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ABSTRACT

Ecological Communications Corporation (EComm) conducted biological data collection and analysis as part of an impairment verification monitoring project on Cypress Creek (Segment 1815). Segment 1815 appears on the State of Texas' 303(d) list as impaired for exceptional aquatic life based on low dissolved oxygen concentrations previously reported by or to the Texas Commission on Environmental Quality (TCEQ) or its predecessor agencies. Due to an insufficient amount of data to support a re-assessment, this water body remained on the draft 2002 303(d) list. The objective of EComm's data assessment was to assemble enough information on the water body to support a use attainability analysis if it was determined that the designated aquatic life use was incorrect.

A separate but related assessment was simultaneously conducted by the Texas Engineering Experiment Station (TEES) and the Conrad Blucher Institute for Surveying and Science (CBI) to facilitate the objective. The TEES/CBI effort included physical and chemical data collection and analysis in an attempt to provide a comprehensive assessment of the water quality within the stream segment. As part of the overriding TMDL project (TCEQ Contract 582-4-58897), the combined biological, physical, and chemical data collection and analytical activities will result in one of four outcomes:

- 1. Removal of the water body from the 303(d) list,
- 2. An evaluation of applicable water quality standards (aquatic life use impairments only),
- 3. Development of a TMDL, or
- 4. Additional monitoring to better characterize the impairment.

Based on data collected by the GBRA, this water body was found to be meeting the dissolved oxygen criteria for exceptional aquatic life use, and was removed from the 303(d) List of impaired waters in 2004. The additional data collected as part of this study represents further support of this action and indicates full attainment of the exceptional aquatic life use on Cypress Creek.

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APPENDICES

Appendix A Complete Raw Data Set Segment 1815 – Cypress Creek September 2002

1.0 Introduction

In 2000 the Texas Commission on Environmental Quality (TCEQ) initiated a study to investigate water quality impairments in 11 water bodies in Basin Groups D & E identified through the 1999 305(b) Water Quality Inventory as part of a total daily maximum load (TMDL) program. The segments are included on the 1999 State of Texas Clean Water Act 303(d) list as impaired due to



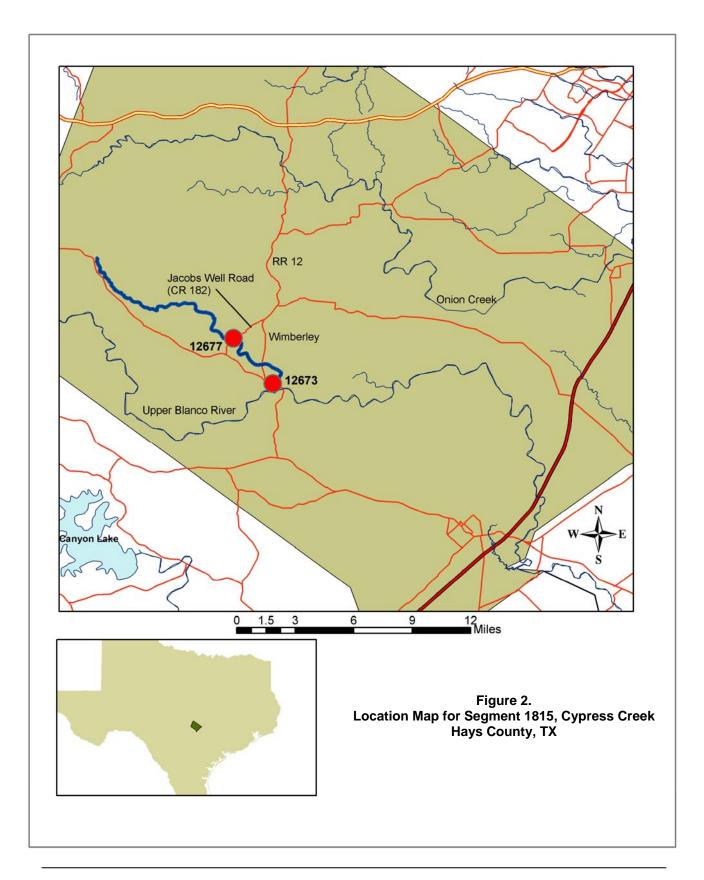
Figure 1. Station 12673

concentration levels of dissolved oxygen or bacteria or both which exceed established criteria. One of these water bodies was Cypress Creek (Segment 1815) which was included on the State's 303(d) list as impaired for its exceptional aquatic life use The impairment to this portion of designation. Cypress Creek was caused by an exceedance of the established dissolved oxygen criteria. As an initial phase for TMDL development, Segment 1815 was assessed to verify the aquatic life impairment using the latest sampling techniques. This initial assessment was performed so that resources within the program can be efficiently utilized for truly impaired waterbodies, preventing TMDL

development for a waterbody that may be delisted or subject to a water quality standards revision at a later date. Chemical, physical, and biological data were collected at two stations (sites) within the segment in an effort to determine what course of action, if any, needed to be taken to address impairments. Data collection activities would result in one of four outcomes:

- 1) Removal of the water body from the 303(d) list,
- 2) An evaluation of applicable water quality standards (aquatic life use impairments only),
- 3) Development of a TMDL, or
- 4) Additional monitoring to better characterize the impairment.

Segment 1815 originates four miles upstream of the most upstream unnamed county road crossing in Hays County. It flows 14 miles southeastward through Hays to the confluence of the Blanco River near downtown Wimberley, Texas. Site 12677 (Figures 3 & 4) is located in Hays County at Jacob's Well in Wimberley. Site 12673 (Figure 1) is located in Hays County, just above the Cypress confluence with the Blanco River in Wimberley. A location map of the segment is provided in Figure 2.



2.0 BIOLOGICAL AND HABITAT METHODOLOGY

Biological data (including fish, benthic macroinvertebrates, and habitat) were collected under

strict interpretation of the Biological Component and Stream Physical Habitat Component sections of the Receiving Water Assessment (RWA) Procedures Manual (Texas Natural Resource Conservation Commission [TNRCC] 1999b). As specified in the RWA manual, EComm evaluated fish sampled in accordance with statewide criteria of Indices of Biotic Integrity (IBI). Additionally, EComm generated IBI for all stations using regional criteria developed by the Texas Parks and Wildlife Department (2002). The regional criteria consider differences in landforms, soil types, vegetation, climatic conditions, and zoogeographic factors among the ecoregions



Figure 3. Station 12677

and thus "provide a better representation of the integrity of fish assemblage" as compared to statewide criteria.

Also, in addition to data collection via RWA guidelines and TCEQ Surface Water Quality Monitoring (SWQM) Procedures Manual (TNRCC 1999a), EComm captured data for 14 previously uncoded biological and habitat parameters. These parameters include: the various metrics used in determining regional IBI scores; the final scores for aquatic life use values for both statewide and regional IBI criteria; the final scores for Rapid Bioassessment Protocol (RBP) for benthic macroinvertebrates; and the final scores for Habitat Quality Indices (HQIs). All 14 parameters were assigned unique STORET codes in an effort to create maximum efficiency for data management. The new STORET codes and descriptions, along with other STORET codes captured for this segment, are provided in Table 1.

Segment 1815 had not previously been designated as a segment requiring a Use Attainability Analysis (UAA). Although the main purpose of the physical/chemical component of the study was to verify the dissolved oxygen impairment, a biological sampling regime satisfying the minimum UAA data requirements was initially attempted for this segment to be used if it was determined that a UAA was the correct course of action. UAA requirements include at least three complete sampling events over two consecutive index periods (March 15 – October 15). One event is required in the early portion (before April 30) of the index period in either Year 1 or Year 2, and the other two efforts must be conducted during the Critical Period (July 1 – September 30), including one sampling event during Year 1 and the other during Year 2. Biological sampling for Segment 1815 was only conducted in September 2002. During the 2004 305(b) assessment, this segment was found to be meeting standards. As such, project resources were shifted to address issues in other segments of poorer water quality, and the data collection under a UAA sampling regime was discontinued.

Table 1. STORET Codes (New STORET codes captured are temporarily assigned to the "00800" series (in italics))

| STORET Code* | Description | STORET Code | Description |
|--------------|--|-------------|--|
| 89832 | Number of lateral transects | 90008 | EPT index |
| 89847 | Average bank slope | 98009 | Total number of sucker species |
| 89846 | Average bank erosion potential | 98010 | Total number of intolerant species |
| 89845 | Percent of substrate that is gravel or larger | 98016 | Percent individuals as tolerants (fish) |
| 800 | Channel flow status | 98017 | Percent individuals as omnivores |
| 89844 | Dominant substrate | 98021 | Percent individuals as insectivores |
| 89843 | Total number of riffles | 98022 | Percent individuals as piscivores |
| 89842 | Number of poorly defined stream bends | 98023 | Total number of individuals in fish sample |
| 89841 | Number of moderately defined stream bends | 98024 | Percent individuals as hybrid |
| 89840 | Number of well defined stream bends | 98030 | Percent with disease |
| 812 | Statewide IBI | 98003 | Number of fish species |
| 833 | Habitat Quality Index | 89905 | Number of minutes debris was sampled |
| 84161 | Stream order | 89851 | Percent grass |
| 84159 | Percent instream cover | 89854 | Percentage tree canopy |
| 813 | Number of Cyprinidae species | 89859 | Drainage area |
| 814 | Number of benthic invertebrates | 89860 | Length of reach |
| 72052 | Streambed slope | 89861 | Average stream width |
| 816 | Percent that are tolerant species, excluding G.affinis | 89862 | Average stream depth |
| 817 | Number of individuals per seine haul | 89864 | Maximum pool width |
| 818 | Number of individuals per minute electroshocking | 89865 | Maximum pool depth |
| 819 | Percentage of individuals as non-native | 89866 | Average width of riparian vegetation |
| 820 | Regional IBI | 90010 | Dominant functional feeding group percentage |
| 832 | Total RBP score | 89899 | Biological rpt unit |
| 89853 | Percent other as riparian vegetation | 90009 | Number of functional feeding groups |
| 89839 | Total number of stream bends | 89906 | Number of individuals in RBA sample |
| 98008 | Total number of sunfish species | 89941 | Seine length |
| 90025 | Percentage benthic gatherers | 89943 | Electrofishing method |
| 90030 | Percentage benthic filterers | 89944 | Electrofishing duration |
| 90035 | Percentage benthic shredders | 89946 | Average mesh size |
| 90036 | Percentage benthic predators | 89948 | Number of seine hauls |
| 834 | Percentage benthic scrapers | 89950 | Benthic sampling code |
| 90042 | Percentage benthic inverts individuals in dominant taxon | 89961 | Texas ecoregion |
| 90050 | Ratio of intolerant to tolerant taxa | 89976 | Area seined |
| 90052 | Number of non-insects | 90007 | Hilsenhoff biotic index |
| 90054 | Percentage of Elmidae | 89849 | Percent trees |
| 92266 | Percentage of Trichoptera that are Hydropsychidae | 89867 | Aesthetics |
| 92491 | Percent Chironomidae | 835 | Benthic invertebrate taxa richness |
| 89850 | Percent as shrubs | 836 | Number instream cover types |
| 98004 | Total number of darter species | 89904 | Minutes spent kicknetting |

^{*} STORET Codes beginning with 8 have yet to be formally established



Figure 4. Salamander collected at Station 12677

Benthic Macroinvertebrate Collections

Collection of benthic macroinvertebrates (Figure 4) in the field was conducted using a 12-inch D-frame kicknet in riffle areas traveling a zigzag pattern across the bed in five-minute intervals. Intervals were repeated until the minimum sample size of 100 specimens was approached, met, or exceeded. All individuals collected within the net were transferred and stored in 70% ethanol for lab analysis and identification. The collection of all individuals within a sample assured that no biases were present for larger, more active, or otherwise more obvious species captured in the net. Most individuals were identified to genus, or as

otherwise suggested by the RWA manual. Collections from sites were analyzed using the 12 metrics defined in the Rapid Bioassessment Protocol in Appendix B of the RWA manual. These metrics include parameters such as species diversity and composition, trophic structure, and species tolerance to adverse environmental conditions.

Nekton Collections

Collection of fish in the field was conducted using both electrofishing and seine methods to ensure a representative sample was collected at each site. Electrofishing was conducted using Smith-Root LR-24 backpack electrofishing gear powered by either 7 amp-hour or 12 amp-hour 24 volt deep-cycle batteries. Each sampling team consisted of three field personnel, including a field director and two technicians. One team member served as the backpack operator while the other two flanked the operator with dip nets. Collected fish were temporarily placed in a five gallon plastic bucket partially filled with water for later identification. Sampling teams moved in

an upstream direction, focusing pulses on snags, along vegetated banks, within large boulders or gravel-based riffles, and any other location most likely to contain fish. Active sampling (instances when current was applied to the water) was conducted for a minimum of 900 seconds. Field teams used best judgment to gauge if enough active sampling had been conducted to collect an accurate representation of present species; therefore, the minimum sampling time was exceeded at some sites. Maximum active sampling time for any site was approximately 1,000 seconds. Upon completion of electrofishing, fish were immediately identified, recorded, and returned to the water in order to minimize mortality. Any fish that could not be identified in the field was preserved in either formalin solution or



Figure 5. Station 12677

ethanol. If more than one fish exhibiting the same characteristics could not be field identified, then only one representative specimen was preserved for later lab identification. Additionally, one individual from each field-identified species was retained as a voucher specimen.

Electrofishing collections were complemented by seining at all sites where seining was possible. A straight seine measuring 30' x 4' with 1/8" mesh was used. Six seine hauls, each approximately 10 meters long, were taken during each sampling event. Only successful seine hauls were counted. Those that encountered obstacles that could have resulted in the escape of fish (heavy snags or rocks that prevented, or otherwise significantly impaired the lead line from traveling across the bottom substrate) were not included. After each successful haul, collected specimens were identified, recorded, and immediately returned to the stream in an effort to minimize mortality. Species which could not be field-identified were handled in the manner described in the electrofishing section.

Collections were analyzed using metrics defined by TNRCC 1999 to generate Statewide IBI. Regional IBI were also calculated using the TPWD 2002 criteria. Both calculations use metrics that capture parameters such as species diversity and composition, community trophic structure, and fish abundance and condition.

Habitat Assessment

Various habitat data were collected at each site, including primary attributes (instream channel measurements), secondary attributes (stream morphology), and tertiary attributes (riparian environment) of each site. Data were used to generate a Habitat Quality Index (HQI), which serves the same function as the RBP for macroinvertebrates and IBIs for fish.

Descriptions of the various data collected are provided in Table 1.

Several subjective habitat parameters were evaluated as required by the RWA manual (TNRCC 1999). These include bank erosion potential, aesthetics, dominant types of riparian vegetation, and to a lesser degree, percent instream cover and percent gravel or larger. For the purpose of this project, EComm attempted to standardize such measurements by using the same crews for each segment during as many sampling events as possible. Because this was not always possible, and because individuals within a crew may have different duties for any given sampling event, a training session was conducted prior to fieldwork to help ensure that all crew members were given identical background and similar interpretation of the subjective measurements.

3.0 RESULTS

Aquatic life use determinations were based upon scores for each of the three ecosystem components (fish, benthic macroinvertebrates, and habitat) analyzed for Segment 1815. The fish component resulted in Statewide and Regional IBI scores, the macroinvertebrate component resulted in a RBP score, and the habitat resulted in a HQI score. The scores from each of these calculations in turn relates to a given Aquatic Life Use designation: limited, intermediate, high, or exceptional (Table 2). The Aquatic Life Use designation is used to assess existing uses according to the health of the sampled biological communities as compared to established water quality standards. It should be noted that the calculated scores of the Statewide IBI may fall in between two range subcategories (see ranges in Table 2). In these cases, subcategories were

assigned as an intermediary between the two subcategories. For example, if a site received a Statewide IBI score of 38, it would fall between the "Limited" and "Intermediate" subcategories, and would be considered to have a "Limited-Intermediate" Aquatic Life Use subcategory.

Table 2. Ranges and Subcategories for each component

| Subcategory | Statewide IBI | Regional IBI (Region 30) | RBP | HQI |
|--------------|---------------|-----------------------------|-------|-------|
| Limited | <34 | <30 | <22 | <14 |
| Intermediate | 40-44 | 30-41 | 22-28 | 14-19 |
| High | 48-52 | 42-51 | 29-36 | 20-25 |
| Exceptional | 58-60 | >51 | >36 | 26-31 |

Results of the biological and habitat analyses for the two sites over the one sampling event are provided in Table 3. Raw data are provided in Appendix A.

Table 3. Results of Biological and Habitat Sampling for Segment 1815, Cypress Creek

| Event 1 | | | | |
|---------------------|---------------|-------------------|-----------|-------------------|
| Station (ecoregion) | Statewide IBI | Regional IBI | RBP | HQI |
| 12673 (30) | 48 - High | 40 - Intermediate | 34 - High | 18 - Intermediate |
| 12677 (30) | 48 - High | 54 - Exceptional | 30 - High | 20 - High |

For each component, an average score was calculated using scores from every sampling event. Scores for sampling events for each component that scored within the subcategory "Exceptional" agreed with the designated aquatic life use value for the segment. A subcategory of "Limited", "Limited-Intermediate", "Intermediate-High", "High", or "Exceptional-High" was considered substandard, as it reflects a poorer level of water quality than that for which the segment is designated. Statewide IBI scores averaged 48 (High) across both sites for the single sampling event. This result was in poor agreement with the designated aquatic life use, which was determined as "Exceptional" (0% overall). Regional IBI scores averaged 46 for the two sites within ecoregion 30 (High) and represented a higher agreement with the standard (50%; 50% below standard). RBP scores averaged approximately 32 (High), while HQI averaged 19 (Intermediate).

4.0 DISCUSSION

Average scores of all components generally were lower than the exceptional aquatic life use designation for Segment 1815. The general trend in Statewide IBI scores is to underestimate the aquatic life use when compared to other assessment methods (TPWD 2002). Therefore, the lower Statewide IBI scores generated from data collected for this study are most likely not indicative of lower aquatic life use. The low scores for Regional IBI may be a function of low sample size during metric development for this region, and may not reflect poor water quality (TPWD 2002).

Segment 1815 did show some spatial variation in aquatic life use scores between the two sites. EComm is currently investigating the causes for this, but it is hypothesized that several factors may contribute, including the effect that inconsistencies in stream attributes between the two sites may have had on sampling effectiveness.

5.0 CONCLUSION

Based on the Regional IBI, RBP, and HQI scores, it is inconclusive that the biological and habitat data support the conclusion that existing aquatic life uses are meeting the established standards. Additional sampling events would be necessary to come to any conclusions about the existing aquatic life use. However, according to results of the physical/chemical component of this study, the dissolved oxygen concentrations in Segment 1815 are above criteria.

REFERENCES

- CONRAD BLUCHER INSTITUTE FOR SURVEYING AND SCIENCE (CBI) 2004. Impairment Verification Monitoring –Volume 1: Physical and Chemical Components; Segment 2113, Upper Frio River.
- CBI. 2003. Total Daily Maximum Load Project: Basin Groups D & E Dissolved Oxygen and Bacteria Impairments, Draft Monitoring Plan. August 2003.
- SULLIVAN, A., M. BEAMAN, F.J. KELLY, V. PALMA AND J. WALTHER. 2004: *Impairment Verification Monitoring in eleven Texas water bodies: Step 1 for the development of successful and cost effective TMDLs*. In: Proceedings of the Water Environment Federation 77th Annual Conference, October 2-6, 2004, New Orleans, LA.
- TEXAS NATURAL RESOURCE CONSERVATION COMMISSION. 1999a. Surface Water Quality Monitoring Procedures Manual. Water Quality Division. Surface Water Quality Monitoring Program. GI-252. June 1999.
- ______. 1999b. *Receiving Water Assessment Procedures Manual*. Water Quality Division, Surface Water Quality Monitoring Program. GI-253. June 1999.
- TEXAS PARKS AND WILDLIFE DEPARTMENT. 2002. Regionalization of the Index of Biotic Integrity for Texas Streams. Gordon W. Linam, Leroy J. Kleinsasser, and Kevin B. Mayes, Resource Protection Division. River Studies Report No. 17. June 2002.

APPENDIX A COMPLETE RAW DATA SET SEGMENT 1815-CYPRESS CREEK SEPTEMBER 2002



Ecological Communications Corporation Austin, TX

BIOTIC ASSESSMENT – FISH

Species Lists and Preliminary Data Manipulation



FISH COLLECTED

| Stream Date ID | Species | N= | Type | Method | Tolerance | Trophic Gp | | |
|-----------------------|--|---|---|---------------------------------------|-----------|---|--------------|--|
| Cypress 9/23/02 12677 | Bluegill | 4 | SF | Е | Т | IF | | |
| .,, | Bluegill | 3 | SF | S | Т | IF | | |
| | Bullhead Minnow | 6 | 0. | Ē | - | IF | | |
| | Bullhead Minnow | 3 | | S | _ | iF | | |
| | Gambusia affinis | 157 | | S | Т | IF | | |
| ** Abnormalities: | Green Sunfish | 6 | SF | Ē | Ť | .: Р | | |
| Orangethroat darter | Green Throated Darter | 14 | D | Ē | i | IF | | |
| with growth on throat | Green Throated Darter | 27 | D | S | i | IF | | |
| Will grown on thout | Largemouth Bass | 3 | _ | Ē | - | .: Р | | |
| | Largemouth Bass | 23 | | S | _ | Р | | |
| | Longear Sunfish | 2 | SF | Ē | _ | İF | | |
| | Orange Spotted Sunfish | 6 | SF | Ē | _ | iF | | |
| | Orangethroat Darter | 16 | D | E | _ | iF | | |
| | Orangethroat Darter | 33 | D | S | _ | IF | | |
| | Redbreast Sunfish | 1 | SF | Ē | _ | IF | | |
| | Spotted Sunfish | 10 | SF | Ē | _ | IF | | |
| | Spotted Sunfish | 10 | SF | S | _ | iF | | |
| | Stoneroller | 51 | O. | E | _ | " H | | |
| | Texas Shiner | 11 | | Ē | _ | IF | KEY: | |
| | Texas Shiner | 129 | | S | _ | iF | SF | Sunfish |
| | Yellow Bullhead | 1 | | Ē | _ | Ö | D | Darter |
| | Total | 507 | | | | | SU | Sucker |
| | Total | 301 | | | | | E | Electroshock |
| | | | | | | | S | Seine |
| Stream Date ID | Species | N= | Type | Method | Tolerance | Trophic Gp | V | Visually Observed |
| Cypress 9/23/02 12673 | Blue Catfish | 1 | | S | - | Р | I | Intolerant |
| | Bluegill | 19 | SF | • | Т | IF | T | Tolerant |
| | | | SE | S | | IF. | 1- | |
| | Bluegill | 14 | SF | S E | T | IF IF | - | Intermediate |
| | | | | | | | 0 | Intermediate Omnivore |
| | Bluegill | 14 | SF | Ε | | | - O IF | Intermediate Omnivore Invertivore |
| | Bluegill Darter (unknown) | 14 1 | SF D | E S | Т | IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass | 14 1 4 | SF D | E S E | Т | IF P | 1 | Intermediate Omnivore Invertivore |
| | Bluegill Darter (unknown) Green Sunfish | 14 1 4 1 | SF D SF | E S E S | Т | IF P P | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish | 14 1 4 1 3 | SF D SF SF | E S E S S | Т | IF P P IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish | 14 1 4 1 3 36 | SF D SF SF SF | E S E S E | Т | IF P P IF IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish | 14 1 4 1 3 36 2 | SF D SF SF SF SF | E S E S S E S | Т | IF P IF IF IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish | 14 1 4 1 3 36 2 15 | SF D SF SF SF SF | E S E S E S E | Т | IF P IF IF IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish Redbreast Sunfish | 14 1 4 1 3 36 2 15 4 | SF D SF SF SF SF SF SF | E | Т | IF P IF IF IF IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish | 14 1 4 1 3 36 2 15 4 8 | SF D SF SF SF SF SF SF | E S E S E S E | Т | IF P IF IF IF IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish Rio Grande Cichlid | 14 1 4 1 3 36 2 15 4 8 | SF D SF SF SF SF SF SF | E | Т | IF P IF IF IF IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish Rio Grande Cichlid Rio Grande Cichlid | 14 1 4 1 3 36 2 15 4 8 1 | SF D SF SF SF SF SF SF | E | Т | IF P IF IF IF IF IF | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish Rio Grande Cichlid Rio Grande Cichlid Smallmouth Bass | 14 1 4 1 3 36 2 15 4 8 1 1 | SF D SF SF SF SF SF SF | E | Т | IF P IF IF IF IF IF F | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish Rio Grande Cichlid Rio Grande Cichlid Smallmouth Bass Spotted Bass | 14 1 4 1 3 36 2 15 4 8 1 1 1 | SF D SF SF SF SF SF | E S E S E S E S E E E | Т | IF PPIFIFIF FPP | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish Rio Grande Cichlid Rio Grande Cichlid Smallmouth Bass Spotted Bass Spotted Sunfish | 14 1 4 1 3 36 2 15 4 8 1 1 1 1 | SF D SF SF SF SF SF | E S E S S E S E S E E E S | Т | IF PPIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFI | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish Rio Grande Cichlid Rio Grande Cichlid Smallmouth Bass Spotted Bass Spotted Sunfish Spotted Sunfish | 14 1 4 1 3 36 2 15 4 8 1 1 1 1 1 1 14 | SF D SF SF SF SF SF | 日 3 日 3 8 日 3 日 8 日 8 日 日 8 日 | Т | IF PPIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFI | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish Rio Grande Cichlid Rio Grande Cichlid Smallmouth Bass Spotted Bass Spotted Sunfish Spotted Sunfish Stoneroller | 14 1 4 1 3 36 2 15 4 8 1 1 1 1 1 1 1 40 13 | SF D SF SF SF SF SF | E | Т | IF PPIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFIFI | P | Intermediate Omnivore Invertivore Piscivore |
| | Bluegill Darter (unknown) Green Sunfish Largemouth Bass Longear Sunfish Longear Sunfish Orange-spotted Sunfish Redbreast Sunfish Redbreast Sunfish Rio Grande Cichlid Rio Grande Cichlid Smallmouth Bass Spotted Bass Spotted Sunfish Spotted Sunfish Stoneroller Stoneroller | 14 1 4 1 3 36 2 15 4 8 1 1 1 1 1 1 1 40 13 7 | SF D SF SF SF SF SF | 日 3 日 3 8 日 3 日 3 日 8 日 日 8 日 8 日 8 日 | Т | IF PPIFIFIFIFIFPPIFIHH | P | Intermediate Omnivore Invertivore Piscivore |

BIOTIC ASSESSMENT – FISH

Indices of Biotic Integrity – Statewide Criteria



Quantitative Biological Scoring for Evaluating Aquatic Life Use Subcategories Based on Fish Statewide Criteria

| Stream: Cypress | Date: 9/23/02 Location: 12677 | County: Hays | |
|----------------------------------|--|---------------|-------|
| Category | Metric | Value | Score |
| Species Richness and Composition | 1. Total number of fish species | 14 | 5 |
| | 2. Number of darter species | 2 | 3 |
| | 3. Number of sunfish species (exc. bass) | 6 | 5 |
| | 4. Number of sucker speices | 0 | 1 |
| | 5. Number of intolerant species | 1 | 3 |
| | 6. Percentage of individuals as tolerants | 34 | 1 |
| | 7. Percentage of individuals as omnivores | 0.01 | 5 |
| Trophic Composition | 8. Percentage of individuals as insectivores | 83 | 5 |
| | 9. Percentage of individuals as piscivores | 6 | 5 |
| | 10. Number of individuals in sample | 507 | 5 |
| Fish Abundance and Condition | 11. Percentage of individuals as hybrids | 0 | 5 |
| | 12. Percentage of individuals with disease/anomalies | 0.01 | 5 |
| | Aquatic Life Use: HIGH | Total Points: | 48 |

Quantitative Biological Scoring for Evaluating Aquatic Life Use Subcategories Based on Fish Statewide Criteria

| Stream: Cypress | Date: 9/23/02 Location: 12673 | County: Hays | 3 |
|----------------------------------|--|---------------|-------|
| Category | Metric | Value | Score |
| Species Richness and Composition | 1. Total number of fish species | 15 | 5 |
| | 2. Number of darter species | 1 | 3 |
| | 3. Number of sunfish species (exc. bass) | 6 | 5 |
| | 4. Number of sucker speices | 0 | 1 |
| | 5. Number of intolerant species | 1 | 3 |
| | 6. Percentage of individuals as tolerants | 15 | 3 |
| | 7. Percentage of individuals as omnivores | 0.01 | 5 |
| Trophic Composition | 8. Percentage of individuals as insectivores | 88 | 5 |
| | 9. Percentage of individuals as piscivores | 3 | 3 |
| | 10. Number of individuals in sample | 241 | 5 |
| Fish Abundance and Condition | 11. Percentage of individuals as hybrids | 0 | 5 |
| | 12. Percentage of individuals with disease/anomalies | 0 | 5 |
| | Aquatic Life Use: HIGH | Total Points: | 48 |

BIOTIC ASSESSMENT – FISH

Indices of Biotic Integrity – Regional Criteria



Quantitative Biological Scoring for Evaluating Aquatic Life Use Subcategories Based on Fish Regional Criteria

| Stream:Cypress | Date:09/23/02 | Location: 12677(Region 30) | County: Hays | | | |
|-------------------------|--|----------------------------|---------------|-------|--|--|
| | Meti | ric | Value | Score | | |
| 1. Total number of fish | n species | | 14 | 5 | | |
| 2. Number of native c | yprinid species | | 3 | 3 | | |
| 3. Number of benthic | invertivore species | | 2 | 5 | | |
| 4. Number of sunfish | species | | 6 | 5 | | |
| 5. Number of intolerar | nt species | | 1 | 3 | | |
| 6. Percentage of indiv | iduals as tolerants (ex | c. G. affinis) | 2.6 | 5 | | |
| 7. Percentage of indiv | iduals as omnivores | | 0.01 | 5 | | |
| 8. Percentage of indiv | iduals as insectivores | | 83 | 5 | | |
| 9. Percentage of indiv | iduals as piscivores | | 6 | 3 | | |
| 10. Number of individu | uals in sample | | 507 | | | |
| a. number of ind/s | eine haul | | 62.7 | 5 | | |
| b. number of ind/n | nin electrofishing | | 8.7 | 5 | | |
| 11. Percentage of ind | as non-native species | 5 | 0.2 | 5 | | |
| 12. Percentage of indi | 12. Percentage of individuals with disease/anomalies | | | | | |
| Aquatic Life Use: E | XCEPTIONAL | | Total Points: | 54 | | |

^{*}Average of 10a and 10b

Drainage area upstream of Station 12677 = 80 sq. km.

5*

Quantitative Biological Scoring for Evaluating Aquatic Life Use Subcategories Based on Fish Regional Criteria

| Stream:Cypress | Date:09/23/02 | Location: 12673 (Region30) | County: Hay | s | |
|--|--------------------------|----------------------------|---------------|-------|--|
| | Met | ric | Value | Score | |
| 1. Total number of fish | n species | | 15 | 5 | |
| 2. Number of native c | yprinid species | | 2 | 1 | |
| 3. Number of benthic | invertivore species | | 0 | 1 | |
| 4. Number of sunfish | species | | 6 | 5 | |
| 5. Number of intolerar | nt species | | 1 | 3 | |
| 6. Percentage of indiv | riduals as tolerants (ex | c. G. affinis) | 15.35 | 5 | |
| 7. Percentage of indiv | riduals as omnivores | | 0.01 | 5 | |
| 8. Percentage of indiv | riduals as insectivores | | 88 | 5 | |
| 9. Percentage of indiv | riduals as piscivores | | 3 | 1 | |
| 10. Number of individe | uals in sample | | 241 | - | |
| a. number of ind/s | eine haul | | 18.83 | 1 | |
| b. number of ind/n | nin electrofishing | | 8.53 | 5 | |
| 11. Percentage of ind | 5.39 | 1 | | | |
| 12. Percentage of individuals with disease/anomalies 0 | | | | | |
| Aquatic Life Use: I | NTERMEDIATE | _ | Total Points: | 40 | |

^{*}Average of 10a and 10b

Drainage area upstream of Station 12673 = 99 sq. km.

BIOTIC ASSESSMENT – BENTHIC MACROINVERTEBRATES

Species Lists and Preliminary Data Manipulation



| Stream | Date | ID | Таха | N= | Func.Gp. | Tolerance | нві |
|---------------|---------------------------------|----------------|--|---------|--------------|-----------|------------------------|
| Cypress | 9/23/02 | 12677 | Odonata-Coenagrionidae-Argia | 7 | Р | 6 | 0.35 |
| Func.Gp | % | | Odonata-Aeshnidae-Basiaeschna | 1 | Р | 2 | 0.0166667 |
| Р . | 28.36022 | | Ephemeroptera-Leptophlebiidae-Farrodes | 1 | CG/SCR | 2 | 0.0166667 |
| SCR | 61.29032 | | Ephemeroptera-Heptageniidae-Stenonema | 1 | SCR/CG | 4 | 0.0333333 |
| CG | 8.602151 | | Hemiptera-Naucoridae-Ambrysus | 1 | Р | - | - |
| FC | 1.747312 | | Hemiptera-Naucoridae-Cryphocricos | 1 | Р | - | - |
| SHR | 0 | | Hemiptera-Veliidae-Rhagovelia | 2 | Р | - | - |
| | 100 | | Trichoptera-Polycentropidae-Polycentropus | 3 | FC/P | 3 | 0.075 |
| P-Predato | or | | Coleoptera-Psephenidae-Psephenus | 52 | SCR | 4 | 1.7333333 |
| SCR-Scra | • | | Diptera-Chironomidae | 2 | P/CG/FC | 6 | 0.1 |
| | ctor/Gathere | | Trichladia (Dugesia) | 21 | Р | 7.5 | 1.3125 |
| SHR-Shre | ng Collector | | Gastropoda (Limnophila)-Pleuroceridae-Elimia | 23 | SCR | 2.5 | 0.4791667 |
| Of the Office | Juuci | | Amphipoda-Hyallelidae-Hyallela (CG-8) | 8 | CG | 8 | 0.5333333 |
| HBI-Hilse | nhoff Biotic | Index= | Decapoda-Cambaridae | 1 | CG | 5 | 0.0416667 |
| sum(nt/N) | • | | Total | 124 | 120 | | 4.6916667 |
| | duals of a pa ce value of tl | articular taxa | Intolerant/Tolerant | 2.16 | | | |
| 7 | of organism | | | | | | |
| | g | | | | | | |
| | | | | | | | |
| Stream | Date | ID | Taxa | N= | Func.Gp. | Tolerance | НВІ |
| Cypress | 9/23/02 | 12673 | Odonata-Coenagrionidae-Argia | 3 | Р | 6 | 0.3103448 |
| | | | Odonata-Libellulidae-Brechmorhoga | 1 | Р | 6 | 0.1034483 |
| | | | Odonata-Gomphidae-Erpetogomphus | 1 | Р | 1 | 0.0172414 |
| Func.Gp | % | | Ephemeroptera-Tricorythidae-Tricorythodes | 1 | CG | 5 | 0.0862069 |
| Р | 22.38095 | | Ephemeroptera-Leptophlebiidae-Thraulodes | 1 | CG/SCR | 2 | 0.0344828 |
| SCR | 10.71429 | | Ephemeroptera-Leptophlebiidae-Neocoroterpes | 2 | CG/SCR | 2 | 0.0689655 |
| CG | 20.2381 | | Ephemeroptera-Heptageniidae-Stenonema | 2 | SCR/CG | 4 | 0.137931 |
| FC | 42.38095 | | Ephemeroptera-Baetidae-Baetis | 10 | SCR/CG | 4 | 0.6896552 |
| SHR | 4.285714 | | Hemiptera-Veliidae-Rhagovelia | 9 | Р | - | - |
| | 100 | | Trichoptera-Hydropsychidae-Cheumatopsyche | 1 | FC | 6 | 0.1034483 |
| | | | Trichoptera-Philopotamidae-Chimarra | 22 | FC | 3 | 1.137931 |
| | | | Coleoptera-Lutrochidae (Limnichidae)-Lutrochus (L) | 2 | CG | - | - |
| | | | Coleoptera-Staphylinidae-Bledius (A) | 1 | Р | - | - |
| | | | Diptera-Chironomidae | 2 | P/CG/FC | 6 | 0.2068966 |
| | | | Diptera-Simulidae-Simulium | 1 | FC | 4 | 0.0689655 |
| | | | Diptera-Stratiomydae-Odontomyia | 1 | - | - | - |
| | | | Diptera-Atherceridae-Suragina | 5 | - | - | - |
| | | | Gastropoda (Limnophila)-Planorbidae-Biomphalaria | 1 | - | - | - |
| | | | Bivalvia (Heterodonta)-Corbiculidae-Corbicula | 5 | FC | 3 | 0.2586207 |
| | | | | | | | |
| | | | Amphipoda-Hyallelidae-Hyallela (CG-8) | 6 | CG/SHR | 8 | 0.8275862 |
| | | | Amphipoda-Hyallelidae- <i>Hyallela (CG-8)</i> Total | 6 70 | CG/SHR 58 | 8 | 0.8275862 4.0517241 |

Intolerant/Tolerant

3.46

BIOTIC ASSESSMENT – BENTHIC MACROINVERTEBRATES

Rapid Bioassessment Protocol



| Stream: Cypress | Date: 9/23/02 | Location: 12677 | County: Hays | 5 | |
|--------------------------|---------------------|-----------------|--------------|----|--|
| | Metric | | | | |
| 1. Taxa Richness | | | 14 | 2 | |
| 2. EPT Taxa Abundan | ce | | 3 | 1 | |
| 3. Biotic Index (HBI) | | | 4.69 | 2 | |
| 4. % Chironomidae | | | 1.612903226 | 4 | |
| 5. % Dominant Taxon | | | 41.93548387 | 1 | |
| 6. % Dominant FFG | | | 28.36016129 | 4 | |
| 7. % Predators | | | 28.36016129 | 2 | |
| 8. Ratio of Intolerant:T | olerant Taxa | | 2.16 | 2 | |
| 9. % of Total Trichopte | era as Hydropsychic | lae | 0 | 4 | |
| 10. # of Non-insect Ta | xa | | 4 | 3 | |
| 11. % Collector-Gathe | rers | | 8.602153226 | 4 | |
| 12. % of Total Number | as Elmidae | | 0 | 1 | |
| Aqautic Life Use: HIG | Н | | Total Score: | 30 | |

| Stream: Cypress | Date: 9/23/02 | Location: 12673 | County: Hays | |
|--------------------------|---------------------|-----------------|--------------|----|
| | Metric | | | |
| 1. Taxa Richness | | | 20 | 3 |
| 2. EPT Taxa Abundan | ce | | 7 | 3 |
| 3. Biotic Index (HBI) | | | 4.05 | 3 |
| 4. % Chironomidae | | | 2.857142857 | 4 |
| 5. % Dominant Taxon | | | 31.42857143 | 2 |
| 6. % Dominant FFG | | | 42.38095714 | 3 |
| 7. % Predators | | | 22.38095286 | 3 |
| 8. Ratio of Intolerant:T | olerant Taxa | | 3.46 | 3 |
| 9. % of Total Trichopte | era as Hydropsychid | lae | 4.347826087 | 4 |
| 10. # of Non-insect Taxa | | | 3 | 2 |
| 11. % Collector-Gathe | 20.23809571 | 3 | | |
| 12. % of Total Number | r as Elmidae | | 0 | 1 |
| Aqautic Life Use: HIG | Н | | Total Score: | 34 |

HABITAT ASSESSMENT

Part I – Stream Physical Characteristics Worksheet



Table B-12. Part 1. Stream Physical Characteristics Worksheet

Part I - Stream Physical Characteristics Worksheet

| Observers: Dat | te: Time:_ | _ Weather | conditions: | | | | | | | | | | | | | | |
|--|---|------------------------------|--|---------------|-----------|------------|-----------|-------------------------------|----------|-----------|-----------|---------|---------|----------|-------------------------------|---|-----------------------|
| Stream:Locat | ion of site: | Ler | igth of stream rea | ich: | | | | | | | | | | | | | |
| Stream Segment No.:_ Ob | served Stream | Uses: | Aesthetics (d | circle on | e): (1) w | vildernes | ss (2) na | itural (3 |) conn | on (4) | offensiv | 'e | | | | The street | |
| Stream Type (Circle One): | perennial or | intermitte | nt w/ perennial p | pools Str | eam Be | nds: No. | Well D | efined_; | No. Mo | deratel | y Defin | ed_; No | . Poorl | y Define | d_ | | |
| Channel Obstructions/Mod | difications: | No. | of Riffles: Cha | annel Flo | ow Statu | ıs (circle | one): hi | igh mod | erate lo | w no fl | ow | | | | | | |
| Riparian Vegetation (%): Left Bank: Trees Right Bank: Tree | S_ Shrubs_ Ges_ Shrubs_ G | rasses, For Grasses, Fo | bs_ Cult. Fields_ orbs_ Cult. Field | Other_s_ Othe | <u>r_</u> | | | | | | | | | | | | |
| Location of Transect | Stream Width (m) | Left Bank Slope (°) | Left Bank Erosion Potential (%) | | Thalwe | eg Depth: | Stream | n Depths | (m) at P | oints Acı | ross Trar | sect | | | Right Bank Slope (°) | Right Bank Erosion Potential (%) | Tree Canopy (%) |
| | | | | | | | | | | | | | | | | 44 | |
| | Habitat Type One) Riffle Glide Pool | e (Circle Run | Dominant Subst | rate Type | | | Left I | nant Typ Bank: Bank: | es Ripar | ian Vege | etation: | | | | | % Gravel or Larg | er |
| | Algae or Ma (Circle One) Abundant C Rare Absen | Common | Width of Natura Vegetation (m) LB: RB: | l Buffer | | Instrea | ım Cover | Types: | | | | | | (6) | | % Instream Cover | |
| | | | | | | | | | | | | | | | | | |
| Location of Transect | Stream Width (m) | Left Bank Slope (°) | Left Bank Erosion Potential (%) | | Thalwe | eg Depth: | Stream | n Depths | (m) at P | oints Ac | ross Tra | nsect | | | Right Bank Slope (°) | Right Bank Erosion Potential (%) | Tree Canopy (%) |
| | | | | | | | | | | | | | | | N | | |
| | Habitat Type One) Riffle Glide Pool | e (Circle Run | Dominant Subst | rate Type | | | Left I | inant Typ Bank: t Bank: | es Ripar | ian Vege | etation: | | | | | % Gravel or Larg | ger |
| - | Algae or Ma (Circle One) Abundant C Rare Absen | Common | Width of Natura Vegetation (m) LB: RB: | l Buffer | | Instrea | am Covei | Types: | | | | | | | | % Instream Cove | er |

| Location of Transect | Stream Width (m) | Left Bank Slope | Left Bank Erosion Potential (%) | k Erosion Stream Depths (m) at Points Across Transect Bank | | | | | | | Right Bank Erosion Potential (%) | Tree Canopy (%) | | | | | |
|-------------------------|---|------------------------------|---|---|---|-----------|-----------------|----------|--------------------|-------------------|---|---|-----------------------|---|------------------------|---|-----------------------|
| | | | | | | | | | | | | | | 1 | | | |
| - | Habitat Type One) Riffle I Glide Pool | (Circle Run | Dominant Subst | Dominant Substrate Type Dominant Types Riparian Vegetation: Left Bank: Right Bank: | | | | | % Gravel or Larger | | | | | | | | |
| | Algae or Mac (Circle One) Abundant C Rare Absen | crophytes common | Width of Natura Vegetation (m) LB: RB: | h of Natural Buffer Instream Cover Types: tation (m) RB: | | | | | | | % Instream Cover | | | | | | |
| Location of Transect | Stream Width (m) | Left Bank Slope | Left Bank Erosion Potential (%) | | Stream Depths (m) at Points Across Transect Right Bank Slope (*) | | | | | | | Right Bank Erosion Potential (%) | Tree Canopy (%) | | | | |
| | | | | | | | | | | | | | | | | (70) | |
| | Habitat Type One) Riffle I Glide Pool | (Circle Run | Dominant Subst | rate Type | | | Domin Left B | | s Riparia | n Veget | ation: | | 7. | | | % Gravel or Larger | |
| *27 | Algae or Mac (Circle One) Abundant C Rare Absent | crophytes onimon | Width of Natura Vegetation (m) LB: RB: | idth of Natural Buffer Instream Cover Types: | | | | | | % Instream Cover | | | | | | | |
| Location of Transect | Stream Width (m) | Left Bank Slope (°) | Left Bank Erosion Potential (%) | | Thalw | eg Depth: | Stream | n Depths | (m) at Po | oints Acı | ross Tran | sect | | | Right Bank Slope | Right Bank Erosion Potential (%) | Tree Canopy (%) |
| | | | | 147 | | | | | | | | | | | | (70) | |
| | Habitat Type One) Riffle I Glide Pool | (Circle Run | Dominant Substi | rate Type | | | Left B | | s Riparia | n Veget | ation: | | | | | % Gravel or Large | er |
| | Algae or Mac (Circle One) Abundant C Rare Absent | ommon | Width of Natura Vegetation (m) LB: RB: | Right Bank: Gidth of Natural Buffer egetation (m) B: RB: | | | | | | | % Instream Cover | | | | | | |
| Location of Transect | Stream Width (m) | Left Bank Slope (°) | Left Bank Erosion Potential (%) | Bank Erosion Stream Depths (m) at Points Across Transect Bank Slope | | | | | | | | Right Bank Erosion Potential (%) | Tree Canopy (%) | | | | |
| | | | | 1010 | | | | 104", | | 10.00 | | | | | | | |
| | Habitat Type One) Riffle I Glide Pool | (Circle Run | Dominant Subst | Dominant Substrate Type Dominant Types Riparian Vegetation: Left Bank: Right Bank: | | | | | | % Gravel or Large | er | | | | | | |
| | Algae or Mac (Circle One) Abundant C Rare Absent | crophytes onunon | Width of Natural Vegetation (m) LB: RB: | h of Natural Buffer Instream Cover Types: | | | | | | % Instream Cover | | | | | | | |

1000

Table B-12. Part 1. Stream Physical Characteristics Worksheet

Part I - Stream Physical Characteristics Worksheet

Jw, Ps, SF Observers: Observers: Date: 13/62 16:00
Observers: Date: Weather conditions: 144, 6/64, 85°
Stream: Capres Location of site: 4/06 for Longth of stream reach: 300 m

Channel Obstructions/Modifications: Dawn No. of Riffles: 2 Channel Flow Status (circle one); high moderate low no flow Stream Type (Circle One) perennial or intermittent w/ perennial pools Stream Bends: No. Well Defined; No. Moderately Defined. No. Poorly Defined. Stream Segment No .: Observed Stream Uses: Lee Aesthetics (circle one): (1) wilderness (2) natural (3) common (4) offensive

Riparian Vegetation (%): Left Bank: Trees Shrubs Grasses, Forb & Cult. Fields Other & Right Bank: Trees & Shrubs & Grasses, Forbs & Cult. Fields Other &

| i - | | 50 | |
|--|--|-------------------------|---|
| 2 | 40m above constituence with | | Location of Transect |
| Algae or Macrophytes (Circle One) Abundant Compon Rare Absent | Habital Type (Circle One) Willie Run Glide Pool | 24.0 | Stream Width (m) |
| crophytes | (Circle Run | 90 | Left Bank Slope (°) |
| Width of Natural Buffer Vegetation (m) LB: RB: Sm | Dominant Substrate Type Bedrack | 7 | Left Bank Erosion Potential (%) |
| il Buffer | rate Type | · 04 | ٦ |
| | | 0 | Thulweg Depth: |
| Instream | | 0 | Depth: |
| menm Cover Types: D | Dominant Ty Left Bank: Right Bank: | .00 | Stream |
| Spes: B | nk: 'c. | 118 | Depths (1 |
| no ban | es Riparian | 19, | n) at Poir |
| Instream Cover Types: Dur bangia us, 1 000 | Dominant Types Riparian Vegetation: Left Bank: en proces sy somewhat, p | 70. 10. 11. 01. 48. 00. | Stream Depths (m) at Points Across Transect |
| 1 53 | on: | 09 | Transect |
| st con | lesson | 1.40 | |
| ra s | 140 | 13 | 1 |
| 2 | ž | dh h | Right Bank Slope |
| ® Instream Cover | % Gravel or Larger | 25 | Right Bank Erosion Potential |
| (ri | N E | 5 | Tree · Canopy (%) |

| | with Blown low | 115 mature conflu | HH Transect |
|---|--|------------------------------------|--|
| Algae or Macrophytes (Circle One) Abundant Cention Rare Absent | Habitat Type (Circle One) Riffie Run Glide 2602 | 12 3 | Stream Width (m) |
| sophytes eminon | (Circle tun | 60. | Left Bank Slope () |
| Width of Natural Buffer Vegetation (m) LB; 18; 10 | Dominant Substrate Type Bedroch | 30 | Left Bank Erosion Potential (%) |
| Buffer | гате Туре | 911, | |
| | | .45 .41 16 .00 .00 .16 .34 .35 ,20 | Thalweg Depth |
| Instream | | .42 | Depth: |
| n Cover T | Domin Left Ba Right I | 47 | Stream , 40 |
| Instream Cover Types: 1802 & Over harmy veg, col | Dominant Types Riparian Vegetation: Left Bank: Cappart Styrenium Right Bank: Cappart Jecon | .00 | Stream Depths (m) at Points Across Transect 48 |
| monophyles | Riparian foress granss | .00 | n) at Poir |
| berk. | Vegetati Sty de | 16 | ils Across |
| ny ve | Trip Tile | 34 | s Transec |
| 5, ce | freen | 35,2 | - |
| 194° | 3 | 2 10 | |
| ble grown | 5.61 -84 | 2 | Right Bank Slope |
| 9 | ,0 | 9 | AV THE STATE OF THE STATE OF |
| % Instream Cover | % Gravel or Larger | 35 | Right Bank Erosion Potential (%) |
| | ier | 12 | Three Camopy (%) |

0

| | | | | | | | | 0 | | | | 0 | 41 | | |
|--|--|---|--|---|---------------|--|-------------|--|---|---------|--|--|--|---------|---|
| | | Location of Transect | | of dam | 5 Im aps from | Transect Dem | and I could | | Ü | | Hy Transect | | | | Lecation of Transect |
| Algae or Macrophytes (Circle One) Abundant Common Rare Absent | Habitat Type (Circle One) Riffle Run Glide Pool | St cam Width (m) | Algae or Macrophytes (Circle Oge) Abundan (Commo) Rare Absent | Habitat Type (Circle One) Riffle Run Glide (59) | 19.0 | Siream Width (m) | 1 | Algae or Macrophytes (Circle One) Abundant Common Rare Absent | Habitat Type (Citele One) Riffle Artho Glide Pool | 823 | Steam Width (m) | Algae or Macrophytes (Chicle One) Abundant Comann Rare Absent | Habitat Type (Circle One) Riffle Run Glide Pool Pol Lo | 20.5 | Stream Width (m) |
| hytes | irele | Left Bank Slope | | Tirele | 55 | Left Bank Slope | | phytes | ₽ Gick | 30 | Left Bank Slope | Ophytes | Circle Run Corl Lon | à | Left Bank Slope |
| Width of Natural Buffer Vegetation (m) LB: RB: | Dominant Substrate Type | Left Bank Erosion Potential (%) | With of Natural Buffer Vegetation (m) LB: RB: O O | Dominant Substrate Type Sodreck | 70 | Left Bank Brosion Potential (%) | | Width of Natural Buffer Vegetation (m) I.B.; RB: | Dominant Substrate Type Bedroch | 20 | Left Bank Exosion Potential (%) | Width of Natural Buffer Vegetation (m) LB; O RB: / S | Dominant Substrate Type Be drack | 40 | Left Bank Erosion Potential (%) |
| uffer | о Туре | Thalwe | 3uffer | le Type | .33 . 37 | Thalwe | | Buffer | ate Type | .02 .0 | Thalw | al Buffer | rate Type | .19 .27 | Thalwa |
| Instream (| | Thalweg Depth: | Instream | | ,33 , | Thalweg Depth: | | Instream Cov | | | Thalweg Depth: | Instrear | | .22 | Thalweg Depth: |
| Instream Cover Types: | Dominant Typ Left Bank: Right Bank: | Stream Depth | Instream Cover Types: | Dominant Ty Left Bank: Right Bank: | JP. 9E | Stream Dept | 1 | Instream Cover Types: | Dominant T Left Bank: Right Bank: | .20 .19 | Stream Dep | Instream Cover Types: | Dominam T Left Bank: Right Bank: | .22 .2 | Stream Dep |
| | Dominant Types Ripatian Vegetation: Left Bank: Right Bank: | Stream Depths (m) at Points Across Transcet | 6mml | Dominant Types Riparian Vegetation: Left Bank: mad berry, crypts Right Bank: Sy damages ess | .57 | Stream Depths (in) at Points Across Transect | 11 | spal is | Dominant Types Riparian Vegetation: Left Bank: Cyproces Sycamore | 1.2. | Stream Depths (m) at Points Across Transect 2_1 | " in dence t | Dominant Types Riparian Vegetation: Left Bank: | 2.19 | Stream Depths (m) at Points Across Transvet 27 |
| | egetation: | s Across Trac | An or | regention: | 1.1 18 | ls Across Tm | | cotte | Vegetation: | 11 .17 | nts Across Ti | et to amp | Vegetation: | 19.12 | nts Acmss Tr |
| | | Rect | complants, | P ~ | . 1% | nsect | | ch, c | 4 | .21,0 | ansect | stoor, | 1 | .26. | ansect |
| | | | | anight . | | 22.72 | | medan | | 0 03 | -05 | | Black wa | 10 .08 | 2.06 |
| | | Right Bank Slope | | 000 | 99 | Right Bank Slope | | hon Lil | | 10 | Right Bank Slope | | walnut | - | Right Bank Slope |
| % Insueam Cover | % Gravel or Larger | Right Bank Prosion Potential (%) | % Instream Cover | % Gravel or Larger | 0 (%) | Right Bank Etosion Potential | 80 | % Instream | % Gravel or Larger | 15 | Right Bank Erosion Potential | % Instream Cover | % Gravel or Larger | | Right Bank Erosion Potential |
| | et. | Tree Canopy | | | 00 | Tree Canopy (%) | | 12 | ger | 4 | Tree Canopy (%) | ver | | /3 | Tree Canopy (%) |

HABITAT ASSESSMENT

Part II – Summary of Physical Characteristics of Water Body



Part II - Summary of Physical Characteristics of Water Body

| Stream name | Cypress 12677 |
|---|------------------------------|
| Date of assessment | 9/23/2002 |
| Stream bed slope over evaluated reach | 0.0051 |
| Approximate drainage area above transect furthest downstream | 80km² |
| Stream order | 3 |
| Length of stream evaluated | 300m |
| Number of lateral transects made | 5 |
| Average stream width | 14.38m |
| Average stream depth | 0.91m |
| Instantaneous flow | 13.72 ft ³ /sec |
| Indicate flow measurement method | Current Meter |
| Channel flow status | High |
| Maximum pool width | 14m |
| Maximum pool depth | 2.48m |
| Total number of stream bends | 1 |
| Number of well defined bends Number of moderately defined bends Number of poorly defined bends | 0 0 1 |
| Total number of riffles | 1 |
| Dominant substrate type | Gravel |
| Average percent of substrate gravel sized or larger | 85% |
| Average percent instream cover | 60% |
| Number of stream cover types | 8 |
| Average percent stream bank erosion potential | 65.50% |
| Average stream bank slope | 84° |
| Average width of vegetative buffer | 10m |
| Average riparian vegetation percent composition by: Trees Shrubs Grasses/Forbes Cultivated Fields Other | 16% 1% 72% - 11% |
| Average percent tree canopy coverage | 73% |
| Overall aesthetic appraisal of stream | Natural |

Part II - Summary of Physical Characteristics of Water Body

| Stream name | Cypress 12673 |
|--|-------------------------------|
| Date of assessment | 9/23/2002 |
| Stream bed slope over evaluated reach | 0.0081 |
| Approximate drainage area above transect furthest downstream | 99km² |
| Stream order | 3 |
| Length of stream evaluated | 300m |
| Number of lateral transects made | 5 |
| Average stream width | 18.5m |
| Average stream depth | 0.25m |
| Instantaneous flow | 17.09 ft ³ /sec |
| Indicate flow measurement method | Current Meter |
| Channel flow status | High |
| Maximum pool width | 19m |
| Maximum pool depth | >1m |
| Total number of stream bends | 1 |
| Number of well defined bends Number of moderately defined bends | 0 1 |
| Number of poorly defined bends | 0 |
| Total number of riffles | 8 |
| Dominant substrate type | Bedrock |
| Average percent of substrate gravel sized or larger | 23% |
| Average percent instream cover | 18% |
| Number of stream cover types | 6 |
| Average percent stream bank erosion potential | 18% |
| Average stream bank slope | 56° |
| Average width of vegetative buffer | 0m |
| Average riparian vegetation percent composition by: Trees Shrubs Grasses/Forbes Cultivated Fields Other | 12.50% 2% 55% 30.50% |
| Average percent tree canopy coverage | 62% |
| Overall aesthetic appraisal of stream | Common |

HABITAT ASSESSMENT

Part III – Habitat Quality Indices



Part III - Habitat Quality Index

| mostly healed over; bank angles average 30-39.9° average 40-60° banks; bank angles average 40-60° banks; banks angles average 40-60° banks | | | | | |
|--|---|--|---|--|--|
| Available Instream Cover Abundant | Habitat Parameter | Scoring Category | | Location: 12677 | Date: 9/23/02 |
| Score: 4 Stable | | | Common | | |
| for colonization and fish cover- good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, pobble, graved or larger substrate le, pob su | Available instream cover | | | | |
| good mix of several stability conte wy fall or transient) cover types such as senaps, obble, undercut banks, macrophytes | | | | | |
| Content will or transienty Content will be content will b | | for colonization and fish cover; | supports a stable habitat; | supports stable habitat; | stable habitat; lack of |
| Incompany Inco | | good mix of several stable | adequate habitat for | habitat availability less than | habitat is obvious: |
| Score: 4 Bottom Substrate Stability Score: 4 Number of Riffes Number of Riffes Number of Riffes Score: 2 Number of Riffes Score: 2 Large Large Larges Pool Largest Pool Larges Pool Covers more than 50% of both the channel and beat least as long as the channel width Score: 3 Large Moderate Pool covers approximately the channel width channel and beat least as long as the channel width. Maximum depth is > 1m depth is > 1m Moderate Valer Files Score: 3 Bank Stability Score: 1 Bank Stability Score: 3 Bank Stability Score: 3 Bank Stability Score: 3 Bank Stability Score: 3 Bank Stability Score: 1 Bank Stability Score: 1 Bank Stability Score: 3 Bank Stability Score: 1 Bank Stability Score: 3 Bank Stability Score: 1 Bank Stability Score: 3 Bank Stability Score: 3 Bank Stability Score: 1 Bank Stabi | | <u>ا</u> | · · | , | · · |
| Score: 4 Biotion Substrate Stability Score: 4 A Moderately Stable Substrate Stability Score: 4 A Moderately Stable Substrate Stability Score: 4 Number of RIMEs Numbe | | (not new fall or transient) | maintenance of populations; | desirable; substrate | substrate unstable or |
| Score: 4 Biotion Substrate Stability Score: 4 A Moderately Stable Substrate Stability Score: 4 A Moderately Stable Substrate Stability Score: 4 Number of RIMEs Numbe | | cover types such as snags. | may be limited in the | frequently disturbed or | lacking |
| Score: 4 Biottom Substrate Stability Biottom Substrate Stability Stable Software or larger substrate, i.e., gravel, cobbie, boulders, dominant substrate type is mix of gravel with some filtent substrate; dominant substrate; do | | , | _ | | |
| Score: 4 Bottom Substrate Stability Stable Score: 4 Bottom Substrate Stability Score: 4 Bottom Substrate Stability Score: 4 Burnber of Riffles Score: 2 Burnensions of Largest Pool Score: 2 Burnensions of Largest Pool Burnensions of Largest Pool Score: 3 Bank Stability Burnensions of Largest Pool Burnensions of Large | | | | removed | |
| Score: 3 Score: 3 Score: 3 Stable Stable Stable Stable Score: 4 Score: 5 Score: 4 Score: 5 Score: 5 Stable Score: 5 Score: 6 Stable Score: 6 Stable Score: 6 Score: 6 Score: 6 Score: 6 Stable Score: 7 Stable Score: 7 Stable Score: 9 Score: 9 Stable Score: 9 Stable Score: 9 Score: 9 Stable Score: 9 Stable Score: 9 Stable Stable Score: 9 Stable Score: 9 Stable Score: 9 Stable Score: 9 Score: 9 Stable Score: 9 Stable Score: 9 Stable Score: 9 Score: 9 Stable Score: 9 Score: 1 | | macrophytes | types | | |
| Score: 3 Score: 3 Score: 3 Stable Stable Score: 4 Score: 5 Score: 4 Score: 5 Score: 5 Score: 5 Score: 6 Stable Score: 6 Score: 7 Score: 9 Scor | | | | | |
| Solver S | | 4 | | | |
| substrate, i.e., gravel, cobble, boulders, dominant substrate by sin x of gravel with some finer sediments on the substrate by sin sin to gravel with some finer sediments. Number of Riffles 1 be counted, riffles must extend - 50% the width of the channel and be at least as long as the channel width. Score: 2 1 Abundant 2-4 riffles 1 riffle 2 riffle 1 riffle 2 riffle 2 riffle 1 riffle 2 riffl | Bottom Substrate Stability | Stable | Moderately Stable | Moderately Unstable | Unstable |
| substrate, i.e., gravel, cobble, boulders, dominant substrate by sin x of gravel with some finer sediments on the substrate by sin sin to gravel with some finer sediments. Number of Riffles 1 be counted, riffles must extend - 50% the width of the channel and be at least as long as the channel width. Score: 2 1 Abundant 2-4 riffles 1 riffle 2 riffle 1 riffle 2 riffle 2 riffle 1 riffle 2 riffl | | >50% gravel or larger | 30-50% gravel or larger | 10-29 9% gravel or larger | <10% gravel or larger |
| Score: 4 Number of Riffles Number of Riffles Number of Riffles Abundant 50% the width of the channel width Score: 2 Dimensions of Largest Pool Pool covers more than 50% of both the channel width; maximum depth is > 1 m Score: 3 Channel Flow Status High Water reaches the base of both the work parks, 5% of channel substrate is exposed channel substrate is exposed of channel substrate is exposed Score: 3 Score: 4 Score: 3 Score: 4 Score: 3 Score: 4 Score: 3 Score: 3 Score: 4 Score: 3 Score: 4 Score: 3 Score: 4 Score: 3 Score: 3 Score: 4 Score: 5 Score: 1 | | | - | | |
| type is gravel or larger variety | substrate, i.e., gravel, cobble, | substrate; dominant | substrate; dominant | substrate; substrate is |
| type is gravel or larger variety | boulders: dominant substrate | substrate type is mix of | substrate type is finer than | uniform sand, silt, clay, or |
| Score: 4 Number of Riffles Number of Riffles Number of Riffles Abundant Common 2-4 riffles 1 riffle No riffles No riffles 1 riffle No riffles 1 r | | | · · · · · · · · · · · · · · · · · · · | | |
| Number of Riffles To be counted, riffles must extend 50% the width of the channel and be at least as long as the channel width Score: 2 Dimensions of Largest Pool Large Pool covers more than 50% of between width the channel width; maximum depth is > 1m Score: 3 Large Pool covers more than 50% of between width the channel width; maximum depth is > 1m Score: 3 Absent No riffles Small Pool covers approximately between width; maximum depth is < 0.5 ma | | type is graver or larger | _ | - | bedrock |
| Abundant 2-4 riffles 1 riffle 3 2 1 1 1 1 1 1 1 1 1 | 0 4 | | | | |
| To be counted, riffles must extend 50% of some width of the channel width 50core: 2 Dimensions of Largest Pool Large Pool covers more than 50% of sightly less than the channel width; maximum depth is > 1m depth is > 1m Moderate Pool covers approximately the channel width; maximum depth is <0.5 meter Book of the channel width shallow auxiliary pockets mater than the channel width; maximum depth is <0.5 meter Book of the channel width shallow auxiliary pockets mater than the channel width; maximum depth is <0.5 meter Book of the channel width shallow auxiliary pockets mater than the channel and or of the shallow auxiliary pockets of the handle substrate is exposed channel substrate is exposed of channel substrate is exposed. Boore: 3 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° where the content of the con | | | | | |
| Score: 2 Impensions of Largest Pool Large Pool covers more than 50% of Pool covers approximately the channel width; maximum depth is > 1m Moderate Pool covers more than 50% of Pool covers approximately the channel width; maximum depth is > 1m Moderate Channel Flow Status Channel Flow Status Channel Flow Status High Water reaches the base of both the lower banks; <5% of channel substrate is exposed Score: 3 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 0 3 Moderately Stable Little evidence (<10%) of erosion bank failure; bank angles average 30-39.9° Score: 0 3 Score: 1 Riparian Buffer Vegetation Score: 1 Riparian Buffer Vegetation Wideress Outstanding natural beauty; usually wooded or unpastured ara; water clarity is usually wooded or growing and process approximately book or slightly less than the after width; maximum depth is <0.5 mater Moderate Water fills <75% of the channel width; no swimm maximum depth is <0.5 meter Moderate variant maximum depth is <0.5 meter Moderate varialise channel and/or infill existrates are mostly stream is dry. Score: 3 3 2 1 0 Moderate variant failure; sommon (30-50%); or from failure; raw areas for the maximum depth is <0.5 meters Moderate variant failure; sommon (30-50%); or from failure; raw areas failure; raw areas for the maximum depth is <0.5 meters Moderate variant failure; sommon (30-60%); or from failure; raw areas failure; raw areas failure; raw areas from the failure; raw areas failure; raw areas for some the failure; raw areas failure; raw areas failure; raw ar | | | Common | Rare | Absent |
| Score: 2 Impensions of Largest Pool Large Pool covers more than 50% of Pool covers approximately the channel width; maximum depth is > 1m Moderate Pool covers more than 50% of Pool covers approximately the channel width; maximum depth is > 1m Score: 3 Channel Flow Status High Water reaches the base of both the lower banks; <5% of channel substrate is exposed Score: 3 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 0 Score: 1 Riparian Buffer Vegetation Score: 1 Raparian Buffer Vegetation Score: 1 Raparian Buffer Vegetation Score: 1 Raparian Buffer Score: 1 Raparian Score: 1 Raparian Score: 2 Score: 1 Raparian Score: 2 Score: 1 Raparian Score: 3 S | To be counted, riffles must extend | ≥5 riffles | 2-4 riffles | 1 riffle | No riffles |
| Score: 2 Dimensions of Largest Pool Large Pool covers more than 50% of the channel width; maximum depth is > 1m Score: 3 Channel Flow Status High Water reaches the base of both the lower banks; <5% of channel substrate is exposed Channel Stability Score: 3 Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 0 Think by and shallow inside areas (point bars) are present Score: 1 Absent No existing pools; only shallow auxiliary pockets of both the lower banks; <5% of channel substrate is exposed Score: 3 Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Thannel Sinuosity Absent No existing pools; only shallow auxiliary pockets of water fills <75% of the channel width; maximum depth is <0.5 meter Moderate Water fills <75% of the Water fills <25.75% of the valiable channel and/or channel and/or channel substrate is exposed Score: 3 Stable Little evidence (<10%) of erosion or bank failure; bank angles average <30° Absent Very little water in the valiable Evidence of erosion bank derive; small areas of erosion mostly healed over; bank angles average <30° Thannel Sinuosity High 22 well-defined bends with deep outside areas (out banks) and shallow inside areas (out banks) an | | 1 | l | | |
| Score: 2 Dimensions of Largest Pool Large Dimensions of Largest Pool Large Dol covers more than 50% of Pool covers approximately the channel width; maximum depth is > 1m Score: 3 Channel Flow Status Chann | | 1 | l | | |
| Large Pool covers more than 50% of the channel width; maximum depth is > 1m Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% of the channel and mostly prose in fill s | at least as long as the channel width | | | | |
| Large Pool covers more than 50% of the channel width; maximum depth is > 1m Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% or less from the fall width; maximum depth is 0.5 meter Pool covers approximately 50% of the channel and mostly prose in fill s | | | | | , |
| Pool covers approximately the channel width; maximum depth is > 1m Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately 50% or slightly less than the channel width; maximum depth is <0.5 meter Pool covers approximately be admined to provide the channel width; maximum depth is <0.5 meter Pool covers approximately be admined to provide the channel width; maximum depth is <0.5 meter Pool covers approximately be admined to provide the channel width; maximum depth is <0.5 meter Pool covers approximately be admined to provide the provided to provide the provided to provide the provided to provide the provided the provide | | | | | • |
| the channel width; maximum depth is > 1m | Dimensions of Largest Pool | Large | Moderate | Small | Absent |
| the channel width; maximum depth is > 1m | _ | Pool covers more than 50% of | Pool covers approximately | Pool covers approximately | No existing pools: only |
| Channel width; maximum depth is <0.5 meter | | | | | 0, , , |
| Score: 3 Channel Flow Status High Water reaches the base of both the lower banks; <5% of channel substrate is exposed channel substrate is exposed. Score: 3 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° High Channel Sinuosity Score: 0 Thannel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 Aesthetics of Reach Wilderness Outstanding natural buffer is >20 Wilderness Outstanding natural buffer is >20 Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity usually wooded or unpastured area; water clarity is usually worded or unpastured area; water clarity is usually worded or unpastured area; water clarity is usually worded wild not a substrate is exposed (both the lower banks, 5-4 meters) Wilderness Outstanding natural bauty; usually wooded or unpastured area; water clarity is usually turbid or discolored with the channel and mostly prese to available channel and/or or devalable channel and/or or devalable channel and/or or devallable channel and/or or devalable channel and/or or devalable channel and/or or devalable channel and/or or devaled because available channel and/or or devaled because available channel and/or or devaled because available channel and/or or devaled because and or or site manufactor or devaled tor the channel and/or or site available channel and/or or site ava | | the channel width; maximum | 50% or slightly less than the | 25% of the channel width; | snallow auxiliary pockets |
| Score: 3 Channel Flow Status High Water reaches the base of both the lower banks; <5% of channel substrate is exposed channel substrate is exposed. Score: 3 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° High Channel Sinuosity Score: 0 Thannel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 Aesthetics of Reach Wilderness Outstanding natural buffer is >20 Wilderness Outstanding natural buffer is >20 Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity usually wooded or unpastured area; water clarity is usually worded or unpastured area; water clarity is usually worded or unpastured area; water clarity is usually worded wild not a substrate is exposed (both the lower banks, 5-4 meters) Wilderness Outstanding natural bauty; usually wooded or unpastured area; water clarity is usually turbid or discolored with the channel and mostly prese to available channel and/or or devalable channel and/or or devalable channel and/or or devallable channel and/or or devalable channel and/or or devalable channel and/or or devalable channel and/or or devaled because available channel and/or or devaled because available channel and/or or devaled because available channel and/or or devaled because and or or site manufactor or devaled tor the channel and/or or site available channel and/or or site ava | | depth is > 1m | channel width: maximum | maximum depth is <0.5 | |
| Score: 3 Channel Flow Status High Water reaches the base of both the lower banks; <5% of channel substrate is exposed channel substrate is exposed exposed Score: 3 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 0 Score: 3 Score: 3 Score: 3 Score: 3 Score: 3 Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 4 Score: 1 Score: 1 Score: 1 Score: 1 Aesthetics of Reach Widtenses Outstanding natural beauty; usually worded or unpastured area; water clarity is usually worded or unpastured area; water clarity is usually exposed exposed of the exposed channel and/or of the area is developed, but uncluttered area; water clarity is usually worded water clarity may be slightily turbid or discolored Moderate Vater fills <75% of the variable saverage sof of channel substrate is exposed of channel substrate is exposed channel and/or riffle substrates are mostly exposed in saviable between leavel over; bank angles average <30° on bank failure; sommon (30-50%); evidence (<50%) of erosion mostly healed over; bank angles average 30-39.9° Score: 0 Score: 1 | | | , | · · | |
| High Water reaches the base of both the lower banks; <5% of channel substrate is exposed Score: 3 3 2 1 Stable Score: 1 Score | | | deptir is 0.5-1 meter | illetei | |
| High Water reaches the base of both the lower banks; <5% of channel substrate is exposed Score: 3 3 2 1 Stable Score: 1 Score | Score: 3 | 3 | 2 | 1 | 0 |
| Water reaches the base of both the lower banks; <5% of channel; or <25% of the channel; or <25% of channe | | | | | |
| both the lower banks; <5% of channel; or <25% of channel and/or Annel substrate is exposed 2 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 0 The Channel Sinuosity Stable Little evidence (<10%) of erosion bank failure; bank angles average 30° and shallow inside areas (point banks) and shallow inside areas (point banks) are present Score: 1 Riparian Buffer Vegetation Score: 1 Aesthetics of Reach Wilderness Cut banks) and shallow inside areas (point bars) are present Score: 1 Aesthetics of Reach Wilderness Cut banks) and shallow inside areas (point bars) are present Natural Area Cut banks) and shallow inside area; water clarity is usually exceptional Wilderness Cut banks) and shallow inside area (point bars) are present Score: 1 Aesthetics of Reach Vilderness Cut banks) and shallow inside area (point bars) are present Score: 1 Aesthetics of Reach Vilderness Cut banks) and shallow inside area (point bars) are present Score: 1 Aesthetics of Reach Vilderness Cut banks (angles average 30°-39.9° and barlow inside area (point bars) are present Score: 1 Aesthetics of Reach Vilderness Vilder of natural buffer is developed, but uncluttered stevel area; water clarity is usually water clarity may be slightly turbid or discolored Vilder of discolored Vilderness | Chamile Flow Status | • | | | |
| Channel substrate is exposed Channel substrate is Channel substrate Channel substate is Channel substrate Channel substate is Channel substrate Channel substate is Channel substate Channel substate Channel substate is Channel substate Channel | | Water reaches the base of | Water fills <75% of the | Water fills 25-75% of the | Very little water in the |
| Channel substrate is exposed Channel substrate is Channel substrate Channel substate is Channel substrate Channel substate is Channel substrate Channel substate is Channel substate Channel substate Channel substate is Channel substate Channel | | both the lower banks: <5% of | channel: or <25% of | available channel and/or | channel and mostly present |
| Score: 3 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 0 Score: 0 Score: 1 Riparian Buffer Vegetation Score: 1 Aesthetics of Reach Wilderness Outstanding natural buffer is 20 meters Coustanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Extensive Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Extensive Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Extensive wilder or solon or bank failure; raw areas frequent along steep banks; bank angles average 40-60° Thomas angles average 30-39.9° Moderate Fivience of erosion bank failure; common (30-50%); high potential of erosion during flooding; bank angles average 40-60° Thomas average 40-60° Thoma | | The state of the s | | | |
| Score: 3 Bank Stability Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 0 Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 Restables Score: 1 Restables Width of natural buffer is >20 meters Score: 1 Aesthetics of Reach Wilderness Outstanding natural beauty; usually wooded or unpastured area, water clarity is usually exceptional Stable Stable Moderately Stable Some evidence (10-29.9%) of erosion or bank failure; small areas of erosion bank failure; small areas of erosion or bank failure; small areas of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; small areas of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; scommon (30-50%); high potential of erosion or bank failure; | | channel substrate is exposed | | | • • • |
| Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° Score: 0 This part of the possible areas (cut banks) and shallow inside areas (point bars) are present Score: 1 Scor | | | | | |
| Little evidence (<10%) of erosion bank failure; bank angles average <30° bierosion or bank failure; small areas of erosion mostly healed over; bank angles average <30° bierosion or bank failure; small areas of erosion mostly healed over; bank angles average 40-60° average 40- | | - | | · | - |
| erosion bank failure; bank angles average <30° small areas of erosion or bank failure; small areas of erosion during flooding; bank angles average 40-60° spank gangles average 30-39.9° bigh potential of erosion during flooding; bank angles average 40-60° average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; small areas of erosion during flooding; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; small areas of erosion during flooding; bank angles average ≥60° or bank failure; small areas of erosion during flooding; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; small areas of erosion during flooding; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or banks; bank angles average | Bank Stability | Stable | Moderately Stable | Moderately Unstable | Unstable |
| erosion bank failure; bank angles average <30° small areas of erosion or bank failure; small areas of erosion during flooding; bank angles average 40-60° spank gangles average 30-39.9° bigh potential of erosion during flooding; bank angles average 40-60° average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; small areas of erosion during flooding; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; small areas of erosion during flooding; bank angles average ≥60° or bank failure; small areas of erosion during flooding; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; small areas of erosion during flooding; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or bank failure; raw areas frequent along steep banks; bank angles average ≥60° or banks; bank angles average | | Little evidence (<10%) of | Some evidence (10-29.9%) | Evidence of erosion bank | Large and frequent |
| score: 0 Score: 0 Altight | | ` , | , , | | |
| Moderate Score: 0 3 2 1 1 0 | | erosion bank failure; bank | of erosion of bank failure; | railure is common (30-50%); | evidence (>50%) of erosion |
| Moderate Score: 0 3 2 1 1 0 | | angles average <30° | small areas of erosion | high potential of erosion | or bank failure; raw areas |
| angles average 30-39.9° average 40-60° banks; bank angles average >60° saverage >60° | | | mostly healed over; hank | during flooding; bank angles | frequent along steen |
| Score: 0 3 2 1 0 Channel Sinuosity High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present Score: 1 Riparian Buffer Vegetation Score: 1 Restensive Width of natural buffer is >20 meters Score: 1 Aesthetics of Reach Wilderness Outstanding natural beautry usually wooded or unpastured area; water clarity is usually exceptional Score: 1 Aesthetics of Reach None Straight channel; may be channelized Narrow Width of natural buffer is 5-10 meters 10 meters Natural Area Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be a dumping area; water clarity may be slightly turbid Natural Area Video Width of natural buffer is 5-10 meters Offensive Stream does not enhance the aesthetics of the area cluttered; highly develope may be a dumping area; water clarity is usually turbid Natural Area Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Natural Area Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored | | | | | |
| Score: 0 Channel Sinuosity High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present Score: 1 Riparian Buffer Vegetation Score: 1 Aesthetics of Reach Wideness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Moderate Wideness Outstanding natural beauty; usually exceptional Straight channel; may be channelized None Straight channel; may be channelized Wide Width of natural buffer is 10.1-20 meters 10.1-20 meters 10.1-20 meters 10.0 None Straight channel; may be channelized Wide Width of natural buffer is 10.1-20 meters 10.0 Narrow Width of natural buffer is 10.1-20 meters 10.0 Offensive Stream does not enhance the aesthetics of the area cluttered; highly developed may be a dumping area; water clarity may be slightly turbid Wide Width of natural buffer is 10.1-20 meters 10.1-20 meters 10.0 Offensive Width of natural buffer is 10.1-20 meters 10.0 Offensive Width of natural buffer is 10.1-20 meters 10.1-20 me | | | angles average 30-39.9° | average 40-60° | banks; bank angles |
| High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present Score: 1 Riparian Buffer Vegetation Extensive Width of natural buffer is >20 meters Score: 1 Aesthetics of Reach Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Moderate 1 well-defined bend OR ≥3 moderately-defined bends present Vide 1 well-defined bends present None Straight channel; may be channelized Narrow Width of natural buffer is 10.1-20 meters Narrow Width of natural buffer is 10.1-20 meters Data and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be turbid or discolored Wilderness Outstanding natural beauty; usually exceptional Wilderness Outstanding natural beauty; water clarity may be slightly turbid None Straight channel; may be channelized Narrow Width of natural buffer is 5-10.1-20 meters Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid or discolored | | | | | average >60° |
| ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present Score: 1 3 2 1 0 | Score: 0 | | | | |
| deep outside areas (cut banks) and shallow inside areas (point bars) are present Score: 1 Riparian Buffer Vegetation Extensive Width of natural buffer is >20 meters Score: 1 Aesthetics of Reach Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Moderate Width of natural buffer is someters Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid Dends OR only poorly-defined bends present Moderate Width of nolograph of the natural bends present Moderate Width of natural buffer is someters Width of natural buffer is someters Natural Area Tree and/or native vegetation common; some developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored | | | | | |
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| banks) and shallow inside areas (point bars) are present Score: 1 Riparian Buffer Vegetation Extensive Width of natural buffer is >20 meters Score: 1 Aesthetics of Reach Wilderness Outstanding natural beauty; usually exceptional Wilderness Outstanding natural beauty; usually exceptional Discording in the present of the present | | High | Moderate | Low | None |
| areas (point bars) are present Score: 1 3 2 1 0 Moderate Width of natural buffer is >20 meters Score: 1 Aesthetics of Reach Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Width of natural buffer is >20 meters 10.1-20 meters Width of natural buffer is 5-10 meters 10.1-20 meters Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Wilderness Outstanding natural beauty; usually exceptional Wilderness Outstanding natural beauty; usually exception common; some development evident (from fields, pastures, dwellings); water clarity may be turbid or discolored Width of natural buffer is 5-10 meters Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Wilderness Outstanding natural beauty; usually exceptional Wilderness Outstanding natural beauty; water clarity may be turbid or discolored | | High ≥2 well-defined bends with | Moderate 1 well-defined bend OR ≥3 | Low <3 moderately-defined | None Straight channel; may be |
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| Riparian Buffer Vegetation Ri | | High ≥2 well-defined bends with deep outside areas (cut | Moderate 1 well-defined bend OR ≥3 moderately-defined bends | Low <3 moderately-defined bends OR only poorly- | None Straight channel; may be |
| Riparian Buffer Vegetation Extensive Width of natural buffer is >20 meters Score: 1 Aesthetics of Reach Width of natural buffer is >20 Milderness Outstanding natural beauty; usually exceptional Width of natural buffer is 10.1-20 meters Midth of natural buffer is 10.1-20 meters 10 meters Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be slightly turbid Width of natural buffer is 5-10 meters Midth of natural buffer is 5-10 meters Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Width of natural buffer is 5-10 meters Offensive Stream does not enhance developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored | | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present | Low <3 moderately-defined bends OR only poorly- | None Straight channel; may be |
| Riparian Buffer Vegetation Extensive Width of natural buffer is >20 meters Score: 1 Aesthetics of Reach Width of natural buffer is >20 Milderness Outstanding natural beauty; usually exceptional Width of natural buffer is 10.1-20 meters Midth of natural buffer is 10.1-20 meters 10 meters Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be slightly turbid Width of natural buffer is 5-10 meters Midth of natural buffer is 5-10 meters Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Width of natural buffer is 5-10 meters Offensive Stream does not enhance developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored | | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present | Low <3 moderately-defined bends OR only poorly- | None Straight channel; may be |
| Width of natural buffer is >20 meters | Channel Sinuosity | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present | Low <3 moderately-defined bends OR only poorly- defined bends present | None Straight channel; may be channelized |
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| Aesthetics of Reach Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Milderness Outstanding natural beauty; usually exceptional Diffensive Stream does not enhance development evident (from fields, pastures, dwellings); water clarity may be slightly turbid Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Cummon Setting Not offensive (Stream does not enhance developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored | Channel Sinuosity Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate | None Straight channel; may be channelized 0 Narrow |
| Aesthetics of Reach Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Offensive Stream does not enhance development evident (from fields, pastures, dwellings); water clarity may be slightly turbid Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Cummon Setting Not offensive Stream does not enhance developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored | Channel Sinuosity Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate | None Straight channel; may be channelized 0 |
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| Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored Stream does not enhance the aesthetics of the area such as in an urban park; water clarity may be a dumping area; water clarity is usually turbid or discolored | Channel Sinuosity Score: 1 Riparian Buffer Vegetation | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 | None Straight channel; may be channelized O Narrow Width of natural buffer is </td |
| usually wooded or unpastured area; water clarity is usually exceptional vegetation common; some developed, but uncluttered such as in an urban park; water clarity may be slightly turbid developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored the aesthetics of the area such as in an urban park; water clarity may be a dumping area; water clarity is usually turbid or discolored | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 | None Straight channel; may be channelized O Narrow Width of natural buffer is </td |
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| exceptional fields, pastures, dwellings); water clarity may be turbid water clarity may be slightly turbid may be a dumping area; water clarity is usually turbid or discolored | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is | None Straight channel; may be channelized 0 Narrow Width of natural buffer is meters 0 Offensive Stream does not enhance</td |
| exceptional fields, pastures, dwellings); water clarity may be turbid water clarity may be slightly turbid may be a dumping area; water clarity is usually turbid or discolored | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is | None Straight channel; may be channelized O Narrow Width of natural buffer is < meters O Offensive |
| water clarity may be slightly turbid or discolored water clarity is usually turbid turbid or discolored | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; usually wooded or unpastured | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native vegetation common; some | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is developed, but uncluttered | None Straight channel; may be channelized 0 Narrow Width of natural buffer is < meters 0 Offensive Stream does not enhance the aesthetics of the area; |
| turbid turbid or discolored | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native vegetation common; some development evident (from | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; | None Straight channel; may be channelized 0 Narrow Width of natural buffer is < meters 0 Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed |
| turbid turbid or discolored | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; | None Straight channel; may be channelized 0 Narrow Width of natural buffer is meters 0 Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed</td |
| | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid | None Straight channel; may be channelized 0 Narrow Width of natural buffer is meters 0 Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed may be a dumping area;</td |
| Score: 2 3 2 1 0 | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid | None Straight channel; may be channelized O Narrow Width of natural buffer is < meters O Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed may be a dumping area; water clarity is usually |
| | Channel Sinuosity Score: 1 Riparian Buffer Vegetation Score: 1 | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid | None Straight channel; may be channelized 0 Narrow Width of natural buffer is meters 0 Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed may be a dumping area; water clarity is usually</td |
| Total Score: 20 HIGH | Score: 1 Riparian Buffer Vegetation Score: 1 Aesthetics of Reach | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present 3 Extensive Width of natural buffer is >20 meters 3 Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present 2 Wide Width of natural buffer is 10.1-20 meters 2 Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid | Low <3 moderately-defined bends OR only poorly- defined bends present 1 Moderate Width of natural buffer is 5- 10 meters 1 Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored | None Straight channel; may be channelized O Narrow Width of natural buffer is meters O Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed may be a dumping area; water clarity is usually turbid or discolored</td |

Part III - Habitat Quality Index

| Habitat Parameter | Scoring Category | | Location: 12673 | Date: 9/23/02 |
|---|---|--|---|---|
| Available Instream Cover | Abundant >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, macrophytes | Common 30-50% of substrate supports a stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types | Rare 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate | Absent <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking |
| Score: 2 | 4 | 3 | 2 | 1 |
| Bottom Substrate Stability | Stable >50% gravel or larger substrate, i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger | Moderately Stable 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments | Moderately Unstable 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be in mix of sizes | Unstable <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock |
| Score: 2 | 4 | 3 | 2 | 1 |
| Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width | Abundant ≥5 riffles | Common 2-4 riffles | Rare 1 riffle | Absent No riffles |
| Score: 4 | 4 | 3 | 2 | 1 |
| Dimensions of Largest Pool | Large Pool covers more than 50% of the channel width; maximum depth is > 1m | Moderate Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5-1 meter | Small Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter | Absent No existing pools; only shallow auxillary pockets |
| Score: 3 | 3 | 2 | 1 | 0 |
| Channel Flow Status | High Water reaches the base of both the lower banks; <5% of channel substrate is exposed | Moderate Water fills <75% of the channel; or <25% of channel substrate is exposed | Low Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed | No Flow Very little water in the channel and mostly present in standing pools; or stream is dry |
| Score: 3 | 3 | 2 | Madantah Hustahla | 0 |
| Bank Stability | Stable Little evidence (<10%) of erosion bank failure; bank angles average <30° | Moderately Stable Some evidence (10-29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30- 39.9° | high potential of erosion | Unstable Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60° |
| Score: 1 | 3 | 2 | 1 | 0 |
| Channel Sinuosity | High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present | Moderate 1 well-defined bend OR ≥3 moderately-defined bends present | Low <3 moderately-defined bends OR only poorly- defined bends present | None Straight channel; may be channelized |
| Score: 1 | 3 | 2 | 1 | 0 |
| Riparian Buffer Vegetation | Extensive Width of natural buffer is >20 meters | Wide Width of natural buffer is 10.1- 20 meters | Moderate Width of natural buffer is 5- 10 meters | Narrow Width of natural buffer is <5 meters |
| Score: 0 | 3 Wilderness | Notural Area | 1 Common Setting | Offensive |
| Aesthetics of Reach | Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional | Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid | Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored | Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored |
| Score: 1 | 3 | 2 | 1 | 0 |
| Total Score: 18 | INTERMEDIATE | | | |