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AGRICULTURAL POLLUTION AND TROUT

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The Montana Fish and Game Department and many Montana sportsmen are concerned with the harmful effects of agricultural pollution on trout streams. We know that heavily silted streams are not good trout fishing streams. We also know that the vast majority of trout caught from our streams are wild trout - fish that grew from eggs incubated in the clean gravel in a stream.

The future of stream fishing in Montana will depend on how many of these wild trout our streams will produce. Therefore, it is to the benefit of Montana, both from an economic and recreational standpoint, to keep streams in a suitable condition to produce trout. To maintain and improve the capacity of our streams to produce trout, we must know the specific requirements of trout and we must also know the specific conditions harmful to trout.

We are now studying the effects of agricultural pollution on trout. Our study considers silt in streams, accompanied by low stream flows and high water temperatures and the effects of these agricultural pollutants on trout.

I would like to use Bluewater Creek, one of our study streams, as an example of a stream affected by agricultural pollution. The use of the water from this stream is fairly typical of situations found in other trout streams in Montana. Diversion ditches take cool, clean water out of the stream. Some of this water is used to irrigate cultivated cropland. Unused water is returned to the creek via waste water ditches, warmer and dirtier - in other words, its water quality is changed.

How does agricultural pollution affect trout in Bluewater Creek? Let us look first at the creek above the diversion ditches where the water is cool and clean. In this part of the stream, one acre of stream produced over 4,000 trout and only 40 suckers. This is good trout water. Below the ditches that return

irrigation waste water, Bluewater Creek is warm and muddy. Here, we find only 80 trout and over 12,000 suckers, dace, and minnows in one acre. Obviously, this is not good trout water.

In upper Bluewater Creek, the average daily silt or sediment concentration was a low 20 parts per million. The lower part of the creek receives silt from irrigation waste water ditches. Here, the average daily silt concentration is 8 times as great as in the upper part of the creek. Also, in the upper part of the creek the silt concentration ranged from 5 to 25 parts per million. Lower down the concentration ranged from 15 to 211 parts per million. For the most part, the high concentrations of silt in the lower part of the creek occurred during the irrigation season.

Comparing stream flows in the creek above and below the diversion ditches show the following. Above the diversion ditches, the average daily flow was 12 cubic feet per second. It ranged from 11 to 13 cubic feet per second, an extremely even flow. Here the fish have a stable supply of water throughout the entire year. Below the diversion ditches, the average daily flow was 15 cubic feet per second. However, the average flow ranged from one and one-half to 29 cubic feet per second. The fish here have an unstable water supply with the low flows occurring during the irrigation season.

What effects do these low flows have on water temperatures? In July the average maximum monthly temperature was 72°F, well within the limits for trout. Below the ditch, the average maximum monthly temperature was 81°F, higher than ideal temperatures for trout.

The Bluewater Creek study was initiated to show how agricultural pollution - stream silt accompanied by low flows and high water temperatures - reduce the capacity of a stream to produce trout. By comparing the fish populations with silt concentrations, stream flow, and water temperature in two areas in the

stream; we can see that agricultural pollution changes Bluewater Creek from a trout stream in the clean water areas to a rough fish stream in the silty areas.

Specifically, how does agricultural pollution harm trout? We know that trout deposit their eggs in streambed gravels. In order to hatch, the incubating eggs need high concentrations of oxygen and enough water to wash any waste products given off by growing trout eggs. Large amounts of silt settling on riffle areas where eggs are incubating clog up the gravels. In a sense, the eggs are smothered by silt.

We buried live eggs in the gravels in both the clean and silty parts of Bluewater Creek. Approximately 1,500 eggs were incubated in the unsilted part; 6,000 in the silty part.

In the clean part of the stream, 98 percent of the eggs hatched successfully. In the silty part of the stream not one of the eggs hatched. A careful examination of the dead trout eggs revealed the death-dealing agent - a layer of silt covered the eggs.

Our study shows how agricultural pollution with high silt concentrations accompanied by low flows and high water temperatures harm wild trout. The Montana Fish and Game Department feels that agricultural pollution should be recognized along with municipal and industrial pollution as a detriment to outdoor recreation in Montana. We want to emphasize that agricultural pollution is not limited to a few streams, rather it is a statewide problem in Montana.