

TRIENNIAL STANDARDS REVIEW OF BADFISH CREEK,
OREGON BRANCH. RECEIVING STREAM FOR THE
VILLAGE OF OREGON AND THE MADISON METROPOLITAN
SEWAGE DISTRICT WASTEWATER TREATMENT FACILITIES.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

January, 1990

Prepared by David Marshall

BACKGROUND INFORMATION

Oregon Branch originates within the Village of Oregon and flows southeast approximately 10 miles to the confluence with Rutland Branch in Section 16, T5N, R10E to form Badfish Creek. Historically, Oregon Branch was considered marginal trout water, however the entire stream had been ditched for agricultural drainage since the 1920's. Since the early 1950's the Village of Oregon has discharged municipal wastewater to the stream. By 1958, the Madison Metropolitan Sewage District (MMSD) had diverted wastewater from the Yahara Chain of Lakes to the stream. The combined effects of stream channelization, urban and agricultural nonpoint source pollution, and wastewater discharges have greatly modified the original stream characteristics.

Above the Oregon wastewater treatment facility, stream flow is intermittent. The USGS estimated Q7,10 is less than .01 cfs. For the first mile below Oregon, the treatment plant sustains most of the flow with an average discharge of 1.0 cfs. Near the confluence with the MMSD effluent ditch, groundwater seepage contributes to the flow as well. During storms and periods of snow melt, surface runoff substantially increases flow. Surface runoff from adjoining urban and agricultural land use have caused heavy deposition of silt over gravel and clay substrates. Based on the Hilsenhoff Biotic Index, macroinvertebrates collected in 1983 and 1988 indicated "good" and "fairly poor" water quality respectively. Representative macroinvertebrates were largely dominated by tolerant and very tolerant species in both years, but a larger percentage of the intolerant Gammarus pseudolimneus were found in 1983. Although Gammarus is considered intolerant of organic pollution, the amphipod is also successful in heavily silted and ditched streams that many desirable arthropods cannot tolerate. The fishery is dominated by central mudminnows, brook sticklebacks and fathead minnows based on a fish shocking survey performed on November 7, 1983.

Below the confluence with the MMSD effluent ditch, flow increases substantially with an average wastewater discharge of 56 cfs. Prior to the wastewater diversion in 1958 the Oregon Branch was characterized as a small muddy stream with a slow current. The baseflow in the stream was approximately 2 cfs (Surface Water Resources of Dane County, 1985). The fishery consisted of sucker and minnow populations (Dohrman, 1946). Following the 1958 wastewater diversion, the fishery was scarce because of very poor effluent quality even though the flow had increased roughly ten-fold. In 1975, the fishery in the Oregon Branch was limited to low number of fathead minnows, brook sticklebacks (Fago), and a few black bullheads (Magnuson). The seston and periphyton were dominated by organic deposits, filamentous bacteria, and stalked protozoans (Ball, 1978). Ammonia concentrations exceeded 10 mg/l. Another impact of poor effluent quality was excessive growth of sago pondweed which occasionally caused overnight dissolved oxygen levels to drop below 1.0 mg/l. The abundant aquatic plants in the stream also impeded flow and occasionally caused flooding along lower reaches of Badfish Creek. During the early 1980's, MMSD managed the sago pondweed nuisance by mechanical harvesting and limited herbicide applications.

A substantial amount of data has been generated documenting water quality of the Yahara Chain of Lakes and Badfish Creek before and after the wastewater diversion. Table 1 lists the major monitoring programs performed since 1946. During the 1980's, MMSD greatly expanded the data base by performing intensive chemical and biological monitoring from the effluent ditch downstream to the confluence with the Yahara River. The monitoring program clearly demonstrated substantial water quality improvements in Badfish Creek following completion of the Seventh Addition to MMSD's Nine Springs treatment plant in 1985. The construction of the Seventh Addition provided advanced nitrification which is the most significant impact on Badfish Creek since the 1958 diversion. Effluent and baseflow chemical sampling revealed NH_3 concentrations $<.04$ mg/l. Dissolved oxygen concentrations increased and reflected combination of low BOD_5 concentrations (ave. conc. <5 mg/l), advanced nitrification within the treatment plant, and signification reduction of sago pondweed growth. Dense sago pondweed beds disappeared as nutrient levels decreased but also when the effluent ditch was riprapped, ultimately scouring soft sediment (G. Stevens, personal communication). The impacts of reduced ammonia concentrations and increased dissolved oxygen levels are reflected by intensive fish shocking surveys and benthic macroinvertebrate collections. Diversity and total numbers of fish increased substantially following construction of the Seventh Addition. Aquatic invertebrate populations indicate improved water quality based on the Hilsenhoff Biotic Index. The results of biological and chemical monitoring are contained in comprehensive reports prepared by MMSD. Currently, the monitoring program continues and is part of MMSD's long-term water quality assessment of Badfish Creek.

Table 1: List of Studies Performed on the Yahara Chain
of Lakes and Badfish Creek

<u>Year</u>	<u>Investigator(s)</u>	<u>Study</u>
1943	Sawyer	Nuisance conditions in Yahara Lakes
1946	WI Cons Dept.	Biological Survey Badfish Creek
1948	Emelity and Hanson	Yahara River Sanitary Survey
1949	Fuller and Darrow	Yahara River Sanitary Survey
1950	Haggerty	Yahara River Sanitary Survey
1950	Roth	Yahara River Stream Poll.
1953	Teletzke	Yahara River Sanitary Survey
1957	Ernest	Badfish Creek Sanitary Survey
1957-Present	MMSD	Badfish Creek Chemical Monitoring
1960	McKenthum, Lueschow, McNabb	Effects of Wastewater Diversion
1961	Clesceri	Madison Lakes Before and After Diversion
1967	USGS	Badfish Creek Discharge Monitoring
1971	Lee and Veith	Effects of MMSD on Badfish Creek
1973	Syers and Iskandar	Hg Levels in Yahara Lakes Sediment
1974	Iskandar and Keenry	Heavy Metals in Yahara Lakes Sediment
1975-1981	WDNR	Ambient Monitoring at Badfish Creek Yahara River
1976	Magnuson and Herbst	Badfish Creek Stream
1976	Hilsenhoff and Kar	Badfish Creek Macroinvertebrates
1976	WDNR	Badfish Creek Fish Survey
1976	WDNR	Periphyton & Seston in Badfish Cr.
1976	WDNR	Badfish Creek Stream Classification
1976	WDNR	Badfish Creek Waste Load Allocation
1979-81	WDNR	Phosphate Ban Study on Badfish Cr.
1983-Present	MMSD	Badfish Cr. Fish & Macroinvert. Survey
1983	WDNR	Oregon Branch Macroinvertebrate and Fish Survey
1983	WDNR	Badfish Cr. Fish Contaminant Sur.
1987	WDNR	Hg Trends in Yahara Lakes
1988	WDNR	Hg Levels in Yahara Lakes
1989	WDNR	Contaminant Levels in Lake Monona
1989	MMSD	Badfish Creek Bacteriological Study
1989	MMSD	Badfish Cr. Macroinvert. Studies
1989	MMSD	Badfish Cr. Fish Surveys

Table 2: Oregon WWTP Discharge Monitoring Data
(Monthly Averages)

<u>Date</u>	<u>Flow</u> MGD (cfs)	<u>Sus. Solids</u> mg/l	<u>BOD₅</u> mg/l
11-88	.6221 (.96)	6	5
12-88	.6050 (.94)	5	4
01-89	.5994 (.93)	5	5
02-89	.6050 (.94)	4	5
03-89	.7207 (1.1)	4	5
04-89	.7446 (1.2)	4	5
05-89	.7441 (1.2)	3	3
06-89	.7234 (1.1)	2	2
07-89	.7066 (1.1)	4	3
08-89	.7271 (1.1)	3	4
09-89	.7058 (1.1)	6	4
10-89	.6762 (1.0)	4	4
11-89	.6368 (.99)	4	3

Table 3: MMSD Discharge Monitoring Data

<u>Date</u>	<u>Flow</u> MGD (cfs)	<u>Sus. Solids</u> mg/l	<u>BOD₅</u> mg/l	<u>NH₃</u> mg/l
11-88	34.14 (52.8)	5	3	
12-88	35.4 (54.8)	5	4	
01-89	35.45 (54.8)	7	7	
02-89	35.69 (55.2)	7	6	
03-89	37.55 (58.1)	5	4	
04-89	37.39 (57.8)	4	3	0.2
05-89	36.51 (56.5)	4	3	
06-89	36.62 (56.7)	4	3	
07-89	37.24 (57.6)	4	3	
08-89	37.46 (57.9)	5	4	
09-89	37.25 (57.6)	5	3	
10-89	35.44 (54.8)	6	4	0.3
11-89	34.52 (53.4)	10	6	0.3

Region SCR County Dane Report Date 1/1990 Classification LFF/LAL

Water Body: Badfish Creek, Oregon Branch

Discharger: V. of Oregon, MMSD

If stream is classified as Limited Forage Fish (LFF) or Limited Aquatic Life (LAL), check any of the following Use Attainability Analysis factors that are identified in the classification report:

- Naturally occurring pollutant concentrations prevent the attainment of use
- Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met
- Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place
- Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or operate such modification in a way that would result in the attainment of the use
- Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses
- Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact

Supporting Evidence in the report (include comments on how complete/thorough data is)

- Biological Data (fish/invert)
- Chemical Data (temp, D.O., etc.)
- Physical Data (flow, depth, etc.)
- Habitat Description
- Site Description/Map
- Other: slides,

Historical Reports in file:

- 1/1990 - Dave Marshall
- 7/21/77 - Douglas Morrisette
- 10/5/76 - Tom Bainbridge

Additional Comments/How to improve report:

- low flow limits this stream (1977) - * In absence of effluent discharge... doesn't discharge need to be considered?
- the 1990 report doesn't seem to include a class'n recommendation
- Check w/ Region on this class'n

DNR JUL 22 1977

CORRESPONDENCE/MEMORANDUM

STATE OF WISCONSIN

DNR - Southern District

Date: July 21, 1977

File Ref: 3200

(Jerry McKersie)

To: Anthony Earl

From: Douglas Morrisette

Subject: NR 104 Classification of Badfish Creek

On October 5, 1976, members of the Southern District Small Stream Classification Team classified the Oregon Branch of Badfish Creek as continuous surface waters not supporting a balanced aquatic community downstream to County Trunk A. From the County Trunk A bridge and for the remainder of Badfish Creek, the classification of continuous fish and aquatic life was offered. Badfish Creek was managed as a trout stream from 1937 to 1956 and trout were stocked in the stream beginning in 1933 through 1952. During this period of time, fisheries personnel gave Badfish Creek a trout stream classification of C which would approximate a Class 3 trout stream classification by today's standards. This low classification was due largely to the rather poor morphology of the stream. Badfish Creek has been ditched and straightened for practically its total length beginning in the 1920's. It is interesting to note that in a fisheries report compiled by Herbert Dohrman of the Southern District, in 1946, prior to the diversion of effluent, mention was made that the Rutland Branch of Badfish Creek exhibited a much higher water quality than did the Oregon Branch of Badfish Creek which now receives treated effluent. Mr. Dohrman stated, "Of the upper part, the right branch is the better since it has colder, clearer water and better bottoms. The left branch, the Oregon Branch, has muddy water, slower current, ditched areas and its sucker and minnow populations are already crowded." Mr. Dohrman also made mention of the fact that trout stocking activities, especially for rainbow trout, take place in the region of stream by County Trunk Highway A, as this was the most suitable habitat. Drawing from the citations of previous reports such as the one mentioned above and relying heavily on Madison Area Fish Manager Brynildson's evaluation of the fish potential of Badfish Creek under the influence of a clean effluent, it was agreed that a fish and aquatic classification could only be defended up to the mouth of the Rutland Branch to Badfish Creek. The County Trunk Highway A boundary is not an enigmatic point on Badfish Creek where the fisheries is expected to flourish, but rather is a well defined point with easy access for monitoring and while it is approximately one-half stream mile below the Rutland Branch mouth, it serves as a buffering agent for the improved water quality addition to Badfish Creek via the Rutland Branch. It also serves as the uppermost point of the better habitat contained in Badfish Creek. In a more recent report compiled by John Magnuson and Gary Herbst of the University of Wisconsin under grant monies from O'Brien & Gere Engineers, Inc., in 1976, the following is stated:

"It is unlikely that removal of sewage effluent from Badfish Creek would by itself result in the transformation of the fish fauna into a community similar to the Rutland Branch. The combined effects of ditching, deforestation and present agricultural practices result in a lowered water quality in a stream that 30 years ago was a subaverage trout stream. However, improved water quality would result in an improved sport fishery for other game fish. In contrast, increased sewage loading and reduced water quality would result in a downstream movement of the septic zone for fish causing the downstream region of Badfish Creek to lose its ability to support the current low populations of game fish. Further impairment of Badfish Creek water quality may also result in increased effects on the Yahara River."

It is felt by the Southern District Classification Team that the resulting classification of Badfish Creek provides equitably for the potential fisheries of Badfish Creek as well as its other recreational capabilities and for the communities who will have to upgrade their treatment systems to meet the real potentials of Badfish Creek.

The change in classification at County Trunk A recognizes the impact of Rutland Branch on the Badfish Creek and also differences in the stream above and below this point. Badfish Creek was evaluated, as is normally done in our stream classification work, as though there were no treatment plant effluents reaching it. Under these circumstances, Rutland Branch would add a substantial flow of very high quality water. Two other factors also supporting the fish and aquatic life classification below Highway A are the stream morphology and land use adjacent to the Creek. Compared to above the Rutland Branch, the bottom is more suitable, the gradient better, and the pool-riffle ratio better, all of which are more conducive to supporting a fish population. The existence of the Badfish Creek Wildlife Area is also helpful below County Highway A, since it provides a buffer adjacent to the stream, reducing the detrimental impact that some farming practices may have upon the fishery.

In the same way, the comparatively inferior morphology and the lack of the buffer above the Rutland Branch support a somewhat lower classification. The low flows that would exist in the Oregon Branch in the absence of treatment plant effluents would make support of a full time fishery difficult and indicate that the intermediate fish and aquatic life classification is appropriate.

In summary, the classification of the parts of Badfish Creek is quite clear when we imagine the stream without wastewater discharges and evaluate it based on the factors used. The flow conditions, morphological characteristics, and land use adjacent to the stream strongly support the classifications as established by the Southern District Small Stream Classification Team.

TB:cb

NOTED:

Madison Metro Sewerage District
Dane County

October 5, 1976

Madison Metro Sewerage District pumps its effluent to an effluent ditch which leads to Badfish Creek east of Oregon.

Badfish Creek - Surface Acres = 34.8 Miles, Miles = 14.5, Gradient = 4.1 feet per mile.

Originally a small stream tributary to the Yahara River, but now the recipient of a large amount of effluent from M.M.S.D. and from Oregon treatment utility. Prior to diversion the stream was considered marginal trout water; currently, it harbors small populations of suckers and panfish for about half its length. Over 42 acres of fresh meadow and shallow marsh adjoin the stream.

Recommendations

From the Madison Metro outfall to the juncture with Badfish Creek the classification should be wastewater effluent channel, marginal surface waters. From this juncture downstream to C.T.H. A the classification should be continuous surface waters not supporting a balanced aquatic community. From C.T.H. A downstream for the remainder of Badfish Creek the classification should be continuous fish and aquatic life.

The above recommendations represent a concurrence of opinion of the stream classification team who are as follows:

Jerry Friederichs - District Engineer
Clifford Brynildson - Area Fish Manager
Tom Bainbridge - District Biologist
Roger Schlessler - Natural Resources Technician

Respectfully submitted,


Thomas Bainbridge
Stream Classification Coordinator

RS:js

MADISON (CAPITOL) 12 MI.

CORPORATE BOUNDARY
T6N
T5N

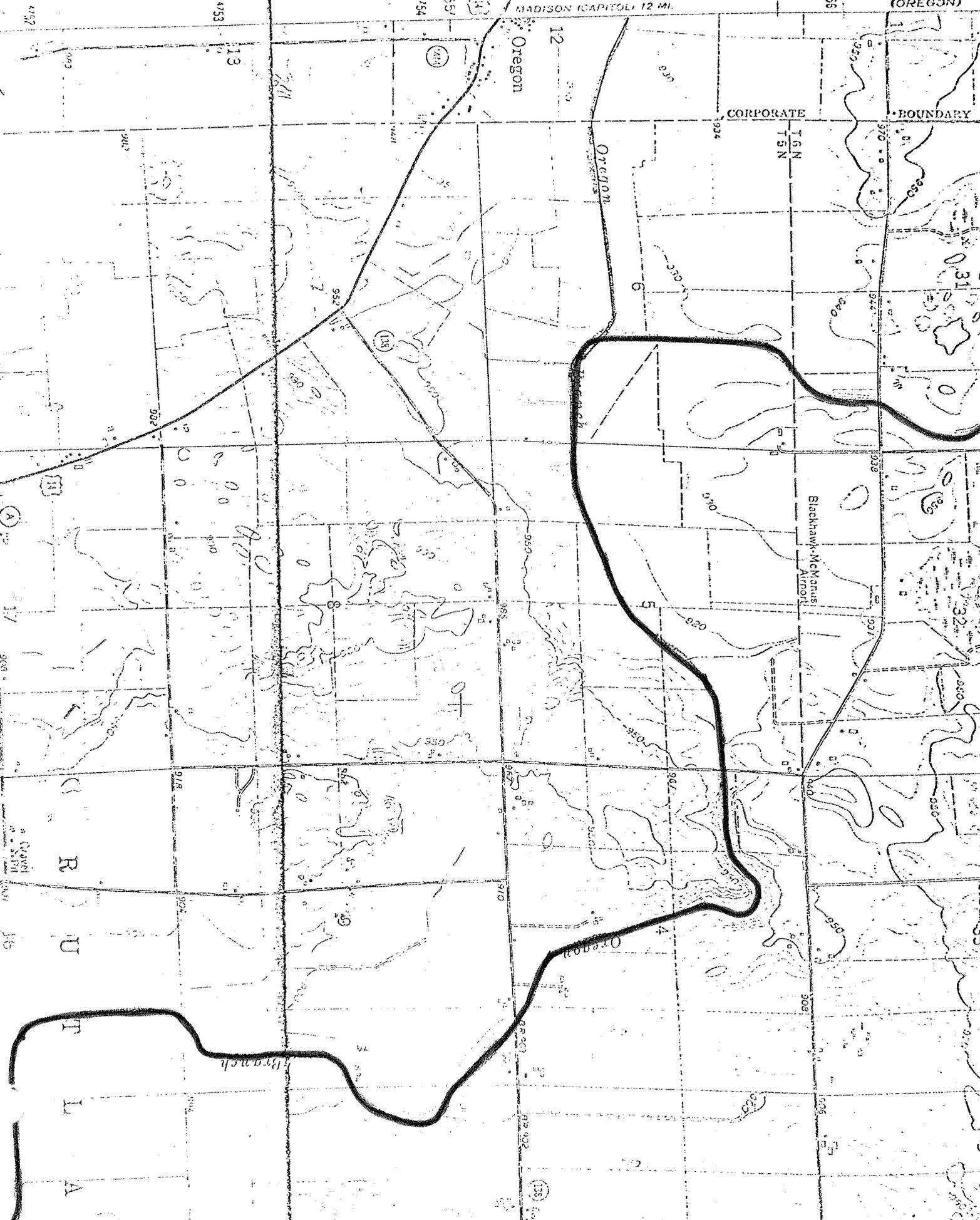
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Badfish

Quarry

DANE CO
ROCK CO

COOKSVILLE 0.5 MI.
EDGERTON 10 MI.

3,100,000
FEET

5 MILES

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RIDE

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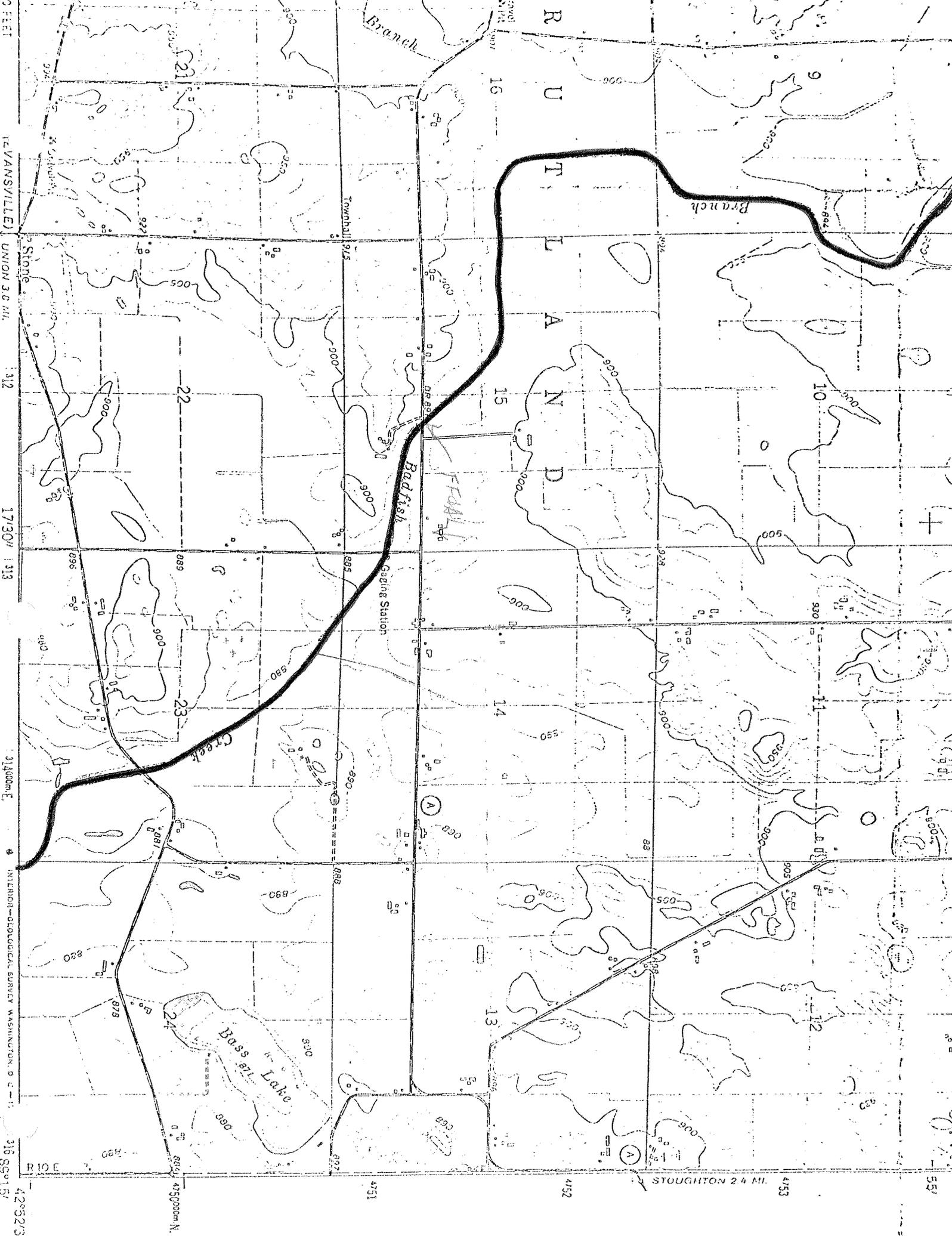
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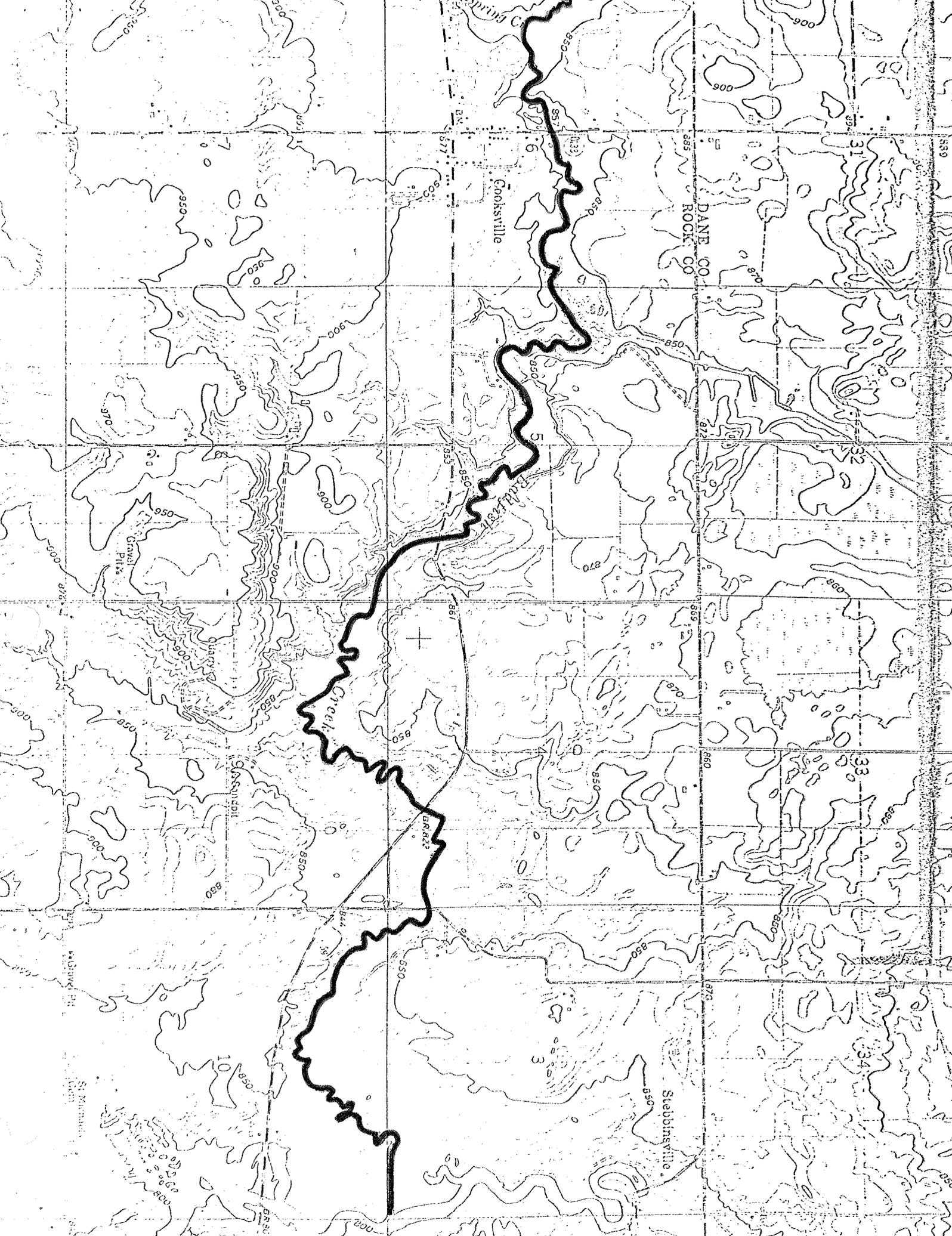
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Gaging Station
Towhall 915
Bassett Lake
Stone
Branch
STOUGHTON 2.4 MI.
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4752
4751
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Oregon Municipal Water and Sewer Utility
Dane County

October 5, 1976

Badfish Creek - Surface Acres = 34.8 Miles, Miles = 14.5, Gradient = 4.1 feet per mile.

Originally a small stream tributary to the Yahara River, but now the recipient of a large amount of effluent from M.M.S.D. and from Oregon treatment utility. Prior to diversion the stream was considered marginal trout water; currently, it harbors small populations of suckers and panfish for about half its length. Over 42 acres of fresh meadow and shallow marsh adjoin the stream.

Recommendations

From the Oregon outfall to the juncture with the M.M.S.D. effluent ditch the classification should be noncontinuous marginal. From this point downstream to C.T.H. A the classification should be continuous surface waters not supporting a balanced aquatic community. From C.T.H. A and for the remainder of Badfish Creek the classification should be continuous fish and aquatic life.

The above recommendations represent a concurrence of opinion of the stream classification team who are as follows:

Roy Lembcke - District Engineer
Clifford Brynildson - Area Fish Manager
Tom Bainbridge - District Biologist
Roger Schlessler - Natural Resources Technician

Respectfully submitted,


Thomas Bainbridge
Stream Classification Coordinator

RS:js