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STATE OF WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, Olympia, Washington 98504 206/753-2353

MEMORANDUM

November 21, 1978

To: Ron Devitt

From: Jerry Thielen

Subject: Effects of Black Diamond on Ginder Creek

Introduction:

Black Diamond is a small rural community of approximately 300 residents located in southeast King County (Figure 1). It is without a sewage treatment plant. Sewage wastes are treated by septic tanks and drainfields that reportedly contaminate Ginder Creek. These wastes are discharged into the creek at three known locations: (1) Cedar Brook Mobile Home Park, located near the creek just above town; (2) below town where the city septic tank that serves the majority of the community discharges; (3) a raw sewage discharge (concrete pipe) that serves the south end of town.

On July 27, 1978 a study was conducted to determine the effects of Black Diamond on the water quality of Ginder Creek. The main objective was to evaluate bacterial conditions in the creek. Additional data on general water quality characterisitcs also were collected.

Methods

A visual inspection was made prior to sample collection to generally characterize the creek and determine if any point sources, other than the three known sources, were discharging into the creek. At this time ten stations were established for sampling (Figure 1).

Station locations and descriptions are listed below:

1. Ginder Creek below Ravensdale Road approximately 500 yards above the affected area. (Control station)

2. Drainage ditch from trailer court septic tanks. Most upstream ditch. (Point source)

3. Ginder Creek at fence line below farm approximately 100 yards below station 2.

4. Ginder Creek below city pond at the Auburn-Black Diamond Road.

4A. North end of city pond (total and fecal coliform samples only).

4B. South end of city pond (total and fecal coliform samples only).

5. Ginder Creek approximately 10 yards below city septic tank outfall.

6. Concrete pipe above Morgan Street. (Point source)

7. Ginder Creek below Morgan Street.

8. East tributary of Mud Creek above Hwy. 169.

At each station the following parameters were measured in the field: temperature (°C), pH with a Analytical Measurements Model 107 field pH meter, specific conductance by Chemtrix Model 70 field conductivity bridge (mhos/cm), and dissolved oxygen by the Winkler Method (mg/l). In addition, water quality samples were collected and taken to the Department of Ecology Analytical Laboratory in Tumwater for the following analyses: fecal and total coliforms, chemical oxygen demand (COD), biological oxygen demand (BOD), nitrate (NO_3-N), nitrites (NO_2-N), ammonia (NH_3-N), ortho phosphate (O-PO_4-P), total phosphate (T-PO_4-P), total solids (TS), total non-volatile solids (TNVS), total suspended solids (TSS), and total suspended non-volatile solids (TSNVS). Soap residue (MBAS) was tested for only at stations 5 through 8. All laboratory results are reported in mg/l.

Results

It is important to note that results from this survey may not be indicative of normal water quality conditions in the creek, due to heavy rainfall on the day prior to sampling.

The visual inspection showed that Ginder Creek is a slow, meandering stream that averages about three feet wide by less than one foot deep. It flows mainly through farm and pasture lands. No additional point sources other than the three previously noted were observed.

Below each of the three point sources a distinct "sewage odor" was apparent. Visible signs of sewage contamination were found at stations 5 and 7, below the city septic tank outfall and Morgan Street discharge pipe. The most obvious was toilet paper. This section of the stream did not appear to meet the State Water Ouality Standards for aesthetics which states, "that aesthetic values shall not be impaired by the presence of materials or their effects, which offend the senses of sight, smell, touch, or taste". (1)

High fecal coliform counts were found in the stream below each of the three point sources (Table 1). The control station (#1) had a fecal coliform count of 72 col/100 ml; however, at station 3, 100 yards below Cedar Brook trailer court, the count increased to 2,000 col/100 ml. The trailer court effluent (station 2) had a fecal coliform count of 1270 col/100 ml, indicating it as the major contributor to the high fecal counts in the stream. Station 4, above the city septic tank effluent, had a fecal coliform count of 510 col/100 ml while below this source (station 5) the count increased substantially to 210,000 col/100 ml. The third point source (station 6) had a fecal coliform count of 9,000 col/100 ml while the downstream station (#7) had a count of 84,000 col/100 ml. Fecal counts at station 7 apparently were still affected by the city septic tank.

Additional fecal and total coliform samples were taken from the city pond (stations 4A and 4B). Fecal samples taken at the north end (4A) and south end (4B) showed values of 600 col/100 ml and 920 col/100 ml, respectively.

This and previous data collected by Devitt (2) indicate bacterial levels in this pond exceed the state Water Quality Standards for fecal coliforms of 100 organisms/100 ml, median-class A waters. (1)

Of the three point sources, the city septic tank and Morgan Street discharges appeared to have the greatest effect on BOD in the receiving waters. At all four stations above these two point sources BOD values were 2 mg/l or less. However, below the city outfall (station 5) BOD increased to 24 mg/l. The lower town discharge (station 6) showed a BOD value of 46 mg/l for the effluent. At station 7, 20 yards below this last discharge, the BOD dropped to 16 mg/l. Although these values are not considered to be necessarily high, organic contamination is indicated.

Dissolved oxygen levels in Ginder Creek declined below each of the three point sources with some recovery between stations. Also, D.O. levels generally declined as the creek passed through the community. An 8.3 mg/l D.O. level was measured at the control; however, the level dropped to 4.3 mg/l by station 7 below the town. This D.O. sag appeared to be due to the impact of the point sources. This also is below that as required for class A waters.

Nutrient levels may have been enhanced by a combination of surface runoff and raw sewage effluent. Nutrient enriched waters were found throughout the study area. Nitrates increased below the septic tank and the concrete pipe, stations 5 and 7, apparently due to the raw sewage effluent. The increase in the nitrate level at station 4 was due to the high levels found in Mud Creek (station 8). The increase at station 3 may have been due to farm runoff.

Ammonia levels increased at all stations below the control, except station 4. This increase was apparently due to the effects of the raw sewage and farm runoff. The stream exceeded the lethal threshold for un-ionized ammonia at stations 3, 5 and 7 (Table 1). Water Quality Criteria states that un-ionized ammonia levels above 0.02 mg/l do not provide for adequate safety in regards to freshwater aquatic life. (3)

MBAS was tested for at stations 5 through 8. Stations 5, 6, and 7 showed MBAS values of 0.25, 16.0, and 4.5 mg/l, respectively. A background level of 0.05 mg/l for MBAS was obtained at station 8. The source is unknown.

Although an extremely high temperature of 27.6°C was found at the third point source (station 6), a thermal problem is not caused due to the small discharge rate. This source has intermittent flow, with the high temperature possibly due to dishwashing or other similar domestic activities. Station 7 showed rapid recovery from this thermal input (Table 1).

Conclusions and Recommendations

Sewage wastes discharged by the community of Black Diamond appeared to be having a substantial adverse impact on water quality in Ginder Creek. High fecal coliform counts make this water unfit for any water contact activities. The depressed oxygen levels may be having a detrimental effect on the stream's fishery.

Asthetic problems were apparent in terms of odor, sludge, and visible signs of contamination. And finally, some nutrient concentrations approach or exceed levels which may promote algal growth and possibly cause toxicity to aquatic life.

It is possible that Ginder Creek may not meet the State Water Quality Standards for fecal coliforms, dissolved oxygen, toxicity, and aesthetics. Corrective action should be taken to alleviate or reduce this source of contamination.

JT:cp

cc: Dick Cunningham
John Bernhardt
Central Files

Literature Cited

1. Washington State Department of Ecology. Washington State Water Quality Standards, 1977. Olympia, WA 98504

2. Memorandum: Ron Devitt to Mark Premo. Unnamed Tributary to Rock Creek at Black Diamond - Fecal Coliform Contamination. November 1977.

3. U. S. Environmental Protection Agency. Quality Criteria for Water, 1976. Washington, D. C. 20460. EPA-440/9-76-023.

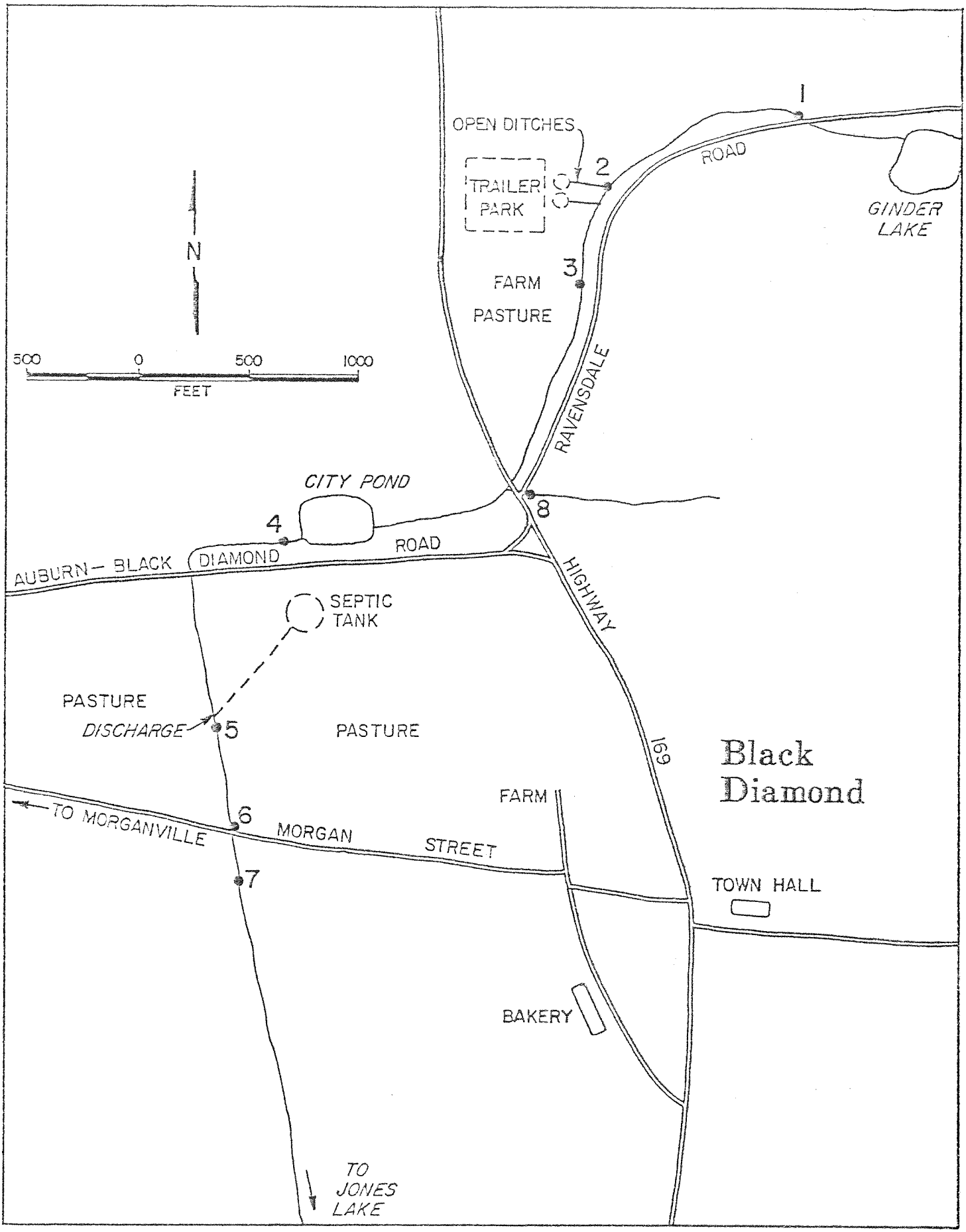

Figure 1. MAP SHOWING WATER QUALITY SAMPLING STATIONS, BLACK DIAMOND AREA, 7-27-78.

Table 1. Department of Ecology - Field Study Results
Ginder Creek, Black Diamond, WA. July 27, 1978

Station	Station Description	Temp. °C	pH	Specific Conductance µmhos/cm	D.O. mg/l	BOD mg/l	COD mg/l	Total Coliforms col/100 ml	Fecal Coliforms col/100 ml
1	Ginder Creek below Ravensdale Road (Control)	19.2	8.1	250	8.3	< 2	24	5,600	72
2	Drainage Ditch from Trailer Court	18.3	7.9	253	7.0	2	39	10,000	1270 est.
3	Ginder Creek 100 yds. below Trailer Court	18.4	7.8	247	5.0	2	31	> 40,000	> 2000
4	Ginder Creek immediately below City Pond	17.5	7.9	271	7.5	2	31	11,000	510
4a	North End of City Pond	- -	- -	- -	- -	- -	- -	3,000 est.	600
4b	South End of City Pond	- -	- -	- -	- -	- -	- -	8,000 est.	920
5	Ginder Creek immediately below City Septic Outfall	18.3	7.6	284	6.0	24	78	1,700,000 est.	210,000
6	Morgan Street Discharge Pipe	27.2	7.5	156	6.1	46	150	340,000	9,000 est.
7.	Ginder Creek 20 yds. below Morgan Street	19.3	7.7	278	4.3	16	63	520,000	84,000
8	E. Tributary of Mud Creek above Hwy. 169	17.5	7.6	164	4.9	2	27	22,000	300

Table 1. Department of Ecology - Field Study Results
Ginder Creek, Black Diamond, WA. July 27, 1978 (Continued)

Station	Station Description	Nitrate NO_3-N mg/l	Nitrite NO_2-N mg/l	Ammonia NH_3-N mg/l	Un-ionized Ammonia* NH_3 mg/l	Ortho Phosphate $O\text{-}PO_4$-P mg/l	Total Phosphate $O\text{-}PO_4$-P mg/l	TS mg/l	TNVS mg/l	TSS mg/l	TSNVS mg/l	MBAS mg/l
1	Ginder Creek below Ravensdale Road (Control)	.04	<.01	.01	<.001	.01	.06	161	109	4	3	- -
2	Drainage Ditch from Trailer Court	.06	<.01	.31	.011	.05	.07	163	114	6	4	- -
3	Ginder Creek 100 yds. below Trailer Court	.18	.03	1.0	.030	.16	.16	164	109	4	2	- -
4	Ginder Creek immediately below City Pond	.62	.01	.12	.004	.04	.04	178	130	6	2	- -
5	Ginder Creek immedidiately below City Septic Outfall	.28	.01	4.0	.075	1.0	1.1	180	130	12	2	0.25
6	Morgan Street discharge pipe	.69	.03	.98	.025	.35	.45	160	105	28	9	16.0
7	Ginder Creek 20 yds. below Morgan Street	.54	.17	.93	.024	.35	.40	200	153	14	6	4.5
8	E. Tributary of Mud Creek above Hwy. 169	.57	<.01	.06	<.001	.02	.04	116	86	2	0	<.05

* = Calculated results.