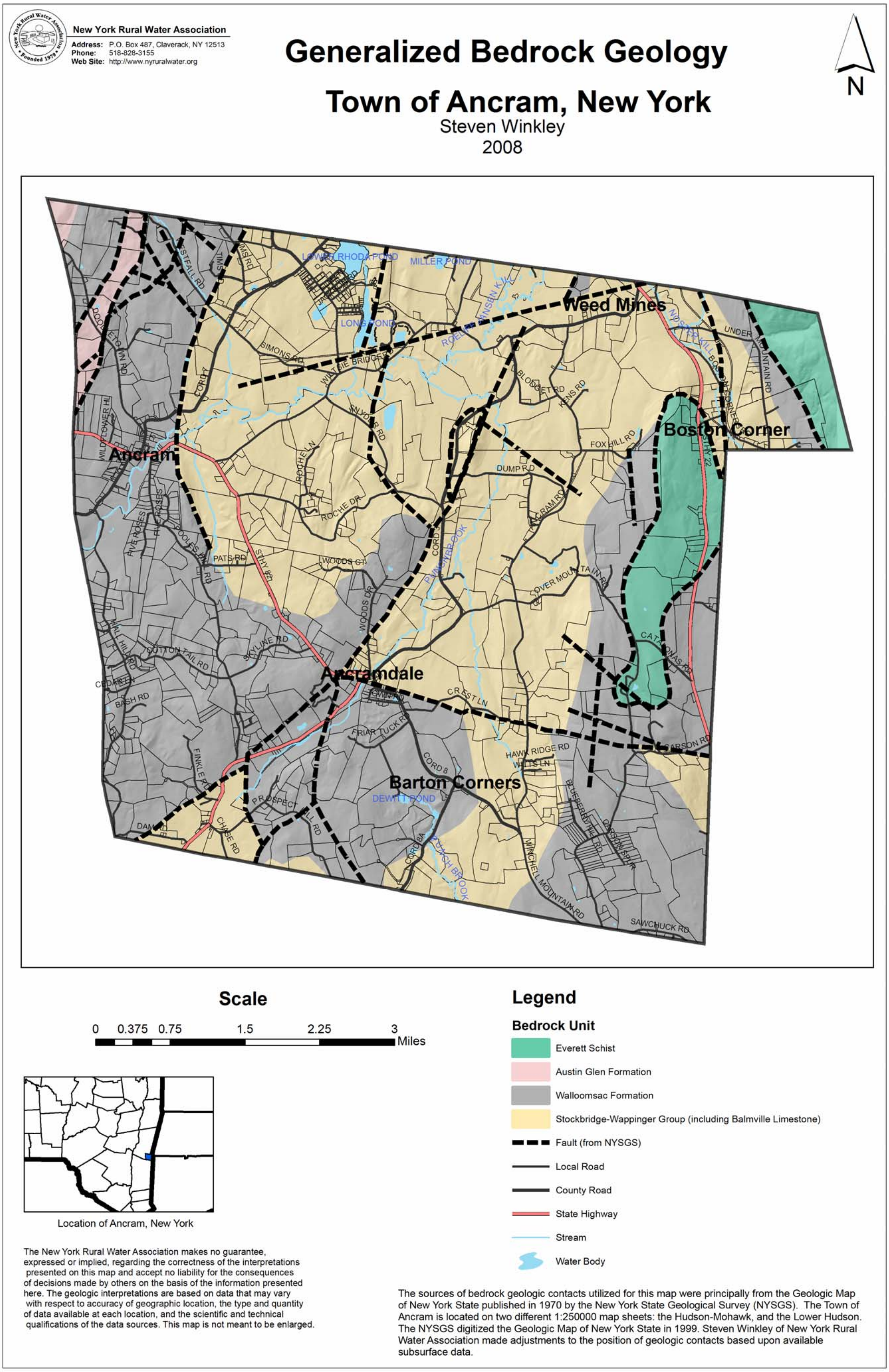


Figure 4. Generalized Bedrock Geology.

Figure 5. Local exposure of Wappinger-Stockbridge Group Carbonates.

Figure 5 above is a photograph of an exposure of the Wappinger-Stockbridge Group carbonates along the Ancram-Copake boundary. The carbonates are predominately whitish to gray, often with orange-gray weathering. In some areas, the limestone and dolostone were exposed to heat and/or pressure and were metamorphosed to a more crystalline rock - marble. Following a period of erosion, the Ancram area became part of a deep ocean trench analogous to those found in today's Pacific Ocean. A thick layer of silty mud was deposited in this deep trench. These sediments eventually consolidated to form shale rock and were later metamorphosed into slate and a higher grade rock known as phyllite. Collectively, the slate and phyllite are referred to as the Walloomsac Formation. It is dark gray to black, with numerous thin layers (see Figure 6). This formation is the likely source of iron and lead that was historically mined in Ancram. The extent of the Walloomsac Formation is shown on Figure 4 and Plate 4.

Figure 6. Local exposure of the Walloomsac Formation.

The cause of the heat and pressure that caused metamorphism of the Walloomsac Formation and the Wappinger-Stockbridge Group carbonates was related to a mountain building event that began to occur some 450 million years ago. At this time, the area that is today Ancram was at the intersection of two crustal plates. As these two plates collided, the Taconic Mountains were thrust upwards. As this occurred, older rocks were pushed large distances westward over the younger Walloomsac Formation and the Wappinger-Stockbridge carbonates. The rocks that were thrusted make up slices of rock known as *allochton* material (see Figure 7). The underlying rocks that were originated in place are part of *autochton* material (Figure 7). In Ancram, the allochton material is principally composed of the Everest Schist (see Figure 4 and Plate 4). It is highly metamorphosed rock that is greenish in color due to the distinctive minerals in it. The Everest Schist comprises the Taconic Mountains in Ancram, as well as the erosional remnant (*klippe* – see Figure 7) that is Fox Hill. Another piece of allochton rock is the Austin Glen Formation exposed in northwest portion of Ancram. It consists of impure sandstone, known as greywacke, interbedded with shale.

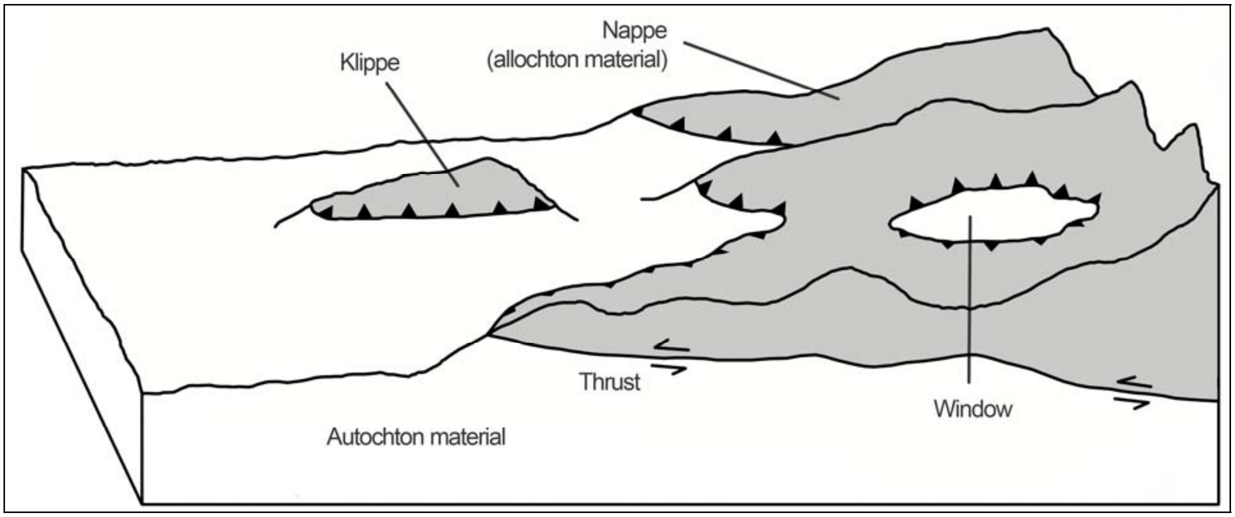


Figure 7. Schematic overview of a thrust system (from Wikipedia).

The boundaries between allochton and autochton rocks are marked by low angled thrust faults. Most of the faults mapped on Plate 4 are thrust faults. Rocks of the allochton and the underlying autochton were severely deformed along these fault zones. In other places, the rocks were also folded as a result of the tremendous pressures that were exerted.

2.3 Surficial Geology

Surficial deposits are geologic materials that are found at the land surface. In contrast to the ancient geologic history defining the bedrock geology of the Ancram area, the unconsolidated deposits above the bedrock originated within the past 15,000 years and actually continue to be formed today. A detailed map of surficial deposits has been completed by NYRWA (see Figure 8 and Plate 2). This map was derived from examination of digital soils mapping, topographic expression of the various deposits, water well data, and site reconnaissance.

Surficial geologic maps have many different potential uses for planning purposes. One of the most frequent uses is to help identify sand and gravel aquifer boundaries. Surficial geologic maps are also important for identifying economically important deposits such as sand and gravel for aggregate. Surficial geologic maps are also important to study environmental issues such as the potential for migration of groundwater contaminants. Finally, surficial geology maps are useful for planning site development activities such as designing and locating septic systems, building new roads, excavating foundations, etc.

The principal material left by the advancing glacial ice sheet was glacial till, a relatively dense poorly-sorted mixture of boulders, gravel, sand, silt and clay. Till is commonly found in upland areas and underlies other deposits in valleys. Relatively thin accumulations of till are found in many areas of Ancram (Figure 8 and Plate 2). Here there is generally less than ten feet of till present, and bedrock outcrops are common. Till thicknesses are often greater than ten feet in Ancram, though bedrock outcrops can still occur in these areas (Figure 8 and Plate 2). Thicker accumulations of till in excess of 100 feet also exist in Ancram, probably marking the former edge or front of the glacial ice (Figure 8 and Plate 2). Glacial till has relatively low permeability and does not typically produce significant water well yields. Nevertheless, some large-diameter dug wells are sometimes constructed in thicker till deposits. However, these wells can fail during dry periods and are sometimes prone to contamination from surface water runoff.

Kame deposits and outwash typically consist of sorted and stratified sand and gravel that was deposited from glacial meltwater streams during the deglaciation period. These meltwater deposits comprise potentially high yielding aquifers. In Ancram, meltwater deposits take two forms. One is as kame deposits. These are deposits of sand, gravel, and boulders that were deposited adjacent to melting ice. Kame deposits exist in many of the tributary valleys of the Roeliff Jansen Kill such as that of Punch Brook. Kame deposits form a distinctive landscape of rolling hills and hollows known as hummocky topography. An example of this terrain is depicted on Figure 9. This is a photograph of the area east of New York State Route 82 in the vicinity of Roche Drive.

Outwash consists of better sorted sand and gravel deposits laid down by glacial streams that flowed further in advance of the ice. Sometimes these deposits formed deltas where such streams entered a quieter body of water. In the area, outwash filled valleys as wide, flat plains. Figure 10 is a photograph depicting an outwash plain along Four Corners Road to the west of Long Lake.

The outwash sand and gravel deposits often grade downwards into glaciolacustrine silt and clay and/or glaciolacustrine silt and sand. For example, in the area of the Roeliff Jansen Kill along Wiltsie Bridge Road, there is 12-15 feet of surficial sand deposits underlain at depth by 14-28 feet of silt and clay deposits. These finer-grained deposits are the result of sedimentation into a glacial lake that existed in the valley of the Roeliff Jansen Kill during deglaciation.

Following retreat of glacial ice from the region, modern streams and rivers have reworked some of the glacial deposits and deposited alluvium. Alluvium consists of fine sand, gravel, and silt that has been deposited in areas historically prone to flooding. A particular form of alluvium is known as an alluvial fan deposit. Several alluvial fans exist across Ancram (Figure 8 and Plate 4). These are fan-shaped accumulations of sediments that are deposited where a steeply draining stream enters onto a wider and flat valley floor.

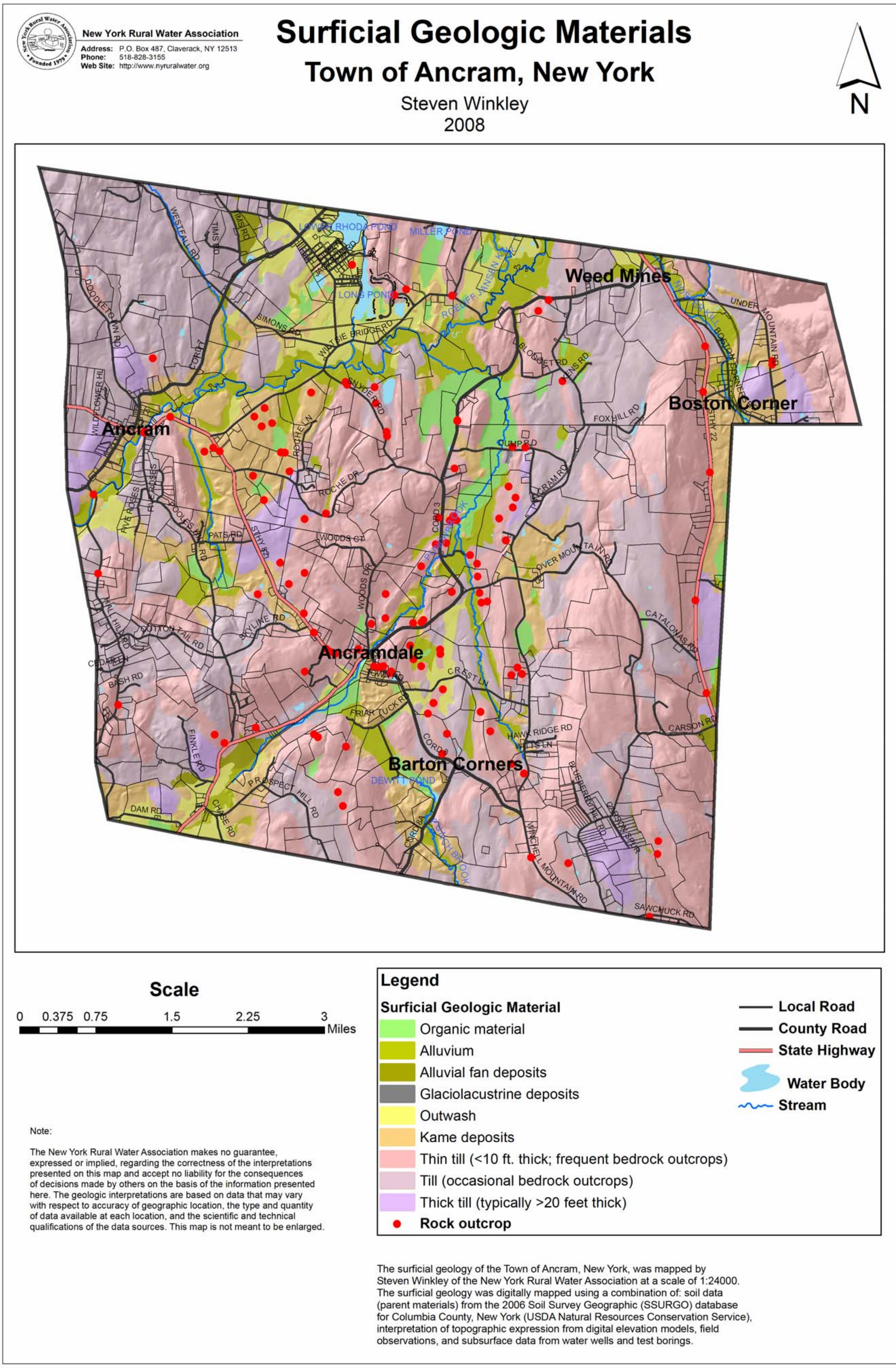


Figure 8. Surficial Geology.

Figure 9. Hummocky topography characteristic of kame deposits (east of NYS Rt. 82 – Roche Drive in background).

Figure 10. Flat outwash plain between Four Corners Road and Long Lake.

3.0 GROUNDWATER UTILIZATION

3.1 Public Water Supply Wells

There are several public water systems in Ancram. All rely upon groundwater wells for their source of supply. A public water system is an entity that provides water to the public for human consumption through pipes or other constructed conveyances. Any system having at least 5 service connections or that regularly serves an average of at least 25 people daily for at least 60 days out of the year is considered a public water system. Public water systems are classified as one of three types: community, non-transient non-community, or transient non-community.

A community water system is a public water system that serves the same people year-round. It has the most regulatory requirements of the three system types, including the need for a certified operator and more extensive monitoring. The only community water system in the Town of Ancram is the Long Lake Homeowners Association (see Figure 11). This system serves the Long Lake community, a group of 68 homes centered around Long Lake (Long Pond) and other adjacent water bodies. The Long Lake water system utilizes two drilled wells, one that is 307 feet deep and produces 50 gallons per minute and one that is 127 feet deep and yields 65 gallons per minute.

A non-transient non-community water system water system does not serve year-round residents, but does regularly serve at least 25 of the same people more than six months per year. It now requires a certified operator, but has less monitoring and reporting requirements than a community system. A single non-transient non-community water system exists in the Town of Ancram: Schwitzer-Mauduit International in the hamlet of Ancram (see Figure 11).

A transient non-community water system does not regularly serve at least 25 of the same people over six months per year. It does not require a certified operator and monitoring is largely limited to bacteria, nitrate, and nitrite. There are at least 10 businesses that had wells and were regulated as a transient non-community water system in the Town of Ancram (see Figure 11). The heaviest concentration of such systems is in the hamlet of Ancram.

No health-based violations were found for any of the public water systems in Ancram based upon a search of the United States Environmental Protection Agency's Safe Drinking Water Information System (SDWIS).

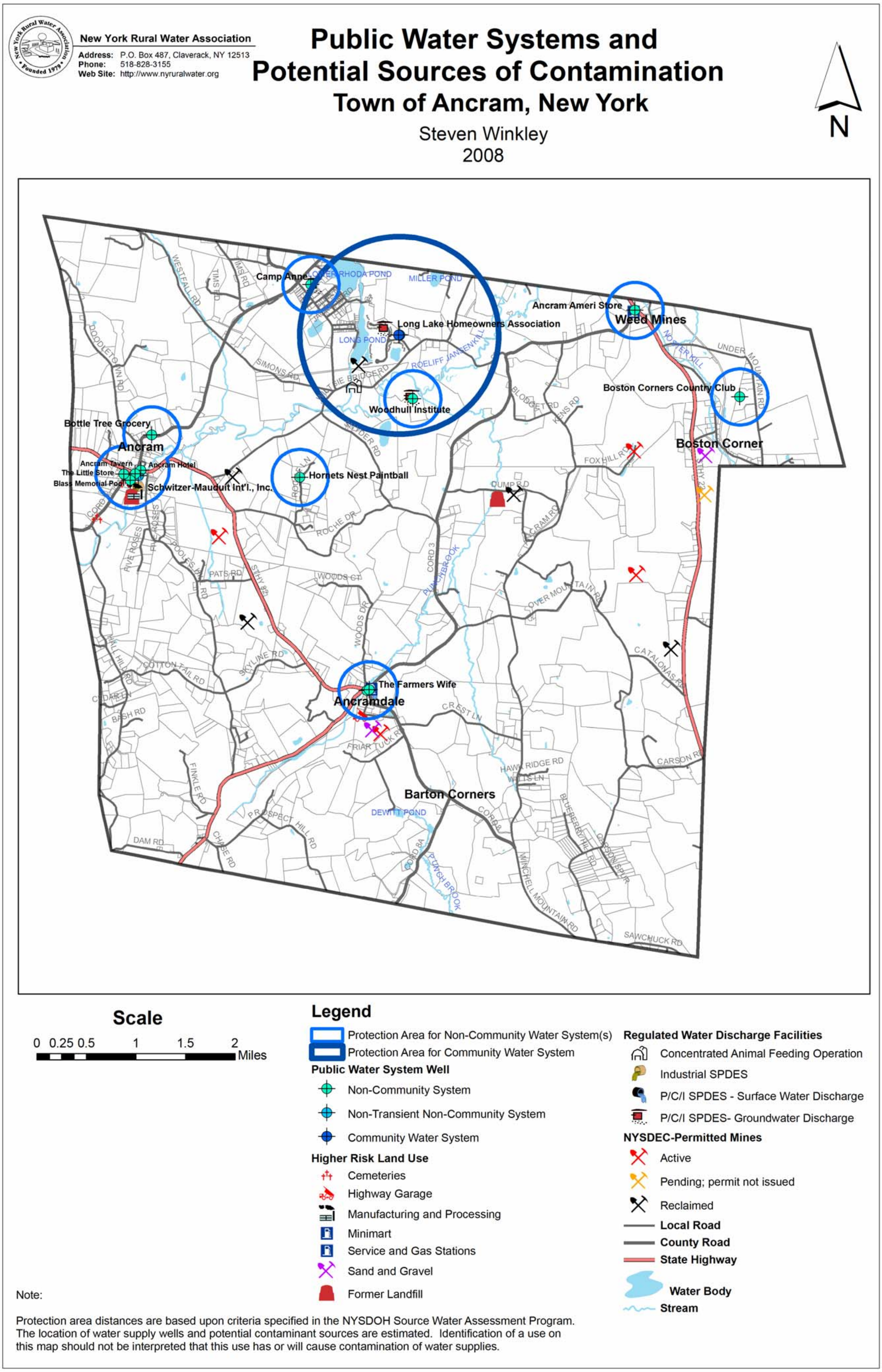


Figure 11. Public Supply Wells, Wellhead Protection Areas, and Potential Contaminant Sources.

3.2 Wellhead Protection Areas

The USEPA defines a wellhead protection area as the surface and subsurface area surrounding a well through which contaminants are reasonably likely to move toward and reach the water well. This is the area where preventative steps should be focused to reduce the risk of contamination of the public water supply. For most of the community and non- community system wells, NYRWA has mapped a 1,500-foot fixed radius wellhead protection area (Figure 11). This baseline delineation is consistent with the default outer zone of the 2003 New York State Source Water Assessment Program. Note that the radius of the Long Lake Homeowners Association wells was based upon a larger fixed radius of one-mile, consistent with the Source Water Assessment Program.

3.3 Individual Homeowners

Virtually all residents in the Town of Ancram currently receive their drinking water from individual groundwater wells (a few may receive their water from springs or from surface water). In order to document the nature of water wells in Ancram, NYRWA designed a questionnaire and the Town of Ancram distributed this water well survey form to residents. A total of 185 survey forms were received by NYRWA. Using addresses, real property data, and digital orthoimagery, NYRWA was able to approximately map 92 percent of these wells (see Figure 1 and Plate 1). Results indicate that over 90 percent of the public gets their drinking water from drilled wells. Similarly, nearly 90 percent of households rely upon bedrock for their source of supply (see Section 4.0). Twenty-seven percent of respondents indicated that they had no complaints about their well water.

Fifteen percent of respondents indicated that their well did not produce enough water. Over 70 percent of households in Ancram also reported water quality problems. Over one-half of all households (56 percent) indicated problems with hard water. The hardness of water affects the amount of soap or detergents used for washing. Hard water also leaves a scale in vessels or fixtures that are heated. It is largely related to the presence of calcium and magnesium in the water.

Problems with odor, largely sulfur or rotten egg odor, occur in 19 percent of households. This odor is caused largely by the presence of dissolved hydrogen sulfide gas in the water. Hydrogen sulfide is common in waters with a high amount of sulfate. Sulfates in water can also cause a bitter taste and lead to a hard to remove scale. Staining and sediment problems were reported in 13 percent and 11 percent of households, respectively. These problems are often attributable to iron and manganese in the water. Dissolved iron in water can lead to reddish sediments and staining of clothing, fixtures, etc. The presence of manganese in water can lead to gray to black staining and sediment. Bacterial contamination was reported by one household. Other concerns about water quality were expressed by two others.

4.0 GROUNDWATER OCCURRENCE

Ground water is subsurface water that fills (saturates) all the voids in the rock or soil. Ground water is found between in the pore spaces between individual grains that range in size from clay to gravel. This is referred to as primary porosity. Ground water also occurs in cracks (fractures) found in rock. This is known as secondary porosity. Most of the water in bedrock is found in fractures. Some of these fractures in limestones, dolostones, and marbles (carbonates) have been enlarged from chemical dissolution.

An aquifer is a loosely-defined term that has several different meanings. Some refer to an aquifer as a body of rock or sediment that produces usable quantities of water. Using this definition, virtually all of the Town of Ancram overlies an aquifer because typically enough ground water can be found at most locations for residential purposes. However, an aquifer is also sometimes defined as a body of rock or sediment that yields *significant* quantities of water. This is the definition of aquifer that is referred to in this plan. A significant quantity of water is defined in this report as an amount of water that is sufficient for use as a municipal water supply source.

4.1 Bedrock

As indicated before, bedrock in the Town of Ancram is the major source of ground water for most residents and businesses. In bedrock, steel casing is set through the overburden and into the first few feet of sound rock. The remainder of the well is left as an open borehole in the rock. The median depth of bedrock wells in Ancram is 259 feet, with depths ranging from 50 to 1,400 feet. The median depth of casing is 28 feet. Casing depths range up to 500 feet. Note that water well drilling regulations promulgated by the New York State Department of Health now specify a minimum of 19 feet of casing below grade.

Figure 12 below is a graph showing the distribution of well yields from bedrock wells. With the median bedrock well yield at 5 gallons per minute, nearly one-half of all Ancram bedrock wells (46%) yield less than the 5 gallons per minute. This is the minimum well yield necessary for Federal Housing Administration (FHA) insured loans for new construction.

For existing homes to be eligible for FHA insured loans, the well system must be capable of delivering three gallons per minute. As Figure 12 shows, thirty-one percent of the wells would not meet this requirement for existing construction.

For lower yielding wells, the New York State Department of Health (NYSDOH) indicates that additional storage can be provided to meet peak household water demand. Water storage can be through storage in the well or a supplemental storage tank. NYSDOH does not recommend the use of wells with yields of 1 gallon per minute or less for any homes with four or more bedrooms.

There are several factors that control bedrock well yield. Higher yielding wells are generally found in more permeable bedrock formations that have more intense rock fracturing, are more often in topographic lows, and frequently are situated near linear features found on topographic maps or aerial photographs. Conversely, low yielding wells are often found in poorly permeable formations and are usually situated on steep slopes at higher elevations or hilltops.

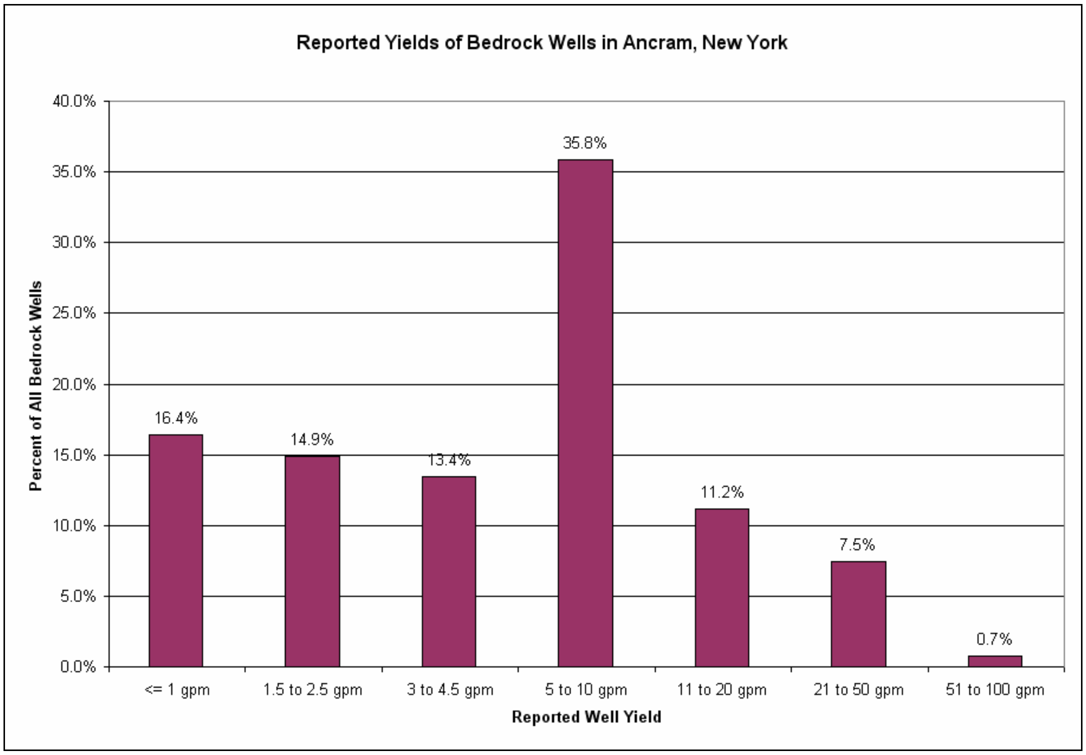


Figure 12. Graphical Distribution of Bedrock Well Yields in the Town of Ancram.

Undoubtedly, the major control on bedrock well yield is the type of bedrock. NYRWA has grouped Ancram's bedrock into so-called hydrostratigraphic units. These are mappable bodies of rock that are hydraulically connected or grouped together on the basis of similar hydrologic properties such as hydraulic conductivity, porosity, and well yields. In general, each hydrostratigraphic unit acts as a reasonably distinct hydrologic system. Figure 13 is a map of bedrock hydrostratigraphic units in Ancram, together with bedrock well yields.

4.1.1. Walloomsac Formation

Due to its reduced permeability, the availability of ground water in the Walloomsac Formation is significantly less than the other major bedrock hydrostratigraphic unit in Town (the Wappinger-Stockbridge Group carbonates). The median yield in the Walloomac is only 3.75 gallons per minute. Approximately one-fourth (24 percent) of residents in Ancram that have wells completed in the area underlain by the Walloomsac Formation report that they have insufficient water.

As Figure 14 indicates, 27.5 percent of all wells drilled in the Walloomsac yield 1 gallon per minute or less and are not suitable for four bedroom homes according to NYSDOH. In addition, over one-half (55 percent) of wells drilled in the Walloomsac Formation are not sufficient in order to qualify for FHA financing of new homes.

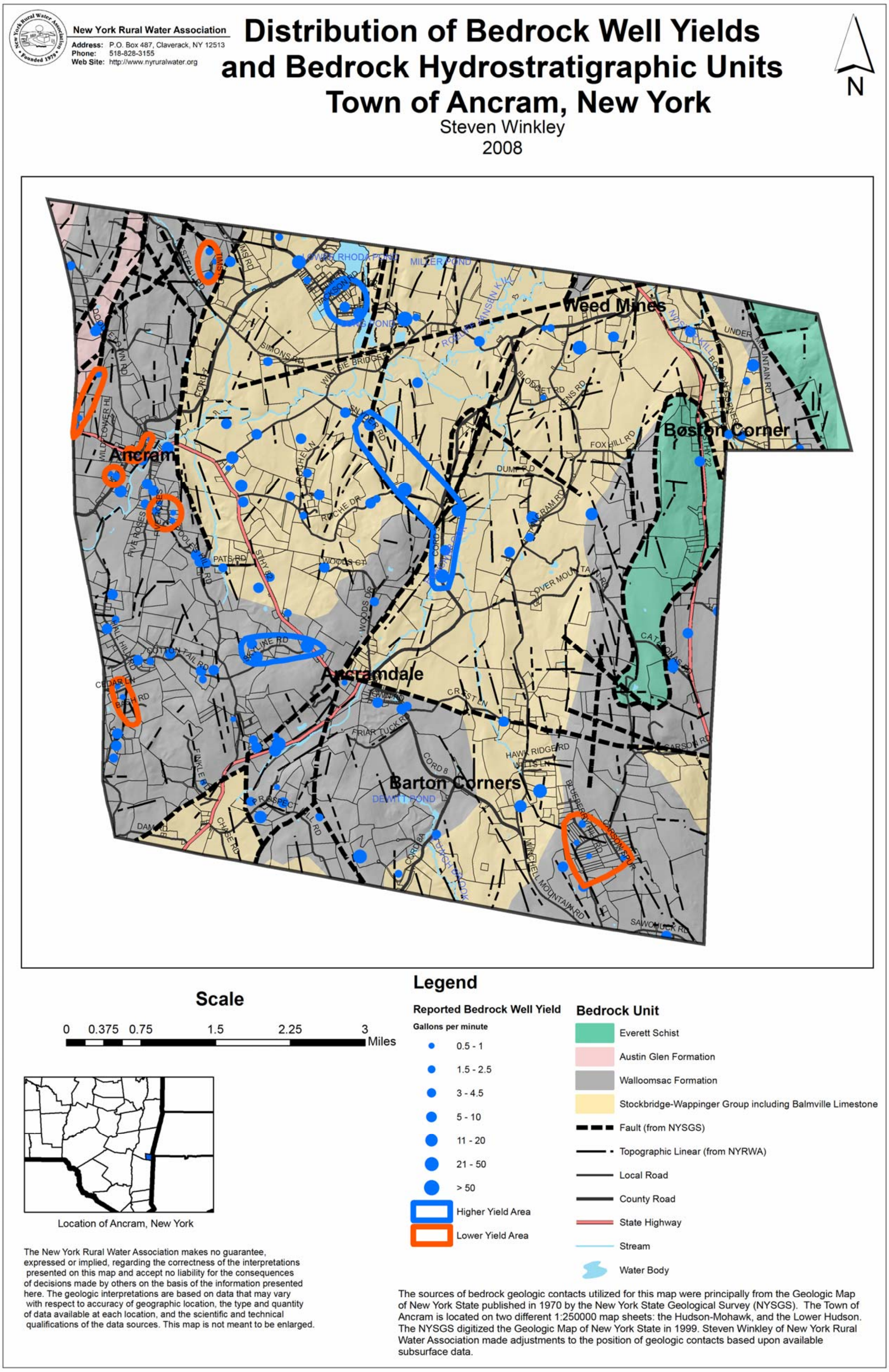


Figure 13. Bedrock Well Yields and Hydrostratigraphic Units.

As indicated on Figure 13 and Plate 4, NYRWA has identified several clusters of low-yield wells in the area underlain by the Walloomsac Formation. Several of these groupings are in the vicinity of the hamlet of Ancram. Only one area of relatively higher well yields was identified in the area underlain by the Walloomsac (Figure 10). Yields in this area may be enhanced by the underlying carbonate rocks.

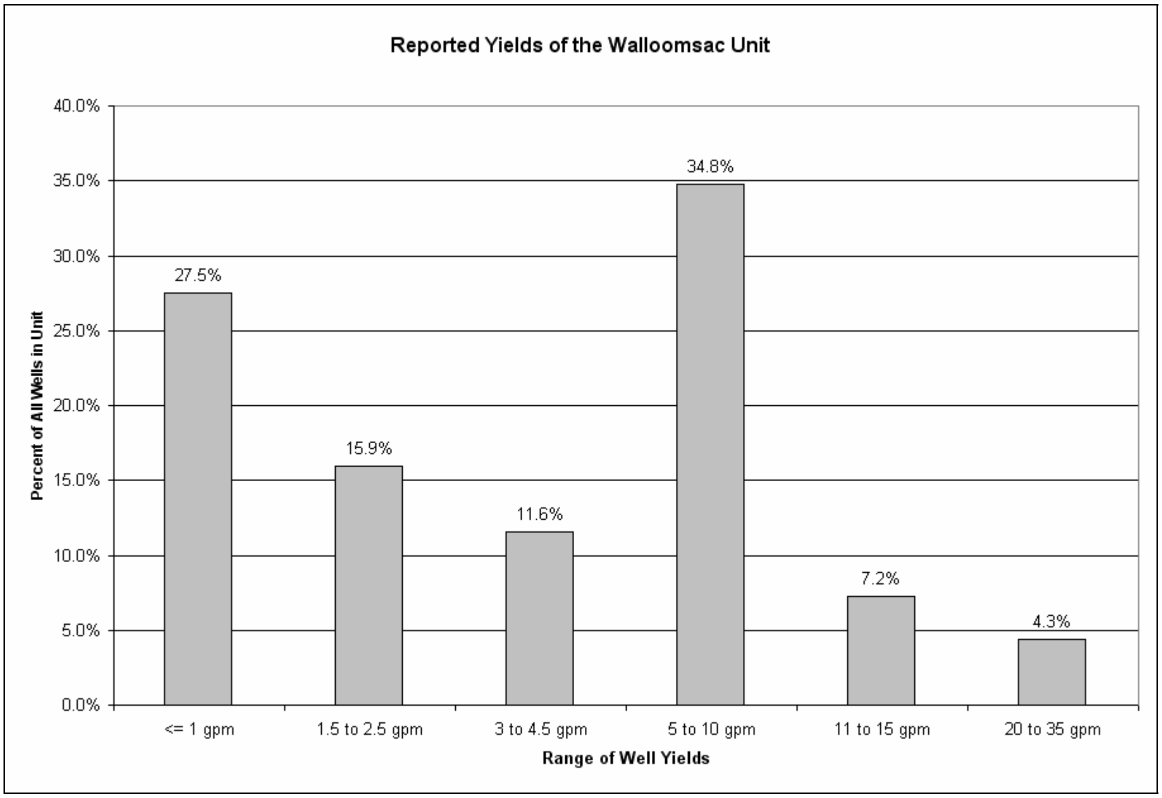


Figure 14. Yields of Wells Completed in the Walloomsac Formation.

In terms of water quality, Arnow (1951) had reported that well water from the shaly rock in Columbia County (including the Walloomsac) is relatively soft. However, 56 percent of residents with wells completed in the Walloomsac Formation reported hard water. This could be due to the presence of sulfate minerals in the water. Accordingly, a higher percentage of residents (25 percent) reported odor problems with water from the Walloomsac Formation. This is likely from the pyrite, galena, and other sulfide minerals associated with the rock type.

4.1.2 Wappinger-Stockbridge Group

The carbonate rocks of the Wappinger-Stockbridge Group (including the Balmville Limestone) often have significantly higher permeability due to the presence of openings that have been enlarged and opened through dissolving of the rock material. In some instances, dissolution of the rock can lead to karst features, including caves, springs, sinkholes, and disappearing streams. There is one reported cave in Ancram, Indian Oven Cave on Round Ball Mountain.

Due to its enhanced permeability, well yields in the Wappinger-Stockbridge Group carbonates are significantly higher than in the Walloomsac Formation. The median yield in the carbonates is 8 gallons per minute. Only 10 percent of residents in Ancram that have wells completed in the area underlain by carbonate rocks report that they have insufficient water. Similarly, just six percent of all wells drilled in the carbonates yield 1 gallon per minute or less and are unsuitable according to the NYSDOH (see Figure 15).

Very high well yields have been reported in the Wappinger-Stockbridge Group. For example, the wells for the Long Lake community yield 50 to 65 gallons per minute. Nearly twenty percent of wells drilled in the Wappinger-Stockbridge Group yield 20 gallons per minute or more. If suitable fracture zones can be located in the carbonates, it is not unreasonable to expect well yields approaching or exceeding 100 gallons per minute in the Wappinger-Stockbridge Group.

As expected, water from the Wappinger-Stockbridge Group is characteristically hard. Sixty-eight percent of residents that utilize the carbonates for their water supply source report hard water. Incidences of odor (14 percent), staining (12 percent), and sediment (7 percent) are reduced compared to the Walloomsac Formation because of lesser amounts of iron and sulfide minerals in the rocks.

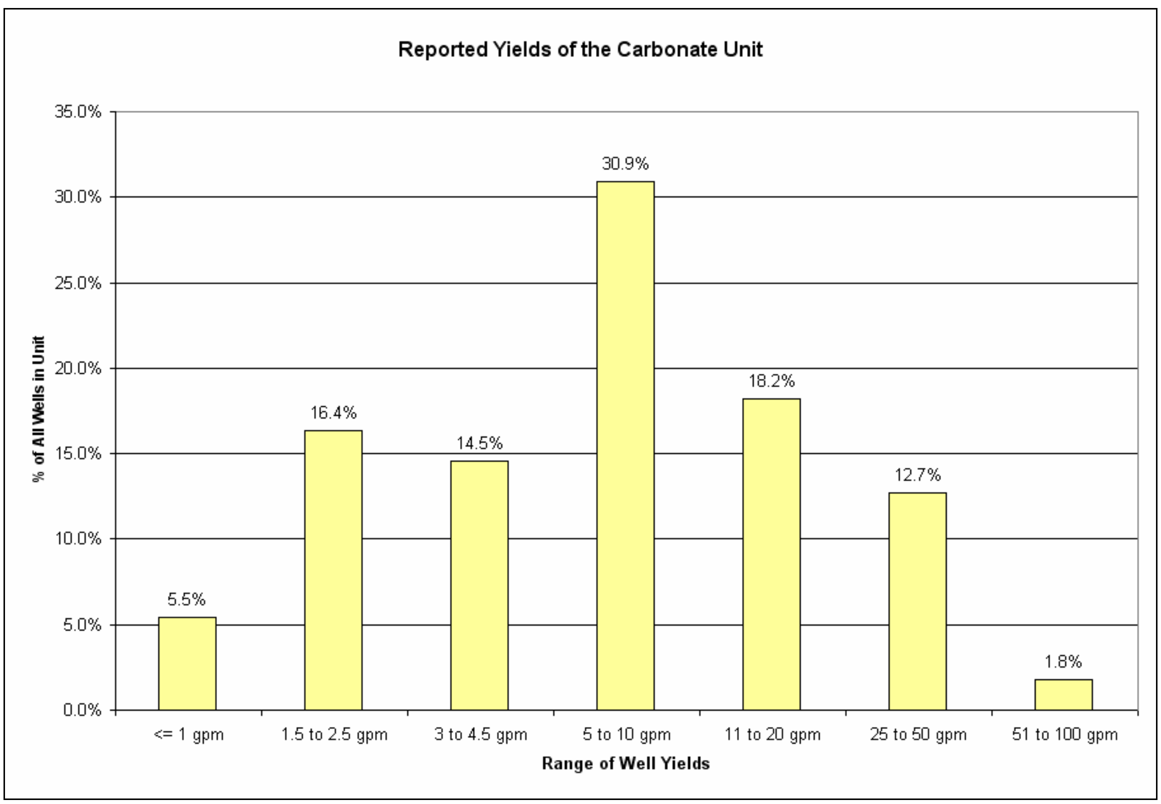


Figure 15. Yields of Wells Completed in the Wappinger-Stockbridge Group.

4.1.3 Other Bedrock Hydrostratigraphic Units

Very few wells in Ancram utilize the Everett Schist or the Austin Glen Formation in Ancram. Based upon data from other areas, including Dutchess County, the yields from these two units are believed to be intermediate between those of the Walloomsac Formation and the Wappinger-Stockbridge Group.

4.2 Unconsolidated Aquifers

4.2.1 Well Types

Approximately ten percent of all wells in the Town of Ancram are completed in the overburden (unconsolidated deposits) above the bedrock. A few wells in Town are so-called dug wells, constructed of stone, concrete, or brick (see Figure 1 or Plate 1 for locations). These wells tap glacial till deposits and are typically several feet in diameter. They usually yield only a few gallons per minute due to the relatively impermeable nature of till.

Another type of overburden well is the driven point. These consist of small diameter (1-¼ inch diameter) pipe equipped with a pointed screen known as a point. The pipe and point are driven into sandy deposits to a typical depth of 10-30 feet (the median depth of driven wells in Ancram is 18 feet). They are fairly common in some areas of Ancram, such as in the vicinity of Lower Rhoda Pond /Long Lake, Ancramdale, and other areas of Ancram where sandy deposits exist at or near the surface and the water table (depth to groundwater) is fairly shallow (see Figure 1 and Plate 1). Well points can produce significant quantities of water (the median yield in Ancram from points is 40 gallons per minute). Driven points can be installed with relatively simple equipment. However, since they meet the definition of a water well, driven points should be installed by a contractor that is registered with the New York State Department of Environmental Conservation as a water well contractor.

The final type of well utilized in unconsolidated aquifers are drilled wells. In general, wells that are completed in the unconsolidated deposits and are utilized for private, residential use are simply left as open ended casing. The casing is terminated in the water-bearing material (the median depth of such wells is 65 feet). Such construction is sufficient for many purposes (the median yield of such wells in Ancram is 20 gallons per minute). However, unconsolidated deposits are capable of producing very high yields if wells are finished with a properly sized and developed screen. A well screen is a filtering device that permits water to enter the well but prevents the unconsolidated material (sand, etc.) from entering the well. Screening is placed in the well and the casing is generally pulled back to expose the screen to the unconsolidated material. Screens are typically made of stainless steel and have openings referred to as slots. Public water supply wells in sand and gravel are typically fitted with screens. Such wells are usually capable of producing 100's of gallons per minute.

4.2.2 Extent of Unconsolidated Aquifers

The distribution of water-bearing unconsolidated deposits is generally limited to areas along or near the valleys in Ancram. On Figure 16 and Plate 3, NYRWA has mapped unconsolidated aquifers in the Town of Ancram. This map shows the type and distribution of unconsolidated aquifers in the Town of Ancram, New York. These aquifers were delineated by NYRWA on the basis of surficial geologic boundaries (see Plate 2) and available subsurface data (see Plate 1).

NYRWA has divided unconsolidated aquifers into three general groups: (1) currently utilized sand and gravel aquifers; (2) potential sand and gravels (those that may have water-bearing potential but are not being utilized); and (3) other areas of stratified deposits (areas not typically utilized by wells due to a lack of saturated thickness or coarse-grained material). The currently utilized sand and gravel aquifers and potential sand and gravel aquifer areas are further divided by general depth.

Shallow sand and gravel aquifers in Ancram are areas where sand and gravel lies at or near the land surface. Here the water-bearing deposits are frequently tapped by driven wells less than 30 feet deep. Deeper sand and gravel aquifers occur in some areas beneath finer-grained deposits. An example is along the northern portion of the hamlet of Ancram. Here, a 6 to 8 foot layer of sand and gravel is buried beneath approximately 40 feet of silt and clay. With so few wells completed in the unconsolidated deposits, it is not possible to characterize the water-bearing properties of the sand and gravel in some settings. Therefore, NYRWA has categorized these areas as potential sand and gravel aquifers.

Finally, there are some areas where NYRWA has determined that the water-bearing potential of unconsolidated deposits is likely to be low due to a lack of thickness or fine-grained texture. Nevertheless, these areas do provide recharge to underlying bedrock or discharge groundwater to surface water bodies.

4.2.3 Water Quality

In terms of quality, water from unconsolidated aquifers is very hard. Over eighty percent of Ancram residents with unconsolidated aquifer wells reported hard water. However, the water from unconsolidated aquifers has less reported problems with odor, staining, and sediment.

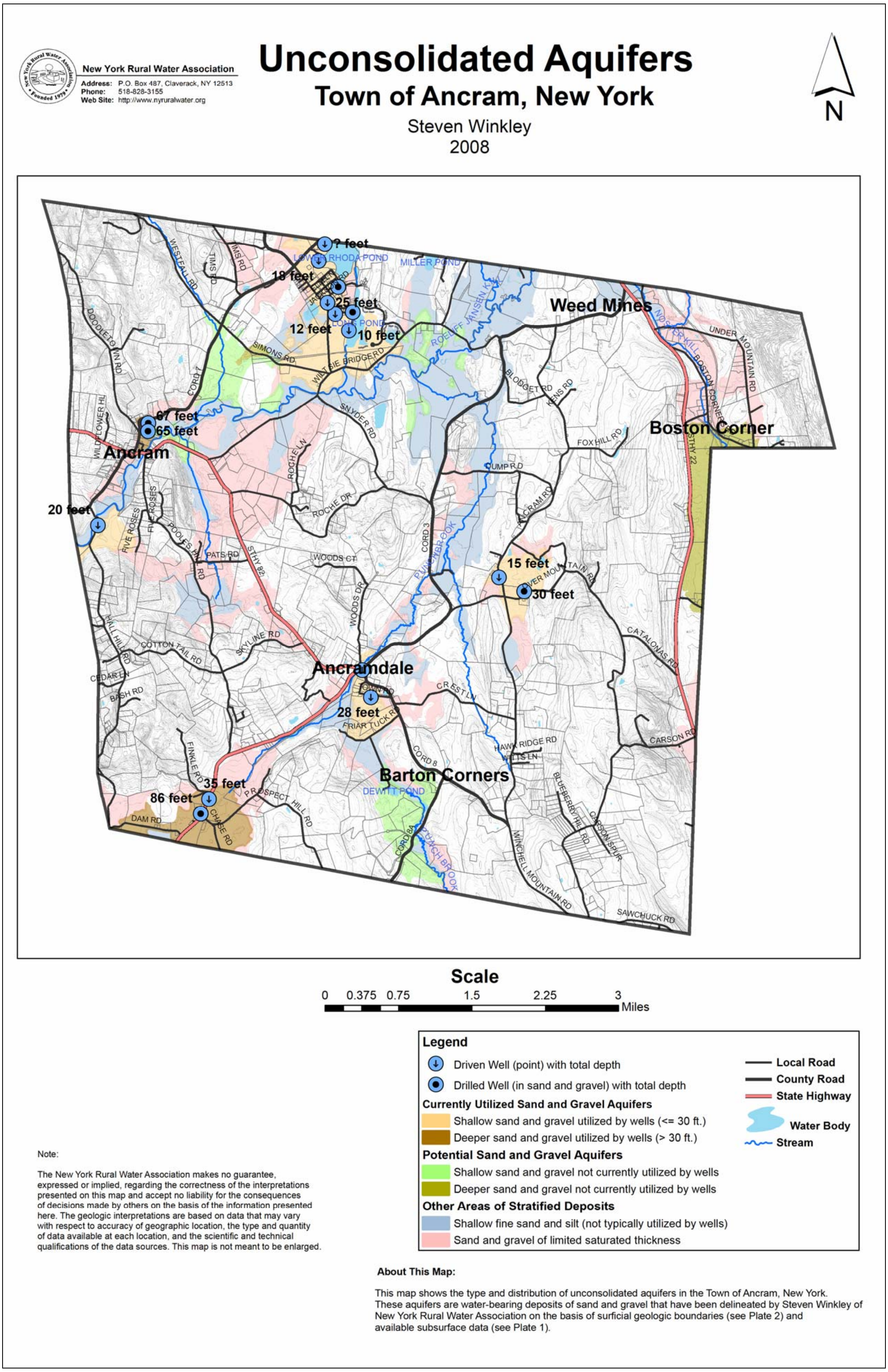


Figure 16. Unconsolidated Aquifers.

5.0 GROUNDWATER RECHARGE AND DISCHARGE

Ground water flows from recharge areas to discharge areas. Recharge areas are where ground water is being replenished and it is flowing downwards and away from the water table. Typically recharge areas represent 70 to 95 percent of a region (Freeze & Cherry, 1979). Conversely, in discharge areas, ground water flows upwards toward the water table and eventually is removed from the subsurface into surface water bodies. In an area of high topographic relief such as in Town of Ancram, much of the ground water moves in local flow systems. In local flow systems, ground water is recharged at a topographic high and discharged at the next local topographic low. Some deeper ground water in Town *may* be involved in regional flow systems. Ground water here may move greater distances and be discharged at pronounced regional lows.

5.1 Recharge

Most of the ground water in Ancram is ultimately recharged (replenished) through infiltration of rainfall or snow melt. Rates of shallow groundwater recharge in Ancram have been calculated by NYRWA based on a recent study by Chazen (2006) for Dutchess County. In this study, recharge rates were determined based upon hydrologic soil groups for various regional watersheds. One of these was the Tenmile River Watershed. This watershed extends into southeastern Ancram since the Webatuck Creek is a tributary of the Tenmile River.

The average annual precipitation in Ancram is 42 inches, compared to the average annual precipitation across the Tenmile River Watershed of 43 inches. NYRWA adjusted the Chazen (2006) recharge rates for the Tenmile River Watershed slightly downward to reflect the lower precipitation rates found across the Hudson Valley region as opposed to the Taconic region. Figure 17 is a map of estimated annual groundwater recharge rates in Ancram based upon hydrologic soil groups.

A hydrologic group is a group of soils having similar runoff potential under similar storm and cover conditions. Group A soils have high infiltration rates and low runoff potential. Conversely, group D soils have very slow infiltration rate and high runoff potential. The vast majority of Ancram is covered by Group C soils. These soils are calculated to have an average annual groundwater recharge rate of 7.4 inches per year.

5.2 Discharge

Ground water discharge areas are relatively low-lying areas where ground water is removed from the subsurface through evapotranspiration at the land surface or movement into surface water bodies. The water table is at or relatively near the land surface in discharge areas. One indicator of these wet conditions is the Compound Topographic Index (CTI), commonly referred to as the Wetness Index. This parameter is a function of the topography and the slope of the landscape. A high CTI indicates probable wet conditions and likely discharge area(s). Figure 18 is a map of probable groundwater discharge areas based upon high CTI values.

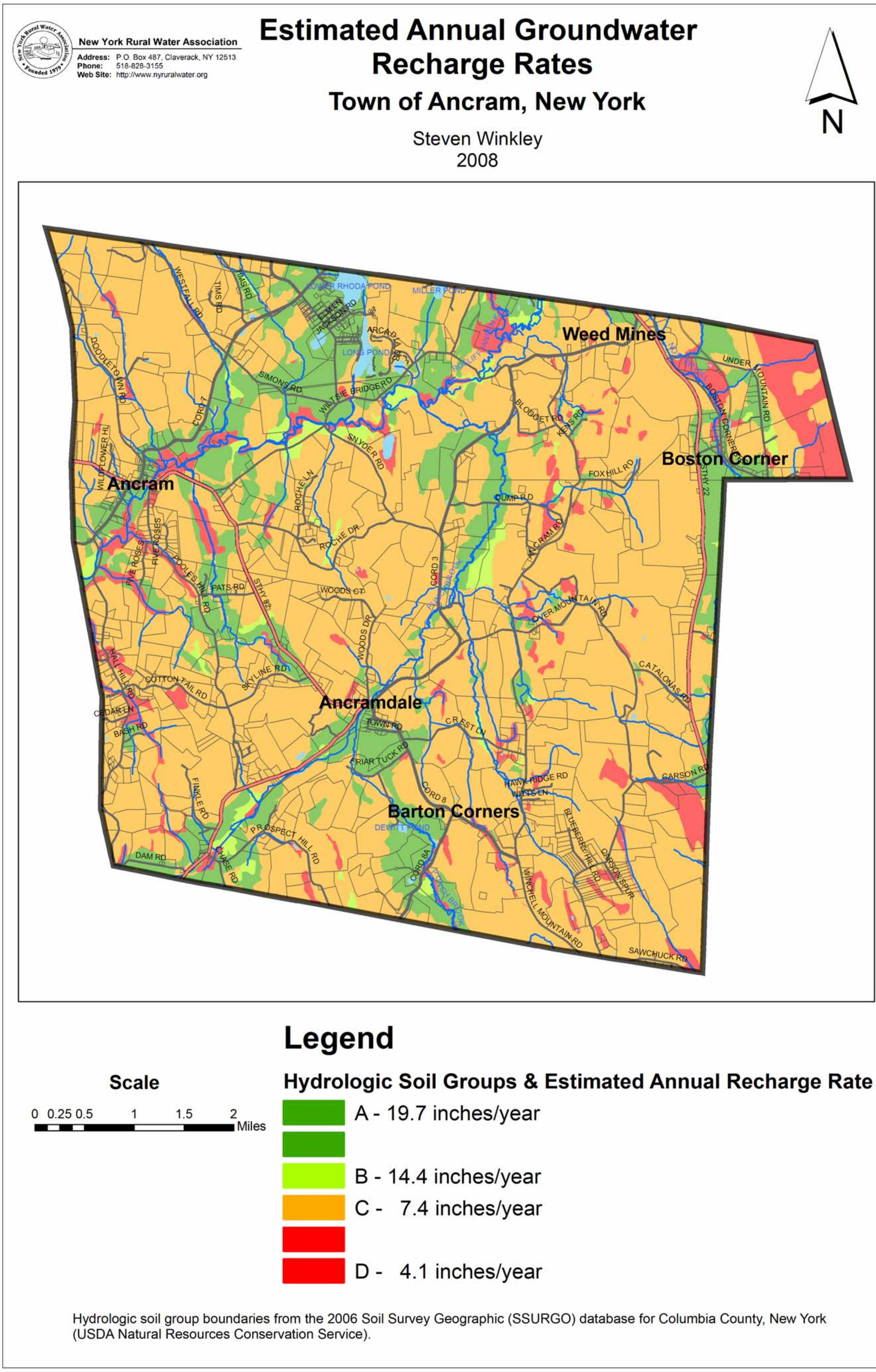


Figure 17. Estimated Groundwater Recharge Rates.

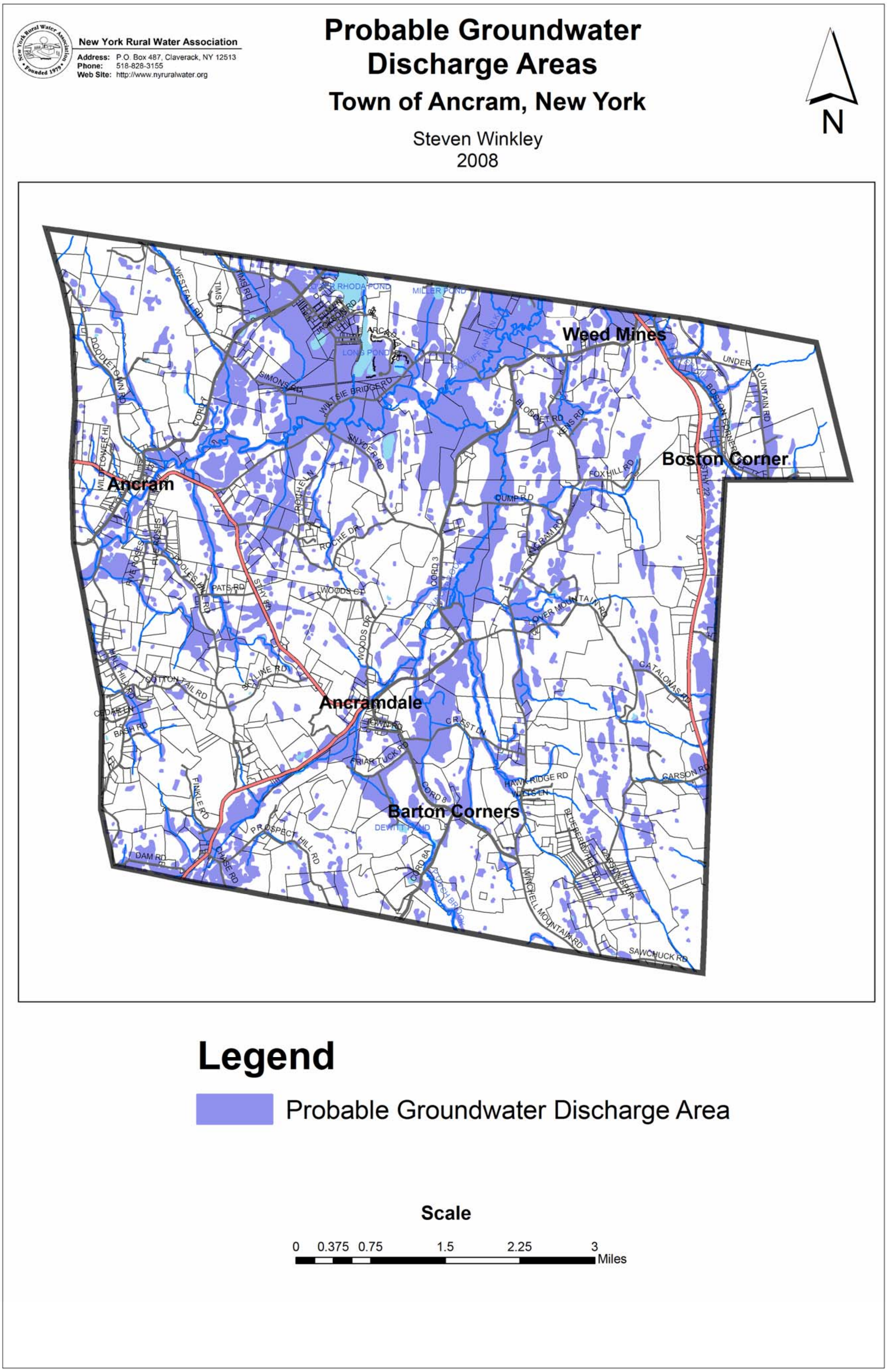


Figure 18. Probable Groundwater Discharge Areas.

6.0 GROUNDWATER CONTAMINATION SUSCEPTIBILITY

Groundwater resources are susceptible to contamination from a variety of manmade sources. These include various industrial, commercial, residential, and agricultural uses and activities. Several of these potential sources of contamination are regulated by state agencies such as the New York State Department of Environmental Conservation (NYSDEC). Some others are not. Once contaminated, ground water is very difficult and costly to cleanup. The susceptibility of groundwater resources to potential contamination is controlled by two factors: potential contaminant prevalence and the hydrogeologic sensitivity. These factors are detailed below for Ancram.

6.1 Potential Contaminant Prevalence

6.1.1 Existing Land Use

As indicated previously, there are a number of different uses and activities that have the potential to contaminate ground water. These practices typically involve the handling, use, storage, and/or disposal of petroleum and other hazardous substances that are capable of contaminating ground water. The threat of groundwater contamination can be reduced to some extent through the use of environmentally-sound best management practices and/or structural methods. Figure 11 includes potential groundwater contamination sources in Ancram. Some of these potential sources are regulated by the NYSDEC. These include mines, former landfills, and wastewater discharge facilities (SPDES permitted discharges).

NYRWA also used property classification codes from the New York State Office of Real Property Services to identify largely non-regulated uses that could be considered as potential contamination sources. These land uses are plotted on Figure 11 according to the property classification.

One trend that is evident on Figure 11 is the number of regulated wastewater discharges in the Roeliff Jansen Kill watershed in Town. These include several institutional septic systems that are designed to discharge greater than 1,000 gallons per day to the subsurface.

The other notable fact is the quantity of present and former sand and gravel mines in Ancram. This is largely due to the abundance of kame and outwash deposits that occur in various areas. The process of aggregate mining does is not likely to directly impact groundwater levels unless mining exposes the water table. However, activities associated with mining can potentially impact groundwater quality. For example, fuel spills and leaks can occur during on-site activities. Second, illicit and unregulated debris dumping can occur in inactive pits. Many of these concerns can be alleviated through proper operation during the active life of the mine and through careful reclamation after mining ceases.

6.1.2 Future Growth

Development involves a number of potential groundwater resource issues. These issues involve: (1) water supply; 2) wastewater treatment; 3) impervious surfaces and storm water systems; and (4) improper waste disposal and spills.

Most recent rural development in the Town of Ancram has chiefly involved the use of individual private wells (though a community water system was developed for the Long Lake development beginning in the late-1980's). Compared to central water systems, individual wells are less expensive to install and their operation is not regulated. The density and placement of individual water wells with respect to the groundwater flow direction is important. Adequate well spacing is necessary to sustain well yields. Wells should also be placed such that their recharge area does not overlap with that portion of the lot where effluent from the wastewater disposal system is diluted. Ideally, wells should not be placed directly downgradient of disposal systems on adjacent lots as well.

Excessive nitrate loading of ground water can occur if there is too high a density of septic systems in a given area. Based upon the average annual recharge rate of 7.4 inches per year, the density of equivalent single family residential septic systems should not exceed an average of one per 3.5 acres.

Based upon NYSDOH standards for wells, there should also be a 100 to 300 foot separation between wells and on-site septic systems. The highest figure (300 feet) is for shallow (<50 foot) wells where there is sand and gravel soils. There are some areas in Ancram where these standards are not currently being met. For example, residents rely upon shallow points and drilled wells, have septic systems, and are situated on lots of less than ½-acre near Lower Rhoda Pond-Long Lake as well as in the hamlet of Ancramdale.

Development inevitably increases the amount of impervious surfaces in an area. These are roofs, roads, driveways, parking lots, pools, and other surfaces that do not allow precipitation to infiltrate into the soil and reach the water table. Impervious surfaces result in water running off the land surface, directly into wetlands, lakes, and streams. As overland flow and stormwater runoff increases, so does the magnitude and frequency of flooding. Imperviousness can significantly decrease groundwater recharge. This in turn reduces the amount of ground water available to local wells, and reduces stream baseflow.

Also, as the volume of stormwater increases, pollutants picked up by the water have less time to settle out. These include nutrients such as phosphorus and nitrogen, hazardous substances and chemicals from automobiles and other sources, sediment from construction activities, and pesticides, herbicides and fertilizers. The result is that these pollutants are more likely to contaminant surface waters and ground water. Recent research indicates that groundwater resources and streams can be considered stressed once the impervious coverage in an area exceeds a threshold of 10 percent.

Finally, as an area becomes developed, there is an increased likelihood that contamination could result from either improper waste disposals or accidental spills. Dumping of waste oil, paint wastes, antifreeze, and other substances on the ground or down the drain can harm groundwater quality. It does not take very much of a substance to contaminate a large volume of ground water. It is not surprising therefore that the source of contaminants found in ground water often cannot be identified. Spills of fuel oil and other substances can sometimes be the result of equipment failure such as a tank failure. Other times the cause is human error such as overfilling a tank, etc.

6.2 Hydrogeologic Sensitivity

The *hydrogeologic sensitivity* of a location is a relative measure of the ease and speed with which a contaminant could migrate into and within the upper-most water-bearing unit. High to very high hydrogeologic sensitivity ratings indicate that, in general, ground water could be easily and quickly impacted by surface activities.

The hydrogeologic sensitivity is a function of the naturally occurring hydrogeologic characteristics of an area. The nature and extent of potential sources of groundwater contamination (see above) are not factored into hydrogeologic sensitivity ratings. Instead, the two factors controlling the hydrogeologic sensitivity are the site's geologic materials (the hydraulic characteristics of the uppermost water-bearing unit and the overlying soils) and the site's topographic position (the topographic factors influencing the vertical migration of ground water). Resultant hydrogeologic sensitivity ratings based upon geologic materials and topographic position ratings are mapped on Figure 19.

Areas with high hydrogeologic sensitivity that are depicted on Figure 19 are typically topographically higher areas with coarse-grained or thin soils overlying sand and gravel aquifers or carbonate bedrock.

6.3 Potential Development and Sensitive Groundwater Resources

In order to protect groundwater resources from the negative aspects of growth, one strategy is to try to predict where development may occur on areas with high hydrogeologic sensitivity. First, an assumption is made that development will occur on land that is not now developed. These relatively undeveloped areas include privately-held lands that have been classified as agricultural or vacant. Using GIS, NYRWA then identified those relatively undeveloped parcels that had areas of high to very high hydrogeologic sensitivity. These parcels are mapped on Figure 20, and have been classified by parcel size.

In addition, NYRWA has included on Figure 20 so-called physical constraints. These characteristics of the land that would inhibit site development in certain areas. These constraints include: wetlands, hydric soils, floodplains, and steep slopes (> 15%).

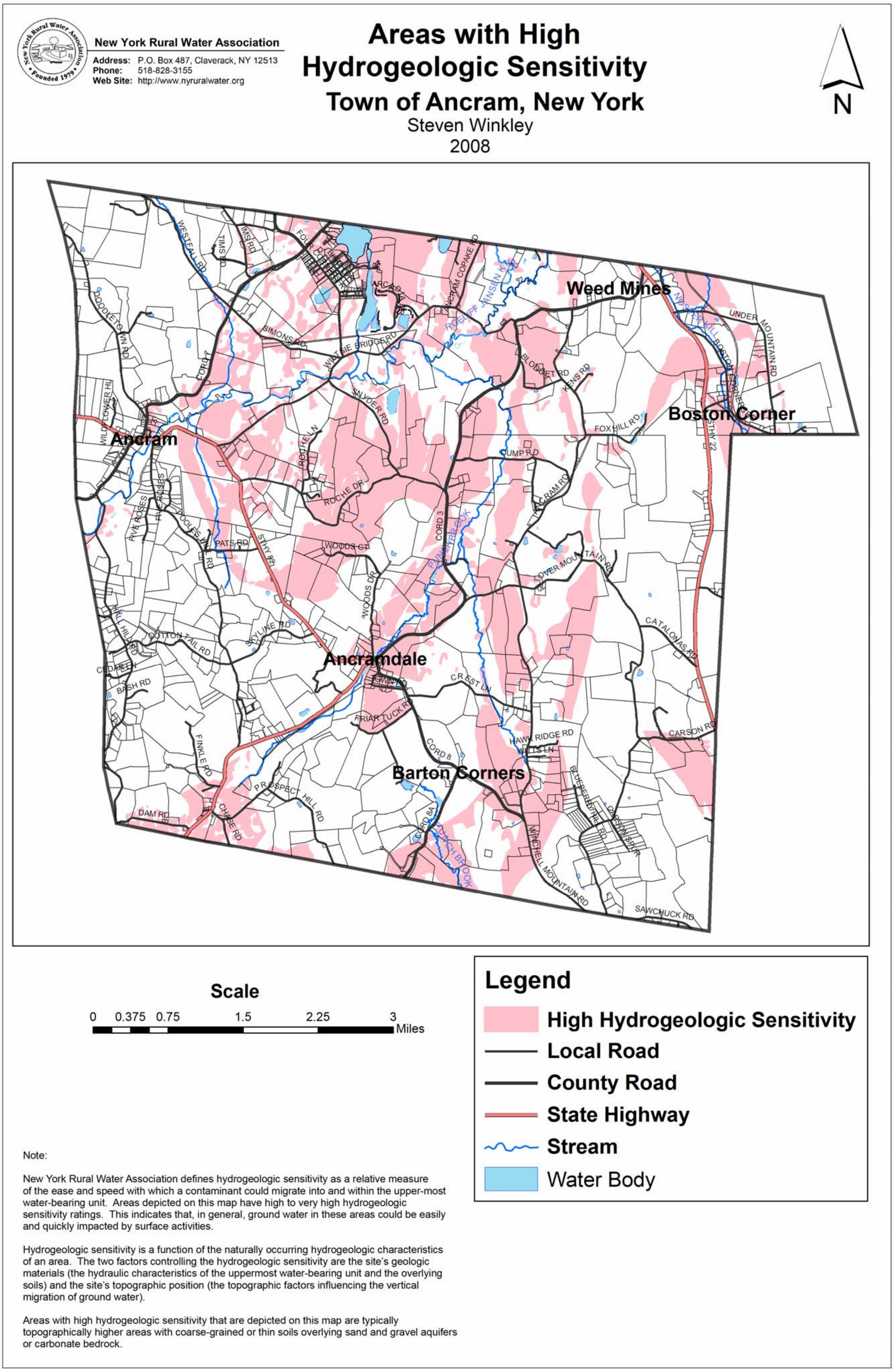


Figure 19. Areas with High Hydrogeologic Sensitivity Ratings.

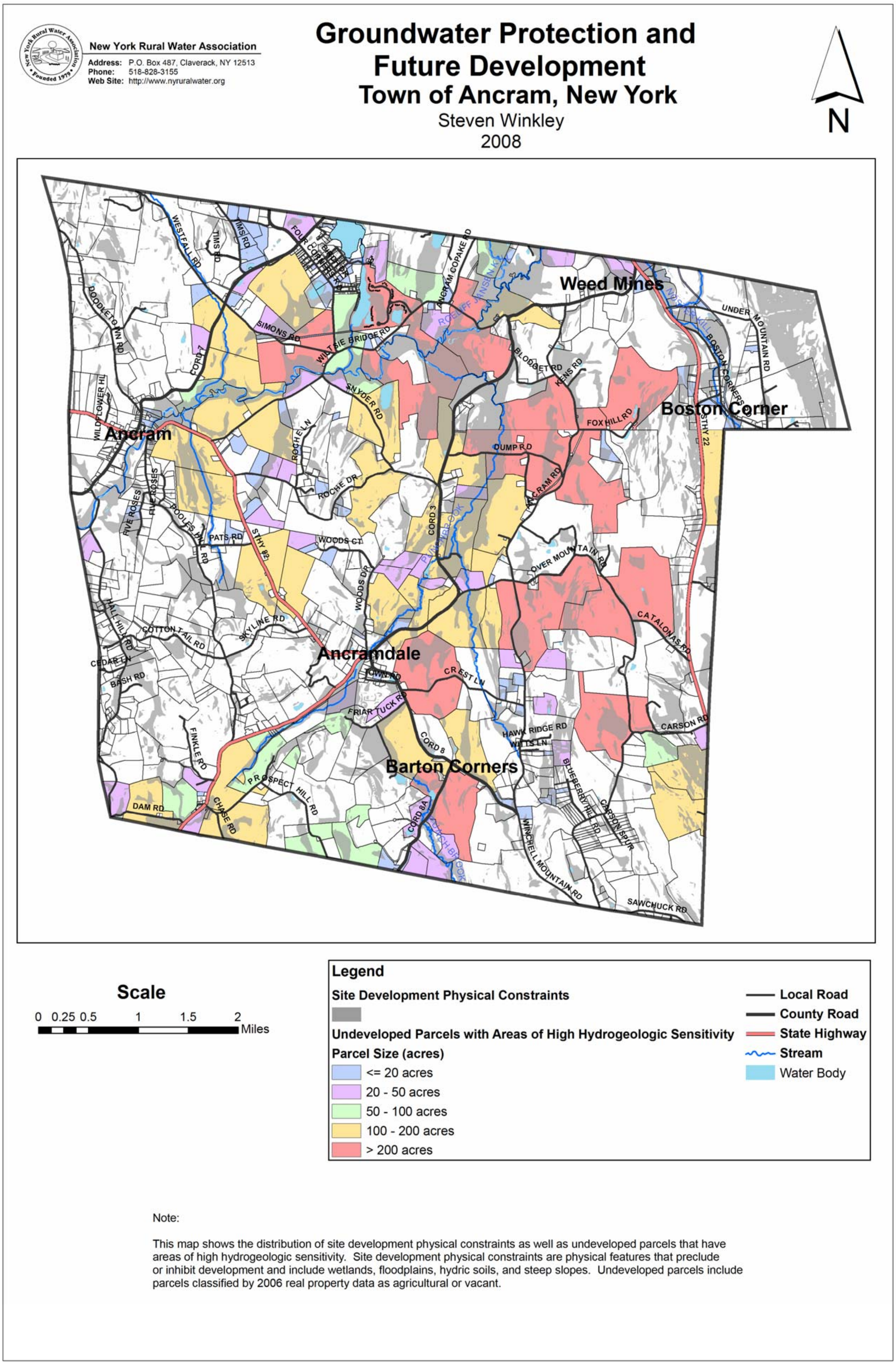


Figure 20. Undeveloped Parcels with High Hydrogeologic Sensitivity.

7.0 GROUNDWATER PROTECTION STRATEGIES

It is important to develop and implement effective groundwater protection measures in order to protect water resources and encourage future development where it is best suited. There are a number of groundwater protection measures that can be chosen. Some of these are regulatory in nature. Others are non-regulatory. The Town of Ancram must determine which measures are acceptable given local socioeconomic and political conditions. These measures could include: promulgation of land use regulations, environmental review, direct land purchase or purchase of conservation easements, further studies, and education.

7.1 Land Use Regulations

<u>Subdivision Regulations</u>

Subdivision regulations relate to how land is to be divided into lots and what improvements such as streets, lighting, fire protection, utilities, drainage, and parks are made to service the lots. NYRWA recommends that subdivision regulations in Ancram be developed and/or amended to optimize protection of groundwater resources. For example, the following elements could be required for conditional approval:

- Location of any existing wells onsite and other proposed lot wells in relation to: local topography, lot lines, roads, on-site sewage system components or sewer lines, petroleum storage tanks, surface water and other drainage features, stormwater conveyance systems, and other applicable features.
- Copies of New York State Department of Environmental Conservation Well Completion Reports for completed well(s) (including the well log and pump test data).
- Any and all water quality testing results.
- Proposed individual water supply system details such as pumps, storage, treatment, controls, etc.
- A completed hydrogeological study, if required.

Such details should be in the plats and documents for final approval as well.

A hydrogeological study could be required for any new subdivision involving ten (10) or more lots that relies upon either on-site groundwater withdrawals and/or on-site sewage disposal. A hydrogeological study could also be performed for any new subdivision involving five (5) or more lots that relies upon on-site groundwater withdrawals and underlies the low-yielding Walloomsac Formation as detailed on the figures and plates in this plan.

In addition, standards may be added to subdivision regulations that specifically cover wells. These standards can specify the following:

A. Well locations. Existing and proposed wells are located at minimum separation distances from on-site and off-site potential sources of contamination as specified in Appendix 5-B of 10 NYCRR Part 5.

B. Supply suitability. A representative number of well(s) indicate that the available quantity and quality of on-site groundwater resources are suitable for household purposes.

C. Adverse impacts. For proposed subdivisions requiring a hydrogeological study, the determination has made that the subdivision avoids adverse impacts to existing or future groundwater users and/or surface waters within 1,500 feet of the subdivision. If adverse impacts cannot be avoided, the applicant must provide adequate mitigation of such impacts. An adverse impact to ground water can be defined as any reductions in groundwater levels or changes in groundwater quality that limit the ability of a groundwater user to withdraw ground water. An adverse impact to surface water would be any reductions in the level of flow or water quality needed for beneficial uses such as protection of fish and wildlife habitat, maintenance of waste assimilation, recreation, navigation, cultural and aesthetic values, drinking water supply, agriculture, electric power generation, commercial, and industrial uses.

Many communities are now encouraging the use of so-called conservation subdivisions. A conservation subdivision is essentially a cluster-type development that is planned around the open space protection of conservation areas. These conservation areas can include areas that are regulated such as wetlands and floodplains as well as other elements such as steep slopes, mature woodlands, prime farmland, meadows, wildlife habitats, stream corridors, historic and archeological sites, scenic views, and of course groundwater recharge areas. Conservation subdivisions also use the similar principles of low-impact development and better site design. In the case of the ground water, the guiding design standard is to maintain or replicate the predevelopment hydrologic functions of storage, infiltration, and groundwater recharge. This can be done by using stormwater retention and detention areas, reducing impervious surfaces, lengthening flow paths and runoff time, and preserving environmentally sensitive site features.

Low-impact development and better site design are primarily stormwater management concepts. Wastewater management is also a very important consideration. On-site septic systems recharge ground water. Properly located, installed, and operated on-site septic systems should be encouraged in order to return water to the subsurface. Sewers not only export wastewater away that can be recharged, they also export ground water and storm water as well since most sewers are prone to inflow from these sources.

Conservation subdivisions do pose a concern with respect to onsite wastewater disposal. By clustering homes on smaller lots, there is the possibility that the density of individual disposal systems will lead to excess nitrate loading. If individual disposal systems are planned, the density of *equivalent* single family residential septic systems should not exceed an average of one per 3.5 acres (see Section 6.1.2). Alternatively, a small on-site centralized wastewater disposal facility could be constructed for the subdivision as long as it is carefully located with respect to ground water and surface water. If there are existing wastewater discharges in the area, these should be considered in order to prevent excess nutrient loading.

Zoning

Zoning regulates land uses, the density of land uses, and the siting of development. For those communities with zoning, it can prove to be an effective means of water resource protection. One approach could be to institute some minimum standards for development involving the intensive use of water, both for supply purposes and for wastewater disposal. Perhaps submittal of a site plan *and* a hydrogeological study could be required for any proposed project that has projected on-site groundwater withdrawals and/or on-site sewage disposal flows equal to or exceeding an average of one thousand (1,000) gallons per day. Such a study would have to satisfactorily show that the proposed use has an adequate water supply in terms of quantity and quality to meet specified needs and would not adversely impact existing or future groundwater users as well as surface waters within 1,500 feet of the site development boundary.

Perhaps the most widely accepted zoning technique for water resource protection involves overlay zoning. Overlay zoning creates a set of regulations for a given area that are in addition to the regulations in the standard “underlying” zoning districts. The area that is covered by overlay zoning depends upon the particular resource to be protected. Examples of overlay zoning are for waterfront areas, flood plains, historic areas, steep slopes, and sensitive environmental areas such as wellhead protection areas, watersheds, and aquifers. Overlay zoning regulations frequently define what additional high-risk uses are prohibited, what the bulk and area regulations exist in the overlay zone, and what design standards apply. The Town may wish to consider adopting an overlay district(s) to protect unconsolidated aquifers, areas of very high hydrogeologic sensitivity, or even to assure that excess development does not occur in low-yielding areas.

7.2 Environmental Review

In New York, all state and local government agencies are required by the State Environmental Quality Review Act (SEQR) to consider environmental impacts prior to making decisions to approve, fund, or directly undertake an action. Types of decisions or actions that are subject to SEQR include approval or direct development of physical projects, planning activities that require a decision, and adoption of rules, regulations, procedures and policies. Note that so-called Type II actions do not require environmental review because they either do not significantly impact the environment or are specifically precluded from environmental review under SEQR. However, all other so-called Type I or Unlisted Actions do require a determination of significance. If an action is determined to have potentially significant adverse environmental impacts, an Environmental Impact Statement (EIS) is required.

One way to insure that agencies take an area of critical environmental importance into account when making discretionary decisions is for a local municipality to designate a specific geographic area within its boundaries as a critical environmental area (CEA) under SEQR. An aquifer, watershed, wetland, etc. would meet the SEQR criteria for a CEA. The consequence of designating a CEA is that all government agencies (local or state) must consider the potential impact of any Type I or Unlisted Action on the environmental characteristics of the CEA when determining the significance of a project.

The Town of Ancram may wish to consider naming unconsolidated aquifer areas, sensitive hydrogeologic areas, etc. as CEAs.

7.3 Direct Purchase or Purchase of Conservation Easements

In some instances, a community may wish to purchase the full interest in a particular parcel(s) in order to conserve its natural resources. A more common method of land preservation is the purchase of an interest in the land, called a conservation easement. The easement places deed restrictions on property uses to assure that the property is not developed in an inappropriate manner. Typical easements permit agriculture, forestry, recreation, etc. but restrict or prohibit industrial, commercial, and residential development.

Communities may purchase conservation easements or individuals can donate the easements and thus qualify for possible tax advantages. Alternatively, non-profit land trusts may purchase lands or conservation easements or work with local governments to facilitate conservation easements. In Ancram, the Columbia Land Conservancy owns and manages two areas: the Drowned Lands Swamp Conservation Area and a recently acquired property on Round Ball Mountain.

7.4 Further Study

In Ancram, bacterial contamination was reported by one homeowner and two others raised concerns about possible contamination from neighboring land uses. The areas that are most likely to have groundwater contamination are areas of small lots, onsite wells and septic systems, and coarse-grained soils. The Town may wish to survey residents in the Lower Rhoda Pond-Long Lake area, Ancramdale, and other sections with wells of less than 50 feet depth in order to determine if there are water/wastewater issues. If so, a well testing program of the area(s) may be in order. Other areas that may merit further study are the hamlets of Ancram and Boston Corners. However, shallow wells (< 50 feet) have not been reported in these areas.

NYSDOH recommends water quality testing for new drinking water wells in addition to periodic evaluation of existing wells and an annual test for coliform bacteria. NYSDOH recommends testing for coliform bacteria, lead, nitrate, nitrite, iron, manganese, sodium, pH, hardness, alkalinity, and turbidity.

7.5 Education

Public education can be an excellent non-regulatory tool to minimize potential contamination and conserve water resources. There are several instances where education may be effective. These include:

- Informing residents about the results of this study;
- Educating homeowners on proper operation and maintenance of onsite wastewater treatment systems and wells;
- Encouraging the use of water saving devices within homes;
- Promoting natural landscaping and other lower demand vegetation;
- Educating homeowners on proper fertilizer/pesticide application rates and practices; and
- Supporting proper waste disposal (i.e. recycling).

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