# Ecological Evaluation of Stream Resources in Deuel County

**Ramona Lundberg**
**Deuel School District #19-4**
**PO Box 770**
**Clear Lake, S.D. 57226**

**Project title: Ecological Evaluation of Stream Resources in Deuel County**

# SOUTH DAKOTA DEPARTMENT OF GAME, FISH, AND PARKS WILDLIFE DIVISION
# SMALL GRANTS PROGRAM PROJECT REPORT

"Ecological Evaluation of Stream Resource in Deuel County"

The objectives of this project include:

1) Providing enhanced learning opportunities for students through field experiences.
2) Provide students opportunities to contribute to a scientific study through fish and macroinvertebrate collection and identification and water quality analysis.
3) Comparison of aquatic community and habitat variables between Monigahn Creek and Clear Lake Creek to increase student understanding of differences between prairie streams in different landscape contexts (i.e. one in native rangeland and one in cropland).
4) Increase student understanding of the impact of upstream and surrounding user activities on the overall quality or health of the streams.
5) Provide data for evaluation of management activities on the Crystal Spring Preserve.
6) Provide data to compare with historical information (i.e. fish studies from Dieterman and Berry, 1994) to evaluate potential changes.

In order to implement curricular changes at Deuel School and successfully complete the objectives of this project, supporting activities occurred during the summer months. To increase the knowledge and understanding for this instructor of the fieldwork involved in this project expertise from several sources was utilized. Nature Conservancy personnel Clint Miller and Peter Bauman along with Craig Milewski from the East Dakota Water Development District provided equipment, resources, and time. Copies of this report will be sent to Clint Miller and Craig Milewski.

An all-day field trip on Monighan Creek with Clint, Peter, Craig, high school student, Robert Haar, and this instructor was an invaluable experience. Examples of data collection and methods were critiqued as to appropriateness and discussion relating to secondary students and time constraints, etc. occurred. Field techniques were described and fish seining and identification was done. Craig sorted the fish collected and later identified several specimens of each species. He developed a key of those species for the students to use and provided that key and collection as the beginning of the Deuel School fish species collection.

In addition, this instructor traveled to Stillwater High School, Stillwater, MN to

consult with Andy Weaver, Biology instructor. Andy has expertise in fieldwork and knowledge of effective application of fieldwork with secondary students. Work with Andy emphasized macroinvertebrate collection techniques and identification. The identification key for the Most Common Riffle Dwelling Benthic Macroinvertebrates 1999 Minnesota Edition was utilized. Andy's students have contributed annually for the past four years to revisions of this key.

After the summer fieldwork and discussions with supporting personnel it was decided that more class time than was originally planned should be devoted to this project. The twenty-two seniors in Advanced Biology, not sophomore biology students as originally proposed, completed this project. This project was the curriculum for ten weeks during the first semester and will be repeated with these same students in a mini-version during three weeks in May of 2000.

Students completed a pre-survey of their general knowledge of watersheds, habitat components, overall stream health indicators, vocabulary, familiarity with fish and macroinvertebrates diversity, previous field experiences, etc. The survey also included questions about land use and conservation ethics. Results of this pre assessment indicated that students had very little knowledge or understanding of any of the survey questions and very limited field experience.

Resources and equipment was purchased to support this project. Twenty-five copies of the *Streamkeeper's Field Guide* were purchased and copies of the Macroinvertebrate Key mentioned above made. The Deuel School and the Nature Conservancy also provided facilities, equipment and transportation. (See Budget and Budget – In-kind).

By utilizing the creek directly on the north edge of town (named by the students as North Clear Lake Creek) the class was able to travel to that creek an average of three times a week. Modifications and combinations of Craig's field collection procedures and the *Streamkeeper's* procedures were made by the instructor. Further modifications into smaller segments that could be completed in a 50-minute class period were also made.

After students were familiar with the surveys and keys, two entire school days were devoted to this project. The days of October 11th and 18th were full field days for the students and instructor. Students collected data and specimen from North Clear Lake Creek on October 11and Monigahn Creek on October 18. Mornings were devoted to field data and organisms collection. Identification was completed in the afternoons. Additional class periods were used for identification of organisms.

Because of weather concerns and to support Deuel students having data to contribute to National Student Streams and Rivers Data Collection Day on the Internet, October 15 was the main goal for field data collection. Further in class study relating to the field experiences and data collected were completed in the four weeks that followed. Supporting curriculum materials were developed by this instructor. Topics addressed or expanded included factors affecting habitat and flow; human alterations and land use

concerns; fish and macroinvertebrate habitat needs, feeding groups and food chains; optimal conditions for aquatic life, data validity and usability; and pollution tolerances of organisms. Comparisons between the two sites were emphasized.

Students did research and developed culminating illustrated papers on a related topic of their choice. Topics of these papers included Dissolved Oxygen Effect on Fish, Riprarian Zones, Water Scorpions, Tiling and Drainage on Our Farm, CRP Effectiveness Related to Hunting and Fishing, Clear Lake Dredging Project, Stream Pollution, Climate Effects on the Stream, Minnow Diversity, and Importance of Trees to Stream Life. The pre assessment survey was given to the students as one form of post assessment. Results indicate that students learned a great deal from this experience.

Students' awareness that their data would be reported to the South Dakota Department of Game, Fish and Parks and their instructor utilized assistance from professionals increased the credibility of the project with the students and the success of this project.

One of the most positive aspects of this project for Deuel School students was their interest and enthusiasm. Students thoroughly enjoyed this project including the hands-on, wet-feet field experiences. Students want to make comparisons with spring data and are looking forward to the opportunity to do so.

This project will be a permanent part of the Advanced Biology curriculum. The Deuel School will continue to provide support for the students to have this experience and learning opportunity. Making biology relevant to students' own home and place while increasing their learning has been an enriching experience.

Thank you.

Ramona Lundberg

# STREAM REACH SURVEY

Names _____ Date 10-18-99 Transect # 6

Creek/Stream Name Monighan Creek Time am

Site Description (site name, landmarks, etc.) Starting point landmark – rock - Nature Conservancy southeast of main shed.

## Vegetation:

| Type | Abundant | Moderate | Sparse | % of 500 sq. ft. area covered |
|---|---|---|---|---|
| Conifer trees | | | | 0 |
| Deciduous trees | | | | 0 |
| Shrubs | | | x | < 2 |
| Herbaceous | | | x | < 2 |
| Grasses | x | | | 95 |

**Width of Riparian Zone:** Looking downstream: 0-50' 50-100' 100+

Left Bank ☐ ☒ ☐

Right Bank ☒ ☐ ☐

**Overhead Canopy:** (at least 3' above water) 0-25%☒ 25-50%☐ 50-75%☐ 75-100%☐

## Channel Characteristics:

**Gradient** Low ☒ Moderate ☐ Steep ☐ _____%

**Sinuosity** Straight ☐ Meandering ☒ Braided ☐ Ranking _____

## Cross Section Shape:

Valley

☒ ☐ ☐

Channel

☐ ☐ ☒ ☐ ☐

## Stream Banks:

**Vegetation cover:** Abundant ☒ Moderate ☐ Sparse ☐ _____ %

**Bank stability:** Erosion in some areas ☒ Erosion in many areas ☐ Intact ☐

Collapsed in some areas ☐ Collapsed in many areas ☐

**Artificial Protection:** none ☒ < 25% ☐ 25-50% ☐ > 50% ☐

Describe and evaluate _____

**Bank steepness:** (What percent of the total length is represented by each?)

< 45° 30 % > 45° 35 % 90° 30 % undercut > 90 5 %

# STREAM REACH SURVEY

## Reach Habitat:

| | | | | |
|---|---|---|---|---|
| **Large Woody debris:** | Abundant ☐ | Moderate ☐ | Sparse ☒ | None ☐ |
| **Small Organic debris:** | Abundant ☐ | Moderate ☒ | Sparse ☐ | None ☐ |
| **Overhanging debris:** | Abundant ☐ | Moderate ☐ | Sparse ☒ | None ☐ |
| **Overhanging banks:** | Abundant ☐ | Moderate ☒ | Sparse ☐ | None ☐ |
| **Overhanging vegetation:** (< 3 ft. above water) | Abundant ☒ | Moderate ☐ | Sparse ☐ | None ☐ |
| **Aquatic Vegetation:** | Abundant ☐ | Moderate ☒ | Sparse ☐ | None ☐ |
| **Boulders:** | Abundant ☐ | Moderate ☐ | Sparse ☒ | None ☐ |

## Human Alterations:

| | | | | | |
|---|---|---|---|---|---|
| Dredging | ☐ | Garbage/litter | ☐ | Culverts | ☒ |
| Channelization | ☐ | Toxic substances | ☐ | Pipes | ☐ |
| Diversions | ☐ | Sewage | ☐ | Detention ponds | ☐ |
| Dams | ☐ | Bridges | ☐ | Storm drains | ☐ |
| Weirs | ☐ | Roads | ☒ | Other _____ | ☐ |
| Dikes | ☐ | Other_____ | ☐ | Other _____ | ☐ |

**The road and culvert are not in the transects, but are between the lake and the creek.**

## Land Uses:

(Enter 1 if present, 2 if you think the land use is impacting the stream.)

| | | | | | |
|---|---|---|---|---|---|
| residential | _____ | forestry | _____ | grazing | 2 |
| commercial | _____ | mining | _____ | crops | _____ |
| industrial | _____ | recreation | _____ | irrigation | _____ |

## Comments On Stream Reach:

2nd page of Monighan Creek 10-18-99

# STREAM REACH SURVEY

Names _____ Date 10-11-99 Transect # 6

Creek/Stream Name North Clear Lake Creek Time am

Site Description (site name, landmarks, etc.) North of city park, Fetan's land, transects counted from west tree and second gate intersections.

## Vegetation:

| Type | Abundant | Moderate | Sparse | % of 500 sq. ft. area covered |
|---|---|---|---|---|
| Conifer trees | | | | 0 |
| Deciduous trees | | x | | 25 |
| Shrubs | | | x | 5 |
| Herbaceous | | | | |
| Grasses | x | | | 70 |

**Width of Riparian Zone:** Looking downstream: 0-50' 50-100' 100+

Left Bank ☐ ☒ ☐

Right Bank ☒ ☐ ☐

**Overhead Canopy:** (at least 3' above water) 0-25%☐ 25-50%☐ 50-75%☒ 75-100%☐

## Channel Characteristics:

**Gradient** Low ☒ Moderate ☐ Steep ☐ _____%

**Sinuosity** Straight ☐ Meandering ☒ Braided ☐ Ranking _____

## Cross Section Shape:

Valley

☐ ☐ ☐

Channel

☐ ☐ ☐ ☐ ☐

## Stream Banks:

**Vegetation cover:** Abundant ☐ Moderate ☒ Sparse ☐ _____ %

**Bank stability:** Erosion in some areas ☐ Erosion in many areas ☐ Intact ☐

Collapsed in some areas ☒ Collapsed in many areas ☐

**Artificial Protection:** none ☒ < 25% ☐ 25-50% ☐ > 50% ☐

Describe and evaluate _____

**Bank steepness:** (What percent of the total length is represented by each?)

< 45° 20 % > 45° 70 % 90° 10 % undercut > 90 _____%

# STREAM REACH SURVEY

## Reach Habitat:

| | | | | |
|---|---|---|---|---|
| **Large Woody debris:** | Abundant ☒ | Moderate ☐ | Sparse ☐ | None ☐ |
| **Small Organic debris:** | Abundant ☐ | Moderate ☒ | Sparse ☐ | None ☐ |
| **Overhanging debris:** | Abundant ☐ | Moderate ☐ | Sparse ☒ | None ☐ |
| **Overhanging banks:** | Abundant ☐ | Moderate ☒ | Sparse ☐ | None ☐ |
| **Overhanging vegetation:** (< 3 ft. above water) | Abundant ☐ | Moderate ☐ | Sparse ☒ | None ☐ |
| **Aquatic Vegetation:** | Abundant ☐ | Moderate ☒ | Sparse ☐ | None ☐ |
| **Boulders:** | Abundant ☐ | Moderate ☐ | Sparse ☐ | None ☒ |

## Human Alterations:

| | | | | | |
|---|---|---|---|---|---|
| Dredging | ☐ | Garbage/litter | ☒ | Culverts | ☒ |
| Channelization | ☐ | Toxic substances | ☐ | Pipes | ☒ |
| Diversions | ☐ | Sewage | ☐ | Detention ponds | ☐ |
| Dams | ☐ | Bridges | ☒ | Storm drains | ☐ |
| Weirs | ☐ | Roads | ☒ | Other _____ | ☐ |
| Dikes | ☐ | Other see below | ☐ | Other _____ | ☐ |

## Land Uses:

(Enter 1 if present, 2 if you think the land use is impacting the stream.)

| | | | | | |
|---|---|---|---|---|---|
| residential | _____ | forestry | _____ | grazing | 2 |
| commercial | _____ | mining | _____ | crops | _____ |
| industrial | _____ | recreation | 2 | irrigation | _____ |

## Comments On Stream Reach:

2nd page of North Clear Lake Creek 10-11-99

This creek borders on the city park where a swimming pool is located. A white drain pipe runs into stream bed – appears to come from the pool???

Students say that when the pool was drained in the fall and once in the summer, some of the pool water drained into the creek.

# WATER QUALITY

Names _____ Date 8-14-99 Transect # summary

Creek/Stream Name Monighan Creek Time pm

Site Description (site name, landmarks, etc.) _____

Landmark boulder southeast of the main Nature Conservancy shed.

Air Temperature: 26 ° C

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☒ | ☐ | Clear/Sunny |
| ☐ | ☒ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

## Quantitative Water Quality

| pH | Dissolved $O_2$ | Temperature |
|---|---|---|
| 1. 7.0 | 1. 9 ppm | 24 ° C |
| 2. 7.1 | 2. 10 ppm | |
| 3. | 3. | % Dissolved Oxygen Saturation |
| mean | mean | |

| Nitrate (mg / L) | Phosphate (mg / L) | Secchi Disk |
|---|---|---|
| 1. | 1. | 1. |
| 2. | 2. | 2. |
| 3. | 3. | 3. |
| mean 0.1 | mean 0.08 | mean visible to bottom |

## Qualitative Water Quality

| Water Appearance | Stream Bed Coating | Odor |
|---|---|---|
| ☐ Scum | ☐ Orange to red | ☐ Rotten egg |
| ☐ Foam | ☐ Yellowish | ☐ Musky |
| ☐ Muddy | ☐ Black | ☐ Acrid |
| ☐ Milky | ☐ Brown | ☐ Chlorine |
| ☒ Clear | ☒ None | ☒ None |
| ☐ Oily sheen | | |
| ☐ Brownish | | |
| Other | Other | Other |

## Comments:

dry summer -

# WATER QUALITY

Names _____ Date 10-18-99 Transect # summary

Creek/Stream Name Monighan Creek Time am

Site Description (site name, landmarks, etc.) _____

These are averages for the 10 sites that students completed.

Air Temperature: 12 ° C

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☒ | ☐ | Clear/Sunny |
| ☐ | ☒ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

## Quantitative Water Quality

| pH | Dissolved $O_2$ | Temperature |
|---|---|---|
| 1. | 1. | 9 ° C |
| 2. | 2. | |
| 3. | 3. | _____% Dissolved Oxygen Saturation |
| mean 7.1 | mean 9 | |

| Nitrate (mg / L) | Phosphate (mg / L) | Secchi Disk |
|---|---|---|
| 1. | 1. | 1. |
| 2. | 2. | 2. |
| 3. | 3. | 3. |
| mean 0.16 | mean 0.09 | mean visible to bottom all but one hole |

## Qualitative Water Quality

| Water Appearance | Stream Bed Coating | Odor |
|---|---|---|
| ☐ Scum | ☐ Orange to red | ☐ Rotten egg |
| ☐ Foam | ☐ Yellowish | ☐ Musky |
| ☐ Muddy | ☐ Black | ☐ Acrid |
| ☐ Milky | ☐ Brown | ☐ Chlorine |
| ☒ Clear | ☒ None | ☒ None |
| ☐ Oily sheen | | |
| ☐ Brownish | | |
| Other _____ | Other _____ | Other _____ |

**Comments:**

dry fall -

# STREAM BOTTOM SURVEY

Names _____ Date 10-18-99 Transect # _____

Creek/Stream Name Monighan Creek Time am

Site Description (site name, landmarks, etc.) _____

Each partnership of students completed a chart and drawing like this so we have approximately 300 feet of the creek bottom graphed.

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☐ | ☐ | Clear/Sunny |
| ☒ | ☒ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

| **Substrate size** (percent stream bottom that each size represents) | % | **Color Key** |
|---|---|---|
| Silt, clay, mud | 40 | [illegible] |
| Sand (< 0.2 mm) | 10 | xxxx [illegible] |
| Fine gravel (2mm-8mm) | 10 | [illegible] |
| Medium gravel (8mm-16mm) | 7 | |
| Coarse gravel (16mm-64mm) | 10 | |
| Cobble (64mm-128mm) | 20 | |
| Large cobble (128mm-256mm) | 3 | [illegible] |
| Boulder (256mm-512mm) | | |
| Large bolder (> 512mm) | | |

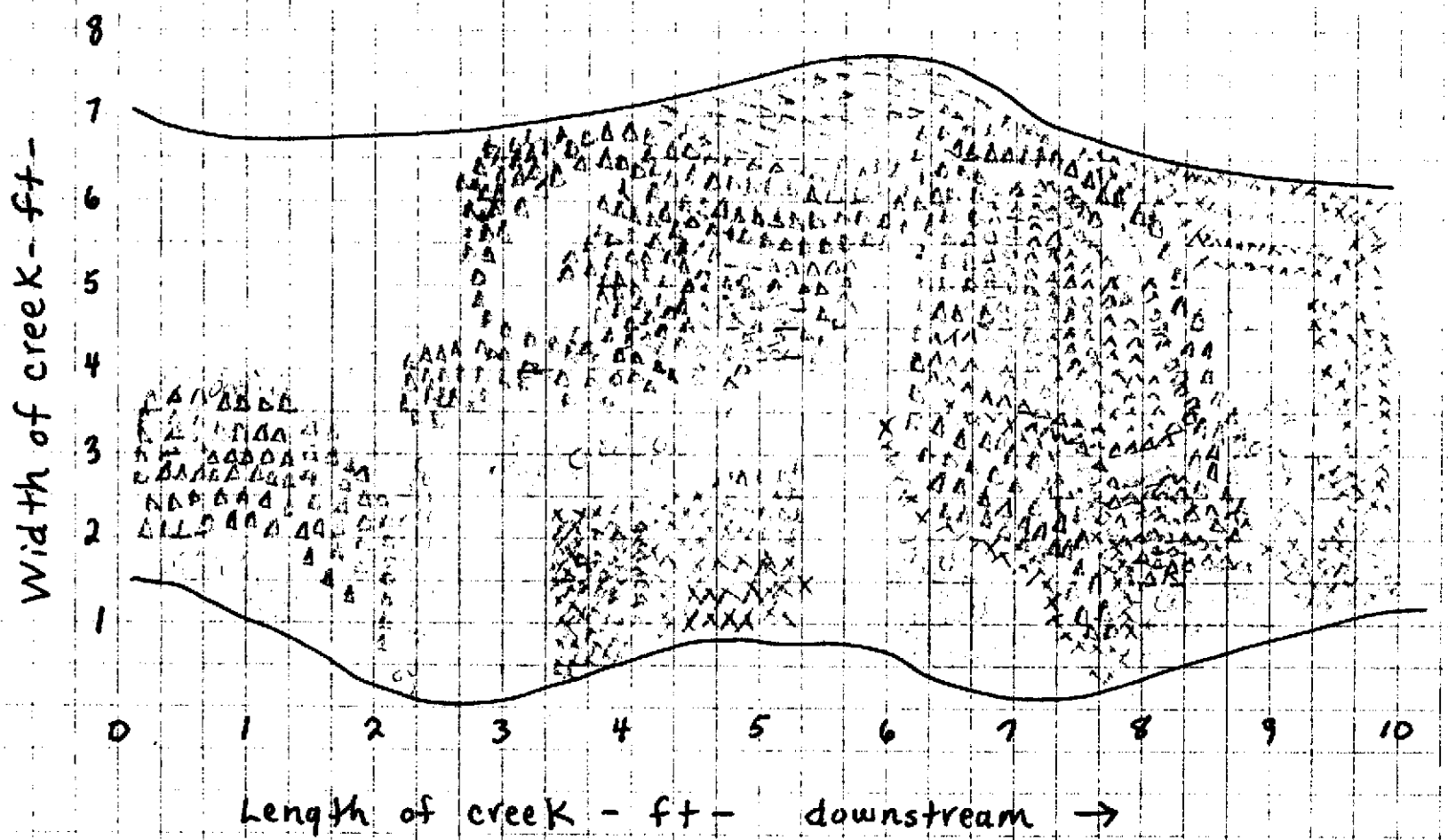
## Embeddedness

(an estimate of the average percent that cobbles are embedded) 20 %

## Consolidation

- ☒ Loose
- ☐ Moderately difficult to move
- ☐ Tightly cemented

Transect $6_1$ Monighan Creek
9-30-99



# STREAM BOTTOM SURVEY

Names _____ Date 10-11-99 Transect # _____

Creek/Stream Name North Clear Lake Creek Time am

Site Description (site name, landmarks, etc.) _____

Each partnership of students completed a chart and drawing like this so we have approximately 300 feet of the creek bottom graphed.

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☒ | ☒ | Clear/Sunny |
| ☐ | ☐ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

| **Substrate size** (percent stream bottom that each size represents) | % | **Color Key** |
|---|---|---|
| Silt, clay, mud | 20 | [illegible] |
| Sand (< 0.2 mm) | 20 | [illegible] |
| Fine gravel (2mm-8mm) | 10 | [illegible] |
| Medium gravel (8mm-16mm) | 20 | |
| Coarse gravel (16mm-64mm) | | |
| Cobble (64mm-128mm) | 20 | |
| Large cobble (128mm-256mm) | | |
| Boulder (256mm-512mm) | | |
| Large bolder (> 512mm) | | |

## Embeddedness

(an estimate of the average percent that cobbles are embedded) 25 %

## Consolidation

- ☒ Loose
- ☐ Moderately difficult to move
- ☐ Tightly cemented

# WATER QUALITY

Names _____ Date 10-18-99 Transect # summary

Creek/Stream Name Monighan Creek Time am

Site Description (site name, landmarks, etc.) _____

These are averages for the 10 sites that students completed.

Air Temperature: 12 ° C

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☐ | ☐ | Clear/Sunny |
| ☐ | ☐ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

## Quantitative Water Quality

| pH | Dissolved $O_2$ | Temperature |
|---|---|---|
| 1. _____ | 1. _____ | 9 ° C |
| 2. _____ | 2. _____ | |
| 3. _____ | 3. _____ | _____% Dissolved Oxygen Saturation |
| mean 7.1 | mean 9 ppm | |

| Nitrate (mg / L) | Phosphate (mg / L) | Secchi Disk |
|---|---|---|
| 1. _____ | 1. _____ | 1. _____ |
| 2. _____ | 2. _____ | 2. _____ |
| 3. _____ | 3. _____ | 3. _____ |
| mean 0.16 | mean 0.09 | mean visible to bottom all but one hole |

## Qualitative Water Quality

| Water Appearance | Stream Bed Coating | Odor |
|---|---|---|
| ☐ Scum | ☐ Orange to red | ☐ Rotten egg |
| ☐ Foam | ☐ Yellowish | ☐ Musky |
| ☐ Muddy | ☐ Black | ☐ Acrid |
| ☐ Milky | ☐ Brown | ☐ Chlorine |
| ☐ Clear | ☐ None | ☐ None |
| ☐ Oily sheen | | |
| ☐ Brownish | | |
| Other _____ | Other _____ | Other _____ |

**Comments:**

dry fall -

# WATER QUALITY

Names _____ Date 10-11-99 Transect # _____

Creek/Stream Name North Clear Lake Creek Time am

Site Description (site name, landmarks, etc.) _____

_____

_____

Air Temperature: 12 ° C

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☐ | ☐ | Clear/Sunny |
| ☐ | ☐ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

## Quantitative Water Quality

| pH | Dissolved $O_2$ | Temperature |
|---|---|---|
| 1. 6.8 | 1. 7 ppm | 12 ° C |
| 2. | 2. 7 ppm | |
| 3. | 3. | _____% Dissolved Oxygen Saturation |
| mean | mean | |

| Nitrate (mg / L) | Phosphate (mg / L) | Secchi Disk |
|---|---|---|
| 1. | 1. | 1. |
| 2. | 2. | 2. |
| 3. | 3. | 3. |
| mean 0.2 | mean 0.10 | mean visible to bottom |

## Qualitative Water Quality

| Water Appearance | Stream Bed Coating | Odor |
|---|---|---|
| ☐ Scum | ☐ Orange to red | ☐ Rotten egg |
| ☐ Foam - some | ☐ Yellowish | ☐ Musky |
| ☐ Muddy | ☐ Black | ☐ Acid |
| ☐ Milky | ☐ Brown | ☐ Chlorine |
| ☒ Clear | ☒ None | ☒ None |
| ☐ Oily sheen | | |
| ☐ Brownish | | |
| Other | Other | Other |

**Comments:**

# CROSS SECTION FLOW SURVEY

Names _____ Date 10-18-99 Transect # 6

Creek/Stream Name Monighan Creek Time _____

Site Description (site name, landmarks, etc.) _____

An example of one pair of student data.

Air Temperature 12 °C

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☐ | ☐ | Clear/Sunny |
| ☒ | ☒ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

## Horizontal Distance:

| Left bank wetted edge to right bank wetted edge. | Bank full left edge | Bank full right edge |
|---|---|---|
| 7.0 ft. | 1.0 ft. | 1.3 ft. |

## Cross Sectional Area:

Record depths at 0.5 ft intervals Depth = D

Cross Section 1

| # | D | # | D |
|---|---|---|---|
| 0.5 | .5 | 5.5 | .8 |
| 1.0 | .5 | 6.0 | .5 |
| 1.5 | 1.5 | 6.5 | .5 |
| 2.0 | 1.6 | 7.0 | .3 |
| 2.5 | 1.6 | 7.5 | |
| 3.0 | 1.6 | 8.0 | |
| 3.5 | 1.8 | 8.5 | |
| 4.0 | 1.6 | 9.0 | |
| 4.5 | 1.6 | 9.5 | |
| 5.0 | 1.2 | 10. | |
| | | ( | 17.0 |

Cross Section 2

| # | D | # | D |
|---|---|---|---|
| 0.5 | .5 | 5.5 | .5 |
| 1.0 | .5 | 6.0 | .5 |
| 1.5 | 1.0 | 6.5 | .1 |
| 2.0 | 1.0 | 7.0 | |
| 2.5 | 1.2 | 7.5 | |
| 3.0 | 1.3 | 8.0 | |
| 3.5 | 1.4 | 8.5 | |
| 4.0 | 1.2 | 9.0 | |
| 4.5 | 1.0 | 9.5 | |
| 5.0 | 1.5 | 10.0 | |
| | | + | 11.7 |

Cross Section 3

| # | D | # | D |
|---|---|---|---|
| 0.5 | .3 | 5.5 | 1.0 |
| 1.0 | .6 | 6.0 | 1.0 |
| 1.5 | .6 | 6.5 | .5 |
| 2.0 | .8 | 7.0 | .5 |
| 2.5 | 1.2 | 7.5 | |
| 3.0 | 1.3 | 8.0 | |
| 3.5 | 1.6 | 8.5 | |
| 4.0 | 1.1 | 9.0 | |
| 4.5 | 1.6 | 9.5 | |
| 5.0 | 1.7 | 10.0 | |
| | | + | 13.9 |

) / 3 = 14.2

## Velocity Float Trials:

| Trial # | Time |
|---|---|
| 1 | 80 |
| 2 | 85 |
| 3 | 70 |
| Total | |

Distance: 10 ft.

235/3 = 78

total time/# of trials — avg. time

**Average Cross Sectional Area =** 7.1 sq. ft (multiply sums by 2 if depths were measured in 2 ft. intervals)

**Comments:**

Multiplied by .5 because measured at .5 ft intervals.

**Average Surface Velocity** = 10 ft / 78 sec (distance/avg. time) = .13 feet/sec. **X (0.8)** (velocity correction factor) = **Average Corrected Velocity** = .10

**Flow** = .10 (Avg. Corrected Velocity) **ft/sec. X** 7.1 (Avg. Cross Sectional Area) **sq. ft** = .71 **CFS** (cubic feet/second)

# CROSS SECTION FLOW SURVEY

Names _____ Date 10-11-99 Transect # 6

Creek/Stream Name North Clear Lake Creek Time _____

Site Description (site name, landmarks, etc.) _____

An example of one pair of student data.

Air Temperature 14 °C

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☐ | ☐ | Clear/Sunny |
| ☐ | ☐ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

## Horizontal Distance:

| Left bank wetted edge to right bank wetted edge. | Bank full left edge | Bank full right edge |
|---|---|---|
| 6.0 – 7.0 ft. | .5 ft. | .4 ft. |

## Cross Sectional Area:

Record depths at 0.5 ft intervals Depth = D

Cross Section 1

| # | D | # | D |
|---|---|---|---|
| 0.5 | 1.1 | 5.5 | 1.2 |
| 1.0 | 1.3 | 6.0 | .7 |
| 1.5 | 1.1 | 6.5 | |
| 2.0 | 1.0 | 7.0 | |
| 2.5 | .8 | 7.5 | |
| 3.0 | .9 | 8.0 | |
| 3.5 | .6 | 8.5 | |
| 4.0 | .6 | 9.0 | |
| 4.5 | 1.0 | 9.5 | |
| 5.0 | 1.0 | 10. | |
| | | ( | 12.8 |

Cross Section 2

| # | D | # | D |
|---|---|---|---|
| 0.5 | .6 | 5.5 | .6 |
| 1.0 | 1.1 | 6.0 | .4 |
| 1.5 | 1.1 | 6.5 | |
| 2.0 | 1.6 | 7.0 | |
| 2.5 | 1.6 | 7.5 | |
| 3.0 | .3 | 8.0 | |
| 3.5 | .9 | 8.5 | |
| 4.0 | .8 | 9.0 | |
| 4.5 | .6 | 9.5 | |
| 5.0 | .6 | 10.0 | |
| | | + | 10.2 |

Cross Section 3

| # | D | # | D |
|---|---|---|---|
| 0.5 | .7 | 5.5 | 1.6 |
| 1.0 | 1.6 | 6.0 | 1.5 |
| 1.5 | 1.8 | 6.5 | .2 |
| 2.0 | 1.8 | 7.0 | .2 |
| 2.5 | 1.6 | 7.5 | |
| 3.0 | 1.6 | 8.0 | |
| 3.5 | 1.0 | 8.5 | |
| 4.0 | 1.6 | 9.0 | |
| 4.5 | 1.8 | 9.5 | |
| 5.0 | 1.8 | 10.0 | |
| | | + | 10.7 |

) / 3 = 11.2

## Velocity Float Trials:

| Trial # | Time |
|---|---|
| 1 | 52 |
| 2 | 56 |
| 3 | 83 |
| Total | |

Distance: 10 ft.

191/3 = 63

total time/# of trials — avg. time

**Average Cross Sectional Area** = 5.6 sq. ft (multiply sums by 2 if depths were measured in 2 ft. intervals)

**Comments:**

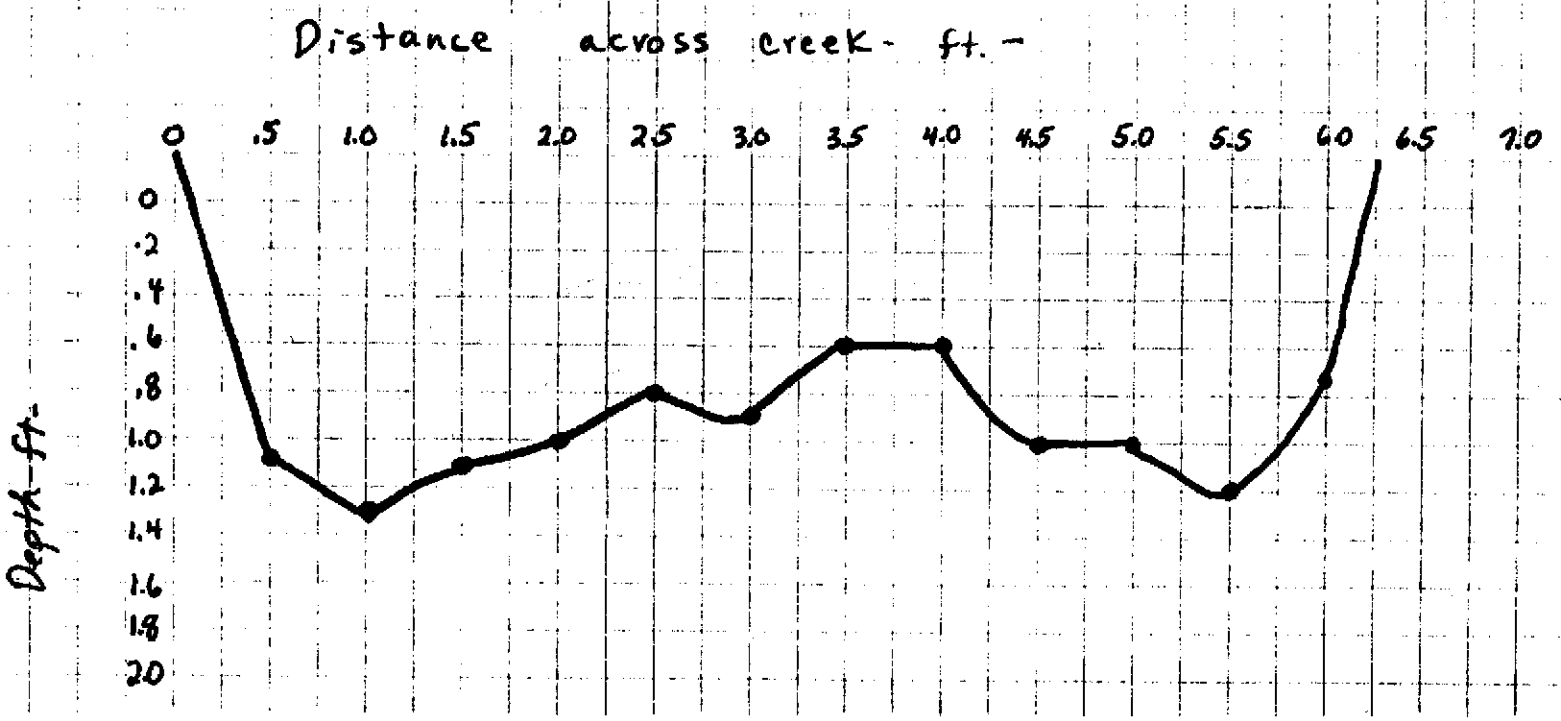
Multiplied by .5 because measured at .5 ft intervals.

**Average Surface Velocity** = 10 ft / 63 sec (distance/avg. time) = .16 feet/sec. **X (0.8)** (velocity correction factor) = **Average Corrected Velocity** = .13

**Flow** = .13 (Avg. Corrected Velocity) **ft/sec. X** 5.6 (Avg. Cross Sectional Area) **sq. ft** = .71 **CFS** (cubic feet/second)

North Clear Lake Creek

Date 10-11-99



# FISH SURVEY

Names _____ Date 8-18-99 Transect # 1-5

Creek/Stream Name Monighan Time am

Site Description (site name, landmarks, etc.) _____

1 seine haul through 150 ft.

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☒ | ☒ | Clear/Sunny |
| ☐ | ☐ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

| Type/Species (if known) | number |
|---|---|
| Northern red belly dace | 28 |
| Common shiner | 82 |
| Green sunfish | 2 |
| Creek chub | 46 |
| White sucker | 8 |
| Fathead minnow | 268 |
| Common stoneroller | 22 |
| Brook stickleback | 0 |
| Brassy minnow | 14 |
| Iowa darter | 11 |
| Blacknose dace | 18 |
| | |

# FISH SURVEY

Names _____ Date 10-18-99 Transect # 1-5

Creek/Stream Name Monighan Time am

Site Description (site name, landmarks, etc.) _____

1 seine haul through 150 ft.

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☐ | ☐ | Clear/Sunny |
| ☒ | ☒ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

| Type/Species (if known) | number |
|---|---|
| Northern red belly dace | 41 |
| Common shiner | 117 |
| Green sunfish | 1 |
| Creek chub | 71 |
| White sucker | 11 |
| Fathead minnow | 226 |
| Common stoneroller | 6 |
| Brook stickleback | 1 |
| Brassy minnow | 21 |
| Iowa darter | 6 |
| Blacknose dace | 42 |
| | |

# FISH SURVEY

Names _____ Date 10-11-99 Transect # 2-6

Creek/Stream Name North Clear Lake Creek Time am

Site Description (site name, landmarks, etc.) _____

1 seine haul through 150 ft.

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☒ | ☐ | Clear/Sunny |
| ☐ | ☒ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

| Type/Species (if known) | number |
|---|---|
| Fathead minnow | 87 |
| Creek chub | 118 |
| Brassy minnow | 22 |
| Brown bullhead | 4 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

# MACROINVERTEBRATE SURVEY

Names _____ Date 10-18-99 Transect # 1

Creek/Stream Name Monighan Creek Time am

Site Description (site name, landmarks, etc.) _____

This is typical results of 1 pair of students' results.

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☐ | ☐ | Clear/Sunny |
| ☒ | ☒ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

| Families in major groups | # | Tolerance value | | # | Tolerance value |
|---|---|---|---|---|---|
| mayflies | | | | | |
| spiny crawler | 2 | 1 | true flies: midges | 3 | 6 |
| small minnow | 1 | 4 | craneflies | | |
| | | | blackflies | | |
| | | | others | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | dobsonflies, alderflies, fishflies | 2 | |
| stoneflies | | | beetles | 4 | 4-5 |
| common stonefly | 1 | 1 | dragonflies/damselflies | | |
| | | | crustaceans: crayfish | 3 | |
| | | | sowbugs | | |
| | | | scuds | 12 | 4-5 |
| | | | others | | |
| | | | | | |
| | | | | | |
| | | | | | |
| caddisflies | | | snails | 2 | 6-8 |
| northern casemakers | 4 | 4 | clams & mussels | | |
| longhorned casemakers | 2 | 4 | worms & leeches | 2 | 10 |
| humpless casemaker | 1 | 1 | others | | |
| finger-net | 1 | 3 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

# MACROINVERTEBRATE SURVEY

Names _____ Date 10-11-99 Transect # _____

Creek/Stream Name North Clear Lake Creek Time am

Site Description (site name, landmarks, etc.) _____

These are typical results for one transect for one pair or partnership of students.

**Weather**

| Now | Past 48 Hours | |
|---|---|---|
| ☒ | ☒ | Clear/Sunny |
| ☐ | ☐ | Overcast |
| ☐ | ☐ | Showers |
| ☐ | ☐ | Rain (steady) |
| ☐ | ☐ | Storm (heavy) |

| Families in major groups | # | Tolerance value | | # | Tolerance value |
|---|---|---|---|---|---|
| mayflies | | | | | |
| small minnow | 1 | 4 | true flies: midges | 2 | |
| | | | craneflies | 1 | |
| | | | blackflies | | |
| | | | others | | |
| | | | watersnipe fly | 1 | |
| | | | | | |
| | | | | | |
| | | | dobsonflies, alderflies, fishflies | 3 | |
| stoneflies | | | beetles | 22 | |
| | | | dragonflies/damselflies | 2 | |
| | | | crustaceans: crayfish | 2 | |
| | | | sowbugs | 2 | |
| | | | scuds | 2 | 4-5 |
| | | | others | | |
| | | | | | |
| | | | | | |
| | | | | | |
| caddisflies | | | snails | 3 | 6-8 |
| northern casemaker | 1 | 4 | clams & mussels | 1 | |
| | | | worms & leeches | 3 | 10 |
| | | | others | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Note:** Water scorpions were found by every group of students – about 25 collected by the class.

# Attachments

The attachments included with this report are examples of data collected. The two with August dates were completed by the instructor. The others were completed by students. If the data is a class summary, the transect blank states *summary* or is described in the site description. If the data is a sample from one transect, the transect number is in the transect blank. Also included are the pre and post assessment survey and an example of a curriculum worksheet.

# Pre and Post Assessment Survey

1. What are wetlands? Give 2 examples.

2. What benefits to the environment are the presence of wetlands?

3. What problems may the presence of wetlands cause?

4. Name 4 lakes in Deuel County.

5. What is a watershed?

6. What major waterway or drainage system do the creeks in Deuel County flow into?

7. Name 4 named creeks in Deuel County.

8. What township do you live in?

9. What factors affect habitat for fish living in a stream or creek in Deuel County?

10. What are macroinvertebrates?

11. What factors affect habitat for macroinvertebrates in a stream or creek in Deuel County?

12. Name 3 different species of minnows.

13. How many different species of minnows live in the creeks of Deuel County?

14. What biological keys have you used?

15. What field experiences have you had?

16. What factors affect the volume of flow of a stream or creek?

17. How do rains affect streams?

18. What chemical factors affect life in a stream or creek?

19. What procedures must be followed so data collected or organisms identified are valid?

20. What land use issues and/or pollution issues may be of concern in Deuel County?

ADVANCED BIOLOGY – Typical Study Guide Sheet Name_____

Define:

1. Pools

2. Runs

3. Riffle

4. Glides

5. How can you estimate overhead shade canopy? (P. 85)

6. Define substrate

7. Name the finest sediments to the largest by order of size from smallest to largest.

8. How can turbidity affect plants?

9. How can turbidity affect animals?

10. Define cobble embeddedness

11. How does cobble embeddedness affect habitat?

12. How does compaction of substrate affect habitat?

13. Look on P. 104 – What are the choices for consolidation and how does that relate to compaction of the substrate?

14. Look at #1 and #2 P. 102 - How do you estimate cobble embeddedness?