2021 BASIN HIGHLIGHTS REPORT

FOR THE

SULPHUR RIVER BASIN

Prepared in Cooperation with the Texas Commission on Environmental Quality

The preparation of this report was financed through funding from the Texas Commission on Environmental Quality.

OVERVIEW

The Texas Clean Rivers Program (CRP) was created by the Texas Legislature in 1991 through the Texas Clean Rivers Act. The CRP is designed to do the planning, coordination, and reporting of water quality monitoring and to involve the public in the process. The program is administered by the Texas Commission on Environmental Quality (TCEQ) and is funded by state-collected fees. The goals of the CRP are to maintain and improve the quality of water within each river basin in Texas through an ongoing partnership involving the TCEQ, river authorities, other state agencies, regional entities, local governments, industry, and citizens. Through the program's watershed management approach, the CRP identifies and evaluates water quality issues, establishes priorities for corrective action, works to implement those actions, and adapts to changing priorities.

The Sulphur River Basin Authority (SRBA) coordinates the CRP for the Sulphur River Basin. To guide its efforts under the CRP, the SRBA has established a Steering Committee to set priorities for the Sulphur River Basin. The Steering Committee members represent the diverse interests of the stakeholders in the Sulphur River Basin. Everyone and every organization in the river basin is a stakeholder, and the CRP is designed to address stakeholder concerns. The CRP investigates water quality concerns and coordinates efforts in order to address water quality issues. Individuals and representatives of organizations are encouraged to attend the SRBA Steering Committee meetings and to become members of the committee.

The Basin Highlights Report (BHR) is an annual report required under the CRP by the Texas Clean Rivers Act. The purpose of the report is to provide an overview of water quality conditions and issues in a watershed in the Sulphur River Basin. As a participant in the Texas Clean Rivers Program, SRBA submits its annual BHR to the TCEQ. SRBA contracts with Texarkana College (TC) to collect, analyze, and report data for the CRP to the TCEQ. The TCEQ and CRP partners use this report and others submitted throughout the state to develop and prioritize programs that protect the quality of healthy water bodies and improve the quality of impaired water bodies.

SULPHUR RIVER BASIN

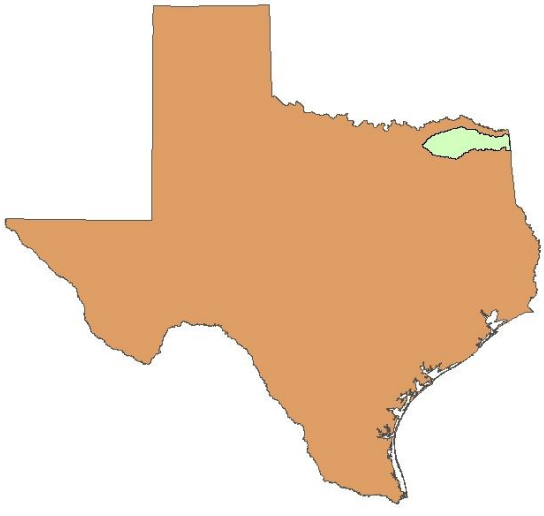

Figure 1- Location of the Sulphur River Basin in Texas

The Sulphur River Basin (SRB) is contained within 11 counties in far northeast Texas. The SRB is identified as 3 or 03 by the TCEQ, so all waterways within the basin begin with 03. There are seven classified waterways in the SRB. From West to East they are 0306 Upper South Sulphur, 0305 North Sulphur, 0307 Jim Chapman Lake, 0303 Sulphur, 0302 Wright Patman Lake (WPL), 0301 Sulphur River Below WPL, and 0304 Days Creek. The focus of this Basin Highlights Report is the 0304 watershed.

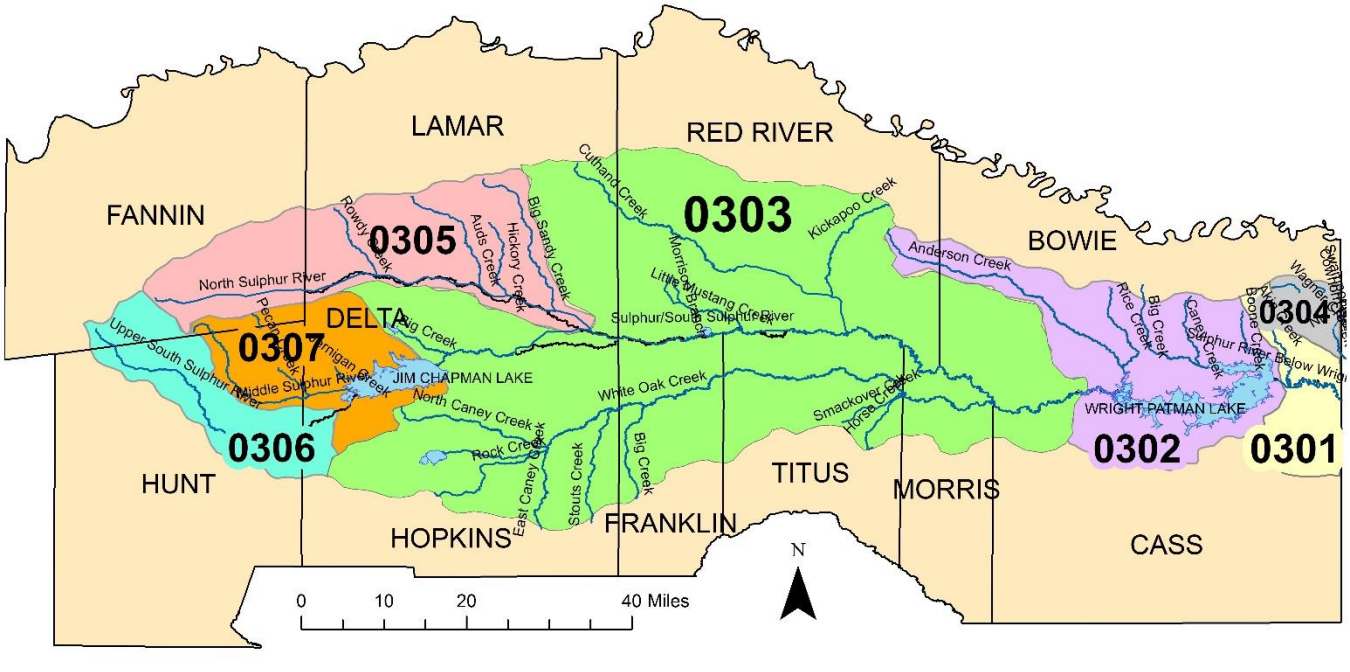

Figure 2 - The seven segments of the Sulphur River Basin

0304 SEGMENT

The 0304 segment is in the extreme east end of the SRB. It is a very urban environment of approximately 47 square miles almost entirely covered by the cities of Texarkana (pop. 36,411), Wake Village (pop. 5,492), and Nash (pop. 1,281). There are about 28 miles of waterways running through urbanized areas and are often channelized. Texarkana Water Utilities operates two wastewater treatment plants that are permitted to discharge over one million gallons daily into Wagner (also known as Waggoner) and Days Creeks. Wagner Creek and Days Creek also flow through EPA superfund sites that were industries for preservative treatment of wooden crossties.

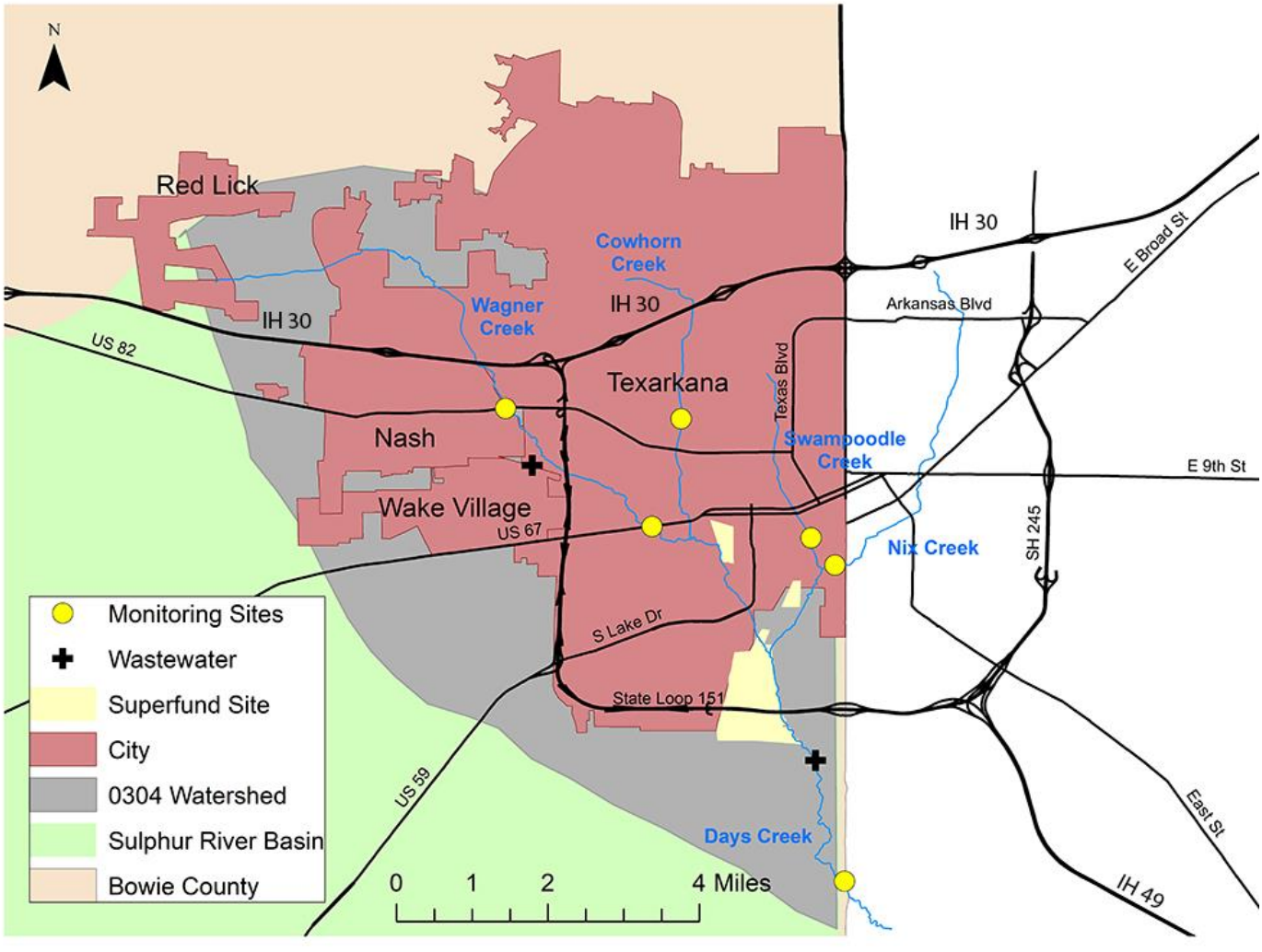

Figure 3 - Map of the 0304 segment

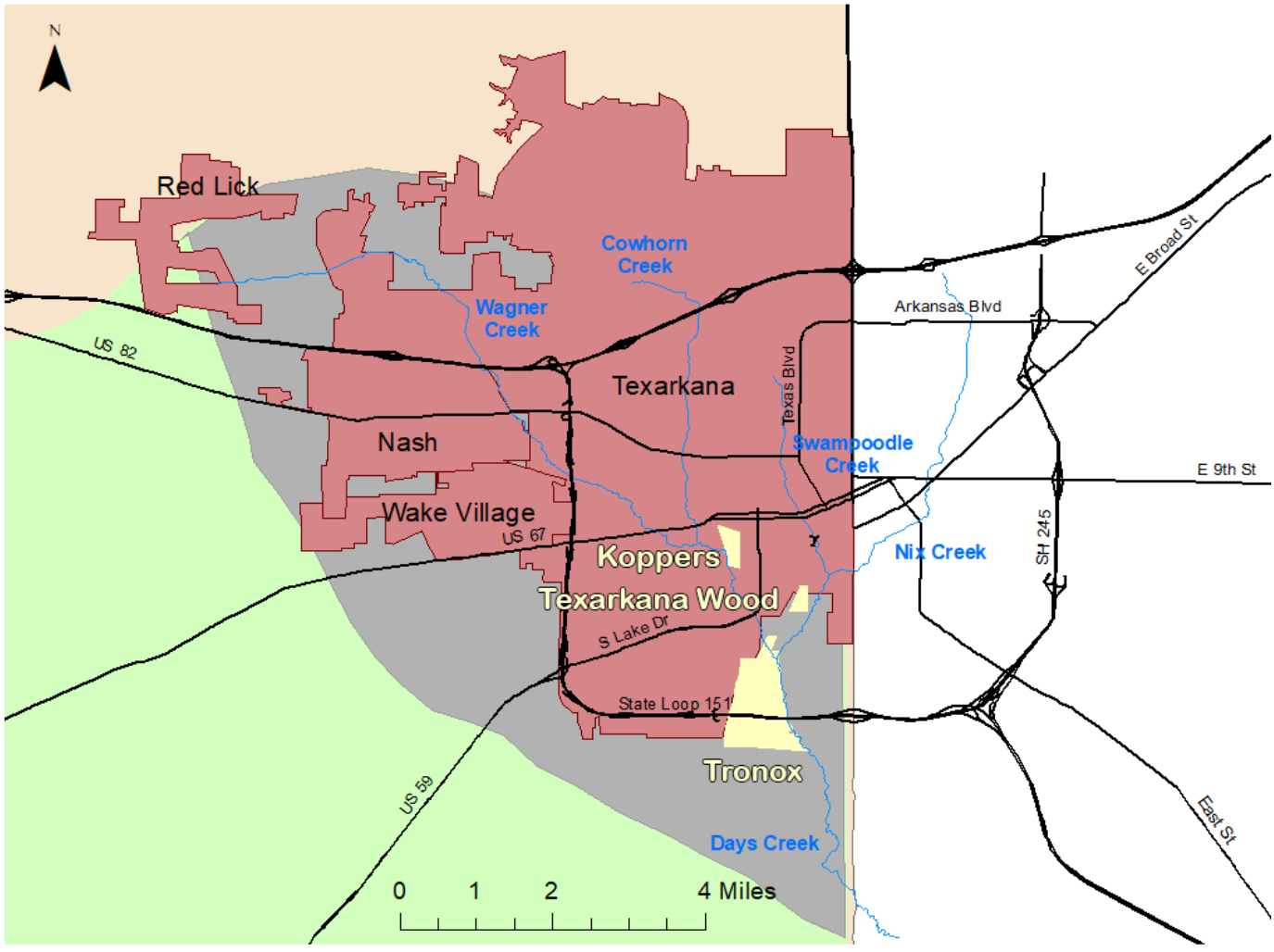

Figure 4 - Contamination sites in the 0304 segment

There are three large contamination sites in the 0304 segment. The largest is the Tronox (Kerr-McGee) site on the south side of the city. Days Creek flows along its eastern edge and Wagner Creek joins Days at the northern end. Approximately $21.3 million was recovered from legal settlements for natural resources damages associated with the release of hazardous substances at or from the site.

In October of 2020, the City of Texarkana, Texas released the Final Work Plan for the Days Creek Watershed Comprehensive Aquatic Ecosystem Restoration. This was adopted by the city in April of 2020. It includes ten projects with a funding of $9.8 million from a Natural Resource Damage Assessment (NRDA). For more details, see this page on the city website. There is a list of links at the end of the report.

The Koppers Co. operated a wood treatment plant on the site from 1903 to 1961 contaminating it with polycyclic aromatic hydrocarbon (PAHs). The Koppers site is where Carver Terrace corp. built a subdivision. The Environmental Protection Agency (EPA) has a

webpage describing the Koppers superfund site. Wagner Creek is a tributary to Days Creek and flows along its western edge.

Texarkana Wood Preserving Co. operated on the site from the early 1900s until 1984. The site used creosote and pentachlorophenol (PCP) for wood preservation. The EPA has a webpage describing the Texarkana Wood superfund site. Days Creek runs a little to the east of this site.

Table 1 - Descriptions of waterways

Segment	Name	Description
0304	Days Creek	From the Arkansas State Line in Bowie County to the confluence of Swampoodle Creek and Nix Creek in Bowie County.
0304A	Swampoodle Creek	From the confluence of Days Creek in central Texarkana in Bowie County to the upstream perennial portion of the stream in northern Texarkana in Bowie County
0304B	Cowhorn Creek	From the confluence of Wagner Creek in southern Texarkana in Bowie County to the upstream perennial portion of the stream in northern Texarkana in Bowie County
0304C	Wagner Creek	Perennial stream from the confluence with Days Creek to a point 1.5 km upstream of IH 30
0304D	Nix Creek	From the confluence with Swampoodle Creek to 1.6 kilometers (1 mile) directly east of the intersection of US HWY 271 and I30

Waterbody segments are divided into the two classifications of classified and unclassified. Classified segments have defined screening levels while unclassified segments have general screening levels, though they may be modified. Classified segments are identified by the basin number (e.g. 03 for SRB) and a number (e.g. 04 for Days Creek). Unclassified waterways have a letter that follows the number for the classified waterway.

Table 2 - Monitoring sites for FY2020-2021

Description	Station	Segment
DAYS CREEK AT STATELINE RD	10226	0304
SWAMPOODLE CREEK AT W BROAD ST	15342	0304A
COWHORN CREEK AT TUCKER ST	15254	0304B
WAGNER CREEK AT US 82	14475	0304C
WAGNER CREEK AT US HWY 67 / W 7TH STREET	21176	0304C
NIX CREEK AT STATE LINE AVENUE	10210	0304D

The Texas Integrated Report (IR) describes the status of Texas' natural waters based on historical data and the extent to which they attain the Texas Surface Water Quality

Standards. The TCEQ produces a new report every two years in even-numbered years, as required by law. Impairments and concerns used in this report are from the 2020 Texas Integrated Report. Using the impairments and concerns for this segment, data for bacteria, ammonia, nitrate, dissolved oxygen, and phosphorus are the only ones examined in this highlights report at the current monitoring sites. The data is from 1-1-2001 to 12-31-2020

Table 3 - Impairments and concerns

Name	Segment	Impairment 303(d)	Concern
Days Creek	304	Bacteria in water (Recreational Use)	Nitrate in water PAHs in sediment
Swampoodle Creek	304A		Bacteria in water (Recreational Use) Depressed DO in water
Cowhorn Creek	304B		Impaired habitat in water Impaired macrobenthic community in water
Wagner Creek	304C	Bacteria in water (Recreational Use)	Ammonia in water Depressed DO in water Nitrate in water Total phosphorus in water
Nix Creek	304D		Impaired habitat in water

E. Coli is an intestinal bacterium of animals. Historical analysis in the 2019 Basin Summary Report found that *E. Coli* concentration increased with increased flow suggesting that the waste products from animals and/or humans are entering the waterways with runoff. All the waterways in the 0304 watershed are at the highest screening level of 126 colony forming units (CFU) for 100 ml of water.

Bacteria in the water also use oxygen for respiration. High levels of bacteria can lead to lower levels of dissolved oxygen (DO) in the water.

Sulfates and the nitrogen compounds (nitrates, TKN, ammonia) are common in wastewater discharge. Also often found in wastewater discharge is phosphorus.

The impervious surfaces (concrete and asphalt) of urban areas do not allow rainfall to enter the ground creating large amounts of runoff. Cities often channelize waterways to quickly remove this runoff. Channelizing (dug out and concreted) destroys the rocks and dirt found at the bottoms of waterways where benthics live. Channelizing leads to impaired habitats. The types of benthics found in the waterway vary depending on the quality of the water and are used as indicators of water quality.

WATERWAYS

Days Creek (0304)

Days Creek is the classified segment for the 0304 watershed. As the classified segment, it has its own defined criterion. It is the waterway from the Arkansas State Line in Bowie County to the confluence of Swampoodle Creek and Nix Creek in Bowie County.

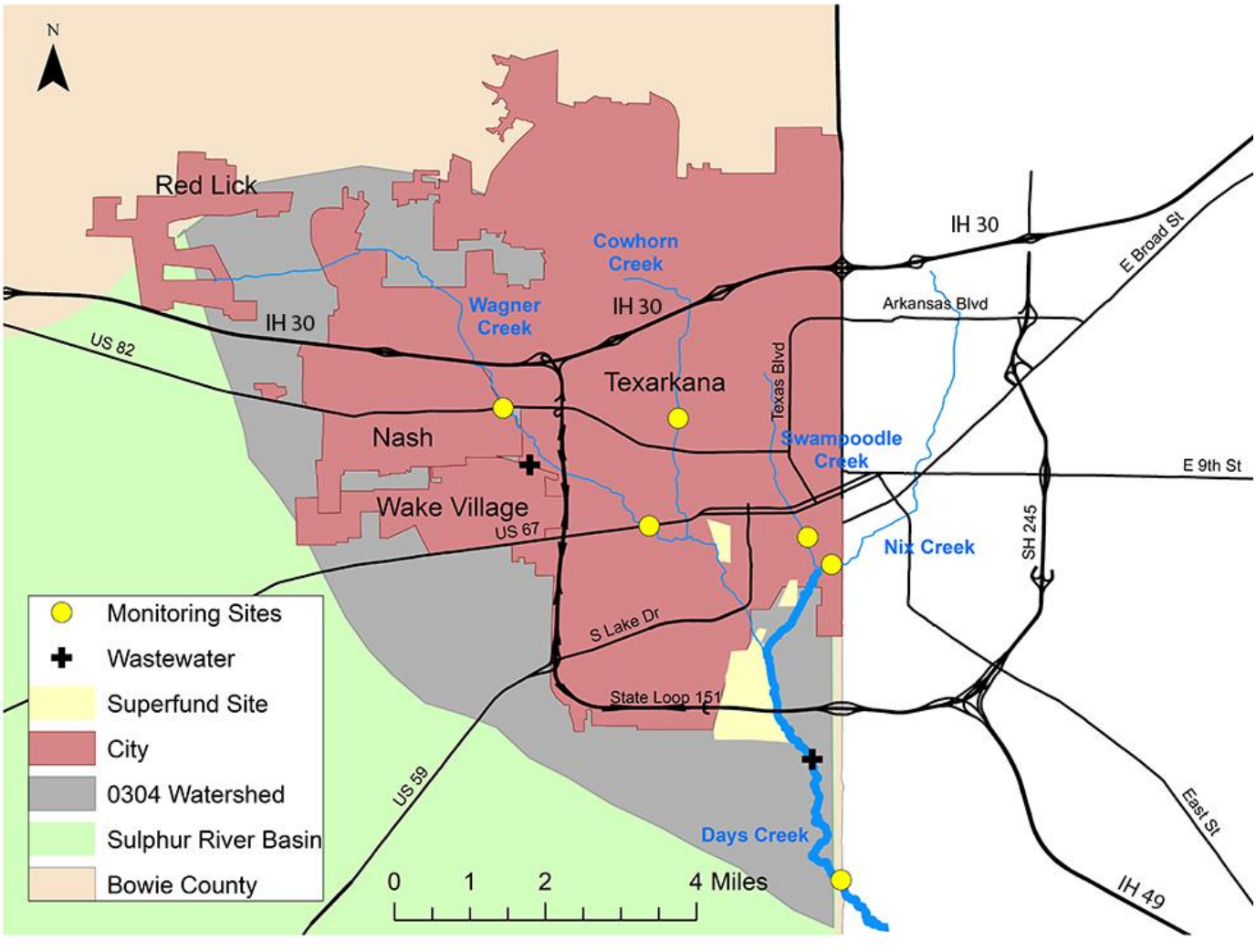

Figure 5 - Map of Days Creek

Days Creek runs along the east side of the Tronox site and by the Texarkana Wood site. The hydrocarbons are not water soluble and the PAHs from this show up in the sediment far from the original sites. So, Days Creek has concerns for polycyclic aromatic hydrocarbons that are present in the sediment. Days Creek also has concerns for high levels of nitrates.

Table 4 - Criterion for Days Creek

Criterion	Limit	Problem
Recreation Use	PCR1	
Aquatic Life Use	I	
E. Coli #/100 mL	126	Impaired
Temp. (degrees C)	32.2	
Dissolved Oxygen (mg/L) Min	3	
Dissolved Oxygen (mg/L) Low	4	
pH High (SU)	8.5	
pH Low (SU)	6	
Cl^{-1} (mg/L)	525	
SO_4^{-2} (mg/L)	75	
TDS (mg/L)	850	
Ammonia (mg/L)	0.33	
Chlorophyll-a (µg/L)	14.1	
Nitrate (mg/L)	1.95	Concern
Total P (mg/L)	0.69	
PAH in sediment	N/A	Concern

Figure 6 - Field monitoring in Days Creek

It drains most of Texarkana and is regularly impacted by high levels of urban runoff. It is below the Texarkana Wastewater Treatment Plant that adds 8-10 million gallons per day of treated effluent to the stream during normal flow. It is also often the site for illegal dumping.

Figure 7 - Illegal dumping found at Days Creek site

The NRDA projects near Days Creek include the preservation of 64 acres of wet forestland and 100 acres of forested riparian habitat. An assessment of the feasibility of adding 23 acres of wetland near the confluence of Days and Howard Creeks will be performed. Additionally, about 2000 linear feet of restoration and enhancement at the confluence is planned.

Swampoodle Creek (0304A)

Swampoodle Creek is the waterway from the confluence of Days Creek in central Texarkana in Bowie County to the upstream perennial portion of the stream in northern Texarkana in Bowie County. It has concerns for bacteria and an impaired macrobenthic community.

The NRDA projects include wetland restoration of about three acres at the head and stream restoration with the removal of concrete channelization, restoration of the natural channel, and bank stabilization along most of the rest of the waterway.

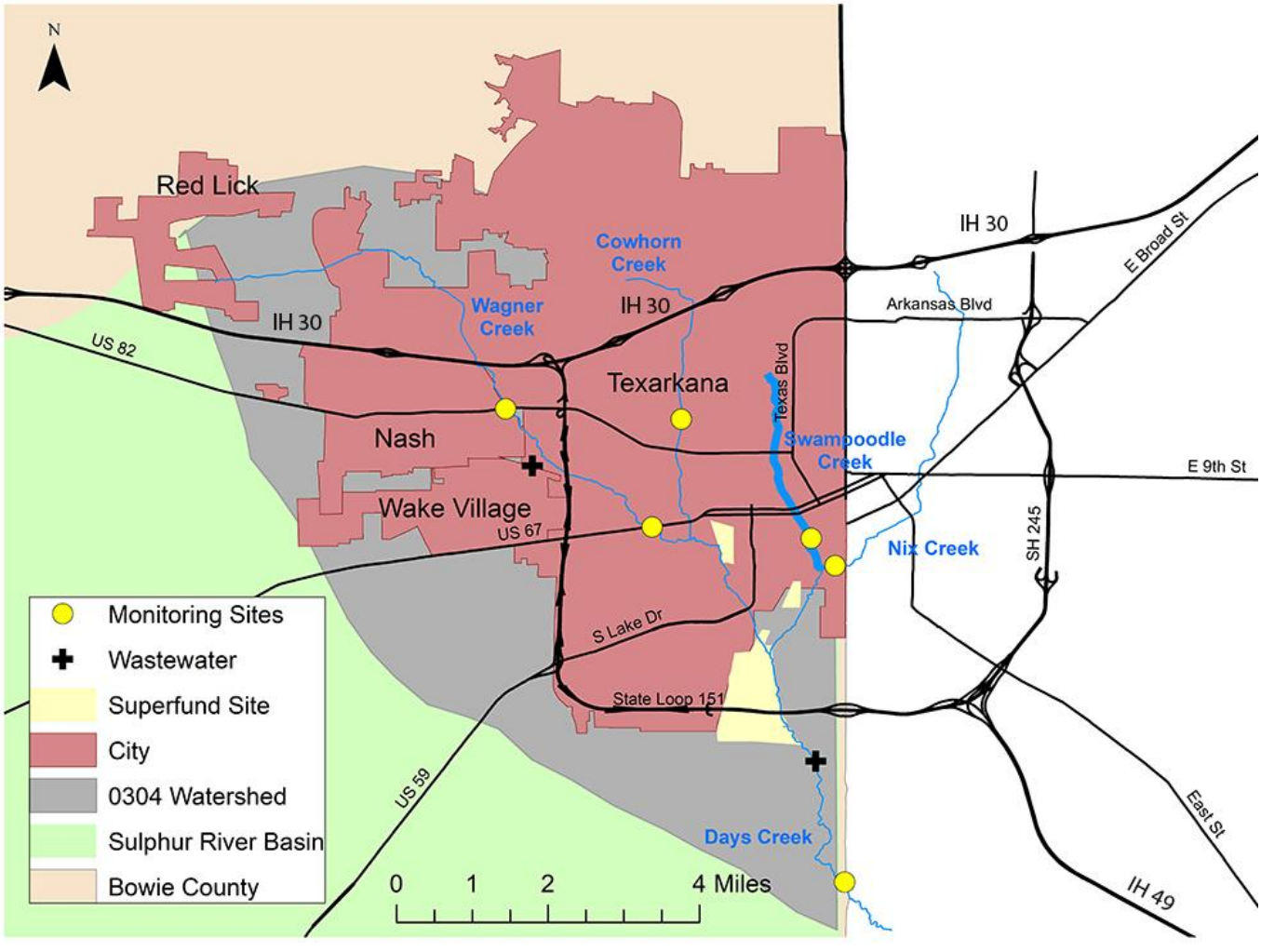

Figure 8 - Map of Swampoodle Creek

Figure 9 - Field monitoring in Swampoodle Creek

Table 5 - Criterion for Swampoodle Creek

Criterion	Limit	Problem
Recreation Use	PCR1	
Aquatic Life Use	H	
E. Coli #/100 mL	126	Concern
Temp. (degrees C)	32.2	
Dissolved Oxygen (mg/L) Min	3	Concern
Dissolved Oxygen (mg/L) Low	5	Concern
pH High (SU)	8.5	
pH Low (SU)	6	
Cl^{-1} (mg/L)	120	
SO_4^{-2} (mg/L)	100	
TDS (mg/L)	500	
Ammonia (mg/L)	0.33	
Chlorophyll-a (µg/L)	14.1	
Nitrate (mg/L)	1.95	
Total P (mg/L)	0.69	

Cowhorn Creek (0304B)

Cowhorn Creek is the waterway from the confluence of Wagner Creek in southern Texarkana in Bowie County to the upstream perennial portion of the stream in northern Texarkana in Bowie County. It has concerns for impaired habitat with an impaired macrobenthic community.

The NRDA project is to do stream restoration along most of the channel with six acres of wetland restoration and three acres of forest preservation.

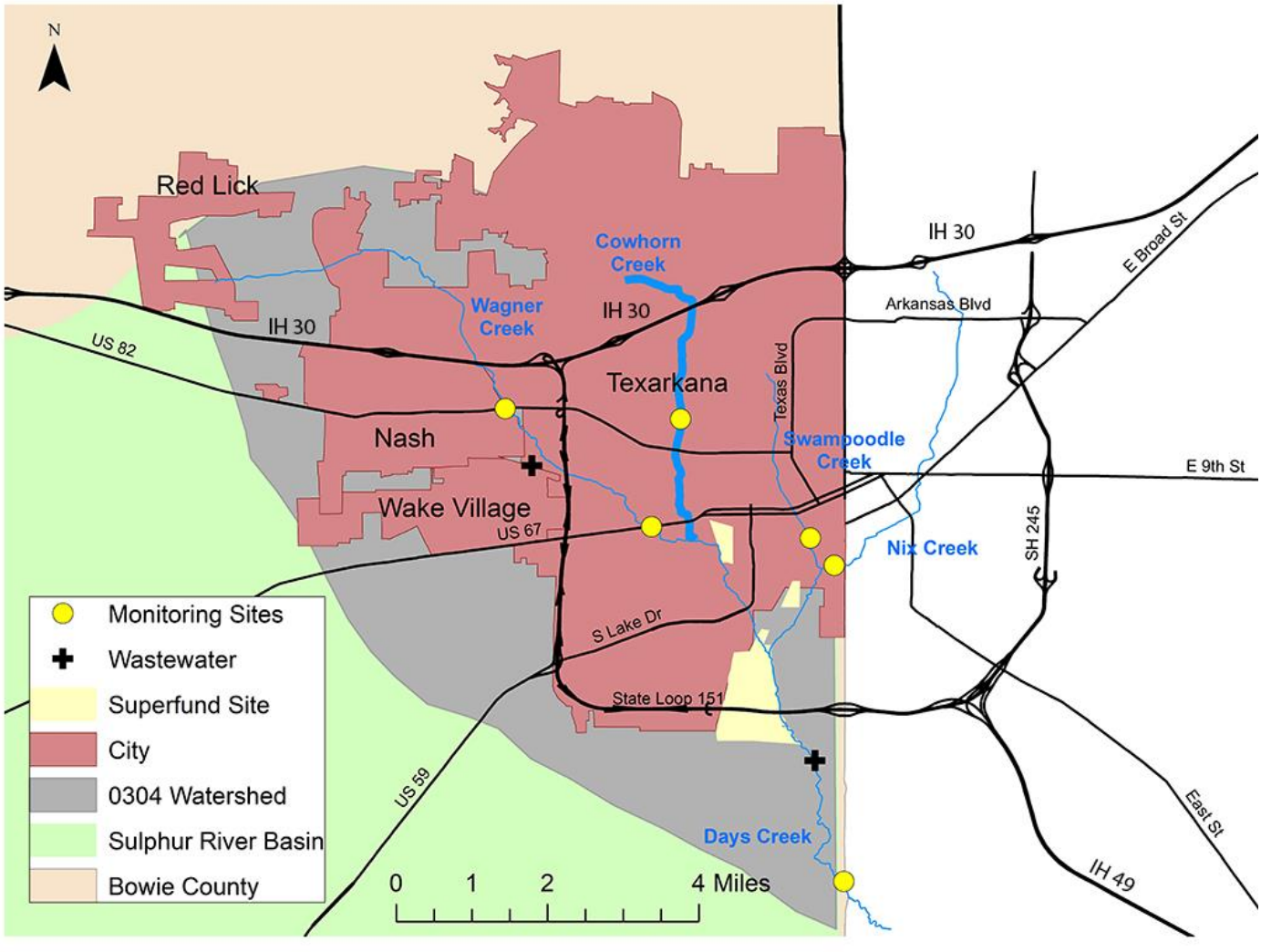

Figure 10 - Map of Cowhorn Creek

Figure 11 - Field monitoring in Cowhorn Creek

Table 6 - Criterion for Cowhorn Creek

Criterion	Limit	Problem
Recreation Use	PCR1	
Aquatic Life Use	H	Concern
E. Coli #/100 mL	126	
Temp. (degrees C)	32.2	
Dissolved Oxygen (mg/L) Min	3	
Dissolved Oxygen (mg/L) Low	5	
pH High (SU)	8.5	
pH Low (SU)	6	
Cl^{-1} (mg/L)	120	
SO_4^{-2} (mg/L)	100	
TDS (mg/L)	500	
Ammonia (mg/L)	0.33	
Chlorophyll-a (µg/L)	14.1	
Nitrate (mg/L)	1.95	
Total P (mg/L)	0.69	

Wagner Creek (0304C)

Wagner Creek (also known as Waggoner Creek) is the perennial stream from the confluence with Days Creek to a point 1.5 km upstream of IH 30. An extension of Gibson Lane (North of I-30) sees the construction of a bridge over Wagner. Wagner Creek receives the effluent from Texarkana Water utilities wastewater treatment plant located in Wake Village, Texas. Wagner Creek has an impairment for bacteria. It has concerns for low DO, nitrogen (ammonia and nitrate), and phosphorus.

The NRDA project is to restore a more natural channel with stabilized banks and restore riparian wetlands and forested wetlands.

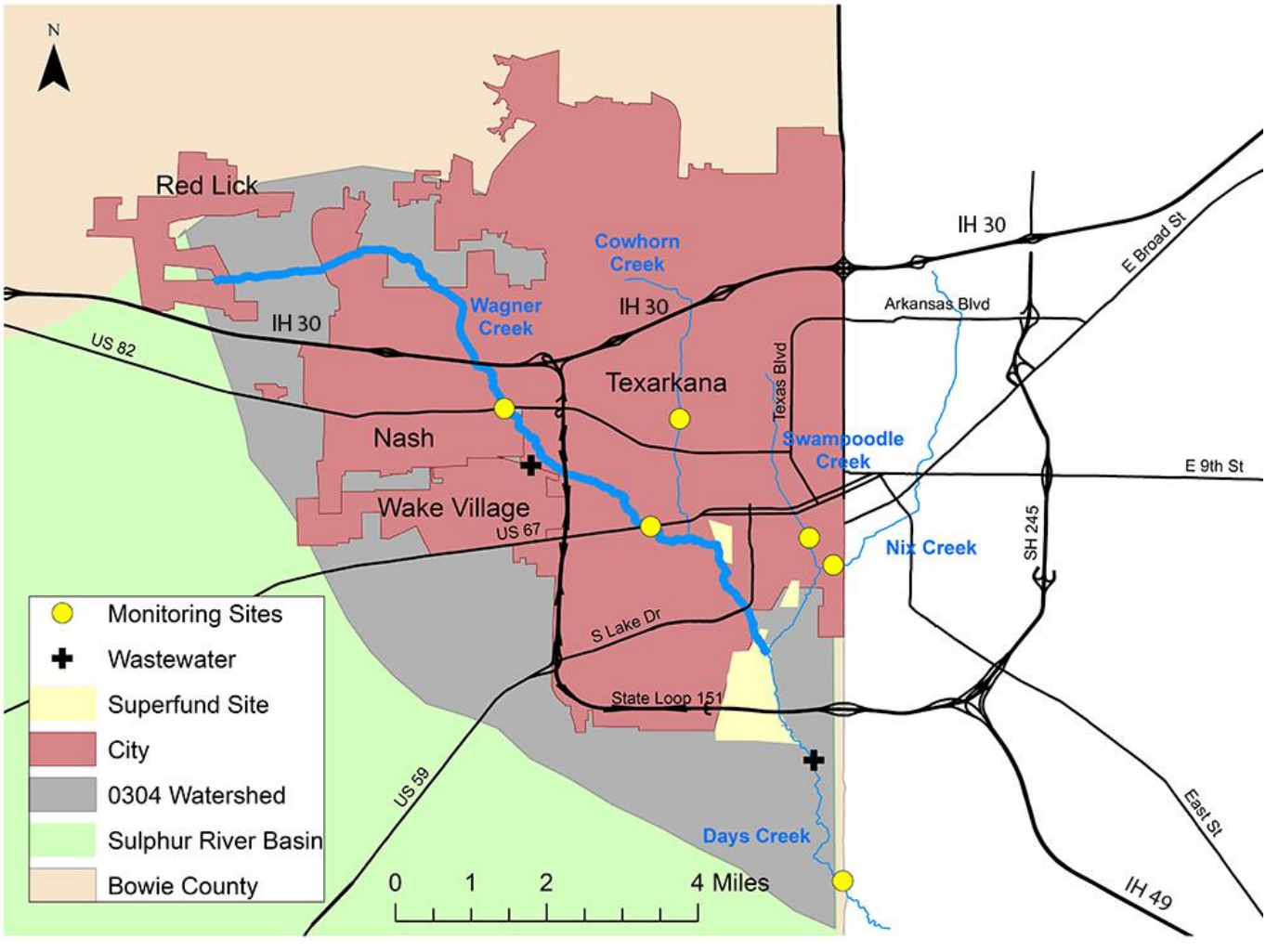

Figure 12 - Map of Wagner Creek

Figure 13 - Field monitoring in Wagner Creek

Figure 14 - Bridge construction over Wagner Creek

Table 7 - Criterion for Wagner Creek

Criterion	Limit	Problem
Recreation Use	PCR1	
Aquatic Life Use	I	Concern
E. Coli #/100 mL	126	Impaired
Temp. (degrees C)	32.2	
Dissolved Oxygen (mg/L) Min	3	Concern
Dissolved Oxygen (mg/L) Low	4	Concern
pH High (SU)	8.5	
pH Low (SU)	6	
Cl^{-1} (mg/L)	120	
SO_4^{-2} (mg/L)	100	
TDS (mg/L)	500	
Ammonia (mg/L)	0.33	Concern
Chlorophyll-a (µg/L)	14.1	
Nitrate (mg/L)	1.95	Concern
Total P (mg/L)	0.69	Concern

Nix Creek (0304D)

Nix Creek is the waterway from the confluence with Swampoodle Creek to 1.6 kilometers (1 mile) directly east of the intersection of US HWY 271 and I30. Nix drains most of northern Texarkana, Arkansas. Nix Creek has concerns for impaired habitat with an impaired macrobenthic community.

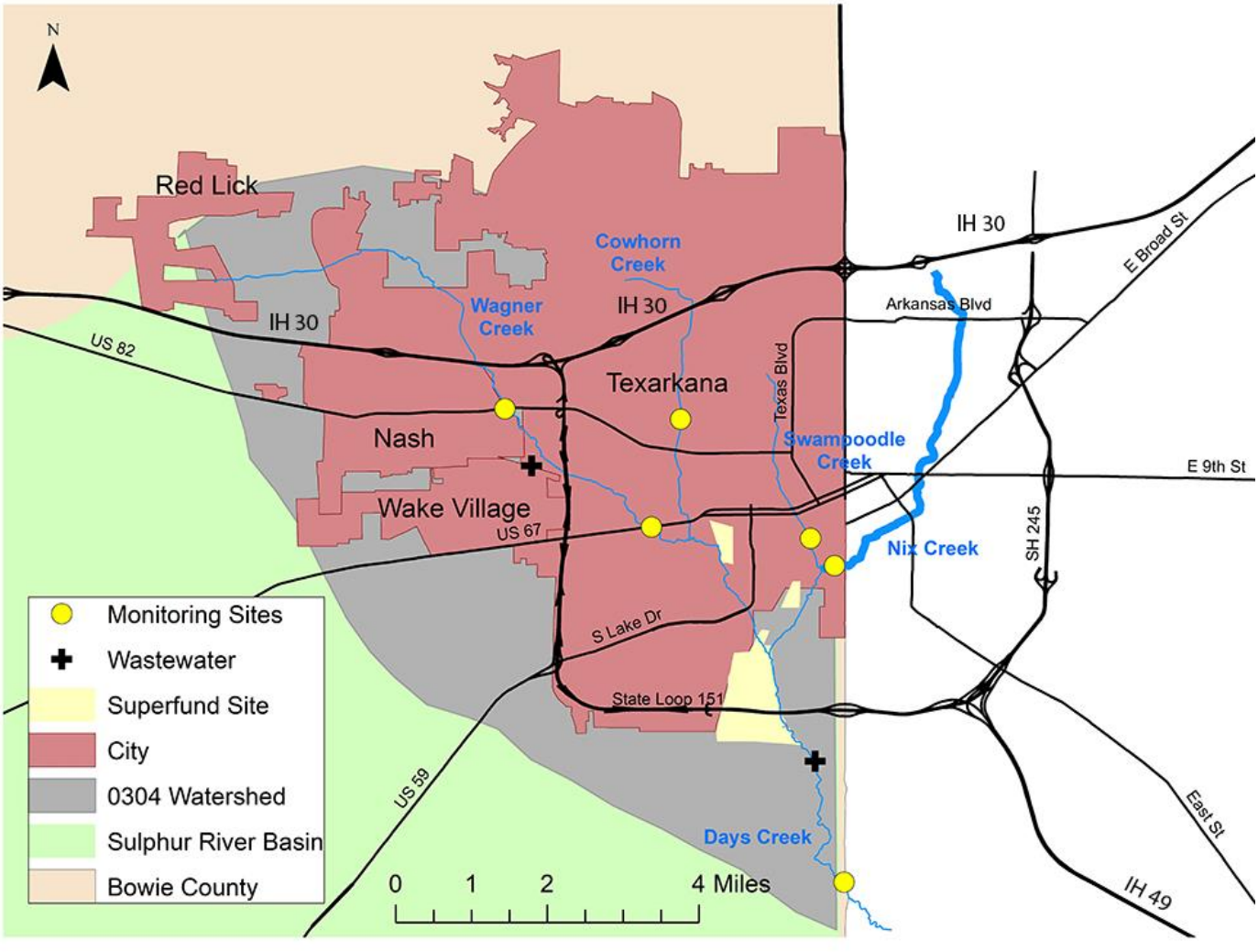

Figure 15 - Map of Nix Creek

Figure 16 - Field monitoring in Nix Creek

Table 8 - Criterion for Nix Creek

Criterion	Limit	Problem
Recreation Use	PCR1	
Aquatic Life Use	H	Concern
E. Coli #/100 mL	126	
Temp. (degrees C)	32.2	
Dissolved Oxygen (mg/L) Min	3	
Dissolved Oxygen (mg/L) Low	5	
pH High (SU)	8.5	
pH Low (SU)	6	
Cl^{-1} (mg/L)	120	
SO_4^{-2} (mg/L)	100	
TDS (mg/L)	500	
Ammonia (mg/L)	0.33	
Chlorophyll-a (µg/L)	14.1	
Nitrate (mg/L)	1.95	
Total P (mg/L)	0.69	

DATA

Dissolved Oxygen (24 Hour Minimum)

This is the oxygen that is dissolved in the water and biologically available. It is found using a probe that measures the DO for twenty-four hours. The minimum DO that was found during the 24 hour period becomes part of the SWQM dataset. The value for the waterway is shown as an orange line on the following graphs. The standard value for DO is usually 5 mg/l (green lines if a different value). The graphs are minimum DO values in twenty-four hours versus time.

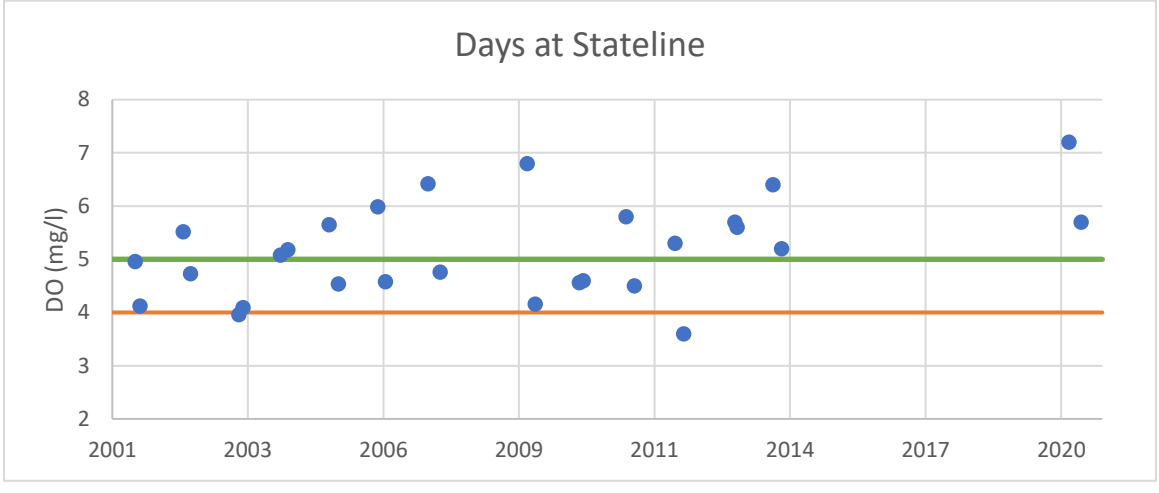

Figure 17 - Graph of DO versus time for Days at Stateline site. The orange line indicates the screening level of 4 mg/l and the green line indicates the normal level of 5 mg/l.

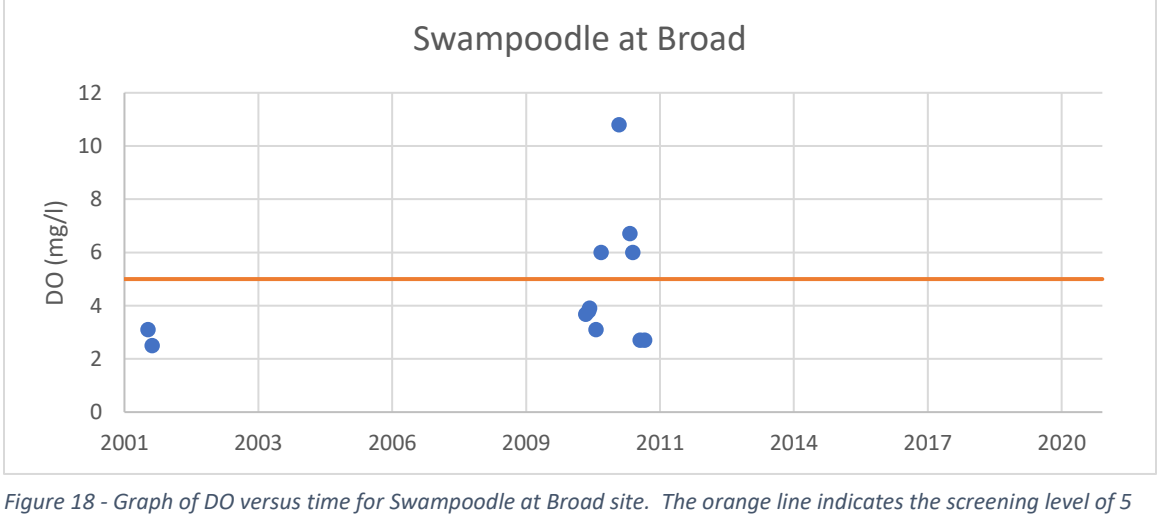

Figure 18 - Graph of DO versus time for Swampoodle at Broad site. The orange line indicates the screening level of 5 mg/l.

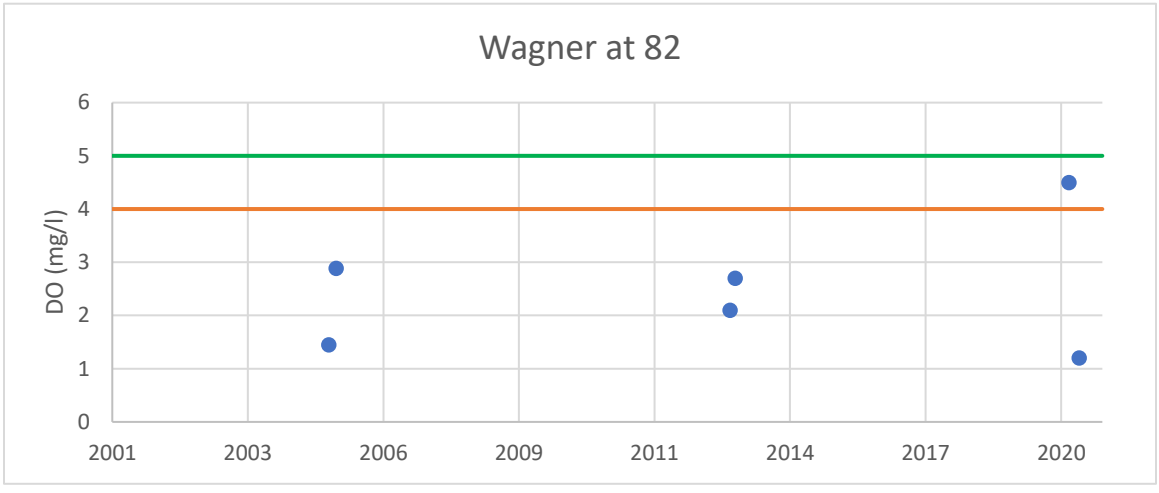

Figure 21 - Graph of DO versus time for Wagner at 82 site. The orange line indicates the screening level of 4 mg/l and the green line indicates the normal level of 5 mg/l.

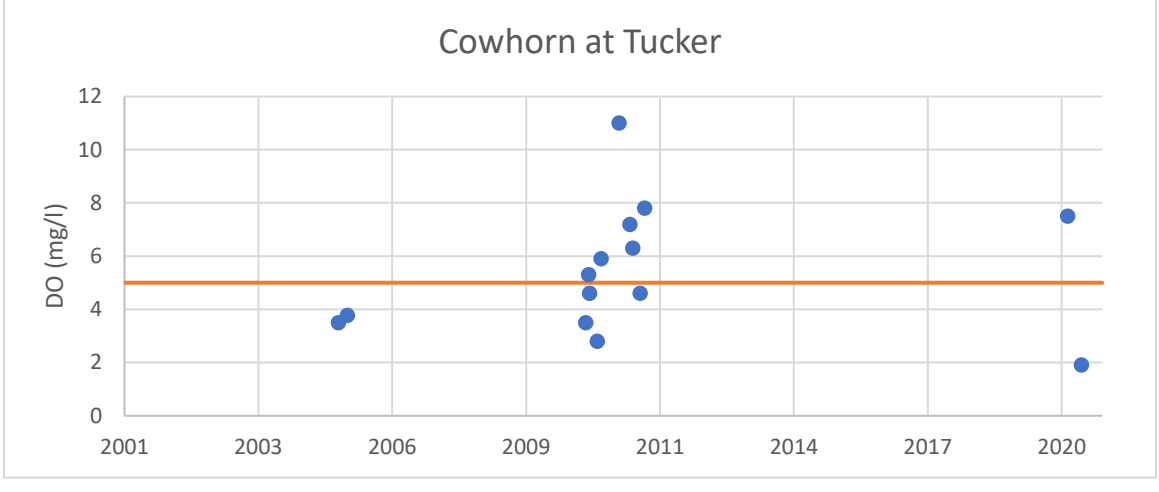

Figure 20 - Graph of DO versus time for Cowhorn at Tucker site. The orange line indicates the screening level of 5 mg/l.

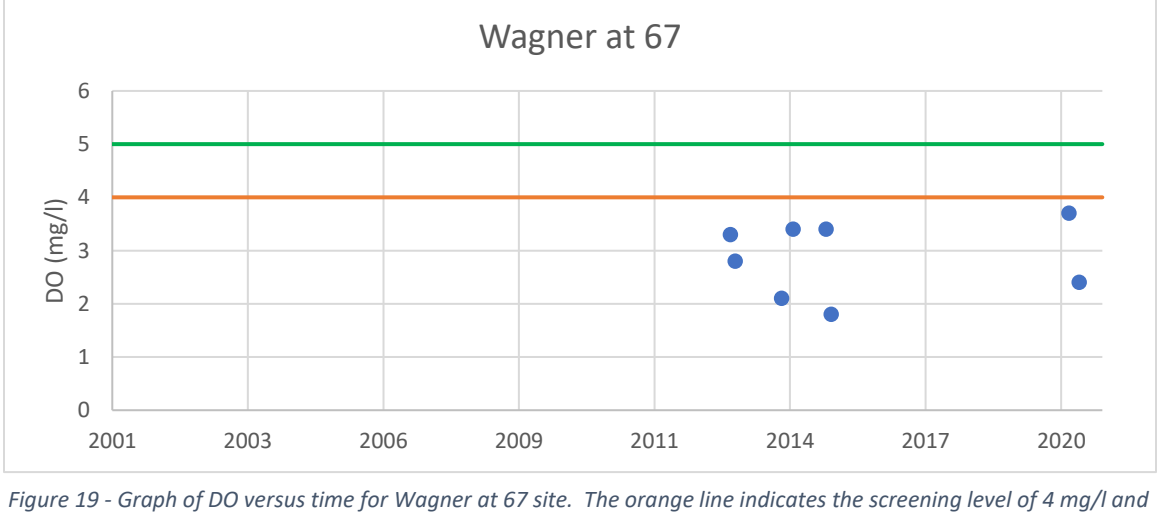

Figure 19 - Graph of DO versus time for Wagner at 67 site. The orange line indicates the screening level of 4 mg/l and the green line indicates the normal level of 5 mg/l.

Wagner has a concern for DO and both locations are showing low values for DO. Nix Creek did not have enough measurements to be included.

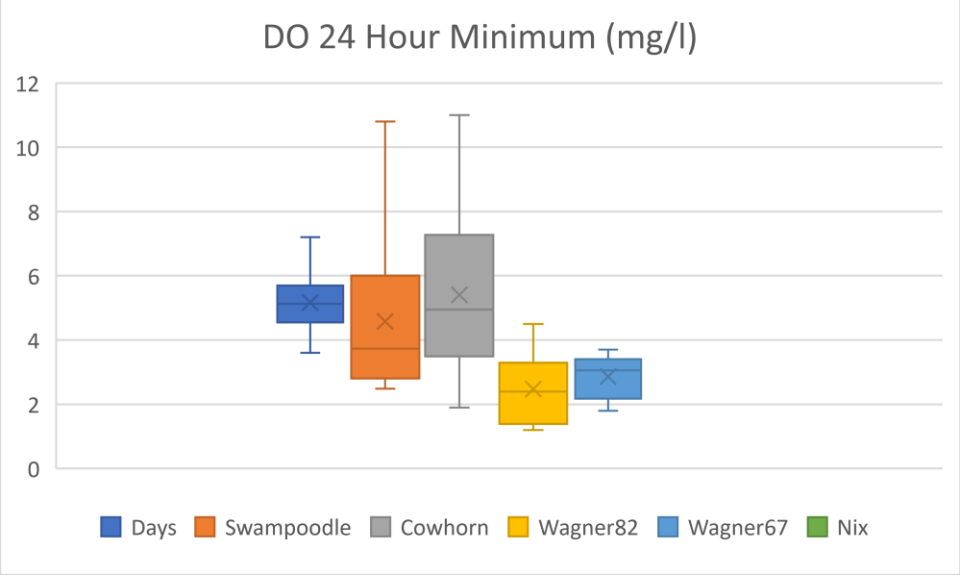

Figure 22 - Statistical analysis of DO 24 hour minimum for current sites

Dissolved Oxygen (Field samples)

During field measurements, a probe is used to find a DO reading at that time. The minimum value for DO is 3 mg/l for all the waterways. This is indicated by an orange line in the following graphs. The graphs are DO versus time.

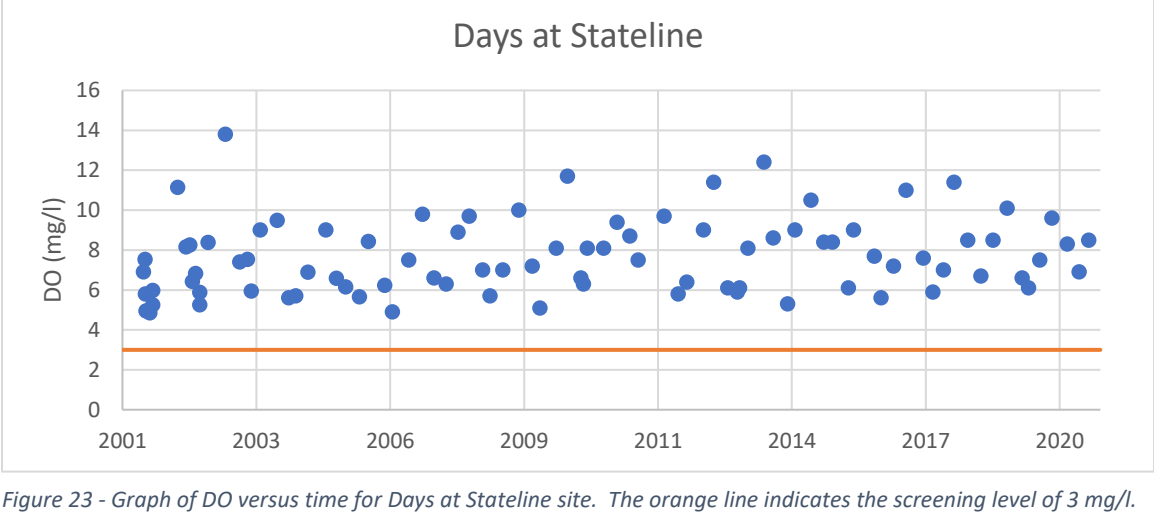

Figure 23 - Graph of DO versus time for Days at Stateline site. The orange line indicates the screening level of 3 mg/l.

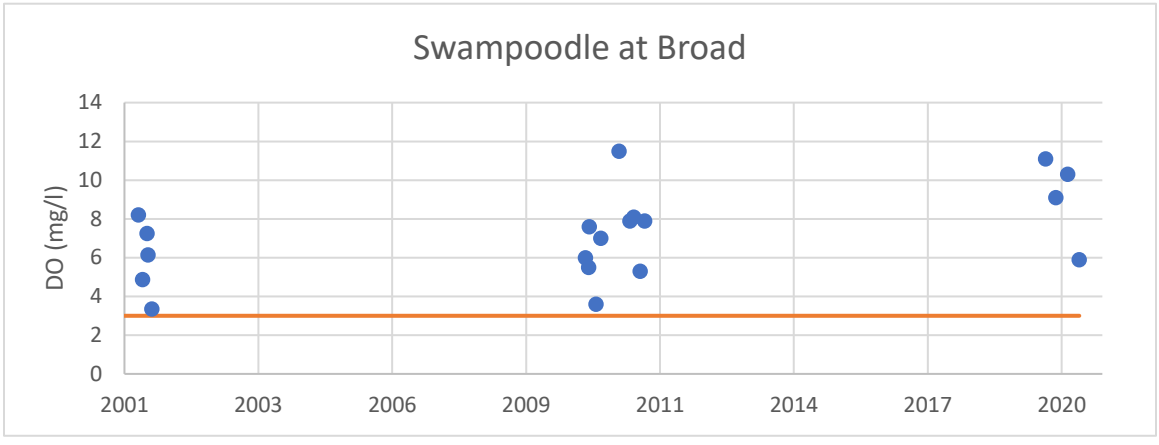

Figure 25 - Graph of DO versus time for Swampoodle at Broad site. The orange line indicates the screening level of 3 mg/l.

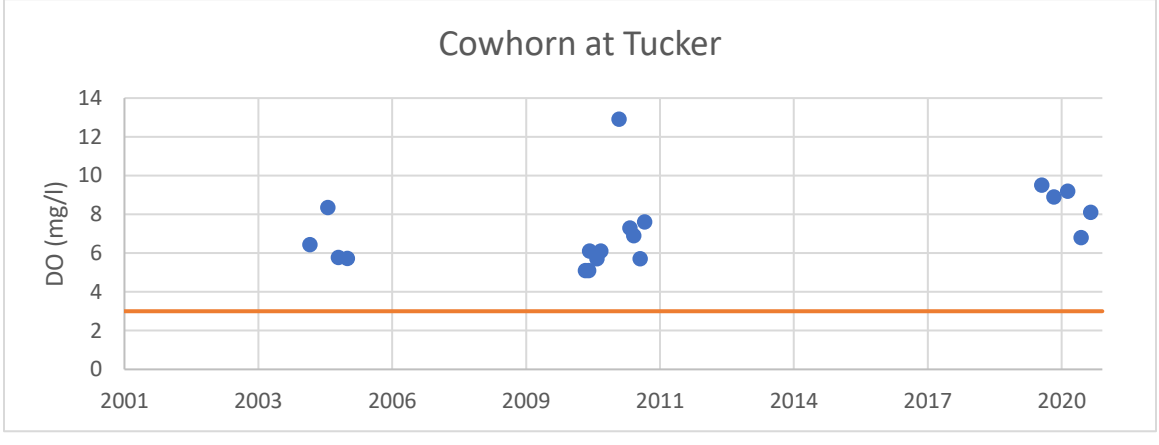

Figure 24 - Graph of DO versus time for Cowhorn at Tucker site. The orange line indicates the screening level of 3 mg/l.

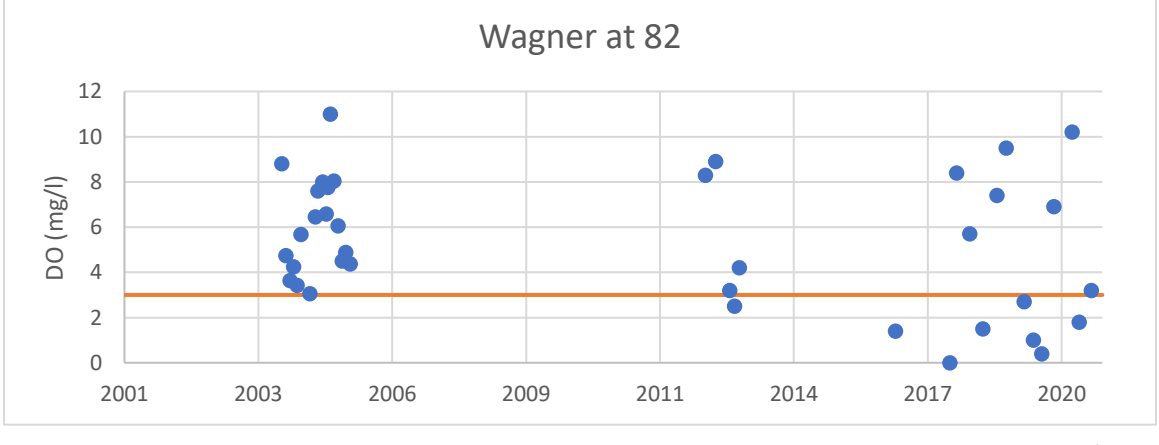

Figure 26 - Graph of DO versus time for Wagner at 82 site. The orange line indicates the screening level of 3 mg/l.

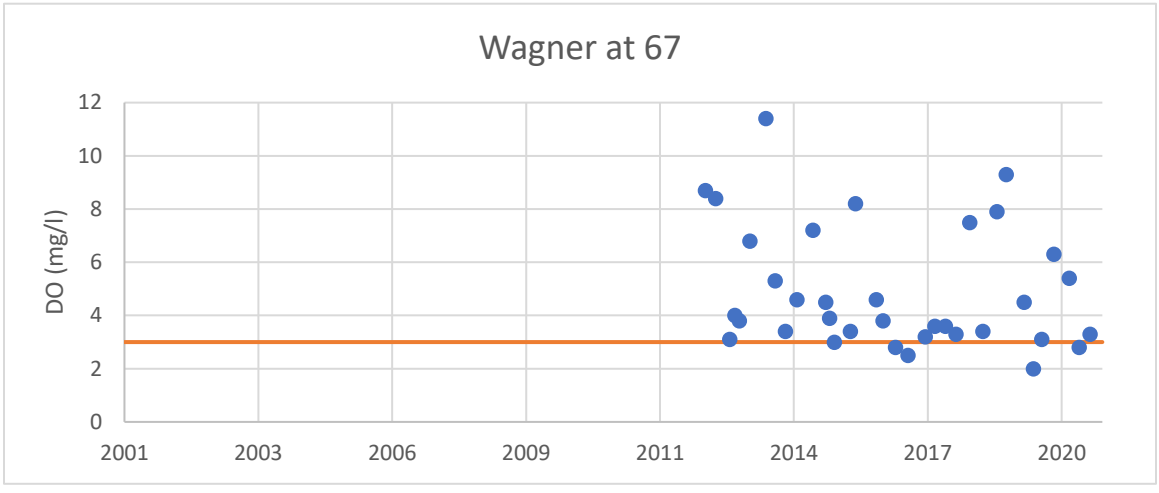

Figure 27 - Graph of DO versus time for Wagner at 67 site. The orange line indicates the screening level of 3 mg/l.

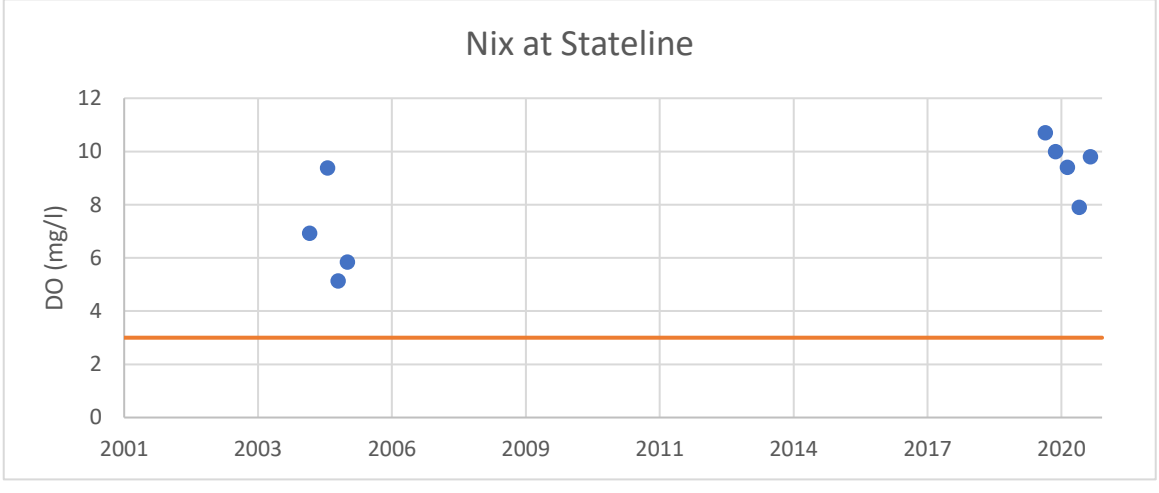

Figure 28 - Graph of DO versus time for Nix at Stateline site. The orange line indicates the screening level of 3 mg/l.

Again, Wagner shows low values for DO with several measurements below the lower limit of 3 mg/l.

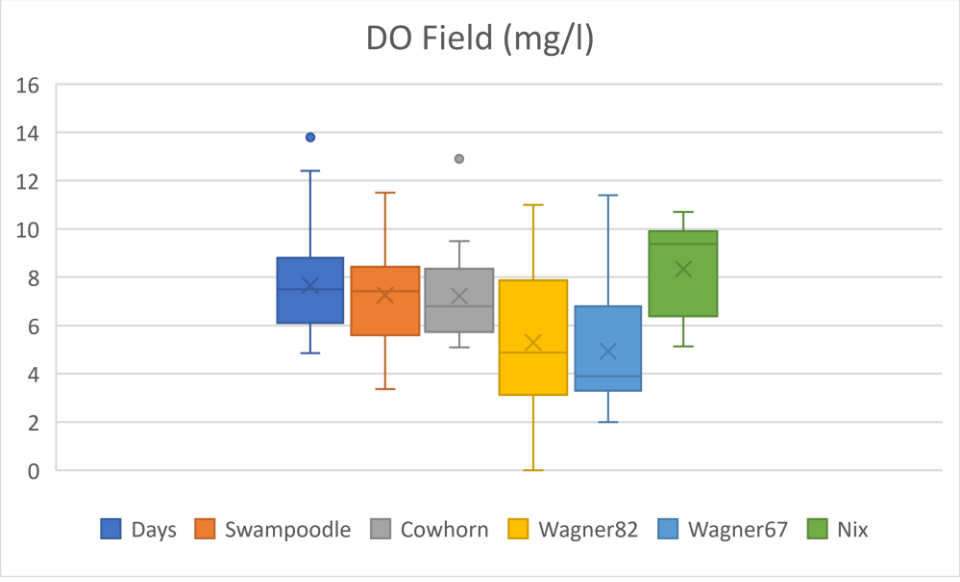

Figure 29 - Statistical analysis of DO field measurements at current sites.

E Coli

Water samples are taken and sent to the lab. The number of colonies that grow for every 100 ml of water is recorded in the SWQM database. All waterways here are designated as "Primary Contact Recreation 1" with a level of 126 colonies for every 100 ml of water. Texas administrative code uses this category unless there is evidence of high bacterial levels and there is evidence of limited aquatic recreation. The graphs below chart E. Coli versus time with the 126 level marked in orange. Because of the large changes in numbers, the graphs use a logarithmic scale.

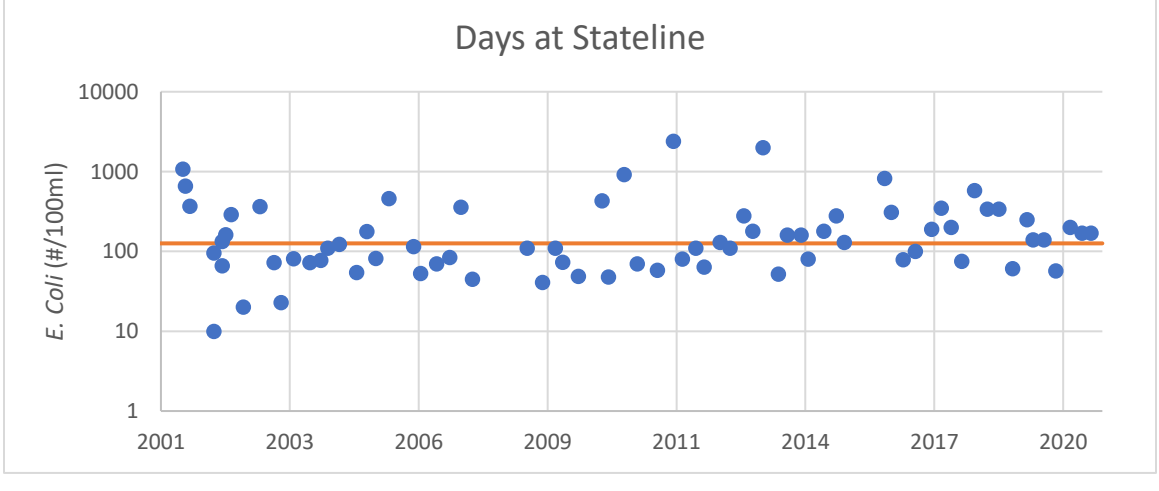

Figure 30 - Graph of E. Coli versus time for Days at Stateline site. The orange line indicates the screening level of 126/100ml.

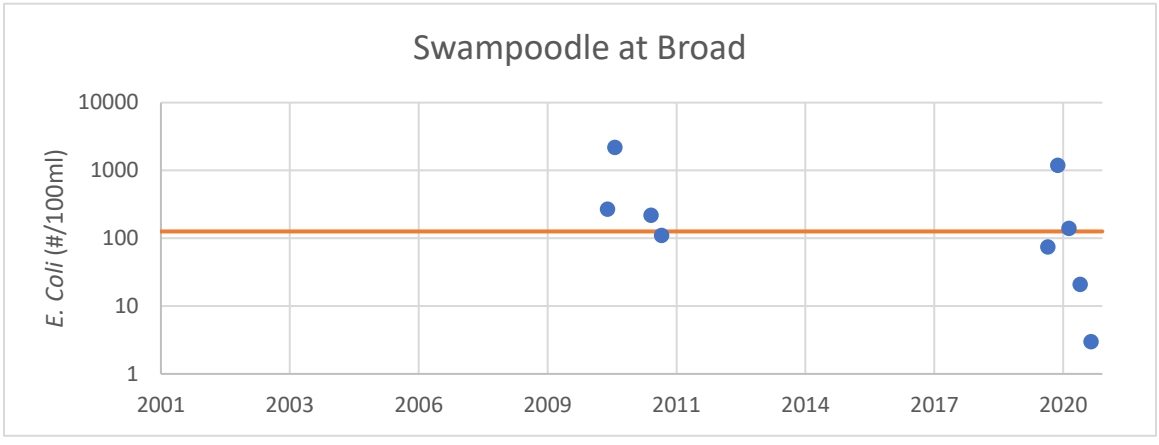

Figure 31 - Graph of E. Coli versus time for Swampoodle at Broad site. The orange line indicates the screening level of 126/100ml.

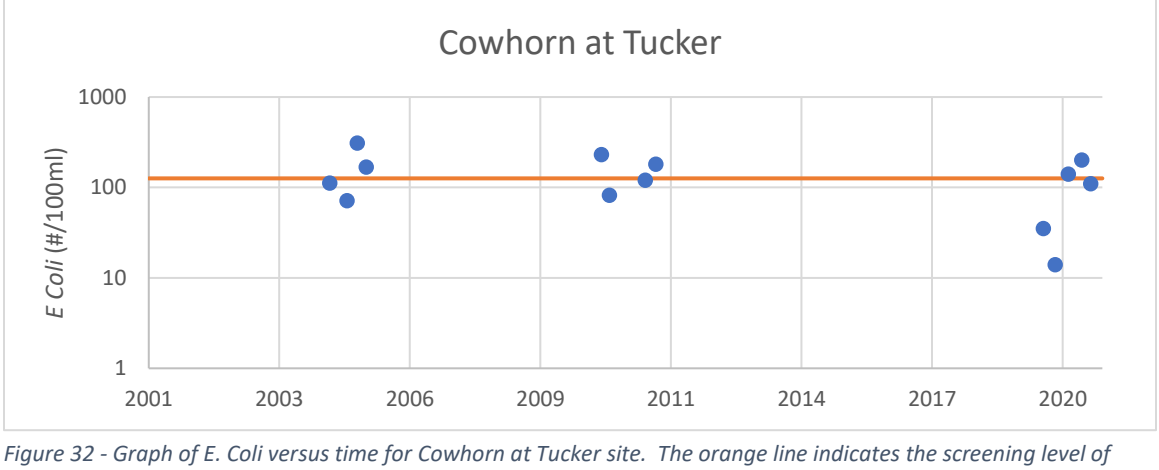

Figure 32 - Graph of E. Coli versus time for Cowhorn at Tucker site. The orange line indicates the screening level of 126/100ml.

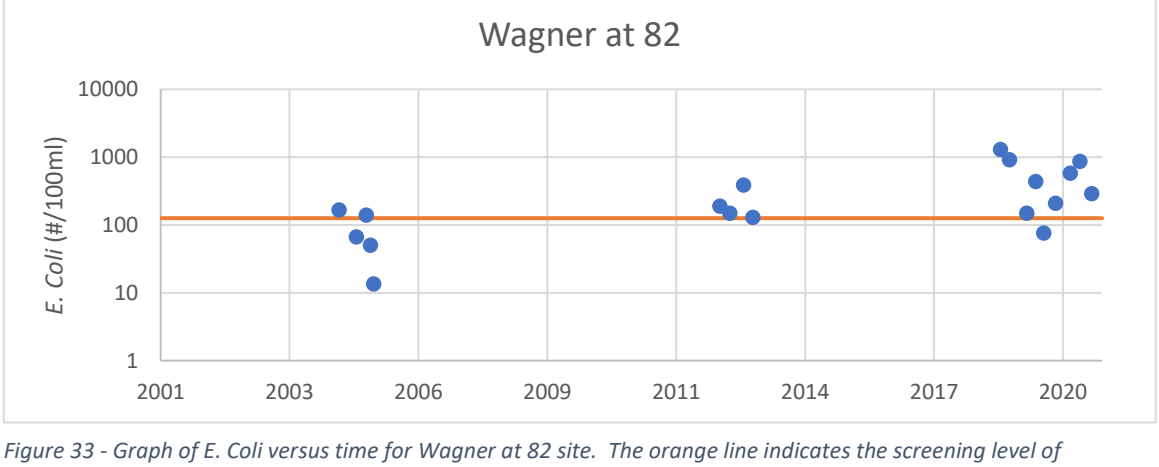

Figure 33 - Graph of E. Coli versus time for Wagner at 82 site. The orange line indicates the screening level of 126/100ml.

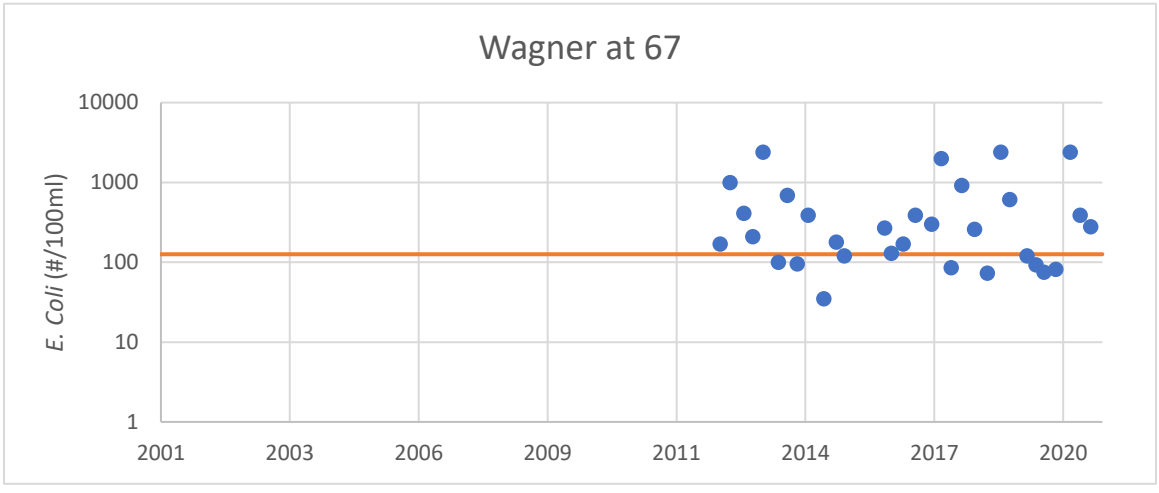

Figure 34 - Graph of E. Coli versus time for Wagner at 67 site. The orange line indicates the screening level of 126/100ml.

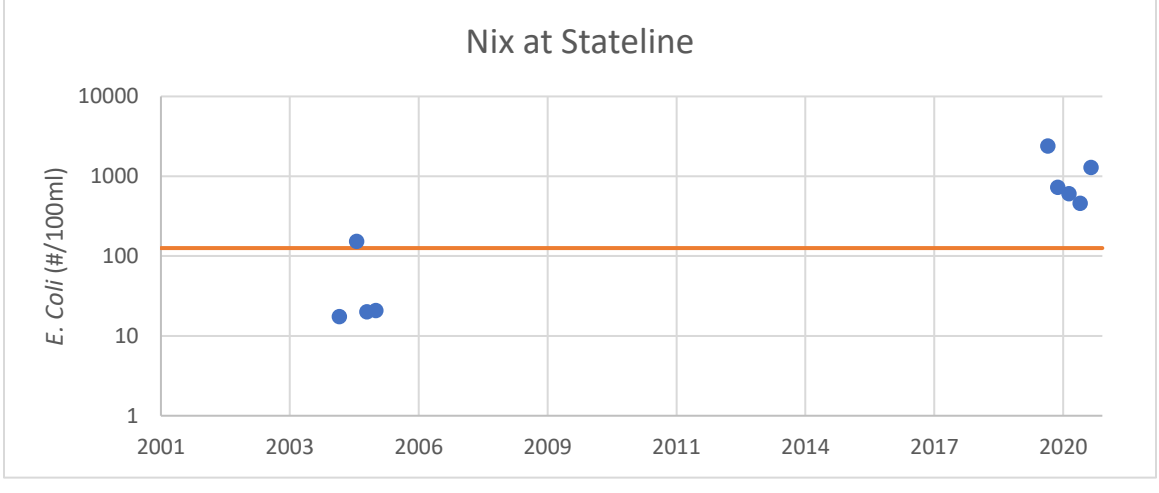

Figure 35 - Graph of E. Coli versus time for Nix at Stateline site. The orange line indicates the screening level of 126/100ml.

The level of 126 per 100 ml is a geomean value. To compare the waterways, the geomeans of available data for each is graphed below along with the 126 limit as an orange line.

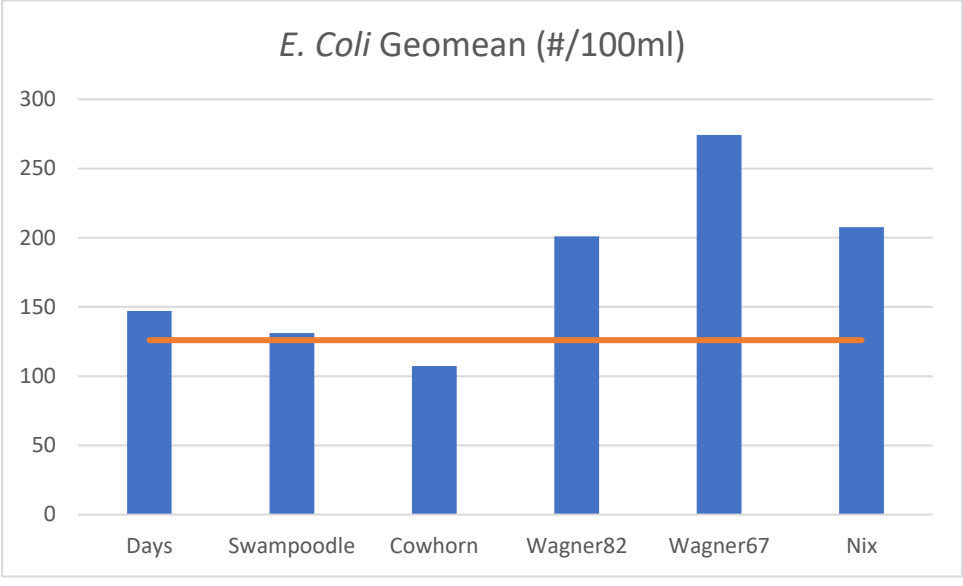

Figure 36 - E. Coli geomeans of available data for current sites. The orange line indicates the screening level of 126/100ml.

Wagner has an impairment for bacteria and the higher levels are evident in the graph. Wagner would have a hard time making the next limit of "Primary Contact Recreation 2" at 206 per 100 ml of water. Nix Creek is also showing high bacteria levels. In order to make a direct comparison of all of the waterways, the next graph is the log of E. Coli so the vertical axis represents actual changes by 10. The screening value of 126 is 2.1 on this graph. Days and Swampoodle have concerns for bacteria, while Wagner is impaired, but all waterways are showing high levels of bacteria.

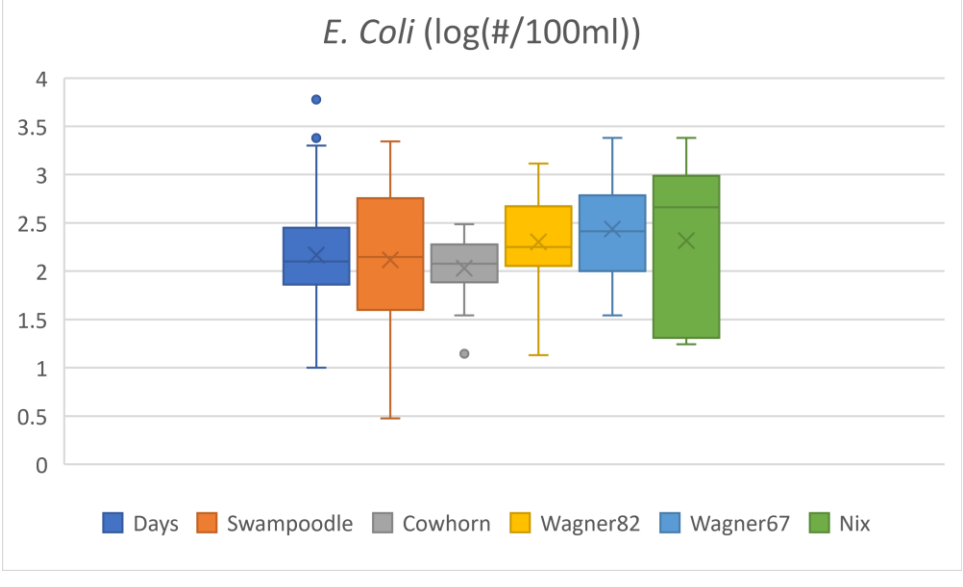

Figure 37 - Statistical analysis of log of #/100ml for E. Coli at current sites. The screening level of 126/100ml is 2.1 on this graph.

Ammonia

Ammonia samples are sent to the lab. The screening level for all waterways is 0.33 mg/l. The following graphs are Ammonia versus time with the screening level indicated by an orange line.

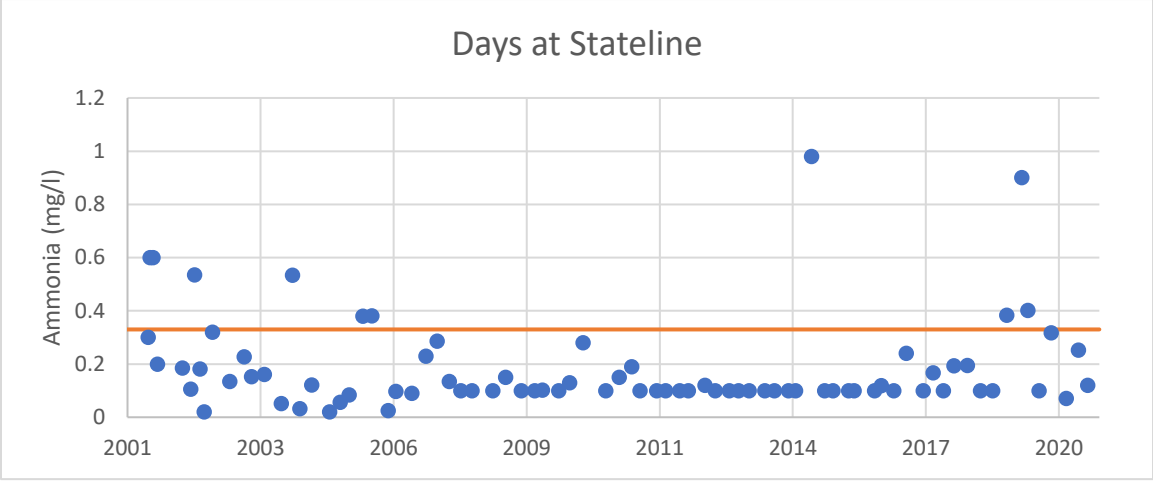

Figure 38 - Graph of Ammonia versus time for Days at Stateline site. The orange line indicates the screening level of 0.33 mg/l.

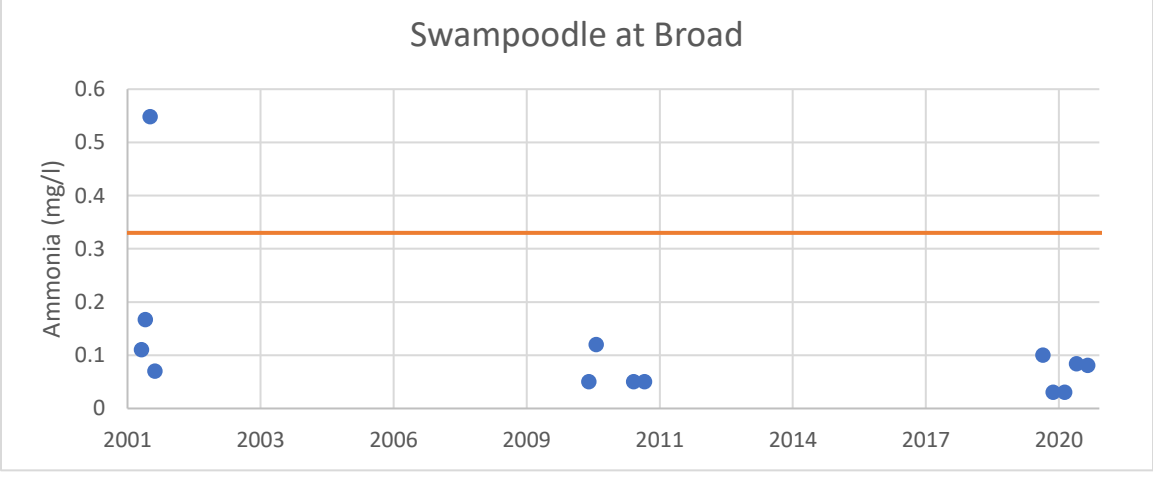

Figure 39 - Graph of Ammonia versus time for Swampoodle at Broad site. The orange line indicates the screening level of 0.33 mg/l.

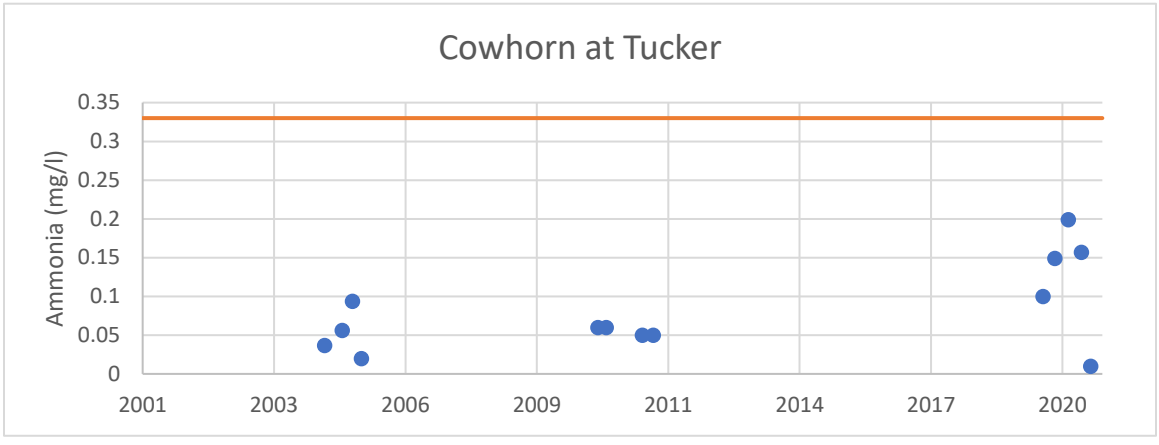

Figure 40 - Graph of Ammonia versus time for Cowhorn at Tucker site. The orange line indicates the screening level of 0.33 mg/l.

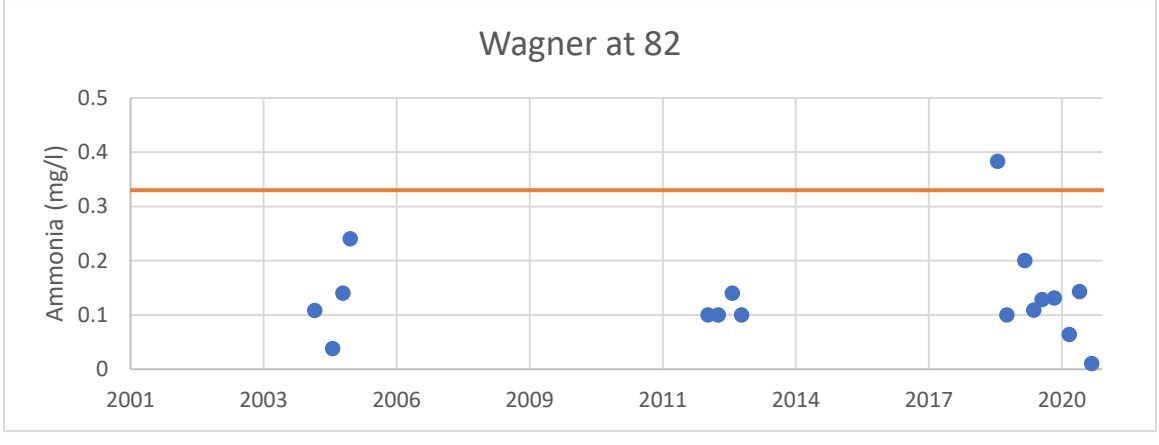

Figure 41 - Graph of Ammonia versus time for Wagner at 82 site. The orange line indicates the screening level of 0.33 mg/l.

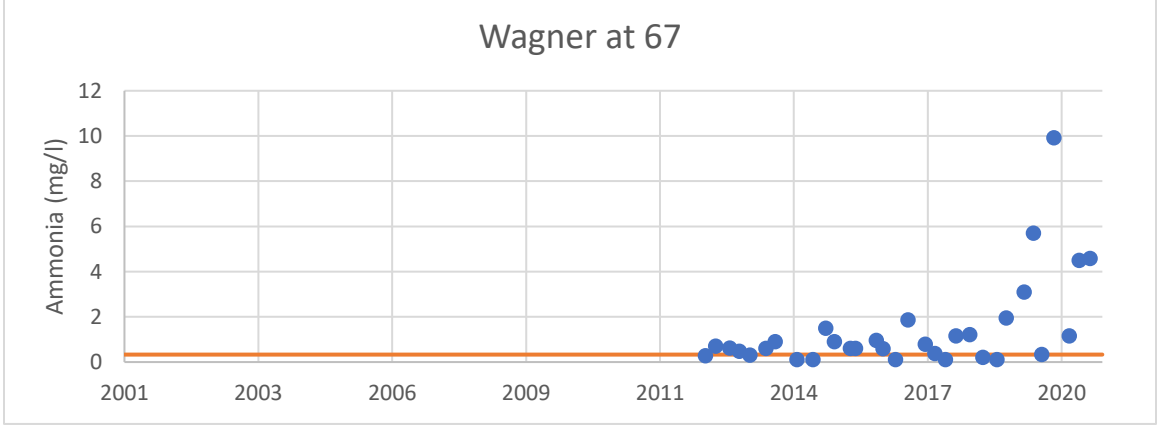

Figure 42 - Graph of Ammonia versus time for Wagner at 67 site. The orange line indicates the screening level of 0.33 mg/l.

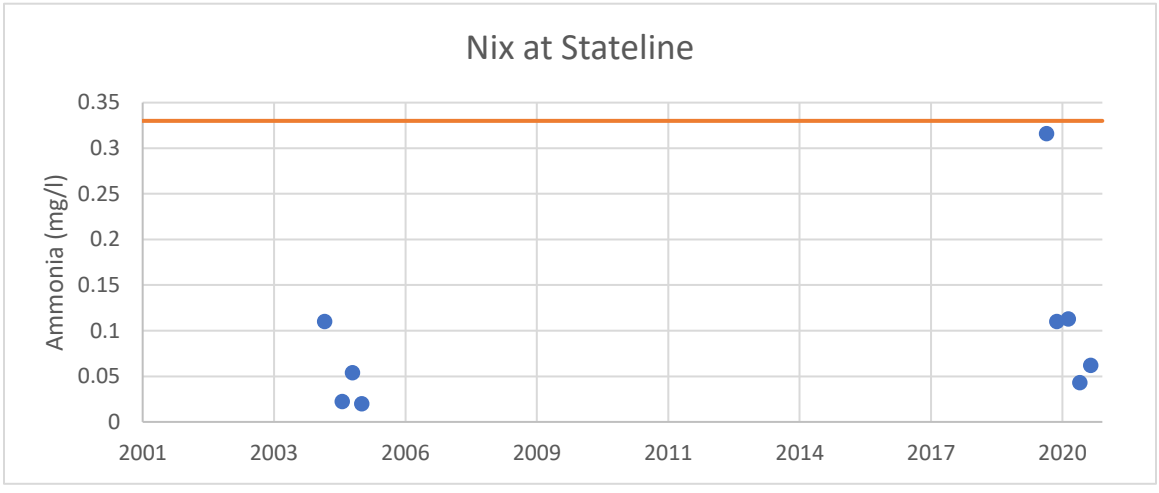

Figure 43 - Graph of Ammonia versus time for Nix at Stateline site. The orange line indicates the screening level of 0.33 mg/l.

Wagner at 67 has a concern for ammonia and the graph below illustrates how much higher the values are at Wagner at 67 than the rest of the watershed.

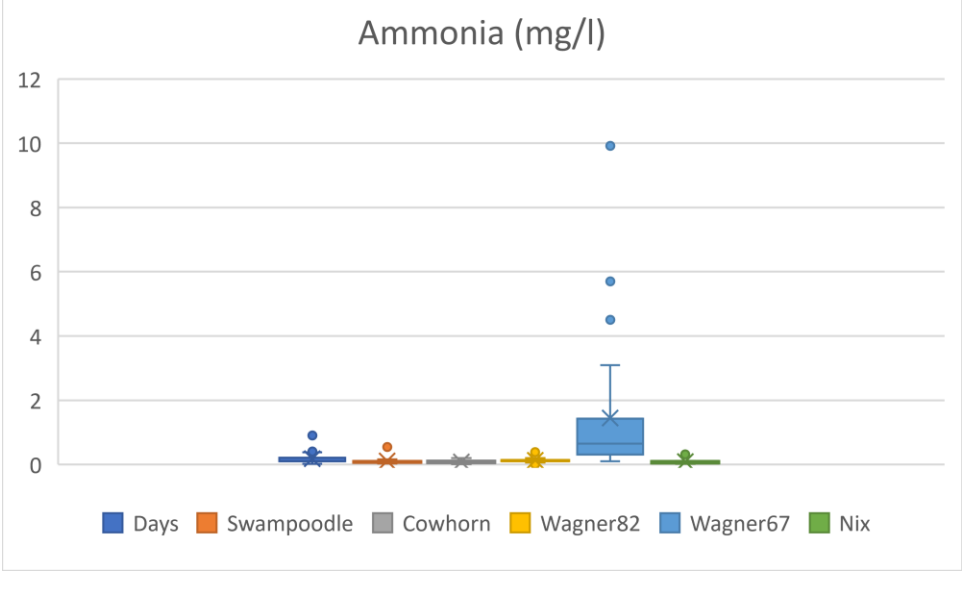

Figure 44 - Statistical analysis of ammonia at current sites. The screening level for ammonia is 0.33 mg/l.

There are several large values found at Wagner and 67. The next graph uses a different scale, but really illustrates how much of a problem there is at this site.

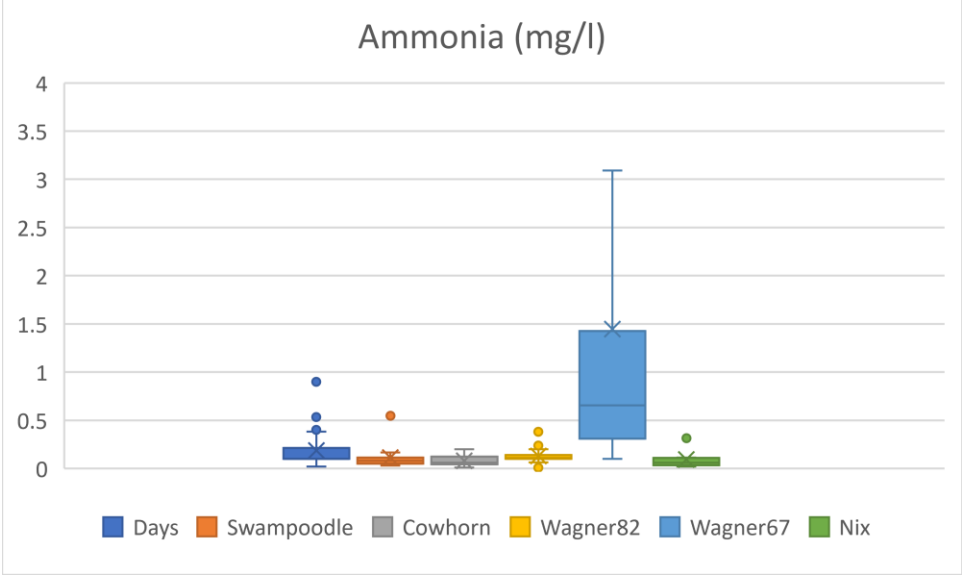

Figure 45 - Statistical analysis of ammonia at current sites. The screening level for ammonia is 0.33 mg/l.

Nitrate

Nitrate samples are sent to the lab. All waterways have a screening level of 1.95 mg/l indicated by the orange line in the following graphs.

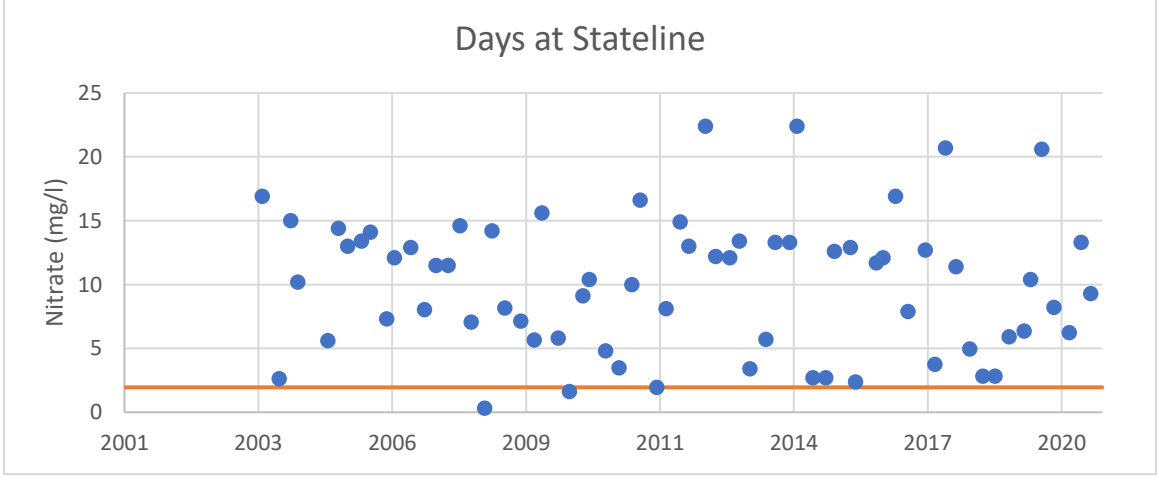

Figure 46 - Graph of Nitrate versus time for Days at Stateline site. The orange line indicates the screening level of 1.95 mg/l.

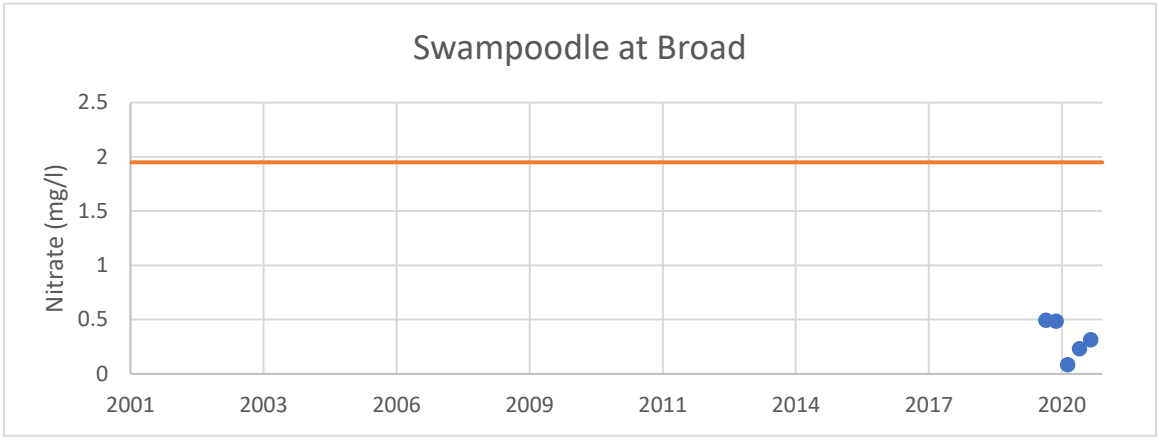

Figure 47 - Graph of Nitrate versus time for Swampoodle at Broad site. The orange line indicates the screening level of 1.95 mg/l.

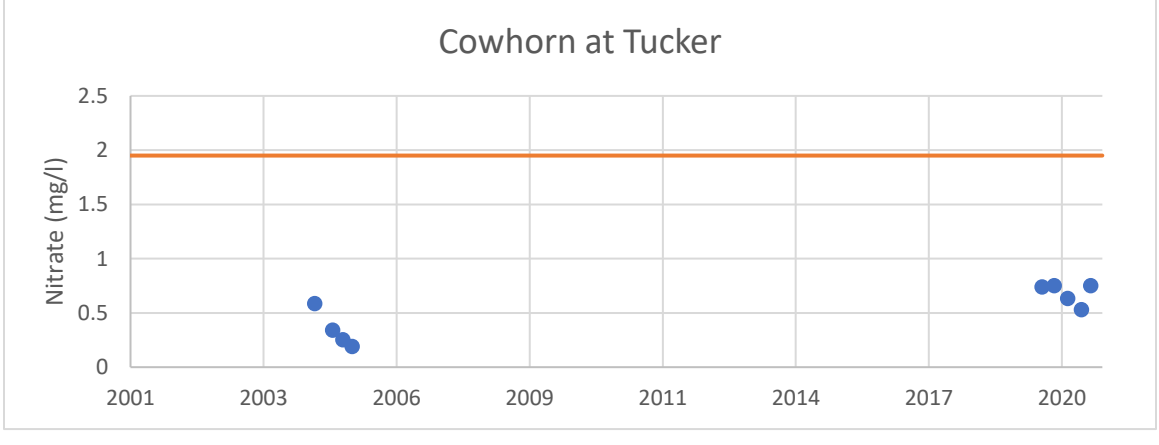

Figure 48 - Graph of Nitrate versus time for Cowhorn at Tucker site. The orange line indicates the screening level of 1.95 mg/l.

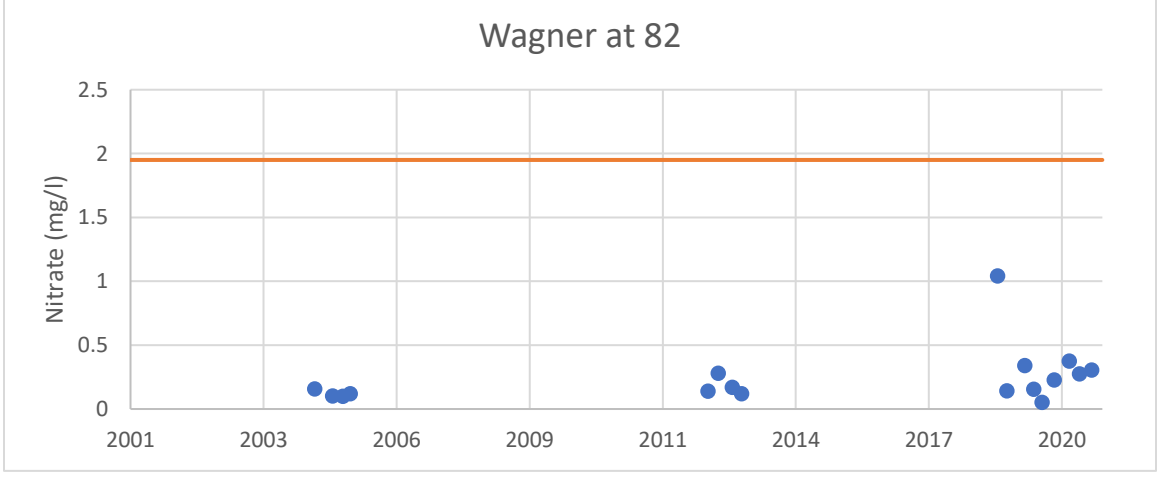

Figure 49 - Graph of Nitrate versus time for Wagner at 82 site. The orange line indicates the screening level of 1.95 mg/l.

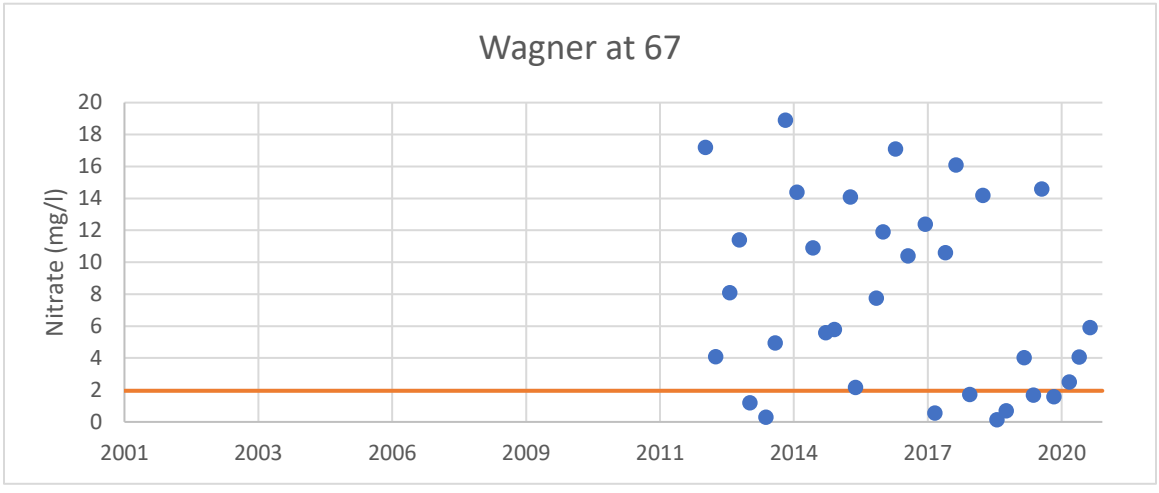

Figure 50 - Graph of Nitrate versus time for Wagner at 67 site. The orange line indicates the screening level of 1.95 mg/l.

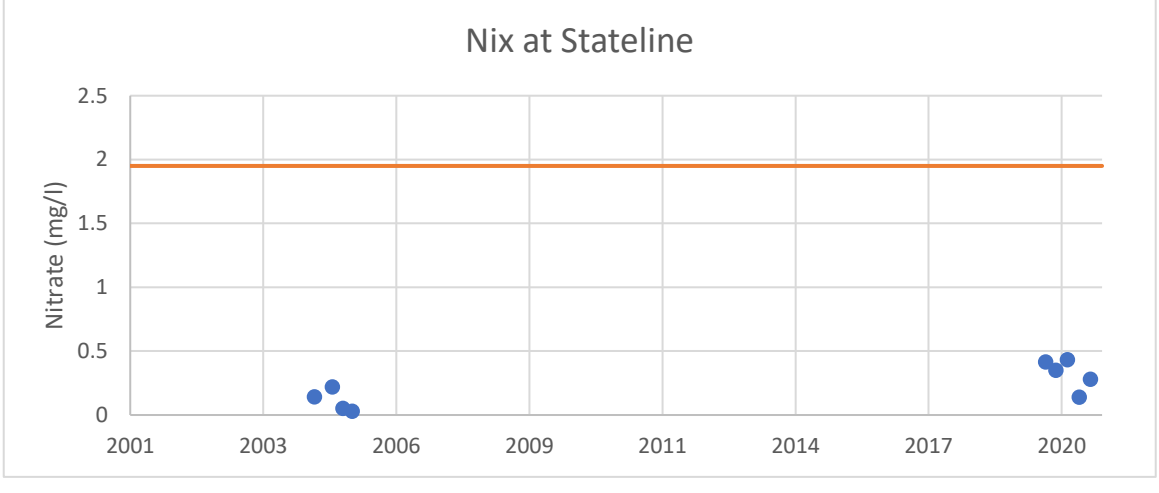

Figure 51 - Graph of Nitrate versus time for Nix at Stateline site. The orange line indicates the screening level of 1.95 mg/l.

Days and Wagner have concerns for high nitrate levels. The graph below shows how much higher the nitrate levels at two sites are than the others. The screening level for nitrate is 1.95 mg/l. Both sites with high nitrate levels are just below wastewater treatment plants. Wagner at 82, upstream of the wastewater treatment plant, shows a low level consistent with the other streams in the segment.

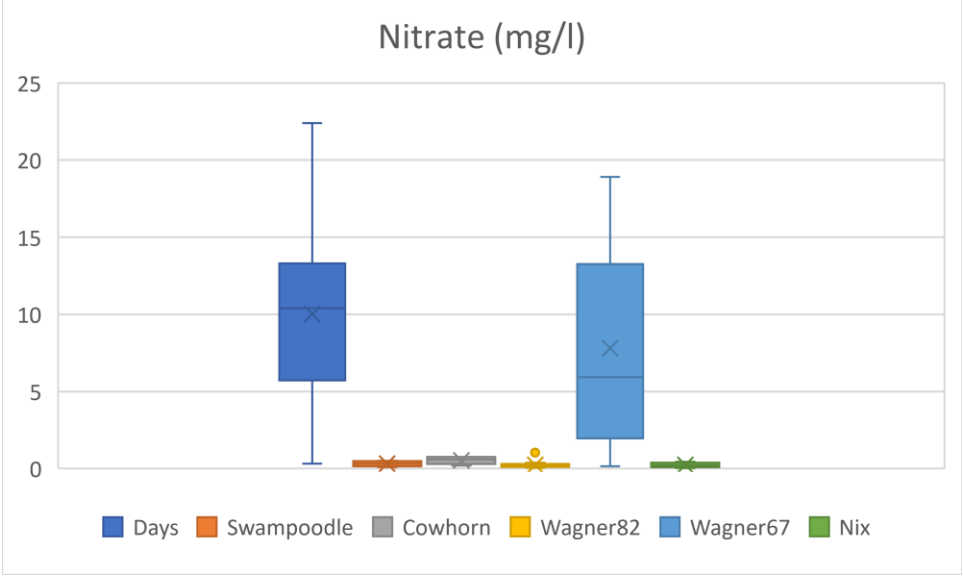

Figure 52 - Statistical analysis of available data for nitrate at current monitoring sites. The screening level for nitrate is 1.95 mg/l.

Phosphorus

Total phosphorus samples are sent to the lab. The screening level for Total P is 0.69 mg/l and is indicated with an orange line in the following graphs.

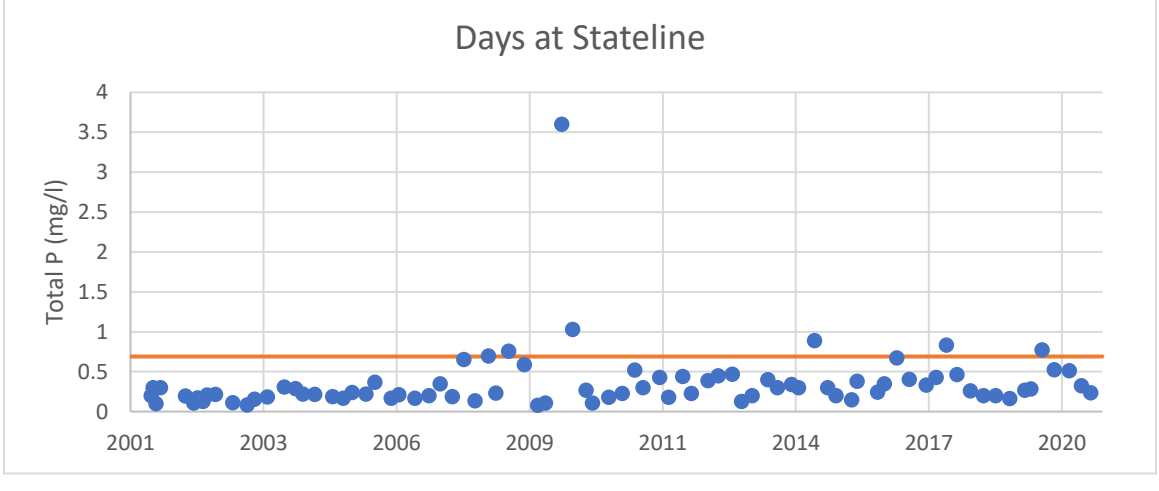

Figure 53 - Graph of Total Phosphorus versus time for Days at Stateline site. The orange line indicates the screening level of 0.69 mg/l.

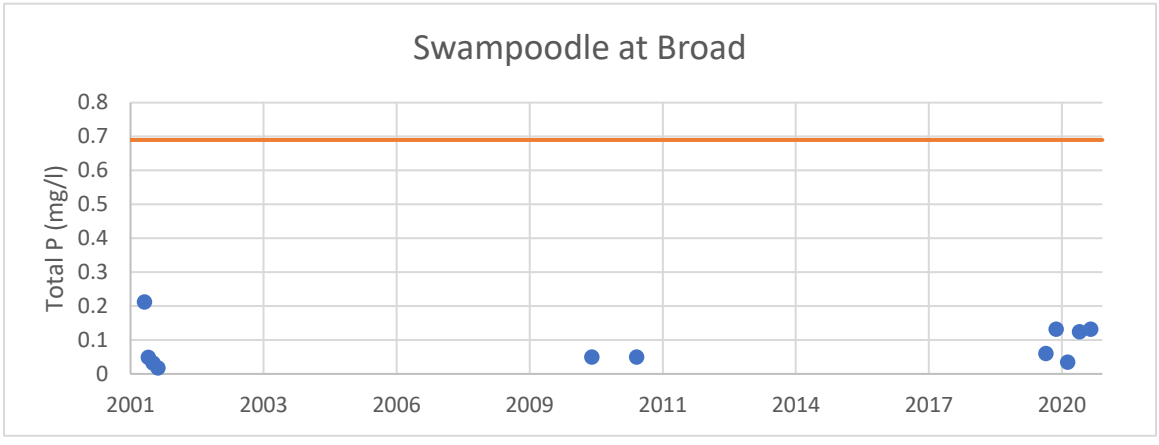

Figure 54 - Graph of Total Phosphorus versus time for Swampoodle at Broad site. The orange line indicates the screening level of 0.69 mg/l.

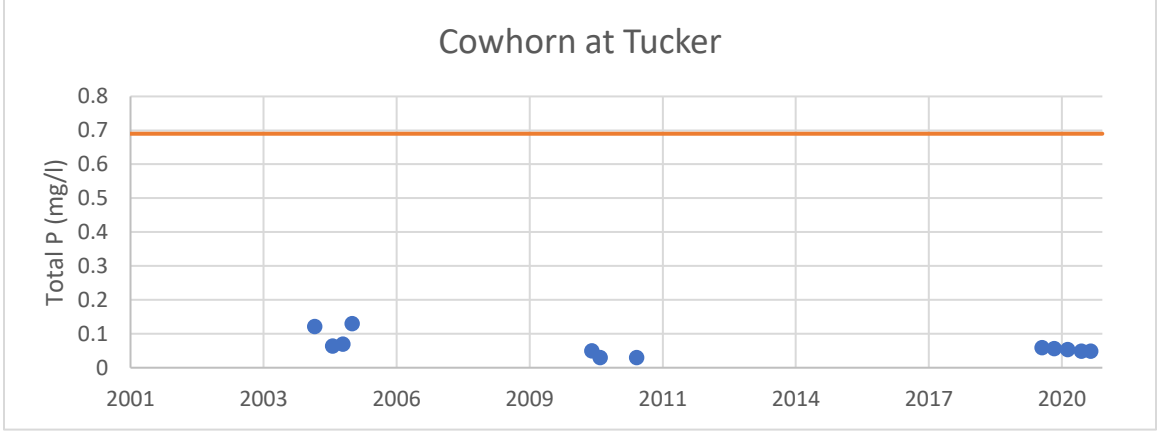

Figure 55 - Graph of Total Phosphorus versus time for Cowhorn at Tucker site. The orange line indicates the screening level of 0.69 mg/l.

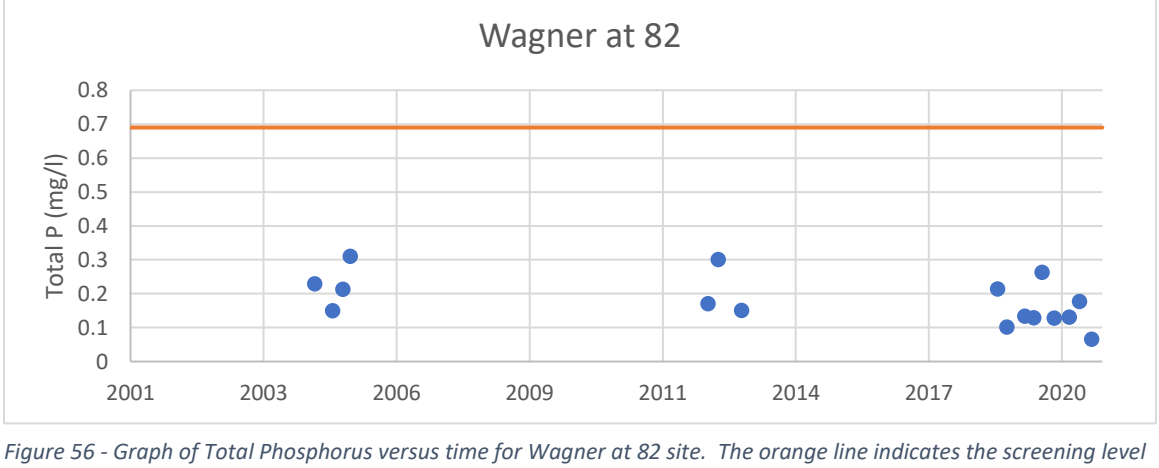

Figure 56 - Graph of Total Phosphorus versus time for Wagner at 82 site. The orange line indicates the screening level of 0.69 mg/l.

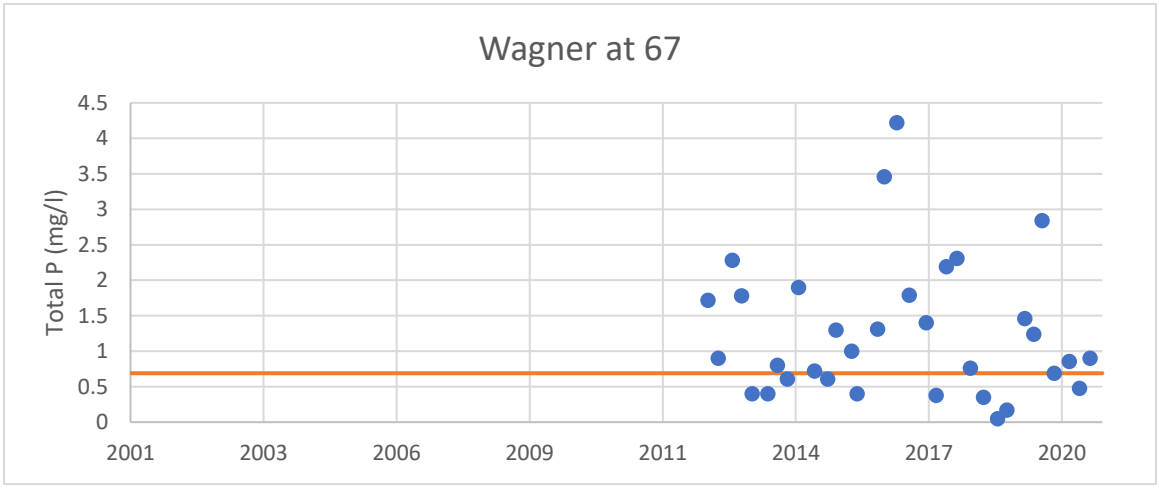

Figure 57 - Graph of Total Phosphorus versus time for Wagner at 67 site. The orange line indicates the screening level of 0.69 mg/l.

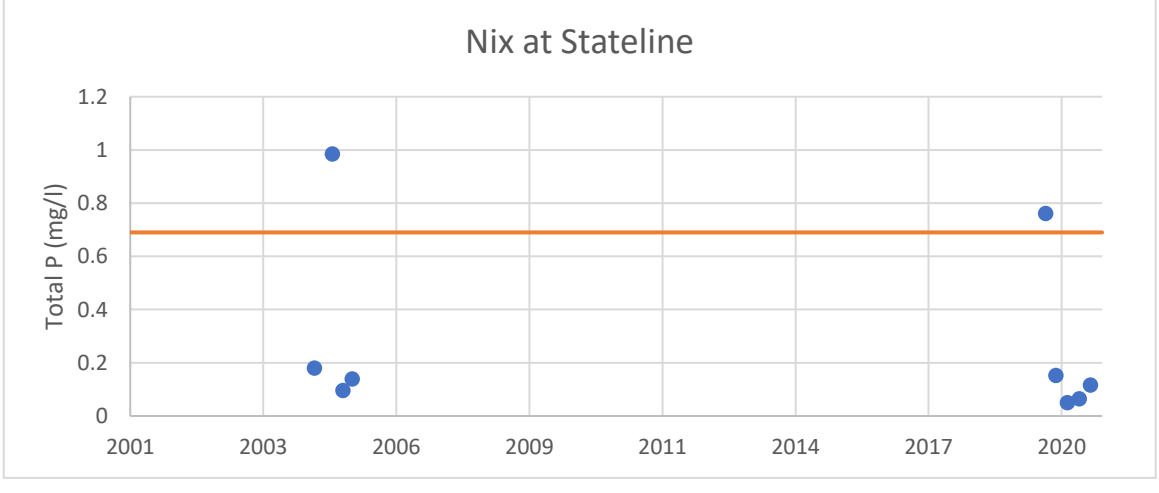

Figure 58 - Graph of Total Phosphorus versus time for Nix at Stateline site. The orange line indicates the screening level of 0.69 mg/l.

Wagner has a concern for Total P. The graph below illustrates its high levels versus those in the rest of the segment. The screening level for Total P is 0.69 mg/l. The rest of the streams are generally below that level with a few exceptions in Nix and Days Creeks. Wagner at 67 is below the wastewater treatment plant, but also has two industrial discharges.

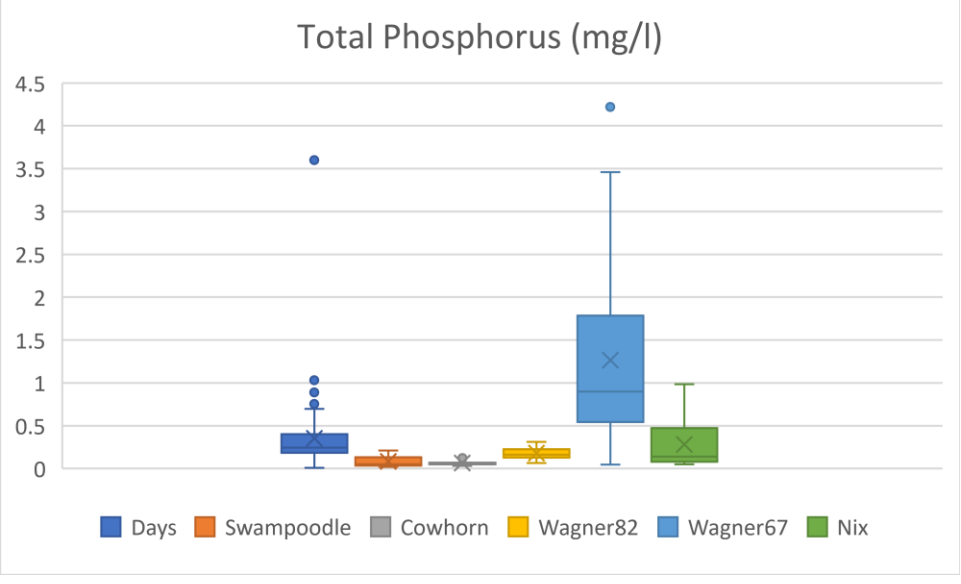

Figure 59 - Statistical analysis of available data for total phosphorus for current monitoring sites. The screening level for Total P is 0.69 mg/l.

RECCOMMENDATIONS

There are concerns for every waterway in the 0304 segment. All the Creeks have concerns for habitat. The use of the NRDA funds with plans to restore more natural stream and riparian habitat should address these problems. A few years after the NRDA restoration projects, biological assessments should be performed to reevaluate the habitats in the streams.

Wagner has consistently lower DO levels than the other streams in the segment. The sites on Wagner are also highest in bacteria levels. The use of DO by bacteria for respiration is probably the explanation for the low DO levels. The reason for the high levels of bacteria and low DO levels at Wagner and 82 could be a future project. The Wagner and 67 site is below the wastewater treatment plant and with high nitrogen, so large bacterial populations make sense there. The Wagner and 82 site is upstream from the wastewater treatment plant, so the reason for high bacteria and low DO levels should be determined.

Bacteria is a concern for Days, Swampoodle, and Wagner Creeks. Recent samples in Nix also show high levels of *E Coli*. Only Cowhorn is below the screening level. This may be due to the site. A future project could be to sample at a site closer to 67. Another interesting project would be the use of bacterial source tracking to find the animal host for the intestinal bacteria. In the last BSR *E. Coli* increased slightly with flow suggesting that the source may be urban runoff. The host source could answer the question of whether this is runoff, or contamination from human waste from either the wastewater treatment plant or ineffective septic systems. A geographic analysis of septic systems and bacterial concentrations may be able to show if there is a correlation between E. Coli in the waterways and septic system use. Wastewater treatment for nitrogen compounds should be improved, if possible. The only way to change the screening level for bacteria is the completion of a recreational use assessment and attainability analysis (RUAA). If the finding is that the recreational use differs from the highest standard, then the CFU may be elevated to a lower standard. Several RUAAs were proposed for Wagner, but not funded. The conducting of a RUAA should be revisited after the NRDA remediations are finished.

Total phosphorus and ammonia levels are very high in Wagner at 67, but not at Wagner and 82. A future project would be to find the source of the ammonia and phosphorus and determine if it is from the industrial discharges, or wastewater discharge, or runoff from the urban environment.

Days and Wagner have concerns for high levels of nitrate. High nitrate levels at the Stateline site for Days and the Wagner site below the wastewater treatment plants suggests the discharge is the source of the nitrate. Sampling just above and below the discharge sites could confirm this.

The PAH and hydrocarbon contamination in the sediment of Days Creek should be reevaluated soon starting at the Tronox site and working south to check the progress of the contamination plume.

This report can be used as a comparison for water quality in the 0304 segment. A few years after completion of the NRDA projects, monitoring of all streams in 03034 should be done again and compared to see if water quality and habitats improve.

URLS FOR LINKS

page on the city website

http://texarkanacitytx.iqm2.com/Citizens/Detail_LegiFile.aspx?MeetingID=1219&ID=2241

webpage describing the Koppers superfund site

https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0602570

webpage describing the Texarkana Wood superfund site

https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0601695

Texas Integrated Report.

https://www.tceq.texas.gov/waterquality/assessment/

Texas administrative code

https://texreg.sos.state.tx.us/public/readtac$ext.TacPage?sl=R&app=9&p_dir=&p_rloc=&p_tloc=&p_ploc=&pg=1&p_tac=&ti=30&pt=1&ch=307&rl=7