Use Attainability Analysis

1 Water Body Name	Cardinal Creek
2 Segment Description	Mouth to Radcliffe STP outfall
3 Segment Length (mi)	6.3
4 Drainage Area (sq. mi.)	14.3
5 Segment Start Latitude, Longitude (DD)	42.29853, -93.31948
6 Segment End Latitude, Longitude (DD)	42.30680, -93.40514
7 Route of Flow (Next Downstream Adopted Designated Use)	Cardinal Creek (A2, BWW2, proposed to A1, BWW2, proposed) to Honey Creek (A2, pending, BWW2, existing, to A3, pending, BWW2, existing, to A2, pending, BWW2, existing) to Iowa River (A1, BWW1, HH)
8 NPDES Facility and Permit Number (If Applicable)	Radcliffe, City of STP (4283001)
9 Sample Site ID(s)	1328-1, 1328-2, 1328-3
10 Segment County Name(s)	Hardin
11 Field Work Date(s)	8/17/2017

12 Aquatic Life Use Attainability Analysis - Conclusion

Recommended Highest Attainable Use: Aquatic Life Use	BWW2
40 CFR 131.10(g)(2) (Flow)	The natural low flow conditions of the stream segment are insufficient to create the habitat necessary to support a viable community of game fish. A lack of age ranges and diversity of game fish species indicates a non-reproducing population (see Site Observations Table). A BWW1 designation requires multiple species and age ranges to be viable. Therefore, the highest attainable aquatic life use for this stream segment is BWW2.
40 CFR 131.10(g)(5) (Physical Conditions)	Physical conditions related to the natural features of the water body are insufficient to support a viable community of game fish. Drainage area and stream width fall within the “consistently negative” game fish indicator responses (see Table 2 in Appendix I). Average depth and maximum depth for 1328-3 also fall within the “consistently negative” game fish indicator responses. A lack of age ranges and diversity of game fish species indicates a non-reproducing population (see Site Observations Table). A BWW1 designation requires multiple species and age ranges to be viable. Therefore, the highest attainable aquatic life use for this stream segment is BWW2.

13 Recreational Use Attainability Analysis - Conclusion

Extent:	Mouth (42.29853, -93.31948) to G Ave. (42.29880, -93.36610)
Recommended Highest Attainable Use: Recreational Use	A1
40 CFR 131.10(g)(2) (Flow)	Water levels and flow are sufficient to support full body immersion (see Site Observations Table). Therefore, the highest attainable recreational use for this stream segment is A1.

Extent:	G Ave. (42.29880, -93.36610) to Radcliffe STP outfall (42.30680, -93.40514)
Recommended Highest Attainable Use: Recreational Use	A2

40 CFR 131.10(g)(2) (Flow)	The natural low flow conditions and water levels of the stream segment prevent the attainment of an A1 recreational use (see Site Observations Table). An A1 designation requires the ability for full body immersion. Therefore, the highest attainable recreational use is A2.

14 Flow

Field Work Date	Description
8/17/2017	USGS stream gage data for the area indicated stream flows were normal at the time of assessment.

Use Attainability Analysis - Data

Site Observations

Use	Site parameter	Site ID # 1328-1
AL/R	**15 Latitude, Longitude (DD)**	42.30665, -93.40501
AL/R	**16 Average Depth (in)**	Not measured
AL/R	**17 Maximum Depth (in)**	Not measured
AL/R	**18 Stream Width (ft)**	Not measured
AL/R	**19 Pools Observed?**	N/A
AL only	**20 Non-Game Fish Present and Counts (Species: Number)**	Not sampled
	21 Game Fish Present and Counts (Species (Size Range): Number)	Not sampled
	22 Stream Habitat (See also: #29 Site Photos)	N/A
R only	**23 Evidence of Use for Primary Contact Recreation? (Yes*/No)**	No
	24 Evidence of Use by Children? (Yes*/No)	No
	25 Evidence of Use for Secondary Contact Recreation? (Yes*/No)	No
AL/R	**26 Additional Description**	Water flowing out of a tile line. Likely outfall location. Flows ease into pasture.

Use	Site parameter	Site ID # 1328-2
AL/R	**15 Latitude, Longitude (DD)**	42.29880, -93.36619
AL/R	**16 Average Depth (in)**	5.5
AL/R	**17 Maximum Depth (in)**	>39
AL/R	**18 Stream Width (ft)**	7.3
AL/R	**19 Pools Observed?**	Yes
AL only	**20 Non-Game Fish Present and Counts (Species: Number)**	Blacknose dace: 21 Central stoneroller: 25 Common shiner: 18 Creek chub: 34 Fathead minnow: 33 Johnny darter: 8 White sucker: 60
	21 Game Fish Present and Counts (Species (Size Range): Number)	None
	22 Stream Habitat (See also: #29 Site Photos)	50x50 foot pool downstream. Not much shading, abundant fish and overhanging vegetation along banks.
R only	**23 Evidence of Use for Primary Contact Recreation? (Yes*/No)**	No
	24 Evidence of Use by Children? (Yes*/No)	No
	25 Evidence of Use for Secondary Contact Recreation? (Yes*/No)	No

Use	Site parameter	Site ID # 1328-2
AL/R	**26 Additional Description**	N/A

Use	Site parameter	Site ID #1328-3
AL/R	**15 Latitude, Longitude (DD)**	42.29604, -93.32250
AL/R	**16 Average Depth (in)**	2
AL/R	**17 Maximum Depth (in)**	18
AL/R	**18 Stream Width (ft)**	6
AL/R	**19 Pools Observed?**	Yes
AL only	**20 Non-Game Fish Present and Counts (Species: Number)**	Bigmouth shiner: 15 Blacknose dace: 39 Bluntnose minnow: 12 Central stoneroller: 43 Common shiner: 36 Creek chub: 95 Fathead minnow: 12 Hornyhead chub: 1 Johnny darter: 23 Unknown: 2 White sucker: 6
	21 Game Fish Present and Counts (Species (Size Range): Number)	None
	22 Stream Habitat (See also: #29 Site Photos)	Overhanging vegetation, attached algae abundant. Few deeper pools. Good shade.
R only	**23 Evidence of Use for Primary Contact Recreation? (Yes*/No)**	No
	24 Evidence of Use by Children? (Yes*/No)	No
	25 Evidence of Use for Secondary Contact Recreation? (Yes*/No)	No
AL/R	**26 Additional Description**	N/A

AL = Aquatic Life
R = Recreation
*If yes, elaborate.

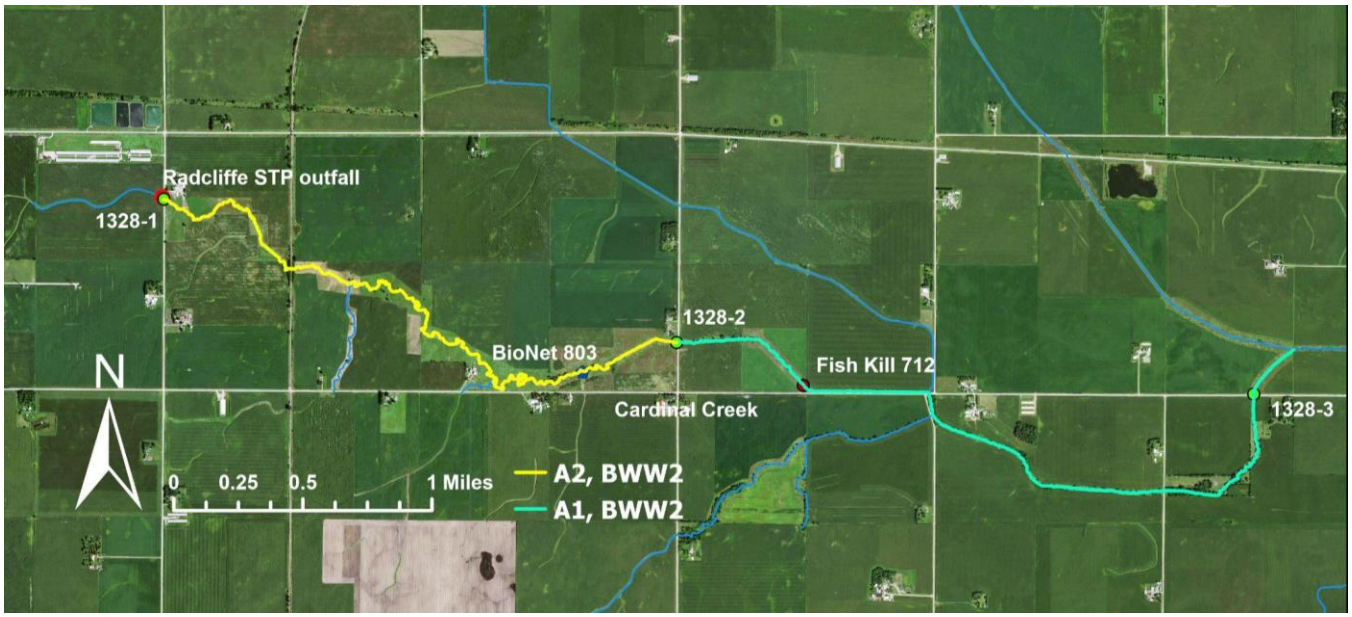
27 Supplemental Data

Use	Site parameter	BioNet Site ID #803
AL/R	**Latitude, Longitude (DD)**	42.29713, -93.37328
AL/R	**Field Work Date**	10/12/2011
AL/R	**Average Depth (in)**	N/A
AL/R	**Maximum Depth (in)**	N/A
AL/R	**Pools Observed?**	N/A
AL only	**Non-Game Fish Present and Counts (Species: Number)**	Bigmouth shiner: 73 Bluntnose minnow: 5 Central stoneroller: 63 Common shiner: 23 Creek chub: 329 Fathead minnow: 151 Johnny darter: 53 Western blacknose dace: 211 White sucker: 8

Use	Site parameter	BioNet Site ID #803
	Game Fish Present and Counts (Species (Size Range): Number)	None
AL/R	**Additional Description**	https://programs.iowadnr.gov/bionet/Sites/803/Report

Use	Site parameter	Fish Kill Site ID #712
AL/R	**Latitude, Longitude (DD)**	42.29641, -93.35657
AL/R	**Field Work Date**	8/19/2006
AL only	**Non-Game Fish Present and Counts (Species: Number)**	7,258
	Game Fish Present and Counts (Species (Size Range): Number)	None
AL/R	**Additional Description**	https://programs.iowadnr.gov/fishkill/events/712

28 Map of Segment, Outfall, and Site(s)



29 Site Photos

Figure 1. 1328-1 View upstream.

Figure 2. 1328-1 View downstream.

Figure 3. 1328-1 Outfall.

Figure 4. 1328-2 Recreational use assessment midpoint looking upstream.

Figure 5. 1328-2 Recreational use assessment midpoint looking downstream.

Figure 6. 1328-2 Recreational use assessment upstream looking upstream.

Figure 7. 1328-2 Recreational use assessment upstream looking downstream.

Figure 8. 1328-2 Recreational use assessment downstream looking upstream.

Figure 9. 1328-2 Recreational use assessment downstream looking downstream.

Figure 10. 1328-2 Beaver dam downstream of road.

Figure 11. 1328-2 Culvert under road.

Figure 12. 1328-2 Start of aquatic assessment view upstream.

Figure 13. 1328-2 End of aquatic assessment view upstream.

Figure 14. 1328-2 End of aquatic assessment view downstream.

Figure 15. 1328-2 White sucker.

Figure 16. 1328-3 Recreational use assessment midpoint looking upstream.

Figure 17. 1328-3 Recreational use assessment midpoint looking downstream.

Figure 18. 1328-3 Recreational use assessment upstream looking upstream.

Figure 19. 1328-3 Recreational use assessment upstream looking downstream.

Figure 20. 1328-3 Recreational use assessment downstream looking upstream.

Figure 21. 1328-3 Recreational use assessment downstream looking downstream.

Figure 22. 1328-3 Start of aquatic assessment looking upstream.

Figure 23. 1328-3 View upstream from bridge.

Figure 24. 1328-3 Hornyhead chub.

Appendix I.

c. Stream Flow and Habitat Data

Data analysis results for stream flow and habitat variables were similar to game fish indicator results. Stream width, average thalweg depth, maximum depth, and flow appear to be the characteristics that correlate the best with consistently positive game fish indicators. Stream flow and habitat dimensions (where available) were consistently larger for streams with watershed sizes exceeding 275 square miles. Habitat measurements are not available for the largest sample sites that were sampled by boat instead of the typical wading method.

Ranges of stream size, habitat and flow associated with varying levels of game fish indicator responses are listed in Table 2. These are general statewide values, which may assist in decision making related to the recommendation of warm water aquatic life use designations. In general terms, stream segments that have watershed area, flow and habitat characteristics in the green shaded boxes have a greater probability that game fish indicators will be consistently positive (i.e., consistent with Class B(WW-1)), while stream habitat and flow levels that equate to the red boxes are much less likely to support game fish populations (i.e., Class B(WW-2) or Class B(WW-3)). Stream segments that have a mixture of characteristics, mainly in the yellow range, may require consideration of the additional habitat features collected during the field assessment, to determine the appropriate aquatic life use designation.

Table 2. Generalized statewide ranges of stream habitat indicator levels and associated game fish indicator responses.

Game Fish Indicator Responses	Stream Watershed Area (sq.mi.)	Stream Flow (typical base flow - cfs)	Stream Width Average (ft)	Average Depth (ft)	Avg. Thalweg Depth (ft)	Maximum Depth (ft)
Consistently Positive	>275	>30	>65	>1.2	>2.2	>4.4
Mixed	25-275	0.8-30	11-65	0.2-1.2	0.8-2.2	1.8-4.4
Consistently Negative	<25	<0.8	<11	<0.2	<0.8	<1.8

Iowa uses U.S. EPA's Level IV Ecoregions as a template for wadeable stream biological condition assessment. Stream flow and habitat characteristics can vary from ecoregion to ecoregion. To provide additional insight into where the area of overlap exists between Class B(LR/WW-2) and Class B(WW/WW-1) streams, a query of Iowa's bioassessment database produced 476 habitat assessment records from which a summary of habitat characteristics was prepared (Table 3a-f) (see appendix for full spreadsheet). The summary is grouped by ecoregion and **former** designated uses in order to illustrate the extremes and ranges of overlap in habitat characteristics.