1995

Trout Run Water Quality Protection Project

Final Report

Submitted by:

Winneshiek County Soil and Water Conservation District

I. PROJECT BACKGROUND

The water resource addressed by this project is Trout Run Creek, a cold water trout stream in Winneshiek County of Northeast Iowa.

Trout Run Creek is designated by the Iowa Department of Natural Resources (IDNR) as a class B (CW) high quality water. The fishable length is 1.6 miles. It is identified in the Nonpoint Source Management Program (NPSMP) as one of twenty-five highest priority cold water streams in Iowa. This stream is part of IDNR "put-and-take" trout fishing program and is stocked annually with 10,500 catchable size Rainbow and Brown Trout once per week from April to October. The IDNR estimates approximately 12,158 angler trips to the stream annually. Trout Run ranks #18 out of 50 streams for angler trips. According to IDNR estimates, the economic value of an angler day is estimated at $20.00.

Siewers Spring, which is near the upper reaches of the fishable portion of Trout Run, provides water for the state fish rearing station. From this facility, IDNR stocks an average of 110,000 Rainbow and Brown Trout annually in 17 Northeast Iowa streams. The streams stocked from this station generate over 300 angler days per week from April through October. The aquifer that supplies the spring is also a source of drinking water for some of the residents within the watershed area.

The water quality of Trout Run Creek and Siewers Spring is affected by sediment deposition, livestock waste, and agricultural chemicals that wash into the stream and sinkholes or leach directly through shallow soils.

The IDNR Water Quality Assessment Report rates Trout Run as partially supported for its designated use. Siltation is the major cause of impairment with a rating of high. Nutrients and pesticides are each rated slight. Agriculture is rated as high for the sources of nonpoint pollution. Siewers Spring also contains water contaminated by excessive nutrients, low dissolved oxygen content, and excessive sediment. Records at the fish rearing station indicate dissolved oxygen levels for water leaving Siewers Spring have been as low as one part per million. It is desirable for fish that are reared in a confined hatchery, such as Siewers Spring, to have a dissolved oxygen level of 12 parts per million. Excess nutrients from livestock waste and sediment entering the aquifer are causing these extremely low readings.

The IDNR has spent $2.5 million renovating the rearing station and installing facilities in an attempt to reduce the sediment and nitrates in the spring water.

The Winneshiek County Health Department has been conducting private well testing in the Trout Run Target Area and has found 72% of the 25 wells tested in 1991 and 1992 as unsafe with bacteria and nitrates. There were 12 wells tested for pesticides. One well had a detectable level of Atrazine, 3 wells had Dual, and 1 well had detectable levels of Dual and Atrazine. None of the levels exceeded the health advisory level.

Excessive sedimentation from the watershed is impairing the trout and aquatic invertebrate habitat by filling pools, destroying spawning areas, increasing turbidity, and making the stream wider and more shallow. Filamentous algae is present; indicating some level of nutrient loading. The local hatchery manager reports that Trout Run is observed as having the highest degree of turbidity related to storm events out of the 17 streams stocked from the Siewers Spring facility.

The IDNR believes that by reducing sedimentation and nutrient runoff and infiltration several benefits will result. Reducing infiltration will reduce the amount of excess ammonia present on the spring flows and will result in healthier fish in both the stream and the trout rearing station. Reducing sedimentation and nutrient runoff will result in improved in-stream habitat, which will result in an estimated 15% increased carrying capacity for trout and other cold water fish species. The number of days the stream is "unfishable" due to turbid water conditions will be reduced with a corresponding increase in trout angler activity days. IDNR estimates the number of angler days to increase by 10%. The potential for successful natural reproduction of trout will be significantly increased.

Farming operations in the watershed are typically livestock or a combination of livestock and cash grain. The major livestock enterprises include dairy, beef, and hogs. Cropland is managed in a corn, oats, and hay rotation on steeper slopes, with more continuous row crop on the flatter slopes. Contouring and stripcropping are used on most cropland, with straight row patterns used on some of the flatter soils. Minimum tillage is used on most row crop land, while hay ground is typically moldboard plowed. The majority of operations are owner-operator.

Soils in the watershed are: Fayette, Downs, Dubuque, and Steeprock land soil associations. These soils consist of well-drained, sloping to steep, light-colored loess soils. The soil depth over fractured limestone bedrock varies from several inches to several feet. The relatively shallow depth to rock allows for easy movement of surface water into the groundwater and presents a constant threat of contamination. Numerous sinkholes occur in the upland areas as well as in and adjacent to drainage ways and streams. Several of the tributary streams in the watershed lose water to the underground aquifer or disappear entirely through rocks and crevices.

Due to shallow soils, abundant sinkholes, need for high quality drinking water, recreational use, and the fish rearing station, the watershed required an expanded emphasis on Best Management Practices (BMP's) implementation, information, and educational efforts.

II. DESCRIPTION OF PROJECT

The original project identified only 5,720 acres to be addressed during a two-year term with the intent of improving water quality of the surface waters of Trout Run Creek. Project staff and cooperating agencies came to an agreement that a large part of the sediment and nutrient load was being contributed from farmland outside the Target Area. After two years into the project, it became very obvious that a very limited project period fell severely short of providing quality assistance to landowners. This prompted the Soil and Water Conservation District (SWCD) and the Division of Soil Conservation (DSC) to enter into a project agreement to expand the area to be addressed to 22,253 acres, extend the project on a year to year basis, and provide additional funding.

Some additional reasons the project was extended and expanded: 1) Project interest among landowners was high, particularly with the Nutrient Management Program and manure management components. Landowners involved with the Nutrient Management Program in prior years were very satisfied with the program and planned to make changes based on the results and recommendations. 2) There continued to be high interest among landowners in ways to address manure handling problems voluntarily and thus, to preclude regulation. 3) The Winneshiek County Natural Resources Conservation Service (NRCS) office had experienced a high rate of personnel turnover within the project period. This had hampered the implementation of the project and had eroded landowner confidence in the service from the NRCS office. 4) The adverse weather of 1993 affected farmers commitment to projects physically and financially. 5) Water quality and the watershed approach to dealing with water quality problems continues to be at the forefront of the environmental agenda. The experience and the solutions developed to handle water quality problems would facilitate the district's transition into the expanded project. 6) The Winneshiek County SWCD has had success in effectively using the funds allocated to the Trout Run Project in past fiscal years. These funds were targeted to high priority areas to achieve the objectives of the project.

The expanded area addressed totals 22,253 acres. The land use within the watershed is: cropland - 13,337 acres (60%), woodland - 1,613 acres (7%), pasture and hayland - 3,724 acres (17%), CRP - 2,600 acres (12%), and buildings and roads - 979 acres (4%). There are 177 farms with 125 farms having livestock. The livestock numbers total 3,000 dairy cows, 1,200 beef cows, and 5,700 hogs.

Considering the characteristics of the watershed, level of sediment in the stream, results of the well testing, and nitrates in the spring, we determined that the primary sources of contaminants are manure, agriculture chemicals, and sediment from the upland.

III. PROJECT ACTIVITIES AND RESULTS

A. Public Information and Education

The information and educational component is an important part of any project. A questionnaire was sent out to landowners before the project started to determine what kind of project participation could be expected. The questionnaire was used to predict cost share needed to achieve the objectives.

Newsletters were mailed twice a year to watershed residents to inform them of progress being made in the watershed, as well as opportunities to participate in the project. News articles were also printed in the local newspaper highlighting project activities.

Another tool used to promote the project was the touring of completed projects. Two tours of completed manure management sites were held. The first tour targeted watershed residents and district cooperators in the county. At each site, farmers were able to visit with the landowners to obtain information on the operation and maintenance of the animal waste facilities. The second tour consisted of agency personnel from Environmental Protection Agency (EPA), IDNR, NRCS, Iowa State University (ISU) Extension, and DSC. The main focus of this tour was the design and construction of the facilities.

Each fall a tour is given to two classes of students enrolled at Luther College in the "Environmental Concerns" course. The Trout Run Project was used for the tour area from 1992 through 1995. These tours highlighted much of the work being done in the Trout Run Watershed.

B. Erosion Control

One of the main objectives of the Trout Run Project was to reduce sedimentation. Excessive sedimentation from the watershed is impairing the trout and aquatic invertebrate habitat by filling pools, destroying spawning areas, increasing turbidity, and making the stream wider and more shallow. The local hatchery manager reports that Trout Run is observed as having the highest degree of turbidity related to storm events out of the 17 streams stocked from the Siewers Spring facility.

To reduce sedimentation, BMP's were promoted to landowners in the watershed. The practices, chosen for their sediment reduction potential and landowner acceptability, were terraces, contour strip-cropping, contouring, contour buffer strips, water and sediment control basins, and diversions. 15,450 feet of terraces, 2 water and sediment control basins, 675 feet of diversions, 558 acres of contour stripcropping or contour buffer strips were installed to reduce the sediment load to Trout Run. See Appendix B for location of projects installed.

The 15,450 feet of terraces protected 53 acres and reduced erosion by 506 tons on the protected acres. The 558 acres of contour buffer strips and contour stripcropping reduced erosion by 6,176 tons on these acres. Using a sediment delivery rate to the stream of 30%, these two practices will reduce sedimentation by 2,005 tons annually. See Appendix A for soil loss breakdown by practice.

C. Livestock Wastes

Livestock accessing the stream and waste from confined livestock systems significantly degrade water quality in the Trout Run Watershed. Livestock waste contributes to problems associated with nitrogen gas, ammonia, and nitrates in the spring water and the stream. The reduction of livestock waste and derived by-products in the stream will result in healthier fish and improved in-stream habitat.

The project targeted practice installation to farmsteads which were having an impact on water quality; specifically, livestock operations within 1/4 mile of major drainages into the stream. Highest priority was given to feedlots directly on Trout Run.

A total of twelve animal waste management systems were installed. The facilities control manure runoff from ten operations totaling 460 dairy cows, 330 beef cows, and 450 hogs. See Appendix B for location of the systems installed.

Problems encountered with animal waste management systems were the farmers lack of commitment, weather, expense, and staff time requirements. The availability of funding for animal waste management systems generated significant interest that resulted in numerous farmer contacts and, consequently, installation of other BMP's. Additional animal waste management systems are recognized as an ongoing need by the farmer and project advisors.

D. Nutrient Management

An objective of this project was to work with farmers with livestock to keep nutrient management records. Eleven farmers enrolled in the program and were each paid $200.00 for the following:

1. Current soil testing of all fields.
2. Recording of livestock manure applied.
3. Recording of fertilizer and manure inputs.
4. Establishment of yield goals using the corn suitability rating (CSR).
5. Conducting yield checks.
6. Recording crop inputs to be analyzed in an Economic Yield Contest.
7. Recording crop histories of fields.
8. Taking credits for manure and legumes.
9. Optional use of the late spring N test.
10. Providing details of livestock numbers, sizes, and manure handling and storage.

NRCS PROVIDED THE FOLLOWING:

1. Technical assistance in determining:
   a. yield goals.
   b. CSR by field.
   c. economic yield summaries.
   d. soil test interpretation.
   e. manure nutrient analysis.
   f. alfalfa stand count and proper legume N credits.
2. Forms for recording data.
3. Summaries of results.
4. Guidelines for improved nutrient handling.
5. Assistance in calibrating manure equipment and application rates.
6. Training in taking a proper soil test.
7. Demonstration of crop residue measurement.
8. Recommendations on timing of manure/fertilizer application.

The goal was to reduce nutrient leaching and run-off by: 1) Taking proper credits for manure, legumes, and fertility levels. 2) Fertilizing based on realistic yield goals. 3) Applying products at rates that maximize utilization.

Results from the first five participants were typical of the overall Nutrient Management Program. The following is a report of the first year participants in detail.

Five producers were enrolled in the Nutrient Management program in the Trout Run Water Protection Project for crop year 1992. All five have livestock. There are two hog producers, three dairyman, and one with sheep. All could be considered family farmers with around 200 acres being the normal size of the operation. All five farms are strip-cropped, three have terraces, and no-till is used on one.

All the producers had outdated soil tests before starting. One producer had not tested in over seven years. The others needed to update their tests. Fertility levels were mostly very good. No phosphorus or potassium levels were below medium, with most in the High-Very High range.

The Corn Suitability Ratings on these farms range from 5 to 95. The average is near 64. Yield goals for corn vary between 90 to 180 bushels per acre. Alfalfa goals are near 6 tons. The yield goals for the farms were close to ISU recommendations based on the soil types of the fields. 160-170 bushel corn yields are common.

Four of the producers had their manure spreaders calibrated in 1992. The fifth has a liquid system. Before calibration, they would blindly estimate manure application rates. Calibrated spreading rates are: 17, 21.6, 16.9, and 26 tons per acre. The producers were only willing to use 10 tons per acre as their spread rate before calibration. Manure is routinely applied on all fields on four of the farms. One operator is not physically able to haul the waste to where it is needed. He must travel over 1.3 miles down a steep road and back up again to reach his fields. His fertility levels are extremely high near his buildings. The other producers have fairly consistent fertility levels across all their fields.

Excessive starter fertilizer rates were evident at the beginning of the project. Starter rates in this area as a whole are excessive, with over 200 pounds per acre being common. The rates of the five producers before starting this program were 210, 180, 145, 120, and 50 pounds per acre.

One dairy producer in the program has cut his starter fertilizer from 120 pounds per acre to 50 pounds per acre of 9-23-30. Based on a cost of $195 per ton for 9-23-30, this is a savings of $7.20 per acre. In the past, this same producer applied commercial fertilizer before seeding oats. In the fall of 1994, he only applied 3,000 gallons of liquid dairy manure per acre from his ag waste storage facility on the area that was planted to oats in the spring. The oat crop was entered in the Quaker Oats contest with a yield of 117 bushels per acre; test weight of 36 pounds at 12% moisture. This resulted in a savings in commercial fertilizer cost of approximately $15 per acre.

Another producer in the program has reduced his nitrogen cost by $7.50 to $10.00 per acre by taking nitrogen credits for ag waste applied to the fields and corn planted in alfalfa sod.

One producer had been routinely liming his fields without soil testing for seven years. His PH levels are 7.1 - 7.4. He will save money as he has discontinued lime applications until his PH drops.

All Eleven producers in the program have adjusted their fertilizer schedules based on the coordinators recommendations. A NRCS staff person continues to work with the producers in the program. The results and changes occur slowly with this program because of many factors. The two main factors are the length of the growing season and the need for the producer to conduct field trials to verify nutrient management recommendations.

Some fields had under-application of nutrients. The farmers need to consider reallocating resources to utilize them where needed. Because of the need to dispose of manure in a timely and efficient manner, some fields will continue to have over-application of nutrients.

E. Streambank Stabilization

An area directly upstream from the stocked section of the stream was identified as having a critical impact on sediment delivery to the stream. The area had severely eroding streambanks ranging from 8 to 15 feet in height with erosion rates estimated to be 300-400 tons annually. The area was determined to have a sediment delivery rate of 100% to the spring and stock portion of the stream. See Appendix B for location of project.

In the past, the stream had been straightened on a significant portion of the lower end of Trout Run. This increased the velocity of water on the lower section of Trout Run. The increased velocity of the stream and the water runoff rate of the watershed were the two main factors that caused the severe streambank erosion.

Two portions of the meandering stream were endangering a county road. The county installed two new bridges and did some road work during the summer of 1995. Because of the sedimentation from the site and the danger to the county road, the SWCD was able to enter into an agreement with Winneshiek County and the U.S. Fish & Wildlife Service (F&WS) to complete work on 800 feet of the eroding streambank. This agreement split the cost of the project between these agencies and the landowner.

Because of the height and erodibility of the banks, the only option to stabilize the site was placement of rock rip-rap. The banks were sloped to a 2:1 slope and rip-rap placed to stabilize the work. A requirement of the project was to fence livestock from the corridor to prevent damage from overgrazing and traffic patterns.

The project successfully stabilized the 800 feet of eroding streambank. It is estimated that this project has reduced erosion by 150-200 tons annually. Additional work is needed on other eroding streambanks on this property.

The main problem encountered with streambank stabilization is the cost to stabilize the bank. Because of the height of the bank and the erosion characteristics of this site, the project cost $24 a foot to stabilize. This site was given high priority because of its location and delivery rate to the stocked portion of the stream.

Compared to other practices, the sediment reduction cost per ton of soil delivered to the stream is comparable.

Project staff attended a streambank stabilization workshop held by the Clayton County SWCD. A workshop was not held in the Trout Run Watershed Project because a project limiting access to the stream by livestock had not been completed by the end of the project term. This type of demonstration has been incorporated in the project extension and cost share incentives have been included to encourage producers to install this practice.

F. Address Disappearing Stream

The original project identified the need to plug two fissures in the stream and divert water away from these areas to a more stable location. After discussions with the IDNR and local contractors, this practice was determined to not be feasible. The IDNR felt that the surface and ground water relationship was too fragile to plug fissures based solely on water quality concerns without knowing the effect the practice may have on spring flow to Siewers Spring.

IV. EVALUATION

The Winneshiek County Health Department, The University of Iowa Hygienic, and IDNR assisted in a water quality monitoring program of the area addressed. The information gathered will serve as baseline data if the project is extended. The duration of the monitoring program was not adequate to draw conclusions from but did serve as a tool to target resources and identified the need of a continued project.

The Winneshiek County Health Department continues to conduct private water well testing in the Trout Run Target Area and has found 72% of the 25 wells tested in 1991 and 1992 as unsafe with bacteria and nitrates. There were twelve wells tested for pesticides. One well had a detectable level of Atrazine, three wells had Dual, and one well had detectable levels of Dual and Atrazine. None of the pesticide levels exceeded the health advisory level.

Dye testing was done by NRCS staff and the Winneshiek County Sanitarian, with technical assistance of the University of Iowa Hygienic Laboratory and the Iowa Geologic Survey. It had been observed that surface water disappeared into sinkholes at places within the streambed. For this reason, two dye tests were conducted with each proving there is a water relationship with surface water and groundwater reaching Siewers Spring.

Surface water was tested in the fall of 1994. Twenty-five sites were sampled by the NRCS and the Winneshiek County Sanitarian, with the University of Iowa Hygienic Laboratory providing the testing and interpretation of the data. The surface water testing showed: 1) Very high fecal coliform; illustrating the need for further work on manure management. 18 out of 25 sites ranged from 120,000 to 360,000 fecal coliform per 100 milliliter. 200 fecal coliform per 100 milliliter is the EPA standard for human contact. 2) There is a general decline in fecal coliforms downstream; likely the result of simple dilution. 3) Moderate nitrate concentrations throughout the tested area; but, for the time of year, they were greater than anticipated. 4) Nitrate concentrations also declined downstream; this is a typical pattern, related to in-stream biological processing, both consumption and denitrification. 5) Near/below the spring, the fecal coliform concentration declined dramatically; likely from the substantial influx of groundwater discharge, further diluting the fecal coliform concentration; but, with the groundwater influx, the nitrate actually increased somewhat.

V. PROJECT FUNDING

The project was funded through REAP Water Protection Funds from the Division of Soil Conservation, ACP through the Consolidated Farm Service Agency, and Partners for Wildlife Funds through the F&WS.

VI. CONCLUSION

The Trout Run Project has been successful at achieving the original project's objectives.

The interest in BMP implementation generated by the project, the need for additional treatment of the surface and groundwater, and Siewers Spring water quality problems made it clear the project duration and financial commitment was not adequate to treat a watershed of this size.

The original project did not anticipate the producers' interest in BMP implementation and the level of treatment needed in this watershed to achieve the original objectives. After the project started, more was learned about the water quality relationships of the surface and groundwater. The need to expand the project to achieve the original objectives became evident. The District passed along these findings and amendments were made to extend and expand the original project.

A new project proposal has been submitted to extend the Trout Run Project with Water Protection Funds (WPF) and EPA Section 319 funds.

The implementation of the Food Security Act (FSA) compliance plans has had a tremendous positive impact in reducing sediment delivery to Trout Run. However, to achieve sediment reductions beyond those provided by FSA compliance, structural practices applied to critically eroding slopes appears to have the most potential. The project-installed structural practices reduced sediment delivery to the stream by over three tons per acre annually.

The Trout Run Project accomplished many of its goals, particularly in the area of manure management. Project work was prioritized to address the most serious pollution problems. The animal waste management systems greatly reduced the manure runoff from ten livestock operations. We were able to demonstrate improvements in manure management on all of the feedlots where manure management facilities were constructed.

The nutrient management plans were well received by the watershed participants and will impact neighboring farms as landowners share information and techniques with each other.

The streambank stabilization project component successfully reduced the sediment load delivered to the stocked portion of the stream and the hatchery. This component has generated alot of interest and revealed needed practice installations. The cost of this practice seems excessive but the cost per ton of soil actually kept out of the stream is comparable to that of other practices.

TROUT RUN WATERSHED
COMPLETED PRACTICES

Fiscal Year 1992

Prac No.	Practice Name	Amount Applied	Acres Benefited	Soil Loss B / A	Tons saved per acre	Tons saved annually
600	Terrace	2600 ft	8.9	18 5	13	115.7
600	Terrace	1800 ft	6.2	19 5	14	86.8
600	Terrace	2900 ft	10.0	18 5	13	130.0
600	Terrace	2550 ft	8.8	11 4	7	61.6
585	Stripcropping	17.8 ac	17.8	12 4	8	142.4
585	Stripcropping	11.8 ac	11.8	12 4	8	94.4
638	Water & Sed. Control Basin	1	2.9	18 1	17	49.3
638	Water & Sed. Control Basin	1	24.0	27 3	24	576.0
590	Nutrient Mgt.					
590	Nutrient Mgt.					
590	Nutrient Mgt.					
590	Nutrient Mgt.					
590	Nutrient Mgt.					

Fiscal Year 1993

Prac No.	Practice Name	Amount Applied	Acres Benefited	Soil Loss B / A	Tons saved per acre	Tons saved annually
585	Stripcropping	12.7 ac	12.7	13 5	8	101.6
585	Stripcropping	29.1 ac	29.1	16 5	11	320.1
312	Waste Mgt.	1				
312	Waste Mgt.	1				
313	Waste Store	1				
313	Waste Store	1				
350	Sed. Basin	1				
350	Sed. Basin	1				
350	Sed. Basin	1				

Fiscal Year 1994

Prac No.	Practice Name	Amount Applied	Acres Benefited	Soil Loss B / A	Tons saved per acre	Tons saved annually
600	Terrace	1950 ft	6.7	14 7	7	46.9
600	Terrace	2150 ft	7.4	8 4	4	29.6
600	Terraces	1050 ft	3.6	8 1	7	25.2
412	Waterway	1000 ft	1.4	20 1	19	26.6
585	Stripcropping	44.0 ac	44.0	37 15	22	968.0
585	Stripcropping	55.1 ac	55.1	17 7	10	551.0
585	Stripcropping	36.3 ac	36.3	26 11	15	544.5
585	Stripcropping	32.8 ac	32.8	15 6	9	295.2
312	Waste Mgt.	1				

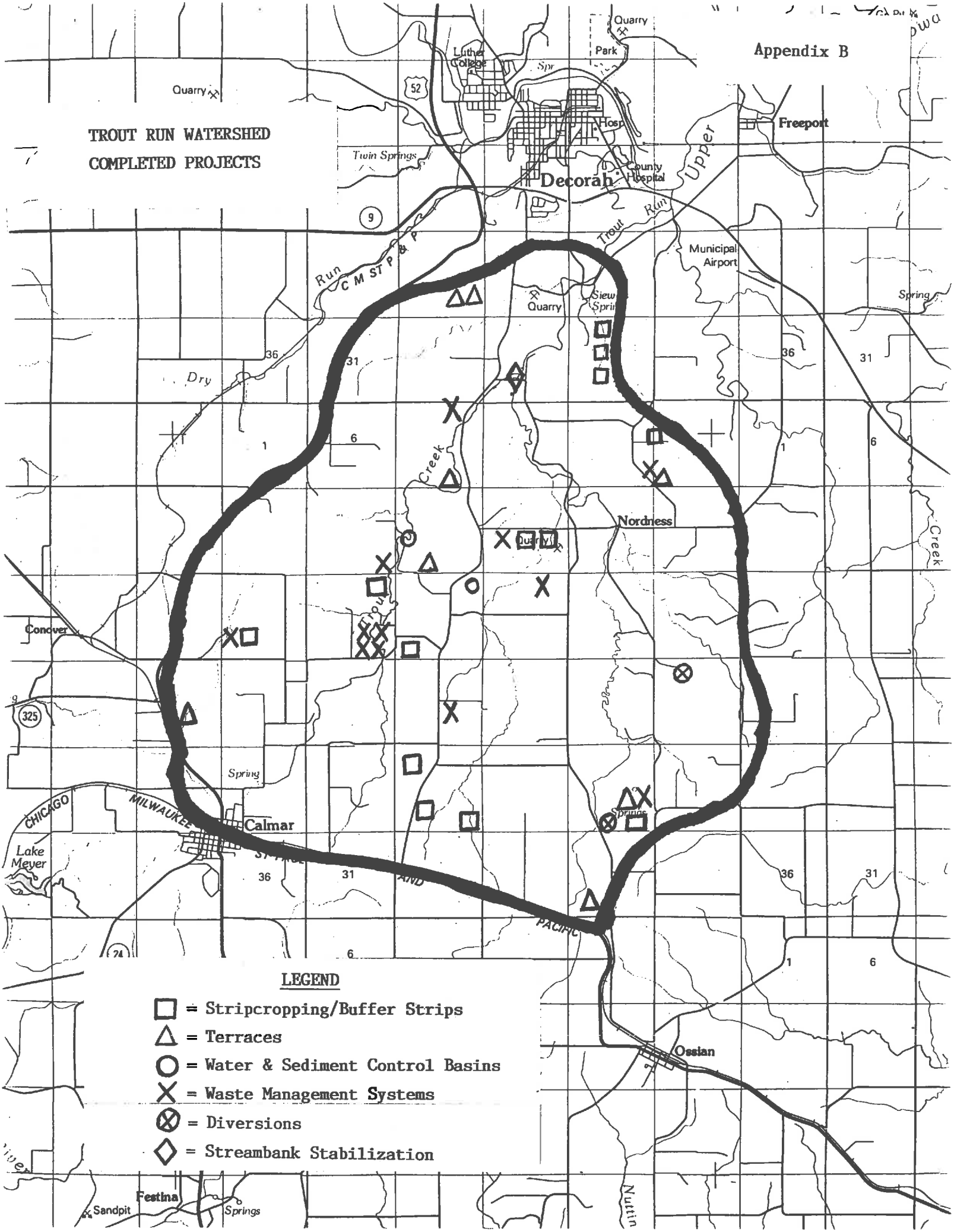
Fiscal Year 1995

Prac No.	Practice Name	Amount Applied	Acres Benefited	Soil Loss B / A	Tons saved per acre	Tons saved annually
600	Terrace	450 ft	1.5	14 7	7	10.5
362	Diversion	400 ft	2.0	8 5	3	6.0
362	Diversion	275 ft	1.0	20 5	15	15.0
584	Streambank Protection	800 ft	10.0	30 5	25	250.0
585	Stripcropping	45.4 ac	45.4	40 19	21	953.4
585	Stripcropping	76.1 ac	76.1	12 5	7	532.7
585	Stripcropping	155.3 ac	155.3	12 5	7	1087.1
585	Stripcropping	41.9 ac	41.9	25 11	14	586.6
350	Sed. basin	1				
312	Waste Mgt.	1				
312	Waste Mgt.	1				
312	Waste Mgt.	1				
590	Nutrient Mgt.					

590	Nutrient Mgt.					
590	Nutrient Mgt.					
590	Nutrient Mgt.					
590	Nutrient Mgt.					

Appendix B

TROUT RUN WATERSHED
COMPLETED PROJECTS



LEGEND

- □ = Stripcropping/Buffer Strips
- △ = Terraces
- ○ = Water & Sediment Control Basins
- X = Waste Management Systems
- ⊗ = Diversions
- ◇ = Streambank Stabilization