| TABLE 1 DETAILED INVERTEBRATE BACKGROUND | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | F | D | E | F | | | G | | | H | | | | | J | | K | L | | |
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | USFS | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | | Nina Creek ****** | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)****** | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| EPHEMEROPTERA (Mayflies) | GENUS | | | | | | | | | | | | | | | | | | | | | |
| **Leptophlebiidae** | | | | | 2 | 26 | 28 | 14 | 38 | 29 | 1 | 8 | 14 | 4 | 3 | | 21 | 2 | | | | |
| | Leptophlebia | x | x | x | 114 | | | | | | | | | | | | | | 251 | | | |
| | Tricorythodes sp. | | | | | | | | | | | | | | | | | | | | | |
| | Choroterpes sp. | | x | | | | | | | | | | | | | | | | | 114-117 | 24.6-25.1 | 8.8 |
| | Paraleptophlebia sp. | x | x | x | | | | | | | | | | | | 1 | | | 463 | | | |
| | P.debilis | | x | | | | | | | | | | | | | | | | | | | |
| | P.guttata | x | x | | | | | | | | | | | | | | | | | 705 | 450 | 7.9 |
| | P.mollis | | x | | | | | | | | | | | | | | | | | | | |
| | P.praepedita | x | x | | | | | | | | | | | | | | | | | 87 | 26.5 | 7.2 |
| | P.volitans | x | x | | | | | | | | | | | | | | | | | 21 | 3.6 | 6.6 |
| **Baetiscidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Baetisica sp. | | | | 129 | | | | | | | | | | | | | | | | | |
| | B.carolina | | x | | | | | | | | | | | | | | | | | | | |
| | B.lacustris | | x | | | | | | | | | | | | | | | | | | | |
| **Baetidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Acerpenna sp. | x | | | | | 1 | | 2 | 4 | | | | | | | | | ~649 | | | |
| | Baetis sp. | x | x | x | 66 | | | | | | 1 | | | | | | | | >1,395 | 16-1000 | <10-5700 | 5.6-8.5 |
| | B.brunneicolor | | x | | | 1 | | | 1 | | | | | | | | | | | | | |
| | B.flavistriga | | x | | | | | | | | | | | | | | | | | | | |
| | B. hageni | | x | | | | | | | | | | | | | | | | | | | |
| | B.intercalaris | | x | | | | | | | | | | | | | | | | | | | |
| | B.levitans | | x | | | | | | | | | | | | | | | | | | | |
| | B.phyllis | | x | | | | | | | | | | | | | | | | | | | |
| | B.pygmaeus | | x | | | | | | | | | | | | | | | | | | | |
| | B.vagans | | x | | | | | | | | | | | | | | | | | | | |
| | Iswaeon sp. | | | | | | | | | | | | | | 1 | | | | | | | |
| | Labiobaetis propinquus | | | | | | | | 1 | | | | | | | | | | | | | |
| | Paracloedes sp. | x | | x | 60 | | | | | | | | | | | | | | | | | |
| | Pseudocloeon sp. | | x | x | | | | | | | | | | | | | | | | 20-260 | 3.-235 | 6.6-8.4 |
| | P.anoka | | x | | | | | | | | | | | | | | | | | | | |
| | P. carolina | | x | | | | | | | | | | | | | | | | | | | |
| | P.cingulataum | | x | | | | | | | | | | | | | | | | | | | |
| | P.dubium | | x | | | | | | | | | | | | | | | | | | | |
| | P.parvulum | | x | | | | | | | | | | | | | | | | | | | |
| | Cloeon sp. | | x | x | | | | | | | | | | | | | | | | | | |
| | Centroptilum sp. | | x | x | | 2 | 3 | | | 1 | | | | | | | | | | | | |
| | Callibaetis sp. | | x | x | | | | | | | | | | | | | | | | | | |
| | Callibaetis ferrugineus | | | x | | | | | | | | | | | | | | | | | | |
| | Baetisca sp. | | | | 129 | | | | | | | | | | | | | | | | | |
| | Heterocloen curiosis | | x | | | | | | | | | | | | | | | | | | | |
| **Ephemeridae** | | | | | | | 1 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | Ephemera sp. | x | x | x | 21 | | | | | | | | | | 2 | | | | 696 | | | |
| | E. simulans | | x | x | | | | | | | | | | | | | | | | | | |
| | Hexagenia sp. | | x | x | 16 | | | | | | | | | | | | | | | 70-233 | 34.9-45.2 | 6.2-7.9 |
| | H. limbata | | | | | | | | | | | | | | | | | | | | | |
| | H.bilineata | | x | | | | | | | | | | | | | | | | | | | |
| | Litobrancha recurvata | | x | | | | | | | | | | | | | | | | | | | |
| **Ephemerellidae** | | | | | 8 | | 1 | | | | | | | 1 | | | | | | | | |
| | Seratella deficiens | x | | x | | | 9 | | | | | | | | | | | | 535 (genera) | | | |
| | Eurylophella sp. | x | | | | 8 | 9 | 14 | 1 | 38 | | | | | 6 | 8 | | 12 | 490 | | | |
| | E. funeralis | | | | | | | | | | | | 1 | | | | | | | | | |
| | Attenella sp. | x | | x | 1 | | | | | | | | | | | | | | ~698 | | | |
| | Ephemerella sp. | x | | | | | | | | | | | | | | | | 5 | 299 | | | |
| | E. attenuata | | x | | | | | | | | | | | | | | | | | | | |
| | E. aestiva | | | x | | | | | | | | | | | | | | | | | | |
| | E.bicolor | | x | | | | | | | | 9 | | | | | | | | | 322 | 313 | 7.2 |

| TABLE 1 DETAILED INVERTEBRATE BACKGROUND | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | F | D | E | F | | | G | | | H | | | | | J | | K | L | | |
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | | Nina Creek ****** | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| | E.deficiens | | x | | | | | | | | | | | | | | | | | | 13- 124 | 7.2 |
| | E.invaria | | x | | | | | | | | | | 49 | 25 | 7 | | 6 | | | | | |
| | E.minimella | | x | | | | | | | | | | | | | | | | | | | |
| | E.needhami | | x | | | | | | | | | | | | | | | | | | | |
| | E.rotunda | | x | | | | | | | | | | | | | | | | | | | |
| | E.serrata | | x | | | | | | | | | | | | | | | | | | | |
| | E.simplex | | x | | | | | | | | | | | | | | | | | 15 | 2.7 | 6.9 |
| | E.sordida | | x | | | | | | | | | | | | | | | | | | | |
| | E.subvaria | | x | | | | | | | | | | | | | | | | | | | |
| | E.temporalis | | x | | | | | | | | | | | | | | 24 | | | 6-216 | 2-135 | 6.8-8.4 |
| | Teloganopsis deficiens | | | | | | | | | | | | | | 4 | | | | | | | |
| **Isonychiidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Isonychia sp. | x | | x | | | | | | 1 | | | | | 3 | | | | 1,180 | | | |
| **Caenidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Brachyercus sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Caenis sp. | x | x | x | 4 | | 2 | | | | | | | | | | 2 | | >3,923 | 6-705 | <1-450 | 5.4-8.5 |
| | C.Diminuta gr. | | | | | 7 | 36 | 1 | | 3 | | 23 | 1 | 1 | 52 | 77 | 74 | 8 | | | | |
| **Siphloneuridae** | | | | | | | | | | | | | | | | | | | | | | |
| | Siphlonurus sp. | | x | x | 7 | | | | | | | | | | | | | | | | | |
| | S. alternans | | x alternatus | x | | | | | | | | | | | | | | | | | | |
| | S.isonychia sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Hydropsyche sp. | | x | | | | 8 | | | | 13 | 4 | 5 | | | | | | | 13 | 43 | 6.9 |
| | H.betteni | | | | | | | | | | 20 | 2 | 5 | | | 1 | 5 | 2 | | | | |
| **Tricorythidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Tricorxthodes sp. | | x | x | | | | | | | | | | | | | | | | 6-705 | 1.3-450 | 5.4-8.5 |
| **Heptageniidae** | | | | | 4 | | | | 10 | | | 1 | | | 1 | | | | | | | |
| | Leucrocuta sp. | x | | | | | | | | | | | 3 | | | | | | 424 | | | |
| | L. hebe | | | x | | | | | | | | | | | | | | | | | | |
| | Rhithrogena sp. | | x | x | | | | | | | | | | | | | | | | | | |
| | Eneorus vitrea | | | x | | | | | | | | | | | | | | | | | | |
| | Heptagenia sp. | x | x flavescens | x | | | | | | | | | | | | | | | 326 | | | |
| | H. pulla | | | x | | | | | | | | | | | | | | | | | | |
| | H. hebe | | x | | | | | | | | | | | | | | | | | | | |
| | Maccaffertium sp. | x | | | | 2 | 3 | 11 | 7 | 7 | 6 | 3 | 2 | 2 | 5 | 1 | 10 | 1 | ~1,035 | | | |
| | M. vicarium | | | | | | 1 | | 7 | | | | | 1 | | | 1 | | | | | |
| | Stenonema sp. | | | | 3 | | | | | | | | | | | | | | >745(genera) | | | |
| | S.candidum. | x | x | x | | | | | | | | | | | | | | | | | | |
| | S. exiguum | | x | x | 1 | | | | | | | | | | | | | | | | | |
| | S.modestum | | | x | | | | | | | | | | | | | | | | | | |
| | S.vicarium | | | x | 86 | | | | | | | | | | | | 1 | | | | | |
| | S.exiquum | | | x | 1 | | | | | | | | | | | | | | | | | |
| | S. terminatum | | x | | 26 | | | | | | | | | | | | | | | | | |
| | S.rubrum | | x | | | | | | | | | | | | | | | | | | | |
| | S.quinquespinum | | x | | | | | | | | | | | | | | | | | | | |
| | S.smithae | | x | | | | | | | | | | | | | | | | | | | |
| | S.tripunctatum | | x | | | | | | | | | | | | | | | | | 60-800 | 418-370 | 7.2-8.4 |
| | Epeorus sp. | x | x | | | | | | | | | | | | | | | | 307 | | | |
| | Stenacron sp. | x | | | 16 | | 2 | | 1 | 3 | | | | | | | | | ~782 | | | |
| | S. interpuctatum | | x | | | | | | | | | | | | | | | | | 13-705 | <1-450 | 5.6-8.4 |
| | S. minnetonka | | x | | | | | | | | | | | | | | | | | | | |
| | S.femoratum | | x | | | | | | | | | | | | | | | | | | | |
| | S. fuscum | | x | | | | | | | | | | | | | | | | | | | |
| | S. fuscum rivulicolum | | x | | | | | | | | | | | | | | | | | | | |
| | S. candidum | | x | | | | | | | | | | | | | | | | | | | |
| | S.annexum | | x | | | | | | | | | | | | | | | | | | | |
| | S.integrum | | x | | | | | | | | | | | | | | | | | | | |
| | S.pulchellum | | x | | | | | | | | | | | | | | | | | 7-233 | <1-72.8 | 5.8-8.4 |
| | Nixe sp. | x | | | | | | | | | | 2 | | | | | | | 319 | | | |

| TABLE 1 DETAILED INVERTEBRATE BACKGROUND | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | F | D | E | F | | | G | | | H | | | | J | | | K | L | | | |
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | Nina Creek ****** | | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH | |
| | Arthroplea bipunctata | | x | | | | | | | | | | | | | | | | | | | | |
| | Stenacron candidum | | x | | | | | | | | | | | | | | | | | | | | |
| **Metretopodidae** | Siphloplecton interlineatum | | x | | | | | | | | | | | | | | | | | | | | |
| **Polymitacyidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Ephoron sp. | | | | | | | | | | | | | | | | | | | | | | |
| | E. leukon | | x | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| PLECOPTERA (stoneflies) | | | | | | | | | | | | | | | | | | | | | | | |
| **Nemouridae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Amphinemura delosa | x | x | | | | | | | | | | | | | | | | >812 (genera) | | | | |
| | A. linda | | x | | | | | | | | | | | | | | | | | | | | |
| | Prostoia completa | | x | | | | | | | | | | | | | | | | | | | | |
| | Shipsa rotunda | | x | | | | | | | | | | | | | | | | | | | | |
| | Podmosta macdunnoughi | | x | | | | | | | | | | | | | | | | | | | | |
| **Lectridae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Leuctra sp. | x | | | | | | | | | | | 1 | | | | | | >2,087 (genera) | | | | |
| | L. ferruginea | | x | | | | | | | | | | | | | | | | | | | | |
| **Capniidae** | | | | | | | | | | 1 | | | 3 | | 5 | | 1 | | | | | | |
| | Allocapina minima | x | x | | | | | | | | | | | | | | | | 542 (genera) | | | | |
| | A. pygmaea | | x | | | | | | | | | | | | | | | | | | | | |
| | Capnia manitoba | | x | | | | | | | | | | | | | | | | | | | | |
| | Paracapinia sp. | x | | | | | | | | | | | | 3 | | | | | 334 (genera) | | | | |
| | P. angulata | | x | | | | | | | | | | | | | | | | | | | | |
| | P. opis | | x | | | | | | | | | | | | | | | | | | | | |
| **Perlidae** | | | | | | | | | | | | 4 | 1 | | | 5 | 1 | | | | | | |
| | Isogenoides sp. | | x | | | | | | | | | | | | | | | | | | | | |
| | Isoperia bilineata | x | x | | | | | | | | | | | | | | | | 460 (genera) | | | | |
| | I. frisoni? | | | x | | | | | | | | | | | | | | | | | | | |
| | I. dicala | | x | | | | | | | | | | | | | | | | | | | | |
| | I.lata | | x | | | | | | | | | | | | | | | | | | | | |
| | I. Illies | | x | | | | | | | | | | | | | | | | | | | | |
| | I. orata | | x | | | | | | | | | | | | | | | | | | | | |
| | I.signata | | x | | | | | | | | | | | | | | | | | | | | |
| | I. slossonae | | x | | | | | | | | | | | | | | | | | | | | |
| | I. transmarina | | x | | | | | | | | | | | | | | | | | | | | |
| | Acroneuria sp. | x | x abnormis | x | | | | | | | | | 2 | | 2 | | | | >2,630 | | | | |
| | A. lycorias | | x | x | | | | 2 | | 1 rare | | 1 | 2 | 1 | | 1 | 1 | | | | | | |
| | A. abnormis | | | x | | | | | | | | | | | | | | | | | | | |
| | A.carolinensis | | | | | | | | | | | | 1 | | | | | | | | | | |
| | A. internata? | | x | x | | | | | | | | | | | | | | | | | | | |
| | Agetinia.sp. | | | | | | | | | | | | | | | | | | | | | | |
| | Paragnetina sp. | x | | x | | | | | | | | | | | | | | | 2,087 | | | | |
| | Paragnetina media | | | | | | | 1 | | | | 1 | p | 2 | | | | | | | | | |
| | Perlesta sp. | x | | x | | | | | | | | | | | | | | | 3,314 | | | | |
| | Isoperia sp. | | | | | | | | | | | | | | | | | | | | | | |
| **Pteronarcyidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Pteronarcys sp. | x | x | | | | 2 | | | | | | | | | | | | ~634 | | | | |
| | P. dorsata? | | | x | | | | | | | | | | | | | | | | | | | |
| **Taeniopterygidae** | | | | | | | 4 | | | | | | | | | | | | | | | | |
| | Strophopterx fasciata | | x | | | | | | | | | | | | | | | | | | | | |
| | Taeniopteryx sp. | x | | | | | 2 | 9 | 11 | 4 | 12 | | 1 | | 12 | | 9 | 15 | 260 | | | | |
| | T.burski | | x | | | | | | | | | | | | | | | | | | | | |
| | T. rivlis sp. | | x | | | | | | | | | | | | | | | | | 70-82 | 45.1-45.2 | 6.0-6.8 | |
| **Chloroperlidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Alloperla? sp. | x | | x | | | | | | | | | | | | | | | 246 | | | | |
| | Hastaperla sp. | | | x | | | | | | | | | | | | | | | | | | | |
| **Perlodidae** | | | | | | | | | | | | | 1 | | | | | 1 | | | | | |

| TABLE 1 DETAILED INVERTEBRATE BACKGROUND | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | F | D | E | F | | | G | | | H | | | | | J | | K | L | | |
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | Nina Creek ****** | | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| | Acroneuria abnormis | | x | x sp. | | | | | | | | | | | | | | | | | | |
| | A.internata | | x | x | | | | | | | | | | | | | | | | | | |
| | A.lycorias | | x | x | | | | | | | | | | | | | | | | | | |
| | Neoperla clymene | | x | | | | | | | | | | | | | | | | | | | |
| | Paragenetina media | | x | | | | | | | | | | | | | | | | | | | |
| | Perlesta placida | x | x | | | | | | | | | | | | | | | | 3,314(genera) | | | |
| | Perlinella drymo | | x | | | | | | | | | | | | | | | | | | | |
| | Phasganophora capitata | | x | | | | | | | | | | | | | | | | | | | |
| | Isoperia sp. | x | x bilineata | x | | | | | | | | | | | | | | | 460 | | | |
| | Isogenoides sp. | | x | | | | | | | | | | | | | | | | | | | |
| | I.dicala | | x | | | | | | | | | | | | | | | | | | | |
| | I.frisoni | | x | | | | | | | | | | | | | | | | | | | |
| | I.lata | | x | | | | | | | | | | | | | | | | | | | |
| | I. signata | | x | | | | | | | | | | | | | | | | | | | |
| | I. slossonae | | x | | | | | | | | | | | | | | | | | | | |
| | I. transmarina | | x | | | | | | | | | | | | | | | | | | | |
| | I. Illies | | x | | | | | | | | | | | | | | | | | | | |
| | I. orata | | x | | | | | | | | | | | | | | | | | | | |
| | Agetinia.sp. | | | | | | | | | | | | | | | | | | | | | |
| TRICHOPTERA (caddisflies) | | | | | | | | | | | | | | | | | | | | | | |
| **Glossosomatidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Glossosma sp. | x | x | x | | | | | | | | | | | 2 | | | | >1,652 | | | |
| | Agapetus sp. | | x | | | | | | | | | | | | | | | | 365 | 66 | 25 | 7.3 |
| **Philopotamidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Chimarra sp. | | | | | 36 | 1 | 1 | 36 | 2 | 8 | 13 | 35 | 22 | 9 | 4 | 2 | 9 | >3,972 | | | |
| | C. socia | x | | x | | | | | | | | | | | | | | | | | | |
| | C. atterima | | | x | 1 | | | | | | | | | | | | | | | 15-19 | 7.6-7.7 | 6.8 |
| | C. obscura | | x | x | | | | | | | | | | | | | | | | 124-600 | 14.2-510 | 7.6-8.3 |
| | C. socia | | x | | 31 | | | | | | | | | | | | | | | 4-800 | 7.3-25 | 6.3-8.7 |
| | C. feria | | x | | | | | | | | | | | | | | | | | 23 | 3.2 | 7.1 |
| | Dolophilodes distinctus | x | x | | | | | | | | | | | | | | | | 863 (genera) | | | |
| **Psychomyiidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Psychomyia flavida | x | x | x | 1 | | | 1 | | | | 1 | | | 11 | | 3 | 3 | >1,131 (genera) | | | |
| | Lype diversa | | x | | | | | | | | 6 | | | | | | | | | 87 | 26.5 | 7.2 |
| **Lepidostomatidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Lepidostoma sp. | x | x | x | | | | | | | | 3 | 5 | 10 | 8 | 1 | | | ~121 | 6-66 | 2.5-25 | 6.4-7.3 |
| **Leptoceridae** | | | | | | | | | | 4 | | | | | | | 1 | | | | | |
| | Ceraclea sp. | | | x | | 1 | 2 | | 1 | | | | | | | | 1 | | | | | |
| | C.ancylus | | x | | | | | | | | | | | | | | | | | | | |
| | C.annulicornis | column H | x | | | | | | | | | | | | | | | | | | | |
| | C. diluta | | x | | | | | | | | | | | | | | | | | | | |
| | C.maculata | | x | | | | | | | | | | | | | | | | | | | |
| | C.misca | | x | | | | | | | | | | | | | | | | | | | |
| | C.neffi | | x | | | | | | | | | | | | | | | | | | | |
| | C.resurgens | | x | | | | | | | | | | | | | | | | | | | |
| | Triaenodes sp. | | | | | | | | | 5 | | | | | | | | | | 66-287 | 25-251 | 6.7-7.3 |
| | T.injusta | | x | | | | | | | | | | | | | | | | | 21-800 | 3.5-46 | 6.6-8.8 |
| | T.marginta | | x | | | | | | | | | | | | | | | | | | | |
| | T. tarda | | x | | | | | | | | | | | | | | | | | | | |
| | Setodes sp. | | | | | | | | | | | | | | | | | | | | | |
| | Mystacides sp. | | | | 1 | 14 | 1 | 2 | | | | 7 | | | | 2 | | | | | | |
| | M.sepulchralis | | x | | | | | | | | | | | | | | | | | | | |
| | Nectopsyche sp | | | | 1 | | | | | | | | | | | | | | | | | |
| | N.candida | | x | | | | | | | | | | | | | | | | | | | |
| | Oecetis sp. | | | | 1 | | 1 | | | | | | | | | | | | | | | |
| | O.avara | | x | | | | 1 | | | | | | | | | | | | | | | |
| | O. Furva Gr. | | | | | 2 | | | | | | 1 | | | | 10 | | | | | | |
| | O.cinerascens | | x | | | | | | | | | | | | | | | | | | | |

| TABLE 1 DETAILED INVERTEBRATE BACKGROUND | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | F | D | E | F | | | G | | | H | | | | | J | | K | L | | |
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | USFS | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | | Nina Creek ****** | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| | O.testacea | | | | | | | | | | 4 | 1 | 2 | | | | | 1 | | | | |
| **Rhyacophilidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Rhyacophila fuscula | x | | x | | | | | | | | | | | | | | | >1,890 (genera) | | | |
| | R.vibox | | x | | | | | | | | | | | | | 1 | | | | | | |
| **Limnephilidae** | | | | | 2 | 1 | 1 | 15 | 1 | 18 | 12 | | 1 | 1 | | | 1 | 5 | | | | |
| | Pycnonsyche sp. | x | | x | 3 | | | | | | | | | | | | | | 295 | 4-705 | 2.4-750 | 6-8.8 |
| | P.suttifer | | x | | | | | | | | | | | | | | | | | | | |
| | P.scabripennis | | x | | | | | | | | | | | | | | | | | | | |
| | Glyphopsyche sp. | | | x | | | | | | | | | | | | | | | | | | |
| | G.goera sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Hydatophylax argus | | x | | | | | 3 | | 1 | 1 | | | | | | | | | | | |
| | Limnephilus sp. | | x | | | | | | | | 3 | 1 | 2 | 1 | | | | 1 | | 6-164 | 2.4-24 | 6.4-8.5 |
| | Nemotaulius hostilis | | x | | | | | | 1 | | | | | | | | | | | | | |
| | Neophylx nacatus | | x | | | | | | | | | | | | | | | | | 66-87 | 25-26 | 7.2-7.5 |
| | Anabolia bimaculata | | x | | | | | | | | | | | | | | | | | | | |
| | G.irrorata | | x | | | | | | | | | | | | | | | | | | | |
| | Platycentropus sp. | | x | | | | | | | | | | | | | | | | | 66 | 25 | 7.3 |
| | P. seudostenophylax sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Anabolia sp. | | | x | | | | | | | | | | | | | | | | | | |
| **Polycentropodidae** | | | | | | | | | 2 | | | | | 1 | 3 | | | | | | | |
| | Neureclipsis sp. | | x | x | 67 | | | | | | | | 2 | | | | | | | 8-800 | <1-72.8 | 5.5-8.5 |
| | Paranyctionphylax sp. | | | | 8 | | | | | | | | | | | | | | | | | |
| | Polycentropus sp. | x | | x | 44 | 1 | | | 1 | 2 | | | | | | | | | >4,713 | | | |
| | P. flavus | | | x | | | | | | | | | | | | | | | | | | |
| | Phylocentropus sp. | | | x | | | | | | | | | | | | | | | | | | |
| | P.placidus | | x | | | | | | | | | | | | | | | | | | | |
| | P.centralis | | x | | | | | | | | | | | | | | | | | | | |
| | P.cinereus | | x | | | | | | | | | | | | | | | | | | | |
| | P.interruptus | | x | | | | | | | | | | | | | | | | | | | |
| | P.remotus | | x | | | | | | | | | | | | | | | | | | | |
| | Nyctiophylax sp. | | | | | | | | 1 | | | | | | | | | | | | | |
| | N. moestus | | x | | | | | | | | | | | | | | | | | | | |
| | N.vestitus | | x | | | | | | | | | | | | | | | | | | | |
| **Odontoceridae** | | | | | | | | | | | | | | | | | | | | | | |
| | Psilotreta indecisa | | | x | | | | | | | | | | | | | | | | | | |
| **Hydropsychidae** | | | | | 6 | 3 | | 20 | 3 | | 4 | 1 | | 14 | | | 11 | | | | | |
| | Cheumatopsyche sp. | x | x | x | | 3 | 14 | 13 | 3 | 2 | 2 | 2 | 3 | 4 | 32 | | 1 | 2 | >9,180 | | | |
| | Ceratopsyche sp. | x | | | 6 | 3 | | | | | | | 11 | | | | | | >6,468 | | | |
| | C.bronta | | | | | | | | | | | | | | 28 | | | | | | | |
| | C. slossonae | | | | 2 | | 1 | | | | | | 2 | | 3 | | | | | | | |
| | C.sparma | | | | | | | | | | | | | | | | 16 | 1 | | | | |
| | Pycnopsyche sp. | | | | | | | | | | | | | | | | | | | 4-705 | 2.4-450 | 6.0-8.8 |
| | Hydropsyche sp. | x | | x | 27 | | | 20 | 7 | 6 | | | 5 | | | | | 10 | >7,010 | | | |
| | H. morosa | | | x | | | | | | | | | | | | | | | | | | |
| | H. slossone | | x | x ? | | | | | | | | | | | 3 | | | | | | | |
| | H. bronta | | | x | | | | | | | | | | | 28 | | | | | | | |
| | H. sparna | | | x | | | | | | | | | | 10 | | | | | | | | |
| | H. alhedra | | | x | | | | | | | | | | | | | | | | | | |
| | H. betteni | | x | x | | | | 10 | 7 | 1 | | 2 | 5 | 2 | | | | | | 154-2100 | 56.2-313 | 5.9-8.5 |
| | H. walkeri?? | | | x | | | | | | | | | | | | | | | | | | |
| | H.cuanis | | x | | | | | | | | | | | | | | | | | 114-117 | 2.2-44 | 6.8-8.8 |
| | H.orris | | x | | | | | | | | | | | | | | | | | 12-233 | 2.2-44 | 6.8-7.9 |
| | H.simulans | | x | | | | | | | | | | | | | | | | | 9-117 | 0.6-25.1 | 6.2-8.8 |
| | Macronema zebratum | | x | | | | | | | | | | | | | | | | | | | |
| | Stactobiella sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Potamyia flava | | | | | | | | | | | | | | | 1 | | | | | | |
| **Hydroptilidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Agraylea sp. | | x | | | | | | | | | | | | | | | | | | | |

| TABLE 1 DETAILED INVERTEBRATE BACKGROUND | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | F | D | E | F | | | G | | | H | | | | | J | | K | L | | |
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | USFS | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | | Nina Creek ****** | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| | Hydroptila sp. | x | x | x | | 5 | | | | | | 3 | | | 4 | 2 | 1 | 1 | >11,227 | | | |
| | Oxyethira sp. | | x | x | | | 6 | | | 10 | 4 | | | | 8 | 2 | 3 | | | | | |
| | Ochrotrichia sp. | x | x | | | | | | | | | | | | | | | | >2,791 | | | |
| | Ithytrichia sp. | | x | | | | | | | | | | | | | | | | | | | |
| | I.clavat | | | x | | | | | | | | | | | | | | | | | | |
| | Mayatrichia ayama | | x | | | | | | | | | | | | | | | | | | | |
| | Neotrichia sp. | | x | | | | | | | | | | | | | | | | | | | |
| **Brachycentridae** | | | | | | | | | | | | | | | | | | | | | | |
| | Brachycentrus numerosus | | x | x | 24 | | | | | | | | | | | | | | | | | |
| | B.americanus | | x | | | | | | | | | | | | | | | | | | | |
| | Micrasema sp. | | x | | | | | | | | | | | | 12 | 1 | | 1 | | | | |
| | M. rickeri | | | | | | | | | | | | 3 | | | | 1 | | | | | |
| | M.Rusticum Gr. | | | | | | | | | | | | | 1 | | | | | | | | |
| **Phryganeidae** | | | | | | | | 1 | | | | | | | | | | | | | | |
| | Agrypina improba | | x | | | | | | | | | | | | | | | | | | | |
| | Banksiola crotchi | | x | | | | | | | | | | | | | | | | | | | |
| | Phryganea cinerea | | x | | | | | | | | | | | | | | | | | | | |
| | Ptilostomis sp. | | x | | 1 | | | 2 | | | | | | | | | | | | 70-287 | 26.5-251 | 3.3-7.4 |
| **Pteronarcyidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Pteronarcys (sp. Dorsata?) | | | x | | | | | | | | | | | | | | | | | | |
| **Chloroperlidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Alloperla? sp. | | | x | | | | | | | | | | | | | | | | | | |
| | Hastaperla sp. | | | x | | | | | | | | | | | | | | | | | | |
| **Brachycentridae** | | | | | | | | | | | | | | | | | | | | | | |
| | Numerosus sp. | | | | | | | | | | | | | | | | | | | | | |
| **Sericostomatidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Agarodes sp. | | | | 2 | | | | | | | | | | | | | | | | | |
| | A.distinctum | | x | | | | | | | | | | | | | 2 | | | | | | |
| | A.distinctus | | | | | | | | | | | | | | | | 2 | 2 | | | | |
| **Molannidae** | Molanna sp. | | | | | | | | | 1 | 4 | | | | | | | | | | | |
| | M. blenda | | x | | | | | | | | | | | | | | | | | | | |
| | M.tryphenna | | x | | | | | | | | | | | | | | | | | | | |
| | M.uniophila | | x | | | | | | | | | | | | | | | | | | | |
| **Helicopsyche** | | | | | | | | | | | | | | | | | | | | | | |
| | Helicopsyche borealis | | x | | | | | | | 2 | 1 | | | | 3 | | | | | | | |
| **Uenoidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Neophylax sp. | x | | | | | | | | | | | | 2 | | | | | 316 | | | |
| ODONATA (Dragonflies) | | | | | | | | | | | | | | | | | | | | | | |
| **Aeshnidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Aeshna | | | x | 2 | | | | | 1 | 1 | | | 1 | | | | 1 | | | | |
| | A. umbrosa | | x | | | 1 | | | 1 | | | | | | | | | | | | | |
| | Boyeria sp. | x | | | 25 | | | | | | 2 | | | | | | | | >7,340 | | | |
| | B. grafiana | | | x | | | | | | | | | | | | | | | | | | |
| | B. vinosa | | x | x | | 2 | 1 | | 1 | 3 | 2 | | | 1 | 2 | | 1 | 1 | | | | |
| | Basiaeschna sp. | | | x | | | | | | | | | | | | | | | | | | |
| | B. janata | | x | | 9 | | | | | | | | | | | | | | | | | |
| **Macromiidae** | | | | | | | | | | | | | | | 1 | 1 | | | | | | |
| | Macromia sp. | | | | 26 | | | | | | | | | | | | | | | | | |
| | M. illinoiensis | | x | x | | | | | | | | | | | | | | | | | | |
| | Didmops transversa | | x | | | | | | | | | | | | | | | | | | | |
| **Corduliidae** | | | | | | | 3 | | | | | | | | | | | | | | | |
| | Neurocordulia sp | | | | 1 | | | | | 1 | | | | | | | | | | | | |
| | N.yamaskanensis | | x | | | | | | | | | | | | | | | | | | | |
| | Somatochlora sp. | | | x | | | | | | | | | | | | | | | | | | |
| | S.linearis | | x | | | | | | | | | | | | | | | | | | | |
| | S.minor | | x | | | | | | | | | | | | | | | | | | | |
| | S.Williamsoni | | x | | | | | | | | | | | | | | | | | | | |
| | Epitheca princeps | | x | | | | | | | | | | | | | | | | | | | |

| TABLE 1 DETAILED INVERTEBRATE BACKGROUND | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | F | D | E | F | | | G | | | H | | | | J | | | K | L | | |
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | USFS | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | Nina Creek ****** | | | USEPA (KY) SC 5% loss common to Mn Cu-Nickel Study (CN018)***** | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| **Coenagrionidae** | | | | | 15 | | | | | 3 | | | | | | | | | | | | |
| | Argia sp. | | | | 1 | | | | | | | | | | | | | | | | | |
| | A. apicalis | | x | | | | | | | | | | | | | | | | | | | |
| | Enallagma sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Ischnura/Anomalagrion sp. | | x | | | | | | | | | | | | | | | | | | | |
| **Cordulegastridae** | | | | | | | | | | | | | | | | | | | | | | |
| | Cordulegaster maculatus | x | x | | | | | | | | | | 1 | | | | | | >1,436 (genera) | | | |
| | C. maculata | | | | | | | | | | | | | | | | | | | | | |
| **Gomphidae** | | | x | | 12 | 5 | 1 | | | | 1 | 2 | | | 2 | 3 | 3 | 2 | | | | |
| | Dromogomphus spinosus | | x | | | | | | | | | | | | | | | | | | | |
| | Hagenius sp. | | | | | | | | | | | | | | | | | | | | | |
| | H.brevistylus | | x | x | 12 | 3 | | | | | | | | | | | | | | | | |
| | Hylogomphus bervis | | x | | | | | | | | | | | | | | | | | | | |
| | Gomphus sp. | | | | 7 | | | | | | 1 | | | | | | | | | | | |
| | G. spicatus | | | x | | | | | | | | | | | | | | | | | | |
| | Ophiogomphus sp. | | | | 16 | | | | | | | | | | | | | | | | | |
| | O.aspersus | | x | | | | | | | | | | | | | | | | | | | |
| | O.colubrinus | | | | | | | | | | | | | 1rare | | | | | | | | |
| | Phanogomphus sp. | | | | 14 | | | | | | | | | | | | | | | | | |
| | Styogomphus sp. | x | | | 6 | | | | | | | | | | | | | | >6,468 | | | |
| | S. albistylus | | x | | | | | | | | | | | | | | | | | | | |
| | Optioservus sp. | | | x | | | 10 | 26 | 73 | 36 | 28 | 31 | 18 | 1 | 13 | 8 | 3 | | | 87-800 | 13-46 | 7.2-8.2 |
| | O. anomalus | | | x | | | | | | | | | | | | | | | | | | |
| **Calopterygidae** | | | | | | | | | | | 1 | | | | 1 | 9 | 1 | 2 | | | | |
| | Calopteryx sp. | | x | x | 26 | | | | | | 1 | 1 | 3 | | | | | | | | | |
| | C. aequabilis | | | | | | 1 | | | 4 | | | 2 | 1 | | | 3 | | | | | |
| **Lestidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Lestes sp. | | | x | | | | | | | | | | | | | | | | | | |
| **Libellulidae** | | | | | 2 | | | | | | | | | | | | | | | | | |
| | Perithemis sp. | | | | 1 | | | | | | | | | | | | | | | | | |
| | Enallagma sp. | | | x | | | | | | | | | | | | | | | | | | |
| **Zygoptera** | | | | | | | | | | | | | | | | | | | | | | |
| | Calopterygidae sp. | | | | | | | | | | 3 | | | | 1 | | | | | | | |
| COLEOPTERA (beetles) | | | | | | | | | | | | | | | | | | | | | | |
| **Elmidae** | | | | | | | | | | | | 8 | 1 | | | | | | | | | |
| | Stenelmis sp. | x | 2 | x | 5 | 2 | 3 | 30 | 22 | 5 | 3 | 88 | 10 | 2 | 2 | 10 | 3 | 1 | >9,790 | | | |
| | S. crenata | | | x | | | | | | | | | | | | | | | | 11-705 | <1-450 | 5.5-8.8 |
| | Optioservus sp. | x | | x | 4 | | 10 | | | | | | | | | | | | >9,790 | | | |
| | O. fastiditus | | | x | | | | | | | | | | | | | | | | 114-800 | 14.2-46.1 | 8-8.8 |
| | Dubiraphia sp. | x | | x | 2 | 2 | 21 | 11 | | | | | | | 23 | 3 | | | >7,370 | | | |
| | Macronychus sp. | x | | x | 7 | | | | | | | 3 | | | | | | | >1,890 | | | |
| | M. glabtrtus | | | | | | | | | | | 1 | 2 | | | 1 | 10 | 5 | | | | |
| **Dryopidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Holichus sp. | | | x | | | | | | | | | | | | | | | | | | |
| **Gyrinidae** | | | | | | | | | | 1 | | | | | | | | | | | | |
| | Gyrinus sp. | | | | 11 | | | | | 4 | 3 | | | | | | | | | | | |
| | Dineutus sp. | | | | 4 | | | | | | | | | | | | | | | | | |
| **Dytiscidae** | | | | | 2 | | | | | | | | | | | | 1 | | | | | |
| | Coptotomus sp. | | | x | | | | | | | | | | | | | | | | | | |
| | Laccophilus sp. | | | | | | | | | 1 | | | | | | | | | | | | |
| | Liodessus sp. | | | | | | | | | 8 | 2 | | | | | | | | | | | |
| **Hydrophilidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Sperchopsis tesselatus | | | x | | | | | | | | | | | | | | | | | | |
| **Chrysomelidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Donacia sp. | | | x | | | | | | | | | | | | | | | | | | |
| MEGALOPTERA | | | | | | | | | | | | | | | | | | | | | | |
| **Corydalidae** | | | | | | | | | | | | | | 4 | | 5 | | 3 | | | | |
| | Nigronia | x | | | | | | | | | | 1 | 3 | | 1 | 2 | | | >9,790 | | | |

| TABLE 1 DETAILED INVERTEBRATE BACKGROUND | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | F | D | E | F | | | G | | | H | | | | | J | | K | L | | | |
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | Nina Creek ****** | | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH | |
| | N. serricornis | | x | | | | | | | | | | | | | | | | | | | | |
| | Chauliodes rastricornis | | x | | | | | | | | | | | | | | | | | | | | |
| **Sialidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Sialis sp. | x | x | x | | | | 1 | | 1 | 2 | | | | | | 1 | | >11,227 | | | | |
| **Corydalidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Nigronia serricornis | x | | x | | | | | | | | | | | | | | | >9,790 | | | | |
| NEUROPTERA (net winged) | | | | | | | | | | | | | | | | | | | | | | | |
| **Sisyridae** | Climacia sp. | | x | | | | | | | | | | | | | | | | | | | | |
| | Sisyra sp. | | x | | | 2 | | | | | | | | | | | | | | | | | |
| HEMIPTERA (true bugs) | | | | | | | | | | | | | | | | | | | | | | | |
| **Veliidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Rhagovelia obesa | x | x | | | | | | | | | | | | | | | | >2,030 (genera) | | | | |
| **Corixidae** | | | | | 32 | | | 3 | | | | | | 1 | | | | | | | | | |
| | Sigara sp. | | | | 13 | | | | | | | | | | | | | | | | | | |
| | Palmacorixa sp. | | | x | | | | | | | | | | | | | | | | | | | |
| | Hesperocorixa sp. | | | | 62 | | 1 | | | | | | | | 2 | | | | | | | | |
| **Hydrometridae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Hydrometra sp. | | x | | | | | | | | | | | | | | | | | | | | |
| **Notonectidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Buenoa sp. | | x | x | | | | | | | | | | | | | | | | | | | |
| | Notonecta sp. | | | | 4 | | | | | | | | | | | | | | | | | | |
| | N. lunata | | x | | | | | | | | | | | | | | | | | | | | |
| **Naucoridae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Pelocoris sp. | | x | | | | | | | | | | | | | | | | | | | | |
| **Nepidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Rantra sp. | | x | | 7 | | 1 rare | | | | | | | | | | | | | | | | |
| **Mesoveliidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Mesovelia sp. | | x | | | | | | | | | | | | | | | | | | | | |
| **Gerridae** | | | | | 1 | | | | | | | | | | | | | | | | | | |
| | Gerris sp. | | | x | | | | | | | | | | | | | | | | | | | |
| | G. remigis | | x | | | | | | | | | | | | | | | | | | | | |
| | Metrobates sp. | | | | 2 | | | | | | | | | | | | | | | | | | |
| | M hesperius | | x | | | | | | | | | | | | | | | | | | | | |
| | Reumatobates rileyi | | x | | | | | | | | | | | | | | | | | | | | |
| **Belostomatidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Belostoma sp. | | x | x | 14 | | | | | | | | | | | | | | | | | | |
| | B. flumineum ( rare) | | | | | | | | | 1 | | | | 1 | 1 | 1 | | 1 | | | | | |
| | Lethocerus sp. | | x | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| **Pleidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Plea striola | | x | | | | | | | | | | | | | | | | | | | | |
| DIPTERA (true flies) | | | | | | | | | | | | | | | | | | | | | | | |
| **Athericidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Atherix sp. | | | | | | | | | | | | | | | | | | >11,646 | | | | |
| | A.variegata | x | x | | 18 | | | | | | | | | | | | | | | | | | |
| **Tabainidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Chrysops sp. | x | x | | | | | | | | | | | | | | | | >11,646 | | | | |
| **Prodiamesinae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Monodiamesa sp. | | | x | | | | | | | | | | | | | | | | | | | |
| **Empididae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Phoridae sp. | | x | | | | | | | | | | | | | | | | | | | | |
| | Roederiodes sp. | | | | | | | 1 | | | | | | 4 | | | | | | | | | |
| | Neoplasta sp. | | | | | | | 1 | | | | | | 2 | | | | | | | | | |
| | Hemerodromia sp. | x | | | | | 4 | 34 | 6 | | 14 | 21 | 5 | | | | 7 | 68 | >9,790 | | | | |
| **Syrphidae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Helophilus | | x | | | | | | | | | | | | | | | | | | | | |
| **Tanypodinae** | | | | | | | | | | | | | | | | | | | | | | | |
| | Ablabesmyia sp. | | | x | 7 | | | | | | | | | | | | | | | | | | |

**TABLE 1 DETAILED INVERTEBRATE BACKGROUND**

| A | B | C | F | D | E | F | | | G | | | H | | | | J | | | K | L | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | USFS | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | Nina Creek ****** | | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| | A. mallochi | | | x | | | | | | | | | | | | | | | | | | |
| | Ablabesmyia sp | | | | | 5 | | 1 | | | | | | | | 9 | 2 | | | | | |
| | Clinotanypus sp. | | | x | 4 | | | | | | | | | | | | | | | | | |
| | Coelottanypus sp. | | | | | | | | | | | | | | | | | | | | | |
| | Larsia sp. | | | | | | 1 | | | | | | | 3 | | | | | | | | |
| | Nilotanypus sp. | | | | | | | | | | | | | | | | | | | | | |
| | Natarsia sp. | | | | | | | | | | | | | | | | 1 | | | | | |
| | Pentaneura sp. | | | | | | | | | | | | | | | | | | | | | |
| | Psectrotanypus sp. | | | | | | | | | | | | | | | | | | | | | |
| | Conchapeliopia sp. | | | | 24 | | | | | | | | | | | | | | | | | |
| | Labrundinia sp. | | | x | | 1 | | | | | | | | | | | | | | | | |
| | Procladius sp. | | | x | 18 | 3 | 10 | 1 | 2 | 1 | | 2 | | | | | | 1 | | | | |
| | Tanypus sp. | | | | | | | | | | | | | | | | | | | | | |
| | Thienemannimyia complex | | | | 26 | | 10 | | 5 | | 39 | | | 32 | 9 | | 10 | | | | | |
| | Zavrelimyia sp. | | | x | | | | | | | | | | | | | | | | | | |
| **Culicidae** | Ades commuis | | x | | | | | | | | | | | | | | | | | | | |
| | Anopheles punctipennis | x | x | | | | | | | | | | | | | | | | >2,768 (genera) | | | |
| **Orthocladiinae** | | | | | | | 3 | | 1 | | | 1 | | | | | 1 | | | | | |
| | Brillia sp. | | x | x | | 1 | | | 1 | | | | 1 | 3 | | | | 4 | | | | |
| | Cardiocladius sp. | | x | | | | | | | | | | | | | | | | | | | |
| | coryneura sp. | | x | | 1 | | | | | | | | | | | | | | | | | |
| | Cricotopus sp. | | x | x | 10 | 1 | 1 | | | | | | 2 | 2 | | 5 | | 3 | | 82-5000 | 25-135 | 6.3-8.8 |
| | C. bicinctus group | | | x | | | | | | | | | 4 | | | | | | | | | |
| | C. tremulus group | | | x | | | | | | | | | | | | | | | | | | |
| | Diplocladius sp. | | x | | | | | | | | | | | | | | | | | | | |
| | D. cultriger | | | | | | | | | | | 1 | | | | | | | | | | |
| | Eukiefferiella sp. | | x | x | | | | | | | | | | | | | | 2 | | 82-110 | 25-45 | 6-8.7 |
| | E. gracei group | | | x | | | | | | | | | | | | | | | | | | |
| | E. devonica group | | | x | | | | | | | | | | | | | | | | | | |
| | Epicocladius sp. | | x | | 1 | | | | | | | | | | | | | | | | | |
| | Lopescladius sp. | | | x | | | | | | | | | | | | | | | | | | |
| | Heterotrissocladius sp. | | x | | | | | | | | | | 1 | | | | | | | | | |
| | Nanocladius sp. | | | x | 11 | | 2 | | | | | | | | | | | | | | | |
| | N. narvulus group | | | x | | | | | | | | | | | | | | | | | | |
| | Parametreocnemus sp. | | x | x | | | | | 2 | | 15 | | | | | | | | | | | |
| | Psectrocladius sp. | | x | x | | | 1 | | | | | | | | | | | | | | | |
| | Synorthocladius sp. | | | x | | | | | | | | | | | | | | | | | | |
| | Tvetenia sp. | | | | 3 | | | | | | | | | | | | | | | | | |
| | T. discoloripes group | | | x | | | | | | | | | | 1 | | | | | | | | |
| | Thienemanniella sp. | | x | | 3 | | | | | | | | | | | | | | | | | |
| | Trissocladius sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Parakiefferiella sp. | | | | | | 3 | | 5 | 1 | 11 | 1 | | 2 | | | | 5 | | | | |
| | Orthocladius sp. | | x | | 1 | | | 3 | | | | | 1 | 19 | 4 | | | | | | | |
| | Psectrocladius sp. | | | | 4 | | | | | | | | | | | | | | | | | |
| | Rheocricotopus sp. | | x | | 6 | | | | | | | | | 2 | | | | 2 | | | | |
| | Smittia sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Xylotopus sp. | | | | 1 | | | | | | 5 | | | 1 | | | | | | | | |
| **Chironomidae** | | | | | 54 | | | | | | | | | | | | | | | | | |
| | Chironomini sp. | | x | | | 3 | | | 1 | | | | | | | | | | | | | |
| | Chironomus sp. | x | | | 1 | | | | | | | | | | | 1 | 1 | | >11,646 | 18-1600 | 0.7-370 | 3-8.4 |
| | Cladotanytarsus sp. | x | | | | 20 | 4 | | | 3 | | 1 | | | | | | | >11,646 | | | |
| | Cryptochironomus sp. | x | x | x | | 10 | 2 | 9 | 1 | | | 7 | | | | 2 | 1 | | >3,489 | | | |
| | Cryptotendipes sp. | | | | | 1 | | | | | | | | | | | | | | | | |
| | Demicryptochironomus sp. | x | | x | | | | | | | 1 | | | | | | | | 322 | | | |
| | Dicrotendipes sp. | x | x | | 2 | 1 | 1 | | | | | 2 | | | | | | | >11,646 | 15-2100 | 0.6120-0.4 | 6.3-8.4 |
| | Endochironomus sp. | | x | x | 1 | | | | | | | | | | | | | | | 7.0-9000 | 2.4-480 | 6.4-8 |
| | Micropsectra sp. | x | | x | | 17 | 18 | | 6 | 4 | 5 | | | | 1 | | | 1 | >6,468 | | | |
| | Microtendipes sp. | x | | | 8 | 88 | 5 | 2 | 2 | 21 | 9 | 4 | 4 | | 3 | 7 | 18 | | >3,489 | | | |

**TABLE 1 DETAILED INVERTEBRATE BACKGROUND**

| A | B | C | F | D | E | F | | | G | | | H | | | | J | | | K | L | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Genus/Species in NE MN in Ecoregions 50n,50p(northern),50t | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | USFS | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | Nina Creek ****** | | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| | M.pedallus group | | | | | | | | | | | | | | | | | | | | | |
| | Paratendipes sp. | | x | x | | 26 | | | | | | | | | | 1 | | | | | | |
| | Paralauterborniella? sp. | | | x | | | | | | | | | | | | | | | | | | |
| | P.nigrohalterale | | | | | | | | | | | | 2 | 1 | | | | | | | | |
| | Phaenospectra sp. | x | x | | 17 | 8 | 4 | | 3 | | 1 | 1 | | | | 9 | | | ~2,332 | | | |
| | Polypedilum sp. | x | x | x | | 17 | 14 | 3 | 5 | | 1 | 2 | 38 | 9 | | | | | >4,884 | Jun-00 | <1-315 | 3.8-8.8 |
| | P. fallax group | | | x | | | | | | | | | | | | | | | | | | |
| | P. convictum group | | | x | | | | | | | | | | | | | | | | | | |
| | Stenochironomus sp. | | x | x | | 1 | | 5 | 1 | | 6 | | | | | 2 | 2 | 4 | | | | |
| | Stictochironomus sp. | | x | x | | | | 2 | | | | | | | | | | | | | | |
| | Stempellinella sp. | x | | | | 3 | | | 3 | | | | | | | | 2 | | >927 | | | |
| | Stempellina sp. | x | | | | | 1 | | | | | 1 | | | | | | | 644 | | | |
| | Tribelos sp | | x | x | | 1 | 4 | 1 | | 6 | 1 | | | | | 25 | 3 | 7 | | | | |
| | Einfeldia sp. | | | | | | | | | | | | | | | | | | | | | |
| | Glyptotendipes sp. | | x | | | | | | | | | | | | | | | | | 21-900 | 3.2-480 | 6.6-8.5 |
| | Micropsectra sp. | x | x | | | 17 | | | 6 | | | | | | | | | | >6,468 | | | |
| | Parachironomus sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Rheotanytarsus sp. | x | x | x | 1 | | 9 | 12 | | 1 | 4 | 1 | 3 | 45 | 7 | | 3 | | >3,489 | | | |
| | Ablabesmyia | x | | | | x | | | | | | | | | | | | | >11,646 | | | |
| | Xenochironomus sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Xylotopus par | | | | | | | | 1 | | 5 | | | | | | | | | | | |
| | X.xenolabis | | | | | | | | 1 | | | | | | | | 1 | | | | | |
| | Nilothauma sp. | | x | | | 5 | | | | 3 | 2 | | | | | 3 | | 1 | | | | |
| | Nanocladius sp. | | | | | | | | 1 | | | | | | | | | | | | | |
| | Pseudochiromus sp. | x | x | | | 3 | 2 | | | | | | | | | | | | >11,646 | | | |
| | Paracladopelma sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Lauterborniella sp. | | x | | | | | | | | | | | | | | | | | | | |
| | L.agrayloides | | | | | | 1 | | | | | | | | 2 | 4 | 2 | 1 | | | | |
| | Zavrelia sp. | x | x | | | | | | | | | | | | | | | | 413 | 6 | 2.5 | 6.4 |
| | Stegopterna?? sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Thienemannimyia Gr. | | | | | 14 | 10 | 16 | 5 | 14 | | 37 | 29 | | | 10 | | 20 | >6,468 | | | |
| | Parametriocnemus sp. | x | | | | | 13 | | 2 | | | | 8 | 14 | | 13 | 4 | 11 | | | | |
| | Trissopelopia ogemawi | | | | | | | | | | | | 9 | | 1 | | | | | | | |
| | Pagastiella sp. | | | | | | | 1 | | 3 | | | | | | | | | | | | |
| | Paramerina sp. | | | | | | | | | 3 | | | | | | | | | | | | |
| | Parametriocnemus sp. | x | | | | | | | | 2 | | | | | | | | | >4,713 | | | |
| | Paratanytarsus sp. | x | | | | | 2 | | | 4 | 3 | | | | | | | | >3,489 | | | |
| | Limnophyes sp. | x | | | | | | 1 | | | | | | | | | | | >5,120 | | | |
| | Lauterborniella agrayloides | | | | | | | | | | | | | | 2 | | 2 | | | | | |
| | Psectrocladius sp. | | | | | | 1 | | | | | | | | | | | | | | | |
| | Tanytarsus sp. | x | x | x | | 8 | 7 | 1 | 7 | 5 | 2 | | 1 | | | 1 | 3 | | >9,180 | | | |
| **Tanytarsini** | | | | | | | | 2 | | | | | | | | | | | | | | |
| | Cladotanytarsus sp. | | | x | | | | | | | | | | | | | | | | | | |
| **Tabanidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Chrysops sp. | x | | | 12 | | | | | | | | | | | | | | >11,646 | | | |
| **Empididae** | | | | | | | | | | | | | | | | | | | | | | |
| | Hemerodromia sp. | x | | x | | | 4 | 34 | 6 | | 14 | 21 | 5 | 19 | | 3 | 7 | | >9,790 | | | |
| **Ceratopogonidae** | | | | | | | | | | | 1 | | | | 1 | | | | | | | |
| | Bezzia / Palpomyia | x | | | | | | | | 2 | 1 | | | | | | | | 380 | | | |
| | Probezzia sp. | | x | x | | | | | | | | 3 | | | | | | | | | | |
| | Palpomyia sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Ceratopogoninae sp. | | | | | 1 | | 1 | 3 | 2 | 1 | | 1 | 10 | 1 | 1 | 1 | 4 | | | | |
| | Serromyia sp. | | | | | | | | | | | 1 | | | | | | | | | | |
| | Mallochohelea sp. | | | | | | | | | | | 3 | | | | | | | | | | |
| | Neoplasta sp. | | | | | | | 1 | | | | | | | | | | | | | | |
| **Tipulidae** | | | | | | | | | | | | | 1 | | | | | | | | | |
| | Antocha sp. | x | x | | | | | | | | | | | 1 | 5 | | | | >6,468 | | | |
| | Dicranota sp. | x | x | | | | | | | | | | | | | | | | >7,010 | | | |

**TABLE 1 DETAILED INVERTEBRATE BACKGROUND**

| A | B | C | F | D | E | F | | | G | | | H | | | | J | | | K | L | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Genus/Species in NE MN in Ecoregions SOn,SOp(northern),SOt | Appalachian Unmined * | Cu-Ni Study (CN088) **** | Pigeon River ** | DNR Upper St Louis 2005 *** | USFS Reeley Creek ****** | | USFS | USFS Filson Creek ****** | | | USFS August Creek ****** | | | Little Isabella ****** | Nina Creek ****** | | | USEPA (KY) SC 5% loss common to Mn | Pollution Tolerance Hardness (mg/l)/Sulfate (mg/l)/pH Cu-Nickel Study (CN018)***** | | |
| | | | | | mile 139.6-19 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2011 | 2012 | 2013 | 2008 | 2011 | 2012 | 2013 | (uS/cm) ^ | hardness | sulfate | pH |
| | Helius sp. | | x | | | | | 1 | | | | | | | | | | | | | | |
| | Hexatoma sp. | x | x | | | | | | | | | | | | | | | | >9,790 | | | |
| | Limonia sp. | x | x | | | | | | | | | | | | | | | | >5,057 | | | |
| | Peicia sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Pedicia sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Hemerodromyia sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Limnophila? sp. | x | | | | | | | | | | | | | | | | | ~1,503 | | | |
| | Pseudolimnophila sp. | x | x | | | | | | | | | | | 1 | | | | | >1,357 | | | |
| | Tipula sp. | x | x | | 7 | | | | | | | | | | | | | | >1,979 | | | |
| **Simuliidae (Black Flies)** | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | Stegopterna?? sp. | | | x | | | | | | | | | | | | | | | | | | |
| | Hexatoma sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Prosimulium sp. | x | x | | | | | | | | | | | | | | | | ~531 | | | |
| | Limnophila? sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Cnephia sp. | | x | | | | | | | | | | | | | | | | | | | |
| | Simulium sp. | x | x | | 30 | | 1 | 10 | 1 | | 15 | | | 21 | | | | 4 | >6,468 | | | |
| | S. pictipes | | x | x | | | | | | | | | | | | | | | | | | |
| | S. jenningsi?? | | | x | | | | | | | | | | | | | | | | | | |
| | Eusimulium eurmandiculum | | x | | | | | | | | | | | | | | | | | | | |
| | Byssodon ruggelsi | | x | | | | | | | | | | | | | | | | | | | |
| **Streatiomyiidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Odontomyia sp. | | | | | | | | | | | | | | | | | | | | | |
| **Athericidae** | | | | | | | | | | | | | | | | | | | | | | |
| | Atherix varieqata | | x | | | | | | | | | | | | | | | | | | | |
| **Blephariceridae** | | | | | | | | | | | | | | | | | | | | | | |
| | Blepharicera.tenuipes | | x | | | | | | | | | | | | | | | | | | | |
| | S. jenningsi?? | | x | | | | | | | | | | | | | | | | | | | |
| **Diamesinae** | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | Atherix varieqata | | x | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | Blepharicera sp. | | x | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | Potthastia? sp. | | x | | | | | | | | | | | | | | | 2 | | | | |
| | Diamesa sp. | | x | | | | | | | | | | | 2 | | | | | | | | |
| **Podonominae** | | | | | | | | | | | | | | | | | | | | | | |
| | Lasiodiamesa sp. | | x | | | | | | | | | | | | | | | | | | | |
| **Ptychopteridae** | Bittacomorpha sp. | | | | | | | | | | | | | | | 1 | | | | | | |
| **Limoniidae** | Pilaria sp. | | | | | | | | | | | 1 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |

***Coding: x in Columns C - D means the species or genus is present; a number in Columns E - J is the count of individuals.***

***References:***


***A Field-Based Aquatic Life Benchmark for Conductivity in Central Appalachian Streams*, U.S. EPA, Office of Research and Development, NCEA, USEPA Cincinnti OH 45268, EPA/600/R 10/023F, Table D-1.**

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******** USDA, U.S. FOREST SERVICE SUPERIOR NATIONAL FORES, Unpublished STORET Data (benthic invertebrates)**