

APPENDIX Z: Fish, Unionid, and Crayfish Report

Tier 2 Environmental Impact Statement

I-69 Section 6

Martinsville to Indianapolis

FINAL FISH, MUSSEL, AND CRAYFISH SURVEY REPORT

I-69 EVANSVILLE TO INDIANAPOLIS SECTION 6 MORGAN, JOHNSON, AND MARION COUNTIES, INDIANA

March 15, 2006

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FINAL FISH, MUSSEL, AND CRAYFISH SURVEY REPORT

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FINAL FISH, MUSSEL, AND CRAYFISH SURVEY REPORT I-69 EVANSVILLE TO INDIANAPOLIS SECTION 6 MORGAN, JOHNSON, AND MARION COUNTIES, INDIANA

1.0 INTRODUCTION

1.1 Project Description

On March 24, 2004, the Federal Highway Administration issued a Record of Decision (ROD) approving a corridor for I-69 between Evansville and Indianapolis. This corridor, designated as Alternative 3C in the Tier 1 Environmental Impact Statement (EIS) for I-69, is approximately 2,000 feet in width. The northern terminus of the project is I-465 on the south side of Indianapolis and the southern terminus is I-64 just north of Evansville. The project is part of a larger, national proposal to connect the three North American trading partners of Canada, Mexico, and the United States with an Interstate highway traversing the states of Michigan, Indiana, Kentucky, Tennessee, Mississippi, Arkansas, Louisiana, and Texas. In its entirety, the National I-69 corridor will extend from the Canadian border to the Mexican border, for a distance of more than 2,100 miles. This corridor was designated by Congress in the Intermodal Surface Transportation Act of 1991 (ISTEA).

To comply with the ROD, the Federal Highway Administration and the Indiana Department of Transportation are preparing a separate Tier 2 EIS for six sections of I-69 between Evansville and Indianapolis. These reports will determine the alignment, interchange locations, and design characteristics of I-69 within the selected corridor, as well as develop more detailed mitigation measures. The Tier 2 sections range in length from 13 to 29 miles. Based on consultation with the U.S. Fish and Wildlife Service (USFWS), the Indiana Department of Natural Resources (IDNR), and other environmental resource agencies, it was determined that surveys for fish, mussels, and crayfish will be required as part of the Tier 2 EIS for two of the aforementioned sections.

J.F. New & Associates, Inc. (JFNew) was contracted by HNTB Corporation (HNTB) to conduct surveys for endangered, threatened, and rare fish, mussel, and crayfish species within the Section 6 corridor. The following report provides descriptions of the methodologies used during the surveys, a discussion of results, and an analysis of potential impacts to federal and state-listed threatened and endangered fish, mussel, and crayfish species resulting from implementation of I-69 between Martinsville and Indianapolis.

1.2 Survey Locations

Eleven sites in Morgan, Johnson, and Marion Counties were surveyed within the Section 6 corridor for fish, mussels, and crayfish (Table 1 and Figure 1). Additionally, qualitative stream habitat assessments were conducted at each of the eleven sites. The eleven survey sites included: Indian Creek, the West Fork of Clear Creek, Clear Creek, Stott's Creek, Crooked Creek, Bluff Creek, North Bluff Creek, Honey Creek, Pleasant Run Creek, Orme Ditch, and Little Buck Creek. With the exceptions of Indian Creek and the West Fork of Clear Creek, all survey locations occurred at the intersection of each tributary and State Road (SR) 37. Due to site accessibility, Indian Creek was surveyed upstream of SR 37 at Low Gap Road. The West Fork of Clear Creek was surveyed near the County Road (CR) 200 North intersection. All eleven sites are tributary streams of the West Fork of the White River.

Table 1. Streams Surveyed for Fish. Mussels, and Cravfish

| Site Number | Stream | County |
|-------------|------------------------|---------|
| 1 | Indian Creek | Morgan |
| 2 | W. Fork of Clear Creek | Morgan |
| 3 | Clear Creek | Morgan |
| 4 | Stott's Creek | Morgan |
| 5 | Crooked Creek | Morgan |
| 6 | Bluff Creek | Johnson |
| 7 | North Bluff Creek | Johnson |
| 8 | Honey Creek | Johnson |
| 9 | Pleasant Run Creek | Marion |
| 10 | Orme Ditch | Marion |
| 11 | Little Buck Creek | Marion |

No previous I-69 fish, mussel, or crayfish survey data was available for these sites. The only known record of sampling for fishes in this area was by Gerking (1945). Gerking collected fishes in Indian Creek (Site 400-Gerking), the West Fork of the White River (Site 401-Gerking), Little Buck Creek (Site 421-Gerking), and a nameless creek (Site 500-Gerking) which is located five miles north of Martinsville in Morgan County. To the best of JFNew's knowledge, no published information exists for mussel or crayfish collections from these streams.

2.0 FISH, CRAYFISH, AND STREAM HABITAT SURVEYS

The I-69 Section 6 Tier 2 fish and crayfish surveys were conducted on September 2 and 3, 2004 at Sites 2-11. Indian Creek (Site 1) was added as an additional survey site in January of 2005 based on draft report comments. Indian Creek was surveyed on May 3, 2005. For Sites 2-11, the sampling crew consisted of Joe Exl (field crew leader), John Richardson, and Jason Babcock-Stiner. For Site 1, the sampling crew consisted of Joe Exl (field crew leader) and John Richardson. Common names of fishes in this report follow Robins et al (1991).



2.1 <u>Methodology</u>

Fish Surveys

JFNew surveyed the fish community at each of the eleven sites (Table 1) using a Coffelt Mark 10 backpack electrofishing unit following the Indiana Department of Environmental Management (IDEM) protocol for Fish Community Assessment (IDEM, 2002). The sample reach surveyed at each site was 15 times the wetted width of the stream at the time of sampling. Regardless of stream width, at least 50 meters and no more than 500 meters was sampled. Table 2 lists the length of the sample reach, as well as the sample time for each stream surveyed. This length of the sample reach ensured that all representative habitats within the stream were sampled. Stunned fish were captured by two dip netters and placed into a livewell for processing at the completion of the survey reach. Captured fish were identified to species; measured for total length to determine length ranges (millimeters); and examined for deformities, eroded fins, lesions, and tumors (DELT). Voucher specimen(s) of unidentified fish were returned to the laboratory for positive identification. All other fish were returned to the stream after processing. Additionally, the fish community of each site was assessed using the Shannon-Wiener Diversity Index (base 2). Please note that no samples were collected from Site 9 since the stream was dry during the time of the survey.

Table 2. Fish Survey Effort

| Site | Stream | Date | Sample Time (seconds) | Sample Length (feet) |
|------|------------------------|----------|-----------------------------|----------------------------|
| 1 | Indian Creek | 5/2005 | 1068 | 675 |
| 2 | W. Fork of Clear Creek | 9/2/2004 | 737 | 450 |
| 3 | Clear Creek | 9/2/2004 | 876 | 225 |
| 4 | Stott's Creek | 9/2/2004 | 854 | 450 |
| 5 | Crooked Creek | 9/3/2004 | 206 | 225 |
| 6 | Bluff Creek | 9/3/2004 | 145 | 150 |
| 7 | North Bluff Creek | 9/3/2004 | 217 | 150 |
| 8 | Honey Creek | 9/3/2004 | 936 | 300 |
| 9 | Pleasant Run Creek | 9/3/2004 | 971 | 600 |
| 10 | Orme Ditch | 9/3/2004 | | |
| 11 | Little Buck Creek | 9/2/2004 | 987 | 450 |

Crayfish Surveys

A combination of collection methods were used to survey the aquatic crayfish community at each of the eleven sites. Sampling generally followed methodology described by Simon and Thoma (2003). As crayfish sampling occurred concurrently with fish electrofishing, the sample reach surveyed at each site was 15 times the wetted width of the stream at the time of sampling. Additionally, crayfish sampling occurred within the same reach (location) in which the fishery survey was conducted for a given site.



Crayfish exposed by the backpack electrofisher during the fishery survey were collected for identification. In addition, crayfish were collected from various habitats with a dip net or by hand.

Stream flows and substrate were not conducive to using the 1-m² seine net as originally outlined in the proposal therefore this methodology was not utilized. Up to ten specimens from each species were retained for laboratory identification. The remaining specimens were returned to the stream following processing.

Stream Habitat Surveys

JFNew performed qualitative habitat surveys at each site using IDEM's Qualitative Habitat Evaluation Index (QHEI) protocol (IDEM, 2002). While the Ohio EPA originally developed the QHEI to evaluate fish habitat in streams, IDEM and other agencies routinely utilize the QHEI as a measure of general "habitat" health. Various attributes of habitat within the survey reach were scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic faunas. The type(s) and quality of substrate; amount and quality of in-stream cover; channel morphology; extent and quality of riparian vegetation; pool, riffle, and run development and quality; and gradient are the metrics used to determined the QHEI score. Each metric was scored individually then summed to provide the total QHEI score. QHEI scores typically range from 20 to 100.

2.2 Survey Results

Fish Results

A complete list of species identified during the electrofishing surveys can be found in Table 3. This information was used to calculate the Shannon-Wiener Diversity Index results for each site (Table 4). A more detailed discussion of the diversity index results can be found below. Copies of the fish survey datasheets can be found in Appendix A.

A total of 1,423 fish representing 30 species (plus a hybrid bluegill) and six families were collected during the surveys (Table 3). One species, originally considered to be Silverband shiner (*Notropis shumardi*), was potentially collected at Site 3. However, no voucher was retained to confirm the identification of this species. A second collection effort was attempted on May 3, 2005 to confirm the presence of this species. None where collected possibly due to negative impacts associated with the removal of an abandoned bridge abutment within the sampling reach. The sampling reach was significantly altered since the first collection. Large amounts of sand had covered significant riffle habitat within the sampling reach. This species has been changed to *Notropis* sp. since no voucher specimen was retained. This species of minnow is not State or Federally listed. Minnows were the most dominant taxa with 729 individuals (52% of the total catch) and 12 species being collected between all sites. Darters were the second most abundant fish species by number with 421 individuals (30% of the total catch) being collected between all sites.



The remaining sculpin, sucker, sunfish, and livebearers families represented 8%, 6%, 3%, and 1% of the total catch, respectively. None of the fish species collected are listed as State or Federally endangered, threatened, rare, or special concern species.

A review of the fishes collected during the survey showed that 9 of the 30 species (12% of individuals collected) collected are categorized as tolerant to a wide variety of environmental disturbances including water quality and habitat degradation or temporarily unavailable or stressed habitats (Barbour et al, 1999). Seventeen species (87% of individuals collected) are considered moderately tolerant, and two species (1% of individuals collected) are considered intolerant to a wide variety of environmental disturbances including water quality and habitat degradation (Barbour et al, 1999). There appears to be more tolerant species present today than when Gerking collected fish in these streams nearly 60 years ago (Gerking, 1945). Poor pool and riffle development coupled with historical stream channelization has apparently had significant negative impacts on these stream's fish communities. Further discussion on stream habitat can be found below in the Stream Habitat Results section.

Table 3. Fish Survey Results

| Species Name | Common Name | | | | , | Survey | Site Lo | cation | 5 | | | | |
|-------------------------|---------------------|----|----|---|-----|--------|---------|--------|-----|----|----|----|-------|
| Species Name | Common Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Total |
| Cyprinidae | Minnow Family | | | | | | | | | | | | |
| Campostoma anomalum | Central stoneroller | | | | 215 | 144 | 8 | | 88 | 83 | | 19 | 557 |
| Carassius auratus | Goldfish | | | 2 | | | | | | | | | 2 |
| Cyprinella spiloptera | Spotfin shiner | 1 | | | | | | | 1 | 1 | | | 3 |
| Cyprinus carpio | Common carp | | | | | | | | | 1 | | | 1 |
| Notropis atherinoides | Emerald shiner | | | | 6 | | | | | | | | 6 |
| Notropis buccatus | Silverjaw minnow | | 17 | | 4 | 3 | | | | | | | 24 |
| Notropis stramineus | Sand shiner | | | | 2 | | | | | | | 1 | 3 |
| Notropis sp. | Shiner species | | | | 22 | | | | | | | | 22 |
| Phenocobius mirabilis | Suckermouth minnow | | | | 17 | 1 | | | | 1 | | | 19 |
| Pimephales notatus | Bluntnose minnow | 1 | | | 14 | 3 | | | | | | | 18 |
| Pimephales promelas | Fathead minnow | | 1 | | | | | | | | | | 1 |
| Rhinichthys atratulus | Blacknose dace | | 3 | | | | 2 | | | 1 | | | 6 |
| Semotilus atromaculatus | Creek chub | | 5 | 3 | 3 | 12 | 5 | 14 | 8 | 32 | | 9 | 91 |
| Cottidae | Sculpin Family | | | | | | | | | | | | |
| Cottus bairdi | Mottled sculpin | | 8 | | | | | | 103 | | | | 111 |
| Percidae | Perch Family | | | | | | | | | | | | |
| Etheostoma blennioides | Greenside darter | 17 | | | 26 | | | | | | | | 43 |
| Etheostoma caeruleum | Rainbow darter | 4 | | 1 | 78 | 6 | 28 | | 13 | 23 | | | 153 |
| Etheostoma nigrum | Johnny darter | 4 | 4 | | 21 | 15 | 1 | | 7 | 10 | | | 62 |
| Etheostoma spectabile | Orangethroat darter | | | | | | | 64 | 79 | 18 | | | 161 |
| Percina sciera | Dusky darter | 1 | | 1 | | | | | | | | | 2 |



Table 3. Fish Survey Results - Continued

| Species Name | Common Name | | | | ; | Survey | Site Lo | cation | s | | | | |
|---------------------------|---------------------|----|----|----|-----|--------|---------|--------|-----|-----|----|----|-------|
| Species Name | Common Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Total |
| Poeciliidae | Livebearer Family | | | | | | | | | | | | |
| Gambusia affinis | Mosquito fish | | | | | | | 8 | | | | | 8 |
| Catostomidae | Sucker Family | | | | | | | | | | | | |
| Catostomus commersoni | White sucker | | | 5 | 8 | 1 | | | 8 | 3 | | | 25 |
| Hypentelium nigricans | Northern hog sucker | 2 | | 1 | 48 | 1 | | | 2 | 7 | | 1 | 62 |
| Moxostoma duquesnei | Black redhorse | 3 | | | | | | | | | | | 3 |
| Moxostoma erythrurum | Golden redhorse | | | | 1 | | | | | | | | 1 |
| Centrarchidae | Sunfish Family | | | | | | | | | | | | |
| Lepomis cyanellus | Green sunfish | | 1 | 3 | | | | | | 1 | | 2 | 7 |
| Lepomis macrochirus | Bluegill | 1 | 2 | 2 | | | | 1 | | 3 | | 4 | 13 |
| Lepomis megalotis | Longear sunfish | 2 | | | | | | | | | | | 2 |
| Micropterus dolomieu | Smallmouth bass | | | | 2 | | | | | | | | 2 |
| Micropterus punctulatus | Spotted bass | 1 | | 1 | 1 | | | | | 5 | | 1 | 9 |
| Pomoxis annularis | White crappie | | | 1 | | | | | | | | | 1 |
| | Hybrid bluegill | | 4 | 1 | | | | | | | | | 5 |
| Total Number of Species | | 11 | 8* | 10 | 16 | 9 | 5 | 4 | 9 | 14 | 0 | 7 | 30 |
| Total Number of Individua | ıls | 37 | 45 | 21 | 468 | 186 | 44 | 87 | 309 | 189 | 0 | 37 | 1,423 |

^{*} Does not include hybrid bluegill

The Shannon-Wiener Diversity Index (H') is a popular measure of heterogeneity and effective species number. This index is also used to measure habitat quality which may be degraded by human activities. Similar to the Simpson's index, this measurement takes into account species richness and the proportion of each species within the local aquatic community. The Shannon-Wiener Diversity Index ranges from 0.0 to approximately 4.6. A community with high species diversity would have many nearly equally abundant species present, resulting in a higher H' value. A value of 0.0 denotes that every organism in the sample is the same species, while a value of 4.6 indicates the number of individuals is evenly distributed among numerous species. It must be noted that mid-range H' values are not particularly descriptive and must be interpreted with care.

Based on the results of the diversity index, H' values for the ten streams that yielded fish (Orme Ditch was dry at the time of the survey and yielded no fish) range between 1.14 and 3.20, while the median H' value for these streams was 2.22 (Honey Creek). The fish community received H' values below the median in four of the eleven streams surveyed. These include North Bluff Creek, Crooked Creek, Bluff Creek, and Little Buck Creek. All other streams received H' values that were above the median.



Table 4. Shannon-Wiener Diversity Index (H') Results for Each Site

| Site | Stream | H' |
|------|------------------------|------|
| 1 | Indian Creek | 2.66 |
| 2 | W. Fork of Clear Creek | 2.65 |
| 3 | Clear Creek | 3.20 |
| 4 | Stott's Creek | 2.64 |
| 5 | Crooked Creek | 1.31 |
| 6 | Bluff Creek | 1.54 |
| 7 | North Bluff Creek | 1.14 |
| 8 | Honey Creek | 2.21 |
| 9 | Pleasant Run Creek | 2.58 |
| 10 | Orme Ditch | |
| 11 | Little Buck Creek | 1.99 |
| | Median H' Value | 2.22 |

Table 5 lists the fish taken from the maps found in Gerking (1945). Site 400 is Indian Creek, Site 401 is the West Fork of the White River, Site 421 is Little Buck Creek, and Site 500 is a nameless creek located five miles north of Martinsville in Morgan County, Indiana. Twenty six species are listed of which 17 were found in this study (highlighted in yellow). In total, twenty nine species were collected by JFNew.

Table 5. List of Fishes Taken from the Maps in Gerking (1945)

| Scientific Name | Common Name | Site | | | | | | |
|-------------------------------|---|------|-----|-----|-----|--|--|--|
| Scientific Name | Common Name | 400 | 401 | 421 | 500 | | | |
| Cyprinidae | Minnow Family | | | | | | | |
| Campostoma anomalum (2) | Central stoneroller | Χ | Х | Х | Х | | | |
| Cyprinella spiloptera | Spotfin shiner | Χ | Х | Х | Х | | | |
| Cyprinella whipplei | Steelcolor shiner | Χ | Х | | | | | |
| Hybognathus nuchalis | Western silvery minnow | Χ | | | | | | |
| Lythrurus umbratilis | Redfin shiner | Χ | Х | Х | | | | |
| Notropis buccatus (2) | Silverjaw minnow | | Х | Х | | | | |
| Notorpis cornutus | Common shiner | Х | Х | Х | Х | | | |
| Notropis stramineus | Sand shiner | Χ | Х | Х | Х | | | |
| Notropis volucellus | Mimic shiner | Χ | | | | | | |
| Phenocobuis mirabilis | Suckermouth minnow | | Х | Х | | | | |
| Phoxinus erythrogaster | Southern redbelly dace | | Х | | | | | |
| Pimephales notatus (1, 2) | Bluntnose minnow | X | Х | Х | Х | | | |
| Pimephales vigilax | Bullhead minnow | Χ | Х | | | | | |
| Rhinichthys atratulus (1) | Blacknose dace | | Х | | | | | |
| Semolitus atromaculatus (1,2) | molitus atromaculatus (1,2) Creek chub | | Х | | | | | |
| Esocidae | Pike Family | | | | | | | |
| Esox americanus | Grass Pickerel | Х | | | | | | |



Table 5. List of Fishes Taken from the Maps in Gerking (1945) - Continued

| Scientific Name | Common Name | | S | ite | |
|---------------------------|-------------------------|-----|-----|-----|-----|
| Scientific Name | Common Name | 400 | 401 | 421 | 500 |
| Percidae | Perch Family | | | | |
| Etheostoma blennioides | Greenside darter | | | Х | |
| Etheostoma caeruleum | Rainbow darter | Χ | Х | Х | Х |
| Etheostoma nigrum (2) | Johnny darter | Χ | Х | | |
| Etheostoma spectabile (2) | Orangethroat darter | Χ | Х | Х | Х |
| Ictaluridae | Bullhead Catfish Family | | | | |
| Ictalurus punctatus | Channel catfish | | Х | | |
| Catostomidae | Sucker Family | | | | |
| Catostomus commersoni (1) | White sucker | | Х | Х | Х |
| Hypentelium nigricans | Northern hog sucker | | Х | Х | |
| Moxostoma erythrurum | Golden redhorse | | Х | | Х |
| Centrarchidae | Sunfish Family | | | | |
| Micropterus punctulatus | Spotted bass | Х | | | |
| Micropterus salmoides | Largemouth bass | | | Х | |
| Total Number of Species | | 16 | 20 | 14 | 9 |

⁽¹⁾⁻ Highly tolerant to a wide variety of environmental disturbances including water quality and habitat degradation (Simon and Dufour, 1997).

Eleven fish species found in 2004 and 2005 were not collected by Gerking in 1943. They are:

| -, - | • . | |
|------|---------------------------------|---|
| • | Carassius auratus (Goldfish) | Highly tolerant to a wide variety of environmental disturbances including water quality and habitat degradation (Simon and Dufour, 1997). |
| • | Cottus bairdi (Mottled sculpin) | Found in riffles and pools in spring branches and streams that receive much of their flow from springs (Pflieger, 1997). |
| • | Cyprinus carpio (Common carp) | Highly tolerant to a wide variety of environmental disturbances including water quality and habitat degradation (Simon and Dufour, 1997). |
| • | Gambusia affinis (Mosquitofish) | Backwaters and adjacent oxbows of warm, sluggish, lowland streams are |



favorite habitats (Pflieger, 1997).

⁽²⁾⁻ Indicator of temporarily unavailable or stressed habitats (Larimore and Smith, 1963; Smith, 1971).

- Lepomis cyanellus (Green sunfish)
- Lepomis macrochirus (Bluegill)
- Micropterus dolomieu (Smallmouth bass)
- Notropis atherinoides (Emerald shiner)
- Percina sciera (Dusky darter)
- Pimephales promelas (Fathead minnow)
- Pomoxis annularis (White crappie)
- Hybrid bluegill

Highly tolerant to a wide variety of environmental disturbances including water quality and habitat degradation (Simon and Dufour, 1997) and are an indicator of temporarily unavailable or stressed habitats (Larimore and Smith, 1963; Smith, 1971).

Occurs in deeper pools and backwaters of streams (Pflieger, 1997). Occurs in clear, gravelly, or rocky rivers that have moderate to fast current and remain relatively cool during the summer months (Smith, 1979).

Typically a large river minnow and occurs only in streams near their mouths (Smith, 1979).

Occupies deep raceways and riffles over a predominately gravel bottom in medium to large sized rivers (Smith, 1979).

Highly tolerant to a wide variety of environmental disturbances including water quality and habitat degradation (Simon and Dufour, 1997).

Most abundant in well-vegetated lakes and large rivers (Smith, 1979).

Crayfish Results

Only one species of crayfish, Northern Crayfish (*Orconectes virilis*), was collected from eight of the eleven sites during the survey (Table 5). No crayfish were collected at Site 6, 7, or 10 during the survey. Additionally, no adult male (Form 1) crayfish were collected at Sites 1, 4, or 9. As adult males are required for positive identification, females that were collected from these sites were released after general inspection. However, given the fact that *O. virilis* were so prevalent at the other sites, the female crayfish released were likely *O. virilis*. *Orconectes virilis* are not considered endangered, threatened, or rare within Indiana and their populations are listed as currently stable (Crandall and Fetzner, 2004).



Table 6. Crayfish Survey Results

| | | | | | Male | | Fe | male |
|------|------------------------|----------|--------------------|-------------------|--------|----------|--------|----------|
| Site | Stream | Date | Species Name | Common Name | Mature | Immature | Mature | Immature |
| 1 | Indian Creek | 5/3/2005 | Orconectes virilis | Northern crayfish | 0 | 3 | 0 | 1 |
| 2 | W. Fork of Clear Creek | 9/2/2004 | Orconectes virilis | Northern crayfish | 4 | 6 | 0 | 0 |
| 3 | Clear Creek | 9/2/2004 | Orconectes virilis | Northern crayfish | 2 | 0 | 1 | 2 |
| 4 | Stott's Creek | 9/2/2004 | Orconectes virilis | Northern crayfish | 0 | 3 | 3 | 4 |
| 5 | Crooked Creek | 9/3/2004 | Orconectes virilis | Northern crayfish | 1 | 9 | 0 | 0 |
| 6 | Bluff Creek | 9/3/2004 | None Collected | | | | | |
| 7 | North Bluff Creek | 9/3/2004 | None Collected | | | | | |
| 8 | Honey Creek | 9/3/2004 | Orconectes virilis | Northern crayfish | 3 | 7 | 0 | 0 |
| 9 | Pleasant Run Creek | 9/3/2004 | Orconectes virilis | Northern crayfish | 0 | 8 | 0 | 0 |
| 10 | Orme Ditch | 9/3/2004 | None Collected | | | | | |
| 11 | Little Buck Creek | 9/2/2004 | Orconectes virilis | Northern crayfish | 2 | 2 | 0 | 4 |
| | • | • | • | SURVEY TOTALS | 12 | 38 | 4 | 11 |

Stream Habitat Results

The QHEI is used to evaluate the characteristics of a stream segment, as opposed to the characteristics of a single sampling site. As such, individual sites may have poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. The IDEM indicates that QHEI scores above 64 suggest that the habitat is capable of supporting a balanced warmwater community; streams with scores between 51 and 64 suggest these streams are partially supportive of a stream's aquatic life use designation. Streams that score less than 51 suggest they are non-supporting of their aquatic life use designation (IDEM, 2000).

Table 6 contains the results for the qualitative habitat survey. Copies of the QHEI field datasheets can be found in Appendix B. Only two of the survey sites (Sites 5 and 8) were considered capable of supporting balanced warmwater fish communities. Sites 6, 7, and 10 had QHEI scores less than 51 and are considered non-supporting of their aquatic life use designation. Five sites (Sites 1, 2, 3, 4, 9, and 11) were considered partially supportive of their aquatic life use designation.

Each of the study streams had substrates that were primarily composed of sand within the survey reach. Indian Creek (Site 1), Crooked Creek (Site 5), Bluff Creek (Site 6), and Little Buck Creek (Site 11) had minor components of gravel substrate. Bluff Creek (Site 6), North Bluff Creek (Site 7), and Orme Ditch (Site 10) lacked pool development. Riffle development was poor to fair for all study streams due to shifting sand substrates. The poor riffle/run/pool development in these streams is likely due to past channelization events and watershed development. Each of the eleven streams surveyed showed signs of historical channelization activity (spoil piles, low to moderate channel sinuosity, etc.).



Table 7. Habitat Survey Results

| Site Number | Stream | Substrate Score | Cover Score | Channel Score | Riparian Score | Pool Score | Riffle Score | Gradient Score | Total Score |
|----------------|------------------------|--------------------|----------------|------------------|-------------------|---------------|-----------------|-------------------|----------------|
| | Maximum Possible Score | 20 | 20 | 20 | 10 | 12 | 8 | 10 | 100 |
| 1 | Indian Creek | 15 | 13 | 12 | 5 | 8 | 2 | 6 | 61 |
| 2 | W. Fork of Clear Creek | 13 | 10 | 9 | 9 | 4 | 0 | 8 | 53 |
| 3 | Clear Creek | 14 | 11 | 11 | 7 | 7 | 3 | 8 | 61 |
| 4 | Stott's Creek | 12 | 11 | 12 | 8 | 8 | 2 | 6 | 59 |
| 5 | Crooked Creek | 14 | 13 | 13 | 4 | 9 | 5 | 10 | 68 |
| 6 | Bluff Creek | 13 | 10 | 8 | 5 | 0 | 2 | 8 | 46 |
| 7 | North Bluff Creek | 13 | 10 | 7 | 5 | 0 | 3 | 8 | 46 |
| 8 | Honey Creek | 14 | 10 | 11 | 8 | 9 | 3 | 10 | 65 |
| 9 | Pleasant Run Creek | 14 | 11 | 9 | 9 | 4 | 3 | 10 | 60 |
| 10 | Orme Ditch | 13 | 5 | 7 | 6 | 0 | 0 | 8 | 39 |
| 11 | Little Buck Creek | 14 | 13 | 11 | 4 | 7 | 1 | 10 | 60 |

3.0 MUSSEL SURVEYS

A survey for endangered, threatened, and rare unionid mussels was completed for ten tributaries to the West Fork of the White River along the proposed I-69 extension corridor. In cooperation with JFNew, two biologists from Commonwealth Biomonitoring, Inc. performed the mussel surveys on August 16 and 17, 2004. They were Melody Myers-Kinzie (primary federal and state permit holder) and Greg Bright (Director of Commonwealth Biomonitoring, Inc.).

3.1 *Methodology*

Ten sites (excludes Orme Ditch) in Morgan, Johnson, and Marion Counties (Table 1) were surveyed for mussels. These sites are tributary streams of the West Fork of the White River and no previous mussel survey data was available for them.

At each site, a 2,000-foot length of stream was examined for mussels using visual and tactile searching. Living mussels and shells of dead individuals were collected by hand from the survey areas. Those collected were identified and counted and living mussels were returned immediately to their original habitat. Shells were classified as either fresh dead, weathered dead, or sub-fossil. Fresh dead shells are those with the periostracum (outer shell covering) largely intact; weathered dead have partially intact periostracum; and sub-fossil shells are chalky.

3.2 Survey Results

Only live mussels or fresh dead shells are considered evidence that a mussel population exists at a given site. Weathered dead or sub-fossil shells indicate that mussels were formerly present somewhere in a stream, possibly far upstream from where they are currently found.



No live mussels or fresh dead shells were identified during the survey effort. However, at Sites 2, 4, and 11 (Table 6), weathered dead or sub-fossil shells were present. Pleasant Run Creek (Site 9) contained only long-dead unionid fragments that were impossible to identify to species. All species identified are common to small streams in Indiana. Note that at the time of the surveys, Orme Ditch was totally dry and two other streams, Little Buck Creek and Crooked Creek, were partially dry.

Table 8. Mussel Survey Results

| Site Number | Stream | Species | Condition |
|-------------|------------------------|----------------------------|----------------|
| 1 | Indian Creek | No Captures | |
| 2 | W. Fork of Clear Creek | Lampsilis siliquoidea | Weathered dead |
| 2 | W. FUIK OF Clear Creek | Anodontoides ferussacianus | Weathered dead |
| 3 | Clear Creek | No Captures | |
| 4 | Stott's Creek | Pyganodon grandis | Weathered dead |
| 5 | Crooked Creek | No Captures | |
| 6 | Bluff Creek | No Captures | |
| 7 | North Bluff Creek | No Captures | |
| 8 | Honey Creek | No Captures | |
| 9 | Pleasant Run Creek | Unknown | Fragment |
| 10 | Orme Ditch | No Captures | |
| 11 | Little Buck Creek | Pyganodon grandis | Sub-fossil |

4.0 SUMMARY AND CONCLUSIONS

Based on the results of the electrofishing surveys and Shannon-Wiener Diversity Index calculations, the ten streams (excludes Orme Ditch) possess a moderate level of diversity and thus are now typical of many central Indiana waterbodies. There has been an apparent loss in fish diversity from these streams since Gerking's field studies. Stream habitat analysis indicates that this loss in diversity can be partially attributed to habitat degradation through historical stream channel modification and watershed development. Nine of the 30 fish species (12% of individuals) collected are categorized as tolerant to a wide variety of environmental disturbances including water quality and habitat degradation or temporarily unavailable or stressed habitats. Seventeen species (87% of individuals collected) are considered moderately tolerant, and two species (1% of individuals collected) are considered intolerant to a wide variety of environmental disturbances including water quality and habitat degradation (Barbour et al, 1999).

No endangered, threatened, rare, or special concern fish, crayfish, or mussel species were identified within the eleven streams during the field survey efforts. Considering the prevalence of tolerant and moderately tolerant aquatic species currently found in these streams, it is the opinion of JFNew that the proposed extension of I-69 along the existing SR 37 corridor will not significantly impact existing fish, crayfish, or unionid mussel populations.



5.0 REFERENCES

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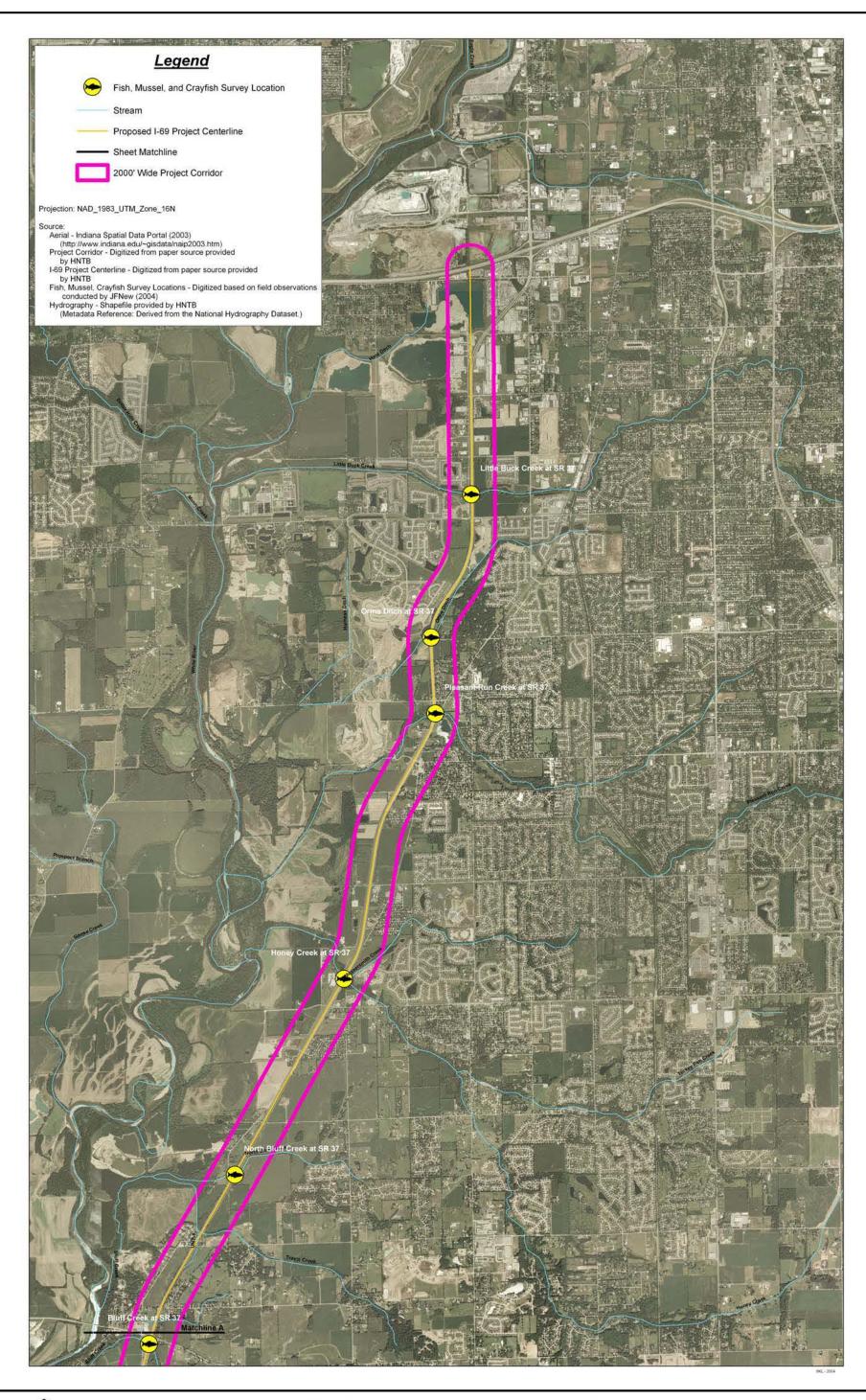
Smith, P.W. 1979. The Fish of Illinois. University of Illinois Press: Champaign, Illinois.



FIGURES

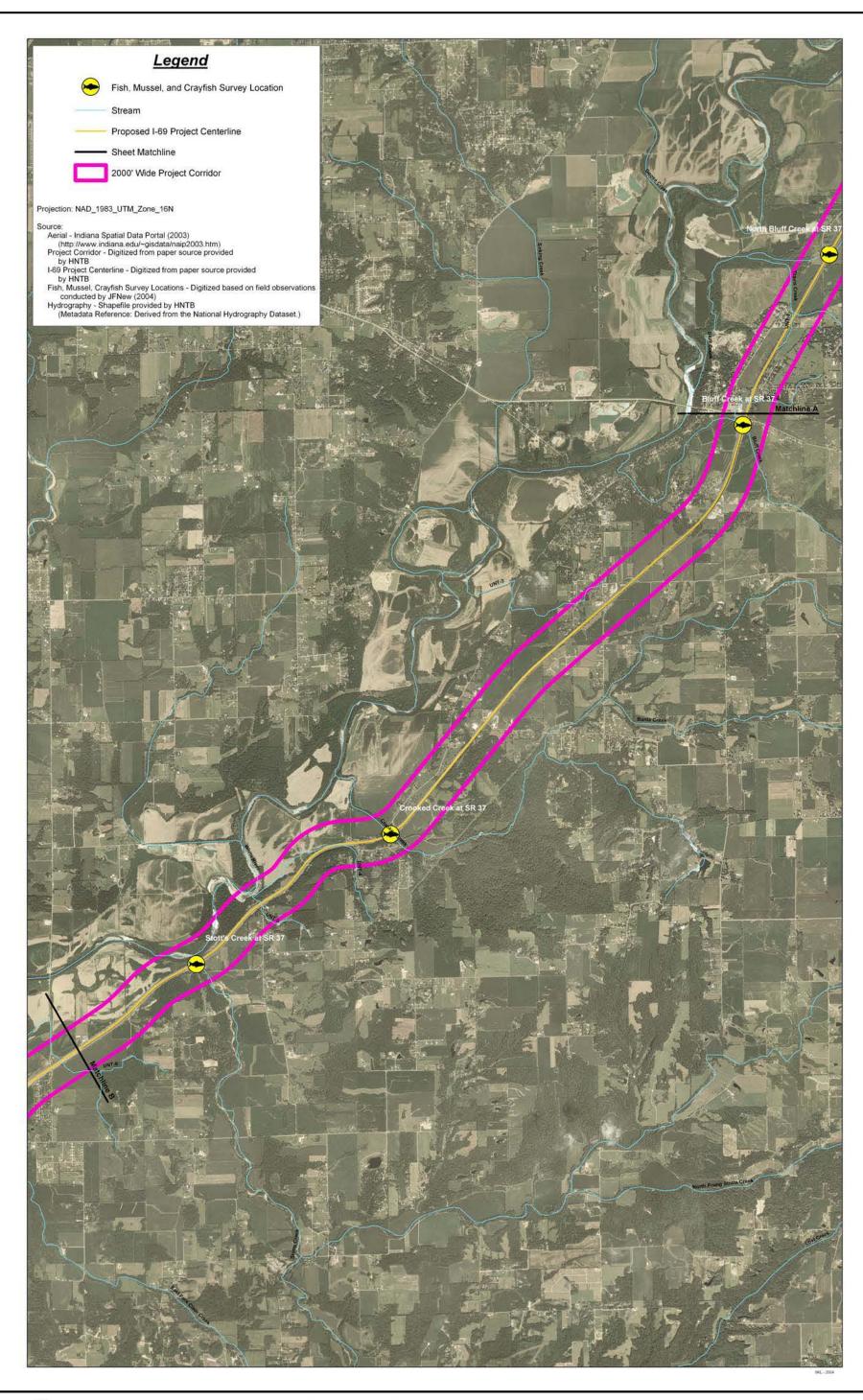
FINAL FISH, MUSSEL, AND CRAYFISH SURVEY REPORT I-69 EVANSVILLE TO INDIANAPOLIS SECTION 6
MORGAN, JOHNSON, AND MARION COUNTIES, INDIANA





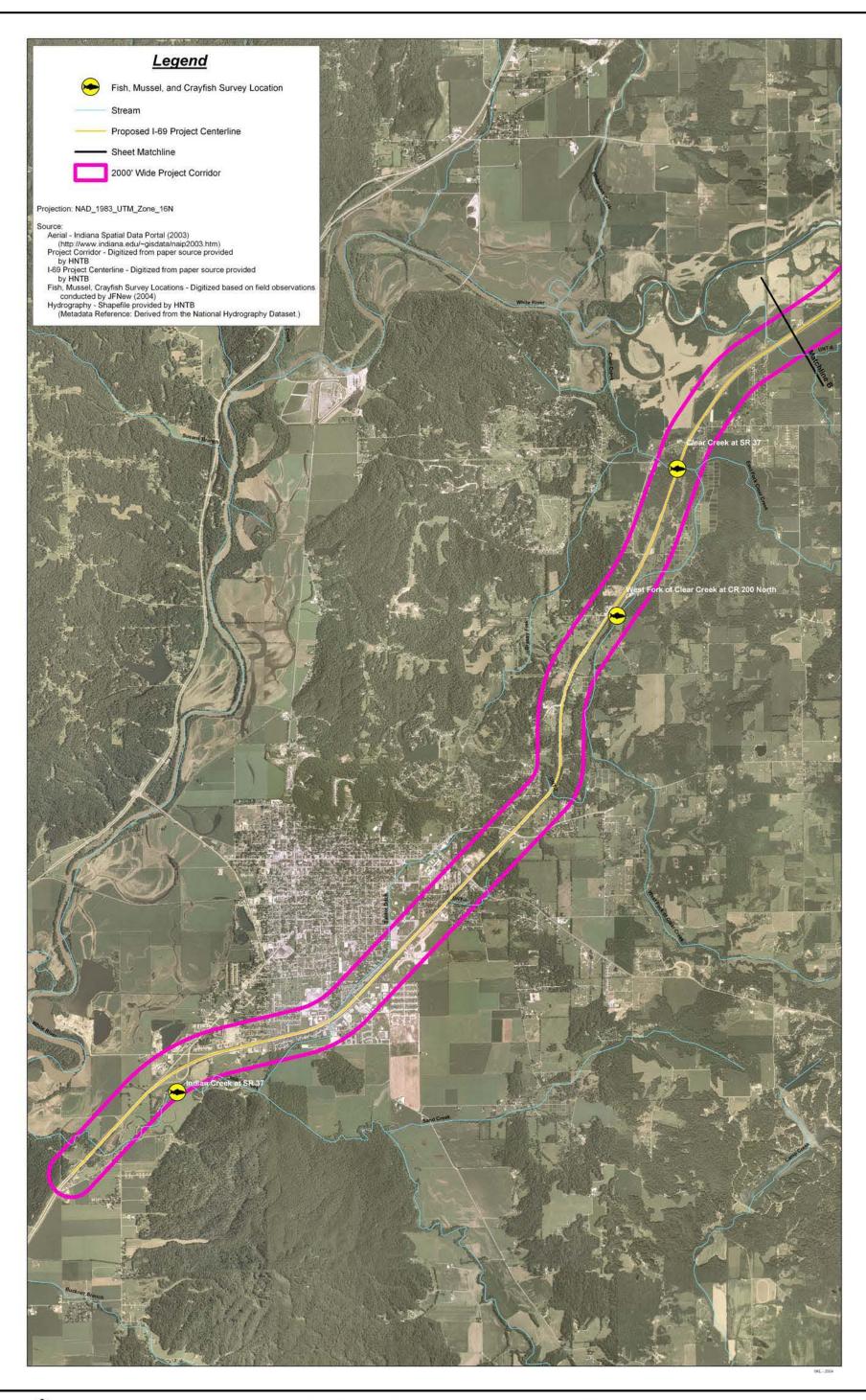
















APPENDIX A

FISH SURVEY DATA SHEETS

FINAL FISH, MUSSEL, AND CRAYFISH SURVEY REPORT I-69 EVANSVILLE TO INDIANAPOLIS
SECTION 6
MORGAN, JOHNSON, AND MARION COUNTIES, INDIANA



J.F. New Fishery Survey

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J.F. New & Associates, Inc Aquatics Unit

FISH NUMBER AND LENGTH FIELD DATA SHEET

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PROJECT # 02-09-37 STREAM/LOCATION Site

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Clear Creek

J.F. New & Associates, Inc Aquatics Unit

Associates, Inc STREAM/LOCATION 5

PROJECT # 02-09-3

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Stotts Creek PROJECT # 02-09-33

J.F. New & Associates, Inc Aquatics Unit

STREAM/LOCATION Site

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J.F. New & Associates, Inc

Aquatics Unit FISH NUMBER AND LENGTH FIELD DATA SHEET

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Crooked Creek

J.F. New & Associates, Inc Aquatics Unit STREAM/LOCATION Site 4

_PROJECT # <u>02-09-3</u>3

FISH NUMBER AND LENGTH FIFLD DATA SHEET

DATE: 9/3/04 RUN 1 of | TIME: 306 (min:sec)

FIELD DATA SHEET release 30 crayfuh METHOD: Backpack LENGTH: 225 (ft) Central rainboro Johnny Species Stoneroller Number Length Number Length Number Length Number Length Length Number HT 1 63,50(a) HT HT 51,47 44,48 38, 37 HHH HIT HIT 57,32 28 H HHHT HTH HT HT HT HT HI HI THE THE HT HT IHT HIT HI HT LHT AHT HTH suckermouth Silverious bluntnose Northern has sucker MINNOW 32,60 111 50,27 52 52

Bluff Creek

J.F. New & Associates, Inc Aquatics Unit STREAM/LOCATION Site 5

PROJECT # <u>02-09-33</u>

FISH NUMBER AND LENGTH FIELD DATA SHEET

DATE: 9/3/04 RUN of TIME: 14/5 (min:sec)

METHOD: Buckpack LENGTH: 150 (ft) Central Species Stonerallet
Number Leng Rainbou Duto Number Length Number Length Creekchub Length Number Length Number Length HT 11 48 33-75 141 111

North Bluff Creek

J.F. New & Associates, Inc Aquatics Unit

FISH NUMBER AND LENGTH FIELD DATA SHEET

STREAM/LOCATION Side 6 PROJECT # 02-09-33

DATE: 9/3/04 RUN _ of _ TIME: _______ (min; sec)

METHOD: Reck pack LENGTH: 150 (ft)

| Species | + HAMA | throat to dart | _ck_dn | 80 | - 5/10/12-1 | -440 | mosquita | fish | bluegill | |
|---------|----------|--|--------|-----------|------------------------|----------|------------|--------|----------|--------|
| | Number | Length | Number | Length | Number | Length | Number | Length | Number | Length |
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Honey Creek

J.F. New & Associates, Inc Aquatics Unit

FISH NUMBER AND LENGTH FIELD DATA SHEET

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| STREAM/LOCATION_ | \$ Site 7 | PROJE | CT # 62-09- |
| | | | |

| DATE: 9/3/04 RUN | of/_ | TIME: 936 | (min:sec) |
|------------------|------|-----------|-----------|
|------------------|------|-----------|-----------|

METHOD: backpack LENGTH: 300 (ft) Species Sculpin orage throat Central stone roller white sucker CK chab Number Length Number Length Number Length Number Length Number Length JH 111 63 THETHE HT/15 1/2 /22 JH JH 18 JH JH HH HH MH 出出 IM IM HT HT 14 41 HTH ### HT IH IHT HI UT 1111 HI HH Johnny darter minioqu danter Nthn hogo or sucker spot-fin shiner 42 AZ 135 80 (A.49 87 37 42

Pleasant Run Greek

J.F. New & Associates, Inc Aquatics Unit

FISH NUMBER AND LENGTH FIELD DATA SHEET

| STREAM/LOCATION | Site 8 | PROJECT # | 02-09-3 |
|-----------------|--------|-----------|---------|
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| DATE: 9/3/04 | RUN | (()1 | TIME: | 971 (1 | minsed |
|--------------|-----|--------|-------|--------|--------|
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METHOD: backpack LENGTH: 600 (ft) N. hogsucker stone tollers . Species ck chub bluegill spotted bass Number Length Number Number Length Length Number Length Number Length HH H 275 HILL 140, 45 75,45 60 81,95 HI IH 90,35 HT HHT 102,52 78,65 240, 144 157 140 HHH JH HI ### IN HH HT JHT 144 white sucker Blacknose dace org throat darter spot-fin shirver 45,58 HHLHI 48,40 63 160 111

Pleasant Run Creek OWT Wed STREAM/LOCATION Site 8 PROJECT # 02-69-33

J.F. New & Associates, Inc Aquatics Unit

FISH NUMBER AND LENGTH FIELD DATA SHEET

DATE: 9/3/64 RUN of TIME: 971 (min: sec)

METHOD: backgack LENGTH: 600 (ft)

Species green sunfish suckermouth minnow johny donter common carp Number Length Number Length Number Number Length Length Number Length 18 JH HI 42,42 246

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J.F. New & Associates, Inc Aquatics Unit FISH NUMBER AND LENGTH

| STREAM/LOCATION_ | Site 9 | _PROJECT # <u>02-09</u> -33 |
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| DATE: 9 3 04 RUN_ | of TIME: | (min:sec) |
| METHOD backback | L ENGTH. | , constitutional |

| | FIELD I | DATA SH | EET . | M | ETHOD: | backpac | | LEN | GTH: | | (ft) | |
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J.F. New & Associates, Inc Aquatics Unit

FIELD DATA SHEET

FISH NUMBER AND LENGTH

DATE: 9/2/04 RUN of 1 TIME: 987 (min:sec)

METHOD: Backpack LENGTH: 450 (ft)

| Species | Creek | Chub | Blues | ill | | Cestral- | Stonesalle | ام. و | Northein | Horackel | , | Geen | D.L |
|---------|---------|-----------|----------------|-----------------|---|---------------------------------------|-----------------------------|-------|----------|----------|---|----------|--------|
| | Number | Length | Blue Number | Length | | Number | <u>Stonesolle</u> Length | - | Number | Length | | Number | Length |
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APPENDIX B

QHEI DATA SHEETS

FINAL FISH, MUSSEL, AND CRAYFISH SURVEY REPORT I-69 EVANSVILLE TO INDIANAPOLIS SECTION 6
MORGAN, JOHNSON, AND MARION COUNTIES, INDIANA



| STREAM: Indian Cleek RIVER MILE Low Gap Rd. DATE: 5/3/05 QHEI SCORE 6 | |
|--|-------------|
| 1) SUBSTRATE: (Check ONLY Two Substrate Type Boxes: Check all types present) TYPE POOL RIFFLE SUBSTRATE ORIGIN (all) SILT COVER (one) SILT-HEAVY(-2) SILT-H | _ |
| 2) INSTREAM COVER: TYPE (Check all that apply) UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) COMMENTS: COVER SCORE AMOUNT (Check only one or Check 2 and AVERAGE) OXBOWS(1) AQUATIC MACROPHYTES(1) LOGS OR WOODY DEBRIS(1) SPARSE 5-25%(3) NEARLY ABSENT <5%(1) | <u>></u> |
| 3) CHANNEL MORPHOLOGY: (Check ONLY ONE per Category or Check 2 and AVERAGE) SINUOSITY DEVELOPMENT CHANNELIZATION STABILITY MODIFICATION/OTHER MODIFICATION/OTHER MODIFICATION/OTHER SNAGGING IMPOUND RECOVERED(4) LOW(2) FAIR(3) POOR(1) RECENT OR NO RECOVERY(1) COMMENTS: | <u> </u> |
| 4) RIPARIAN ZONE AND BANK EROSION: (Check ONE box or Check 2 and AVERAGE per bank) River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) L R (most predominant per bank) WIDE > 150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: RIPARIAN SCORE R | <u></u> |
| 5) POOL/GLIDE AND RIFFLE/RUN QUALITY MAX.DEPTH (Check 1) MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH>RIFFLE WIDTH(1) 1.2-2.4 ft.(2) POOL WIDTH>RIFFLE WIDTH(0) POOL WIDTH>RIFFLE WIDTH(0) POOL WIDTH>RIFFLE WIDTH(0) MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH>RIFFLE WIDTH(1) POOL WIDTH>RIFFLE WIDTH(0) MODERATE(1) INTERMITTENT(-2) SLOW(1) COMMENTS: | |
| | |
| RIFFLE SCORE GENERALLY >4 in. MAX.>20 in.(4) GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | |

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|---|--|---|--|
| STREAM: JENHIG W.FKCL | CA RIVER MILE | DATE: 12/14/04 | QHEI SCORE 53 |
| 1) SUBSTRATE: (Check ONLY Two Substance of Substrate Types | GRAVEL(7) SAND(6) BEDROCK(5) DETRITUS(3) ARTIFIC(0) 2) POOL RIFFLE | SUBSTRATE ORIGIN (all) LIMESTONE(1) RIP/RAP(0) SILT TILLS(1) HARDPAN(0) SILT SANDSTONE(0) Extent (| SUBSTRATE SCORE 33 SILT COVER (one) T-HEAVY(-2) SILT-MOD(-1) T-NORM(0) SILT-FREE(1) Of Embeddedness (check one) ENSIVE(-2) MODERATE(-1) V(0) NONE(1) |
| OVERHANGING VEGETATION(1) | all that apply) EP POOLS(2) OXBOWS(1) OTWADS(1) AQUATIC MACROF JLDERS(1) LOGS OR WOODY | PHYTES(1) DEBRIS(1) EXT: MOD SPA: | COVER SCORE () one or Check 2 and AVERAGE) ENSIVE >75%(11) DERATE 25-75%(7) RSE 5-25%(3) RLY ABSENT <5%(1) |
| 3) CHANNEL MORPHOLOGY: (Check ON SINUOSITY DEVELOPMENT HIGH(4) EXCELLENT(7) GOOD(5) LOW(2) FAIR(3) NONE(1) POOR(1) COMMENTS: | ILY ONE per Category or Check 2 a CHANNELIZATION NONE(6) RECOVERED(4) RECOVERING(3) RECENT OR NO RECOVERY(1) | STABILITY HIGH(3) MODIFICATION SNAGGING RELOCATION CANOPY REMO DREDGING | IMPOUND ISLAND |
| L R (per bank) | ROSION/RUNOFF-FLOODPLAIN R (most predominant per bank) FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | QUALITY | RIPARIAN SCORE 9 BANK EROSION 9.25 L R (per bank) NONE OR LITTLE(3) MODERATE(2) HEAVY OR SEVERE(1) |
| >4 ft.(6) POC 2.4-4 ft.(4) POC | PHOLOGY (Check 1) DE WIDTH>RIFFLE WIDTH(2) DE WIDTH=RIFFLE WIDTH(1) DE WIDTH <riffle td="" width(0)<=""><td>POOL/RUN/RIFFLE CURRENT \ TORRENTIAL(-1) EDDI FAST(1) INTE</td><td>POOL SCORE 4 /ELOCITY (Check all that Apply) ES(1) RSTITIAL(-1) RMITTENT(-2)</td></riffle> | POOL/RUN/RIFFLE CURRENT \ TORRENTIAL(-1) EDDI FAST(1) INTE | POOL SCORE 4 /ELOCITY (Check all that Apply) ES(1) RSTITIAL(-1) RMITTENT(-2) |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4)* GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) UNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | MODERATE(0) LOW(1) | NONE(2) NO RIFFLE(0) |
| 6) GRADIENT (FEET/MILE): 18 | % POOL | FFLE <u>90</u> % RUN <u>90</u> | GRADIENT SCORE |

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|--|---|
| STREAM: JFN# 18 Class GeekRIVER MILE | DATE: 12/14/04 QHEI SCORE 60.3 |
| 1) SUBSTRATE: (Check ONLY Two Substrate Type Boxes: Check all types p TYPE POOL RIFFLE POOL RIFFLE BLDER/SLAB(10) GRAVEL(7) X BOULDER(9) SAND(6) | SUBSTRATE ORIGIN (all) LIMESTONE(1) RIP/RAP(0) SILT COVER (one) SILT-HEAVY(-2) SILT-MOD(-1) |
| BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: NOTE: (Ignore sludge that originates from point sources: score is based on natural substrates) | X TILLS(1) HARDPAN(0) |
| COMMENTS: | |
| 2) INSTREAM COVER: TYPE (Check all that apply) UNDERCUT BANKS(1) DEEP POOLS(2) OXBOWS(1) | COVER SCORE AMOUNT (Check only one or Check 2 and AVERAGE) EXTENSIVE >75%(11) |
| OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) BOULDERS(1) AQUATIC MACROPH BOULDERS(1) LOGS OR WOODY D | |
| COMMENTS: | |
| 3) CHANNEL MORPHOLOGY: (Check ONLY ONE per Category or Check 2 ar SINUOSITY DEVELOPMENT CHANNELIZATION SINUOSITY DEVELOPMENT CHANNELIZATION SINUOSITY DEVELOPMENT CHANNELIZATION SINUOSITY DEVELOPMENT CHANNELIZATION SINUOSITY DEVELOPMENT CHANNELIZATION SINUOSITY NONE(8) RECOVERED(4) RECOVERED(4) RECOVERED(3) RECOVERING(3) RECENT OR NO RECOVERY(1) | TABILITY HIGH(3) MODIFICATION/OTHER HIGH(3) MODERATE(2) LOW(1) CANOPY REMOVAL DREDGING CHANNEL SCORE IMPOUND ISLAND LEVEED BANK SHAPING |
| COMMENTS: | ONE SIDE CHANNEL MODIFICATION |
| 4) RIPARIAN ZONE AND BANK EROSION: (Check ONE box or Check 2 and A River Right Looking Downstream RIPARIAN WIDTH (per hank) L R (per bank) WIDE > 150 ft.(4) MODERATE 30-150 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | RIPARIAN SCORE 6.5 |
| 5) POOL/GLIDE AND RIFFLE/RUN QUALITY MAX.DEPTH (Check 1) A ft.(6) 2.4-4 ft.(4) MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH=RIFFLE WIDTH(1) | POOL SCORE 7 POOL/RUN/RIFFLE CURRENT VELOCITY (Check all that Apply) TORRENTIAL(-1) FAST(1) POOL SCORE 7 EDDIES(1) INTERSTITIAL(-1) |
| 1.2-2.4 ft.(2) POOL WIDTH <riffle <0.6="" <1.2="" comments:<="" ft.(1)="" ft.(pool="0)(0)" td="" width(0)=""><td>MODERATE(1) INTERMITTENT(-2) SLOW(1)</td></riffle> | MODERATE(1) INTERMITTENT(-2) SLOW(1) |
| | RIFFLE SCORE 3 |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4) GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN EMBEDDEDNESS EXTENSIVE(-1) X NONE(2) MODERATE(0) NO RIFFLE(0) LOW(1) |
| 6) GRADIENT (FEET/MILE): 18 % POOL 15 % RIFE | FLE 15 % RUN 70 GRADIENT SCORE 8 |

| STREAM: JFN # 16 Statis Ct. RIVER MILE DATE: 12/14/04 JE QHEI SCORE 59 |
|---|
| 1) SUBSTRATE: (Check ONLY Two Substrate Type Boxes: Check all types present) SUBSTRATE SCORE TYPE POOL RIFFLE POOL RIFFLE POOL RIFFLE SUBSTRATE ORIGIN (all) SILT COVER (one) SILT-HEAVY(-2) SILT-MOD(-1) SAND(6) SILT-HEAVY(-2) SILT-MOD(-1) SANDSTONE(0) Extent of Embeddedness (check one) HARDPAN(4) MUCK/SILT(2) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: >4(2) >4(0) NOTE: (Ignore sludge that originates from point sources: score is based on natural substrates) COMMENTS: |
| 2) INSTREAM COVER: TYPE (Check all that apply) UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) COMMENTS: COVER SCORE AMOUNT (Check only one or Check 2 and AVERAGE) EXTENSIVE >75%(11) AQUATIC MACROPHYTES(1) LOGS OR WOODY DEBRIS(1) SPARSE 5-25%(3) NEARLY ABSENT <5%(1) |
| 3) CHANNEL MORPHOLOGY: (Check ONLY ONE per Category or Check 2 and AVERAGE). SINUOSITY DEVELOPMENT CHANNELIZATION STABILITY MODIFICATION/OTHER MODIFICATION/OTHER SNAGGING IMPOUND MODERATE(3) SOOD(5) RECOVERED(4) LOW(2) NONE(1) POOR(1) RECENT OR NO RECOVERY(1) CHANNEL SCORE AMODIFICATION/OTHER SNAGGING MODIFICATION/OTHER SNAGGING RELOCATION ISLAND LOW(1) CANOPY REMOVAL LEVEED DREDGING ONE SIDE CHANNEL MODIFICATION COMMENTS: |
| 4) RIPARIAN ZONE AND BANK EROSION: (Check ONE box or Check 2 and AVERAGE per bank) River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (most predominant per bank) WIDE > 150 ft.(4) WIDE > 150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: RIPARIAN SCORE BANK EROSION RIPARIAN SCORE WIPARIAN SCORE BANK EROSION RIPARIAN SCORE COMMENTS: |
| 5) POOL/GLIDE AND RIFFLE/RUN QUALITY MAX_DEPTH (Check 1) A ft.(6) POOL WIDTH-RIFFLE WIDTH(2) POOL WIDTH-RIFFLE WIDTH(1) 1.2-2.4 ft.(2) POOL WIDTH-RIFFLE WIDTH(0) POOL WIDTH-RIFFLE WIDTH(0) POOL WIDTH-RIFFLE WIDTH(0) FAST(1) MODERATE(1) MODERATE(1) SLOW(1) POOL SCORE S POOL/RUN/RIFFLE CURRENT VELOCITY (Check all that Apply) FAST(1) INTERMITTENT(-2) SLOW(1) |
| RIFFLE SCORE 2 RIFFLE/RUN DEPTH RIFFLE/RUN SUBSTRATE GENERALLY >4 in. MAX.>20 in.(4)' GENERALLY >4 in. MAX.<20 in.(3) MOD.STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) GENERALLY 2-4 in.(1) GENERALLY 2-2 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: |

COMMENTS:

6) GRADIENT (FEET/MILE): 37 % POOL 20 % RIFFLE 20 % RUN 60 GRADIENT SCORE 6

GRADIENT (FEET/MILE): 37 % POOL 20 % RIFFLE 20 % RUN 60 GRADIENT SCORE 6

GRADIENT (FEET/MILE): 37 % POOL 20 % RIFFLE 20 % RUN 60 GRADIENT SCORE 6

GRADIENT (FEET/MILE): 37 % POOL 20 % RIFFLE 20 % RUN 60 GRADIENT SCORE 6

GRADIENT (FEET/MILE): 37 % POOL 20 % RIFFLE 20 % RUN 60 GRADIENT SCORE 6

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| STREAM: JFNAD CIOO | tel creek RIVER MILE | DATE: 12/15 | 3/04 SE QHEI SCORE 68 |
|--|---|---|---|
| BLDER/SLAB(10) BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES | GRAVEL(7) SAND(6) BEDROCK(5) DETRITUS(3) ARTIFIC(0) | , | SUBSTRATE SCORE |
| 2) INSTREAM COVER: TYPE UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) COMMENTS: | PE (Check ail that apply) DEEP POOLS(2) ROOTWADS(1) BOULDERS(1) OXBOWS(1) AQUATIC MACRO BOULDERS(1) LOGS OR WOOD | DPHYTES(1) | COVER SCORE neck only one or Check 2 and AVERAGE) EXTENSIVE >75%(11) MODERATE 25-75%(7) SPARSE 5-25%(3) NEARLY ABSENT <5%(1) |
| 3) CHANNEL MORPHOLOGY: (SINUOSITY DEVELOP: HIGH(4) EXCELLER MODERATE(3) COOD(5) LOW(2) FAIR(3) NONE(1) POOR(1) COMMENTS: | | STABILITY HIGH(3) MODIF MODERATE(2) LOW(1) MODIF RELC CANC DREI | CHANNEL SCORE 3 ICATION/OTHER GGING IMPOUND DCATION ISLAND DPY REMOVAL LEVEED DGING BANK SHAPING SIDE CHANNEL MODIFICATION |
| 4) RIPARIAN ZONE AND BANK River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) WIDE > 150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | EROSION: (Check ONE box or Check 2 and EROSION/RUNOFF-FLOODPLAIN L R (most predominant per bank FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | QUALITY | MODERATE(2) HEAVY OR SEVERE(1) |
| 5) POOL/GLIDE AND RIFFLE/RI MAX.DEPTH (Check 1) >4 ft.(6) 2.4-4 ft.(4) 1.2-2.4 ft.(2) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) COMMENTS: | MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH=RIFFLE WIDTH(1) POOL WIDTH <riffle td="" width(0)<=""><td></td><td>POOL SCORE G RRENT VELOCITY (Check all that Apply) EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2)</td></riffle> | | POOL SCORE G RRENT VELOCITY (Check all that Apply) EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2) |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4) GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) UNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | EXTENSIVE(- MODERATE(0 LOW(1) |) NO RIFFLE(0) |
| 6) GRADIENT (FEET/MILE): | 13-2 % POOL 13 % R | IFFLE 35 % RUN _ | GRADIENT SCORE 10 |

| STREAM: | JEN#10 | Blaff | <u>Cs.</u> RIVI | ER MILE | DA | TE: 12/13 | lou JE | QHEI SCORE 45.5 |
|---|---|---|--|---|---|---|---|--|
| 1) SUBSTF | | Y Two Sub | bstrate Type Bo | xes: Check all type | • | re origin (ail) | | SSTRATE SCORE 13 |
| BLDE BOUL COBI | ER/SLAB(10) LDER(9) BLE(8) DPAN(4) K/SILT(2) ER OF SUBSTRATE TYPE sludge that originates fro | | GRAVEL(SAND(6) BEDROCK DETRITUS ARTIFIC(0) 4(2) 4(2) 4(0) es: score is based on | X(5) X(5) X(5) X(7) X(7) X(7) X(7) X(7) X(7) X(7) X(7 | LIMESTONE(1) TILLS(1) SANDSTONE(0 SHALE(-1) COAL FINES(-2 | RIP/RAP(0) HARDPAN(0) | SIL1 COV SILT-HEAVY(-2) SILT-NORM(0) Extent of Embedde EXTENSIVE(-2) LOW(0) | /ER (one) SILT-MOD(-1) SILT-FREE(1) edness (check one) MODERATE(-1) NONE(1) |
| UNDERCUT | FBANKS(1) SING VEGETATION(1) I (IN SLOW WATER)(1) | DI | k all that apply) EEP POOLS(2) OOTWADS(1) OULDERS(1) | OXBOWS(1) AQUATIC MACF LOGS OR WOO | | AMOUNT (CI | heck only one or Che EXTENSIVE >75%(MODERATE 25-75% SPARSE 5-25%(3) NEARLY ABSENT | (6(7) |
| 3) CHANNE SINUOSITY HIGH(4) MODERATE LOW(2) NONE(1) COMMENTS | DEVELO EXCELL GOOD(1 FAIR(3) POOR(1 | PMENT ENT(7) | CHANNELI NONE(6) RECOVER | ZATION ED(4) | 2 and AVERAGE). STABILITY HIGH(3) MODERATE(2) LOW(1) | MODIF SNA RELO CAN | C FICATION/OTHER GGING DCATION OPY REMOVAL DGING SIDE CHANNEL MODIFIC | HANNEL SCORE 7.5 IMPOUND ISLAND LEVEED BANK SHAPING ATION |
| River Right L RIPARIAN V L R (per WIDE MODE NARRO | Looking Downstrea VIDTH (per bank) Dank) >150 ft.(4) RATE 30-150 ft.(3) DW 15-30 ft.(2) NARROW 3-15 ft.(1) (0) | im ! | EROSION/RUN L R (most pre | OFF-FLOODPLAI edominant per ban WAMP(3) TURE/ROW CROP(0) RK,NEW FIELD(1) ASTURE(1) | k) L R (per urba X X Shru cons | , | BANK E | PARIAN SCORE 5 ROSION 5.25 (per bank) NONE OR LITTLE(3) MODERATE(2) HEAVY OR SEVERE(1) 2.25 |
| | IDE AND RIFFLE/I | RUN QUAL | | NO POOL eck 1) WIDTH(2) WIDTH(1) | POOL/R TORRI | ENTIAL(-1) 1) RATE(1) | RRENT VELOCITY (EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2) | POOL SCORE (C) |
| GENERALLY GENERALLY | >4 in. MAX.>20 in.(4) >4 in. MAX.<20 in.(3) 2-4 in.(1) <2 in.(Riffle=0)(0) | *************************************** | STABLE (e. | N SUBSTRATE g., Cobble,Boulder)(2) LE (e.g., Pea Gravel)(1) (Gravel, Sand)(0) | | RIFFLE/RUN EXTENSIVE(- MODERATE(0) LOW(1) | | RIFFLE SCORE 2 |
| 6) GRADIEN | T (FEET/MILE): | 20-3 | % POOL _ | <u>Ø</u> %1 | RIFFLE 30 | % RUN | 70 GRADIEN | T SCORE 8 |

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|) m | 0.5 | | And the second second |
|---|--|---|---|
| STREAM: JENHG N. | Bluff C. RIVER MILE | DATE: 12/13/04 | QHEI SCORE 45.5 |
| TYPE POOL RI BLDER/SLAB(10) BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: | wo Substrate Type Boxes: Check all types properties of the pool of | SUBSTRATE ORIGIN (all) LIMESTONE(1) RIP/RAP(0) TILLS(1) HARDPAN(0) SANDSTONE(0) Exte | SUBSTRATE SCORE SILT COVER (one) SILT-HEAVY(-2) SILT-NORM(0) SILT-FREE(1) nt of Embeddedness (check one) EXTENSIVE(-2) MODERATE(-1) NONE(1) |
| 2) INSTREAM COVER: | | | COVER SCORE 10 |
| UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) | C(Check all that apply) DEEP POOLS(2) ROOTWADS(1) BOULDERS(1) COMBOWS(1) AQUATIC MACROPY LOGS OR WOODY I | HYTES(1) DEBRIS(1) | inly one or Check 2 and AVERAGE) EXTENSIVE >75%(11) MODERATE 25-75%(7) SPARSE 5-25%(3) HEARLY ABSENT <5%(1) |
| COMMENTS: | | | |
| 3) CHANNEL MORPHOLOGY: (COMMENTS: | | STABILITY HIGH(3) MODIFICATI SNAGGING RELOCATIO CANOPY RE DREDGING | N IMPOUND ISLAND |
| 4) RIPARIAN ZONE AND BANK E River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) WIDE > 150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | EROSION: (Check ONE box or Check 2 and A EROSION/RUNOFF-FLOODPLAIN C L R (most predominant per bank) FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | | RIPARIAN SCORE 4. 5 BANK EROSION L R (per bank) NONE OR LITTLE(3) MODERATE(2) HEAVY OR SEVERE(1) |
| 5) POOL/GLIDE AND RIFFLE/RUI | N QUALITY NO POOL = 0 | | POOL SCORE |
| MAX.DEPTH (Check 1) >4 ft.(6) 2.4-4 ft.(4) 1.2-2.4 ft.(2) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) | MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(1) POOL WIDTH <riffle td="" width(0)<=""><td>POOL/RUN/RIFFLE CURREN TORRENTIAL(-1) FAST(1)</td><td>T VELOCITY (Check all that Apply) DDIES(1) ITERSTITIAL(-1) ITERMITTENT(-2)</td></riffle> | POOL/RUN/RIFFLE CURREN TORRENTIAL(-1) FAST(1) | T VELOCITY (Check all that Apply) DDIES(1) ITERSTITIAL(-1) ITERMITTENT(-2) |
| COMMENTS: | No Puols | | |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4) GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) VUNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | RIFFLE/RUN EMBE EXTENSIVE(-1) MODERATE(0) LOW(1) | RIFFLE SCORE 3 DDEDNESS NONE(2) NO RIFFLE(0) |
| | 8-2 % POOL O % RIF | FLE / 5 % RUN & 5 | GRADIENT SCORE 7 |

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| STREAM: JEWHS Honey CI RIVER MILE | DATE: 13/13/04 QHEI SCORE 64.5 |
|--|--|
| 1) SUBSTRATE: (Check ONLY Two Substrate Type Boxes: Check all types pro TYPE POOL RIFFLE POOL RIFFLE BLDER/SLAB(10) GRAVEL(7) X X SAND(6) X X COBBLE(8) X BEDROCK(5) HARDPAN(4) DETRITUS(3) MUCK/SILT(2) ARTIFIC(0) TOTAL NUMBER OF SUBSTRATE TYPES: >4(2) X <4(0) NOTE: (Ignore studge that originates from point sources: score is based on natural substrates) COMMENTS: | SUBSTRATE ORIGIN (all) SILT COVER (one) LIMESTONE(1) RIP/RAP(0) SILT-HEAVY(-2) SILT-MOD(-1) |
| 2) INSTREAM COVER: TYPE (Check all that apply) UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) BOULDERS(1) COMMENTS: | |
| 3) CHANNEL MORPHOLOGY: (Check ONLY ONE per Category or Check 2 and SINUOSITY DEVELOPMENT CHANNELIZATION ST HIGH(4) EXCELLENT(7) NONE(6) RECOVERED(4) RECOVERED(4) RECOVERING(3) RECENT OR NO RECOVERY(1) COMMENTS: Sand Grave Development Channel 2 and Grave | CHANNEL SCORE TABILITY MODIFICATION/OTHER HIGH(3) SNAGGING IMPOUND ISLAND MODERATE(2) RELOCATION ISLAND LOW(1) CANOPY REMOVAL LEVEED BANK SHAPING ONE SIDE CHANNEL MODIFICATION |
| 4) RIPARIAN ZONE AND BANK EROSION: (Check ONE box or Check 2 and A' River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) WIDE > 150 ft.(4) WIDE > 150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | RIPARIAN SCORE 7.5 |
| 5) POOL/GLIDE AND RIFFLE/RUN QUALITY MAX,DEPTH (Check 1) >4 ft.(6) POOL WIDTH>RIFFLE WIDTH(2) 2.4-4 ft.(4) 1.2-2.4 ft.(2) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) COMMENTS: NO POOL = 0 POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH+RIFFLE WIDTH(0) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) COMMENTS: | POOL SCORE POOL/RUN/RIFFLE CURRENT VELOCITY (Check all that Apply) TORRENTIAL(-1) FAST(1) MODERATE(1) INTERMITTENT(-2) SLOW(1) |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4) GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE SCORE 3 RIFFLE/RUN EMBEDDEDNESS EXTENSIVE(-1) NONE(2) MODERATE(0) NO RIFFLE(0) LOW(1) |
| 6) GRADIENT (FEET/MILE): 3.5 % POOL 20 % RIFF | LE_15 % RUN 65 GRADIENT SCORE 10 Checked by 58/16/04 |

| (D) | * | | |
|---|--|--|---|
| | Fwo Substrate Type Boxes: Check all type | DATE: 13/13/04) | QHEI SCORE 59.5 |
| TYPE POOL R BLDER/SLAB(10) BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: | GRAVEL(7) SAND(6) BEDROCK(5) DETRITUS(3) ARTIFIC(0) | E SUBSTRATE ORIGIN (all) LIMESTONE(1) RIP/RAP(0) SILT-HEAVY(TILLS(1) HARDPAN(0) SILT-NORM(0) | SILT-FREE(1) eddedness (check one) |
| 2) INSTREAM COVER: TYP! UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) COMMENTS: | Check all that apply) DEEP POOLS(2) ROOTWADS(1) BOULDERS(1) COMBOWS(1) AQUATIC MACK | Fried | 75%(11) 25-75%(7) %(3) |
| 3) CHANNEL MORPHOLOGY: (C SINUOSITY DEVELOPM HIGH(4) SXCELLEN MODERATE(3) COOD(5) IFAIR(3) POOR(1) | | 2 and AVERAGE) STABILITY HIGH(3) MODIFICATION/OTHE SNAGGING RELOCATION CANOPY REMOVAL DREDGING ONE SIDE CHANNEL MO | IMPOUND ISLAND X LEVEED Spoil piles BANK SHAPING |
| 4) RIPARIAN ZONE AND BANK E River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) WIDE > 150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | EROSION: (Check ONE box or Check 2 and EROSION/RUNOFF-FLOODPLAII) L R (most predominant per ban) FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | N QUALITY BAI | RIPARIAN SCORE 9 NK EROSION R (per bank) NONE OR LITTLE(3) MODERATE(2) HEAVY OR SEVERE(1) |
| 5) POOL/GLIDE AND RIFFLE/RU MAX.DEPTH (Check 1) >4 ft.(6) 2.4-4 ft.(4) 1.2-2.4 ft.(2) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) COMMENTS: | N QUALITY MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH=RIFFLE WIDTH(1) POOL WIDTH <riffle td="" width(0)<=""><td>POOL/RUN/RIFFLE CURRENT VELOCI TORRENTIAL(-1) FAST(1) MODERATE(1) SLOW(1) POOL/RUN/RIFFLE CURRENT VELOCI INTERSTITIAL INTERMITTEN</td><td>(-1)</td></riffle> | POOL/RUN/RIFFLE CURRENT VELOCI TORRENTIAL(-1) FAST(1) MODERATE(1) SLOW(1) POOL/RUN/RIFFLE CURRENT VELOCI INTERSTITIAL INTERMITTEN | (-1) |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4)* GENERALLY >4 in. MAX.<20 in.(3) X GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) UNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | RIFFLE/RUN EMBEDDEDNE EXTENSIVE(-1) MODERATE(0) NO RIF LOW(1) | 2) |

6) GRADIENT (FEET/MILE): 88 % POOL 5 % RIFFLE 10 % RUN 85 GRADIENT SCORE 10

checked by SP 10/16/04

| STREAM: JFN#2 Orme | Nitch RIVER MILE | DATE: 13/13/04 3E | QHEI SCORE 39 |
|--|--|--|--------------------------------|
| 1) SUBSTRATE: (Check ONLY Two Sub | strate Type Boxes: Check all types | present) | UBSTRATE SCORE 13 |
| TYPE POOL RIFFLE | POOL RIFFLE | 01 ID 0mm 1 mm | OVER (one) |
| BLDER/SLAB(10) | GRAVEL(7) | LIMESTONE(1) RIP/RAP(0) SILT-HEAVY(-2) | SILT-MOD(-1) |
| BOULDER(9) COBBLE(8) | SAND(6) BEDROCK(5) | TILLS(1) HARDPAN(0) SILT-NORM(0) SANDSTONE(0) Extent of Embedi | SILT-FREE(1) |
| HARDPAN(4) | DETRITUS(3) | SHALE(-1) EXTENSIVE(-2) | MODERATE(-1) |
| MUCK/SILT(2) | ARTIFIC(0) | COAL FINES(-2) LOW(0) | NONE(1) |
| harant . | (2) 🔀 <4(0) | | |
| NOTE: (Ignore sludge that originates from point source COMMENTS: | s: score is based on natural substrates) | | |
| | ************************************** | | |
| 2) INSTREAM COVER: | | | COVER SCORE 5 |
| | (all that apply) EEP POOLS(2) OXBOWS(1) | AMOUNT (Check only one or C | |
| | OOTWADS(1) AQUATIC MACROP | PHYTES(1) EXTENSIVE >759 MODERATE 25-7 | |
| | DULDERS(1) LOGS OR WOODY | h | , , |
| | | NEARLY ABSENT | Γ<5%(1) |
| COMMENTS: | | | |
| 3) CHANNEL MORPHOLOGY: (Check Of | NLY ONE per Category or Check 2 a | and AVERAGE) | CHANNEL SCORE 7 |
| SINUOSITY DEVELOPMENT | | STABILITY MODIFICATION/OTHER | CHAMILE SCORE 4 |
| HIGH(4) | NONE(6) | HIGH(3) SNAGGING | IMPOUND |
| MODERATE(3) GOOD(5) | RECOVERED(4) | MODERATE(2) RELOCATION | ISLAND |
| LOW(2) FAIR(3) POOR(1) | RECOVERING(3) RECENT OR NO RECOVERY(1) | LOW(1) CANOPY REMOVAL | X LEVEED Spal Piles |
| NONE(1) POOR(1) | L RECENT OR NO RECOVER!(1) | DREDGING ONE SIDE CHANNEL MODIF | BANK SHAPING |
| COMMENTS: | | L | |
| A) DIDADIAN ZONE AND DANK EDOCIO | No (Charle ONE have as Charle 2 and | AVERACE are books | |
| 4) RIPARIAN ZONE AND BANK EROSIO River Right Looking Downstream | in. (Check ONE box of Check 2 and | | RIPARIAN SCORE |
| <u> </u> | EROSION/RUNOFF-FLOODPLAIN | | EROSION |
| L R (per bank) | R (most predominant per bank) | L R (per bank) L | R (per bank) |
| WIDE >150 ft.(4) | FOREST, SWAMP(3) | URBAN OR INDUSTRIAL(0) | NONE OR LITTLE(3) |
| MODERATE 30-150 ft.(3) X NARROW 15-30 ft.(2) | OPEN PASTURE/ROW CROP(0) RESID., PARK, NEW FIELD(1) | SHRUB OR OLD FIELD(2) CONSERV. TILLAGE(1) | MODERATE(2) HEAVY OR SEVERE(1) |
| VERY NARROW 3-15 ft.(1) | FENCED PASTURE(1) | MINING/CONSTRUCTION(0) | THEAVY OR SEVERE(1) |
| NONE(0) | 6. P | | |
| COMMENTS: | | | |
| 5) POOL/GLIDE AND RIFFLE/RUN QUAL | ITY NO POOL = | 0 1 | POOL SCORE |
| | PHOLOGY (Check 1) | POOL/RUN/RIFFLE CURRENT VELOCITY | |
| >4 ft.(6) | OL WIDTH>RIFFLE WIDTH(2) | TORRENTIAL(-1) EDDIES(1) | |
| H | OL WIDTH=RIFFLE WIDTH(1) | FAST(1) INTERSTITIAL(-1) | |
| | OL WIDTH <riffle td="" width(0)<=""><td>MODERATE(1) INTERMITTENT(-2</td><td>2)</td></riffle> | MODERATE(1) INTERMITTENT(-2 | 2) |
| <1.2 ft.(1) <0.6 ft.(Pooi≕0)(0) | | SLOW(1) | |
| COMMENTS: No Poo | | | |
| | | | DILLI E SOORE |
| RIFFLE/RUN DEPTH | RIFFLE/RUN SUBSTRATE | RIFFLE/RUN EMBEDDEDNESS | RIFFLE SCORE |
| GENERALLY >4 in. MAX.>20 in.(4) | STABLE (e.g., Cobble,Boulder)(2) | EXTENSIVE(-1) NONE(2) | • |
| GENERALLY >4 in. MAX.<20 in.(3) | MOD.STABLE (e.g., Pea Gravel)(1) | MODERATE(0) NO RIFFLE | E(0) |
| GENERALLY 2-4 in.(1) | UNSTABLE (Gravel, Sand)(0) | LOW(1) | |
| X GENERALLY <2 in.(Riffle=0.)(0) | NO RIFFLE(0) | | |

GENERALLY <2 in.(Riffle=0)(0)

COMMENTS:

6) GRADIENT (FEET/MILE): 12 % POOL Ø % RIFFLE % RUN & GRADIENT SCORE 8

Checked by SPINING

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|--|--|--|-----------------|---|
| STREAM: JEN 1 - Litt | e Book C. RIVER MILE | DAT | E: 19/13/04 | QHEI SCORE 60 |
| TYPE POOL RIF | GRAVEL(7) X SAND(6) | RIFFLE SUBSTRATE LIMESTONE(1) X TILLS(1) | HARDPAN(0) SILT | SUBSTRATE SCORE // SILT COVER (one) T-HEAVY(-2) SILT-MOD(-1) T-NORM(0) SILT-FREE(1) |
| COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: NOTE: (Ignore sludge that originales from po | BEDROCK(5) DETRITUS(3) ARTIFIC(0) >4(2) | | | |

| STREAM: JFN#23 Ind | lier Creek RIVER MILE | DATE: 12/14/04 | QHEI SCORE 61 |
|--|--|--|--|
| TYPE POOL RIF BLDER/SLAB(10) BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: | wo Substrate Type Boxes: Check all types POOL RIFFLE GRAVEL(7) SAND(6) BEDROCK(5) DETRITUS(3) ARTIFIC(0) ARTIFIC(0) ARTISOURCES: Score is based on natural substrates) | SUBSTRATE ORIGIN (all) LIMESTONE(1) RIP/RAP(0) TILLS(1) HARDPAN(0) | SUBSTRATE SCORE SILT COVER (one) SILT-HEAVY(-2) SILT-MOD(-1) SILT-NORM(0) SILT-FREE(1) ent of Embeddedness (check one) EXTENSIVE(-2) MODERATE(-1) LOW(0) NONE(1) |
| 2) INSTREAM COVER: TYPE UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) COMMENTS: | Check all that apply) DEEP POOLS(2) ROOTWADS(1) BOULDERS(1) Check all that apply) OXBOWS(1) AQUATIC MACROI | PHYTES(1) | COVER SCORE Quantification only one or Check 2 and AVERAGE) EXTENSIVE >75%(11) MODERATE 25-75%(7) SPARSE 5-25%(3) NEARLY ABSENT <5%(1) |
| 3) CHANNEL MORPHOLOGY: (C SINUOSITY DEVELOPM HIGH(4) EXCELLENT MODERATE(3) GOOD(5) LOW(2) FAIR(3) NONE(1) POOR(1) COMMENTS: | | STABILITY HIGH(3) MODIFICAT SNAGGING MODERATE(2) LOW(1) CANOPY F DREDGING | ION ISLAND REMOVAL LEVEED |
| 4) RIPARIAN ZONE AND BANK E River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) WIDE >150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | EROSION: (Check ONE box or Check 2 and EROSION/RUNOFF-FLOODPLAIN L R (most predominant per bank) FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | QUALITY | RIPARIAN SCORE 5 BANK EROSION 5.25 L R (per bank) NONE OR LITTLE(3) MODERATE(2) HEAVY OR SEVERE(1) |
| 5) POOL/GLIDE AND RIFFLE/RUI MAX.DEPTH (Check 1) >4 ft.(6) 2.4-4 ft.(4) 1.2-2.4 ft.(2) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) COMMENTS: | N QUALITY MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH=RIFFLE WIDTH(1) POOL WIDTH <riffle td="" width(0)<=""><td>POOL/RUN/RIFFLE CURRED TORRENTIAL(-1) FAST(1)</td><td>POOL SCORE 9 NT VELOCITY (Check all that Apply) EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2)</td></riffle> | POOL/RUN/RIFFLE CURRED TORRENTIAL(-1) FAST(1) | POOL SCORE 9 NT VELOCITY (Check all that Apply) EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2) |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4)' GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobbie,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) UNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | RIFFLE/RUN EME EXTENSIVE(-1) MODERATE(0) LOW(1) | RIFFLE SCORE 3 BEDDEDNESS NONE(2) NO RIFFLE(0) |
| 6) GRADIENT (FEET/MILE): | 6 % POOL 25 % RI | FFLE 15 % RUN 60 | GRADIENT SCORE |

Chocheg & Majot

| STREAM: JEWHAA Sonto | NO DIECE RIVER MILE | DATE: 12/14/043E | QHEI SCORE 38.3 |
|---|---|--|--|
| TYPE POOL RIFE BLDER/SLAB(10) BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: | wo Substrate Type Boxes: Check all types FLE POOL RIFFLE GRAVEL(7) SAND(6) BEDROCK(5) DETRITUS(3) ARTIFIC(0) 34(2) 4(0) nt sources: score is based on natural substrates) | SUBSTRATE ORIGIN (all) LIMESTONE(1) RIP/RAP(0) TILLS(1) HARDPAN(0) SILT-HEAVY(-2) SILT-NORM(0) | DIBSTRATE SCORE 13 DVER (one) SILT-MOD(-1) SILT-FREE(1) dedness (check one) MODERATE(-1) NONE(1) |
| UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) | (Check all that apply) DEEP POOLS(2) ROOTWADS(1) BOULDERS(1) COS OR WOODS | | 6(11) 5%(7)) |
| 3) CHANNEL MORPHOLOGY: (Ch. SINUOSITY DEVELOPME HIGH(4) EXCELLENT(1) MODERATE(3) GOOD(5) FAIR(3) NONE(1) POOR(1) COMMENTS: | | and AVERAGE) STABILITY HIGH(3) MODIFICATION/OTHER SNAGGING RELOCATION CANOPY REMOVAL DREDGING ONE SIDE CHANNEL MODIF | CHANNEL SCORE 7 IMPOUND ISLAND LEVEED BANK SHAPING ICATION |
| 4) RIPARIAN ZONE AND BANK EF River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) WIDE >150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | ROSION: (Check ONE box or Check 2 and EROSION/RUNOFF-FLOODPLAIN L R (most predominant per bank) FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | QUALITY BANK | RIPARIAN SCORE 3.5 EROSION R (per bank) NONE OR LITTLE(3) MODERATE(2) HEAVY OR SEVERE(1) |
| 5) POOL/GLIDE AND RIFFLE/RUN MAX.DEPTH (Check 1) >4 ft.(6) 2.4-4 ft.(4) 1.2-2.4 ft.(2) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) COMMENTS: | MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH=RIFFLE WIDTH(1) POOL WIDTH <riffle td="" width(0)<=""><td>POOL/RUN/RIFFLE CURRENT VELOCITY TORRENTIAL(-1) FAST(1) MODERATE(1) SLOW(1) POOL/RUN/RIFFLE CURRENT VELOCITY EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2)</td><td></td></riffle> | POOL/RUN/RIFFLE CURRENT VELOCITY TORRENTIAL(-1) FAST(1) MODERATE(1) SLOW(1) POOL/RUN/RIFFLE CURRENT VELOCITY EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2) | |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4) GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) UNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | RIFFLE/RUN EMBEDDEDNESS EXTENSIVE(-1) MODERATE(0) LOW(1) | |
| 6) GRADIENT (FEET/MILE): | 14 % POOL () % RI | IFFLE () % RUN (Q) GRADIE | Chacladby Challelog |

| STREAM: JFN#17 W | Tib RIVER MILE | DATE: 12/14/0 | 4 JE QHEI SCORE 39 |
|---|--|--|--|
| 1) SUBSTRATE: (Check ONLY Two S TYPE POOL RIFFLE BLDER/SLAB(10) BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: NOTE: (Ignore studge that originates from point sou COMMENTS: | POOL RIFFLE GRAVEL(7) SAND(6) BEDROCK(5) DETRITUS(3) ARTIFIC(0) >4(2) 44(0) | SUBSTRATE ORIGIN (all) LIMESTONE(1) RIP/RAP(0) TILLS(1) HARDPAN(0) | SUBSTRATE SCORE SILT COVER (one) SILT-HEAVY(-2) SILT-MOD(-1) SILT-NORM(0) SILT-FREE(1) Xtent of Embeddedness (check one) EXTENSIVE(-2) MODERATE(-1) LOW(0) NONE(1) |
| 2) INSTREAM COVER: TYPE (Che UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) COMMENTS: | eck all that apply) DEEP POOLS(2) ROOTWADS(1) BOULDERS(1) OXBOWS(1) AQUATIC MACROI LOGS OR WOODY | PHYTES(1) | COVER SCORE Characteristics only one or Check 2 and AVERAGE) EXTENSIVE >75%(11) MODERATE 25-75%(7) SPARSE 5-25%(3) NEARLY ABSENT <5%(1) |
| 3) CHANNEL MORPHOLOGY: (Check SINUOSITY DEVELOPMENT HIGH(4) EXCELLENT(7) GOOD(5) LOW(2) - AIR(3) NONE(1) - COMMENTS: | ONLY ONE per Category or Check 2 CHANNELIZATION NONE(6) RECOVERED(4) RECOVERING(3) RECENT OR NO RECOVERY(1) | STABILITY MODIFIC SNAGG MODERATE(2) LOW(1) MODIFIC SNAGG RELOCA CANOPY DREDGE | ATION ISLAND Y REMOVAL LEVEED |
| 4) RIPARIAN ZONE AND BANK EROS River Right Looking Downstream RIPARIAN WIDTH (per tank) L R (per bank) WIDE >150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | ION: (Check ONE box or Check 2 and EROSION/RUNOFF-FLOODPLAIN L R (most predominant per bank) FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | | RIPARIAN SCORE 4 BANK EROSION L R (per bank) NONE OR LITTLE(3) MODERATE(2) HEAVY OR SEVERE(1) |
| >4 ft.(6) 2.4-4 ft.(4) | ORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH=RIFFLE WIDTH(1) POOL WIDTH <riffle td="" width(0)<=""><td></td><td>POOL SCORE DENT VELOCITY (Check all that Apply) EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2)</td></riffle> | | POOL SCORE DENT VELOCITY (Check all that Apply) EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2) |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4) GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) UNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | RIFFLE/RUN EM EXTENSIVE(-1) MODERATE(0) LOW(1) | RIFFLE SCORE () MBEDDEDNESS NONE(2) NO RIFFLE(0) |
| 6) GRADIENT (FEET/MILE): | % POOL <u>()</u> % RII | FFLE % RUN | O GRADIENT SCORE 6 Checked 5P 18118/04 |

| STREAM: JFN#14 V | named Till RIVER MILE | DATE: 12/14/6 | OY JE QHEI SCORE 56 |
|--|---|--|---|
| TYPE POOL RII BLDER/SLAB(10) BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES: | wo Substrate Type Boxes: Check all types FLE POOL RIFFLE SAND(6) BEDROCK(5) DETRITUS(3) ARTIFIC(0) >4(0) int sources: score is based on natural substrates) | • | SUBSTRATE SCORE SILT COVER (one) SILT-HEAVY(-2) SILT-HOD(-1) SILT-FREE(1) Extent of Embeddedness (check one) EXTENSIVE(-2) LOW(0) MODERATE(-1) NONE(1) |
| 2) INSTREAM COVER: TYPE UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) COMMENTS: | C(Check all that apply) DEEP POOLS(2) ROOTWADS(1) BOULDERS(1) COMBOWS(1) AQUATIC MACRO LOGS OR WOOD | DPHYTES(1) | COVER SCORE // neck only one or Check 2 and AVERAGE) EXTENSIVE >75%(11) MODERATE 25-75%(7) SPARSE 5-25%(3) NEARLY ABSENT <5%(1) |
| SINUOSITY DEVELOPM HIGH(4) EXCELLENT MODERATE(3) GOOD(5) LOW(2) FAIR(3) NONE(1) POOR(1) | <u> </u> | STABILITY MODIFIED SNAG SNAG SNAG SNAG SNAG SNAG SNAG SNAG | CHANNEL SCORE 14 ICATION/OTHER GGING IMPOUND DCATION ISLAND DPY REMOVAL LEVEED DGING BANK SHAPING SIDE CHANNEL MODIFICATION |
| 4) RIPARIAN ZONE AND BANK E River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) WIDE >150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | EROSION: (Check ONE box or Check 2 and EROSION/RUNOFF-FLOODPLAIN L R (most predominant per bank) FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | QUALITY | MODERATE(2) HEAVY OR SEVERE(1) |
| 5) POOL/GLIDE AND RIFFLE/RUI MAX.DEPTH (Check 1) >4 ft.(6) 2.4-4 ft.(4) 1.2-2.4 ft.(2) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) COMMENTS: | N QUALITY MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(1) POOL WIDTH <riffle pool="" td="" width(0)="" width(0)<="" width<riffle=""><td></td><td>POOL SCORE POOL SCORE RRENT VELOCITY (Check all that Apply) EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2)</td></riffle> | | POOL SCORE POOL SCORE RRENT VELOCITY (Check all that Apply) EDDIES(1) INTERSTITIAL(-1) INTERMITTENT(-2) |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4)' GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) UNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | EXTENSIVE(- MODERATE(0 LOW(1) | NO RIFFLE(0) |
| 6) GRADIENT (FEET/MILE): 2 | JI % POOL () % R | RIFFLE 40 % RUN _ | 60 GRADIENT SCORE 4 |

The che of sollo lot

% POOL

6) GRADIENT (FEET/MILE):

Checked by Spishblo

GRADIENT SCORE

| STREAM: JENHY | Desselsmith of RIVER MILE | DATE: 12/13/04 | QHEI SCORE 38 |
|---|---|--|---|
| TYPE POOL R BLDER/SLAB(10) BOULDER(9) COBBLE(8) HARDPAN(4) MUCK/SILT(2) TOTAL NUMBER OF SUBSTRATE TYPES | GRAVEL(7) SAND(6) BEDROCK(5) DETRITUS(3) ARTIFIC(0) | SUBSTRATE ORIGIN (all) LIMESTONE(1) RIP/RAP(0) SILT-N TILLS(1) HARDPAN(0) SILT-N SANDSTONE(0) Extent of | SUBSTRATE SCORE SILT COVER (one) EAVY(-2) SILT-MOD(-1) ORM(0) SILT-FREE(1) Embeddedness (check one) SIVE(-2) MODERATE(-1) NONE(1) |
| 2) INSTREAM COVER: TYP UNDERCUT BANKS(1) OVERHANGING VEGETATION(1) SHALLOWS (IN SLOW WATER)(1) COMMENTS: | E(Check all that apply) DEEP POOLS(2) ROOTWADS(1) BOULDERS(1) COSS OR WOODY | PHYTES(1) C DEBRIS(1) EXTEN: MODER SPARS: | COVER SCORE ne or Check 2 and AVERAGE) SIVE >75%(11) WATE 25-75%(7) E 5-25%(3) Y ABSENT <5%(1) |
| 3) CHANNEL MORPHOLOGY: ((CSINUOSITY DEVELOPM) HIGH(4) EXCELLEN MODERATE(3) GOOD(5) LOW(2) TAIR(3) NONE(1) POOR(1) COMMENTS: NO | NONE(6) RECOVERED(4) RECOVERING(3) RECENT OR NO RECOVERY(1) | and AVERAGE) STABILITY HIGH(3) MODIFICATION/C SNAGGING RELOCATION CANOPY REMOVA DREDGING ONE SIDE CHANNI | IMPOUND ISLAND LEVEED BANK SHAPING |
| 4) RIPARIAN ZONE AND BANK River Right Looking Downstream RIPARIAN WIDTH (per bank) L R (per bank) WIDE >150 ft.(4) MODERATE 30-150 ft.(3) NARROW 15-30 ft.(2) VERY NARROW 3-15 ft.(1) NONE(0) COMMENTS: | EROSION: (Check ONE box or Check 2 and EROSION/RUNOFF-FLOODPLAIN L R (most predominant per bank) FOREST, SWAMP(3) OPEN PASTURE/ROW CROP(0) RESID.,PARK,NEW FIELD(1) FENCED PASTURE(1) | QUALITY | RIPARIAN SCORE 4 BANK EROSION 3.75 L R (per bank) NONE OR LITTLE(3) MODERATE(2) HEAVY OR SEVERE(1) |
| 5) POOL/GLIDE AND RIFFLE/RUMAX.DEPTH (Check 1) >4 ft.(6) 2.4-4 ft.(4) 1.2-2.4 ft.(2) <1.2 ft.(1) <0.6 ft.(Pool=0)(0) COMMENTS: | N QUALITY MORPHOLOGY (Check 1) POOL WIDTH>RIFFLE WIDTH(2) POOL WIDTH=RIFFLE WIDTH(1) POOL WIDTH <riffle td="" width(0)<=""><td>POOL/RUN/RIFFLE CURRENT VE TORRENTIAL(-1) EDDIES FAST(1) INTERS</td><td></td></riffle> | POOL/RUN/RIFFLE CURRENT VE TORRENTIAL(-1) EDDIES FAST(1) INTERS | |
| RIFFLE/RUN DEPTH GENERALLY >4 in. MAX.>20 in.(4) GENERALLY >4 in. MAX.<20 in.(3) GENERALLY 2-4 in.(1) GENERALLY <2 in.(Riffle=0)(0) COMMENTS: | RIFFLE/RUN SUBSTRATE STABLE (e.g., Cobble,Boulder)(2) MOD.STABLE (e.g., Pea Gravel)(1) ,UNSTABLE (Gravel, Sand)(0) NO RIFFLE(0) | MODERATE(0) LOW(1) | NONE(2) NO RIFFLE(0) |
| 6) GRADIENT (FEET/MILE): | 10-56 % POOL <u>(</u>) % RII | FFLE % RUN _100 6 | GRADIENT SCORE 8 |

Checked my SP 12/16/14