

future in conservation and in realizing our hopes and dreams in this field. Because as I look about me and see so many concerned and interested people in such dedicated groups as yours—I realize that we will never be allowed to forget our obligations to God and nature. I salute your progress of the past—and wish for you—continued success in the future.

THE STREAM DISTURBANCE PROBLEM AND OUR FISHERY RESOURCES—ITS SCOPE AND A METHOD OF EVALUATION AND RESPONSE

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Abstract

Examples of stream disturbance problems are cited. Soil Conservation Service Public Law 566, Army Corps of Engineers Section 208, and highway construction projects cause most stream damage. Significant stream fishery losses are also attributable to agricultural activities, railroad construction, urban and industrial development, and even to private self-interest groups and individuals.

A detailed one-county West Virginia survey was made of fishery damages resulting from Agricultural Stabilization and Conservation Service C-8 bank stabilization cost-sharing practices that occurred during one year. Nineteen separate projects on three quality streams altered more than 22,400 feet of stream. Replacement cost of lost fishery habitat on an acre for acre basis amounted to \$81,600. Annual fish population losses of \$3,517 plus expected losses from downstream sedimentation of \$1,679, and annual man-day angling losses valued at \$1,522 were determined. Sadly enough, only three of these projects were considered successful in accomplishing the private landowner's intended purpose.

An Inter-Agency Stream Disturbance Symposium, sponsored by the West Virginia Department of Natural Resources, was called to bring together involved agencies to expose and discuss this serious problem. A task force was subsequently appointed to propose solutions and procedures. A much better inter-agency understanding and relationship now exists, which has already resulted in many benefits.

The need for additional administrative and legislative action is apparent, in order to bring the problem under control.

THE STREAM DISTURBANCE PROBLEM AND OUR FISHERY RESOURCES—ITS SCOPE AND A METHOD OF EVALUATION AND RESPONSE

In many sections of the country the stream disturbance problem now ranks as the number one threat to our fishery resources. Increasing "channelization" and "dredging" projects, largely under federal sponsorship, have elevated this problem from one of local concern to a national resource calamity and confrontation.

Public awareness of the stream disturbance problem is only beginning, although professional conservationists have been aware of its effects for many years. The general public, however, has no idea of its extent. For example, pollution-caused fish kills occurred in 26 stream miles in West Virginia during 1967. Our citizens howled loud and long and urged new legislation and control. In the same year 4.2 miles of high quality streams were destroyed in one county, as a result of just one channeling program,

with barely a whisper of dissent. Stream disturbance projects have destroyed more stream miles than pollution-caused fish kills have affected in some areas in recent years. Pollution can often be abated, allowing the stream to recover, but channeled streams are permanently impaired. Total habitat destruction occurs at the site and associated siltation deposition and flow changes reduce productive capacity upstream and downstream. Dredging, channelization, and snagging and clearing projects eliminate cover, change pool-riffle ratios, and speed runoff, thus exaggerating stream level fluctuations. Fish food production and spawning are adversely affected.

This problem is not unique to West Virginia or the southeast—it's international in scope. Many critical resolutions have recently been passed by concerned professional groups against Public Law 566, the Corps Section 208, and highway construction projects. Unconcerned men and machines are at work daily, destroying our stream resource base.

In North Carolina, PL-566 projects have altered more than 400 miles of streams. Detailed studies on 23 channeled streams revealed a 90% reduction in both weight and numbers of game fish and no significant return to natural conditions within a 40 year period following channelization (Bayless and Smith).

A Montana survey showed 1,987 individual alterations in 768 miles of streams inventoried. Most frequently mentioned as the cause were agricultural activities, railroad construction, and urban and industrial development (Montana, 1962).

Most southeastern states, especially Georgia, North Carolina, Louisiana, and Mississippi, have reported fish and wildlife losses of grave magnitude because of channeling projects (Davidson, 1969), (Bagby, 1969), (Rich, 1969), (Bayless).

Studies over a 60 year period in Champaign County, Illinois, showed that drainage activities lowered the water table, eliminated marshes and ponds, and caused extreme fluctuations in flow (Larimore and Smith, 1963). Similarly, U. S. Geological Survey records in North Carolina indicated a substantial drop in ground water coincident with completion of projects (Barick, 1966).

Because of damages in Oregon, a law was recently passed requiring anyone removing materials from the bed or banks of any natural waterway to first obtain a permit. This law applies to every department of government, political subdivision, private industry and individual property owner (Anonymous, 1967).

The Kavlinge River in Sweden can be easily traced because it has been continually mapped since 1820. At that time, the drainage included 88,000 acres of lakes, ponds, and marshes. In 1938, the river was deepened and banked to control flooding and create new cropland. By 1950 less than 10,000 acres of lakes and ponds remained. The river ran at high flow or low trickle. By 1954 drastic decreases in crop yields were noted, subsoil moisture had dropped, and landowners had to deepen their wells. Sporting activities had been an important income to the farmers, but wildlife losses eliminated this income source and the farmers demanded that the river be "restored" (Madson and Kozicky, 1966).

In West Virginia, examples of stream disturbance losses can be cited in every county. I'll mention just a few to give you an idea of the scope:

That portion of Wheeling Creek in Marshall County from the Pennsylvania state line downstream for nearly five miles has been severely damaged by gravel removal for road maintenance. When I was in high school this section provided fishing that was seldom equaled. Now it provides water that is seldom fished.

Howards Creek in Greenbrier County, a good trout stream, was totally destroyed when a new channel was constructed to accommodate Interstate Route 64.

The Western Maryland Railroad destroyed 9 miles of trout water in the upper Greenbrier River in attempting to correct a slip.

Numerous ACP bank stabilization projects have caused a serious damage throughout the state. I recall one Dingell-Johnson project on the Little Cacapon River where the Fish and Wildlife Service sent a federal aid inspector to view recently installed cover devices as part of a stream improvement project. Unfortunately, he made his inspection shortly after a Department of Agriculture Bank Stabilization Project was completed. In the process of attempting to stabilize the bank, the stream was dredged from shore to shore and the cover devices were totally destroyed.

Army Corps of Engineers and Soil Conservation Service channeling projects for flood control have caused serious losses. These projects are of serious concern to conservationists everywhere, since their effect seems to be cumulative. One such project often breeds another downstream. The textbook approach of land treatment measures and water-retarding structures to hold water on land where it falls is still the best method of flood control.

An affluent citizen bought a camp on one of our better streams to enjoy the "good life." He also purchased a boat, but to his dismay the river that fronted on his property was all riffle and boulders—certainly not boating water. Well, you guessed it! He hired a dozer to create his own boat-float moat, and in the process destroyed a stretch of high quality water.

Then, there was the case of the camp owner who, one dry summer, decided to doze a small dam across the creek, since his "hole" of water was down a foot or so. Downstream camp owners nearly lynched this fellow when the creek stopped running. The county sheriff ordered the dam removed. The result, however, was much hard feeling by all concerned and the loss of another stretch of stream.

Several towns cleared stream banks as "beautification projects." In the process they exposed their open sewers, accelerated erosion and bank slips, and reduced stream productivity.

These examples are just a few of the occurrences that can be sited in West Virginia. I'm certain that similar problems occur in every other state.

To determine the extent of stream damage resulting from one of the less publicized federal programs, a survey of recent Agricultural Stabilization Conservation Service ACP cost-sharing practices was undertaken in Hampshire County, West Virginia (Menendez, 1968). This county was chosen because of the extent of dredging known to occur there and its reputation as one of the better fishing areas. Admittedly, it is possible that Hampshire County has suffered more stream damage than any of the state's other 54 counties; however, such practices do occur to some degree in every county.

A check of the Hampshire County ASCS file revealed that 79 applications were received during 1967 for special ACP cost-sharing C-8 (channel clearing and stream bank protection) practices. The large number of applications resulted from severe flooding and a subsequent allocation of \$25,000 in emergency relief funds.

Of the 79 applications received, 57 projects were completed. Nineteen of these on three quality streams (Little Cacapon River, North River, and Mill Creek) were selected for inspection. Twenty-two thousand four hundred feet of stream alterations were involved, encompassing 27.2 acres (Table 1). Since water development projects in West Virginia average approximately \$3,000 per acre, replacement costs strictly on a water area basis, ignoring habitat quality, amounted to \$81,600. Adverse downstream effects were expected to destroy an additional 12.5 acres, replacement of which would total \$37,500.

To determine the actual fish loss involved, all available population data for the streams were summarized and the average population compositions and standing crops were derived (Table 2). Average values from *Monetary Values of Fish* (Stubbs, 1966) were used, and the

annual fish population losses determined to be \$3,517 at project, plus annual downstream losses of \$1,679 (Table 3).

Man-day use losses were estimated for each stream and assigned minimal values of \$2.00 per man-day. Annual use loss was thus estimated at \$1,522 (Table 4).

These figures indicate initial fishery losses in excess of \$125,000 plus additional annual losses of over \$6,700 resulting from this one \$25,000 federal allocation (Table 5.) Unfortunately, of the 19 projects inspected only three were considered successful in accomplishing their intended purpose. When you consider that these projects occur in every county and state, the fishery losses from this relatively minor program are alarming.

In West Virginia the stream disturbance and dredging problem was rapidly getting out of hand, even though, like most states, we were objecting to projects on a piecemeal or "come as they may" basis. Most of the often limited and well intentioned water related projects carried out by public agencies were resulting in serious fish, wildlife, and recreational resource losses. Obviously, we had to convince these agencies of the drastic side effects of some of their projects, and solicit their cooperation in minimizing damages. To do this, the Department of Natural Resources sponsored an Inter-Agency Stream Disturbance Symposium. Concurrently with the sponsorship of the symposium, a Dingell-Johnson Highway Coordination Project was established and a *West Virginia High Quality Stream List* prepared. Representatives from the Soil Conservation Service, State Soil Conservation Committee, Agricultural Stabilization and Conservation Service, Forest Service, Bureau of Public Roads, State Road Commission, Army Corps of Engineers, Federal Water Pollution Control Administration, U. S. Fish and Wildlife Service, Geological Survey, and all Divisions of our Department of Natural Resources were invited, and all participated earnestly in the proceedings.

The Symposium was developed in three sessions. The first was a presentation of the problem by Natural Resources personnel, who discussed the scope of the problem, specific damages, the highway coordination project, the quality stream list, and a review of existing state policies, regulations, and laws. The second session was devoted to the procedures, policies, and problems of all other agencies. The final session consisted of a roundtable discussion of possible procedures and solutions. A task force was ultimately formed with representation from both state and federal agencies and charged with responsibility for developing meaningful memorandums of understanding between the Department and other agencies. These agreements establish review procedures for projects adversely affecting stream resources, and insure continued inter-agency understanding and cooperation. Suitable memorandums of understanding were put into effect calling for fishery biologists to review projects involving any stream listed in the *West Virginia High Quality Stream List*.

Training sessions have been held with county and district level technical personnel of these agencies to acquaint them with the stream disturbance problem. Specific problem areas were discussed and a slide program presented. It was the first exposure to the problem for most participants.

The symposium has already resulted in many benefits. A number of highway projects have been altered to minimize damages or enhance wildlife resources. On a project involving channelization of Middle Island Creek, for instance an 8 acre lake will be built adjacent to the channelized area as a mitigating measure. Coordination on a project through Coopers Rock State Forest resulted in changes to prevent damage to Coopers Rock Lake and allow for greater hunting and fishing access. Channelization designs have been changed to provide as much depth and cover as possible. Actual field testing of suggested designs are planned. Specified wildlife cover crops are now being used

for erosion control. Gravel, once routinely taken from the most convenient stream for road maintenance, is now taken only from designated areas in low quality streams. The Public Land Corporation now routinely submits all commercial dredging applications to the Division of Wildlife Resources for review, and to date has honored all recommendations, even to the point of permit denial. The ASCS office now notifies us of all ACP stream channel cost-sharing practice applications on quality streams. Many problems still exist, but we have achieved the essential inter-agency contact, cooperative relationship, and concern at administrative, planning, and work unit levels. The foundation for continued progress thus exists.

Public Law 566 projects have been especially objectionable in recent years, and unfortunately are subject to less control, evaluation, alternative flexibility, mitigation, and compensatory provisions than other federal water resource projects. The accelerating channelization and drainage portions of these projects that change valuable streams into barren water ditches are completely unacceptable. To have these projects portrayed as "stream improvement" is nauseating to conservationists. Terminology such as channel alignment, drainage ditch, flushway, or even waterway enlargement would be acceptable, but stream improvement—never!

Administrative and legislative action at the state and federal level is still needed. Hopefully the Water Resource Council will improve water project cost-benefit analysis procedures by insuring proper consideration of environmental intangibles and realistic assessment of adverse project effects.

Stream protection legislation is needed in every state. Basically, such legislation should require a permit from the Natural Resource agency for all stream bed disturbances work which would change the slope, direction or cross-section of designated quality streams.

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TABLE 1. Stream length and area involved in dredging projects on study streams

Stream	Length of Project (Feet)	Area (Acres)	Downstream Losses (Acres)
Little Cacapon	12,950	18.37	7.5 — 8.0
North River	5,850	6.10	3.5
Mill Creek	3,600	2.73	1.5
Totals	22,400	27.20	12.5 —13.0

TABLE 2. Fish population composition of Little Cacapon River, North River, and Mill Creek.

Stream	Total Lbs/Acre	Game Fish		Rough Fish	
		Lbs/Acre	Percent	Lbs/Acre	Percent
North River	95.87	45.9	47.9	49.97	52.1
Little Cacapon	60.55	29.9	49.4	30.65	50.6
Mill Creek	71.00	44.3	62.4	26.7	37.6

TABLE 3. Fish population values in Little Cacapon River, North River, and Mill Creek.

Stream	Value/Acre	Game Fish	Rough Fish	Total Project Acre	Downstream Losses Anticipated
North River	\$186.77	\$175.28	\$11.49	\$1,139.30	\$653.69
Little Cacapon	108.61	101.56	7.05	1,995.17	814.57
Mill Creek	140.72	134.58	6.14	382.76	211.08
Totals	\$436.10	\$411.42	\$24.68	\$3,517.23	\$1,679.34

TABLE 4. Estimated annual use (man-day) loss.

Stream	Area Involved Acre	Est. Man-Day Loss/Acre	Value/Man-Day Acre	Total Project Area Loss
North River	6.1	20	\$2.00	\$ 244.00
Little Cacapon	18.37	20	2.00	734.80
Mill Creek	2.73	100	2.00	544.00
Totals	27.20	140	...	\$1,522.80

TABLE 5. Summary study stream fishery losses.

	Area Involved		Replacement Value/Acre	Losses		Totals
	Project Acre	Downstream Acre		Project Area	Downstream	
Fish Habitat Loss	27.2	12.5	\$3,000.00	\$81,600.00	\$37,500.00	\$119,100.00
Fish Population Loss (Annual)	...	...	...	3,517.23	1,679.34	5,196.57
Man-Day Use Loss (Annual)	...	...	...	1,522.80	...	1,522.80
Totals	...	...	...	\$86,640.03	...	\$125,719.37