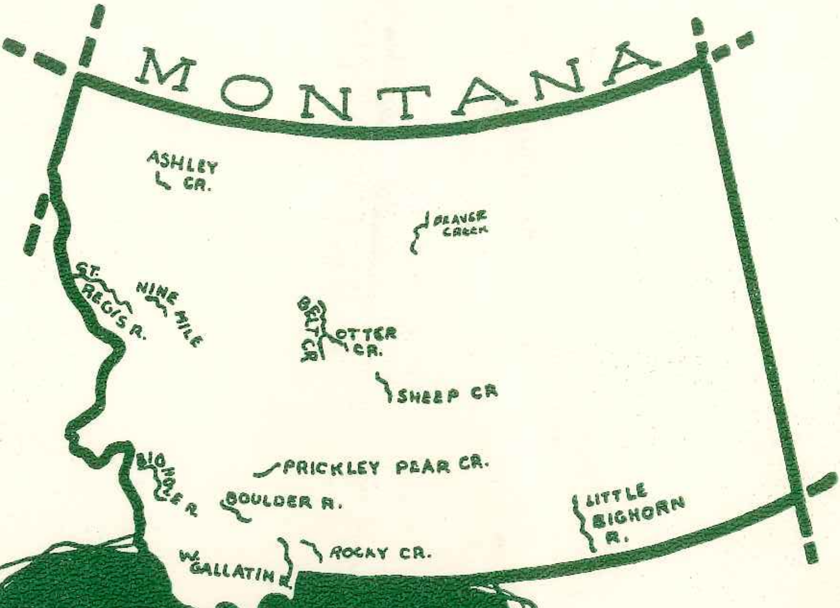


CHANNEL CHANGES IN 13 MONTANA STREAMS

Fisheries Division

MONTANA
FISH & GAME COMMISSION

Helena, Montana

CHANNEL CHANGES IN THIRTEEN MONTANA STREAMS

PREPARED BY

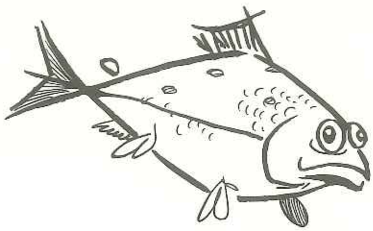
WILLIAM ALVORD

AND

JOHN C. PETERS

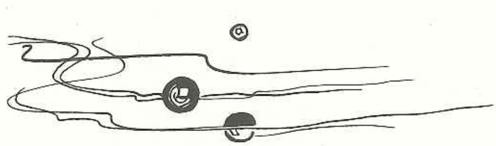
1963

During 1962, thirteen Montana trout streams were surveyed to measure the amount of stream channel alterations and to determine the party responsible for the alterations. In each fisheries management district at least one stream was surveyed. The information compiled gives a statewide perspective of the losses to a valuable renewable resource—trout stream fishing in Montana.



Montana is rapidly losing its trout stream fishing. Parts of naturally winding stream channels have been gutted and straightened to facilitate road and railroad construction, certain agricultural practices, and urban development. More are being re-shaped today.

The man-handling of our cold-water streams is of immediate concern to those who value trout fishing or the dollars that anglers pass around, because re-shaped streams raise far fewer trout. This sad fact shouldn't surprise anyone who considers a trout's basic needs—water, food, and shelter.

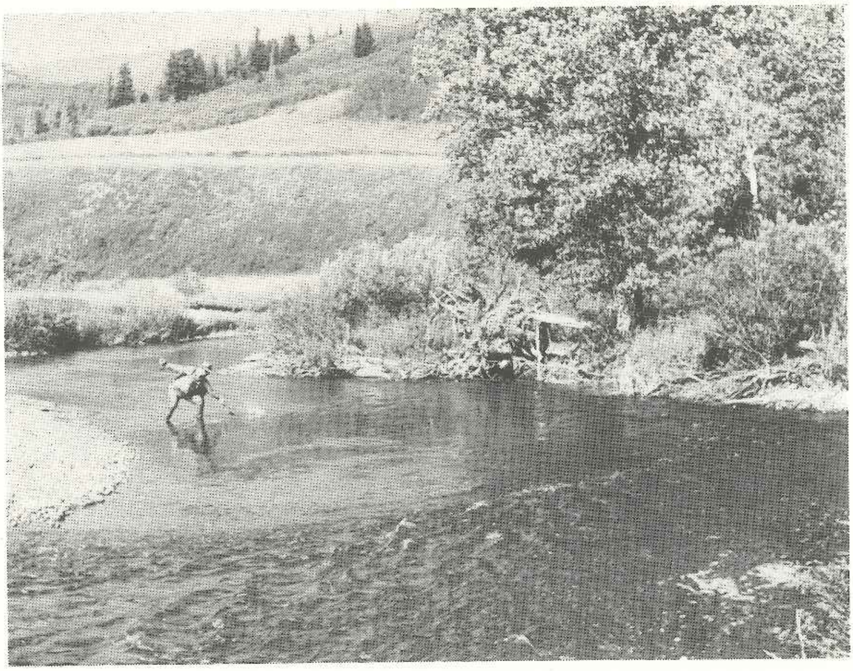


THE NATURAL SHAPE OF THINGS

Clean water, flowing year-long, is important to trout. So is the shape of the bed and banks through which the water flows.

The best trout streams have many meanders or curves with a complex of gravel-bottomed riffles and deep, shaded pools. Below the willows and cottonwoods growing on the stream bank are undercuts, extending several feet under the bank.

Each feature plays an important part in the life of trout. The riffles produce the insects and small fish that trout use for food. Riffles protect trout eggs until they hatch. Young trout spend most of their early lives in riffles and the larger trout use these parts of the streams as feeding areas.



A Natural Stream—Pools, Riffles, Undercut Banks—And Large Trout

Pools and undercut banks serve as shelter—resting and hiding places—for larger trout. Overhanging brush also provides cover but, more important, the root system holds the bank soil together and retards erosion. This preserves the pools and undercuts that provide trout shelter.

THE SHAPE THAT MAN LEFT

A stream that provides these needs—water, food, and shelter—is a fishing stream. Remove the features that supply one or more of these requirements and the stream is no longer a good trout producer.

A Man-handled Stream—No Pools, No Undercut Banks—Few Trout

This essentially is what has happened to a number of Montana's trout streams. Man-made channel changes have removed the deep pools and undercuts—the shelter areas—resulting in a marked decrease in larger trout.

The rechanneling of a part of Flint Creek, near Philipsburg, for highway construction in 1957, is an example. In a 300-foot study section, the number of catchable-sized trout (6 inches or larger) dropped from 69 the year before construction to 6 the following year. Boulders have since been added to the stream to try to replace the shelter areas that were lost. Still, in 1962, 5 years after rechanneling, there were only one-third as many large trout in the study section.

The year following the Flint Creek rechanneling, 17 miles of Rock Creek near Red Lodge were altered for flood control. Snags were removed from the channel. Stream bed gravel was bulldozed into dikes, which replaced the natural banks.

A few months following this alteration, on a study section of Rock Creek, the trout population dropped 75% from the count of one year before.

Our Shape

Is Slipping . .

The man-made channel changes on Flint Creek and Rock Creek are not isolated examples. Similar changes have been noted on parts of almost all Montana streams.

In fact, the practice of reshaping stream channels has increased at such an alarming rate that in 1962 a study was made of 13 streams throughout the state to measure the amount of channel alterations.

The study showed that one-third of the total length of these streams (250 of 768 miles) had been altered from their natural condition. Four of the streams had more than one-half of their length reshaped by man.

As could be expected, far fewer catchable-sized trout were found in the altered stream channels than in the unaltered parts of the same streams. Only 2 trout were censused in the disturbed sections for every 11 in the undisturbed sections. The difference in whitefish was even more striking—1 to 10.

. . . And Slipping

The greatest loss of fishing water in the streams studied resulted from man's apparent unwillingness to allow the streams to meander through their natural courses. Their total length was shortened by 68 miles when 137 miles of natural stream channel was re-routed into 69 miles of inferior, man-made channel.

In all, channel relocations accounted for 55% of the alterations found on the 13 streams. The remaining alterations consisted of riprapping or dumping car bodies, trash, boulders, or anchored material on the stream bank (26%), diking (16%), and channel clearance (3%).

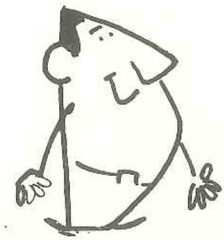
The source of the changes was also determined. More than one-half of the alterations were attributable to road and railroad construction activities with the total almost equally divided between the two.

The bulk of the railroad work was done prior to 1920 while most state, county, and federal road construction projects were of a more recent vintage.

Agricultural activities accounted for over one-third of the channel alterations. The greatest number of individual alterations were enumerated in this category.

The remaining channel changes were attributable to urban and industrial development projects.

Time To Shape Up



What do these statistics mean? Simply that we've ruined a lot of trout stream during the short time that we've lived in this place called Montana. Some of the changes were necessary. Most of the jobs could have been done without damaging the streams. In all cases, the loss was final for there is no way known to remake a trout stream once its natural channel has been destroyed.

Table 1

STREAM MILES LOST AND MILES RELOCATED IN 13 MEASURED STREAMS

	Miles of Natural Meandering Stream Channel Lost	Miles of Relocated Stream Channel Replacing Natural Meandering Stream Channel	Reduction in Stream Length (Miles)
Little Big Horn River	52.9	16.5	36.4
St. Regis River	6.3	5.4	0.9
Ninemile Creek	0.9	0.7	0.2
Sheep Creek	3.6	2.0	1.6
Otter Creek	6.7	2.9	3.8
Belt Creek	8.6	7.2	1.4
Beaver Creek	3.5	2.0	1.5
West Gallatin River	4.4	4.1	0.3
Rocky Creek	9.3	5.3	4.0
Big Hole River	17.3	4.4	12.9
Boulder River	2.1	1.5	0.6
Prickley Pear Creek	19.2	16.0	3.2
Ashley Creek	2.8	1.4	1.4
TOTAL	137.6	69.4	68.2

Table 2

THE LENGTH OF STREAM CHANNEL ALTERED AND THE NUMBER OF ALTERATIONS BY TYPE IN 13 MONTANA STREAMS OR RIVERS

	CHANNEL RELOCATION		RIPRAPPING		CHANNEL CLEARANCE		DIKING		TOTAL			
River or Stream	Miles Altered	No. of Alterations	Miles Altered	No. of Alterations	Miles Altered	No. of Alterations	Miles Altered	No. of Alterations	No. of Stream Miles	Miles Altered	No. of Alterations	% Altered
Little Big Horn R.	16.5(36.4)[1]	68	6.2	95	1.4	13	3.4	15	120.0	63.9	191	53
St. Regis R.	5.4(0.9)	23	17.9	88	0.0	0	1.2	10	37.1	25.4	121	68
Ninemile Cr.	0.7(0.2)	6	1.7	53	0.0	0	2.4	22	23.9	5.0	81	21
Sheep Cr.	2.0(1.6)	15	0.1	9	0.1	1	0.0	0	12.4	3.8	25	31
Otter Cr.	2.9(3.8)	23	0.7	18	0.5	9	0.1	3	34.5	8.0	53	23
Belt Cr.	7.2(1.4)	36	3.4	55	0.3	2	8.8	66	81.0	21.1	159	26
Beaver Cr.	2.0(1.5)	6	1.2	30	0.2	7	0.5	23	49.5	5.4	66	11
West Gallatin R.	4.1(0.3)	20	9.5	143	0.7	13	5.6	88	85.9	20.2	264	23
Rocky Cr.	5.3(4.0)	31	1.3	62	0.2	3	0.8	12	18.4	11.6	108	63
Big Hole R.	4.4(12.9)	56	11.0	107	0.8	13	17.0	219	147.6	46.1	395	31
Boulder R.	1.5(0.6)	14	7.9	246	1.0	21	1.4	27	86.3	12.4	308	14
Prickley Pear Cr.	16.0(3.2)	21	1.0	72	0.9	31	0.1	7	41.0	21.2	131	51
Ashley Cr.	1.4(1.4)	8	1.9	73	2.1	3	0.1	1	30.2	6.9	85	23
TOTAL	69.4(68.2)	327	63.9	1051	8.2	116	41.3	493	767.8	251.0	1987	33

[1] Number in parenthesis refers to miles of stream channel lost as a result of the channel relocations.

Table 3

The Length of Stream Channel Altered, Number of Alternations, and the Reasons For Alternations in 13 Montana Streams or Rivers

River or Stream	RAILROAD CONSTRUCTION		ROAD CONSTRUCTION		URBAN AND INDUSTRIAL DEVELOPMENT		AGRICULTURAL ACTIVITIES		TOTAL			
	Miles[1] Altered	No. of Alterations	Miles[1] Altered	No. of Alterations	Miles[1] Altered	No. of Alterations	Miles[1] Altered	No. of Alterations	No. of Stream Miles	Miles[1] Altered	No. of Alterations	% Altered
Little Big Horn R.	39.8	48	2.9	22	2.0	7	19.2	114	120.0	63.9	191	53
St. Regis R.	13.0	54	10.7	60	1.6	6	0.1	1	37.1	25.4	121	68
Ninemile Cr.	0.1	5	0.6	24	1.9	4	2.4	48	23.9	5.0	81	21
Sheep Cr.	0.0	0	3.8	25	0.0	0	0.0	0	12.4	3.8	25	31
Otter Cr.	0.0	0	4.6	41	0.1	1	3.3	11	34.5	8.0	53	23
Belt Cr.	1.2	10	9.3	74	4.4	28	6.2	47	81.0	21.1	159	26
Beaver Cr.	1.5	3	2.7	25	0.2	10	1.0	28	49.5	5.4	66	11
West Gallatin R.	0.8	6	11.8	98	0.7	26	6.9	134	85.9	20.2	264	23
Rocky Cr.	3.6	7	1.6	22	1.0	26	5.4	53	18.4	11.6	108	63
Big Hole R.	3.8	21	6.1	50	1.3	12	34.9	312	147.6	46.1	395	31
Boulder R.	2.5	26	3.1	49	1.9	18	4.9	215	86.3	12.4	308	14
Prickley Pear Cr.	3.6	26	0.4	7	14.6	24	2.6	74	41.0	21.2	131	51
Ashley Cr.	0.8	9	0.7	35	1.3	3	4.1	38	30.2	6.9	85	23
TOTAL	70.7	215	58.3	532	31.0	165	91.0	1075	767.8	251.0	1987	33

[1] Includes miles of stream channel lost as a result of the channel relocations.

Table 4

The Number of Fish, the Number of Fish 6 Inches or Larger, and the Weight of Fish Censused In Equal Areas of Altered and Natural Stream Channels in 13 Montana Streams and Rivers

River or Stream	Channel Type	NUMBER OF				NUMBER OF FISH 6 INCHES OR GREATER				WEIGHT OF			
		Trout	White-fish	Others	Total	Trout	White-fish	Others	Total	Trout	White-fish	Others	Total
Little Big Horn R.	Natural	76	5	0	81	26	5	0	31	13.7	3.0	0.0	16.7
	Altered	37	1	9	47	1	1	1	3	1.6	0.0	0.4	2.0
St. Regis River	Natural	22	35	19	76	9	35	0	44	4.1	19.8	0.6	24.5
	Altered	6	5	39	50	5	5	1	11	0.8	1.5	1.7	4.0
Ninemile Creek	Natural	65	0	11	76	17	0	0	17	4.3	0.0	0.0	4.3
	Altered	13	0	14	27	0	0	0	0	0.6	0.0	0.0	0.6
Sheep Creek	Natural	35	40	0	75	9	33	0	42	2.4	4.7	0.0	7.1
	Altered	1	0	4	5	0	0	0	0	0.1	0.0	0.1	0.2
Otter Creek	Natural	16	0	75	91	14	0	60	74	8.5	0.0	22.0	30.5
	Altered	1	0	16	17	1	0	11	12	0.4	0.0	4.2	4.6
Belt Creek	Natural	2	3	6	11	1	3	5	9	0.2	2.4	1.8	4.4
	Altered	0	0	16	16	0	0	2	2	0.0	0.0	0.9	0.9
Beaver Creek	Natural	88	0	12	100	17	0	12	29	5.6	0.0	1.7	7.3
	Altered	3	0	5	8	0	0	0	0	0.1	0.0	0.6	0.7
West Gallatin R.	Natural	6	16	10	32	6	15	10	31	4.4	14.6	20.9	39.9
	Altered	1	11	0	12	1	11	0	12	0.1	7.2	0.0	7.3
Rocky Creek	Natural	63	13	59	135	62	13	54	129	29.3	12.9	50.7	92.9
	Altered	55	0	28	83	24	0	24	48	5.0	0.0	4.9	9.9
Big Hole River	Natural	17	68	46	131	14	63	45	122	9.0	26.3	13.8	49.1
	Altered	1	0	2	3	0	0	1	1	0.1	0.0	0.1	0.2
Boulder River	Natural	41	1	0	42	22	1	0	23	4.2	1.3	0.0	5.5
	Altered	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Prickley Pear Cr.	Natural	19	0	45	64	11	0	38	49	5.5	0.0	23.5	29.0
	Altered	13	0	52	65	5	0	48	53	1.7	0.0	23.7	25.4
Ashley Creek	Natural	0	0	86	86	0	0	26	26	0.0	0.0	5.8	5.8
	Altered	0	0	54	54	0	0	0	0	0.0	0.0	0.4	0.4
TOTAL	Natural	450	181	369	1000	208	168	250	626	91.2	85.0	140.8	317.0
	Altered	131	17	239	387	37	17	88	142	10.5	8.7	37.0	56.2

METHODS USED

Aerial photographs (1 inch = 660 feet) were used to measure the original length of the stream channel. Channel alterations visible on the photographs were inspected in the field, measured from the photographs with a map measure and recorded on the photos. Channel alterations not visible on the aerial photos, or made after the photograph flight date, were measured in the field with a steel tape and recorded on the photos. In addition, all channel alterations were recorded on a field note form.

Blueprints of construction projects adjacent to rivers and streams were obtained from the Montana Highway Department and from railroad companies. The prints were examined carefully and compared with the aerial photos to verify man-made stream channel alterations. The blueprints were useful in determining if a cutoff meander was natural or man-made and the party responsible for the alteration. Personal contacts with residents further verified man-made alterations.

Old issue U. S. Geological Survey quadrangle maps and U. S. Forest Service maps were used also to verify man-made alterations. Only stream channel alterations that were positively assessed as man-made were enumerated in this survey.

The four types of man-made alterations measured were defined as follows:

(1) **Channel relocation** is replacement of the natural meandering with a length of man-made channel. The relocated channel has a flume-like appearance, without pools, deep holes, or undercut banks. It is shorter and lacks the well-defined areas of erosion and deposition associated with a meandering stream.

(2) **Riprapping** is placing materials other than streambed rubble adjacent to the natural streambank to prevent lateral erosion. Some of the more common materials observed were car bodies, stumps or logs, large angular rocks, and brush. These materials may or may not be anchored.

(3) **Channel clearance** is removal of materials occurring naturally within the stream channel such as fallen logs, stumps, or gravel and rubble.

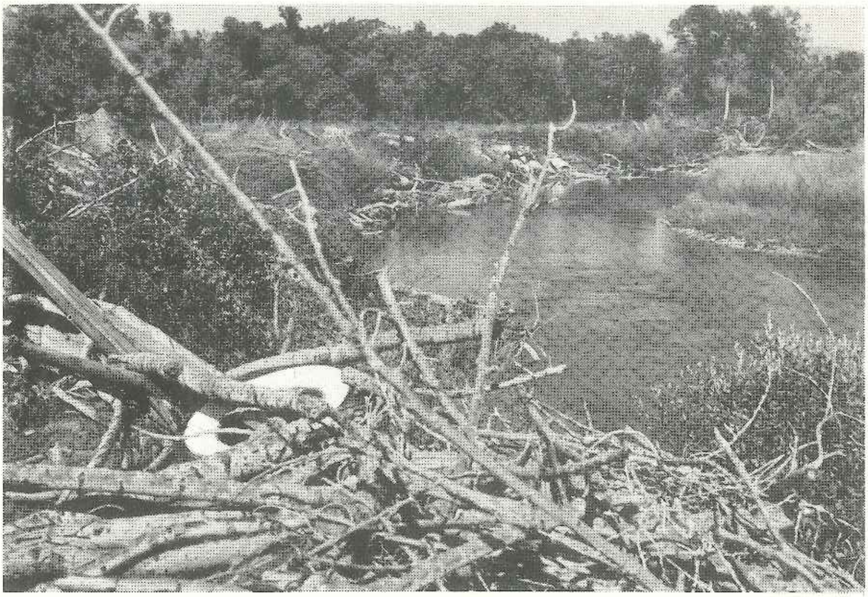
(4) **Diking** is using natural material from the streambed to construct an artificial streambank.

Stream channel alterations were grouped on the basis of activities: railroad construction, road construction, urban and industrial development, and agricultural activities.

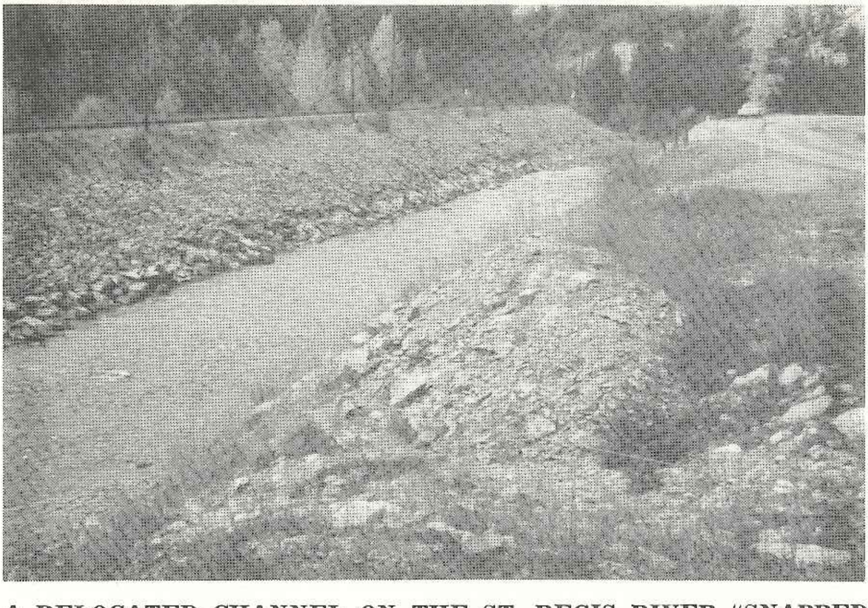
No attempt was made in this survey to evaluate whether or not the alterations were preventing lateral channel erosion.

Standing crop estimates of the fish populations in the streams surveyed were made by electrofishing 4,000 square foot areas of stream. Blocknets were placed in the upstream and downstream boundaries delineating the areas or lengths of stream censused.

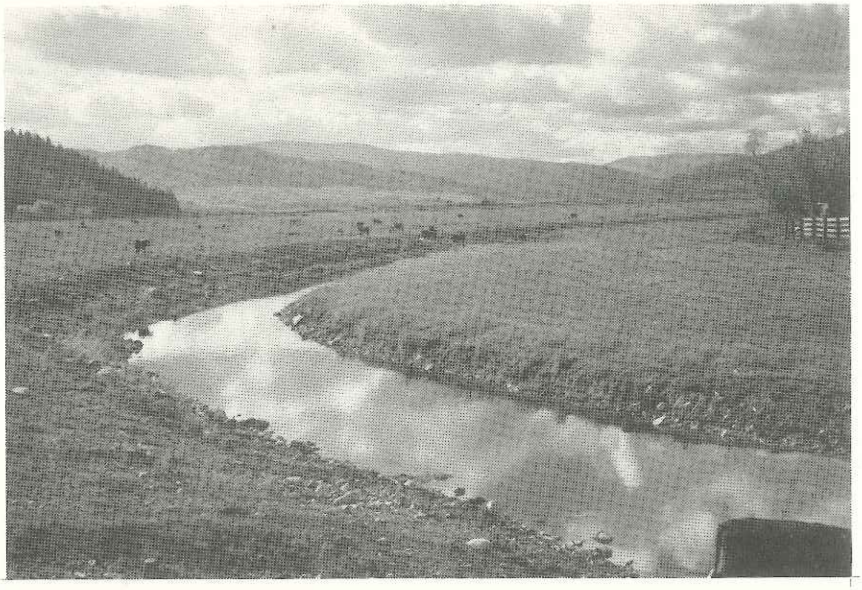
Two sections of equal area were censused for fish in each stream surveyed: (1) a natural meandering stream channel and (2) a stream channel altered by man's activities.



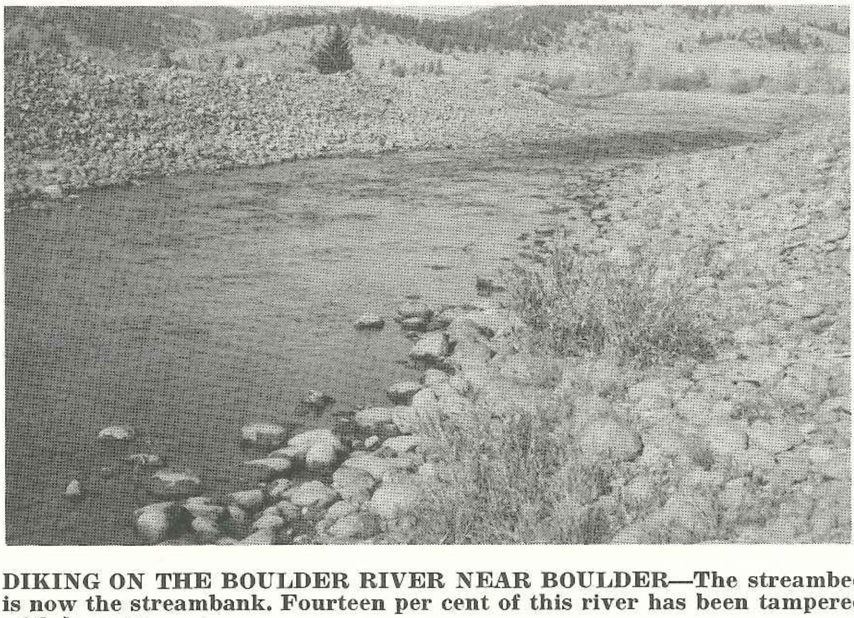
RIPRAPPING ON THE LITTLE BIG HORN RIVER NEAR HARDIN—Everything but the KITCHEN SINK. Over one-half of this river had been altered.



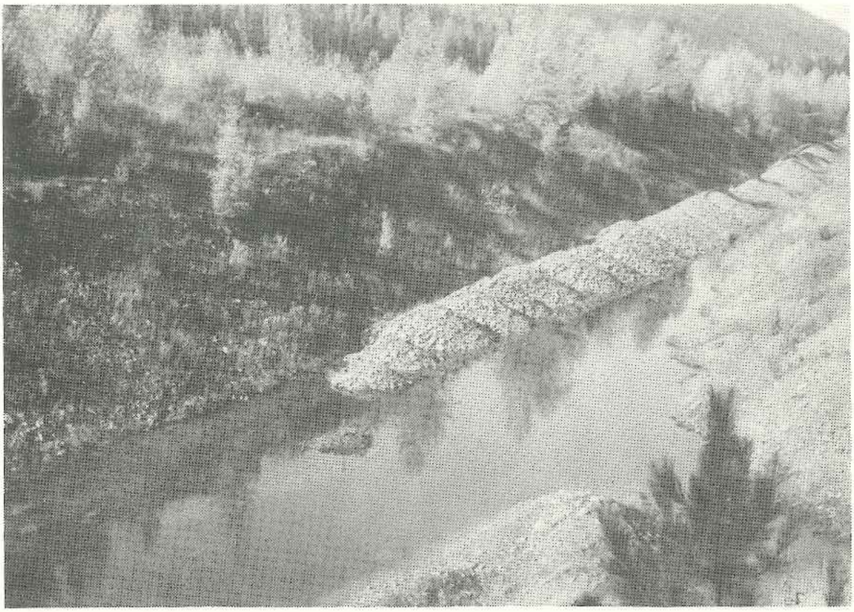
A RELOCATED CHANNEL ON THE ST. REGIS RIVER "SNAPPED STRAIGHT" BETWEEN A HIGHWAY AND A RAILROAD. Channel alterations have changed 68% of this river.



CHANNEL CLEARANCE ON ASHLEY CREEK NEAR KALISPELL— Everything that large trout need for a home has been removed. Man has altered nearly 25% of channel in this stream.



DIKING ON THE BOULDER RIVER NEAR BOULDER—The streambed is now the streambank. Fourteen per cent of this river has been tampered with by man.



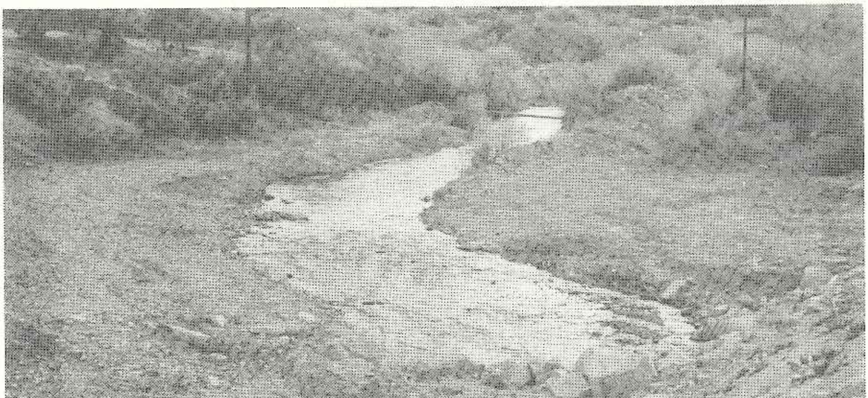
CHANNEL CLEARANCE BY GOLD DREDGING ON NINEMILE CREEK. One-fifth of this creek has been changed by man's activities.

A STRETCH OF RELOCATED CHANNEL RIPRAPPED INTO PLACE. Belt Creek near Great Falls had 26% of channel altered.

A CHANNEL RELOCATION ON OTTER CREEK NEAR BELT. Nearly one-fourth of this stream had been altered.

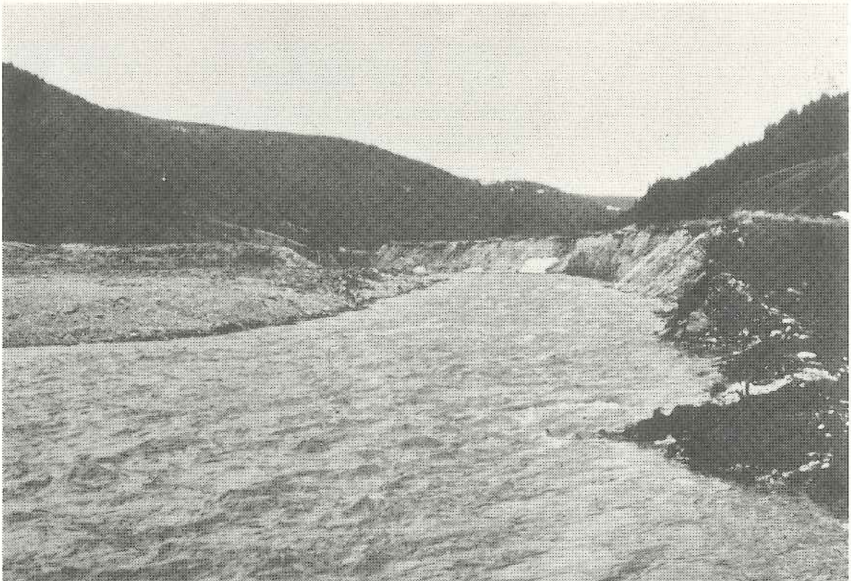
A CHANNEL RELOCATION ON ROCKY CREEK NEAR BOZEMAN. Almost two-thirds of its configuration had been man-changed.

A CHANNEL RELOCATION ON SHEEP CREEK NEAR WHITE SULPHUR SPRINGS WITH RIPRAP USED TO MAINTAIN THE STREAMBANK. Nearly one-third of this stream had been altered.

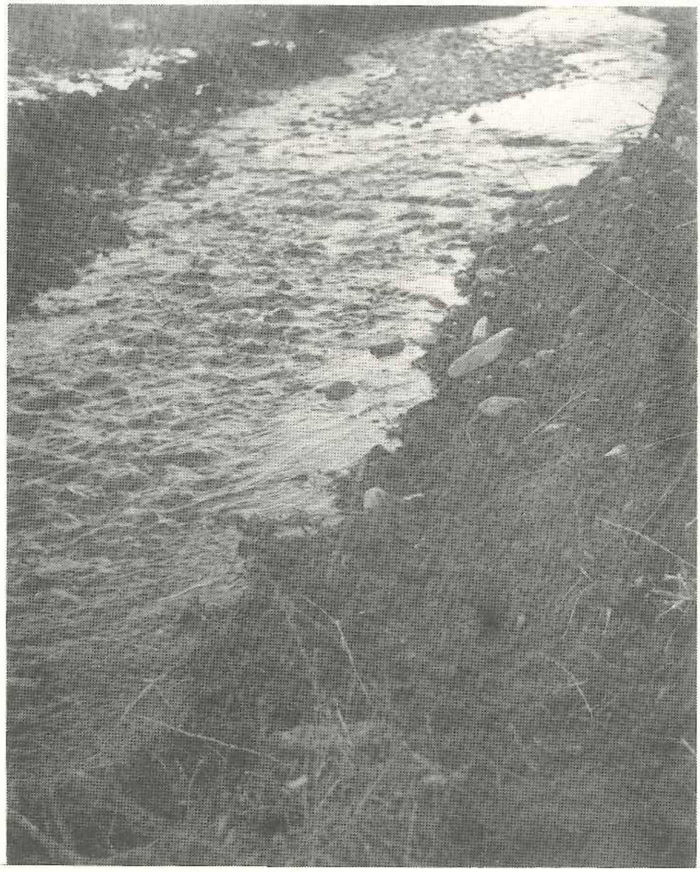


CHANNEL CLEARANCE, DIKING, AND A TOUCH OF RIPRAP DETERIORATED TROUT WATER ON PRICKLEY PEAR CREEK NEAR HELENA. This creek had 51% of altered channel.

CHANNEL CLEARING AND DIKING ON BIG HOLE RIVER. Nearly one-third of this excellent stream had man-made channel changes.



A RELOCATED CHANNEL ON THE WEST GALLATIN RIVER NEAR BOZEMAN. Almost one-fourth of this river has been altered.



A STRETCH OF RELOCATED CHANNEL, TYPICALLY WITHOUT STREAMBANK VEGETATION, ON BEAVER CREEK. This creek had 11% of altered channel.

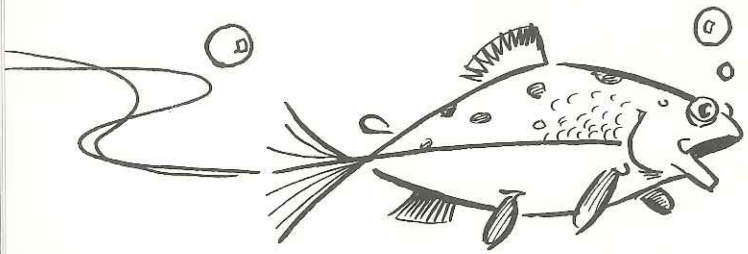
SUMMARY

1. *One-third of the total length of the streams surveyed (250 of 768 miles) had been altered from their natural condition.*

2. *There were nearly three alterations per stream mile and the average length of a channel alteration was 664 feet.*

3. *The most serious loss to fish production was nearly a 10 per cent decrease in the natural length of stream channel.*

4. *There were over 5½ times as many catchable-sized trout and nearly 10 times as many whitefish censused in natural channels as in the altered channels.*



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* Prepared by Perry H. Nelson; District Education and Information Officer; Billings, Montana.

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