Farnsworth Branch

COLDWATER CONSERVATION PLAN

Warren County

WARREN COUNTY CONSERVATION DISTRICT

July 2021

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Prepared By:

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The primary goal of the District is the protection, improvement, and conservation of the county's soil, water, and related natural resources as well as educating the community in various conservation and environmental practices and methods.

The Conservation District coordinates educational events, completes conservation projects, and provides assistance to farmers, citizens, land owners, partner organizations, municipalities and more. The Warren County Conservation District is a local conservation organization formed for the protection and promotion of wise use of land, water, and other natural resources. The District dates back to April 12, 1948 and is governed by a board of eight directors. District staff implement programs, conservation projects, and educational events in cooperation with a number of partnering agencies and organizations. In addition to the District, our building also houses the Natural Resources Conservation Service (NRCS), Penn Soil Resource Conservation and Development Council (Penn Soil RC&D) and Conewango Creek Watershed Association (CCWA). The Warren County Conservation District office is located in Warren, PA at the corner of Hatch Run Rd. and Conewango Avenue.

Project Funders

This project was funded in part by a grant from the Coldwater Heritage Partnership on behalf of the PA Department of Conservation and Natural Resources, the PA Fish and Boat Commission, the Foundation for Pennsylvania Watersheds and the PA Council of Trout Unlimited.

Project Partners

This project could not have been completed in a timely manner without the help and expertise of the Western Pennsylvania Conservancy, PA Council of Trout Unlimited-Cornplanter Chapter, the USFS - Allegheny National Forest, and Brian Bull of the Warren County Assessment Office.

Warren County Assessment Office

Table of Contents

Watershed Background

Farnsworth Branch is classified as a High-Quality Coldwater Fishery as listed in the Chapter 93 Water Quality Standards for Pennsylvania. The headwaters begin in Cherry Grove Township, State Game Lands 29, in Warren County, Pennsylvania. The mainstem flows northeast for 10.3 miles through Cherry Grove and Pleasant Townships before joining West Branch Tionesta Creek less than one mile south of Clarendon, PA in Mead Township. West Branch Tionesta Creek is also classified as a High-Quality Coldwater Fishery. Within the 10.3 stream miles of mainstem, 20.5 miles of tributaries drain this 17.1 square-mile area. From here, the West Branch Tionesta Creek discharges into Tionesta Creek, which joins the Allegheny River, then the Ohio River before entering into the Mississippi River. According to the U.S. Census Bureau (2010), the Borough of Clarendon comprised of 450 people, while Mead Twp. was home to 1,386 residents and Cherry Grove Twp. included 216 people.

Farnsworth Branch is located mostly on public land. The Allegheny National Forest (ANF) comprises 63% of the area while State Game Lands 29 (SGL 29) equals 13.7%. The remaining 23.3% is privately owned and consists of the timber, agriculture, and oil field industries in addition to seasonal camps and year-round residences. A Land Use chart is included in Figure 6 in Appendix 1: Data Tables Cover Types are shown by percentages for the drainage. .

Mead and Cherry Grove Townships were both established in 1847. The first oil well in Mead Township is recorded to have been drilled in 1877 (pa-roots.com). Sometime in the mid-1870s, Henry Landsrath drilled Cherry Grove Township's first oil well in an area presumed to be geologically suited for an oil field, but it hardly produced any oil (Miller, 1952). This location was considered useless. Once he sold his land, George Dimick became interested in the property. He asked Landsrath where he recommended the next oil well should be drilled, which led to the drilling site of the 646 Mystery Drill in 1882. Oil successfully and intensively flowed from this newly constructed oil well. This event led to a population boom to about 6,000 people within a two to three-month time period (Warren County Historical Society). Although the 'oil boom' didn't last, this is still a productive industry in the area. In addition to oil drilling, sawmills became popular in the 1800's (Rann, 1887). The first sawmill in Cherry Grove Township was constructed in 1853 by Josiah Farnsworth. As for Mead Township, Rogers Mill now stands in place of the first sawmill, which had been established in 1806 by three brothers, Jeremiah, Samuel, and James Morrison. At one time there were five sawmills in the area (pa-roots.com).

In the early 1800s, the timber industry became quite prominent in the Allegheny National Forest and in surrounding areas (USDA Forest Service, n.d.). Wood products were needed across the nation, such as for those who were building homes, coal mines, wood chemical industries, and lumber industries. Due to high demand, nearly every tree had been cut down and transported by the early 1900's. In 1923, the Allegheny National Forest (ANF) was established and managed by the United States Forest Service. Successful forest management practices were applied to the ANF, allowing for a balanced relationship between preserving and conserving the trees that began to grow once again.

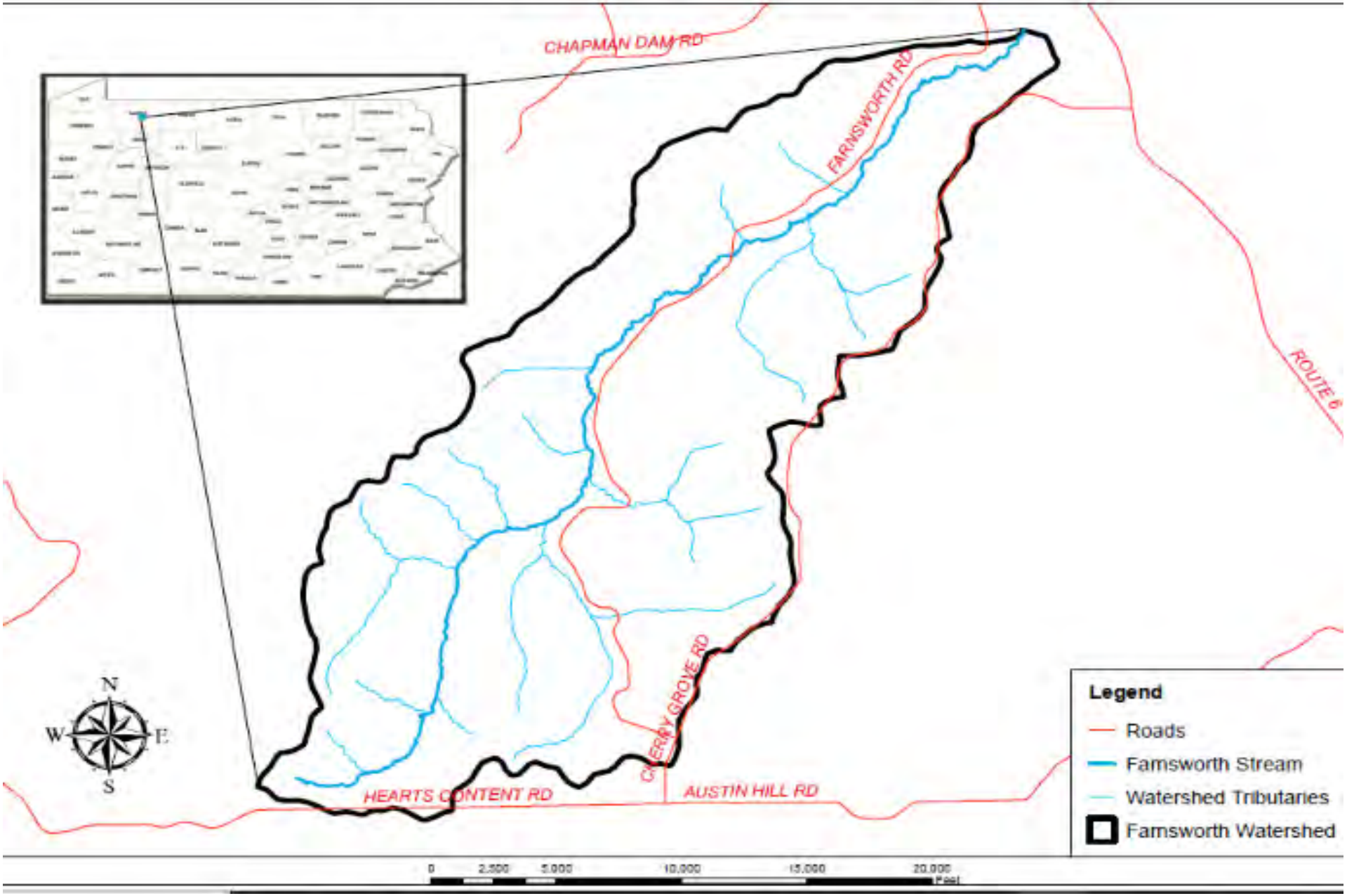
In the Farnsworth Watershed, there are three types of Management Areas (MA's): 3.0 (Even-aged Management), 5.2 (Wilderness Study Area), and 7.2 (Remote Recreation Area) (USDA Forest Service, 2007a). MA 3.0 involves maintaining or improving sites with trees of same age and height as well as sites with a diversity of tree structural classes (USDA Forest Service, 2007b). Having this mixture of structural classes allows for a variety of habitat for species such as deer, turkey, ruffed grouse, and bear. The primary recreational methods focused within this MA are those of which involve the use of roadways. MA 5.2 consists mostly of forested land that has minimal

human impact both historically and presently. The main purpose of this MA is to provide a safe habitat for sensitive species that might be at risk, offer the public the opportunity of recreation involving seclusion or exploration, and eventually develop a late structural hardwood forested land area. MA 7.2 provides the public and wildlife with forested land that is primarily natural, keeping forest management practices to a minimum. There is a variety of trails, scenic locations, and camping sites available within this MA due to its focus on non-motorized recreational activities.

State Impairment Status

The Farnsworth Watershed is listed under Category Two of the PA DEP's 2020 Integrated Water Quality Monitoring and Assessment Report, which states that some of the stream's designated uses are not met likely due to inadequate data or impaired water (Pennsylvania Department of Environmental Protection [DEP], 2020). It was in the same category in 2016 and 2018 (DEP, 2016; DEP 2018).

Farnsworth Creek Watershed



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Watershed Data

Sampling Methods

Staff and volunteers conducted visual assessments in the field to collect the most accurate data on watershed characteristics. Streams were assessed by examining one "segment" at a time, with each segment being the length of stream between two confluences. These confluences could be at two small tributaries, or a tributary joining the mainstem. Each segment is labeled with a GIS_ID number on the maps in Appendix 2, and it is by those numbers that the segments were referred to during field assessments, as well as in this plan.

On every assessment outing, each field team consisted of two to three crew members for safety, as well as objectivity in sampling. A Warren County Conservation District (WCCD) staff person lead each assessment team, following the assessment methodology and standards established at several visual assessment trainings in August of 2020. Due to the Covid-19 pandemic we had to postpone the assessment training which caused us to get a late start on our assessments. Additionally, because of Covid, the group of volunteers was intentionally kept relatively small to limit exposure; however, this unfortunately led to a low productivity of segments assessed per week because of volunteer availability and other scheduling conflicts. As a result of such scheduling conflicts, there were occasions when WCCD staff were not able to lead the assessment team. On these occasions, at least two team members were given all of the necessary equipment and were able to complete the assessment on their own. Assessments took place from August to November of 2020 then continued in March of 2021 after the weather improved.

The primary assessment protocol was based on the EPA's "Rapid Bioassessment Protocols (RBP) for Streams and Wadeable Rivers-Habitat Assessment and Physicochemical Parameters," (Barbour et. al. 1999) in addition to Western Pennsylvania Conservancy's (WPC) current standard Visual Assessment Datasheet. Stream reach, width, depth and velocity, as well as canopy cover, proportion of stream morphology types, channelization and obstructions were recorded. Water quality parameters, including temperature, pH, conductivity, and total dissolved solids (TDS) were measured at the upstream and downstream termini of each segment.

Respecting private property and the landowner's wishes were taken into consideration during these assessments. Several segments were not assessed due to a lack of landowner permission.

Ten physical habitat parameters (from the EPA protocol) observed during field assessments were combined to provide the most concise, informed snapshot of watershed health. These parameters were independently scored and then averaged to provide an overall score for each segment. Each parameter was worth a maximum of 20 points for the most ideal habitat condition, and a minimum of 0 points for the least ideal habitat condition. Point awards of 16–20 scored in the Optimal category, 11–15.9 points scored as Suboptimal, 6–10.9 points for Marginal, and 0–5.9 scored in the Poor category.

In addition to parameters based on the EPA's Habitat Assessment Protocol, special attention was given to the amount of Large Woody Material (LWM) in a segment; the presence of Aquatic Organism Passage (AOP) barriers; the impact of Dirt and Gravel Roads (DGR) on the stream; if the habitat could be improved in general; erosion throughout the segment; presence and length of channelization on the segment; if native or wild trout were observed; and any other

miscellaneous improvement projects that could benefit the watershed. Descriptions of the methods for each of these categories are as follows:

Large Woody Materials (LWM)

During field assessments, segments were classified as having significant, moderate, minimal, or none (not present) amounts of LWM. Guidelines for these categories were somewhat subjective, leaving the scoring up to the discretion of each surveyor.

The District employee was trained on the primary assessment protocol which was based on the EPA's "Rapid Bioassessment Protocols (RBP) for Streams and Wadeable Rivers-Habitat Assessment and Physicochemical Parameters," (Barbour et. al. 1999) in addition to WPC's current standard Visual Assessment Datasheet, by an experienced WPC employee. He described a "significant" amount of LWM as when there were logs down to the extent that passage was difficult and you were climbing over logs every few steps. This definition was passed along to the volunteers.

Volunteers were essentially trained when they came to assess their first segment. The District employee reviewed the Habitat Assessment Field Data Sheet and the Physical Characterization/Water Quality Field Data Sheet with the volunteers and then pointed out examples of each characteristic as they walked the segment. Explanations of parameters were given at this time and the discussion that followed as they were filling out the forms.

Aquatic Organism Passage (AOP)

An Aquatic Organism Passage (AOP) barrier is a structure that impedes the up or downstream movement of fish and other aquatic and riparian species. Man-made and natural AOP barriers were noted. AOP barriers included culvert and bridge structures at road-stream crossings, active and failed dams, and any other man-made structures or natural barriers that would impede passage throughout the reach of the stream segment.

While no formal protocol was used, attributes of each crossing and structure were evaluated and compared with those of the stream. Notes and latitude/longitude coordinates were taken for each suspected AOP barrier.

Dirt and Gravel Roads (DGR)

During in-field assessments, dirt and gravel roads were noted when observed within each segment, as well as any obvious issues that may have been associated with them. These issues may have included stream fords, drainage ditches discharging high amounts of sediment to the stream, heavily eroded tire tracks leading to the stream, and changes in streambed substrate composition near the road-stream interaction zone.

Habitat Improvements

Stream segments lacking habitat, but not necessarily suited for LWM treatment or replacement of an AOP barrier were placed into this category. Issues shown in this category typically involve improving habitat diversity and streambank stability.

Erosion

This study categorized the degree of erosion as None, Minimal, Moderate, or Heavy, based on the amount of erosion observed throughout an entire segment. The EPA habitat parameters of Bank Stability and Vegetative Protection were also used, in part, to help make these determinations. See the Habitat Assessment Field Data Sheet (pgs. 63 and 64, Appendix 3) Habitat Parameter 8 and 9 for more details. Volunteers were shown examples of parameters with suggested scoring during their first assessment.

Channelization

The EPA's habitat parameter of Channel Alteration played heavily into the assessment of this specific category. The assessor(s)'s best professional and scientific judgment was used to estimate the length of channelization in a segment. This was done at the time the channelization was observed - usually culverts and bridge crossings, but in some instances a stream was forced to flow below ground either by nature or by human activity.

Native or Wild Trout Observed

If fish were observed and a positive identification of species (trout) could be made, the location was recorded. No existing fisheries data was references before this assessment.

Miscellaneous Improvement Projects

This category was also used as a "catch-all" to illustrate if a segment needed improvements that wouldn't fall into one of the other specific categories. Examples of projects in this category include removing old and unused oil and natural gas lines, remediating water quality issues, and improving riparian vegetation.

Water Quality Testing

Measurements for pH, conductivity, total dissolved solids (TDS), and temperature were taken in the field with a Waterproof Oakton PCTS 50 Multi-Parameter multi-meter at the upstream and downstream ends of each assessed segment. In instances where the stream ran dry before the end of the channel, measurements and GPS coordinates were taken where the water discontinued. The multi-meter was inserted into the water until a stable value was reached for each parameter, which was then recorded on the datasheet.

Data Summary

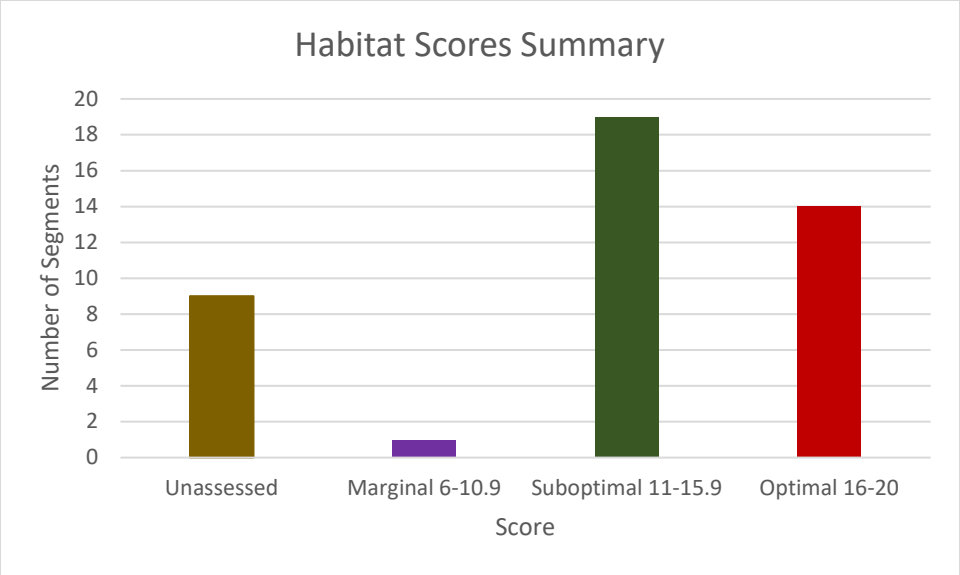
Approximately 75% of the watershed, totaling 23.06 stream miles, was evaluated with field assessments. The remaining 25% of the watershed was either dry or unable to be assessed depending on permission, accessibility, or logistics.

Habitat

The entire assessed watershed averaged an overall habitat quality score of 15.72, putting it just below the Optimal category. The highest average score any singular segment received was 19.0 (near "ideal"- in the high Optimal category), while the lowest average score any segment scored was 10.8 (high Marginal). All individually assessed parameters in the habitat assessment scored a 19 or 20 (most ideal) on at least one segment. Velocity/Depth Regimes and Frequency of Riffles had the

lowest scores of any category on at least one segment, with a score of 5, placing it in the Poor category. Fourteen segments scored between 16 and 19, putting them in the Optimal category. Nineteen segments fell into the Suboptimal category with scores between 11 and 15.9. One segment resulted in the Marginal category with a score of 10.8. Table 3 lists all the habitat scores for each segment, with the map in Appendix 2 giving a visual representation of segment scores by location. **Dry or unassessed segments are not included in these analyses.*

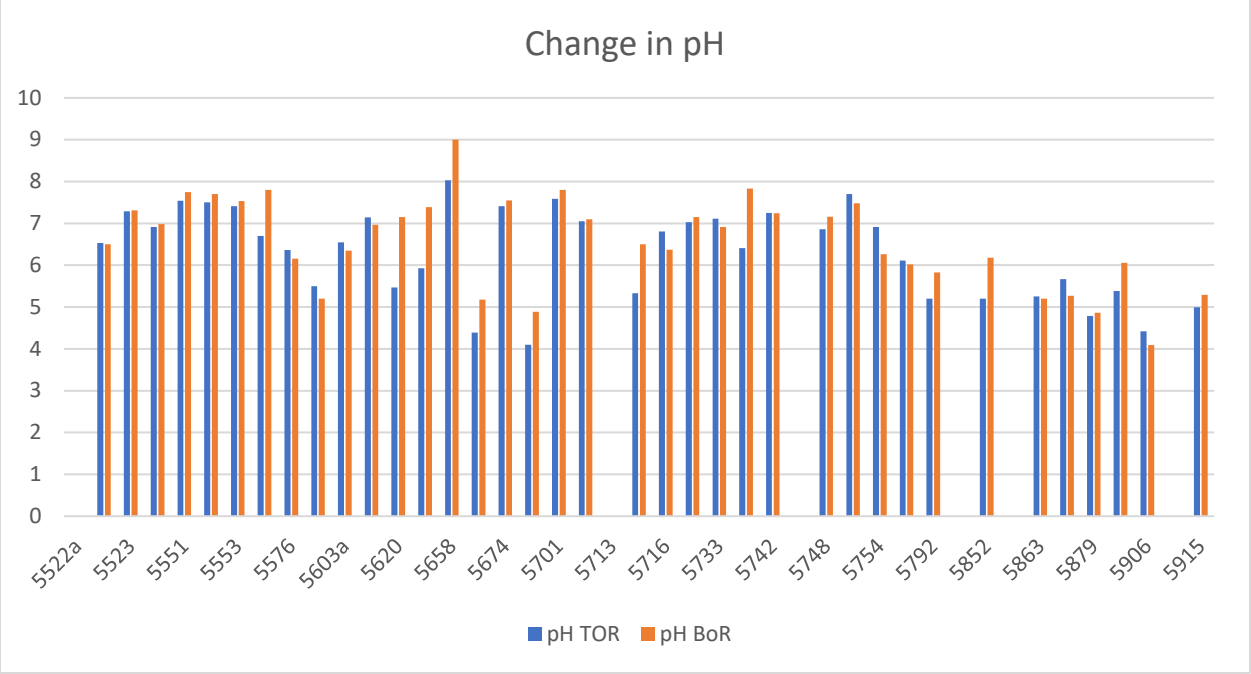
Figure 1 – Summary of Habitat Scores



Acidity (pH)

Acidity (pH) is the measure of free hydrogen ions in solution. It is measured on a logarithmic scale from 0–14, with a pH of 7.0 as a neutral midpoint. Solutions become 10 times more acidic with each integral drop in pH value (e.g. pH 5 is ten times more acidic than pH 6). Streambed elevation and groundwater interaction with the stream figure heavily into stream pH value. Headwater streams on the Allegheny Plateau tend towards a pH of 4.5–6.0 due to acid precipitation and initial reduced groundwater interaction, while downstream pH's in lower elevations often range from 5.5 to 7.0, with some as high as 8.0. Coldwater fishes on the Allegheny Plateau can survive through a range of acidic solutions, but tend to do best in the pH 6.0–7.0 range. pH readings at the bottom of each stream reach ranged from 4.09 to 9.00. Top of Reach pH readings exhibited a slightly smaller range, from 4.10–8.03 (Figure 2). The average difference between Top of Reach and Bottom of Reach readings was 0.33. Details on pH recorded at the bottom of each specific segment can be found on the Farnsworth Branch Watershed- pH map in Appendix 2, and overall water quality data can be found in Table 4: Water Quality. According to the Chapter 93: Pennsylvania Water Quality Standards an acceptable range for pH is 6.0 – 9.0. This standard applies to the critical uses of Coldwater and Warmwater Fisheries, Trout Stocking, and Migratory Fishes.

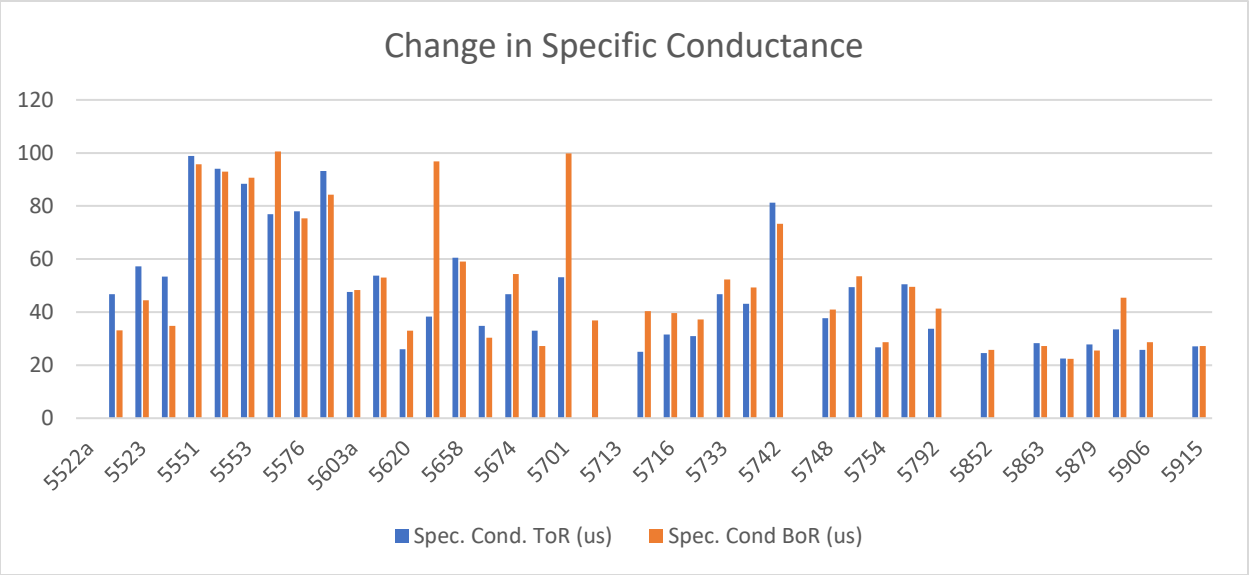
Figure 2 – Changes in pH values of stream segments in the Farnsworth Branch watershed



Specific Conductance (or Conductivity)

Specific Conductance (or Conductivity) is the ability of water to conduct an electrical current. Pure water is unable to conduct electricity, yet as the amount of dissolved ions in solution increases, water is increasingly able to pass electrons through it. On the Allegheny Plateau, conductivity in streams similar to the East Branch of Tionesta Creek generally range from about 20 to 100 µs/cm, with typical values between 50–70 µs/cm. Like pH, conductivity is also influenced by elevation and groundwater interaction. Since it is a measure of dissolved ions (usually salts, metals, and other conductive materials), conductivity is influenced by human activity within a watershed. Top of Reach specific conductivities ranged from 98.9 µs/cm to 9.4 µs/cm. Bottom of Reach specific conductivities ranged from 100.6 µs/cm to 9.3 µs/cm (Figure 3). The average change from Top of Reach to Bottom of Reach was 4.88 µs/cm. Details on conductivity recorded in each specific segment can be found in Table 4: Water Quality. A map representation is available in Appendix 2. According to the Environmental Protection Agency ***Water: Monitoring & Assessment – 5.9 Conductivity,*** (EPA, 2012), a specific conductance range of 150 – 500 µhos/cm support a good variety of fisheries (1 µhos=1 µs). Using these standards, specific conductance in the Farnsworth Branch watershed is low in all segments. However, given the ranges mentioned above, specific to the Allegheny Plateau, the acceptable range for this study was sited as being 20 – 100 µs/cm.

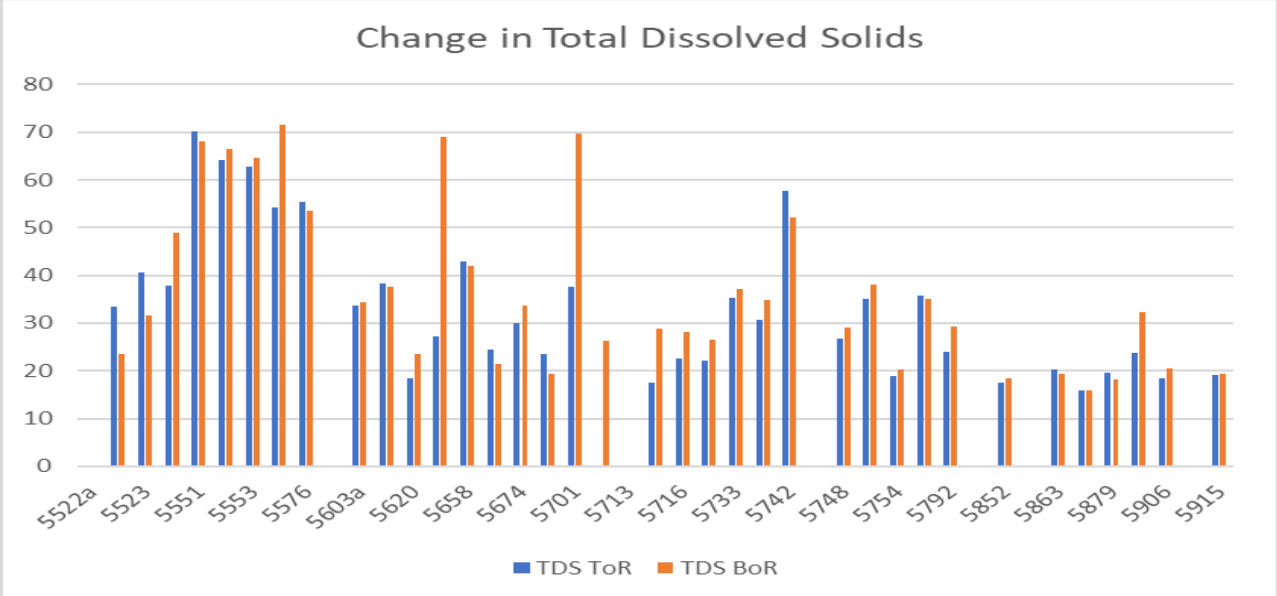
Figure 3 – Changes in Specific Conductance values of stream segments in the Farnsworth Branch watershed



Total Dissolved Solids (TDS)

Total Dissolved Solids (TDS) are inorganic salts and small amounts of organic matter present in solution in water. The main elements are usually calcium, magnesium, sodium, and potassium cations and carbonate, hydrogen-carbonate, chloride, sulfate, and nitrate anions. TDS measurements were taken in this assessment because of the gas lines and oil and gas activity present in the watershed. Top of Reach TDS ranged from 70.2 ppm to 15.8 ppm. Bottom of Reach TDS ranged from 71.5 ppm to 15.8 ppm (Figure 4). The average change from Top of Reach to Bottom of Reach was 4.4 ppm. Details on TDS is recorded in each specific segment can be found in Table 4: Water Quality. A map representation is available in Appendix 2. According to the Chapter 93: Pennsylvania Water Quality Standards, 500mg/l is an acceptable limit for the average of monthly samples for TDS. An acceptable maximum value is 750mg/l. These standards apply to a Potable Water Supply critical use.

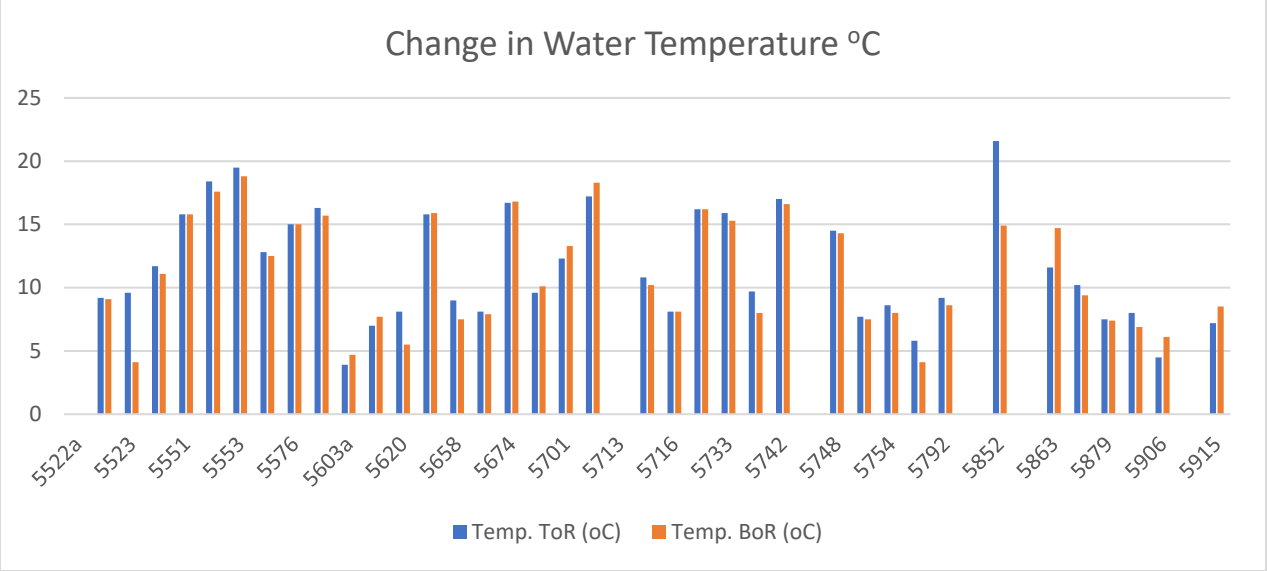
Figure 4 – Changes in Total Dissolved Solids (TDS) values of stream segments in the Farnsworth Branch watershed



Water Temperature

Water temperature is another important factor in the quality of a stream for fish habitat. Though there is some slight variation in temperature thresholds between species; in general, trout can survive in water temperatures near freezing (0°C, 32°F) and begin to experience thermal and oxygen-related stress between 18–21°C (65–70°F). Field investigations were conducted in fall and spring with air temperatures ranging from 39°F to 78°F. Stream temperatures ranged from 21.6°C–3.9°C (70.9–39.0°F) (Figure 5). Data for each segment are available in Table 4: Water Quality, as well as the Temperature Change map in Appendix 2. An acceptable temperature range according to the Chapter 93: Pennsylvania Water Quality Standards ranges from 38°F (3.33°C) in January to 66°F (18.89°C) in July and August for cold water fisheries (CWF).

Figure 5 – Changes in Water Temperature (°C) values of stream segments in the Farnsworth Branch watershed



Wild Trout Observations

Farnsworth Branch is designated as a wild trout stream by the PA Fish and Boat Commission in Pennsylvania Wild Trout Waters (Natural Reproduction) – May 2021. It is also stocked by the PA Fish and Boat Commission for the purpose of public fishing. Locations where trout were identified are listed below (Table 1). The trout observed were small enough to be described as Young of the Year and were, therefore, determined to be wild trout.

Table 1 – Wild Trout Sightings on Segments of Farnsworth Branch Watershed

Segment	GPS Coordinates
5550	N 41.74652, W 79.13790
5572	Throughout Segment
5576	N 41.73942, W 79.12235 (possible sighting)
5674	Some possible sightings throughout segment, but not confirmed
5716	N 41.7146, W 79.1497 N 41.71161, W 79.14652
5742	N 41.71000, W 79.16737 N 41.71074, W 79.16815
5754	N 41.71132, W 79.14606

5791	N 41.70100, W 79.15981
5864	N 41.7083, W 79.1680
5897	N 41.69299, W 79.15868

Invasive Species

An invasive species identified during this assessment was multiflora rose (*Rosa multiflora*) which was present in Segment 5712. This is a mowed area where the Farnsworth Hatchery is located. It is possible Japanese stiltgrass was found in Segment 5572; however, more investigation is required to confirm identification.

Discussion

Importance of Specific Evaluation Categories

Large Woody Materials (LWM)

Trees and forests play an essential role in the protection of coldwater resources. Not only do they shade and cool streams, but branches and entire trunks physically interact with water. Trees growing nearer to the water stabilize the streambank thereby reducing erosion and providing habitat and hiding places for young trout and other aquatic species if undercutting occurs. Standing trees lessen the impact force of precipitation, reducing soil compaction and erosion, and provide channels along roots for water to seep into the ground. After they fall, trees on land become natural "water bars" on slopes, slowing and further infiltrating sheet-flow of water into the soil. This process also ensures that summer low-flows have a cool, clean, underground reservoir to draw from. As muddy, debris-filled flood waters are dispersed over the floodplain and their velocity is reduced, their ability to keep particles suspended is also reduced, forcing them to drop sediment. This nutrient-rich sediment fertilizes the land. Seeds from higher in the watershed are also caught by floodplain vegetation and woody debris, providing a freshly fertilized seedbed in the dropped sediment for the next generation of riparian plants to grow. In this manner, vegetation that has evolved to be in and near streams stays in those environments to provide habitat for aquatic and terrestrial species, and the associated ecosystem services they provide.

Woody materials in the channel help provide habitat and cover for aquatic and terrestrial species while adding oxygen, diversity, and stability to the channel. Benefits include setting the grade of the stream, and providing areas for nesting, feeding, breeding, and rearing young, as well as providing refuge from predators. Aquatic macroinvertebrates, fungi, and plants transfer energy up the food web from the diverse substrate created by multiple tree species of different age classes, and states and rates of decay. Also, as long as the material consists of a sufficient size, mass, and shape so as to not be transported (a "key piece"), LWM can force the water to scour additional pools, sort gravels, and build sediment in slack waters when stream channels are flowing at higher volumes.

Aquatic Organism Passage (AOP)

Several AOP barriers were encountered during the field assessments. Some AOP barriers are the result of undersized or improperly placed culverts. These barriers were evaluated on their ability to keep the aquatic ecosystem connected. A crossing structure that in some way hinders or prevents passage bottlenecks the ecosystem, thereby reducing the flow of nutrients and energy in both directions.

Bridges and undersized culverts can become blocked by debris or sediment thereby creating problematic flooding at road/stream intersections. The worst-case-scenario that can occur because

of undersized bridges and culverts is structural failure of the road and/or crossing structure. Additionally, flooding of low-lying roads can pose a safety hazard and, of course, the crossing structure and road base can erode, increasing maintenance costs. Crossing structures that are adequately sized to their stream reach and location will allow for a floodplain to develop inside the structure, as well as provide passage at multiple flow levels for aquatic and terrestrial species. This will connect the entire stream system and allow it to perform naturally.

Dirt and Gravel Roads (DGR)

Roads and trails surfaced with dirt and/or gravel can provide an economic alternative to impervious surfacing materials like concrete or asphalt. Environmental benefits include allowing storm water to more readily infiltrate into the ground and slowing runoff. However, negative watershed impacts can occur if these roads are improperly built or maintained. Sediment that quickly washes off DGR's into streams fills the spaces between cobble and gravel, thereby eliminating important habitat for fish and aquatic macroinvertebrates.

Habitat Improvements

Habitat improvements include improvements that don't fit into the Large Woody Materials and Aquatic Organism Passage Barriers categories. This presents stakeholders with more options of conservation practices.

Erosion

While some erosion is natural and necessary in a stream system, excessive erosion can have a negative impact on aquatic ecosystems. Similar to the sediment originating from dirt and gravel roads, erosion of a stream's bed and banks can produce harmful sediment loads. This erosion is most often observed as non-vegetated areas on banks, undercutting of the riparian vegetation's roots systems, and headcutting of the substrate in an upstream direction causing the stream channel to become incised.

Channelization

We felt it was necessary to show how much channelization was present in each stream segment in addition to the EPA parameter of Channel Alteration that is used in the determination of habitat scores. The removing of natural bed substrate like boulders, cobbles, gravels, and woody materials from the aquatic ecosystem can reduce the habitat quality as well as energy dissipation abilities of streams. Channelization was often observed near road stream crossings.

Native or Wild Trout Observed

As a state-listed Wild Trout stream (from headwaters to mouth) as well as a High-Quality Coldwater Fishery, Farnsworth Branch is protected by some of the most stringent water quality protections in Pennsylvania. Under the Tributary Linkages rule of the PA Code, all tributaries to a wild trout streams are also considered to be wild trout streams for "their function as habitat for segments of wild trout populations, including nurseries and refuges, and in sustaining water quality necessary for wild trout." (58 PA Code §57.11). And, since they are associated with a Wild Trout streams, wetlands in the Farnsworth Branch watershed are protected by even more stringent regulations, which apply to Exceptional Value waters (25 PA Code §105.17).

Though the entirety of the watershed has rigorous water quality protections in place and is

considered to contain Wild Trout, staff and volunteers in field investigations were encouraged to record any wild trout they observed, as an informal record for future reference. Should climate change or some unexpected, random events extirpate a portion of the trout population present in the Farnsworth Branch watershed, locations where trout were observed in this study can serve as source populations or refuge areas for future restoration efforts.

Miscellaneous Improvement Projects

This category was included as a space for any improvement project that would improve the water or habitat quality in Farnsworth Branch, and did not fit in to the other assessment categories.

Water Quality Measurements

Water pollution can appear in several forms: 1) Thermal - Often the result of a "top release" pond with a spillway or overflow pipe draining the warmest water in the pond into the stream. 2) Chemical - In the form of acid rain in areas with soils that have low buffering capacity or road runoff that elevates the stream's conductivity. 3) Physical - A substance (usually sediment) filling the spaces between cobble and gravel substrate that provide habitat for fish and aquatic macroinvertebrates. While the thermal and chemical qualities of water in Farnsworth Branch were measured, sediment in the form of turbidity was not quantitatively measured, but was subjectively estimated.

Areas of Concern and Opportunity with Recommendations

Table 2 –Recommendations for placement or enhancement of LWM

Segment	Entire Segment	Additional Specific Locations
5552	Yes	N 41.73588, W 79.15336
5553	Yes	N 41.73567, W 79.15479
5572	Yes	N 41.73600, W 79.15392
5603a	Yes	N 41.73824, W 79.15046
5698	Yes	N 41.71460, W 79.15604
5791	Yes	N 41.71226, W 79.16698
5879	Yes	N 41.68126, W 79.20026

Segment 5522b	N 41.75414, W -79.11969 N 41.755788, W -79.117730
Description: Erosion on left descending bank (LDB)	
Recommendation: Modified mud sills or root wads in both locations.	

Segment 5523	N 41.75230, W 79.12473
Description: Concrete box culvert across FR 154 is creating a large pool downstream and there is a debris jam at the upstream side of the culvert which inhibits flow. Manmade hand dam downstream of box culvert also causes AOP blockage. Recommendation: Resize culvert or replace with bridge. Remove manmade hand dam.	

Segment 5550	N 41.74596, W 79.13863
Description: Culvert across FR 154 is creating a large pool downstream and there is a debris jam at the upstream side of the culvert which inhibits flow. Recommendation: Resizing culvert and replacing with squash pipe.	

Segment 5551	N 41.746261, W 79.127131
Description: Possible gas line found. State of activity unknown. No oily sheen was found around the pipe or downstream of the pipe. Recommendation: Determine activity status of pipe.	

Segment 5551	N 41.745724, W 79.126722 and upstream
Description: Erosion occurs regularly throughout this segment.	
Recommendation: There are several opportunities throughout this segment for streambank stabilization / fish habitat structures.	

Segment 5551
N 41.745649, W 79.126779
Description: There is a 15' eroding streambank with 1.5' incised bank that could cause flow problems if it is not addressed. Recommendations: Stabilize toe of slope and vegetate streambank

Segment 5552	N 41.75059, W 79.12201
Recommendation: There are several opportunities throughout this segment for streambank stabilization / fish habitat structures.	

Segment 5552	N 41.75002, W 79.12376 (throughout reach)
Recommendation: There are several opportunities throughout this segment for LWM enhancement structures.	

Segment 5553	N 41.74589, W 79.13152
Recommendation: Log jams in this segment present an opportunity for large woody material (LWM) enhancement projects.	

Segment 5572	N 41.7452, W 79.1273
Recommendation: This segment is mostly riffles. Some areas could use more LWM in the channel.	

Segment 5603a	N 41.73912, W 79.14917
Description: This segment shows several areas of erosion and incised streambanks.	
Recommendation: The gravel bar in the third photo is sending water straight into the right descending bank (RDB). Root wads might work well here to divert water around the bend and protect the streambank. LWM could work to reduce the erosion and incision in other areas.	

Segment 5603b	N 41.73588, W 79.15336
Recommendation: LWM or modified mudsill to protect eroding streambank.	

Segment 5603b	N 41.73567, W 79.15479 N 41.73600, W 79.15392
Recommendation: LWM to reduce erosion and reconnect stream to floodplain.	

Segment 5603b	N 41.73824, W 79.15046
Recommendation: LWM to reconnect stream to floodplain.	

Segment 5620	N 41.73002, W 79.16051 N 41.73056, W 79.17036
Recommendation: This segment has a steep terrain which created many "waterfalls" throughout the channel; several could pose aquatic organism passage barriers. We recommend adjusting the amount of fall at these locations to maintain the natural integrity of the channel but remedy the aquatic organism passage barriers.	

Segment 5634	N 41.74493, W 79.12815 N 41.735011, W 79.138710
Recommendation: Good candidate for large wood (accessible floodplain, side channels) Large wood could be added from bottom to N 41.735011, W 79.138710.	

Segment 5658	N 41.7310, W 79.1596 (throughout segment) N 41.72652, W 79.15981 (cut logs)
Description: This segment has an abundance of downed wood that can be utilized to create stable structures that will create habitat and protect streambanks. There is also a fair amount of erosion in this segment that could be addressed. Recommendation: Place LWM in locations of existing wood-fall and install supplemental tree plantings in areas of open space along the stream. We also recommend not cutting logs out of the stream as LWM can add habitat and help protect streambanks from erosion.	

Segment 5662	N 41.72463, W 79.16964
Description: Culvert creating an AOP barrier on the downstream side. There is also possible stormwater runoff entering the stream from FR 252. Recommendation: Recommend replacing with a resized culvert or a bridge.	

Upstream Inlet Runoff Downstream Outlet

Segment 5698	N 41.71473, W 79.14935 (throughout segment)
Description: There are many natural elevation changes that could pose possible aquatic organism passage barriers. Recommendation: It's possible to add appropriately sized LWM to reduce the height of the elevation changes making it easier for aquatic organisms to travel the channel.	

Segment 5701	N 41.7176, W 79.1607
Description: Box culvert creating aquatic organism passage barrier. Recommendation: Opportunities for LWM projects at N 41.71528, W 79.15850 and N 41.71460, W 79.15604	

Segment 5712	N 41.7176, W79.1607
Recommendation: We recommend not cutting the trees that fall into the stream. There's opportunity for LWM at N 41.71226, W 79.16698 to address an AOP barrier. We also recommend removing any hand-dams found downstream.	

***Photos unavailable**

Segment 5715	N 41.71188, W 79.14658
Description: Two culvert pipes provide a private road crossing. Recommendation: Recommend replacing the culverts with a small bridge.	

Segment 5717	N 41.7121, W 79.1673
Recommendation: Opportunities to enhance existing log jams, possible opportunities to install streambank stabilization/fish habitat structures.	

Segment 5733	N 41.7118, W 79.1728
Recommendation: Recommend large woody material toward the bottom of the segment – consider bridge.	

Segment 5742	N 41.71023, W 79.16774
Description: Large logs already down can use some embellishment as log jams. Recommendation: Areas of erosion could be addressed. Channel downstream could be reconnected to the floodplain. There is also potential near the top of the segment for a large woody material project at N 41.70984, W 79.16807 to reconnect the stream to the floodplain.	

Segment 5748	N 41.70942, W79.17770
Recommendation: Reduce sediment load behind LWM at this location. Address erosion problems upstream to prevent future sediment loads from accumulating here.	

Segment 5754	N 41.71135, W 79.14629
Recommendation: Streambank protection beside structure.	

Segment 5791	N 41.7085, W 79.1678
Description: Erosion and incision occur regularly through this segment. Recommendation: LWM would also benefit this segment by addressing areas of erosion and adding fish habitat.	

Segment 5792	N 41.7010, W 79.1608
Recommendation: Address possible fish passage barriers. Remove low-head AOP barriers if they're not benefiting the stream structure.	

Segment 5879	N 41.7010, W 79.1608
Description: The slope of this segment causes 1ft elevation changes that could pose AOP barriers. Recommendation: Establish areas of appropriately sized LWM to build up the streambed and reduce the height in current elevation changes to make the channel more passable.	

Segment 5915	N 41.68126, W 79.20026
Description: Undersized culvert is causing an AOP barrier and incision of the channel downstream. Recommendation: Replace with a resized squash pipe. Add LWM or other in-stream devices reconnect the incised channel to its floodplain.	

Upstream Inlet

Downstream Outlet:

Downstream Incised Channel:

Species of Concern and Other Species Observed:

During the assessment species witnessed in the watershed include a snapping turtle, and ruffed grouse. Evidence of species such as white-tailed deer, coyotes, and beaver were also found. It was brought to our attention that the PA Game Commission is conducting a study on ruffed grouse and a graduate research assistant from West Virginia University is researching wood turtles in the area. No wood turtles were found during the assessment.

Several species of common fungus were also found during the assessment, such as the turkey tail mushroom and at least four species of shelf (or bracket) fungus.

Snapping Turtle (*Chelydra serpentine*)

Turkey tail mushroom (*Trametes versicolor*)

Wild Reishi Mushroom (*Ganoderma tsugae*)

Other Recommendations:

Stream Crossings / Channelization

Due to the number of road/stream crossings creating aquatic organism passage (AOP) barriers, a North Atlantic Aquatic Connectivity Collaborative Aquatic Organism Passage (NAACC AOP) assessment could be beneficial.

Despite impact from numerous stream crossings, the road itself had little effect on the stream overall. For more information about Dirt & Gravel Road best management practices (BMPs) refer to the Penn State Center for Dirt and Gravel Road Studies website at https://www.dirtandgravel.psu.edu/.

Landowner Outreach

It may be advantageous to reach out to landowners who have property along the stream that could benefit from streambank stabilization measures. Educational material and informational conversations with the landowners could go far in obtaining cooperation to address any damaging stream conditions.

Water Quality

Due to the low buffering capacity of soils on the Allegheny Plateau, areas of low pH are common. In most cases the top of each reach was more acidic than the bottom; however, there are a few instances where the bottom of the reach had a lower pH reading than the top of the reach. Refer to the **Farnsworth pH** map for a visual reference. For segments with high pH that are next to forest roads, adding a limestone driving surface aggregate (DSA) could be beneficial to both raise the pH and reduce the amount of sediment entering the stream from the road.

Although conductivity results were within an acceptable range, addition of LWM within certain segments could reduce the span of the changes from the top of the reach to the bottom. For example, Segments 5701 and 5634 had the larges changes in conductivity ranges from top of reach to bottom of reach reading 46.6 and 58.5µs respectively.

Summary

Generally, this watershed is in good condition. Only one segment (5863) received a Marginal score of 10.8 (Marginal: 6-10.9). Forty-four percent of the segments came in at Suboptimal with scores between 11-15.9, and 33% received Optimal scores of 16-20; 20 being the highest possible score. Twenty-one percent of the segments were not assessed either due to inaccessibility or lack of landowner permission to enter the property. Erosion, although more severe in some places, is mostly minimal. There is a moderate amount of large wood, both in the stream and on land, that contributes to instream habitat, bank stability, and rain infiltration.

Potential Project Partners

Allegheny National Forest
United States Department of Agriculture
Forest Supervisor's Office
4 Farm Colony Drive
Warren, PA 16701
814-728-6100
www.fs.usda.gov/main/allegheny/home

Allegheny WINs Coalition
Coordinated by Allegheny National Forest
Fisheries Biologist Nathan Welker
4 Farm Colony Drive
Warren, PA 16701
814-728-6163
nwelker@fs.fed.us

Pennsylvania Fish and Boat Commission
Northwest Region Office
11528 PA-98
Meadville, PA 16335
814-337-0444

Pennsylvania Fish and Boat Commission
Habitat Management Division
595 East Rolling Ridge Drive
Bellefonte Pa 16823
814-359-5126

American Rivers
Mid-Atlantic – Pittsburgh Office
150 Lloyd Ave
Pittsburgh, PA 15218
412-727-6130
www.americanrivers.org/

Cornplanter Chapter #526 of Trout Unlimited
21 Glenwood St
Warren, PA 16365

North Atlantic Aquatic Connectivity Collaborative
https://streamcontinuity.org/
contact@streamcontinuity.org

Pennsylvania Department of Conservation and Natural Resources
323 N State St
North Warren, PA 16365 / 814-723-0262

Pennsylvania Department of Environmental Protection
Northwest Regional Office
230 Chestnut Street
Meadville, PA 16335-3481
Phone: 814-332-6945
Emergencies: 1-800-373-3398
http://www.dep.pa.gov/Business/Water/Pages/default.aspx

Pennsylvania Game Commission
Northwest Region Office
1509 Pittsburgh Rd
Franklin, PA 16323
(814) 432-3187

Ruffed Grouse Society
ALLEGHENY
Mary Hosmer
Kane, PA 16735
E-Mail: wlhab@windstream.net

Warren County Conservation District
4000 Conewango Ave.
Warren, PA 16365
814-726-1441

Western Pennsylvania Conservancy
Allegheny Regional Office
159 Main Street
Ridgway, PA 15853 / 814-776-1114

Potential Funding Sources

Colcom Foundation

http://colcomfdn.org/

Coldwater Heritage Partnership

http://www.coldwaterheritage.org/

Community Foundation of Warren County

http://communityfoundationofwarrencounty.org/receive/grants

Eastern Brook Trout Joint Venture

http://easternbrooktrout.org/

Eastern National Forest Interpretive Association

http://www.enfiami.org/home.aspx

Foundation for Pennsylvania Watersheds

http://pennsylvaniawatersheds.org/apply-for-a-grant/

National Fish and Wildlife Foundation

https://www.nfwf.org/programs

National Forest Foundation

https://www.nationalforests.org/grant-programs

Northwest Greenways

http://www.northwestpa.org/greenways-block-grant-program/

Ohio River Basin Fish Habitat Partnership

http://www.fishhabitat.org/the-partnerships/ohio-river-basin-fish-habitat-partnership

PA Department of Conservation and Natural Resources

https://www.dcnr.pa.gov/Communities/Grants/Pages/default.aspx

PA Department of Environmental Protection: Growing Greener

http://www.dep.pa.gov/Citizens/GrantsLoansRebates/Growing-Greener/Pages/default.aspx

PA Fish and Boat Commission- Cooperative Habitat Improvement Program

http://www.fishandboat.com/Resource/Habitat/Documents/CHIP-GuidelinesApplication.pdf

Patagonia

http://www.patagonia.com/environmental-grants-and-support.html

US Department of Agriculture: Natural Resources Conservation Service

https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/

US Fish and Wildlife Service Fish Passage Program

https://www.fws.gov/fisheries/fish-passage.html

List of Resources for BMPs relating to Watershed Conservation

Association of State Wetland Managers

https://www.aswm.org/aswm/aswm-webinarscalls/3355-2020-past-beaver-restoration-webinar-series#beavermimicry

Low-Tech Process-Based Restoration of Riverscapes

http://lowtechpbr.restoration.usu.edu/workshops/2020/SGI/#course-materials

North Atlantic Aquatic Connectivity Collaborative

https://streamcontinuity.org/

Pennsylvania Center for Dirt and Gravel Roads

http://www.dirtandgravel.psu.edu/

PA Department of Environmental Protection

http://www.dep.pa.gov/Business/Water/Waterways/Pages/default.aspx

PA Fish and Boat Commission

https://www.fishandboat.com/Resource/Habitat/Pages/default.aspx

PA State Conservation Commission

https://www.agriculture.pa.gov/Plants_Land_Water/StateConservationCommission/Pages/default.aspx

Penn State Extension Service

http://extension.psu.edu/natural-resources/water

Stroud Water Research Center

http://www.stroudcenter.org/

US Department of Agriculture: Natural Resource Conservation Service Field Office Technical Guide (FOTG)

https://efotg.sc.egov.usda.gov/

US Forest Service: Guidance for Stream Restoration and Rehabilitation

https://www.fs.fed.us/biology/nsaec/assets/yochumusfs-nsaec-tn102-2gudncstrmrstrtnrhbltn.pdf

Acknowledgements

This plan would not have been possible without the tireless effort of staff and volunteers from a variety of organizations. Copious thanks go out to Luke Bobnar of the Western Pennsylvania Conservancy who was responsible for training on the assessment protocol. Cornplanter Chapter #526 of Trout Unlimited Volunteers Gary Finger, Gary Kell, Mike Fadale, and Gary Candreia. Independent volunteers Leigh Fehlman, Gary Lester, Jim and Denise Pearson, and Joseph Lindstrom. USFS-Allegheny National Forest staff Bethany Ketchum. Special thanks to Brian Bull of the Warren County Assessment Office for creating the data maps and Laura Ayers of the Natural Resources Conservation Service for producing the Watershed Map.

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Appendix 1 – Data Tables

Table 3– Habitat Assessment Scores

GIS_ID	Name	Segment Length (Feet)	Segment Length (Miles)	Epifa. Subs.	Embed.	Velo. Depth	Sed. Dep.	Chan. FlowSta	Chan. Alt.	Freq. Rif	Bank Stab.	Veg. Pro.	Rip.Veg.	**Total Score**
5522a	Farnsworth Branch	7787	1.47	Lack of Landowner Permission										**0**
5522b	Farnsworth Branch	4107	0.78	19	15	12	16	19	20	19	18	17	16	**17.1**
5523	1st Order Trib to Farnsworth Branch	3638	0.69	17	16	15	14	10	16	12	18	18	18	**15.4**
5550	1st Order Trib to Farnsworth Branch	2144	0.41	16	16	15	16	15	16	17	18	18	16	**16.3**
5551	2nd Order Trib to Farnsworth Branch	1301	0.25	12	16	14	16	9	18	19	17	16	18	**15.5**
5552	Farnsworth Branch	1728	0.33	15	19	18	12	8	19	17	13	16	16	**15.3**
5553	Farnsworth Branch	3572	0.68	16	16	16	13	10	16	14	16	18	18	**15.3**
5572	2nd Order Trib to Segment 5551	2367	0.45	18	17	10	17	10	20	18	20	20	20	**17**

GIS_ID	Name	Segment Length (Feet)	Segment Length (Miles)	Epifa. Subs.	Embed.	Velo. Depth	Sed. Dep.	Chan. FlowSta	Chan. Alt.	Freq. Rif	Bank Stab.	Veg. Pro.	Rip.Veg.	**Total Score**
5576	1st Order Trib to Segment 5572	3216	0.61	13	17	12	12	11	18	17	18	18	18	**15.4**
5600	1st Order Trib to Segment 5572	2679	0.51	11	16	5	18	10	20	16	20	20	20	**15.6**
5603a	Farnsworth Branch	4854	0.92	17	15	15	15	15	18	18	14	18	17	**16.2**
5603b	Farnsworth Branch	4755	0.90	16	14	16	14	13	18	15	16	18	20	**16**
5620	1st Order Trib to Farnsworth Branch	4836	0.92	16	15	15	16	16	20	18	18	18	20	**17.2**
5634	1st Order Trib to Segment 5551	9872	1.87	16	18	12	7	10	19	18	18	18	18	**15.4**
5658	Farnsworth Branch	3930	0.74	13	15	15	12	15	19	18	13	16	15	**15.1**
5662	1st Order Trib to Farnsworth Branch	3663	0.69	13	14	14	16	15	15	11	16	20	14	**14.8**

GIS_ID	Name	Segment Length (Feet)	Segment Length (Miles)	Epifa. Subs.	Embed.	Velo. Depth	Sed. Dep.	Chan. FlowSta	Chan. Alt.	Freq. Rif	Bank Stab.	Veg. Pro.	Rip.Veg.	**Total Score**
5674	Farnsworth Branch	1539	0.29	16	17	14	13	10	20	17	18	20	20	**16.5**
5698	1st Order Trib to Segment 5701	3679	0.70	17	18	14	20	19	19	15	20	16	18	**17.6**
5701	2nd Order Trib to Farnsworth Branch	3880	0.73	14	15	14	8	12	18	14	18	18	16	**14.7**
5712	Farnsworth Branch	2923	0.55	10	10	17	10	11	11	16	18	17	16	**13.6**
5713	1st Order Trib to Farnsworth Branch	5043	0.96	DRY										**0**
5715	1st Order Trib to Segment 5716	3098	0.59	16	12	10	13	12	19	17	16	18	17	**15**
5716	2nd Order Trib to Segment 5701	1405	0.27	19	17	19	15	18	19	18	18	18	18	**17.9**
5717	Farnsworth Branch	1612	0.31	15	11	16	18	8	19	10	11	16	16	**14**

GIS_ID	Name	Segment Length (Feet)	Segment Length (Miles)	Epifa. Subs.	Embed.	Velo. Depth	Sed. Dep.	Chan. FlowSta	Chan. Alt.	Freq. Rif	Bank Stab.	Veg. Pro.	Rip.Veg.	**Total Score**
5733	Farnsworth Branch	1339	0.25	15	17	11	15	8	18	10	17	12	18	**14.1**
5734	1st Order Trib to Farnsworth Branch	4418	0.84	DRY										**0**
5742	Otter Branch	1589	0.30	12	18	13	14	11	19	16	15	14	18	**15**
5743	1st Order Trib to Segment 5752	3653	0.69	DRY										**0**
5748	Farnsworth Branch	1480	0.28	17	15	14	14	14	20	7	18	16	20	**15.5**
5752	2nd Order Trib to Farnsworth Branch	2443	0.46	DRY										**0**
5754	1st Order Trib to Segment 5716	1848	0.35	19	14	18	14	18	19	16	18	17	16	**16.9**
5791	Otter Branch	3465	0.66	19	18	14	15	14	20	19	12	18	20	**16.9**

GIS_ID	Name	Segment Length (Feet)	Segment Length (Miles)	Epifa. Subs.	Embed.	Velo. Depth	Sed. Dep.	Chan. FlowSta	Chan. Alt.	Freq. Rif	Bank Stab.	Veg. Pro.	Rip.Veg.	**Total Score**
5792	1st Order Trib to Otter Branch	7940	1.50	18	16	7	18	15	18	12	17	18	16	**15.5**
5849	1st Order Trib to Segment 5752	6873	1.30											**0**
5852	Farnsworth Branch	6046	1.15	19	19	19	19	19	20	17	18	20	20	**19**
5862	1st Order Trib to Farnsworth Branch	3529	0.67	Inaccessible										**0**
5863	Farnsworth Branch	1025	0.19	12	10	5	8	11	20	5	9	8	20	**10.8**
5864	1st Order Trib to Otter Branch	7659	1.45	19	15	12	16	12	16	18	18	16	16	**15.8**
5879	1st Order Trib to Farnsworth Branch	2279	0.43	15	18	11	15	16	20	18	18	14	20	**16.5**
5897	Otter Branch	8918	1.69	18	16	15	18	15	20	15	16	20	19	**17.2**

GIS_ID	Name	Segment Length (Feet)	Segment Length (Miles)	Epifa. Subs.	Embed.	Velo. Depth	Sed. Dep.	Chan. FlowSta	Chan. Alt.	Freq. Rif	Bank Stab.	Veg. Pro.	Rip.Veg.	**Total Score**
5906	1st Order Trib to Farnsworth Branch	2595	0.49	Mostly Dry										**0**
5908	Farnsworth Branch	4316	0.82	Lack of Landowner Permission										**0**
5915	Farnsworth Branch	3350	0.63	11	11	14	16	16	18	10	18	15	16	**14.5**

Mean	**3776.58**	**0.72**	**15.56**	**15.47**	**13.56**	**14.50**	**13.09**	**18.38**	**15.21**	**16.65**	**17.06**	**17.76**	**12.43**
Maximum	**9872**	**1.87**	**19**	**19**	**19**	**20**	**19**	**20**	**19**	**20**	**20**	**20**	**19**
Minimum	**1025**	**0.194129**	**10**	**10**	**5**	**7**	**8**	**11**	**5**	**9**	**8**	**14**	**0**
Median	**3529**	**0.668371**	**16**	**16**	**14**	**15**	**12.5**	**19**	**16.5**	**18**	**18**	**18**	**15.4**
Range	**8847**	**1.68**	**9**	**9**	**14**	**13**	**11**	**9**	**14**	**11**	**12**	**6**	**19**

Table 4 – Water Quality

Key: Low pH (water quality) Low pH (brook trout) High pH (brook trout) High Temperature

Segment_ID	Name	Segment Length (Feet)	Segment Length (Miles)	pH ToR	pH BoR	Δ pH From ToR to BoR	Spec. Cond. ToR (µs)	Spec. Cond. BoR (µs)	Δ S.C. From ToR to BoR	TDS ToR	TDS BoR	Δ TDS From ToR to BoR	Temp. ToR (°C)	Temp. BoR (°C)	Δ T From ToR to BoR
5522a	Farnsworth Branch	7787	1.47	Lack of Landowner Permission					0			0			0
5522b	Farnsworth Branch	4107	0.78	6.53	6.5	-0.03	46.8	33.1	-13.7	33.4	23.5	-9.9	9.2	9.1	-0.1
5523	1st Order Trib to Farnsworth Branch	3638	0.69	7.29	7.31	0.02	57.3	44.5	-12.8	40.6	31.6	-9	9.6	4.1	-5.5
5550	1st Order Trib to Farnsworth Branch	2144	0.41	6.91	6.98	0.07	53.4	34.8	-18.6	37.9	48.9	11	11.7	11.1	-0.6
5551	2nd Order Trib to Farnsworth Branch	1301	0.25	7.54	7.75	0.21	98.9	95.7	-3.2	70.2	68	-2.2	15.8	15.8	0
5552	Farnsworth Branch	1728	0.33	7.5	7.7	0.2	94.0	93.0	-1.0	64.2	66.5	2.3	18.4	17.6	-0.8
5553	Farnsworth Branch	3572	0.68	7.41	7.53	0.12	88.4	90.7	2.3	62.7	64.6	1.9	19.5	18.8	-0.7

Segment_ID	Name	Segment Length (Feet)	Segment Length (Miles)	pH ToR	pH BoR	Δ pH From ToR to BoR	Spec. Cond. ToR (µs)	Spec. Cond. BoR (µs)	Δ S.C. From ToR to BoR	TDS ToR	TDS BoR	Δ TDS From ToR to BoR	Temp. ToR (°C)	Temp. BoR (°C)	Δ T From ToR to BoR
5572	2nd Order Trib to Segment 5551	2367	0.45	6.7	7.8	1.1	76.9	100.6	23.7	54.3	71.5	17.2	12.8	12.5	-0.3
5576	1st Order Trib to Segment 5572	3216	0.61	6.36	6.16	-0.2	78	75.3	-2.7	55.5	53.5	-2	15	15.0	0
5600	1st Order Trib to Segment 5572	2679	0.51	5.5	5.2	-0.3	93.2	84.3	-8.9	xx.x	xx.x	x	16.3	15.7	-0.6
5603a	Farnsworth Branch	4854	0.92	6.55	6.35	-0.2	47.6	48.3	0.7	33.7	34.4	0.7	3.9	4.7	0.8
5603b	Farnsworth Branch	4755	0.90	7.14	6.97	-0.17	53.8	53.0	-0.8	38.2	37.7	-0.5	7.0	7.7	0.7
5620	1st Order Trib to Farnsworth Branch	4836	0.92	5.47	7.15	1.68	26	33	7	18.4	23.5	5.1	8.1	5.5	-2.6
5634	1st Order Trib to Segment 5551	9872	1.87	5.93	7.39	1.46	38.3	96.8	58.5	27.2	69	41.8	15.8	15.9	0.1
5658	Farnsworth Branch	3930	0.74	8.03	9	0.97	60.5	59.1	-1.4	42.9	41.9	-1	9	7.5	-1.5

Segment_ID	Name	Segment Length (Feet)	Segment Length (Miles)	pH ToR	pH BoR	Δ pH From ToR to BoR	Spec. Cond. ToR (µs)	Spec. Cond. BoR (µs)	Δ S.C. From ToR to BoR	TDS ToR	TDS BoR	Δ TDS From ToR to BoR	Temp. ToR (°C)	Temp. BoR (°C)	Δ T From ToR to BoR
5662	1st Order Trib to Farnsworth Branch	3663	0.69	4.39	5.18	0.79	34.8	30.4	-4.4	24.5	21.5	-3	8.1	7.9	-0.2
5674	Farnsworth Branch	1539	0.29	7.41	7.55	0.14	46.8	54.4	7.6	30	33.7	3.7	16.7	16.8	0.1
5698	1st Order Trib to Segment 5701	3679	0.70	4.1	4.89	0.79	33	27.2	-5.8	23.5	19.3	-4.2	9.6	10.1	0.5
5701	2nd Order Trib to Farnsworth Branch	3880	0.73	7.59	7.8	0.21	53.2	99.8	46.6	37.7	69.8	32.1	12.3	13.3	1
5712	Farnsworth Branch	2923	0.55	7.05	7.1	0.05	xx.x	36.8	x	xx.x	26.3	x	17.2	18.3	1.1
5713	1st Order Trib to Farnsworth Branch	5043	0.96	DRY		0			0			0			0
5715	1st Order Trib to Segment 5716	3098	0.59	5.33	6.5	1.17	25	40.4	15.4	17.4	28.8	11.4	10.8	10.2	-0.6

Segment_ID	Name	Segment Length (Feet)	Segment Length (Miles)	pH ToR	pH BoR	Δ pH From ToR to BoR	Spec. Cond. ToR (µs)	Spec. Cond. BoR (µs)	Δ S.C. From ToR to BoR	TDS ToR	TDS BoR	Δ TDS From ToR to BoR	Temp. ToR (°C)	Temp. BoR (°C)	Δ T From ToR to BoR
5716	2nd Order Trib to Segment 5701	1405	0.27	6.81	6.37	-0.44	31.6	39.6	8	22.5	28.1	5.6	8.1	8.1	0
5717	Farnsworth Branch	1612	0.31	7.03	7.15	0.12	31	37.2	6.2	22.1	26.5	4.4	16.2	16.2	0
5733	Farnsworth Branch	1339	0.25	7.11	6.91	-0.2	46.75	52.3	5.55	35.3	37.2	1.9	15.9	15.3	-0.6
5734	1st Order Trib to Farnsworth Branch	4418	0.84	6.41	7.83	1.42	43.1	49.3	6.2	30.6	34.9	4.3	9.7	8.0	-1.7
5742	Otter Branch	1589	0.30	7.25	7.24	-0.01	81.2	73.3	-7.9	57.7	52.1	-5.6	17	16.6	-0.4
5743	1st Order Trib to Segment 5752	3653	0.69	DRY		0			0			0			0
5748	Farnsworth Branch	1480	0.28	6.86	7.16	0.3	37.7	40.9	3.2	26.8	29	2.2	14.5	14.3	-0.2
5752	2nd Order Trib to Farnsworth Branch	2443	0.46	7.7	7.48	-0.22	49.4	53.5	4.1	35.1	38	2.9	7.7	7.5	-0.2

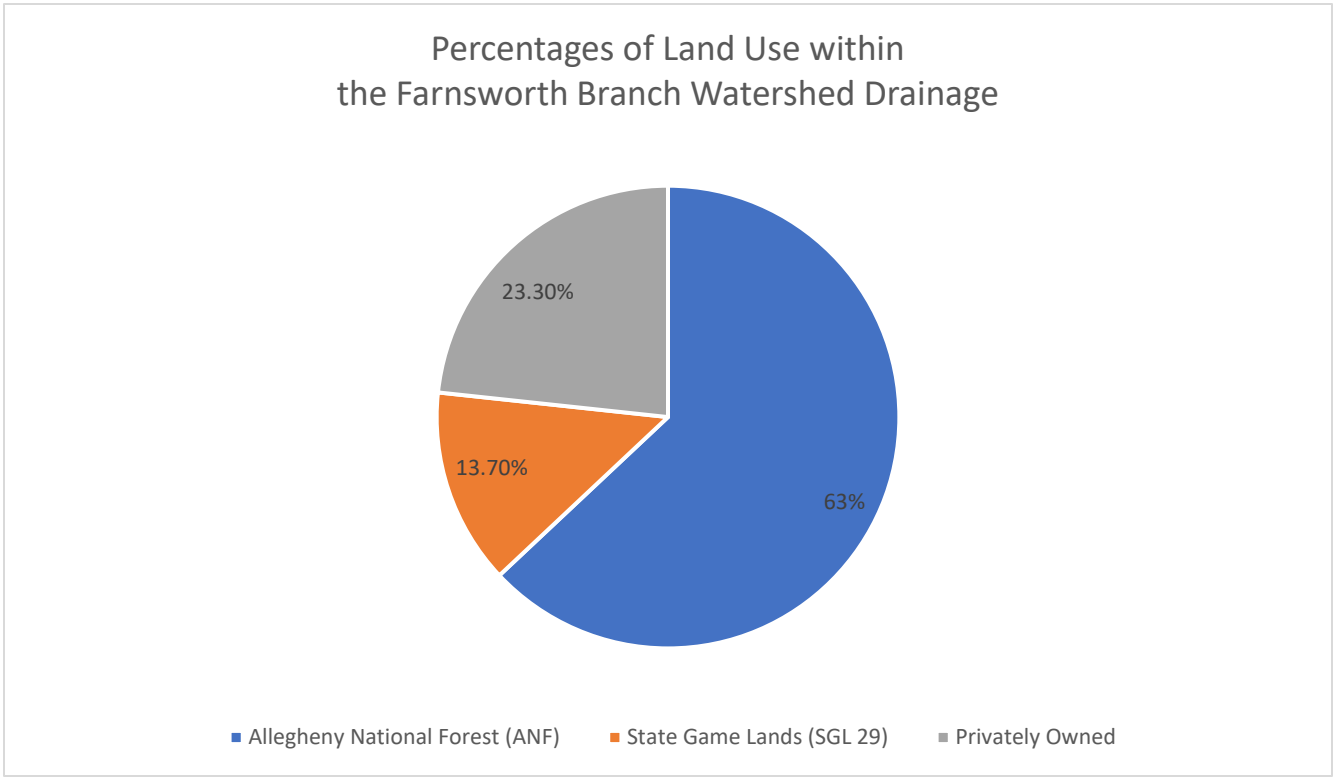
Segment_ID	Name	Segment Length (Feet)	Segment Length (Miles)	pH ToR	pH BoR	Δ pH From ToR to BoR	Spec. Cond. ToR (µs)	Spec. Cond. BoR (µs)	Δ S.C. From ToR to BoR	TDS ToR	TDS BoR	Δ TDS From ToR to BoR	Temp. ToR (°C)	Temp. BoR (°C)	Δ T From ToR to BoR
5754	1st Order Trib to Segment 5716	1848	0.35	6.91	6.26	-0.65	26.7	28.6	1.9	18.9	20.3	1.4	8.6	8.0	-0.6
5791	Otter Branch	3465	0.66	6.11	6.02	-0.09	50.5	49.5	-1	35.8	35.1	-0.7	5.8	4.1	-1.7
5792	1st Order Trib to Otter Branch	7940	1.50	5.2	5.83	0.63	33.7	41.3	7.6	24	29.3	5.3	9.2	8.6	-0.6
5849	1st Order Trib to Segment 5752	6873	1.30	DRY		0			0			0			0
5852	Farnsworth Branch	6046	1.15	5.2	6.18	0.98	24.6	25.8	1.2	17.5	18.4	0.9	21.6	14.9	-6.7
5862	1st Order Trib to Farnsworth Branch	3529	0.67	Inaccessible		0			0			0			0
5863	Farnsworth Branch	1025	0.19	5.25	5.2	-0.05	28.3	27.25	-1.05	20.2	19.4	-0.8	11.6	14.7	3.1
5864	1st Order Trib to Otter Branch	7659	1.45	5.67	5.27	-0.4	22.5	22.4	-0.1	15.8	15.8	0	10.2	9.4	-0.8

Segment_ID	Name	Segment Length (Feet)	Segment Length (Miles)	pH ToR	pH BoR	Δ pH From ToR to BoR	Spec. Cond. ToR (µs)	Spec. Cond. BoR (µs)	Δ S.C. From ToR to BoR	TDS ToR	TDS BoR	Δ TDS From ToR to BoR	Temp. ToR (°C)	Temp. BoR (°C)	Δ T From ToR to BoR
5879	1st Order Trib to Farnsworth Branch	2279	0.43	4.79	4.86	0.07	27.8	25.5	-2.3	19.6	18.2	-1.4	7.5	7.4	-0.1
5897	Otter Branch	8918	1.69	5.38	6.06	0.68	33.5	45.4	11.9	23.7	32.2	8.5	8	6.9	-1.1
5906	1st Order Trib to Farnsworth Branch	2595	0.49	4.42	4.09	-0.33	25.8	28.7	2.9	18.4	20.4	2	4.5	6.1	1.6
5908	Farnsworth Branch	4316	0.82	Lack of Landowner Permission					0			0			0
5915	Farnsworth Branch	3350	0.63	4.99	5.29	0.3	27.1	27.2	0.1	19.2	19.4	0.2	7.2	8.5	1.3
Mean		**3776.58**	**0.72**	**6.27**	**6.60**	**0.28**	**44.85**	**48.52**	**4.20**	**32.45**	**35.95**	**3.77**	**11.65**	**11.1**	**-0.49**
Maximum		**9872**	**1.87**	**8.03**	**9**	**1.68**	**98.9**	**100.6**	**58.5**	**70.2**	**71.5**	**41.8**	**21.6**	**18.8**	**3.1**
Minimum		**1025**	**0.19**	**4.1**	**4.09**	**-0.65**	**9.4**	**9.3**	**-18.6**	**15.8**	**15.8**	**-9.9**	**3.9**	**4.1**	**-6.7**
Median		**3529**	**0.67**	**6.53**	**6.91**	**0.07**	**38**	**40.9**	**0.1**	**27.2**	**30.45**	**1.15**	**10.2**	**10.1**	**-0.2**
Range		**8847**	**1.68**	**3.93**	**4.91**	**2.33**	**89.5**	**91.3**	**77.1**	**54.4**	**55.7**	**51.7**	**17.7**	**14.7**	**9.8**

*Notes: Segment 5522 was divided into two segments due to lack of landowner permission to access the downstream portion of the segment (5522a). Segment 5522b was assessed from is confluence with Segment 5523 to N41.7596, W 79.1143.

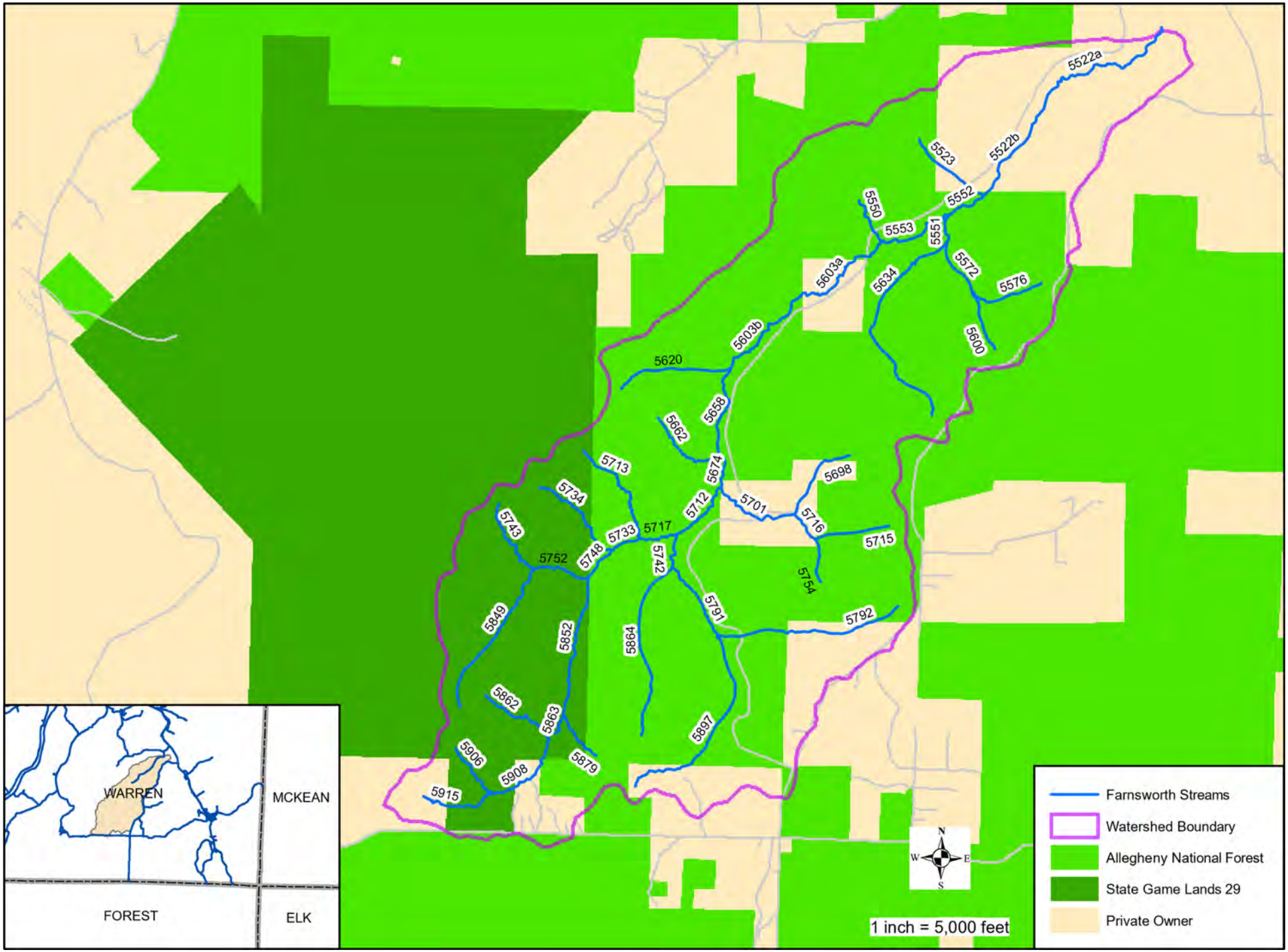
Segment 5603 was split into two segments due to time constraints. Segment 5603a is the downstream portion and Segment 5603b is the upstream portion. The beginning and end point for the assessments of these portions is N 41.73912, W 79.14917.

Figure 6 – Percentages of Land Use within the Farnsworth Branch Watershed Drainage

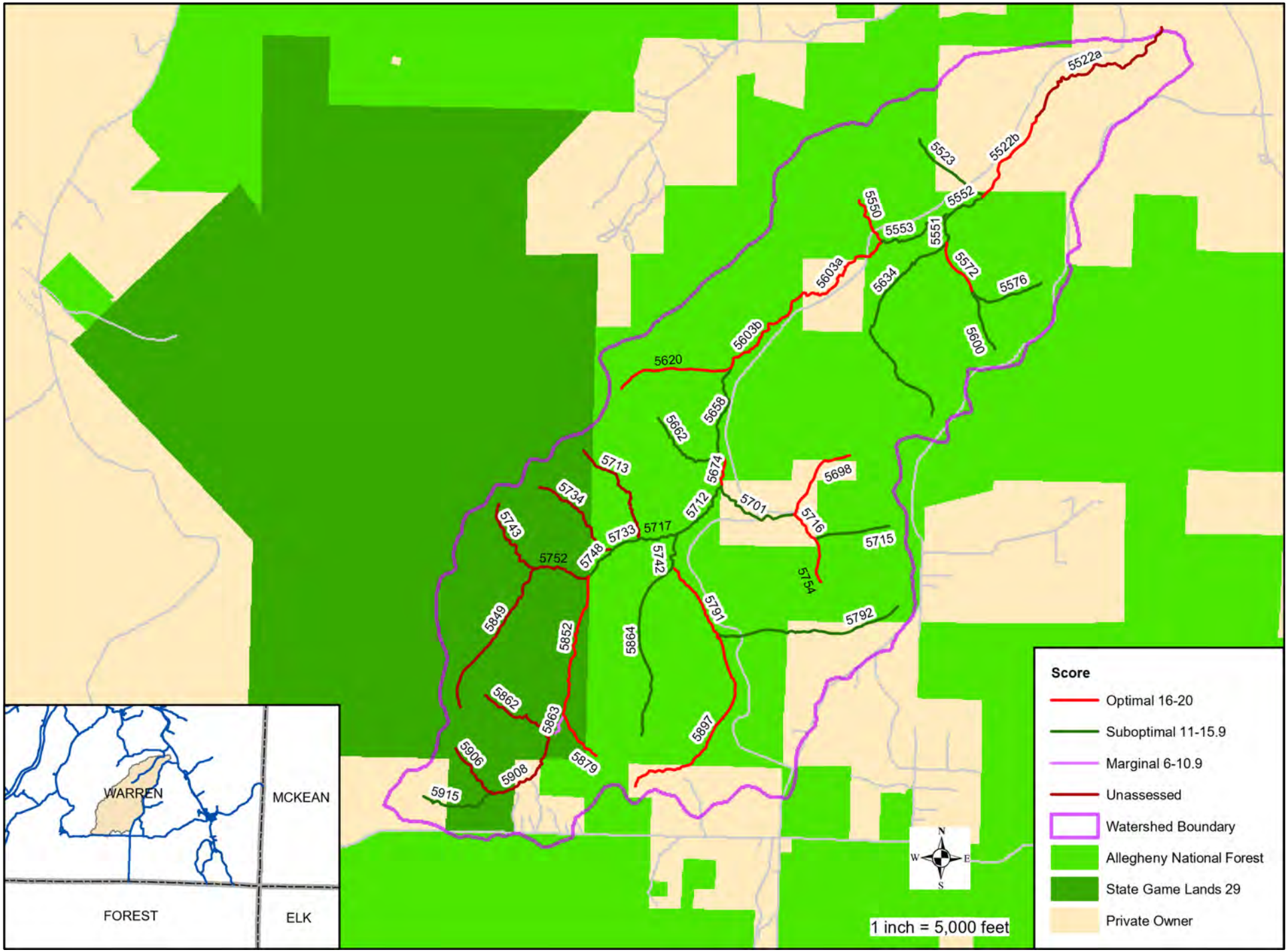


Appendix 2: Watershed Maps

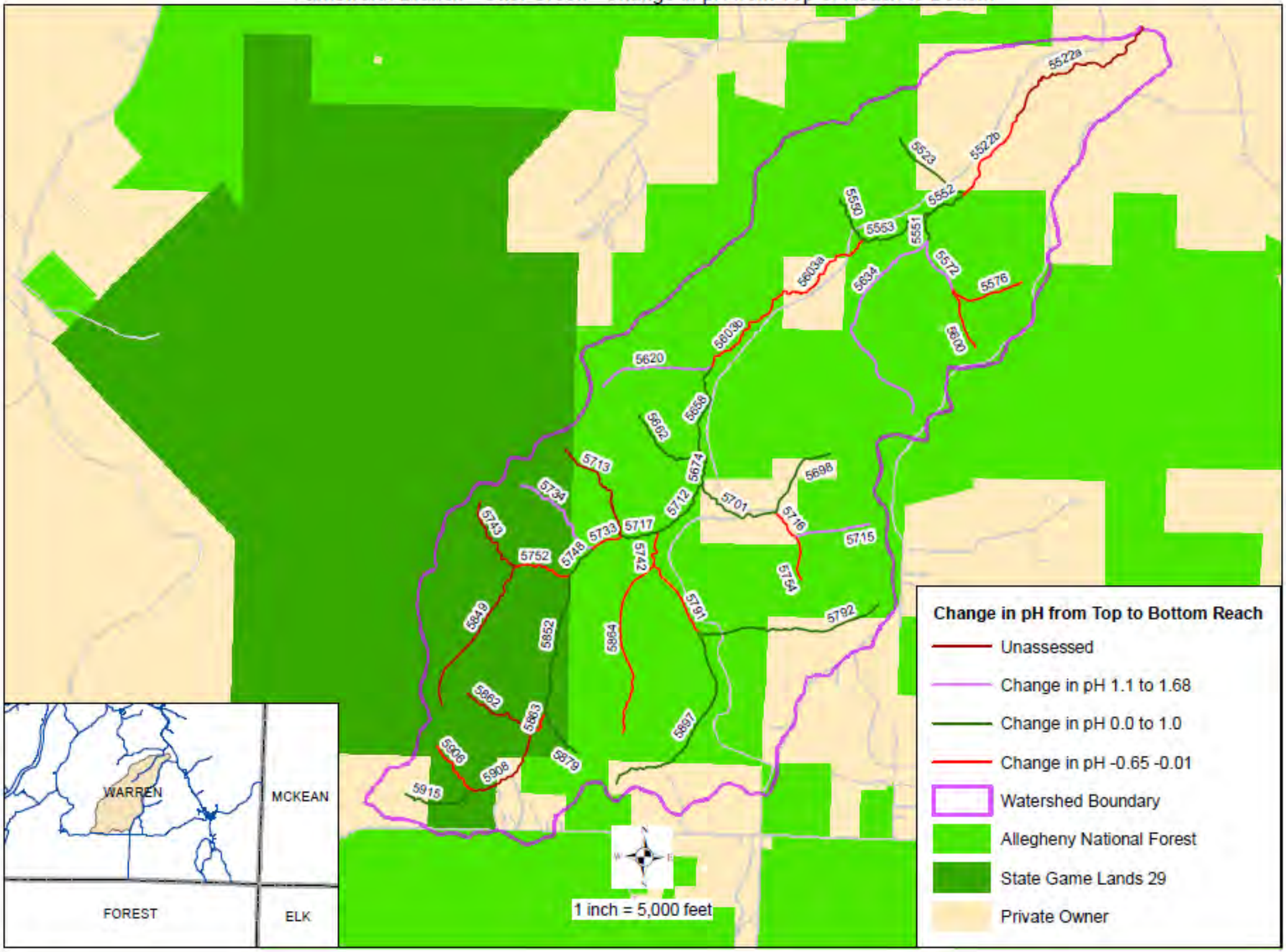
Farnsworth Branch - Otter Creek - GIS ID's



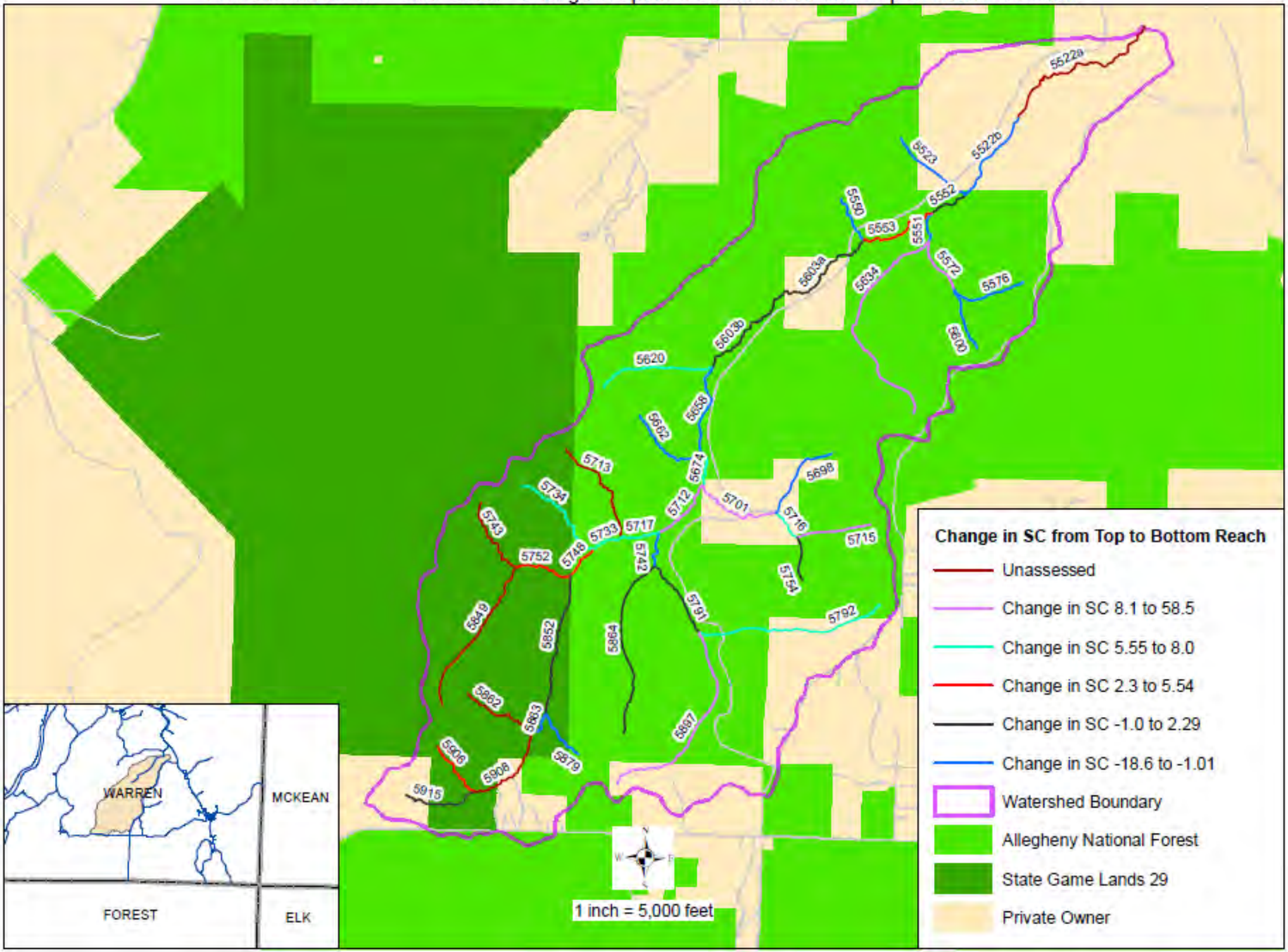
Farnsworth Branch - Otter Creek - Total Habitat Scores



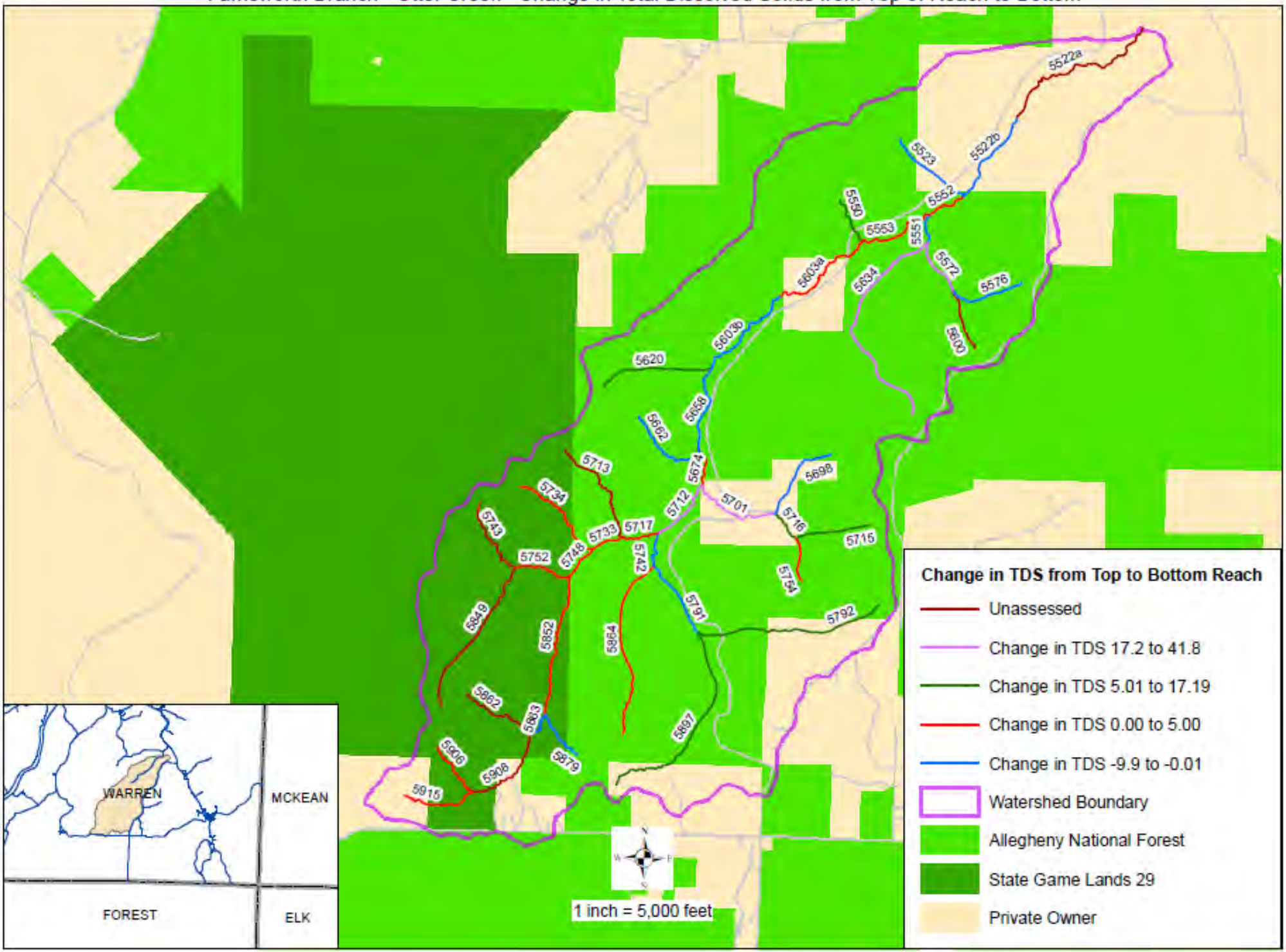
Farnsworth Branch - Otter Creek - Change in pH from Top of Reach to Bottom



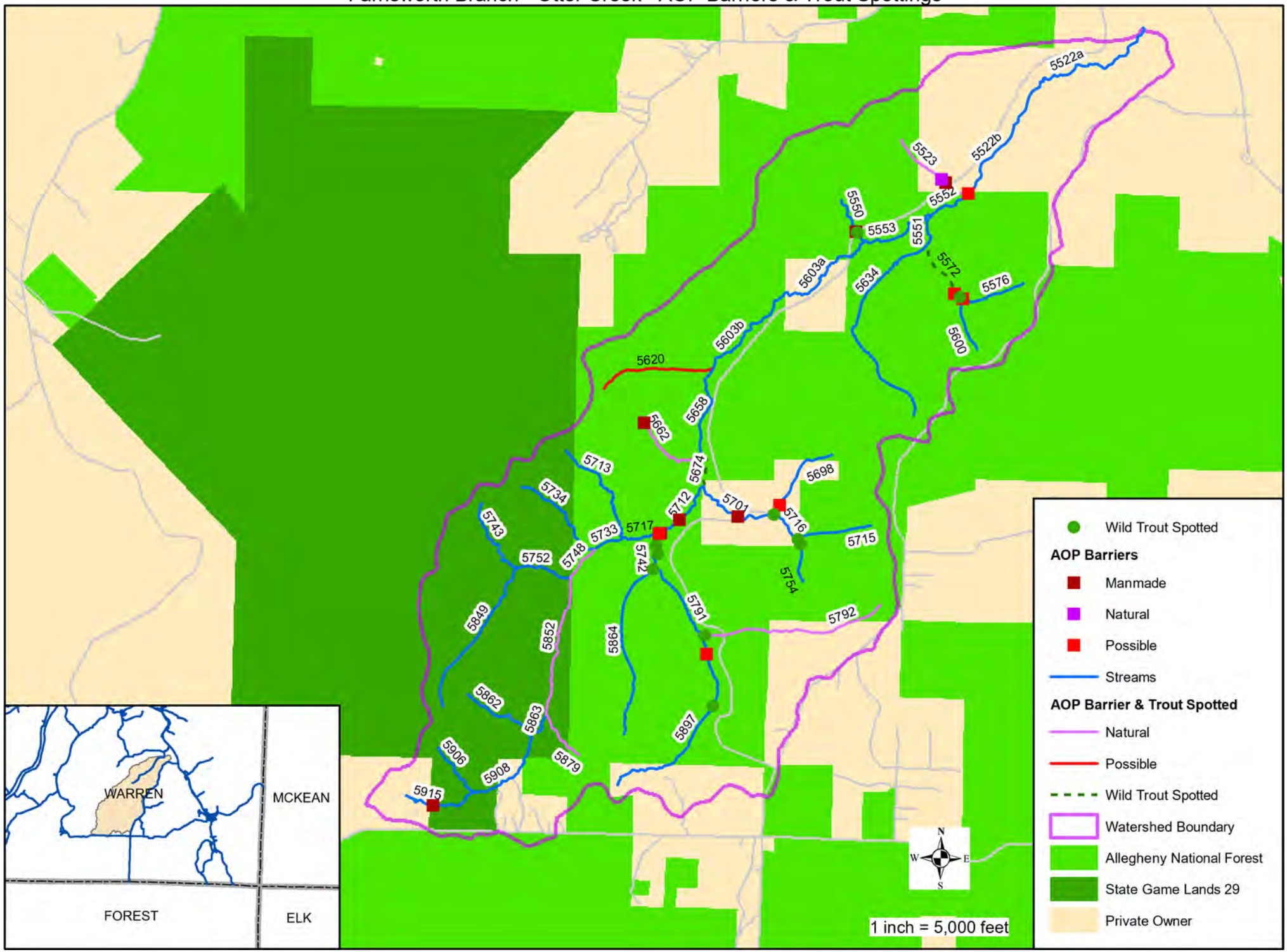
Farnsworth Branch - Otter Creek - Change in Specific Conductance from Top of Reach to Bottom



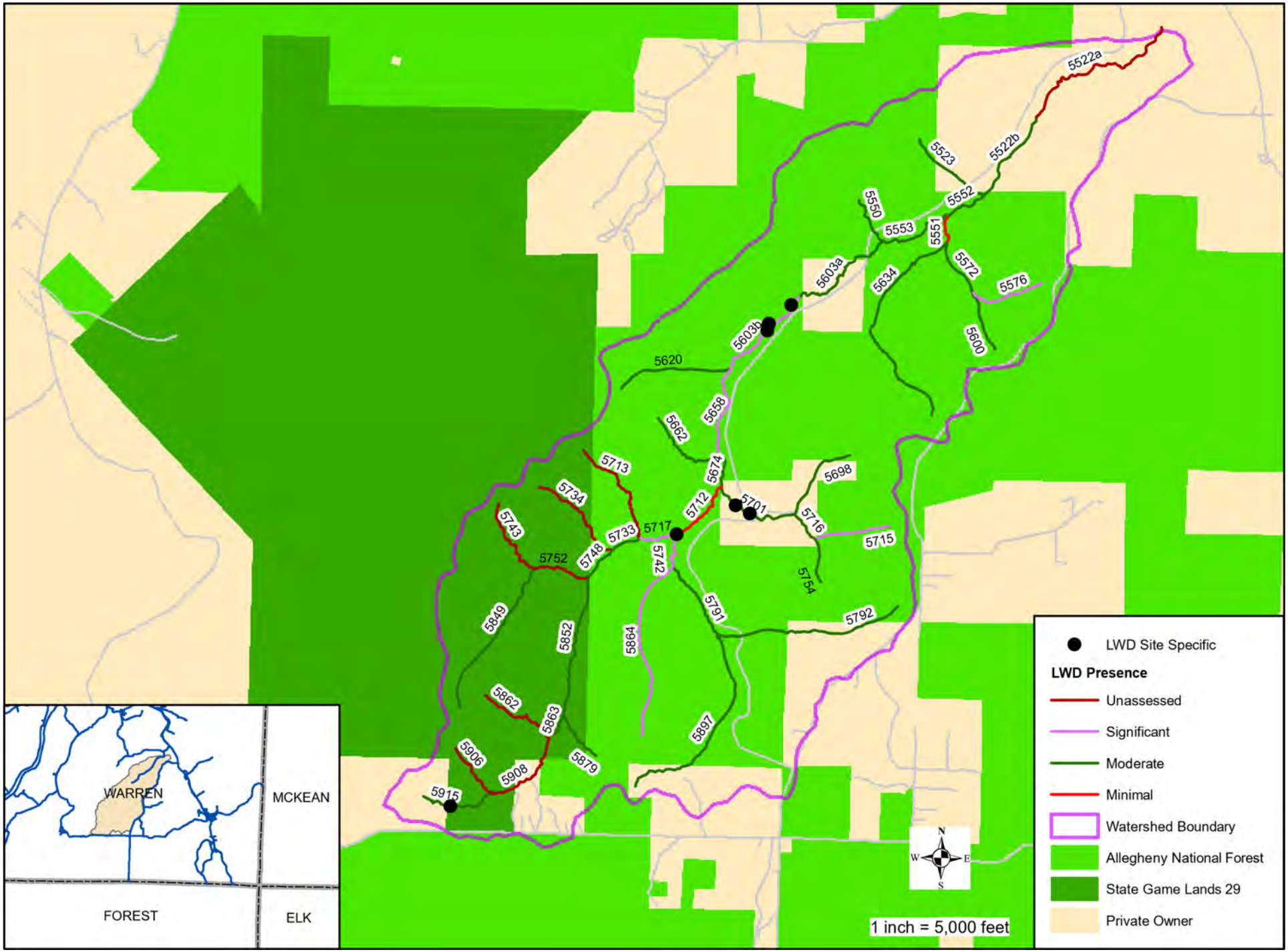
Farnsworth Branch - Otter Creek - Change in Total Dissolved Solids from Top of Reach to Bottom



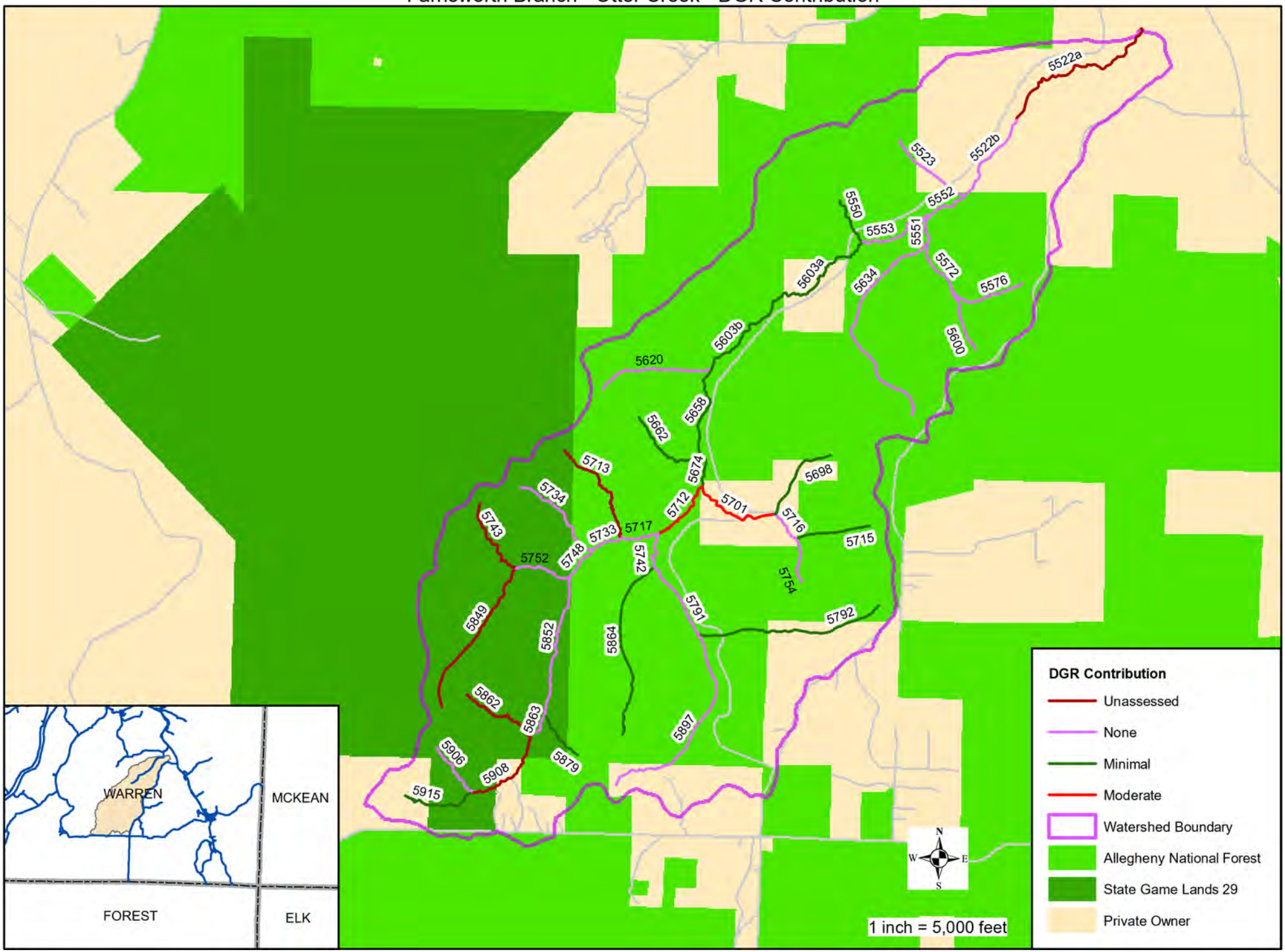
Farnsworth Branch - Otter Creek - AOP Barriers & Trout Spottings



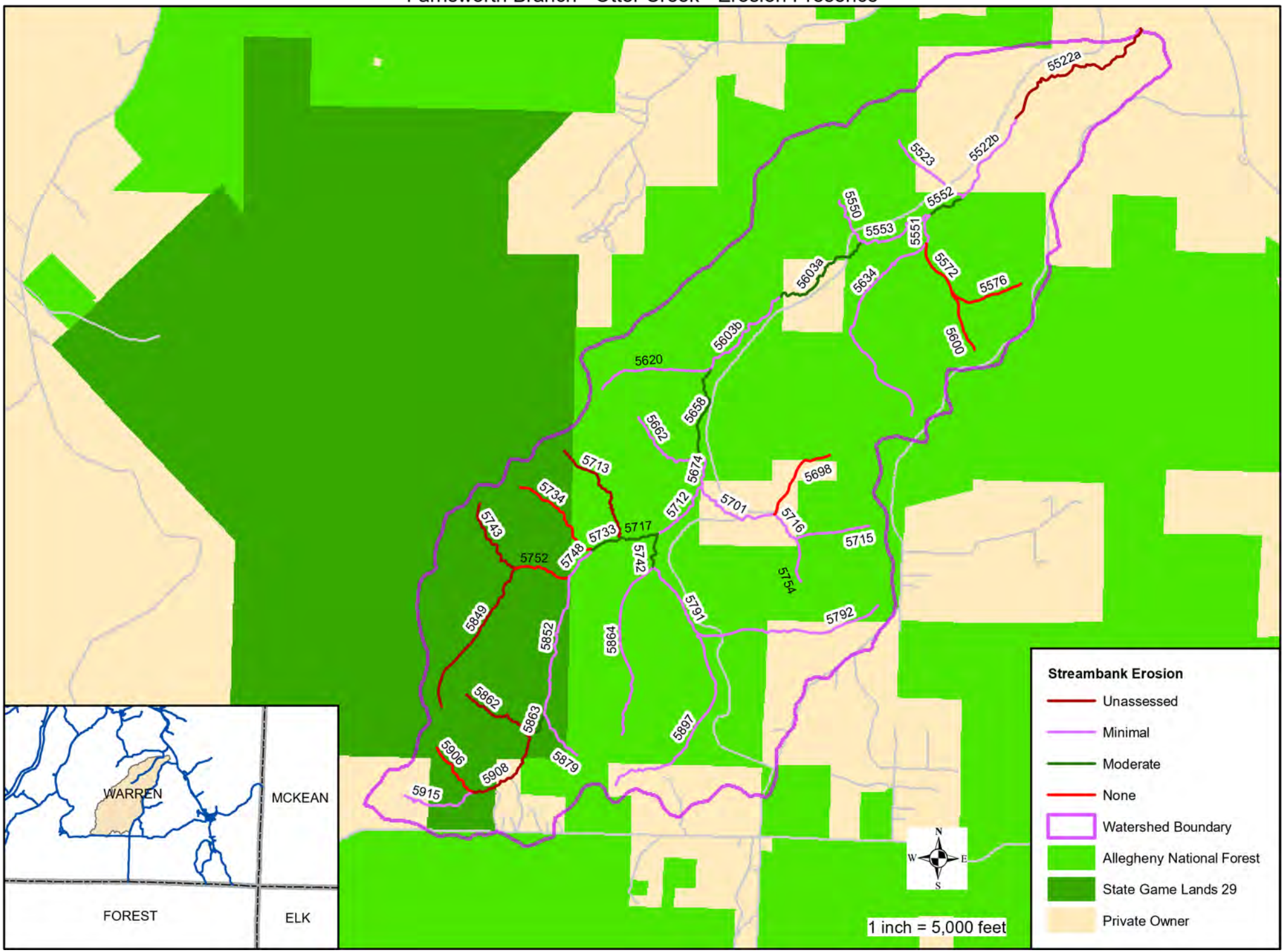
Farnsworth Branch - Otter Creek - LWD Presence



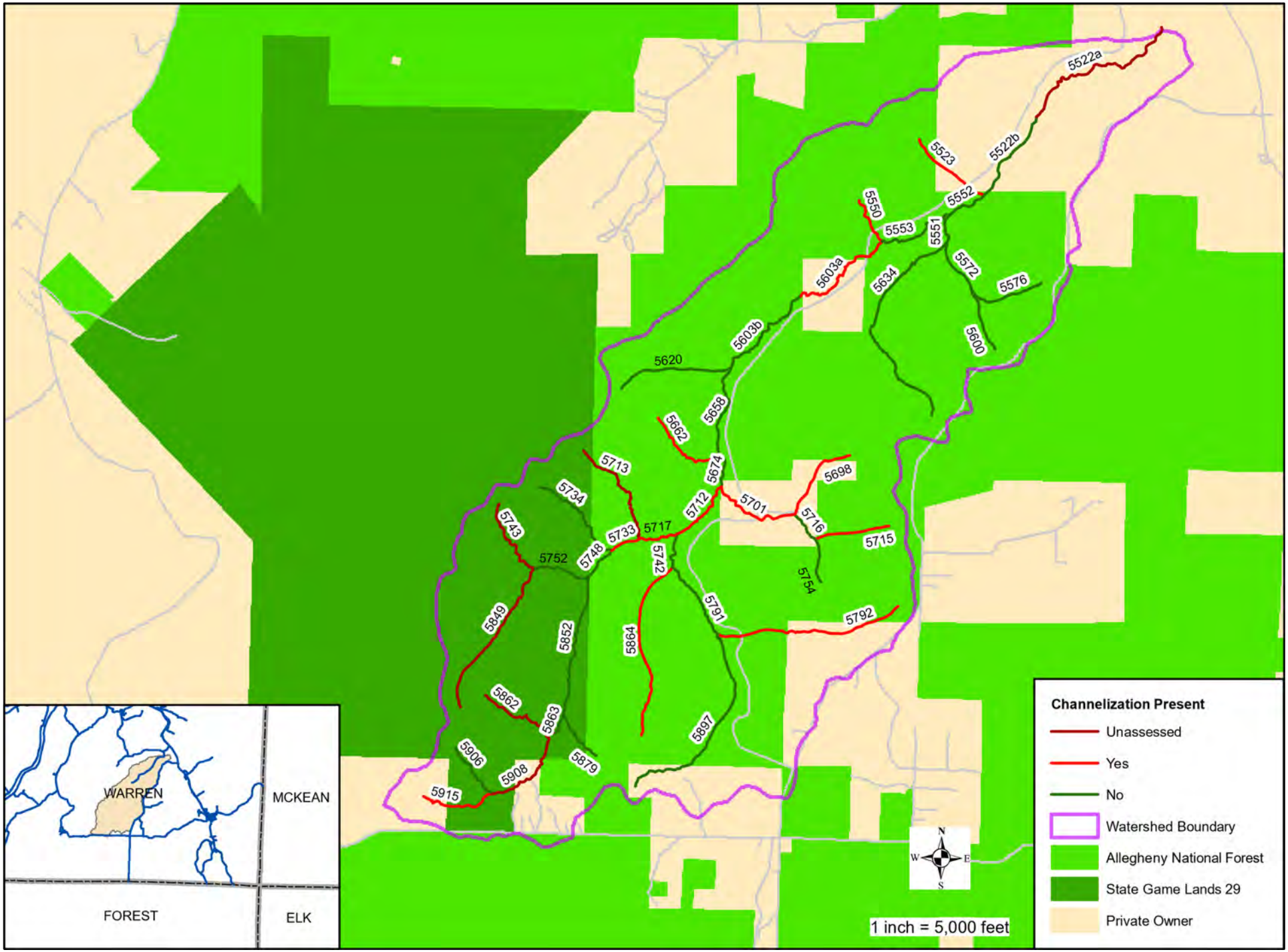
Farnsworth Branch - Otter Creek - DGR Contribution



Farnsworth Branch - Otter Creek - Erosion Presence



Farnsworth Branch - Otter Creek - Channelization Present



Appendix 3 – Standard Data Forms

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

STREAM NAME Farnsworth Branch	**SEGMENT ID**	
GIS ID #___------___	**STREAM CLASS** CWF	
LAT _____ **LONG** _____	**RIVER BASIN** Tionesta Creek	
STORET # N/A	**AGENCY** Warren County Conservation District	
INVESTIGATORS		
FORM COMPLETED BY *** Take a Picture Once Completed**	**DATE** _____ **TIME** _____ **AM PM**	**REASON FOR SURVEY** CHP

WEATHER CONDITIONS	**Now** ☐ clear/sunny ☐ storm (heavy rain) ☐ rain (steady rain) ☐ showers (intermittent) ☐ % cloud cover (circle %) 25% - 50 % - 75% - 100%	**Past 24 hours** ☐ clear/sunny ☐ storm (heavy rain) ☐ rain (steady rain) ☐ showers (intermittent) ☐ % cloud cover (circle %) 25% - 50 % - 75% - 100%
	Has there been a heavy rain in the last 7 days? ☐ Yes ☐ No **Air Temperature** _____ °F **Other**_____	
FEATURES of NOTE:	**Describe significant features and/or impacts seen in section. Include GPS points when applicable**	

Latitude (North)	Longitude (West)

☐ Check box if stream is dry and record any significant info about section.

HABITAT IMPROVEMENT OPPORTUNITIES: **Recommendation(s):**	☐ Segment has need for improvement project(s) Describe:
	Segment Accessibility: ☐ Excellent ☐ Good ☐ Poor ☐ In-Accessible – Describe:_____

STREAM CHARACTERIZATION	**Stream Subsystem** ☐ Perennial ☐ Intermittent **Stream Type** ☐ Main Stem ☐ Named Tributary ☐ Unnamed Tributary ☐ ☐ Headwater UNT ☐ Other _____	**Stream Type** ☐ Coldwater ☐ Warmwater

WATERSHED FEATURES (with in 30 meter buffer)

Predominant Surrounding Land-Use (Must = 100%)

- ☐ Forest ____%
- ☐ Field/Pasture ____%
- ☐ Agricultural ____%
- ☐ Open space (i.e., parks/golf courses) ____%
- ☐ Commercial/Industrial ____%
- ☐ Residential ____%
- ☐ Paved Roads ____%
- ☐ Dirt and Gravel Roads ____% (TWP, Gas & Logging)
- ☐ Rail Line ____%
- ☐ Wetland ____%
- ☐ Other _____ ____%

Stormwater Inputs ☐ None

☐ Tile Drain ☐ Road Ditch ☐ Urban Stormwater Pipe
☐ Field Ditch ☐ Overland Flow

D&GR Sediment Contribution (Runoff): ☐ None

☐ Minimal ☐ Moderate ☐ Heavy

Bank revetments: ☐ None

☐ Rip-rap ☐ Gabion ☐ Concrete ☐ Other _____

VEGETATION INFORMATION

NOTE: Bank side determined when facing DOWN Stream

Riparian Zone Width **Riparian Zone Encroachment** ☐ Yes ☐ No

Right Bank: ☐ 0 – 15 feet ☐ 16 – 50 feet ☐ 51 – 150 feet ☐ 150 – 300 feet ☐ Greater than 300 feet
Left Bank: ☐ 0 – 15 feet ☐ 16 – 50 feet ☐ 51 – 150 feet ☐ 150 – 300 feet ☐ Greater than 300 feet

Indicate dominant vegetation type within riparian zone (~18 meter buffer),and record dominant species present:

☐ Trees ☐ Shrubs ☐ Grasses ☐ Herbaceous ☐ Invasive - Dominant species present:_____

Bank Canopy Vegetation:
Left Bank ☐ 100% (Shaded) ☐ 75% ☐ 50% ☐ 25% ☐ 0% (No Cover)
Right Bank ☐ 100% (Shaded) ☐ 75% ☐ 50% ☐ 25% ☐ 0% (No Cover)

Channel Canopy: ☐ Open ☐ Closed

Presence of Large Woody Debris (LWD): ☐ Significant ☐ Moderate ☐ Minimal ☐ None

Presence of aquatic vegetation: ☐ None ☐ Normal ☐ Excessive - Describe:_____

INSTREAM FEATURES

Average Stream Width _____ ft

Active Streambank Erosion for Segment

☐ None ☐ Minimal ☐ Moderate ☐ Heavy

Surface Velocity: ☐ Slow ☐ Moderate ☐ Fast

Flow Status: ☐ Low ☐ Moderate ☐ High

Springs/Seeps: ☐ Abundant ☐ Minimal ☐ None

Adjacent Wetlands: ☐ Abundant ☐ Minimal ☐ None

Proportion of Stream Morphology Types

☐ Riffle_____% ☐ Run_____% ☐ Pool_____%

Average Number of Riffles in section _____

Channelization ☐ No ☐ Yes: Length of Straitening ____ft

Dam Present (Beaver or Human) ☐ Yes ☐ No

Constrictions Present : ☐ None ☐ Culvert ☐ Bridge
☐ Old Abutment ☐ Bedrock Outcrop ☐ Other _____

Stream Ford or Animal Crossing Present ☐ Yes ☐ No

Debris Jam Present ☐ Yes ☐ No

Connectivity to Flood Plain
(Zero percent equals not connected to flood plain)

Right Bank: ☐ 100% ☐ 75% ☐ 50% ☐ 25% ☐ 0%
Left Bank: ☐ 100% ☐ 75% ☐ 50% ☐ 25% ☐ 0%

WATER QUALITY

(During visual assessment use pH and conductivity meters to take reading.)

WQ Instrument(s) Used

_____
_____

pH _____ (Top of section) H2O Temp _____(Top)
pH_____(Bottom of section) °F or C _____(Bot.)

Specific Conductance (Top) _____ (Bottom)_____
TDS (Top) _____ (Bottom)_____

Turbidity (if not measured)
☐ Clear ☐ Slightly turbid ☐ Turbid
☐ Opaque ☐ Stained ☐ Other_____

Water Odors
☐ Normal/None ☐ Sewage ☐ Petroleum
☐ Chemical ☐ Fishy ☐ Other_____

Water Surface Oils
☐ Slick ☐ Sheen ☐ Globs ☐ Flecks
☐ None ☐ Other_____

Overall Water Quality

☐ Excellent ☐ Good ☐ Fair ☐ Poor

Primary source(s) of water quality impact

☐ Agriculture ☐ Active Pasture ☐ AMD
☐ Gas Wells ☐ Development ☐ Sewage
☐ Bank Erosion ☐ Sedimentation

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)

Substrate Type	Diameter	% Composition in Sampling Reach
Bedrock		
Boulder	> 256 mm (10")	
Cobble	64-256 mm (2.5"-10")	
Gravel	2-64 mm (0.1"-2.5")	
Sand	0.06-2mm (gritty)	
Silt	0.004-0.06 mm	
Clay	< 0.004 mm (slick)	

Additional Notes

WT Observed? Y or N **Coord. of Obs.:**

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Farnsworth Branch	**GIS ID #** _____
SEGMENT ID	**STREAM CLASS** CWF
LAT _____ **LONG** _____	**RIVER BASIN** Tionesta Creek
STORET # N/A	**AGENCY** Warren County Conservation District
INVESTIGATORS	
FORM COMPLETED BY	**DATE** _____ **TIME** _____ **AM PM**
	REASON FOR SURVEY Visual Assessment

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate & Available Cover	Greater than 70% (50% for low gradient streams) of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% (30-50% for low gradient streams) mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% (10-30% for low gradient streams) mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% (10% for low gradient streams) stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/ Depth Regimes	All 4 velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (slow is <0.3 m/s, deep is >0.5 m).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET – HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE ___	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) **Note: determine left or right side by facing downstream**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) **Note: determine left or right side by facing downstream**	More than 90% of the streambank surfaces and immediate riparian zones covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score _____

HABITAT ASSESSMENT SCORE SHEET
HIGH GRADIENT STREAM

STREAM NAME Farnsworth Branch	**GIS ID #** ____------____	
SEGMENT ID	**STREAM CLASS** CWF	
LAT _____ **LONG** _____	**RIVER BASIN** Tionesta Creek	
STORET # N/A	**AGENCY** Warren County Conservation District	
INVESTIGATORS		
FORM COMPLETED BY	**DATE** _____ **TIME** _____ **AM PM**	**REASON FOR SURVEY** Visual Assessment

Habitat Parameter	Score	Explanation of Score Given *(Complete especially for poor rating)*	
1. Epifaunal Substrate /Available Cover			
2. Embeddedness			
3. Velocity/ Depth Regimes			
4. Sediment Deposition			
5. Channel Flow Status			
6. Channel Alteration			
7. Frequency of Riffles (or bends)			
8. Bank Stability (score each bank) *Note: determine left or right side by facing downstream*	Total of LB & RB	(LB)	
		(RB)	
9. Vegetative Protection (score each bank) *Note: determine left or right side by facing downstream*	Total of LB & RB	(LB)	
		(RB)	
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Total of LB & RB	(LB)	
		(RB)	
Total Score		**Add all scores and divide by the number of scores given.**	