# APPENDIX A
# UPPER KICKAPOO WATERSHED ANALYSIS

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# UPPER KICKAPOO WATERSHED

## SLEIGHTON CREEK BRANCH

Sleighton Creek Branch joins the Kickapoo near Wilton as seen in Figure A1.


Figure A1 – Sleighton Creek

### *1202900 SLEIGHTON CREEK*

Sleighton Creek flows for 5.0 miles before reaching the Kickapoo River in Wilton. Sleighton Creek is not a classified trout stream. Five stations have been monitored in since 2000 by the WDNR and VSN.

**10013791 Sleighton Creek Station 1 - Cth "M" Bridge Crossing**

While this station is the most upstream of the five stations monitored, it is located in the downstream half of the creek. VSN tested this site for temperature, turbidity, *E.coli* and nutrients. The temperature and turbidity data did not show any impairment.

Table A1 – Core Data for Station 10013791 Sleighton Creek

| Date/Time | Field Temp.(C) | Turbidity Field (NTU) |
|---|---|---|
| **Sep 27, 2006 2:40 PM** | 14 | <10 |
| **Apr 25, 2007 10:50 AM** | 11 | <10 |
| **Sep 26, 2007 11:00 AM** | 14.5 | |

Nutrient data was insufficient to make a conclusive determination. The ammonia levels did not indicate toxicity. Nitrate and nitrite levels were elevated. They were not over the 10 mg/L limit for drinking water. They were within and above the 1-2 mg/L range indicating typical levels for the sub-ecoregion and above the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels did not exceed the 0.033 mg/L EPA aggregate value and the WDNR impairment level.

Table A2 – Nutrient Data for Station 10013791 Sleighton Creek

| Date/Time | Dissolved Ammonia (mg/L) | Dissolved Nitrate/Nitrite (mg/L) | Total Phosphorous Dissolved (mg/L) |
|---|---|---|---|
| **Apr 25, 2007 10:50 AM** | < 0.5 | | |
| **May 23, 2008 5:25 PM** | <0.5 | 0.8 | |
| **Jul 30, 2008 12:00 AM** | <0.5 | 2.4 | |
| **Oct 15, 2008 11:25 AM** | <0.5 | 1.63 | 0.09 |

The *E.coli* testing indicates contamination from fecal matter. Though a single data set is not conclusive for an impairment determination, the *E.coli* average value was 558 cfu/100 mL , exceeding the WDNR flowing rivers and streams recreational limit of 400 cfu/100 mL. The bacteriological samples indicate that impact by human activity was causing elevated *E.coli* levels. The PCR analyses showed positive results for both human and cow DNA showing contamination was likely from septic or holding tanks and farming operations.

Table A3 – Bacteriological Data for Station 10013791 Sleighton Creek

| | Count n | Average | Median | Mode | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|---|---|---|
| ***E.coli* - mtec(cfu/100mL)** | 5 | 558 | 500 | 500 | 1000 | 190 | 291 |
| **Hetertrophic Plate Count (cfu/100mL)** | 5 | 77400 | 50000 | | 160000 | 37000 | 52714 |

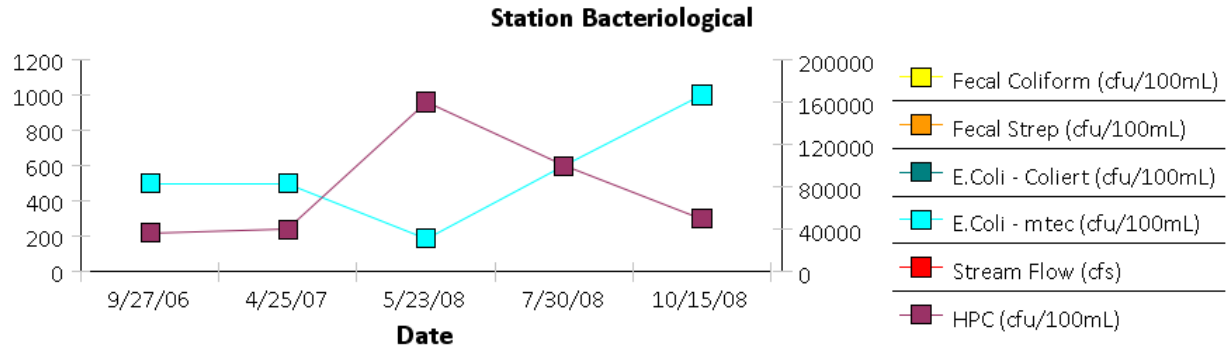


Figure A2 – Bacteriological Data for Station 10013791 Sleighton Creek

Table A4 – PCR Data for Station 10013791 Sleighton Creek

| | Human | Cow | Ruminant | Pig | Sheep | Horse |
|---|---|---|---|---|---|---|
| **Number of positives** | 5 | 5 | 0 | 0 | 0 | 0 |
| **Number of No Detects** | 2 | 0 | 0 | 0 | 3 | 3 |

## 423093 Sleighton Creek at 1st Cth M Bridge Upstream From Mouth

This station is very near, but downstream, of station 10013791. One sample was taken by WDNR in 2000. All remaining data was collected by the VSN during their *E.coli* testing program. Reviewing the data in Table A5, neither temperature nor turbidity data indicates impairment.

Table A5 – Core Data for Station 423093 Sleighton Creek

| Date/Time | Field Temp.(C) | Turbidity Lab (NTU) | Turbidity Field (NTU) |
|---|---|---|---|
| **Oct 17, 2000 3:30 PM** | | 5 | |
| **Apr 25, 2007 11:00 AM** | 11 | | <10 |

Nutrient data was insufficient to make a conclusive determination. The ammonia level did not demonstrate toxicity. Some nitrate and nitrite levels were elevated. They were not over the 10 mg/L limit for drinking water. They were in the 1-2 mg/L range indicating typical levels for the sub-ecoregion and over the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels exceed the 0.033 mg/L EPA aggregate value and the WDNR impairment levels.

Table A6 – Nutrient Data for Station 423093 Sleighton Creek

| | Count n | Average | Median | Mode | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|---|---|---|
| **Dissolved Ammonia (mg/L)** | 1 | 0.019 | 0.019 | | 0.019 | 0.019 | |
| **Dissolved Nitrate/Nitrite (mg/L)** | 4 | 1.5 | 1.4 | | 2.4 | 0.8 | 0.71 |
| **Total Kjeldahl Nitrogen (mg/L)** | 1 | 0.38 | 0.38 | | 0.38 | 0.38 | |
| **Total Phosphorous (mg/L)** | 1 | 0.081 | 0.081 | | 0.081 | 0.081 | |

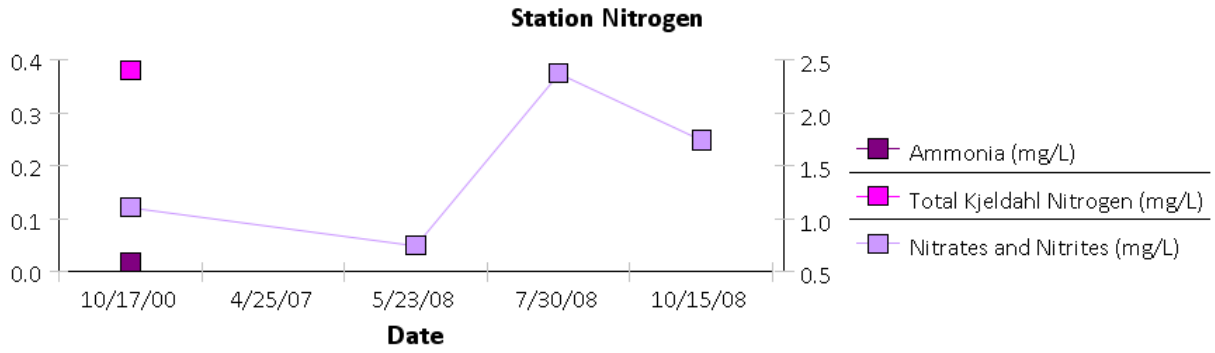


Figure A3 – Nitrogen Data for Station 423093 Sleighton Creek

The IBI data just met the minimum to be rated as "good" condition gradient for cold streams. The HBI and FBI show a "good" water quality rating and "some" degree of organic pollution. The diversity index was high and richness values indicated a good range of aquatic life.

Table A7 – Macroinvertebrate Data for Station 423093 Sleighton Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Sep 26, 2007 12:00 AM** | 5.1 | 5 | 5 | 4.8 | 3.6 | 35 | 28 |

As seen in Table A8 and Figure A4, *E.coli* values frequently exceed the WDNR flowing rivers and streams recreational limit of 400 cfu/100 mL. This data indicates impact by human activity was causing elevated *E.coli* levels. Looking at the PCR summary in Table A9, human and cow DNA was detected in some of the samples (cow DNA was positive in all tested samples). The human DNA positives indicate contamination from human sources such as septic or holding tanks or wastewater treatment plants. It was most likely the human DNA was from septic or holding tank contamination, as no wastewater treatment plants exist on Sleighton Creek. Cow DNA would be from farming operations.

Table A8 – Bacteriological Summary for Station 423093 Sleighton Creek

| | Count n | Average | Median | Mode | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|---|---|---|
| **Fecal Coliform(cfu/100mL)** | 1 | 3 | 3 | | 3 | 3 | |
| ***E.coli* - mtec(cfu/100mL)** | 4 | 725 | 410 | | 1900 | 180 | 806 |
| ***E.coli* - Thermo tolerant (cfu/100mL)** | 1 | 600 | 600 | | 600 | 600 | |
| **Hetertrophic Plate Count (cfu/100mL)** | 4 | 132500 | 150000 | | 210000 | 20000 | 81803 |

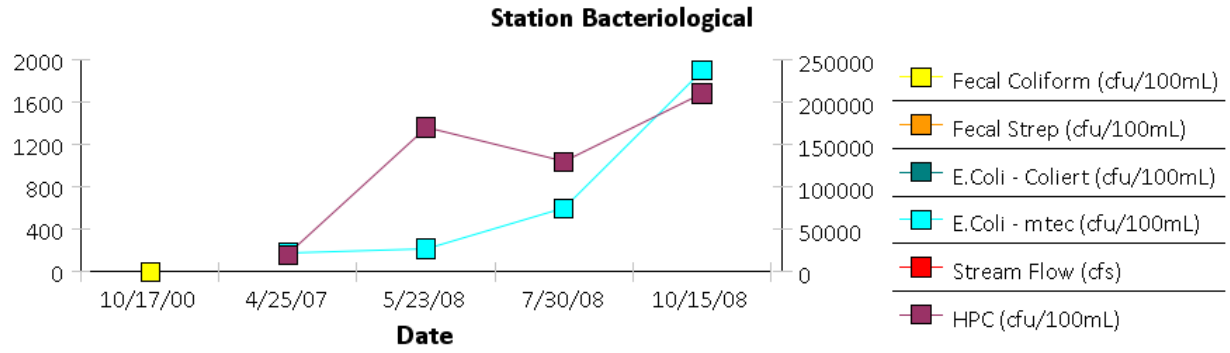


Figure A4 – Bacteriological Summary for Station 423093 Sleighton Creek

Table A9 – PCR Data for Station 423093 Sleighton Creek

| | Human | Cow | Sheep | Horse |
|---|---|---|---|---|
| **Number of positives** | 4 | 4 | 0 | 0 |
| **Number of No Detects** | 3 | 0 | 3 | 3 |

Calcium and magnesium were indicative of water hardness which has an impact on ammonia toxicity. At levels around 210 mg/L hardness, ammonia levels could be at the low end of the toxicity range and be toxic.

Table A10 – Chemical Data for Station 423093 Sleighton Creek

| Date/Time | Calcium Recoverable (mg/L) | Magnesium (mg/L) |
|---|---|---|
| **Oct 17, 2000 3:30 PM** | 3.2 | 49 |

## 10033423 Sleighton Creek Upstream Of Atteln Barnyard

Data for this station was collected by VSN during the *E.coli* testing program. Temperature and turbidity data did not indicate any impacts and ammonia levels were below toxic levels.

Table A11 – Temperature, Turbidity and Nutrient Data for Station 10033423 Sleighton Creek

| Date/Time | Field Temp.(C) | Turbidity Field (NTU) | Dissolved Ammonia (mg/L) |
|---|---|---|---|
| **Apr 25, 2007 10:00 AM** | 11 | <10 | < 0.5 |

As seen in Table A12, the *E.coli* data exceeded the WDNR flowing rivers and streams recreational limit of 400 cfu/100 mL. The bacteriological data indicates that impact by human activity was causing elevated *E.coli* levels. Looking at the PCR summary, also in Table A12, no human DNA was detected, however both cow and ruminant DNA was detected. Cow and ruminant DNA would be from farming operations.

Table A12 – Bacteriological Data for Station 10033423 Sleighton Creek

| Date/Time | *E.coli* mtec (cfu/100mL) | Heter. Plate Count (cfu/100mL) | PCR Human | PCR Cow | PCR Ruminant |
|---|---|---|---|---|---|
| **Apr 25, 2007 10:00 AM** | 470 | 24000 | ND | POS | POS |

## 10020620 Sleighton Creek Downstream Of Atteln Barnyard

This station is located downstream of station 10033423. Both VSN and WDNR have collected data at this site. Bacteriological data was collected by VSN during the *E.coli* testing program. Temperature and turbidity data did not indicate any degradation.

Table A13 – Temperature and Turbidity Data for Station 10020620 Sleighton Creek

| Date/Time | Field Temp.(C) | Turbidity Field (NTU) |
|---|---|---|
| **Apr 25, 2007 10:10 AM** | 11 | <10 |

Nutrient data was insufficient to make a conclusive determination. The ammonia levels did not demonstrate toxicity. Nitrate and nitrite levels were elevated. They were not over the 10 mg/L limit for drinking water. They were within the 1-2 mg/L range indicating typical levels for the sub-ecoregion and over the EPA 0.5 mg/L aggregate value for the ecoregion. The TP level exceeded the 0.033 mg/L EPA aggregate value and the WDNR impairment levels.

Table A14 – Nutrient Data for Station 10020620 Sleighton Creek

| Date/Time | Dissolved Ammonia (mg/L) | Dissolved Nitrate/Nitrite (mg/L) | Total Phosphorous Dissolved(mg/L) |
|---|---|---|---|
| **Apr 25, 2007 10:10 AM** | < 0.5 | | |
| **May 23, 2008 12:00 AM** | <0.5 | 0.66 | |
| **Jul 30, 2008 12:00 AM** | <0.5 | 2 | |
| **Oct 15, 2008 12:25 PM** | <0.5 | 1.71 | 0.1 |

The IBI data just met the minimum for a rating of "poor" condition gradient for cold streams. The HBI and FBI data show a "good" water quality rating with "some" degree of organic pollution. The diversity index was high and richness values indicated a good range of aquatic life.

Table A15 – Macroinvertebrate Data for Station 423093 Sleighton Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Apr 26, 2007 12:00 AM** | 5.5 | 5.5 | 0.6 | 5.9 | 3.7 | 23 | 19 |

All of the *E.coli* values exceeded the WDNR flowing rivers and streams recreational limit of 400 cfu/100 mL (see Table A16 and Figure A5). The data indicates that impact by human activity was causing elevated *E.coli* levels.

Table A16 – Bacteriological Summary for Station 423093 Sleighton Creek

| | Count n | Average | Median | Mode | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|---|---|---|
| ***E.coli* - mtec(cfu/100mL)** | 4 | 3513 | 2550 | | 8400 | 550 | 3620 |
| **Hetertrophic Plate Count (cfu/100mL)** | 4 | 89750 | 94000 | | 130000 | 41000 | 36700 |

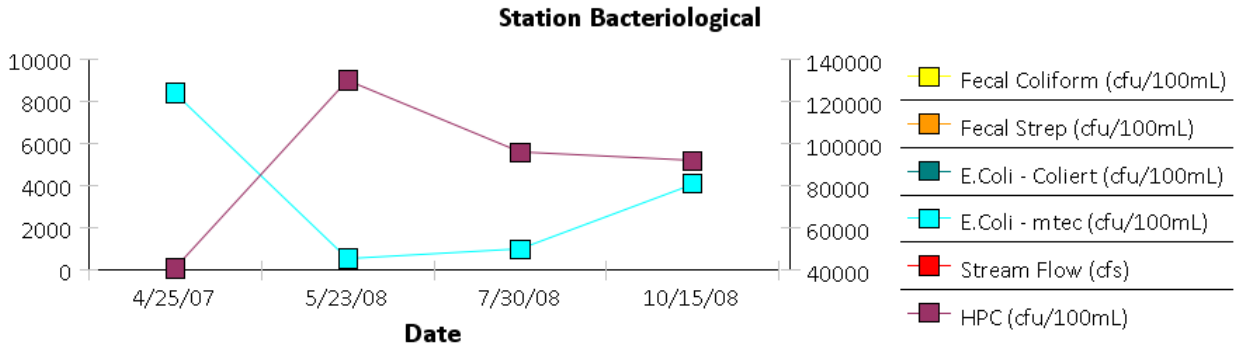


Figure A5 – Bacteriological Summary for Station 423093 Sleighton Creek

## 10031055 Sleighton creek - bike trail bridge

This station is near the mouth of stream. The data for this station was collected by the WDNR and VSN during the *E.coli* testing program. Temperature was high in the September 5th data point and exceeded the limit for classification as a cold stream, however Sleighton Creek was not a classified trout stream. Turbidity data did not indicate any degradation of transparency. Ammonia data did not indicate toxic levels.

Table A17 – Temp and Core Data for Station 10031055 Sleighton Creek

| Date/Time | Field Temp.(C) | Turbidity Field (NTU) |
|---|---|---|
| **Sep 5, 2005 12:00 AM** | 26 | <10 |
| **Sep 8, 2005 12:00 AM** | 19 | <10 |
| **Sep 13, 2006 2:55 PM** | 17.5 | <10 |

Table A18 – Nutrient Data for Station 10031055 Sleighton Creek

| Date/Time | Dissolved Ammonia (mg/L) |
|---|---|
| **Apr 25, 2007 10:00 AM** | < 0.5 |

The IBI data rates as a "poor" condition gradient. The HBI and FBI also showed a "fair" and "fairly poor" water quality rating with a "fairly significant" and "significant" degree of organic pollution. However the diversity index was high and the richness values indicated a range of aquatic life.

Table A19 – Macroinvertebrate Data for Station 10031055 Sleighton Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Mar 17, 2010 2:25 PM** | 6.4 | 6.1 | 2.5 | 5.6 | 3.9 | 36 | 31 |

As seen in Table A20, all of the *E.coli* values greatly exceed the WDNR flowing rivers and streams recreational limit of 400 cfu/100 mL. The data indicates that impact by human activity was causing elevated *E.coli* levels. The PCR analysis showed no detectable human DNA but tested positive for both cow and ruminant DNA showing contamination was likely from farming operations.

Table A20 – Bacteriological Summary for Station 423093 Sleighton Creek

| Date/Time | *E.coli* mtec (cfu/100mL) | Heter. Plate Count (cfu/100mL) | PCR Human | PCR Cow | PCR Ruminant |
|---|---|---|---|---|---|
| **Sep 5, 2005 12:00 AM** | 7500 | 220000 | ND | | POS |
| **Sep 8, 2005 12:00 AM** | 6000 | 240000 | ND | | POS |
| **Sep 13, 2006 2:55 PM** | 6300 | 330000 | ND | POS | |

## POE CREEK BRANCH

Poe Creek Branch joins the Kickapoo south of Wilton as seen in Figure A6.

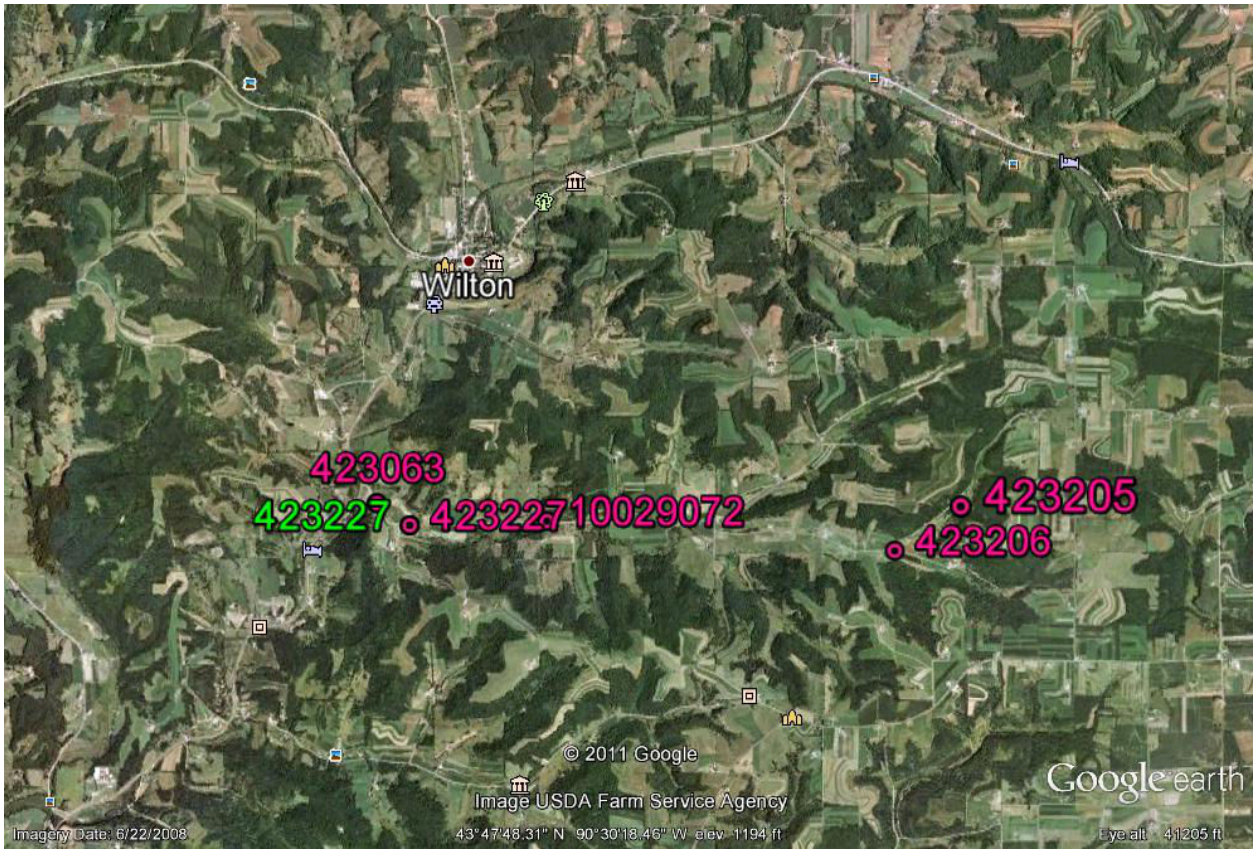


Figure A6 – Poe Creek

### *1202200 POE CREEK*

Poe Creek flows for 4.3 miles before reaching the Kickapoo River south of Wilton. Poe Creek is not a classified trout stream. Five stations have been monitored since 2000 by the WNDR and VSN over a number of years.

#### 423205 Poe Creek - Poe Creek

This station is located in the headwaters of Poe Creek and was monitored by the WDNR in 2003. The ammonia levels did not indicate toxicity. Nitrate and nitrite levels were elevated. They were not over the 10 mg/L limit for drinking water. They were over the 1-2 mg/L range indicating typical levels for the sub-ecoregion and the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels were just below the 0.033 mg/L EPA aggregate value and below the WDNR impairment levels.

Table A21 – Nutrient Data for Station 423205 Poe Creek

| Date/Time | Dissolved Ammonia (mg/L) | Dissolved Nitrate/Nitrite (mg/L) | Total Kjeldahl Nitrogen (mg/L) | Total Phosphorous Dissolved (mg/L) | Total Phosphorous Unfiltered(mg/L) |
|---|---|---|---|---|---|
| **Aug 14, 2003 12:00 AM** | ND | 2.82 | 0 | 0.018 | 0.032 |
| **Jun 23, 2003 12:00 AM** | 0.014 | 2.4 | 0 | 0.02 | 0.031 |

The IBI data rates as a "fair" condition gradient. The HBI and FBI also showed "good" water quality ratings with "some probable" degree of organic pollution. However the diversity index was high and the richness values indicated a good range of aquatic life.

Table A22 – Macroinvertebrate Data for Station 423205 Poe Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Oct 22, 2003 12:00 AM** | 5.1 | 5 | 4.3 | 4.7 | 3.7 | 32 | 30 |

## 423206 Poe Creek - (Bridge)

The WDNR took one nutrient sample in 2003 at this station located near the headwaters of the stream. The ammonia levels did not indicate toxicity. Nitrate and nitrite levels were typical for the sub-ecoregion. They were not over the 10 mg/L limit for drinking water. They were within the 1-2 mg/L range indicating typical levels for the sub-ecoregion and the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels were high exceeding the 0.033 mg/L EPA aggregate value and below the WDNR impairment level.

Table A23 – Nutrient Data for Station 423206 Poe Creek

| Date/Time | Dissolved Ammonia (mg/L) | Dissolved Nitrate/Nitrite (mg/L) | Total Kjeldahl Nitrogen (mg/L) | Total Phosphorous Dissolved (mg/L) | Total Phosphorous Unfiltered(mg/L) |
|---|---|---|---|---|---|
| **Jun 23, 2003 12:00 AM** | 0.04 | 1.67 | 0.17 | 0.043 | 0.055 |
| **Aug 14, 2003 12:00 AM** | ND | 1.47 | 0.24 | 0.058 | 0.064 |

## 10029072 Poe Creek -- at CTH Z near Mahnard Rd

The WDNR took one nutrient sample in 2008. The ammonia level did not indicate toxicity. Nitrate and nitrite levels were typically for this sub-ecoregion. They were not over the 10 mg/L limit for drinking water. They were within the 1-2 mg/L range indicating typical levels for the sub-ecoregion and the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels were very high exceeding the 0.033 mg/L EPA aggregate value and the WDNR impairment levels.

Table A24 – Nutrient Data for Station 10029072 Poe Creek

| Date/Time | Dissolved Ammonia (mg/L) | Dissolved Nitrate/Nitrite (mg/L) | Total Kjeldahl Nitrogen (mg/L) | Total Phosphorous Unfiltered(mg/L) |
|---|---|---|---|---|
| **Aug 18, 2008 2:05 PM** | 0.016 | 1.59 | 0.25 | 0.146 |

## 423227 Poe Creek at 2nd Cth Z Bridge

This station is near the mouth of the stream. VSN tested this site for temperature, turbidity, *E.coli* and HPC. The temperature and turbidity values did not indicate impairment, though a single data set is not conclusive for an impairment determination. The *E.coli* value was much higher than the WDNR flowing rivers and streams recreational limit of 400 cfu/100 mL (See Table A25). The bacteriological sample indicates impact by human activity was likely causing elevated *E.coli* levels.

Table A24 – Core Data for Station 423227 Poe Creek

| Date/Time | Field Temp.(C) | Turbidity Field (NTU) |
|---|---|---|
| **Sep 26, 2005 12:00 AM** | 13 | <10 |
| **Sep 27, 2006 3:00 PM** | 14 | <10 |

Table A25 – Bacteriological Data for Station 423227 Poe Creek

| Date/Time | *E.coli* mtec (cfu/100mL) | Heter. Plate Count (cfu/100mL) |
|---|---|---|
| **Aug 30, 2004 3:00 PM** | 3600 | 120000 |

## 423063 Poe Creek - Cth Z Just East Sth 131

This station is nearest the mouth of the creek. The temperature levels were on the high side if the stream was to be considered for cold stream classification. The value of 27 °C exceeded the maximum instantaneous level of 25 °C for cold streams. Turbidity levels were less than 10 NTU indicating no transparency issues.

Table A26 – Core Data for Station 423063 Poe Creek

| Date/Time | Field Temp.(C) | Turbidity Field (NTU) |
|---|---|---|
| **Sep 11, 2005 12:00 AM** | 27 | <10 |
| **Sep 14, 2005 12:00 AM** | 19 | <10 |
| **Sep 26, 2005 12:00 AM** | 13 | <10 |
| **Sep 7, 2006 4:00 PM** | 23 | <10 |

As seen in Table A27, the *E.coli* values were much higher than the WDNR flowing rivers and streams recreational limit of 400 cfu/100 mL. The bacteriological samples indicate impact by human activity was likely causing elevated *E.coli* levels.

Table A27 – Bacteriological Data for Station 423063 Poe Creek

| Date/Time | *E.coli* Mtec (cfu/100mL) | Heter. Plate Count (cfu/100mL) |
|---|---|---|
| **Aug 22, 2004 4:50 PM** | 11000 | 500000 |
| **Aug 25, 2004 7:00 PM** | 800 | 100000 |
| **Aug 30, 2004 2:45 PM** | 1400 | |

The IBI data rates as a "good" condition gradient. The HBI and FBI also showed a "very good" water quality rating with a "possible slight" degree of organic pollution. The diversity index was high and the richness values indicated a range of aquatic life.

Table A28 – Macroinvertebrate Data for Station 423063 Poe Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Oct 7, 2003 12:00 AM** | 4.2 | 4.2 | 5.2 | 4.2 | 3.6 | 27 | 22 |

## MOORE CREEK BRANCH

Moore Creek drains the Norwalk area as seen in Figure A7.

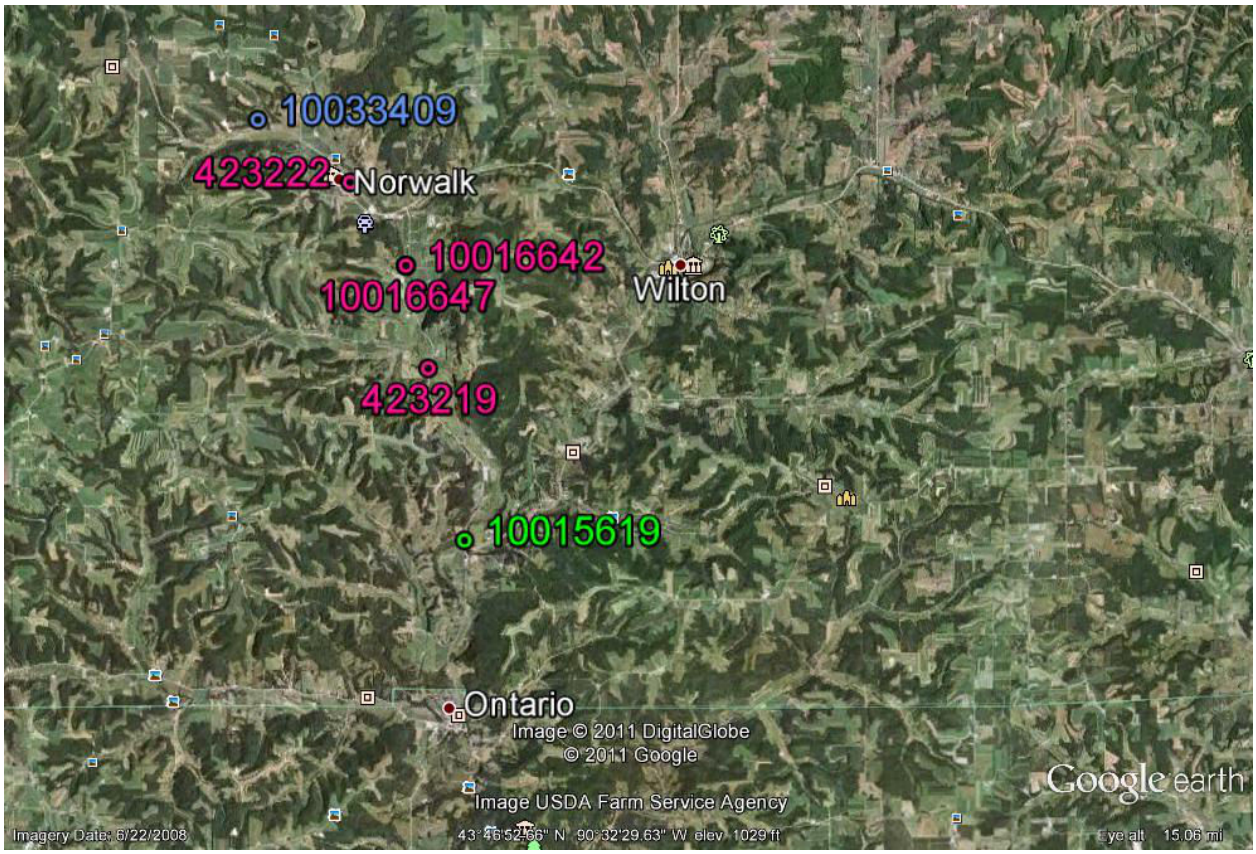


Figure A7 – Moore Creek

## *5026622 UNNAMED STREAM AT LIBERATION PARK*

This stream is a headwater for Morris (Moore) Creek. One site has been monitored by either the WDNR or VSN since 2000.

### 10033409 Unnamed Stream at Liberation Park

This site was monitored in 2010 through the VSN WAV program. The temperature data was consistent with a cold stream however DO levels were very low. This could indicate something has caused oxygen depletion such as high nutrients or sediment.

Table A29 – Temperature and Core Data for Unnamed Stream Liberation Park

| Date/Time | Field Temp.(C) | Dissolved Oxygen Field (mg/L) | Calculated % Saturation | pH Field | Turbidity Field (NTU) | Stream Flow – cfs |
|---|---|---|---|---|---|---|
| **Aug 23, 2010 7:30 PM** | 17.2 | 6.5 | 67.5 | 7.4 | 11 | 0.3 |
| **Jul 9, 2010 7:00 PM** | 19.4 | 6.5 | 70.6 | 7.2 | 17 | 2 |

The WAV data provides a "fair" rating which is a common rating in the Kickapoo Watershed.

Table A30 – WAV for Unnamed Stream Liberation Park

| Date/Time | WAV Biotic Index |
|---|---|
| **Jul 9, 2010 7:00 PM** | 2.4 |

## *1200000 MOORE CREEK*

Moore Creek, also known as Morris Creek, flows for 7.5 miles before reaching the Kickapoo River north of Ontario. Moore Creek is not a classified trout stream. Five sites have been monitored by the WDNR and VSN since 2000.

### 423222 Moore Creek Tributary at Norwalk, WI

The WDNR monitored this site in the Village of Norwalk. The turbidity was slightly elevated at 12 NTU.

Table A31 – Turbidity Data for Station 423222 for Moore Creek

| Date/Time | Turbidity Field (NTU) |
|---|---|
| **Jun 21, 2001 1:15 PM** | 12 |

The IBI rates as "good" condition rating. The HBI and FBI showed a "very good" water quality rating with "possible slight" organic pollution. The Shannon Diversity Index and the species and genera richness show a good mix of aquatic organisms present.

Table A32– Macroinvertebrate Data for Station 423222 for Moore Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Oct 17, 2001 12:00 AM** | 4 | 4.2 | 5.8 | 4.1 | 3.1 | 25 | 23 |

Ammonia levels did not demonstrate toxicity although the maximum value was approaching the chronic toxicity range. Nitrate and nitrite levels were typically for this sub-ecoregion. They did not over the 10 mg/L limit for drinking water, below the 1-2 mg/L range indicating typical levels for the sub-ecoregion and over the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels exceed the 0.033 mg/L EPA aggregate values and WDNR impairment levels.

Table A33 – Nutrient Data for Station 423222 for Moore Creek

| | Count n | Average | Median | Mode | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|---|---|---|
| **Dissolved Ammonia (mg/L)** | 5 | 0.032 | 0.023 | | 0.058 | 0.018 | 0.017 |
| **Dissolved Nitrate/Nitrite (mg/L)** | 5 | 0.9 | 0.8 | | 1.1 | 0.7 | 0.15 |
| **Total Kjeldahl Nitrogen (mg/L)** | 5 | 0.45 | 0.44 | | 0.66 | 0.26 | 0.15 |
| **Total Dissolved Phosphorous (mg/L)** | 5 | 0.052 | 0.000 | | 0.067 | 0.023 | 0.017 |
| **Total Phosphorous (mg/L)** | 5 | 0.092 | 0.099 | | 0.132 | 0.039 | 0.034 |

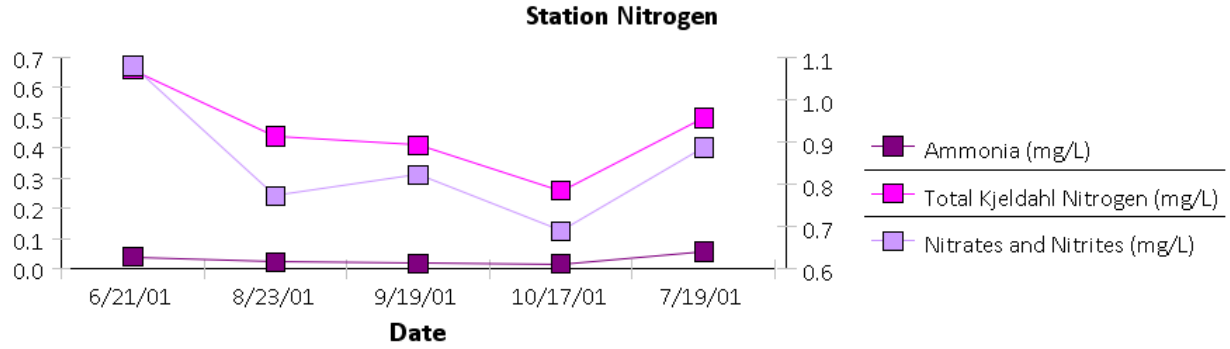


Figure A8 – Nitrogen Data for Station 423222 for Moore Creek

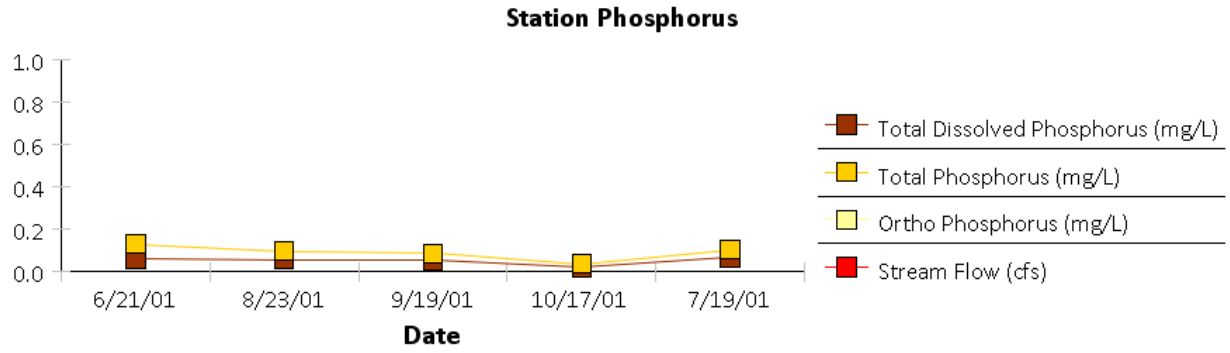


Figure A9 – Phosphorous Data for Station 423222 for Moore Creek

## 10016642 Moore (Morris) Creek - 25 Yds Upsteam Of Cth T Bridge near Mead Rd.

This station was monitored by the WDNR and VSN. Although insufficient data is available to make a conclusive determination, no degradation in DO, pH or turbidity was observed.

Table A34 – Temperature and Core Data for Station 10016642 Moore Creek

| Date/Time | Field Temp.(C) | Dissolved Oxygen Field (mg/L) | Calculated % Saturation | pH Field | Turbidity Field (NTU) | Stream Flow – cfs |
|---|---|---|---|---|---|---|
| **Aug 22, 2010 10:00 AM** | 14.5 | 10 | 101.3 | 8 | <10 | 15.1 |
| **Sep 9, 2010 2:30 PM** | 18.9 | 11.5 | 121.4 | 8.1 | <10 | 14.9 |
| **Jul 9, 2010 1:00 PM** | 20 | 9.5 | 97.4 | 7.9 | 11 | 26 |

The IBI condition gradient for cold streams rated as "good" in May and "excellent" in October. The HBI and FBI also showed a "very good" water quality rating with a "possible slight" degree of organic pollution. The richness values indicated a good range of aquatic life. The WAV index rated "fair".

Table A35 – Macroinvertebrate Data for Station 10016642 Moore Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | WAV Biotic Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **May 6, 2004 12:00 AM** | 4.5 | 4.8 | 6 | 4.6 | | 39 | 30 |
| **Oct 14, 2004 12:00 AM** | 3.7 | 4.1 | 9.1 | 4 | | 35 | 29 |
| **Jul 9, 2010 1:00 PM** | | | | | 2.2 | | |

## 10016647 Moore - 38 30 M Us From Hwy T

This station is very near station 10016642 and was monitored by the WDNR. The IBI condition gradient for cold streams rated as "fair". The HBI and FBI also just met the rating for a "very good" water quality rating and a "possible slight" degree of organic pollution. The richness values indicated a good range of aquatic life.

Table A36 – Macroinvertebrate Data for Station 10016647 Moore Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Oct 20, 2002 12:00 AM** | 4.6 | 4.5 | 3.7 | 4.8 | 3.5 | 26 | 23 |

## 423219 Moore Creek at Cth T, Near

Ammonia levels for this station did not demonstrate toxicity levels, although the maximum value was approaching the possible toxic range. Nitrate and nitrite levels were elevated. They were not over the 10 mg/L limit for drinking water. They were within the 1-2 mg/L range indicating typical levels for the sub-ecoregion and over the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels greatly exceed the 0.033 mg/L EPA aggregate values and WDNR impairment levels.

Table A37 – Nutrient Data for Station 423219 for Moore Creek

| | Count n | Average | Median | Mode | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|---|---|---|
| **Dissolved Ammonia (mg/L)** | 6 | 0.030 | 0.029 | | 0.056 | 0.000 | 0.019 |
| **Dissolved Nitrate/Nitrite (mg/L)** | 6 | 1.7 | 1.7 | | 2.0 | 1.2 | 0.27 |
| **Total Kjeldahl Nitrogen (mg/L)** | 6 | 0.43 | 0.42 | | 0.59 | 0.29 | 0.11 |
| **Total Dissolved Phosphorous (mg/L)** | 6 | 0.160 | 0.000 | | 0.222 | 0.109 | 0.042 |
| **Total Phosphorous (mg/L)** | 6 | 0.202 | 0.198 | | 0.260 | 0.145 | 0.046 |

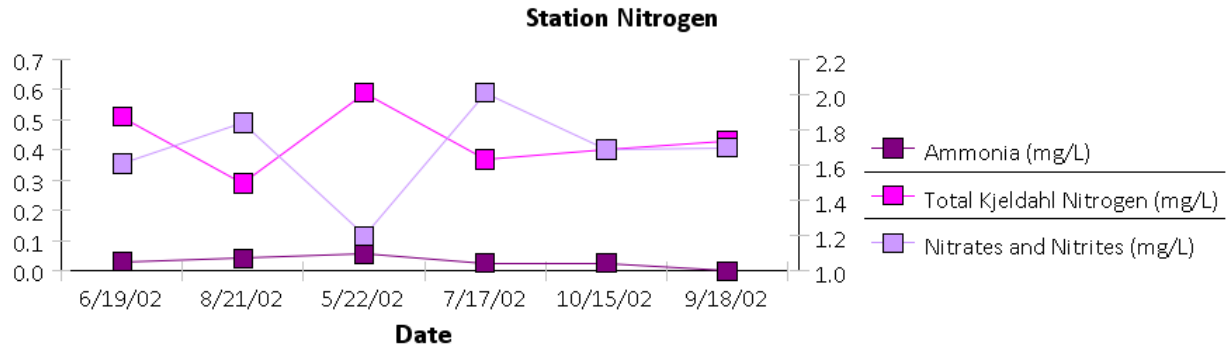


Figure A10 – Nitrogen Data for Station 423219 for Moore Creek

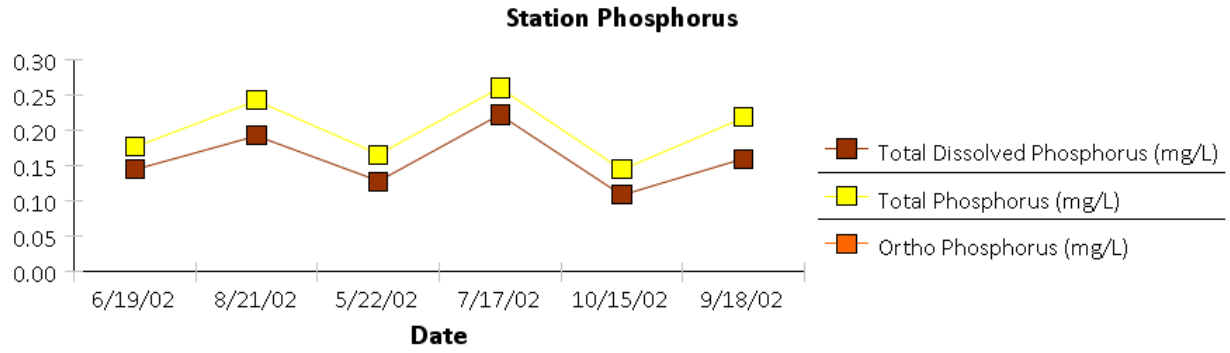


Figure A11 – Phosphorus Data for Station 423219 for Moore Creek

## 10015619 Morris (Moore) Creek Station 1 - Cth T Bridge In S23

This station was monitored by VSN during the *E.coli* testing program. The turbidity data did not demonstrate degradation.

Table A38 – Turbidity Data for Station 10015619 for Moore Creek

| Date/Time | Turbidity (NTU) |
|---|---|
| **Oct 2, 2005 12:00 AM** | <10 |
| **Oct 12, 2005 12:00 AM** | <10 |

As seen in Table A39 and Figure A11, numerous *E.coli* values exceed the WDNR flowing rivers and streams recreational limit of 400 cfu/100 mL. The data indicates that impact by human activity was causing elevated *E.coli* levels.

Table A39 – Bacteriological Summary for Station 10015619 for Moore Creek

| | Count n | Average | Median | Mode | Maximum | Minimum | Std. Dev. |
|---|---|---|---|---|---|---|---|
| ***E.coli* - mtec(cfu/100mL)** | 6 | 547 | 370 | | 1700 | 60 | 584 |
| **Hetertrophic Plate Count (cfu/100mL)** | 6 | 55667 | 59500 | | 98000 | 18000 | 32365 |

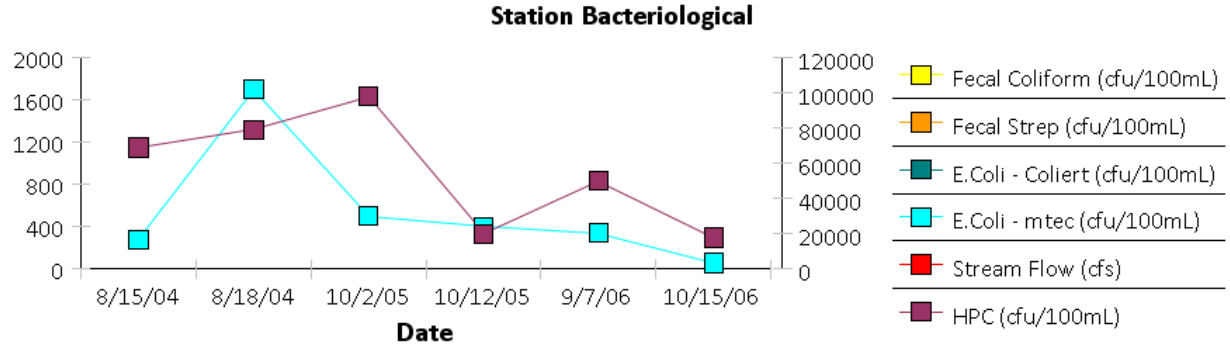


Figure A11 – Bacteriological Summary for Station 10015619 for Moore Creek

## BREY CREEK BRANCH

Brey Creek is located east of Ontario as seen in Figure A12.


Figure A12 – Brey Creek

### *1199400 BREY VALLEY CREEK*

Two sites have been monitored by the WDNR and VSN since 2000.

### 423204 Brey Valley Creek - (Bridge)

This station was monitored by the WDNR in 2003. The June ammonia data was high but neither value demonstrates toxicity. Nitrate and nitrite levels were quite elevated. They were not over the 10 mg/L limit for drinking water. They were over the 1-2 mg/L range indicating typical levels for the sub-ecoregion and the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels exceed the 0.033 mg/L EPA aggregate value but were below the WDNR impairment levels.

Table A40 – Nutrient Data for Station 423204 Brey Valley Creek

| Date/Time | Dissolved Ammonia (mg/L) | Dissolved Nitrate/Nitrite (mg/L) | Total Kjeldahl Nitrogen (mg/L) | Total Phosphorous Dissolved (mg/L) | Total Phosphorous Unfiltered (mg/L) |
|---|---|---|---|---|---|
| **Jun 23, 2003 12:00 AM** | 0.032 | 2.35 | 0.27 | 0.02 | 0.043 |
| **Sep 11, 2003 12:00 AM** | ND | 2.17 | 0.29 | 0.028 | 0.053 |

The IBI data rates as an "excellent" condition gradient for cold streams. The HBI and FBI also showed an "excellent" water quality rating and an "unlikely" degree of organic pollution. The diversity index was in the lower half of the scale and richness values indicated only a range of aquatic life.

Table A41 – Macroinvertebrate Data for Station 423204 Brey Valley Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Oct 22, 2003 12:00 AM** | 3.1 | 2.5 | 9.8 | 3.3 | 2.1 | 12 | 12 |

## 423203 Brey Valley Creek - Deep Hole

This station was monitored by the WDNR in 2003 downstream of station 423204. The ammonia data did not demonstrate toxicity. Nitrate and nitrite levels were elevated. They were not over the 10 mg/L limit for drinking water. They were over the 1-2 mg/L range indicating typical levels for the sub-ecoregion and the EPA 0.5 mg/L aggregate value for the ecoregion. TP levels exceed the 0.033 mg/L EPA aggregate value but were below the WDNR impairment levels.

Table A42 – Nutrient Data for Station 423203 Brey Valley Creek

| Date/Time | Dissolved Ammonia (mg/L) | Dissolved Nitrate/Nitrite (mg/L) | Total Kjeldahl Nitrogen (mg/L) | Total Phosphorous Dissolved (mg/L) | Total Phosphorous Unfiltered (mg/L) |
|---|---|---|---|---|---|
| **Jun 23, 2003 12:00 AM** | 0.024 | 2.02 | 0.19 | 0.023 | 0.049 |
| **Sep 11, 2003 12:00 AM** | ND | 2.18 | 0.24 | 0.029 | 0.057 |

The IBI data rates as an "excellent" condition gradient for cold streams. The HBI and FBI also showed an "excellent" water quality rating and an "unlikely" degree of organic pollution. The diversity index was in the lower half of the scale and richness values indicated a range of aquatic life.

Table A43 – Macroinvertebrate Data for Station 423203 Brey Valley Creek

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Oct 22, 2003 12:00 AM** | 2.8 | 2.5 | 11.3 | 3 | 2.1 | 16 | 16 |

## THE UPPER KICKAPOO RIVER

The Upper Kickapoo River drains the entire Upper Kickapoo Watershed as seen in Figure A13.

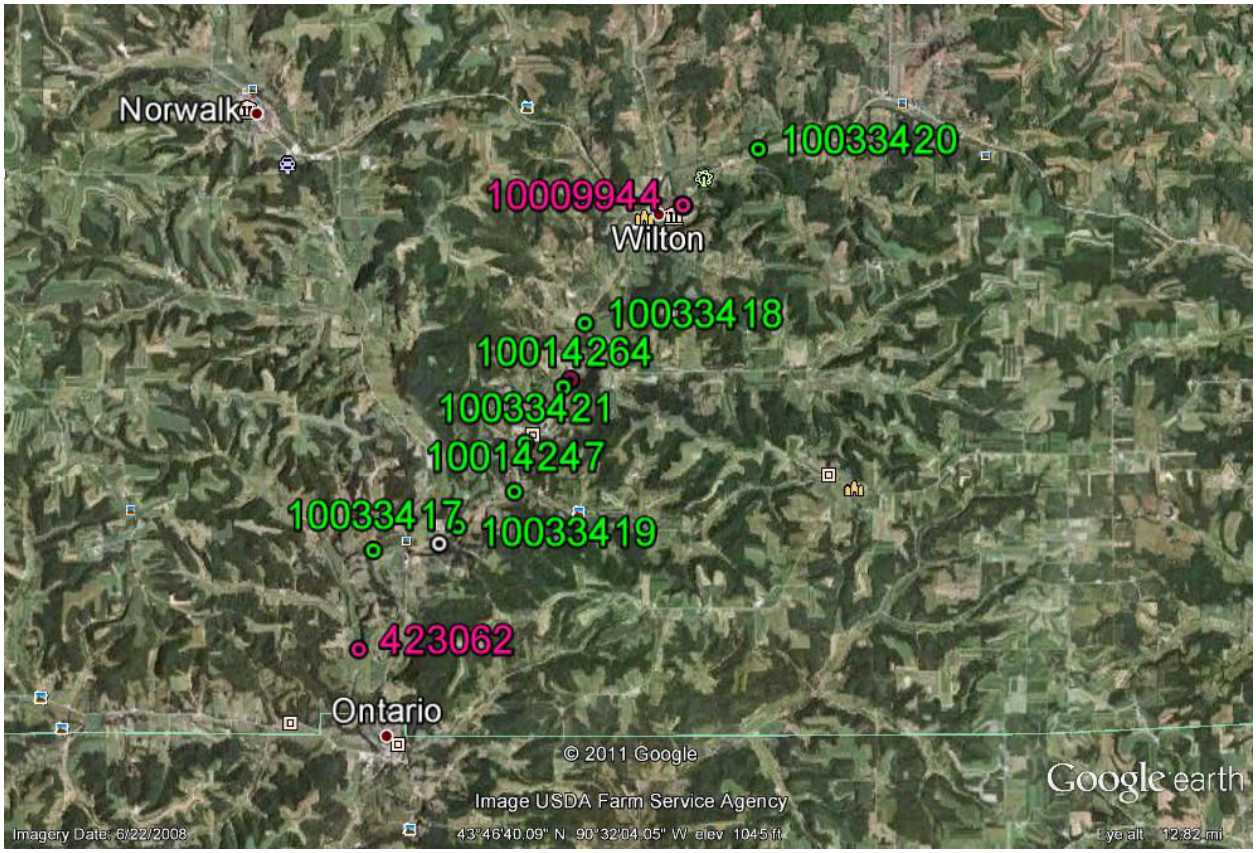


Figure A13 – Upper Kickapoo River

### *1202100 UNNAMED CREEK (CREEK 7-12)*

Unnamed Creek 7-12 is a tributary to the Kickapoo River. Only one station was monitored by the WDNR and the VSN since 2000.

### 10031054 Creek 7-12 Downstream of hwy 131

The IBI data rates as a "fair" condition gradient, indicating restoration was needed, for all stream classifications unless determined a "limited forage fish stream" or a "limited aquatic life stream". The HBI and FBI also showed a "fair" water quality rating and a "fairly significant" degree of organic pollution. However the diversity index was high and the richness values indicated a range of aquatic life.

Table A44 – Macroinvertebrate Data for Unnamed Creek 7-12

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Mar 17, 2010 12:30 PM** | 6.2 | 5.5 | 2.2 | 5.8 | 3.1 | 22 | 21 |

### *1199600 COOK CREEK (UPPER KICKAPOO WATERSHED)*

There are two Cook Creeks in the greater Kickapoo Watershed. This one lies north of Ontario. Only one sample has been taken at this stream by WDNR or VSN since 2000.

### 423062 Cook Creek - 16 Ave Brdge Sec34t15r2w

The IBI data rates as a "good" condition gradient for cold streams. The HBI and FBI show an "excellent" water quality rating and an "unlikely" degree of organic pollution. The diversity index was mid-range and the richness values indicated a range of aquatic life.

Table A45 – Macroinvertebrate Data for Station Cook Creek (Upper Watershed)

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Oct 7, 2003 12:00 AM** | 3.4 | 3.5 | 7 | 3.4 | 2.2 | 16 | 13 |

### *1182400 UPPER KICKAPOO RIVER*

The Upper Kickapoo River is more characteristic of a small spring creek with a steep gradient of 23 percent. This portion is classified as a class I trout stream.

### 10033420 Kickapoo River at Keystone Rd

This site was monitored by the VSN during the *E.coli* testing program. The data can be seen in Table A46 and A47. Since there is only one data point it cannot be compared with the maximum daily mean value of 22 °C for determination of fish and aquatic habitat classification. However, it can be compared against the instantaneous limit of 25°C for cold streams. As such the temperature data point was within limits for cold stream designation. Turbidity was less than 10 NTU indicating no transparency concerns.

Table A46 – Temperature and Turbidity Data for Station 10033420 Kickapoo River

| Date/Time | Temperature Field (°C) | Turbidity (NTU) |
|---|---|---|
| **Sep 8, 2005 12:00 AM** | 20 | <10 |

VSN also sampled for microbes in 2006. The fecal coliform and *E.coli* testing indicated contamination from fecal matter. The bacteriological data shows impact from human activity through elevated *E.coli* levels and the presents of ruminant DNA.

Table A47 – Bacteriological Data for Station 10033420 Kickapoo River

| Date/Time | *E.coli* (cfu/100mL) Mtec | Heter. Plate Count (cfu/100mL) | PCR Human | PCR Ruminant |
|---|---|---|---|---|
| **Sep 8, 2005 12:00 AM** | 11000 | 400000 | ND | POS |

### 10009944 Kickapoo River - Kickapoo River (East Fork) Station 1-2003 Upstream Side Of Bridge

This station was monitored by the WDNR. The IBI data rates as a "fair" condition gradient for cold streams. The HBI and HBI Max-10 just met the threshold for "very good" water quality rating and a

"slight possible" degree of organic pollution, however, the FBI rated only "good". The diversity index was high and as were the richness values indicating a good range of aquatic life.

Table A48 – Macroinvertebrate Data for Station 10009944 Kickapoo River

| Date/Time | Hilsenhoff Biotic Index Std | Hilsenhoff Biotic Index Max-10 | Index of Biotic Integrity | Family Biotic Index | Shannon Diversity Index | Species Richness | Genera Richness |
|---|---|---|---|---|---|---|---|
| **Oct 8, 2003 12:00 AM** | 4.5 | 4.5 | 4.2 | 4.3 | 3.8 | 33 | 26 |

## 10033418 Kickapoo River HWY 131 Bridge at Midas

This site was monitored by the VSN during the *E.coli* testing program. The bacteriological data shows impact from human activity through elevated *E.coli* levels above the maximum recreational WDNR limit of 400 cfu/100 mL. The data indicates the presents of ruminant DNA and not human, therefore was likely the elevated levels of *E.coli* were from farming operations.

Table A49 – Bacteriological Data for Station 10033418 Kickapoo River

| Date/Time | *E.coli* (cfu/100mL) Mtec | Heter. Plate Count (cfu/100mL) |
|---|---|---|
| **Aug 22, 2004 4:35 PM** | 1500 | 90000 |
| **Aug 25, 2004 7:30 PM** | 400 | 300000 |

## 10014264 Kickapoo River Station 5 - Sth 131 Crossing In Sw 1/4, Sw 1/4 Of S7

This site was monitored by the VSN during the *E.coli* testing program. Data can be seen in Table A50 and A51. The temperature data was elevated in October but less than the instantaneous limit of 25°C. Turbidity values were also elevated in the October sample.

Table A50 – Temperature and Turbidity Data for Station 10014264 Kickapoo River

| Date/Time | Temperature Field (°C) | Turbidity (NTU) |
|---|---|---|
| **Sep 26, 2005 12:00 AM** | 13 | <10 |
| **Oct 5, 2005 12:00 AM** | 23 | 19 |

The bacteriological data shows impact from human activity through elevated *E.coli* levels above the single maximum recreational WDNR limit of 400 cfu/100 mL. The data indicates the presence of ruminant DNA and not human, therefore was likely impacted by farming operations.

Table A51 – Bacteriological Data for Station 10014264 Kickapoo River

| Date/Time | *E.coli* mtec (cfu/100mL) | Heter. Plate Count (cfu/100mL) | PCR Human | PCR Cow | PCR Ruminant |
|---|---|---|---|---|---|
| **Sep 26, 2005 12:00 AM** | 50000 | 740000 | ND | | POS |
| **Oct 5, 2005 12:00 AM** | 600 | 160000 | ND | | POS |
| **Oct 15, 2006 5:50 PM** | 1200 | 52000 | ND | POS | |

## 10033421 Kickapoo River at Hwy 131, Bridge 8

This site was also monitored by the VSN during the *E.coli* testing program. Data can be seen in Table A52 and A53. The temperature data was elevated in the October value but less than the instantaneous limit of 25°C. Turbidity values were also elevated in the October sample.

Table A52 – Temperature and Turbidity Data for Station 10033421 Kickapoo River

| Date/Time | Temperature Field (°C) | Turbidity (NTU) |
|---|---|---|
| **Sep 26, 2005 12:00 AM** | 13 | <10 |
| **Oct 5, 2005 12:00 AM** | 22.5 | 17 |

The bacteriological data shows impact from human activity through elevated *E.coli* levels above the maximum recreational WDNR limit of 400 cfu/100 mL. The data also indicates the presents of ruminant DNA and not human, therefore was likely impacted by farming operations. The data was reflective the upstream data from station 10014264 monitoring on the same days.

Table A53 – Bacteriological Data for Station 10033421 Kickapoo River

| Date/Time | *E.coli* (cfu/100mL) Mtec | Heter. Plate Count (cfu/100mL) | PCR Human | PCR Ruminant |
|---|---|---|---|---|
| **Sep 26, 2005 12:00 AM** | 50000 | 800000 | ND | POS |
| **Oct 5, 2005 12:00 AM** | 1300 | 160000 | ND | POS |

## 10014247 Kickapoo River Station 3 - Sth 131 Crossing In Ne 1/4 Of S24

This site was also monitored by the VSN during the *E.coli* testing program. Data can be seen in Table A54 and A55. The temperature data was elevated in September above the instantaneous limit of 25°C. Turbidity values were also elevated in the September sample.

Table A54 – Temperature and Turbidity Data for Station 10014247 Kickapoo River

| Date/Time | Temperature Field (°C) | Turbidity (NTU) |
|---|---|---|
| **Sep 11, 2005 12:00 AM** | 28.5 | <10 |
| **Sep 14, 2005 12:00 AM** | 20.5 | <10 |
| **Sep 13, 2006 3:20 PM** | 19 | 19 |

The bacteriological data shows impact from human activity. *E.coli* levels were above the maximum recreational WDNR limit of 400 cfu/100 mL. The data also indicates the presents of ruminant DNA and not human, therefore was likely the elevated *E.coli* levels were due to farming operations.

Table A55 – Bacteriological Data for Station 10014247 Kickapoo River

| Date/Time | *E.coli* (cfu/100mL) Mtec | Heter. Plate Count (cfu/100mL) | PCR Human | PCR Ruminant |
|---|---|---|---|---|
| **Sep 11, 2005 12:00 AM** | 1000 | 180000 | ND | POS |
| **Sep 14, 2005 12:00 AM** | 400 | 200000 | ND | POS |

## 10033419 Kickapoo River at Hwy 131, Bridge 5

This station was sampled by the VSN. Temperature analysis was not completed during any of the summer months. Data can be seen in Table A56 and A57 and Figure A13. The average value was 19°C the maximum value was 26°C over the instantaneous limit of 25°C.

Table A56 – Temperature Data Summary for Station 10033419 Kickapoo River

| | | | |
|---|---|---|---|
| Average | 19.0 | Average n | 5 |
| Max Value | 26.0 | Average Standard Deviation | 4.6 |
| Average Daily Max | 19.0 | Daily Maximum n | 5 |

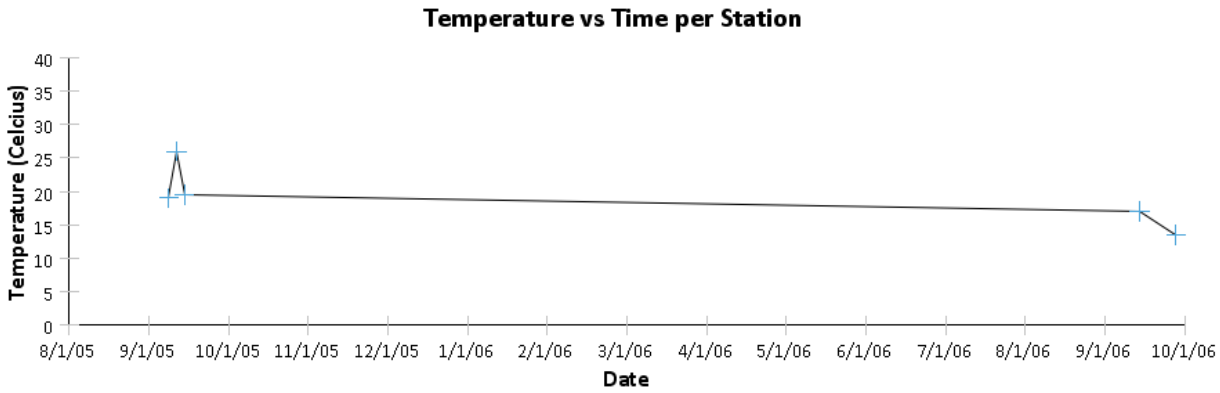


Figure A13 – Temperature Data Summary for Station 10033419 Kickapoo River

Most of the data has turbidity less than 10 NTU but one event saw the turbidity increase. The increase in turbidity was likely due to high sediment or nutrients causing algal growth.

Table A57 – Turbidity Data for Station 10033419 Kickapoo River

| | 0-10 NTU | 11-20 NTU | 21-50 NTU | 51-100 NTU | >100 NTU |
|---|---|---|---|---|---|
| **Turbidity Field** | 4 | 1 | 0 | 0 | 0 |

## 10033417 Kickapoo River 50 ft upstream of confluence with Moore (Morris) Creek

This site was monitored by the VSN during the *E.coli* testing program. The bacteriological data shows impact from human activity. *E.coli* levels were above the maximum recreational WDNR limit of 400 cfu/100 mL. The data indicates the presents of ruminant DNA and not human, therefore was likely the elevated levels of *E.coli* were from farming operations.

Table A58 – Bacteriological Data for Station 10033417 Kickapoo River

| Date/Time | *E.coli* (cfu/100mL) Mtec | Heter. Plate Count (cfu/100mL) |
|---|---|---|
| **Aug 15, 2004 5:40 PM** | 3100 | 79000 |
| **Aug 18, 2004 5:55 PM** | 6000 | 130000 |