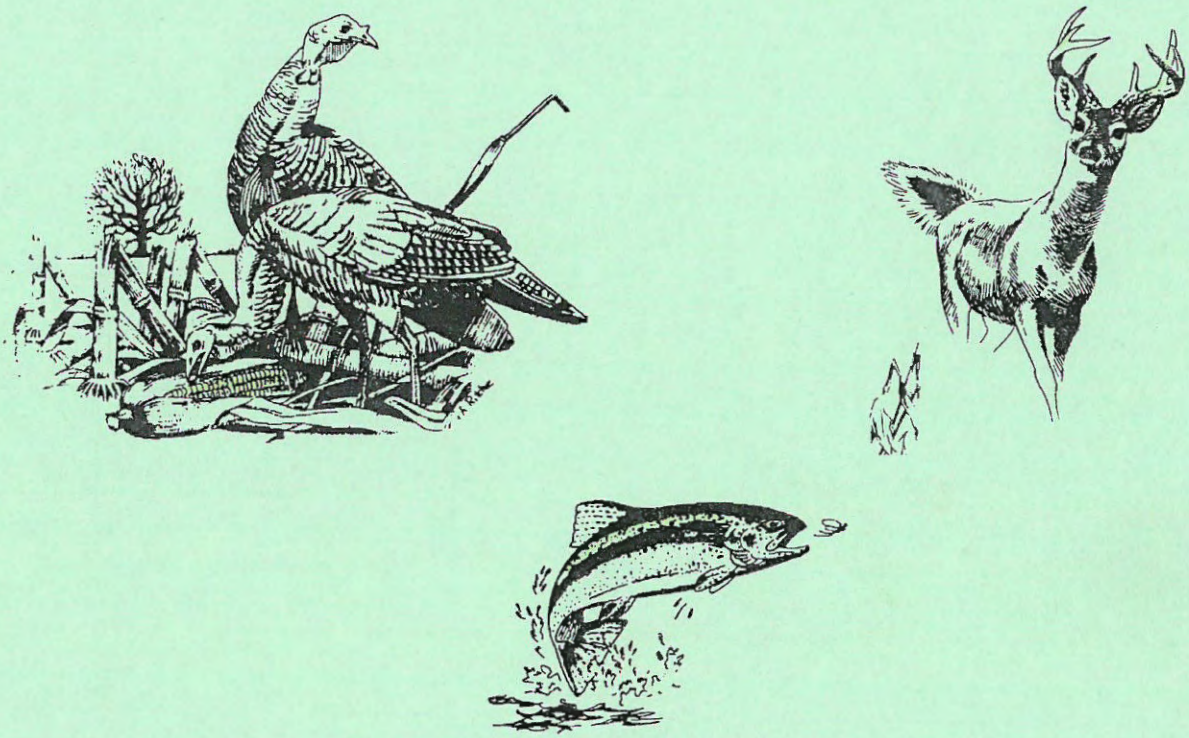
RCD

BEAR CREEK

Watershed Plan
And
Environmental Assessment



Winneshiek and Allamakee Counties, Iowa
Houston and Fillmore Counties, Minnesota

U.S. Department of Agriculture
Natural Resources Conservation Service
Forest Service

September 1998

ADDENDUM

The Bear Creek watershed was evaluated using a 1996 price base and current normalized prices. More current price base indexes were not available. Therefore benefits and costs as shown in table one through six are the most current and accurate.

BEAR CREEK WATERSHED

WATERSHED PLAN - ENVIRONMENTAL ASSESSMENT
Public Law 83-566

BEAR CREEK WATERSHED
Allamakee County, Iowa
Winneshiek County, Iowa
Houston County, Minnesota
Fillmore County, Minnesota

prepared by:

Winneshiek County Soil and Water Conservation District
Winneshiek County Board of Supervisors
Root River Soil and Water Conservation District
Houston County Board of Commissioners
Iowa Department of Natural Resources

USDA
FOREST SERVICE
NATURAL RESOURCES CONSERVATION SERVICE
DES MOINES, IOWA
SEPTEMBER, 1998

WATERSHED AGREEMENT

between
Winneshiek County Soil and Water Conservation District
Winneshiek County Board of Supervisors
Root River Soil and Water Conservation District
Houston County Board of Commissioners
Iowa Department of Natural Resources

(Referred to herein as Sponsors)

and the
Natural Resources Conservation Service
United States Department of Agriculture

(Referred to herein as NRCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by Sponsors for assistance in preparing a plan of works of improvement for the Bear Creek Watershed, State of Iowa and State of Minnesota, under the authority of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1008); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to NRCS; and

Whereas, there has been developed through the cooperative efforts of the Sponsors and NRCS a plan for works of improvement of the Bear Creek Watershed, State of Iowa and State of Minnesota, hereinafter referred to as the Watershed Plan - Environmental Assessment, which plan is annexed to and made a part of this agreement.

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through the NRCS, and the Sponsors hereby agree on this plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this watershed plan and including the following:

1. The Sponsors will acquire with other than Public Law 83-566 funds, such real property as will be needed in connection with the works of improvement. (Estimated Cost $89,000)

2. The Sponsors hereby agree that they will comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. 4601 et. seq. as implemented by 7 C.F.R. Part 21) when acquiring real property interests for this federally assisted project. If the Sponsors are legally unable to comply with the real property acquisition requirements of the Act, they agree that, before any federal financial assistance is furnished, they will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance. In any event, the Sponsors agree that they will reimburse owners for necessary expenses as specified in 7 C.F.R. 21.1006 (c) and 21.1007.

The cost of relocation payments in connection with the displacements under the Uniform Relocation Act will be shared by the Sponsors and NRCS as follows:

	Sponsors (percent)	NRCS (percent)	Estimated Relocation Payment Costs (dollars)
Relocation Payments	86.6	13.4	0 1/

1/ Investigation of the watershed project area indicates that no displacements will be involved under present conditions. However, in the event that displacement becomes necessary at a later date, the cost of relocation assistance and payments will be cost-shared in accordance with the percentages shown.

3. The Sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of works of improvement.

4. The Sponsors will obtain all necessary federal, state, and local permits required by law, ordinance, or regulation for installation of the works of improvement.

5. The percentages of construction costs to be paid by the Sponsors and by NRCS for floodwater-retarding structures are as follows:

Works of Improvement	Sponsors (percent)	NRCS (percent)	Estimated Construction Costs (dollars)
All structural measures	0	100	2,725,000

6. Cost-sharing rate for the establishment of enduring land treatment practices (terraces, fencing, water supply, pasture planting, livestock waste management, timber stand improvement, and tree planting) is 65 percent of the average cost of installing enduring practices in the selected plan for the evaluation unit. The estimated total financial assistance cost for enduring practices is $1,235,100.

7. The percentages of the engineering services costs to be borne by the Sponsors and NRCS are as follows:

Works of Improvement	Sponsors (percent)	NRCS (percent)	Estimated Engineering Service Costs (dollars)
All structural measures	0	100	545,000 2/

2/ The sponsors and NRCS will bear the cost of construction inspection that each incurs, estimated to be $0 and $163,500, respectively.

8. The NRCS will assist the Sponsors in providing technical assistance to land owners or operators to plan and install land treatment practices shown in the plan. Percentages of technical assistance costs to be borne by Sponsors and NRCS are as follows:

Works of Improvement	Sponsors (percent)	NRCS (percent)	Estimated Technical Assistance (dollars)
Land Treatment Practices	0	100	166,000

9. The Sponsors and the NRCS will each bear the costs of Project Administration that each incurs, estimated to be $0 and $272,500, respectively.

10. The Sponsors will obtain agreements from owners of not less than 50 percent of the land above each floodwater-retarding structure. These agreements state that the owners will carry out conservation farm plans on their land. The Sponsors will ensure that 75 percent of the land in Iowa and 50 percent of the land in Minnesota upstream of any detention reservoir site is adequately protected before construction of the dam.

11. The Sponsors will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed plan.

12. The Sponsors will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

13. The Sponsors agree to participate in and comply with applicable Federal floodplain management and flood insurance programs before construction starts.

14. The Sponsors will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with agreements to be entered into before issuing invitations to bid for construction work.

15. The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto, will be the actual costs incurred in the installation of works of improvement.

16. This agreement is not a fund obligation document. Financial and other assistance to be furnished by NRCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

17. A separate agreement will be entered into between NRCS and Sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

18. This plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may deauthorize or terminate funding at any time it determines that the Sponsors have failed to comply with the conditions of this agreement. In this case, NRCS shall promptly notify the Sponsors in writing of the determination and the reasons for deauthorization of project funding, together with the effective date. Payments made to the Sponsors or recoveries by NRCS shall be in accord with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the Sponsors having specific responsibilities for the measure involved.

19. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

20. The program conducted will be in compliance with the nondiscrimination provisions as contained in Titles VI and VII of the Civil Rights Act of 1964, as amended, the Civil Rights Restoration Act of 1987 (Public Law 100-259) and other nondiscrimination statutes, namely, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1975, and in accordance with regulations of the Secretary of Agriculture (7 C.F.R. 15, Subparts A & B), which provide that no person in the United States shall, on the grounds of race, color, national origin, age, sex, religion, marital status, or handicap be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving Federal financial assistance from the Department of Agriculture or any agency thereof.

21. Certification Regarding Drug-Free Workplace Requirements (7 CFR 3017, Subpart F).

By signing this watershed agreement, the Sponsors are providing the certification set out below. If it is later determined that the Sponsors knowingly rendered a false certification, or otherwise violated the requirements of the Drug-Free Workplace Act, the NRCS, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

Controlled substance means a controlled substance in Schedules I through V of the Controlled Substances Act (21 U.S.C. 812) and as further defined by regulation (21 CFR 1308.11 through 1308.15);

Conviction means a finding of (including a plea of nolo contender) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes;

Criminal drug statute means a Federal or non-Federal criminal statute involving the manufacturing, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) all direct charge employees; (ii) all indirect charge employees unless their impact or involvement is insignificant to the performance of the grant; and, (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement; consultants or independent contractors not on the grantees' payroll; or employees of subrecipients or subcontractors in covered workplaces).

Certification:

A. The Sponsors certify that they will or will continue to provide a drug-free workplace by:

(1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(2) Establishing an ongoing drug-free awareness program to inform employees about--

(a) The danger of drug abuse in the workplace;

(b) The grantee's policy of maintaining a drug-free workplace;

(c) Any available drug counseling, rehabilitation, and employee assistance programs; and

(d) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace

(3) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (1);

(4) Notifying the employee in the statement required by paragraph (1) that, as a condition of employment under the grant, the employee will --

(a) Abide by the terms of the statement; and

(b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(5) Notifying the NRCS in writing, within ten calendar days after receiving notice under paragraph (4)(b) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice shall include the identification number(s) of each affected grant;

(6) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (4)(b), with respect to any employee who is so convicted--

(a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(b) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency.

(7) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (1),(2),(3),(4),(5), and (6).

B. The Sponsors may provide a list of the site(s) for the performance of work done in connection with a specific project or other agreement.

C. Agencies shall keep the original of all disclosure reports in the official files of the agency.

22. Certification Regarding Lobbying (7 CFR 3018).

(1) The Sponsors certify to the best of their knowledge and belief, that:

(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Sponsors, to any person for influencing or attempting to influence an officer or employee of an agency, Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL,"Disclosure Form to Report Lobbying," in accordance with its instructions.

(c) The Sponsors shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

(2) This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

23. Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions (7 CFR 3017).

(1) The Sponsors certify to the best of their knowledge and belief, that they and their principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

(2) Where the primary Sponsors are unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this agreement.

WINNESHIEK COUNTY SOIL AND WATER CONSERVATION DISTRICT

By Wilbur E. Stoen

Title Comm.

Address Decorah Iowa

Date 9-16-98

The signing of this plan was authorized by a resolution of the governing body of the Winneshiek County Soil and Water Conservation District adopted at a meeting held on 8/18, 1998

Stacy L. Opat
Secretary

Decorah 52101
Address Zip

8/18/98
Date

WINNESHIEK COUNTY BOARD OF SUPERVISORS

By Lester E. Askelson

Title Chairman

Address Decorah, IA. 52101

Date 9-16-98

The signing of this plan was authorized by a resolution of the governing body of the Winneshiek County Board of Supervisors adopted at a meeting held on 8/24, 1998.

Georgiann Schweinefus
Secretary

Decorah 52101
Address Zip

8/24/98
Date

ROOT RIVER SOIL AND WATER
CONSERVATION DISTRICT

By [illegible signature]

Title Root River SWCD

Address Caledonia Minnesota

Date Sept 16 1998

The signing of this plan was authorized by a resolution of the governing body of the Root River Soil and Water Conservation District adopted at a meeting held on 9/9, 1998

Doug Meyer
Secretary

Caledonia, MN 55921
Address Zip

9/16/98
Date

HOUSTON COUNTY BOARD
OF COMMISSIONERS

By Wendell K Wild

Title Commissioner

Address New Albin Ia

Date 9-16-98

The signing of this plan was authorized by a resolution of the governing body of the Houston County Board of Commissioners adopted at a meeting held on 9/8, 1998

Wendall Wild
Secretary

Caledonia, MN 55921
Address Zip

9/16/98
Date

IOWA DEPARTMENT OF
NATURAL RESOURCES
Wallace State Office Building
Des Moines, Iowa 50319-0002

By D Paulin (for)
Larry Wilson
Director

Date Sept. 16, 1998

Forest Service
United States Department of Agriculture
Headquarters Office
5 Radnor Corporate Center, Suite 200
Radnor, Pennsylvania 19087-4585

Approved by:

for Michael S. Rains
Michael Rains
Director

Date: 9/16/98

Natural Resources Conservation Service
United States Department of Agriculture
375 Jackson Street - Suite 600
St. Paul, Minnesota 55101-1854

Approved by:

William Hunt

William Hunt
State Conservationist

Date: 9/16/98

Natural Resources Conservation Service
United States Department of Agriculture
693 Federal Building
210 Walnut Street
Des Moines, Iowa 50309-2180

Approved by:

Leroy Brown

Leroy Brown
State Conservationist

Date: 9/16/98

CONTENTS

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INTRODUCTION

This Watershed Plan-Environmental Assessment (Plan-EA) report for Bear Creek Watershed describes water resource problems, alternatives for alleviating identified problems, beneficial effects, and costs of alternatives. A Recommended Plan outlines project measures, costs, and operation and maintenance obligations. Adverse effects of the Recommended Plan are discussed.

Studies leading to the preparation of this report were funded under authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 U.S.C. 1001-1008), and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 U.S.C. 4321 et seq.) Responsibility for compliance with the National Environmental Policy Act rests with the Natural Resources Conservation Service (NRCS).

A preapplication report was prepared in January 1989, indicating potential for a feasible project. An application for assistance under the PL-566 program for Bear Creek Watershed was submitted by local sponsors in March 1989, and approved in December of 1989, by the State Soil Conservation Committee. In April 1995, the preauthorization report was prepared and a request for planning submitted. Planning funds were provided during fiscal year 1995.

Sponsors requesting assistance are:

Winneshiek County Soil and Water Conservation District
Winneshiek County Board of Supervisors
Root River Soil and Water Conservation District
Houston County Board of Commissioners
Iowa Department of Natural Resources (IDNR)

Sponsors identified these objectives for project action:

1. Reduce floodwater damages to public and private lands and infrastructure.
2. Reduce environmental damages to land and water resources in the watershed.
3. Improve trout fishery to maximize recreational benefits.

The U. S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), and Forest Service (FS), provided assistance to the Sponsors in developing the Plan-EA. Other agencies providing input included the Iowa Department of Natural Resources, Minnesota Department of Natural Resources, Iowa Department of Agriculture and Land Stewardship, Division of Soil Conservation, and the U.S. Department of Interior, Fish and Wildlife Service (USFWS).

Water resource planning specialists have studied Bear Creek Watershed problems and opportunities and have assisted in preparing this Plan-EA for accomplishing Sponsor's objectives.

The Recommended Plan includes:

1. Fifty-two floodwater retarding structures to control runoff from 42 percent of the watershed to reduce flood, sedimentation, and turbidity damages.
2. Land treatment practices to reduce deterioration of the land resource base, sedimentation, and turbidity.

Additional supporting data not found in this document can be obtained by contacting NRCS at Ste. 693 Federal Building, 210 Walnut St., Des Moines, Iowa 50309

PROJECT SETTING

Bear Creek Watershed is located in Allamakee and Winneshiek counties of northeast Iowa and Fillmore and Houston counties of southeast Minnesota. The project consists of two subwatersheds, North Bear Creek (34 square miles) and South Bear Creek (21 square miles). North Bear Creek (including it's tributary Middle Bear Creek)flows southward about nine miles from Spring Grove, Minnesota to its junction with South Bear Creek. South Bear Creek has headwaters about nine miles west-northwest of this junction. Bear Creek continues east-southeast eight miles to its confluence with the Upper Iowa River. At its mouth, Bear Creek has a total drainage area of 118 square miles. See Project Map in Appendix C.

The project drainage area by county is:

County	Acres
Allamakee	110
Winneshiek	24,670
Fillmore	50
Houston	10,160
Total	34,990

Bear Creek Watershed is located within the Paleozoic Plateau landform region of northeast Iowa and southeast Minnesota. This region is characterized by deep valleys, high bluffs, abundant rock outcrops, caves, and sinkholes. The valleys are incised into members of the Jordan sandstone, Prairie du Chien, and St. Peter sandstone formations. The rock outcrops and high bluffs are exposures of the latter two formations. Although caves and sinkholes are located in the dolomites of the Prairie du Chien formation, major karst areas lie south of Bear Creek Watershed.

The Jordan sandstone is the principal water-bearing unit in the Cambrian-Ordovician aquifer which also includes the Oneota dolomite and New Richmond sandstone members of the Prairie du Chien formation. The thin soil overburden of this region makes the aquifers very susceptible to contamination from human impacts. The Jordan sandstone is the lowest unit exposed at the surface in the watershed and feeds springs in North, Middle, and South Bear Creeks.

Ridge tops and plateaus are covered by relatively thin deposits of Pre-Illinoian glacial till and Wisconsin age loess. Upland ridge soils are primarily silt loam derived from loess. Rolling to steep topography is associated with the sideslopes of major drainageways. The lower reaches of the watershed are steeper. These lower reaches generally feature rocky residual soils with bedrock outcrops common. The upper reaches are less steep and generally have thicker loess soils. The floodplain contains alluvial soils. Elevations range from 1,350 feet (MSL) at the apex to 660 feet (MSL) at its mouth. More intensive use of these fragile soils in the future will result in degradation of the soil resource base.

State highway, Minnesota 44, borders the watershed on the north. Other major transportation routes are provided by county roads, several of these being paved. Communities include Spring Grove, Minnesota; Hesper, Iowa; and Highlandville, Iowa. The latter two are small unincorporated areas, whose populations have been relatively stable in the past. The economy of the watershed is largely agricultural.

The climate is mid-continental with warm summers and cold winters. Average annual precipitation is 33 inches, with 24 inches occurring as rain during the months of April through September. Runoff from intense short duration rainfalls, typical of this climate, causes upland erosion and produces sediment and flooding to the streams and flood plain. Snowfall averages 40 inches annually. Average frost-free growing season is 138 days, from May 10 to September 25. Mean annual temperature is 50 degrees Fahrenheit with recorded extremes of -27 and 95 degrees Fahrenheit.

North and South Bear Creeks are classified for designated uses by the Iowa Department of Natural Resources (IDNR) as class "B" (c) HQ waters. Waters designated as class "B" waters are to be protected for wildlife, fish, aquatic and semi-aquatic life, and secondary contact water uses. The (c) classification refers to a coldwater stream and the HQ means these are high quality waters to be maintained at or above existing (chemical) quality. North Bear Creek is classified as class "B" (c) HQ water from the junction with South Bear, 5.4 miles upstream to near the Iowa-Minnesota State Line. This classification for South Bear Creek extends from the junction with North Bear Creek, upstream 5.2 miles to Mestad Springs.

Middle Bear, a tributary of North Bear, is classified as "B" (c) HQR for 2.2 miles from the junction with North Bear to the north line of Section 16, T100N, R7W. HQR waters are afforded special protection under the Iowa Administrative Code because of naturally high physical and biological factors of these streams.

Bear Creek is classified as "B" (w) HQ from the confluence of South Bear and North Bear to its mouth at the Upper Iowa River. The (w) portion of the water use designation signifies a warm-water stream, and the "B" and HQ designations are the same as used for the coldwater streams described above.

North and South Bear Creek are managed by the IDNR as a put-and-take trout fishery. Trout are grown at the Decorah Fish Hatchery until they reach about ½ pound and then the fish are released into the streams to augment natural reproduction and provide recreational opportunities for anglers. The upper end of South Bear, upstream of Highlandville, is stocked exclusively with Brown Trout and the balance of the system is stocked with a mixture of 20 percent Brown Trout and 80 percent Rainbow Trout. Currently the two streams are stocked once or twice weekly, depending upon environmental conditions and accessibility for the stocking truck, with approximately 250 trout released per mile of stream weekly from April 1 to November 30. Since not all fish are caught, trout persist in the streams year-round and active fishing occurs throughout the year, not just during the stocking period.

Currently some sections of both North and South Bear Creeks are so degraded that they provide little or no cover or feeding areas for trout. These areas are usually short reaches scattered throughout the stream system. Since these sections provide no cover or food for trout, when trout are released into the stream they do not linger or use these areas but move to other areas to seek suitable habitat. In the future, if present trends in land use changes, sedimentation, and livestock waste management continue, these sections will continue to provide no habitat for trout or opportunities for anglers to fish.

In addition, if these trends continue, more sections of the stream may become unsuitable for cover or feeding areas for trout. This would then reduce the quantity of suitable fishing areas to the point where less fish per mile would be stocked or the stocking frequency would be reduced.

Middle Bear Creek is managed differently than North and South Bear. Because of its smaller size and inaccessibility to stocking vehicles, it can not support the intense pressure of a put-and-take fishery. The IDNR manages Middle Bear as a put-and-grow stream in which three inch fingerling Brown Trout are stocked each spring to augment any natural reproduction in the stream. These fingerlings grow to a catchable size of 10-13 inches in their first year in the stream. Since they are a much wilder fish, having grown to adulthood in the stream, and due to the reduced level of fishing pressure under this system of management, they often survive much longer, and 3-4 pound fish are not uncommon. This stream provides a more remote and more aesthetic experience for experienced anglers to catch trophy size fish. Future impacts from the same trends as discussed for North and South Bear Creeks above could also lead to a complete loss of the fishery on Middle Bear Creek in the future, or to a much shorter stretch of the stream being suitable for the growth and survival of the stocked fingerling Brown Trout. This would reduce the potential fishery and angler use of this stream.

North Bear Creek and South Bear Creek are two of 25 priority streams identified for water quality protection and improvement in the State of Iowa Nonpoint Source Management Program. This priority designation indicates that the stream is a unique and valuable resource to be protected from degradation and targeted for reduction of the current level of nonpoint source pollution.

The lower eight miles of Bear Creek, the portion below the confluence of North and South Bear, has a smallmouth bass fishery. These fish are not stocked by IDNR, but are naturally reproducing fish. This fishery is a reproduction and growth area as well as an area used by adult fish. The same pollution factors found in the trout waters are impairing this fishery and reducing its potential to provide quality habitat for smallmouth bass. The IDNR indicates that excessive sedimentation reduces the ability of the stream to provide more reproduction and cover for the young and adult bass. Current trends in non-point pollution as was the case with the trout waters, will lead to a continued or accelerating loss of this fishery in the future and will reduce or eliminate its availability to provide recreation to bass anglers.

The State of Iowa Water Quality Assessment Report (AKA 305(b) report) Water Quality in Iowa during 1994 and 1995 includes assessments for North Bear Creek and Middle Bear Creek. South Bear Creek was not specifically assessed.

These assessments for class B (aquatic life) uses indicated that this use is "Fully Supported/Threatened". Waters assessed as "Fully supported/Threatened" fully support their designated uses but may not fully support uses in the future because of anticipated sources of pollution or adverse pollution trends. These use support statements are based on bio-assessment studies at one site that represents the general conditions throughout the stream.

Natural trout reproduction has been greatly reduced in all parts of Bear Creek due to heavy sedimentation over the natural stream substrate. Sediment and animal waste are the major pollutants delivered to the stream. The delivery of these two major pollutants is anticipated to increase in the future. Habitat Suitability /index values provide a method for calculating the overall ability of a stream to support targeted aquatic species. Current trout habitat suitability index values and projected index values show that sediment and animal waste will reduce Bear Creek's ability to support both rainbow and brown trout in the future if current trends continue.

Land ownership of most of the watershed is private, except for transportation rights-of-way, a Winneshiek County Conservation Board park, and Iowa DNR land used for wildlife management, recreational trout fishing, and public access parking. There are approximately 176 farms in the watershed.

Land use is almost entirely agricultural. Cropland occupies 51 percent of the area and is mostly corn, soybeans, small grain, and hay. The remaining area is permanent pasture and forest. Pastureland and much of the forest land are grazed by beef and dairy cattle. Forest land also provides timber products, firewood, wildlife habitat, and recreation. The 990 acre flood plain is 3 percent of the total watershed and consists of 20 percent cropland, 53 percent permanent pasture, and 27 percent woods and other uses.

Current Land Use	Iowa	Minnesota	Total
		(acres)	
Cropland	12,240	5,690	17,930
Pastureland	9,290	3,420	12,710
Forest land	2,700	610	3,310
Other(roads, urban, farmsteads, etc.)	550	490	1,040
Total	24,660	10,330	34,990

Upland cropland soils are primarily loess derived soil map units that are intensively row-cropped mainly to corn and soybeans. Nearly all of the cropland fields in Iowa are highly erodible land (HEL). The Minnesota portion is 80 percent HEL cropland.

A major portion of the cropland has slopes of 5 to 14 percent which results in excessive sheet and rill erosion and ephemeral cropland gully erosion unless adequate control practices are installed.

Pastureland or forestland is generally on land that has limitations that make it undesirable for cropland. These conditions can include: steep slopes, soils shallow to bedrock on sloping land, frequent flooding, and land incised by streams resulting in irregular or small fields not practical to farm.

Excessive livestock grazing on pastureland and forest land results in inadequate vegetative cover. This causes excessive sheet and rill erosion and results in sediment and manure delivered to surface water.

The leading forest type within the Bear Creek Watershed is the maple-beech-birch complex, followed in acreage closely by the white oak-red oak-hickory complex. The current emphasis of forest management within the watershed, on those acres with a management plan, is to increase the oak-hickory component.

Growing stock inventory will likely continue to build until 2020. This will occur as trees on existing forest land grow to larger diameter classes, and as net growth accrues faster than timber removals. The inventory of growing stock is expected to be extended as technologies emerge to utilize trees currently considered non-growing stock, such as small diameter trees from thinnings, tree tops and limbs, short-logs, and rough and rotten trees.

The average annual mortality rate of growing stock is approximately 1.1 percent. Higher mortality rates for disease-prone species such as elms, ash, and oaks have been reported. Oak Wilt which causes foliage to wilt and die, continues to be the most serious tree disease with new acreage increasing slightly. Dutch elm disease will also continue to be a problem until sanitation efforts targeted at infected trees improve.

Existing stands of mature oak-hickory are in decline in part as a result of disease and overgrazing. In the majority of the grazed stands, the sawtimber quality is poor. In this watershed, poor quality sawtimber is usually a result of excessive knots on the butt log due to excessive branching resulting from understocked stands. Another degradation of the butt log is hollowing which is a result of trampling and scarring of tree roots and tree boles, as well as soil compaction. Economic impact due to grazing is severe since the butt log on a hardwood tree holds most of the value. These stands are converting to the less desirable basswood-sugar maple type. This is a response brought on by retiring the land from grazing and allowing the forest to reproduce naturally. Due to the prolific seeding, sprouting and root suckering of the maples, combined with their ability to withstand shade, these species usually dominate a naturally regenerated forest following heavy grazing. In an effort to keep the more desirable oak-hickory type, it is necessary to supplement the regeneration process through planting of trees and direct seeding following the retirement of land from grazing.

Bottomlands consisting of floodplains and low lying terraces are usually dominated by silver maple, green ash, hackberry, cottonwood, river birch, and american elm. Other species less common but found are sycamore, locust, bitternut and shellbark hickories, and various oaks. The riparian community found on a narrow band or belt along stream banks, mud flats and sand bars is generally dominated by cottonwood, silver maple, boxelder, river birch and various willows.

Farms in the watershed are decreasing in number and increasing in size. Cropping intensity is expected to continue increasing as corn and particularly soybean acres increase while small grains and legumes decrease. This trend is partially due to a reduction in the number of dairy farms which reduces the need for crop rotations that include oats, alfalfa, or red clover.

There are about seven miles of stream that are specifically impacted by livestock access. Delivery of sediment and livestock manure also affects the stream. Livestock numbers are expected to increase and the number of operators are expected to decrease resulting in more streambank erosion causing some reaches of the stream to no longer support their designated use.

An estimated 77 livestock operations are located within the watershed, 47 are in Iowa and 30 in Minnesota. Animal numbers are summarized below. Approximately 25 percent of these farms have some type of animal manure management system. Livestock numbers in confined and enclosed facilities should remain relatively constant, while the number of animals in open lots and pasturing systems are expected to increase over the evaluation period.

Animal Type	Number of Operations	Number of Animals
Dairy	28	1,700
Beef	34	1,800
Swine	10	6,800
Other	5	150

Wetlands in the Bear Creek Watershed are almost nonexistent, and wetland acreage could not be accurately quantified using the sampling techniques employed to estimate land use numbers for the watershed. Wetlands are uncommon due to a mature, entrenched drainage pattern and the presence of fractured limestone bedrock at or near the surface in the watershed. A few small wetlands are present in scattered areas of the floodplain. Most of these are associated with old meander scars in pastures or near spring seeps.

Both federal- and state-listed threatened and endangered species are likely to be found in the watershed, especially in the forested areas. Federally listed species that may occur are: Prairie Bush Clover (Lespedeza leptostachya), Northern Wild Monkshood (Aconitum noveboracense), and Bald Eagle (Haliaeetus leucocephalus).

State of Minnesota listed species likely to occur in the watershed include: Hill's Thistle (Cirsium hillii), Wolf's junegrass (Poa wolfii), Valerian (Valeriana edulis), Tuberous Indianplantain (Cacalia tuberosa), and Unnamed (Carex laevivaginata).

State of Iowa listed threatened or endangered species that may be found in the project area include: Nodding onion (Allium cernuum), Shrubby cinquefoil (Potentilla fruiticosa), Jeweled shooting star (Dodecatheon amethystinum), Bluff vertigo (Vertigo meramecensis), Spotted Wintergreen (Chimaphila umbellata), Yellow trout lily (Erythronium americanum), Narrowleaf pinweed (Lechea intermedia), Unnamed (Carex tonsa).

A search of state archaeological site files indicates the presence of several archaeological sites in Bear Creek Watershed. Evidence from archaeological sites in the vicinity suggests that the area has been occupied for the last 11,000 years. This span of human occupation encompasses the Paleo-Indian, Archaic, Woodland, and Oneota periods. Archaeological site locations in the vicinity include valley bottoms, rock shelters, and ridge tops. Little or no change in cultural resources is expected during the evaluation period.

WATERSHED PROBLEMS AND OPPORTUNITIES

Floodwaters cause damages to several categories of resources in Bear Creek Watershed. They damage crops, pastures, and other agricultural infrastructure; recreational facilities such as campgrounds and parking lots; public roads and bridges, including stocking trails used by IDNR vehicles for stream access. Floodwaters also degrade and impair in-stream structures that provides habitat for feeding, cover and reproduction by trout. The high velocity flows associated with flood events increase turbidity by delivering sediments temporarily stored in the floodplain and in dry channels upslope of the streams, detaching soil particles from streambanks and by mobilizing sediments stored in the stream bottom.

Improper use and management of the steep, fragile lands found in the Bear Creek watershed are causing excessive soil erosion on cropland, pastureland and forest land. Delivery of sediment during runoff events is degrading the surface water quality of the streams for trout. The high volume of sediment currently being delivered to the stream prevents trout spawning, reduces the number and quality of invertebrate species that provide forage for the trout, destroys in-stream habitat by filling the deep water pools and smothers desirable vegetation that provides cover for fish.

All problems discussed are forecasted for the Future Without Project conditions, 25 years from present. These are the conditions projected to exist at the midpoint of the 50 year evaluation period.

PROBLEMS

Flooding

Floodwater damages and increased turbidity levels associated with floodwaters reduce the usage of the recreational resources, such as fishing, camping, nature study, hiking, hunting, etc., in the project area. Unsafe water depth and high velocity flows during flood events, create hazardous conditions for persons in or adjacent to the streams. The social and economic well-being of the community is negatively affected by the damage to infrastructure and disruption of normal travel patterns caused by these flood events.

Crop and Pasture

Flooding from Bear Creek and its tributaries generally occurs up to four times per year and more often in some reaches. The flooding varies in depth and duration in different reaches. Approximately 66 percent of the floods occur during the months of March, April, May, and June. Floods during these months reduce yields and cause problems in tillage operations. Crops are sometimes destroyed. Crops may usually be replanted or an alternative crop may be planted but yields are reduced from optimum levels and input costs increase.

Pasture damages occur when floodwater inundates land being used for livestock grazing. Flooding and sedimentation limit vegetative growth and introduce undesirable plant species. Livestock gains are reduced because of reduced access to these areas.

The total floodplain is estimated to be 990 acres. Average annual acres flooded are estimated to be 980. Average annual crop and pasture damages are estimated to be $15,600.

Other Agricultural

Other agricultural damages in the Bear Creek Watershed floodplain include damages to fences, farm lanes, field roads and crossings, equipment, and deposition of debris and sediment. Damages from deposition include the costs of removing logs, sediment, and debris. Average annual other agricultural damages are estimated to be $13,100.

Road and Bridge

Roads, bridges, and culverts at 14 locations are subject to damage. Floodwaters damage transportation routes by scouring materials from roadways and embankments, and by bending, breaking, or removing bridge and culvert members. Damages to roads include costs of replacement of road fills and surfacing materials and cost of sediment and debris removal. Sediment may be deposited on roads and bridges, and debris moved into channels where it often lodges against bridges and culverts. Roads closed by flooding and for flood related repairs cause traffic delays and rerouting of traffic. Farmers with land on both sides of the creek either lose access to land or must travel long distances while roads are closed for repair. Traffic rerouting causes problems for school bus travel and other vital services. These damages are estimated to be $16,200 annually.

Recreation Facilities

Flooding deposits debris and sediment on trout stocking roads, stream fords, trails, and fences. Roads, trails, and stream fords are undermined and surfaces are damaged. In-stream structures for fish production and protection are damaged by high flows. Stocked fish are lost from the trout stream. High water prevents access until it recedes and repairs are made. Fences on public property are torn out by high flows or smashed down by debris left on them after water recedes. All damages necessitate increased expenses for maintenance and repair. Damages on an average annual basis are estimated to be $5,000.

Loss of Angler Days

No fishing is possible during flood periods. Out-of-bank flooding which limits access to the stream will occur on Bear Creek on an average of six to eight times per year. Extent of out-of-bank flow is dependent upon magnitude of the event and antecedent runoff condition. There is an estimated average annual loss of 6,700 angler days due to flooding with a value of $149,700.

Flooding and Water Quality

The primary water quality impairment from suspended sediment is temporary increases in turbidity following flood runoff events. These sediments are derived from erosion on cropland, pasture land, forest land, stream banks, miscellaneous areas, and feedlots.

Sediments delivered to the stream during runoff events increase the turbidity of the stream. Turbidity is primarily caused by suspended sediment consisting of clay, silt and fine sand sized particles. Sediment sources are from sheet and rill, ephemeral gully, classic gully and stream bank erosion. Total sediment delivery from soil erosion to Bear Creek is estimated to be about 53,770 tons per year.

Flood water and sediment damages are generally inseparable. The following damages are arbitrarily split between flooding and water quality based upon the estimates of field technicians.

Loss of Activities Related to Anglers

Campsite use is decreased due to flooding, both in Bear Creek Watershed, and at nearby campgrounds. When anglers stay away from the area due to impaired fishing, there is a corresponding loss in family use of campsites. In addition, when actual inundation of campground areas occur there is an even greater loss in campsite use. Annual loss in use of campsites in Bear Creek Watershed related to flooding is estimated at 2,100 visitor days with a value of $15,400.

Loss in Angler Days Due to Turbidity

Sediments are transported to the fishery primarily during flood events. Since trout are sight feeders, periods of turbid water are unproductive for trout fisherman and they do not fish at those times. When streams are turbid, IDNR may skip a stocking and all fishing usage is lost for a few days. Anglers have a lower success rate during turbid flows and often do not even try to fish until the water quality conditions improve. This results in a loss of recreation to the public and has a negative impact upon the local recreation economy of Highlandville and Spring Grove.

The IDNR estimates that 13 percent of potential fishing days are lost due to turbidity. A portion of these damages are attributable to excessive erosion on the uplands. An estimated 8,200 angler days are lost annually due to flooding and associated turbidity. These fishing days have an estimated value of $183,300.

Loss of Angler Days Due to Deposited Sediment

Sediment from excessive erosion is being deposited in the trout stream, decreasing both the number of pools per mile and the average depth of pools. Since pools are the main area where trout congregate to rest and hide while waiting to feed, these are the areas that best support fishing use by recreationists.

Deposition of sediment decreases the quality of the warm water fishery by filling in pools and reducing their depth and number. These pools provide needed cover for smallmouth bass to live and hide from avian and terrestrial predators. Sediment covers the spawning beds and smothers the eggs which reduces or prevents bass reproduction. This reduces potential numbers of fish in the stream and downstream in the Upper Iowa River which further reduces current fishing recreation.

Over the next 25 years (midpoint of the evaluation period) some areas that now support trout, and therefore fishing, will become unsuitable and not be available for recreation. If the quantity and quality of stream pools did not decrease, IDNR estimates angler days would increase 10 percent over the evaluation period. However, due to degradation of pools, number and depth, fewer areas will be fishable and angler days will only increase five percent. This is a foregone opportunity loss of 3,200 angler days due to flooding and sedimentation annually with an annual value of $71,500.

There will also be a loss of recreation in the future for smallmouth bass anglers if the current trends in impairment continue. While the eight miles of stream below the watershed boundary provides recreation for anglers throughout much of the year, no actual angler use surveys have been conducted by the IDNR that document the number of angling days on the stream. Although the actual dollars cannot be evaluated, both economic and sociologic damages are occurring now, and will occur in the future.

Other Watershed Recreation

Based upon interviews with IDNR biologists and others aware of needs and demand for outdoor recreation in the Bear Creek watershed, it is estimated that if a PL-566 project is not installed there will not be an improvement in upland watershed conditions. If a PL-566 project is installed, general land use changes, reduction of flood damages, installation of land treatment practices on cropland, enhancement of pastures, and improvement of forest land will result in additional enhancement benefits or opportunities in the upland portion of the watershed through an increased Habitat Suitability Index (HSI).

The improved HSI will result in more visitations for all kinds of related activity such as hunting, camping, picnicking, bird watching, etc., in the watershed outside the floodplain. Enhancement benefits will result in growth of recreation visits for all other outdoor recreation of about 30% for the next 25 years. The opportunity for other outdoor recreation activities related to the flooding problem are estimated at 1100 visits with an estimated annual value of $8,100.

SUMMARY OF AVERAGE ANNUAL IMPACTS
Future Without Project Conditions

Item	Flooding	Water Quality
	(dollars)	(dollars)
Crop and Pasture	15,600	
Other Agricultural	13,100	
Road and Bridge	16,200	
Recreation Facilities	5,000	
Loss of Angler Days	149,700	
Loss of Activities Related to Anglers	11,600	3,800
Loss of Angler days Due to Turbidity	137,500	45,800
Loss of Angler Days Due to Deposited Sediment	53,600	17,900
Other Watershed Recreation	6,100	2,000
Enhancement Opportunities	202,800	67,600
Cropland		
Soil Resource Depletion		36,000
Ephemeral Cropland Gully Erosion		53,500
Annual Sheet and Rill Erosion		28,800
Pastureland		
Additional Grazing		156,400
Forest land		
Additional Forest Products		27,800
Animal Waste		
Nutrient Utilization		8,400
Total	611,200	448,000

Enhancement Opportunities

An opportunity to improve both the quality and quantity of recreational use of the stream is currently being foregone. The IDNR would like to see more natural reproduction by trout in the system. This is being prevented by both the flooding intensity and excessive inputs of sediments and nutrients. The IDNR would also like to install more in-stream habitat but that is not feasible with the current level of high velocity flood flows. Improvements in quality of the fishery would

result in a more aesthetic experience for the anglers and other recreational users of the streams. Installing more in-stream structures would provide more cover and holding areas for trout and also allow more fish to be stocked in addition to increased natural reproduction from improved water quality conditions. Higher levels of fish numbers would support more angler use of the streams.

Sponsors wish to implement opportunities to maximize habitat conditions in the stream for trout and to improve the aesthetic recreational experience on Bear Creek. Reduction of flooding and the resultant sediment delivery to this stream would permit more valuable instream and bank vegetation to become established. Increased cover would result in more trout per mile of stream, providing more fishing and a more aesthetic experience for trout anglers since the stream would be closer to a natural state.

Due to the threat of recurring floods, with accompanying impaired water quality, stream fishery habitat cannot be successfully improved. If feasible, these improvements would increase the quality of the stream so that it could hold additional trout in more areas of the stream which would enhance opportunities for anglers to utilize the fishery. An example of this improvement is construction of fish shelters along stream banks. Shelters are subject to destruction during floods.

A Habitat Evaluation Procedure (HEP) was used to evaluate the existing trout habitat conditions in the three Bear Creek tributaries within the project area. The trout Habitat Suitability Index Models (HSI) published by the US Fish and Wildlife Service were used for the watershed. (Habitat Suitability Information: Rainbow Trout. FWS/OBS-82/10.60, January 1984. Habitat Suitability Index Models and Instream Flow Suitability Curves: Brown Trout. Biological Report 82 (10.124) September 1986 Revised.)The values shown in the plan are a composite of the values derived from the Rainbow and Brown Trout models. These models were used to give an overall habitat quality value for the two trout species using the Bear Creeks. The HSI evaluates habitat factors such as water temperature, dissolved oxygen, silt concentrations, number and depth of pools, bank and in-stream cover, and water chemistry that affect the ability of the stream to support trout. The index expresses quality of the stream in a value from 0.1 to 1.0, with a 1.0 being the optimal condition for the fish species being evaluated.

The existing HSI values for the streams are shown below:

Stream	Rainbow Trout HSI	Brown Trout HSI
North Bear Creek	0.57	0.58
South Bear Creek	0.67	0.69
Middle Bear Creek	N/A	0.57

Currently the average HSI index for Rainbow trout in the Bear Creek system is 0.57 and for Brown trout it is 0.69. It is forecast that the HSI for Rainbow trout will decrease to 0.54 and Brown trout to 0.66 in the future if no actions are taken to control flooding and improve water quality.

The enhancement of the watershed HSI values for terrestrial species and for trout would have the effect of increasing both the quantity of available habitat and the quality of the existing and increased acres of habitat for all species that provide recreational opportunities for the public. The enhancement of a watershed affects both the number of days of recreation use and the economic value per day per recreation visit. Lost enhancement opportunities to improve the trout HSI represent an annual loss of 12,100 angler days with a value of $270,400.

Improvements in the upland land resources resulting from the land treatment measures planned for the forest land and pastureland in the project will increase recreational use by both hunters

and nonconsumptive users of wildlife. This will result in an increase in visitor days in the watershed attributable to the land treatment portion of the plan.

Water Quality

Excessive erosion from the lack of proper land use and management degrades the soil resource base for agriculture. This results in a decline in economic returns to landowners both now and in the future. These economic losses result from lower yields from crops, forage and wood products and increased costs of inputs to offset the loss of natural soil fertility from erosion.

Trout are intolerant of high water temperatures and low levels of dissolved oxygen. The input of excessive livestock waste induces excessive Biochemical Oxygen Demand (BOD) lowering dissolved oxygen concentrations to lethal levels for trout. The waste and nutrient input can also warm the waters, especially in late summer months, to untenable levels for trout species. Additionally the excess nutrient input can produce undesirable shifts in invertebrate and plant communities in the stream interfering with the food webs that support trout.

Erosion and Sediment Sources

Soil losses in excess of the tolerable amount result in soil depletion. However, sediment delivered to Bear Creek from all land uses, regardless of the erosion rate, is the major water quality problem. Estimated annual soil loss from all types of erosion for all land uses is currently about 240,480 tons. Sediment delivered to Bear Creek from all sources of soil erosion and livestock waste is estimated to be nearly 53,770 tons annually.

Cropland

Sheet, rill, and ephemeral cropland gully erosion is annually occurring in excess of tolerable levels on 8210 acres of the 17,930 acres of cropland. Cropland sheet and rill erosion results in an excessive average erosion rate of 9.9 tons per acre per year. Ephemeral cropland gully erosion affects 4000 acres. Total cropland erosion equals 109,500 tons. An estimated 19,500 tons of sediment reach the stream each year. For this analysis, cropland currently in CRP was considered as returned to crop production.

Excessive erosion reduces net farm income, both now and in the long term, by reducing crop yields as the soil resource is depleted. Soil resource depletion damages are estimated to be $36,000 annually. Ephemeral cropland gully erosion damages are estimated to be $53,500 annually. Annual sheet and rill erosion damages are estimated at $28,800 annually.

Pastureland

Poorly managed pastureland results in sheet and rill erosion at a rate of 14.2 tons per acre per year which is in excess of tolerable limits on 6320 acres. This rate is higher than the cropland rate because pasture is located on more erosive soils. Total erosion equals 100,100 tons per year. Total sediment delivered to the trout fishing stream from this source is 19,020 tons per year.

Poorly managed pastureland results in a loss of desirable forage species and decreases overall production resulting in a loss of milk and meat production. The potential of increased Animal Unit Months (AUMs) as a result of better management was determined to be worth $156,400 on an average annual basis.

Forest Land

Improper grazing on 1250 acres of grazed forest land is causing severe sheet and rill erosion in excess of the tolerable amount or 16.7 tons per acre per year. Forest land erosion rates are higher than cropland and pasture rates because grazed forest is on steeper land. Total erosion on all grazed forest land equals 21,630 tons per year. An estimated 7350 tons of sediment reach the stream each year because much of the forest land is adjacent to Bear Creek. The remainder of the forest land, much of which is in state ownership is eroding at levels below tolerable limits.

Overgrazing of forest land causes loss of lumber and firewood income to owners both now and in the future by reducing growth of existing trees and destroying seedlings of desirable tree species. The estimated loss of income from forest products is estimated to be $27,800 annually.

SUMMARY OF AVERAGE ANNUAL EROSION AND SEDIMENT DELIVERY
Future Without Project Conditions

Item	Area	Average Erosion Rate	Total Erosion	Sediment Delivered to Stream	Delivery Ratio
	(ac)	(t/ac)	(tons)	(tons)	(percent)
Cropland					
T & Below	9,720	2.4	23,800	4,200	17
Above T	8,210	9.9	81,700	14,300	17
Ephemeral	(4,000)		4,000	1,000	25
Pastureland					
T & Below	6,390	1.6	10,580	2,010	19
Above T	6,320	14.2	89,520	17,010	19
Forest Land					
Grazed					
T & Below	340	2.3	800	270	34
Above T	1,250	16.7	20,830	7,080	34
Ungrazed					
T & Below	1,350	.4	580	170	29
Above T	370	1.5	570	160	29
Animal Waste					
All			1/	3,400 2/	
Streambank Erosion					
All			2,200	2,200	100
Other					
All	1,040	5.7	5,900	1,970	33
Total	34,990		240,480	53,770	

1/ Procedure used for estimating animal waste and sediment from animal waste operations computed values delivered to stream.
2/ Includes animal waste and sediment.

Streambank Erosion

Many cattle dispersed on pastures currently have direct access to the trout streams. This access degrades water quality by direct deposition of manure into the stream. Cattle congregate in areas adjacent to the streams, which causes loss of vegetation due to excessive traffic along the streambanks. Cattle also trample the steep or straight-walled creek banks as they seek to cross the stream or go to the stream to drink. These actions destroy streambank stability. This trampling and loss of vegetation on the stream banks in an area immediately adjacent to the streams increase erosion which deposits sediments in the outflow channels and fisheries of Bear Creek. Uncontrolled livestock access to springs and other flowing waters areas is also a concern.

Streambank erosion occurs at many sites throughout the Bear Creek system. A total of five miles of streams are affected. The amount of erosion is estimated to be 2200 tons per year with all of that amount reaching the stream immediately. The IDNR in a 1981 physical inventory report on trout streams categorized one-third of the length of North and South Bear Creeks as having unstable, bare, eroding streambanks. The severity of streambank erosion and the resulting high sediment producing areas contributes to lower water quality.

Other

Three percent of the watershed, 1040 acres, including farmsteads, roads, streams, and a limestone quarry, contribute a minor amount of sediment. Included in this estimate are: sheet and rill erosion, streambank erosion, road surface and road ditch erosion, and mining/construction activity erosion. The State of Iowa owns portions of land along the perennial portion of Bear Creek. Well vegetated banks, protected from grazing, contribute very little sediment to the stream. Intermittent streams, which drain the major portion of the basin, do supply a small amount of streambank derived sediment to the system during floods.

Improper Management of Livestock Waste

Improper livestock waste management is causing delivery of excessive amounts of nutrients and associated sediments to streams. Existing conditions provide the potential of delivering 2,100 tons of animal waste and 1,300 tons of sediment annually to the streams from livestock operations. The mixture of sediment and solid waste can lead to siltation of pools and riffles which reduces their ability to provide cover and food production for trout. This causes a loss to the fishery in the Bear Creek trout streams. The nutrient enrichment associated with these waste products can lead to undesirable shifts in species composition of the aquatic plant and invertebrate communities in the streams.

The IDNR has no on-site data to document the extent of the current problem, however they have had to cease stocking some trout streams below areas of high livestock waste pollution. They have reported that during some spring and summer run-off events, large volumes of manure have been delivered to some streams. To date, no fish kills have been reported in Bear Creek, but with inadequate animal waste management, the potential exists. No laboratory water quality data is available for these streams to establish a base line for water quality evaluation.

The input of excessive amounts of nutrients associated with livestock waste and sediment induces high BOD which lowers the levels of dissolved oxygen in the trout waters. The input of waste material can also lead to warming of the water in the stream. Trout are very sensitive to low oxygen levels and high water temperatures. The combination of warmer water and lower dissolved oxygen concentrations can, especially in warm summer months, create a situation that is untenable or lethal to trout. In addition, the waste products can produce toxic ammonia and add potentially pathogenic bacteria to the streams.

Improper land application of animal waste can result in animal waste runoff. Excessive application rates and surface application on frozen and or sloping ground produce the greatest potential for manure runoff into surface water. Improper animal waste application also reduces the value of the waste as a crop nutrient. By improperly managing livestock waste, landowners lose nutrients worth an estimated $8,400 per year.

OPPORTUNITIES

Road Structures

Installation of flood control structures on roads provides opportunity for improving the quality of life within the watershed. Bridges and culverts replaced with smaller flood control conduits will reduce operation and maintenance costs of these crossings. Bridges replaced by the flood control structures also result in fewer road use restrictions due to weight or width restrictions. Local construction costs can be reduced by utilizing cost-share opportunities through the PL-566 program.

Dry Hydrants

Dry hydrants can be installed in conjunction with flood control structures. These hydrants will upgrade existing fire fighting capabilities for the watershed by providing easily accessible water supplies in the rural area. Lower insurance rates are available to landowners living near dry hydrants.

On-Farm Uses

The flood control structures could provide additional fishing opportunities for other fish species. Pools at some sites are large enough to sustain adequate fish populations to support revenue producing alternatives such as fishing and camping.

Campsites

Enhancement of wildlife habitat is expected to increase hunting, fishing, and tourism in the area. With these increased recreational opportunities, the need for additional lodging accommodations may provide employment and revenue producing opportunities.

Forest land Management

Removing livestock from forested areas should allow natural regeneration to occur, providing necessary stocking levels to support a sustainable yield of forest products. Professional woodland management could improve wildlife habitat, timber quality and recreational opportunities. Consumptive uses such as timber harvesting, hunting, and non-consumptive uses such as bird watching and viewing fall color changes could generate revenues for both the local economy and state tax base.

Under the Forest Reserve Law in Iowa, ungrazed forested areas of at least two acres in size with a stocking rate of 200 trees per acre or more can qualify for real estate tax exemption. Harvesting of wood products is allowed, provided the stocking levels are maintained at or above 200 trees per acre.

Public Ownership

The potential for increased public ownership exists for all three of the trout streams. The IDNR will continue to purchase areas from willing sellers in the watershed. Opportunities will arise as the number of locations with livestock on pasture decreases. With the reduced need for livestock pasture, some of these landowners may sell the areas adjacent to the stream to the IDNR. Public ownership of the corridors would allow land use changes and in-stream enhancements that would increase the use of the streams for trout fishing. The public ownership would also allow the IDNR to develop other recreation potentials for hunting and non-consumptive wildlife use by the public.

The consolidation of livestock and farming enterprises at fewer sites provides an opportunity for private ownership and development of recreational resources. Small farms and non-cropland portions of larger tracts may be purchased by people seeking personal recreational areas or wanting to develop commercial ventures. This potential would be enhanced by the positive land use changes proposed by the project, especially the enhancement of woodland and grasslands by improved management. The enhancement of the trout fishery would also raise the numbers of people coming to the watershed for recreation and provide more people to use the spin-off recreation opportunities as they become available.

The private development of recreational resources will provide some seasonal or year-round employment for watershed residents. It will also lead to some construction jobs for contractors repairing existing buildings or constructing new facilities or vacation homes. This new construction would have the added benefit of providing more property tax revenues.

Partnerships

There is an opportunity for in-stream habitat improvement work to be installed as a result of the proposed project measures. Once areas of the streams receive flood control protection and stream corridors have livestock exclusion installed, then it is feasible to install measures such as trout hides that provide increased fish holding capacity.

The USFWS continues to provide limited funding through cooperative agreements with the conservation districts for corridor protection and stream habitat enhancement measures, as well as wetland or native grass restoration where appropriate. This may lead to more opportunities to improve environmental conditions in conjunction with the PL-566 measures. There is also the possibility that non-governmental groups such as the Hawkeye Fly Fishers, Izaak Walton League, and Trout Unlimited will contribute funds and/or labor to install these in-stream habitat improvements. These groups may also be willing to defray some of the local costs to install the PL-566 measures. These groups have expressed a willingness to be involved in such projects in the past and would be interested in tying their efforts into the Bear Creek Watershed project as it becomes operational.

SCOPE OF THE ENVIRONMENTAL ASSESSMENT

Potential impacts on environmental, economic, cultural, and social concerns were considered during the environmental evaluation and scoping process to determine which alternative actions were most beneficial and least damaging. The environmental issues that arose during the scoping process are identified, their impacts summarized, and results shown in the table below.

Evaluation Of Identified Concerns

Economic, Social, Environmental, and Cultural Concerns	Degree of Significance to Decision Making*	Remarks
Fish Habitat	High	Resource is being degraded by sediment, and animal waste. Flooding removes fish.
Sedimentation	High	Excessive sedimentation causes major impairments affecting the trout fishery.
Floodwater	High	Crop and pasture, other agricultural, roads and bridges, recreational facilities, the fishery, recreational fishing, trails and roads are being damaged.
Erosion (sheet and rill, ephemeral, gully)	High	Excessive erosion causes soil productivity losses, sedimentation damages, annual crop production loss, and land voiding and depreciation.
Forestry/ Forest Products	High	Potential income source for landowners in watershed.
Economic Factors	High	The trout fishery brings recreation dollars into the watershed and surrounding area.
Recreation	High	Recreational use is affected directly by the quality of trout fishery.
Wildlife Habitat	High	Watershed area is generally high quality habitat and needs to be maintained.

EVALUATION OF IDENTIFIED CONCERNS (continued)

Economic, Social, Environmental, and Cultural Concerns	Degree of Significance to Decision Making*	Remarks
Water Quality	High	Affects fish habitat and fishery.
Stream Corridor	High	Is a unique feature in Iowa. Degrading influences need to be minimized and enhancing measures promoted.
Land Use	Medium	Affects erosion, sedimentation and environmental values.
Cultural Resources	Medium	Numerous historic sites.
Visual Quality	Medium	Generally is very pleasing. Important to tourism and recreation.
Agricultural Production	Medium	Landowners want to maintain crop and pasture production.
Social Factors	Medium	This stream introduces many people to trout fishing.
Threatened or Endangered Species	Medium	No threatened or endangered species have been identified in project measure areas. Some may be present.
Human Health and Safety	Low	Concern about flood damage to roads and bridges
Prime Farmland	Low	Minimal loss
Water Quantity	Low	Not a concern of the Sponsors. Adequate supplies available.
Wetlands	Low	Small areas of wetlands are associated with low areas connected to the stream, streambank riparian areas, and where local conditions cause saturated soil.

*High--Must be considered in the analysis of alternatives.
Medium--May be affected by some alternative solutions.
Low--Consider, but not too significant.

Participants in the environmental evaluation process were local landowners in the watershed, members of the county boards of supervisors, boards of commissioners, soil and water conservation district commissioners, employees of the Natural Resources Conservation Service, the Iowa Department of Natural Resources, the Iowa Department of Agriculture and Land Stewardship, the Iowa Wildlife Federation, and the Iowa Natural Heritage Foundation. Other interested agencies and private organizations were invited to participate in the evaluation. They were invited to provide comments on the proposed alternative plans and effects of the Recommended Plan.

Alternative actions considered in the Plan-EA were assessed for their impacts on those concerns with a high or medium degree of significance to decision making. Those issues with a low degree of significance were scoped out and were not considered in formulation of alternative action plans for this Plan-EA.

FORMULATION AND COMPARISON OF ALTERNATIVES

Alternatives were developed that solved problems identified by the Sponsors. This process was guided by provisions contained in "The Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (P&G). The broad objective of P&G is to contribute to national economic development consistent with protecting the nation's environment. Early in the formulation process, the Sponsors expressed their concerns of resource problems within the watershed.

This Plan-EA was formulated to solve the main problems of concern to the local residents and sponsors of the watershed. Flooding adversely affects crop and pasture, other agricultural, road and bridge, the fishery, recreational fishing, campground use, campground facilities, trails, and access roads. Impairment of surface water quality caused by sediment and livestock waste, adversely affects the fishery, fish habitat, and recreational use of the trout stream.

The objective of the sediment control portion of the plan is to further reduce sediment delivery from all sources to Bear Creek. This portion of the plan includes land where erosion is controlled at a level to protect the soil resource. Examples of this strategy include trapping sediment from adequately treated land in a floodwater retarding structure, applying additional land treatment to control erosion on land with excessive erosion, and in other cases applying land treatment measures to further reduce erosion below tolerable limits.

Formulation Process

The goals of the formulation process were to identify a combination of measures that would protect the resource base, significantly reduce the flooding problem, and improve the quality of water in the trout stream. The Sponsors wish to improve the quality of water in the trout stream such that trout can naturally reproduce and produce greater recreational opportunities.

The formulation process was used to identify alternatives that met the following criteria:

1. were economically feasible,
2. would reduce flooding,
3. would protect the resource base,
4. would improve water quality while enhancing fish and wildlife habitat,
5. would increase recreational opportunities.

Formulation proceeded with an analysis of accelerated land treatment needs to reduce soil erosion to tolerable (T) levels, or less. An inventory of critically eroding soils was completed and served as the basis for developing evaluation units. Several alternative methods of controlling soil erosion were then considered, including conservation tillage, contouring, terraces, rotations, grade stabilization structures, pasture and hayland planting, pasture management, fencing of forest land, woodland improvement, and tree planting.

Combinations of land treatment measures to be used on cropland, pastureland and forest land were identified based on their current acceptability with landowners in and near the watershed. Combinations of land treatment measures are compatible with current farming operations.

Changes in land use will occur, as landowners will convert some grazed forest land to ungrazed forest land. Some livestock operators will install more adequate systems to manage manure.

Floodwater retarding structures were analyzed to determine their effects and benefits to properties within the flood plain. Combinations of dams of various sizes and at various locations were analyzed to determine their effects.

The Sponsor's established goals are:

-Future water quality impairments will be prevented and present impairments will be reduced by controlling 75 percent of sediment and animal waste delivered to the streams.

-Floodwater damages to recreational trout fishing, public recreation areas, access roads, in-stream habitat, crops, other agricultural items, roads, bridges, and stream banks will be reduced by controlling runoff from up to 50 percent of the watershed area.

A "land treatment only" alternative was evaluated but not considered because it was not economically feasible and would have had very little effect on flooding. An alternative of "floodwater retarding structures" only was considered but discarded because it did not provide enough water quality benefits to the trout stream. Several combinations of floodwater retarding structures and land treatment were also considered but discarded because they did not maximize net benefits and because water quality benefits were not maximized.

Several alternative plans were considered to relieve the identified problems. Non-structural measures such as flood proofing, flood warning systems, and floodplain acquisition were not considered since they would not reduce damages, are too expensive, or are not locally acceptable. Watershed conditions and public input indicated that smaller dams were the most acceptable measures to consider in developing a recommended plan.

Description Of Alternative Plans

Two alternative plans were considered during planning and are described in this section. A no-project action (Future Without Project) alternative was evaluated. Alternative 1 (NED Plan) returns the largest economic benefit and was selected as the Recommended Plan. Changes resulting from project activities associated with the ongoing soil and water conservation program, the conservation compliance provision of FSA, and those due to existing trends are recognized in the Future Without Project condition. Without implementation of a project, existing floodwater, sediment, and erosion problems, and most resource impairment or deterioration would continue.

No-Action (Future Without Project Plan)

The Future Without Project condition was forecasted to be the same as the existing current condition. Therefore, existing conditions are the same as the No Action condition.

Alternative 1 -NED Plan-(Recommended Plan)

Structural Components

Alternative 1 has been identified as the National Economic Development (NED) Plan. Forty-six small single-purpose floodwater retarding structures (50 to 500 acres drainage area, 0.8 to 6.0 acres permanent pools) and six larger single-purpose floodwater retarding structures (500 to 1310 acres drainage area, 7.4 to 16.4 acres permanent pools) for a total of 52 single-purpose floodwater retarding structures are proposed. Refer to Project Map, Appendix C, for approximate structure locations.

Land Treatment Components

Cropland	1,500 acres, stripcropping 1,700 acres, terraces 2,500 acres, conservation tillage 1,500 acres, contour farming 550 acres, pasture and hayland planting
Pastureland	4,740 acres, fencing 4,740 acres, pasture and hayland planting 24 each, livestock watering systems
Forest Land	500 acres, woodland improvement 120 acres, tree planting 620 acres, fencing (livestock exclusion)
Riparian Areas	53,000 feet, fencing (livestock exclusion) 10 each, livestock watering systems
Animal Manure Management	20 waste management systems

Estimated Installation Costs

Item	PL-566	Other	Total
	----------(dollars)----------		
Structural measures	3,542,500	89,000	3,631,500
Land treatment	1,401,100	676,900	2,078,000
Total	4,943,600	765,900	5,709,500

Average Annual Costs

Item	Installation	OM&R	Total
	----------(dollars)----------		
Structural Measures	275,200	9,500	284,700
Land Treatment	248,400	53,600	302,000
Total	523,600	63,100	586,700

Benefits

Average Annual Benefits: $654,300
Benefit/Cost ratio: 1.1:1.0

Effects Of Alternative Plans

No-Action (Future Without Project Plan)

Frequent flooding will continue to result in damages to crops, pasture, other agriculture, roads, bridges, and other public property on 990 acres. Road and bridge damage will continue at 14 locations. Some floodplain damages are likely to occur six to eight times a year. Peak flows will continue at 4,000 cfs for the 24-hr 10-yr event with erosive velocities which create stream bank erosion and require high capacity culverts and bridges. High volumes of sediment being

transported and deposited through the project's stream channel system will continue. Sediment delivered to the stream will continue at 53,770 tons annually and deposition will occur at a rate of 540 tons annually. Both agricultural and public area flood damages will continue.

Average Annual Flood Damages

Evaluation Reach	Flood Plain	Crop and pasture	Other Agriculture	Road and Bridge	Recreation	Other	Total Damages
	(acres)	($)	($)	($)	($)	($)	($)
North Bear	430	12,150	6,200	7,350	158,950	1,400	186,050
Middle Bear	220	2,200	3,800	4,750	171,950	1,550	184,250
South Bear	270	850	2,400	4,100	181,750	1,600	190,700
Offsite	50	400	700	0	48,650	450	50,200
Total	990	15,600	13,100	16,200	561,300	5,000	611,200

Flooding and sedimentation will continue to destroy fish and wildlife habitat, resulting in reduced recreation visits in the public use area. Turbidity will continue resulting in a 13 percent annual loss of fishing days.

With no project action, approximately 240,480 tons of soil erode annually, causing a major resource concern in the Bear Creek Watershed project area. Soil losses result from sheet and rill erosion, ephemeral gullies, and stream bank erosion.

Sheet and rill erosion on cropland causes reduced yields and increased production costs due to the depletion of topsoil, organic matter, moisture holding capacity, applied fertilizer, herbicides, and pesticides. Annually, sheet and rill erosion is reducing soil productivity on 8,210 acres of cropland and 6,320 acres of pasture land.

Present conservation programs will continue for the Future Without Project alternative throughout the evaluation period of the plan. The ongoing land treatment program would result in enduring land treatment measures being installed at a rate such that there would be no net gain or loss. Due to the current emphasis of the conservation reserve program, no additional highly erodible cropland will be converted to permanent vegetation. Approximately 16,150 acres would still have soil loss greater than the tolerable level.

An estimated 2,200 tons of sediment are produced annually by stream bank erosion. Roads, bridges, and fences are damaged, land adjacent to stream channels is voided and depreciated, and fisheries habitat is degraded. These problems are the result of excessive runoff, absence of woody or vegetated corridors between cropland and the stream channel, and uncontrolled livestock grazing along stream banks.

Expected land use changes for the future without project are 120 acres of grazed forest land converted to open pasture. Intensive row cropping will return to those areas now in the Conservation Reserve Program. Long term productivity of corn will be reduced about three bushels per acre with each erosion phase change. Pasture production, defined as AUM's of grazing capacity, will continue at a low level (3.0 per acre) if no project action occurs. Overstocked and overgrazed areas will continue to erode at excessive rates. Nesting cover will continue to be limited as continuous grazing maintains very short vegetative height. Declining yields of timber products will continue, and tree disease damage to timber products will reduce market value if no project action occurs. Regeneration of forest land tree species will not occur on 120 acres of grazed forest lands. Wildlife habitat will continue to deteriorate on these grazed woodlands as the understory is removed by grazing.

Continued operation of the existing livestock operations will contribute 2,100 tons of manure and 1,300 tons of sediment annually to the trout streams. Reduced water quality will also reduce trout habitat. Impairments to water quality will continue to deteriorate stream quality.

Trout fish habitat suitability will continue to decline with no project action.

There are some 19th Century farmsteads which currently are slightly affected by gully erosion. With no project action, these same conditions will continue. Visual quality in Bear Creek watershed will remain virtually unchanged.

No appreciable economic change is forecast for the future without project.

Alternative 1 -NED Plan-(Recommended Plan)

The recommended plan will eliminate flooding on approximately 200 acres and reduce flooding on 770 acres with the 100-year flood event. Peak flows will be reduced to 2,000 cfs for a 10-year event. The total average annual flood damages will be reduced by 45 percent. Average annual road and bridge damages will be reduced by 40 percent. Damages to crops, pastures, and other agricultural property will be reduced 42 percent, annually. Sediment delivery to the public use area and trout stream of Bear Creek will be reduced 48 percent.

Average Annual Flood Damages With Recommended Plan

Evaluation Reach	Flood Plain	Crop and pasture	Other Agriculture	Road and Bridge	Recreation	Other	Total Damages
	(acres)	($)	($)	($)	($)	($)	($)
North Bear	350	8,350	3,500	3,500	103,800	950	120,100
Middle Bear	170	1,500	1,800	3,150	95,900	850	103,200
South Bear	210	600	1,200	3,150	86,350	700	92,000
Offsite	40	150	300	0	20,450	200	21,100
Total	770	10,600	6,800	9,800	306,500	2,700	336,400

Soil losses from sheet and rill erosion were calculated using the Universal Soil Loss Equation. Existing conservation practices including terraces and conservation tillage were included in the sheet and rill erosion calculations and the economic analysis.

Land treatment to adequately control erosion is required on 75 percent of the drainage area above each floodwater retarding structure in Iowa. The minimum treatment level is 50 percent of each structure drainage area in Minnesota. With the installation of land treatment practices, about 25,800 acres will have soil loss less than the tolerable rate, 39 percent more than in the Future Without Project condition. Land treatment measures on 11,750 acres will reduce erosion from all sources about 115,580 tons annually or 52 percent. Increased cost-share assistance will be available to all landowners in the watershed for accelerated land treatment.

With the construction of 52 floodwater retarding structures, the frequency of bankfull flow conditions are reduced, decreasing stream bank erosion by an expected 10 percent.

Yields will increase on treated crop, pasture, and forest lands. Pasture planting and ongoing pasture management will reduce erosion and increase annual production 2.2 AUM's per acre. Total available AUM's will increase by 15,600 annually, providing an additional $156,400 in annual pasture production. Timber products will be harvested as a profitable economic enterprise, with an average annual increase in forestry product sales of $27,800.

Waste management systems will be installed at 20 livestock operations. Selection criteria will be used to prioritize project sites. See Appendix B for worksheet to prioritize sites. The installation of each waste management system will result in an average 75 percent reduction of manure and sediment reaching the stream. The resulting reduction from livestock waste is expected to be 45 percent for the watershed. Increased water quality and trout habitat will provide additional visitor days to the area.

Summary of Average Annual Erosion With Recommended Plan

Sediment Sources	Future Without Project		Alternative 1	
	Upland	Erosion	Upland	Erosion
	(acres)	(tons)	(acres)	(tons)
Cropland				
sheet and rill	17,930	105,500	17,380	60,700
ephemeral gully	(4,000)	4,000	(2,000)	2,000
Pastureland				
sheet and rill	12,710	100,100	13,260	46,100
Forest land				
sheet and rill	3,310	22,780	3,310	8,000
Streambank		2,200		2,000
Other	1,040	5,900	1,040	6,100
Total	34,990	240,480	34,990	124,900

Installation of 52 floodwater retarding structures will cause removal of woody type habitat. Wildlife mitigation costs have not been included in the construction costs for these sites because improvement in the Habitat Suitability Index on those acres of forest land treated for excessive erosion will more than offset losses in habitat at floodwater retarding structure sites. This alternative provides net increases in habitat value for both grassland and woodland habitats.

Significant increases in Wildlife Habitat Units for all habitat types will occur with the Recommended Plan. See Comparison of Alternative Plans table for details.

No historic properties are present in the sample areas studied. This study also indicates little potential for prehistoric sites in the project area.

The 52 floodwater retarding structures have slight potential to affect a few 19th century farmsteads. No threatened or endangered species are known to be present where project activities will occur, therefore, the plan will have no effect. Application of additional improved land treatment will increase the aesthetics of the landscape and the introduction of floodwater retarding structures will add pleasing visual diversity. Marked reduction in flooding greatly lessens unsightly flood aftermath scenes of debris, sediment, and damaged property.

Average annual benefits are $654,300. In addition to these direct benefits, general business activity and employment in the watershed area will be stimulated during and following implementation of the plan.

Comparison Of Alternative Plans

Alternatives considered during planning are described in this section. Economic, environmental, and social impacts of greatest significance to decision making are displayed in the Comparison of Alternatives table. Formulation for each of the priorities are compared with the Future Without Project condition.

One alternative plan was prepared. The NED Plan returns the largest economic net benefit and was selected as the Recommended Plan. This plan meets the objectives specified by sponsors for a high level of flood damage reduction, reduced environmental damage to land and water resources, and an improved trout fishery. The plan maximizes obtainable goals stated by sponsors.

Tabulated below are respresentative data showing effects of the Recommended Plan upon concerns deemed most important during the scoping process.

Risk and Uncertainty

Individual landowners and operators participation in the accelerated program is voluntary. Land use and practice selection decisions are entirely the prerogative of the landuser. If this Plan-EA is to be successfully installed, planned total reduction in erosion, and consequently in sediment delivery and deposition, must occur as a result of individual decisions.

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Benefits expected to accrue to the planned measures depend upon installation of the complete plan. Due to the large number of landowners involved there is some uncertainty as to whether all measures will be installed. However, due to current landowner acceptance of soil conservation measures and the record of their willingness to install conservation practices it is believed that planned measures will be installed.

Slight dam location adjustments on the same drainage may be made during design. Movement of dams from one drainage to another would affect their justification. The participation rate will be high. This was determined during the investigation process, at which time landowners supported the locations.

The project is located in a karst geologic area. A detailed investigation of each site will be done to determine exact characteristics present to ensure adequate design. Slight adjustment of the site location up or down stream may be needed to eliminate construction problems such as bedrock outcrops.

Analysis of the plan assumed no dramatic changes in technology, crop prices, government programs, or agriculture in general. These factors may affect the economic stability of some landowners, land rights acquisition, and local funding.

Rationale for Plan Selection

The primary objective of the sponsors is to protect and maintain as much of the resource base as possible from further impacts of flooding and sedimentation while keeping project benefits greater than project costs. They wish to maximize the reduction of flooding, but also would like to improve the water quality in the trout stream. For those reasons they selected the Recommended Plan, to best meet their objectives. The Recommended Plan is the NED Plan. The Recommended Plan provides a high degree of flood protection, with maximized net benefits. The Recommended Plan also provides benefits to water quality and to the environment in general.

COMPARISON OF ALTERNATIVE PLANS

	Future without Project	Recommended Plan
MEASURES		
Structural	0	52 Floodwater retarding structures
Land Treatment		
Cropland	0	6,070 acres
Pastureland	0	4,740 acres
Forest land	0	940 acres
Animal waste systems	0	20 systems
PROJECT INVESTMENT		
Structural	$0	$3,631,500
Land Treatment	$0	$2,078,000
NATIONAL ECONOMIC DEVELOPMENT (NED) ACCOUNT		
Average annual adverse effects	$0	$586,700
Average annual beneficial effects	$0	$654,300
Net beneficial effects	$0	$51,100
Annual floodwater damage	$611,200	$336,400
Additional pasture production	$0	$156,400
Additional forest production		
Fuelwood	$0	$9,900
Sawlogs	$0	$17,900
Increased recreational use	$0	$94,800
ENVIRONMENTAL QUALITY (EQ) ACCOUNT		
LAND USE		
Cropland	No erosion reduction	Reduced erosion on 2,600 acres to tolerable ("T") levels.
Pastureland	Continued decline in resource and forage management	Improved productivity and reduced erosion on 4,700 acres.
Forest land	Continued decline in forest resources	Improved management on 500 acres and plantings on 120 additional acres.
Agricultural Sustainability	Declines	Improved
Soil Quality	Decrease	Improved Quality
Prime Farmland		27.2 acres covered by dams and sediment

Comparison of Alternative Plans (continued)

ENVIRONMENTAL QUALITY (EQ) ACCOUNT

	Future without Project	Recommended Plan
WATER QUALITY		
Gross erosion (tons/year)	240,480	124,900
Sedimentation	Continued sediment damage	Annual sediment deposition reduced by nearly 50 percent.
Delivered to stream (tons/year)	53,770	27,430
Deposited in stream (tons/year)	540	270
Animal waste systems	Annual manure and sediment loads of 2,100 and 1,300 tons, respectively.	Annual reduction of 45 percent in manure and sediment loading to the trout streams.
UPLAND WILDLIFE	a) Pasture: No change in Habitat Units (HU) for White-Tailed Deer or Ring-necked Pheasant are forecasted but they were not qualified	a) Pasture: Net change of +400 HU for each of theses species with project measures
	b) Forest land: No change to a moderate decrease in HU is forecasted for White-Tailed Deer, Red-Headed Woodpecker and Fox Squirrel	b) Forest land: Net change of +11 HU for each of these three species are forecasted
STREAM HABITAT	a) Trout Habitat: No change in Habitat Units (HU) for Trout is forecasted but was not quantified.	a) Trout Habitat: Net change 0.21 HSI points for Rainbow and 0.13 HSI points for Brown Trout in the entire Bear Creek System.
	b) Recreation: No change to a slight decrease is forecasted for recreational use in the area.	b) Recreation: Net increase for recreational use in the area.
THREATENED AND ENDANGERED SPECIES	No effect on any state or federal listed species is foreseen.	No negative impact to any state or federal listed species will occur from project measures.

Comparison of Alternative Plans (continued)
ENVIRONMENTAL QUALITY (EQ) ACCOUNT

	Future without Project	Recommended Plan
LANDSCAPE DIVERSITY	a) No effect on landscape, since no structures will be constructed.	a) Installation of 52 structures with associated pools modify the visual landscape. If pools do not hold water, effect on landscape may be negative.
	b) Current land use patterns will continue, no change in landscape diversity occurs.	b) Permanently changes 320 acres of crop, pasture, and forest land use to structures and pools altering the current landscape diversity.
	c) Overgrazing by livestock degrades visual quality of 6,320 acres of pasture by increasing the amount of bare eroding land.	c) Proper pasture management maintains vegetative cover, eliminating unsightly, bare, eroding areas on 4,740 acres.
	d) Grazing on 1,590 acres of forest land removes under-story plants, prevents reproduction of trees, and degrades the visual quality of resources for recreationists and watershed residents.	d) Livestock exclusion on 620 acres of forest land allows development of a more diverse and mature forest land under-story improving the visual appearance for recreational and other land users.
	e) Current mismanagement of forest land allows growth of undesirable species, some of which are visually unappealing.	e) Timber stand improvement on 500 acres of forest land will remove mature trees, create more open areas, and establish multi-age stands which may be less visually appealing to some landusers.
	f) Most privately owned riparian corridors continue to be open grazed grassland.	f) Fenced riparian corridors will be converted to taller more dense vegetative species, and some may become wooded and less appealing to landowners and or fishermen.

Comparison of Alternative Plans (continued)

ENVIRONMENTAL QUALITY (EQ) ACCOUNT

	Future without Project	Recommended Plan
RIPARIAN CORRIDOR		
Floodplain area		
Average annual acres	980	690
	a) High flood flows will continue to damage stream banks, degrade the riparian plant community, reduce wildlife habitat and travel lanes.	a) Reduction in intensity and duration of flood flows allow stabilization of stream banks and development of a more diverse and mature plant community and provides more habitat for safer travel corridors for riparian wildlife species.
	b) High flood flows deposit sediment and debris in the floodplain which degrades visual aesthetics of the corridor for recreationists	b) Reduction in flood flows will result in less sediment and debris deposition which will improve visual quality for recreational users.
	c) Livestock access into the trout streams degrade water quality	c) Livestock exclusion from the trout streams removes a source of water quality impairment and streambank erosion.

Comparison of Alternative Plans (continued)

OTHER SOCIAL EFFECTS (OSE) ACCOUNT

	Future without Project	Recommended Plan
	No effect on present social condition of citizens in the watershed.	66 landowners will receive benefits of the floodwater retarding structures.
	Continued flooding will continue to degrade recreation opportunity and facilities.	Citizens of the State of Iowa will benefit from damage reduction to state owned property
	No effect on infrastructure as roads, bridges, and facilities continue to be damaged.	Reduced flooding adds 3,040 increased quality recreation visitor days, annually.
	No effect on income.	Projected land treatment measures will mean an estimated annual increase in income of $192,600, thereby making the community more economically sound.
		Additional annual income to landowners will provide for a more viable community for continued local trade.
		Annual damages to roads, bridges and facilities will be reduced $8,700.
Cultural resources	No change	Damage reduction

Comparison of Alternative Plans (continued)

REGIONAL ECONOMIC DEVELOPMENT (RED) ACCOUNT

	Future without Project	Recommended Plan
Positive Effect[1]		
Region	$0	$654,300
Rest of Nation	$0	$0
	Employment will not change.	Installation of structural measures and land treatment will result in employment of 58 person years of skilled labor and 19 years of unskilled labor. OM&R will result in employment of 2 person years annually.
Negative Effects[2]		
Region	$0	$765,900
Rest of Nation	$0	$4,943,600

1 – Average Annual Amount
2 – Life of Project

NOTES:

Interest Rates – All alternatives evaluated at 7 3/8 percent interest rate.

Period of Analysis – Structural measures evaluated over 50 years, land treatment is evaluated over its useful life.

Price Levels – Current normalized prices used for crop, pasture and recreation. Current 1996 prices used for all others.

CONSULTATION AND PUBLIC PARTICIPATION

Application for assistance was submitted by the sponsors in March 1989. The request was a result of local concern and interest in addressing flood protection, soil erosion control, trout habitat protection and recreational development.

The sponsors of the Bear Creek Watershed have held public meetings to receive input, discuss project alternatives, and update progress. The following list summarizes the meetings held:

July 14, 1988 - Representatives of potential sponsors and members of the Water Resources Planning Staff toured the watershed to determine the feasibility of a PL-566 project.

October 31, to November 3, 1988 - Field trip with representatives of the sponsors and members of the Water Resources Planning staff to gather information for preparation of pre-application report.

January 26, 1989 - A public meeting was held to discuss the pre-application report and to encourage sponsors to submit an application.

March 8 and 16, 1989 - Winneshiek and Houston sponsors request planning assistance.

May 15, 1990 - Meeting with sponsors to discuss water quality policy and future planning objectives.

January 26, 1993 - Meeting with a group of local people to discuss the enhancement of trout habitat in the watershed. Local individuals and clubs or groups are interested in participating in improvement projects on the creeks.

March 12, 1993 - Meeting with state and federal agencies and local fisherman to discuss trout habitat and the potential impacts of project activity

March 19, 1996 - Meeting with interested individuals, sponsors and members of the NRCS staff to provide information and an update of progress of planning activities.

March 20, 1996 - Meeting with about 40 landowners to discuss specifics of the planning activities and to present plan alternatives. The discussion included the proposed project, plan elements, cost share rates, and the availability of funds.

April 16, 1996 - Meeting with sponsors, interested groups and staff members to discuss progress relating to planning activities

April 29, 1997 - Meeting with sponsors, interested groups and staff members. At this time the local watershed sponsors and residents of the watershed selected the recommended plan.

April 1998 - The final draft Plan-EA was distributed for public comment.

Threatened and Endangered Species

The Section 7 consultation process in the Endangered Species Act was followed. At the design phase, prior to construction, the site will be inspected for the presence or use by any state or federally listed threatened or endangered species in conjunction with respective state DNR and/or USFWS personnel. If any species are found, project measures will be relocated, modified, or dropped for that site as deemed feasible with the input from the DNR or USFWS personnel involved.

Archeological and Historic Resources Coordination

An archeological and historic overview has been prepared. Copies of the report were furnished to the State Historic Preservation officers (SHPO) in Iowa and Minnesota. A programmatic agreement will be developed before any construction activities begin. The agreement will specify remaining cultural resources compliance activities. It will include NRCS, Minnesota and Iowa SHPOs, and possibly the Advisory Council on Historic Preservation.

RECOMMENDED PLAN

The Recommended Plan is the NED Plan. The purpose of the Plan is to reduce damages from floodwater and sediment deposits, maintain high quality water in the trout stream, improve recreational opportunities, and protect the watershed from excessive erosion and resource depletion.

Plan measures include 52 dams plus land treatment measures which are to be constructed during the 15-year project installation period. Structural measures will be properly maintained over a 50-year project life. Land treatment measures installed under this program will be based upon conservation plans prepared according to standards and specifications as described in the NRCS field office technical guide. Elements of this plan will be installed and coordinated with other on-going federal and state cost-share programs.

Estimated costs of the recommended plan are shown in Tables 1 and 2. Estimated average annual costs for land treatment and structural measures are shown in Table 4. Estimated average annual flood damage reduction benefits are shown in Table 5. Estimated average annual watershed protection damage reduction benefits are shown in Table 5A. A comparison of benefits and costs is shown in Table 6.

PL-566 assistance will be provided under authority of the Watershed Protection and Flood Prevention Act (P.L.-566, 83rd Congress 68 Stat. 666), as amended. PL-566 assistance in carrying out this Plan-EA is contingent on appropriation of funds for that purpose and securing land rights and permits for installation of project measures. PL-566 funds will be used for technical assistance, construction, engineering services, and project administration costs incurred by the NRCS. An estimated schedule of PL-566 and other obligations during the fifteen-year installation period is shown in Figure 1.

Land Treatment

Installation

Land treatment consists of practices voluntarily planned and applied by private landowners as needed to obtain the desired level of erosion control and further reduce sediment delivery to Bear Creek. Each acre of land treated may have one or more practices applied as a part of a resource management system which addresses soil erosion and water quality problems as well as resource concerns and opportunities dealing with plant, animal, air and human resources. Land treatment practices will be installed using long term contracts. All long term contracts will be signed within five years of the date of which the plan is approved.

Land treatment measures installed primarily to reduce erosion and sediment delivery to Bear Creek will be installed on a priority basis to obtain the most environmental benefits early in the installation period. This will be done in concert with the installation of floodwater retarding structures and the need for land treatment above them. Over the 15 year installation period the priority areas targeted will change as installation progresses. The SWCD's will make these prioritization decisions based on a locally developed procedure. The total land treatment plan is displayed in the following table.

Terraces will be installed on cropland. Fencing can be used to exclude livestock from forest land needing protection, to protect the natural springs and streams within the stream corridor, and to subdivide grazing land to permit improved pasture management. Livestock watering systems will supply water to cattle in pastures where livestock are excluded from the stream corridor or

where management systems have excluded them from existing water supplies. Existing pastures will be improved by reseeding or interseeding. In addition 550 acres of cropland will be converted to pasture. A grazing management plan will be developed for this improved pasture in accordance with the prescribed grazing standard.

LAND TREATMENT
Recommended Plan

Item	Unit	Number	Cost-Share Rate PL-566	Other
			------(percent)------	
Terraces	acre	1,700	65	35
Fencing	feet	269,000	65	35
Livestock Watering Systems	each	34	65	35
Pasture and Hayland Planting	acre	5,290	65	35
Waste Management Systems	each	20	65	35
Woodland Improvement	acre	500	65	35
Tree Planting	acre	120	65	35
Stripcropping	acre	1,500		100
Contour Farming	acre	1,500		100
Conservation tillage	acre	2,500		100

Woodland improvement will be installed on existing forest land. Tree planting will be installed on forest land or other land uses. Tree planting will involve a three year contract that includes site preparation, planting, and weed control. Weed control is needed for the year of planting and for a minimum of two following years. At the end of the third year, Sponsors and NRCS should inspect to determine if a satisfactory stand has been established.

Stripcropping on 1500 acres, contour farming on 1500 acres, and conservation tillage on 2500 acres, are part of the Recommended Plan, but will not be cost-shared with PL-566 funds because they are not considered enduring practices. The landowners portion of the land treatment practice is included in the other column. Practices shown as not receiving PL-566 cost-sharing may receive incentive payments from on-going state and federal water quality programs. These practices make up an important segment of the overall project.

Long term contracts for the installation of land treatment measures will be between the SWCD and the landowners. Each long term contract will be based on a plan and schedule of operations developed by the landowner, and concurred in by NRCS. The contracting officer will be chairman of the local SWCD or other SWCD commissioner or supervisor or commissioner as appointed. Long term contracts may include a period of 3 to 10 years. Contracts of 3 to 5 years will be encouraged.

In order to improve water quality in the trout streams, cost share funds will be available for fencing to exclude livestock from any riparian area adjacent to the Bear Creek tributaries. Fencing to exclude livestock may also be used to protect any spring or flowing water area that is within one mile of and empties into a stocked trout water segment of the Bear Creek tributaries. If livestock have access to both sides of the stream to be protected on one landowner's property, both sides must be protected to qualify for cost share. These funds may also be used for fence construction and for providing an alternative source of livestock water such as nose pumps, hydraulic rams, solar pumps, associated water tanks. They may also be used for shaping the bank into a 50 foot or narrower ramp, and riprapping the ramp and stream bed for a limited access to the stream.

In designing and locating the fence for the livestock exclusion area it is important to recognize that floodwater and debris can cause significant operation and maintenance problems with riparian fences. To reduce maintenance caused by flood damages it is recommended that the fence be located above the two year flood elevation. If this is not possible, it is recommended that the fencing be installed a minimum of 30 feet from the streambank. This will allow equipment access for mowing of weeds, repairs and maintenance of the fence and watering facilities. Flexibility in corridor design, layout, and width is needed. There is no maximum width for the corridor and associated odd areas to make the program more practical for the landowner.

Different designs of fences can also reduce damages from floodwaters and debris. Using a minimum number of wires and keeping the bottom wire of the fence at least 12-15 inches above the ground will allow some smaller flood flows to pass under the fence without the water-borne debris catching the wires and breaking the posts. Constructing the fence in short, breakaway sections rather than continuous strings of wire can also reduce the length of fence damaged by a flood event and allows easier maintenance and clean-up of debris. Examples would be a fence constructed of cattle panels individually wired to posts or three to four rod sections of woven or barbed wire with each section attached separately to fence posts rather than tied together in continuous strings. It is also recommended that the fence be 'smoothed' in its alignment and not follow every turn of the stream. This allows easier construction, reduces corners that can catch debris, and twists and turns that increase the length of fence that needs to be maintained.

Cost share for fencing to exclude livestock will be done as a one-year contract per protected stream segment based on average cost for fencing and actual cost for the alternative watering system. If landowners need to fence both sides of a stream to qualify for funds, they can choose to use a two year installation period, fencing one side each year.

Limited livestock access to the corridor can be allowed. The purpose of access would be to control undesirable herbaceous and woody growth within the corridor without mowing and provide some forage for livestock. The recommended guidelines are for a maximum of one day access per event, no more than three events per year, with a minimum of 30 days recovery between grazings.

Priorities for implementation of waste management systems will be established with emphasis on building those with the greatest potential to protect the trout stream. A suggested method for prioritizing animal waste operations in the watershed is shown in appendix B. Emphasis is placed on size of operation, distance of operation to the trout stream, and land application distance to the trout stream. Procedures used for evaluation will be consistent with current national, state, and local guidelines for each state.

Waste management systems include practices which incorporate both structural and waste management components. A complete waste management system may include combinations of different components which could include but are not limited to the following: diversion, waste treatment lagoon, waste storage pond, waste storage facility, filter strip, fencing, and nutrient management. The nutrient management plan will account for the nutrient content of the manure in determining the application rate that meets the needs of the crop being grown in accordance with the nutrient management standard.

Construction or operation permits from Iowa or Minnesota may be required for waste management systems. Obtaining permits is the responsibility of the landowners. Permit requirements may be established at township, county and/or state levels.

Assistance through PL-566 will be limited to operations of 1,000 animal units or less. Proposed waste management system plans must include waste utilization and some type of structural application (i.e. waste storage pond, filter strip or diversion) to qualify for assistance. Under PL-566, cost share amounts for animal waste management systems will be based on the amount of animal waste storage. Systems which store livestock waste and associated waste products such as polluted runoff, bedding and milkhouse waste water for 180 days or more will be cost shared up to $25,000 in PL-566 funds per operation. Cost share rates for all remaining livestock facilities will not exceed $10,000 PL-566 funds per operation. (Dollar amounts are based on 1997 costs.) The amount of cost sharing will be adjusted for inflation and changes in regulations during the project installation period. In both cases, the cost share amount shall not exceed the 65 percent maximum cost share rate based on the overall animal waste system cost.

There is an opportunity for in-stream habitat improvement work to be installed as a result of the proposed project measures. Once areas of the streams receive flood control protection and stream corridors have livestock exclusion installed, then it is feasible to install measures such as trout hides that provide increased habitat and fish holding capacity.

The USFWS continues to provide limited funding through cooperative agreements with the conservation districts for corridor protection and stream habitat enhancement measures, as well as wetland or native grass restoration where appropriate. This may lead to more opportunities to improve environmental conditions in conjunction with the PL-566 measures. There is also the possibility that non-governmental groups such as the Hawkeye Fly Fishers, Izaak Walton League, and Trout Unlimited will contribute funds and/or labor to install these in-stream habitat improvements. These groups may also be willing to defray some of the local costs to install the PL-566 measures. These groups have expressed a willingness to be involved in such projects in the past and would be interested in tying their efforts into the Bear Creek Watershed project as it becomes operational.

Costs

Each state will be individually responsible for obtaining PL-566 funding for works of improvement to be installed in their state. Land treatment elements for each state are estimated based on the drainage area involved. About 29 percent of the Bear Creek watershed is in Minnesota, therefore, about 29 percent, or $406,000 of the total PL-566 estimated cost of land treatment measures will come through the Minnesota NRCS budget. The remaining $994,800 will come through the Iowa NRCS budget. Other funds for each state will be in the same proportion as PL-566 funds.

An estimated $166,000 of technical assistance for educational meetings, and for design and layout of practices is included in the project. Approximately $48,000, two staff years, will be allocated to the Minnesota portion and $118,000, four staff years, will be needed for the Iowa portion. About six staff-years of assistance will be needed to plan, design, and lay out practices included in the land treatment portion of the project.

Cost-Share

Other funds required for land treatment installation, and operation, maintenance and replacement will be provided by landowners, and by non PL-566 cost-sharing programs. See Tables 1 and 2 for details.

Land treatment in the Recommended Plan will be cost shared 65 percent PL-566 and 35 percent Other. Financial assistance for landowners in fulfilling land treatment obligations will be a priority of the Winneshiek and Root River SWCD. Other potential sources of funds are states of Iowa, Minnesota USDA, EPA, and local cost-share programs.

Long term contracts between SWCD's and landowners will be used to administer and cost-share land treatment practices. Agreements will be developed under policy provided in appropriate sections of the National Contracts, Grants, and Cooperative Agreements Manual, principally in Section 515.

Operation, Maintenance and Replacement (OM&R)

The Winneshiek and Root River Soil and Water Conservation Districts will be responsible for insuring proper OM&R for land treatment measures. Actual operation and maintenance of land treatment measures will be the responsibility of landowners. OM&R requires effort and expenditures throughout the life of the project to maintain safe conditions and assure proper functioning. Total estimated average annual operation and maintenance costs are $53,600.

Long-term contracts will include OM&R agreements, and will provide for inspections, reports, and procedures for performing operations and maintenance items. The agreements will be based upon information outlined in the National Operation and Maintenance Manual. SWCD's will use the cooperative agreement with the individual landusers as the operation and maintenance agreement for land treatment of individual farms. Responsibility for OM&R of a practice begins when any segment, or all of the installation, is completed and accepted by the Sponsors, landusers, and NRCS, and will continue throughout the life of land treatment practices. The sponsors' liability extends throughout the actual life of the land treatment measure.

Structural Measures

Installation

Structural measures consist of 52 dams with approximate site locations shown on the Project Map, Appendix C. Structure site locations as shown on the project map are not site specific. Actual structure location is dependent on availability of land rights and other site conditions. A display of statistics extrapolated from 11 sample sites are shown in the following table. Data for 11 individual structures are displayed in Table 3.

STRUCTURAL STATISTICS
Sample Structures

Drainage Area Range	Release Rate Range	Average Sediment Pools Surface Storage		Average temporary Pools Surface Storage	
(ac)	(csm)1/	(ac)	(ac-ft)	(ac)	(ac-ft)
0-200	27-44	1.5	10.1	2.5	10.8
201-500	17-33	3.7	27.7	8.0	44.9
>500	14-24	8.3	66.8	18.0	105.8

1/ csm - cubic feet per second per square mile

Land treatment to adequately control erosion is required on 75 percent of the drainage area above each floodwater retarding structure in Iowa. The minimum treatment level is 50 percent of each structure drainage area in Minnesota.

All dams will be designed for a 50-year life and will be constructed of earth available at the site. They will be constructed on alluvial material overlying bedrock consisting of sandstone and fractured dolomite. Most earth fills will be constructed with 2.5 to 1 or 3 to 1 side slopes. Level or sloping berms, as needed, will protect earth fills from wave action damage. Principal spillway crest elevations will be established for 50 years of submerged sediment storage below the crest.

Foundation drainage may be needed for some dams. Trench drains should be used to relieve pressures and control seepage and piping. Detail foundation investigations will identify those sites requiring drains. A pro-rata cost has been included in the cost estimate for those that will need drains.

Most dams will have principal spillways consisting of polymer coated corrugated metal pipe with cathodic protection, aluminumized steel type 2 pipe, smooth metal pipe or a material with equivalent resistance to electrical and chemical corrosion. Trash racks, propped outlets and hood, canopy, or drop inlets will be utilized, as appropriate.

To reduce negative impacts on wildlife habitat, clearing and grubbing of the reservoir area should be limited to that needed for the dam, spillway, and that portion of the sediment pool needed for borrow area. The area cleared below the principal spillway crest elevation will extend a minimum of 400 feet upstream of the principal spillway. Additional area will be cleared as needed for borrow material.

Permanent vegetation to control erosion will be established on all disturbed areas above the normal pools and around the earth fills, emergency spillways, and any other areas disturbed by construction. This will also provide wildlife food and cover, and improve esthetic values. Sediment pools and any additional borrow areas will be cleared as determined during field design. Erosion and pollution control measures are integral parts of the design of each dam. Construction contracts will include measures for these purposes as necessary.

Sponsoring local organizations will secure all land rights needed for installation of the dams. Land rights for approximately 480 acres will be obtained for the dams, their associated spillways, and pools (including flood pools).

Engineering services for all projects will be performed by the NRCS, unless agreements are made with the sponsors which address engineering laws associated with each state. This will

include engineering services such as design surveys, investigations, design, preparation of drawings and specifications for project measures, and construction inspection. Sponsors may provide their own services for contract administration, sponsor representatives, obtaining permits, relocation assistance advisory services, and administrative functions connected with relocation payments. NRCS will provide occasional oversight on all phases of structure planning and implementation.

Agreements will be executed between the county, SWCD, and NRCS setting forth work and costs to be incurred by each. Project measures will be installed by contracts awarded and administered by the Winneshiek SWCD, or the Winneshiek County Board of Supervisors; the Root River SWCD, or the Houston County Board of Commissioners. The Soil and Water Conservation Districts will be the contracting local officer unless other requests are made.

Construction of the dams with planned storage will create pools that cover a total of 192 acres. Due to the permeability of the bedrock foundation, seepage may result in less than normal water elevation. Floodwater retarding pools will cover an additional 122 acres for short periods of time following large rainfall events.

The dams will be designed to minimize potential vector problems. Foundation drains will be installed when needed for dam stability to eliminate seepy or marshy areas below the dams and surface drainage will be provided for all exposed borrow areas.

Construction operations will be in compliance with applicable federal, state, and local laws and regulations concerning environmental pollution control and abatement. Construction and water storage permits required by Iowa and Minnesota law will be acquired by the SWCD.

Water and air pollution that might be caused by construction operations will be minimized by the following methods as needed:

1. Leaving existing vegetation on work areas as long as possible.
2. Constructing debris basins.
3. Diverting runoff water from highly erodible areas.
4. Establishing temporary vegetative cover.
5. Controlling smoke during burning.
6. Suppressing dust on haul roads.
7. Scheduling operations so unvegetated areas are not exposed over long periods of time (generally not to exceed 30 days).

Dams are classified according to the potential hazard to life and property should the dam suddenly breach or fail. Existing and future floodplain development including controls for future development must be considered when classifying the dam.

All dams in the Recommended Plan will be hazard class (a). Class (a) dams are designed for less than maximum runoff and are defined as follows:

> Class (a) -- Dams located in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and county roads.

None of the dams in this project are expected to fail; however, in the remote possibility one should fail, damage would be limited to agricultural land, county roads, the trout fishery, and minor problems to the picnicking and camping area. No habitable structures in the Highlandville area will be inundated in the event of a breach.

Areas subject to damage, if dams should fail, are shown on the Generalized Breach Inundation Map, Appendix A. No additional development should be allowed in the breach flood hazard areas because of the possibility of flood damage. Before developing in the breach inundation area, specific site evaluation studies should be done to reduce the possibility of creating an unsafe condition.

Costs

All costs are for the purposes of flood prevention and water quality. See Tables 1 and 2 for details. Construction costs for labor, equipment, and materials are the engineer's estimate which includes an allowance for contingencies. The estimates were made by applying appropriate unit costs to detailed quantity estimates. Unit costs, based on the most recent contract bid schedules and actual construction costs of similar projects in Iowa and Minnesota, were adjusted to the 1996 average price level. Cost allowances for contingencies of fifteen percent are included to offset unknown conditions which may appear during construction. Estimated cultural resources mitigation costs of $23,500 are included in the construction costs.

The allocation of PL-566 funds for structural measures is based upon the actual number of structures estimated for each state. About 41 percent, or $1,452,400 of the total estimated cost of structural measures will come from the Minnesota NRCS budget. The remaining 59 percent, or $2,090,100 will come from the Iowa NRCS budget. Other funds for each state will be in the same proportion as PL-566 funds.

Cost-Share

Other funds required for structure installation, and OM&R will be provided by sponsors. Sources of funds could include tax levies assessed by the Board of Supervisors and the Board of Commissioners. See Tables 1 and 2 for details.

Engineering services costs, estimated to be $545,000, include the direct cost of design surveys, investigations, design, preparation of drawings and specifications for project measures, and construction inspection. Of this amount approximately $223,000 will be allocated to Minnesota and $322,000 will be allocated to Iowa.

Project administration costs, estimated to be $272,500, are associated with the installation of project measures, including the cost of contract administration, government representatives, obtaining permits, relocation assistance advisory services, and administrative functions connected with relocation payments. Of this amount approximately $112,000 will be allocated to Minnesota and $160,500 will be allocated to Iowa. The NRCS and the Sponsors will pay the administrative costs each incurs.

The SWCD's, the County Board of Supervisors, and the County Board of Commissioners will jointly provide land rights for dams. The Board of Supervisors (in Iowa) and the Board of Commissioners (in Minnesota) have power of eminent domain and agree to use it if needed to acquire land rights for project measures. Land rights costs include all expenditures made to acquire land or easements for construction of dams. Values were estimated by the Sponsors and concurred with by NRCS. The Sponsors are responsible for 100 percent of land rights costs.

At present, no PL-566 or other costs associated with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (P.L.-646, 91st Congress) are foreseen. If they are needed later, these payments will be cost-shared as shown in item 2 of the agreement. Relocation payments are applicable to a displaced person, business, or farm operation.

Operation, Maintenance and Replacement (OM&R)

The amount for Operation, Maintenance, and Replacement (OM&R), estimated to be $9,500 annually, is the cost of materials, equipment, services, and facilities needed to operate the project, and make repairs and replacements necessary to maintain project measures in sound operating condition during the evaluated life of the project. Included are costs of repairs, replacements, or additions and an appropriate charge for inspection, engineering, supervision, and general overhead. Costs for OM&R will be paid from local funds. Sponsoring local organizations will be responsible OM&R which occurs in their area.

Total benefits to be derived from installation of structures cannot be realized unless they are operated, maintained, and replaced to serve the full purpose for which they are installed.

> ***Operation:*** Administration, management, and performance of non-maintenance actions needed to keep a completed measure safe and functioning as planned.
>
> ***Maintenance:*** Performance of work and application of measures to repair damage to project measures, prevent deterioration of project measures, and replace a measure if one or more of its components fail. Repair of damages to completed measures caused by normal deterioration, drought, and flooding caused by rainfall in excess of design rainfall, or vandalism is considered maintenance.
>
> ***Replacement:*** Planned periodic replacement of facilities, parts of project measures, or complete project measures.

Operation, maintenance, and replacement (OM&R) consist of routine and recurring needs such as:

1. Replacing soil moved by erosion and burrowing animals on earthfills and emergency spillways.
2. Re-establishing vegetative cover on earthfills, emergency spillways, and borrow areas.
3. Removing debris accumulations in sediment and retarding pools.
4. Keeping trash racks in proper working order and free of trash and debris.
5. Replacing or repairing damaged or depleted principal spillways.
6. Stabilizing spillway outlets.
7. Removing undesirable vegetation from earthfills and emergency spillways.
8. Repairing or replacing damaged sections of fence around embankments, pools, and livestock exclusion areas.

OM&R work will generally be accomplished by mechanical means such as mowing, seeding, planting, and earthmoving. Undesirable vegetation will be controlled by mechanical methods. However, to prevent the resprouting of brush or trees that have been cut down, spot application of herbicide may be needed. Mowing will be done only between July 15 and September 1.

Sponsors will be responsible for all OM&R of the installed structural and land treatment project measures. OM&R requires effort and expenditures throughout the life of the project to maintain safe conditions and assure proper functioning.

Sponsors' liability extends throughout the actual life of the structural measure, until the measure is modified to remove potential risk of loss of life and property, or as may be required by federal, state, and local laws.

A specific OM&R agreement will be made for each plan element before signing a landrights, relocation, project agreement, or long-term contract. The agreements will provide for inspections, reports and procedures for performing the OM&R items. The agreements will include specific provisions for retention, use, and disposal of property acquired or improved with PL-566 financial assistance.

Inspections are necessary to ensure that the installed project measures are safe and functioning properly. Inspections are to assess the adequacy of the OM&R activities, identify needed OM&R work, identify unsafe conditions, specify means of relieving unsafe conditions or performing other needed work, review adequacy of land treatment above structures, set action dates for performing corrective actions, and review hazard classification of structures.

Mitigation

Analysis of the Recommended Plan shows overall net positive effects for all wildlife habitat types will result from installation of project measures. Impacts to woodland and grassland habitats were quantified using Habitat Suitability Index (HSI) models. White-tailed Deer, Red-headed Woodpecker and Fox Squirrel were the species used to measure impacts to woodland habitat and White-tailed Deer and Ring-necked Pheasant were used for grassland and cropland habitat types. The model is used to derive an HSI for each species. Impacts are quantified by multiplying this quality index, which has a value range from 0-1.0 with a 1.0 being optimal habitat conditions, times the affected acres to give Habitat Units (HU) for each habitat type the species uses.

Installation of floodwater retarding structures will cause a loss of HU's on all three habitat types. To maximize the amount of drainage area controlled by the structures, they will frequently be located toward the lower ends of the tributary drainage ways. Due to the topography, these areas are primarily steep, timbered draws. This means the major wildlife impact from installation of the structures will be a loss of woody HU's.

Installation of the land treatment measures on grazed woodland, pastureland and cropland will result in a significant increase in the HSI on large acres of these habitat types and will therefore add many HU's to the watershed. The losses of woodland HU's from the structure installation will be more than offset by gains in HU's that result from the livestock exclusion and other improvements on the grazed woodlands. The land treatment measures planned for grassland and cropland will result in a large net increase in HU's on these two habitat types.

Since there will be a net gain of HU's for all habitat types due to the project measures, formal mitigation will not be required unless the planned acres of land treatment measures are not installed. The minimum quantity of woodland livestock exclusion and improvement to preclude the need for mitigation is 1145 acres of the 1240 acres planned for the project area. The minimum quantity of conversion of cropland acres to grassland acres to preclude the need for mitigation is 155 acres. If fewer than the minimum acres of these practices are installed in each state, then formal mitigation will be required. Approximately 0.27 acres of mitigation will be required for every acre of woodland livestock exclusion below the 1145 acre minimum threshold and 0.52 acres of mitigation will be required for every acre of cropland to grassland conversion not installed. Since cropland habitat is not a limiting factor for wildlife in the watershed, no minimum threshold for cropland measures is required. This will require monitoring by the local NRCS representatives in consultation with the respective state DNR

representatives to see that these minimum thresholds are realized in each state before the project can be completed. If formal mitigation becomes necessary, then the acres of required mitigation will have to be fenced to exclude livestock and a 50 year term easement will be required to be recorded to ensure that the mitigation remains in place for the evaluation life of the project.

Wetlands

The interagency review of the watershed determined that because of the planned location of structural and land treatment measures, there should be no negative impacts to wetland resources. Since a sample of sites was used to quantify environmental impacts, not all potential structure sites were analyzed in detail. It is expected that any wetland impacts will be very minor and any potential wetland impacts will be offset by incidental wetlands created by structures.

Permits and Compliance

Obtaining permits is the responsibility of the sponsoring local organization and landowners. A Federal Clean Water Act, Section 404, permit for the project may be required. No other federal permits or licenses will be required. Construction permits and water storage permits from the Iowa Department of Natural Resources, Environmental Protection Division (EPD), or the Minnesota Department of Natural Resources, Division of Water are required for most of the dams. Houston County, Minnesota requires a permit on construction projects where over 5000 cubic yards of earth are to be moved. Construction activities on wetlands where over 50 cubic yards of earthwork are planned also require a Houston County permit. Only those on the smallest drainage areas will be exempt from state permits. Construction of dams on Minnesota state protected waters will require a Minnesota Department of Natural Resources protected waters permit. The structural components of waste management systems may require the producer to obtain a construction or operations permit from the Iowa Department of Natural Resources or the Minnesota Pollution Control Agency.

Federal Fish and Wildlife Coordination Act procedures were used to ensure important fish and wildlife resources are not lost. The Plan has been prepared to be in compliance with the National Environmental Policy Act and Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

Project measure installation will be in compliance with applicable federal, state, and local laws and regulation concerning environmental pollution control and abatement.

Cultural Resource Features

The NRCS will do a cultural resources survey on each structure site prior to construction according to its policy and procedures. The NRCS will avoid cultural resources whenever it is appropriate. Because of the relatively small sizes of the potential structures, it is anticipated that the NRCS will have flexibility in choosing alternative sites.

Because this watershed spans the state line between Iowa and Minnesota, State Historic Preservation Officers (SHPO) from both states will be involved in the clearance process. Consultation will be sought from the respective SHPO on the proposed structures in their state.

The NRCS anticipates that certain earth disturbing actions resulting from the planned construction will have the potential to disturb cultural resources. Among these earth disturbing actions will be the excavation of core trenches and borrow areas. The core trenches and some of

the borrow areas will be in the valley bottoms. Some borrow areas may be on the ridge tops. Neither of these topographic positions are anticipated to have the potential for the presence of cultural resources.

Archeological sites in the vicinity indicate that the area has been occupied for approximately the last 11,000 years, including the Paleoindian, Archaic, Woodland, and Oneota periods. Prehistoric archeological site locations in the vicinity include valley bottoms, rock shelters, and ridge tops. Two archeological sites have been recorded in the watershed. Archeological site, 13WH67, is located on a terrace and contains both prehistoric and historic components. Archeological site, 13WH35, is a rock shelter containing a long prehistoric cultural sequence, and is likely to be eligible for the National Register of Historic Places.

Historic period sites are expected to be quite numerous. The area had a relatively dense occupation during the latter part of the 19th century, and numerous abandoned farmstead sites greater than 50 years of age are expected to be encountered. The chances of disturbing historic sites will be much higher than the chances of disturbing prehistoric sites.

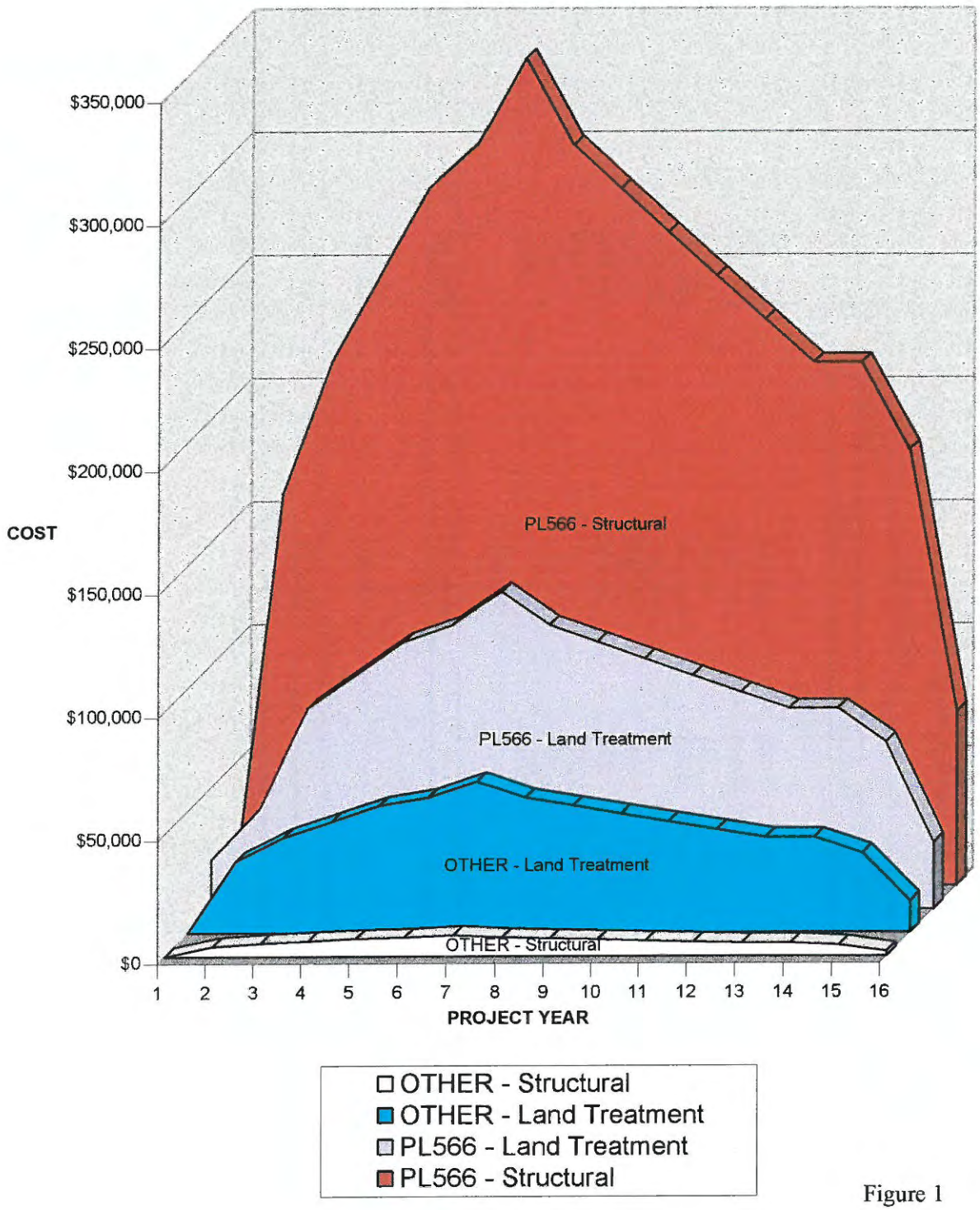
SCHEDULE OF OPERATIONS
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
COST
PL566 - Structural
PL566 - Land Treatment
OTHER - Land Treatment
OTHER - Structural
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
PROJECT YEAR
OTHER - Structural
OTHER - Land Treatment
PL566 - Land Treatment
PL566 - Structural

Figure 1

TABLE 1 – ESTIMATED INSTALLATION COST

Bear Creek Watershed, Iowa and Minnesota

(Dollars)1/

Installation Cost Item	Unit	Number	Estimated Cost		
			P.L.-566	Other Funds	TOTAL
LAND TREATMENT					
Terraces	ac	1,700	353,600	190,400	544,000
Fencing	ft	269,000	262,300	141,200	403,500
Livestock Watering Systems	no	34	16,600	8,900	25,500
Pasture and Hayland Planting	ac	5290	343,900	185,100	529,000
Waste Management Systems	no	20	195,000	105,000	300,000
Woodland Improvement	ac	500	32,500	17,500	50,000
Tree Planting	ac	120	31,200	16,800	48,000
Stripcropping	ac	1,500		3,000	3,000
Contour Farming	ac	1,500		1,500	1,500
Conservation Tillage	ac	2,500		7,500	7,500
Technical Assistance			166,000		166,000
Subtotal-Non-Structural			1,401,100	676,900	2,078,000
STRUCTURAL MEASURES					
Floodwater Retarding Structures	no	52	3,542,500	89,000	3,631,500
Subtotal-Structural			3,542,500	89,000	3,631,500
TOTAL PROJECT			**4,943,600**	**765,900**	**5,709,500**

1/ **Price Base 1996**

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TABLE 2 - ESTIMATED COST DISTRIBUTION - STRUCTURAL AND LAND TREATMENT

Bear Creek Watershed, Iowa and Minnesota

(Dollars)1/

	Installation Cost-P.L.-566					Installation Cost-Other Funds			
	Construc-tion	**Engineer-ing**	**Technical Assist.**	**Project Admin.**	**Total P.L.-566**	**Construc-tion**	**Real Property Rights**	**Total Other**	**Total Installation Cost**
STRUCTURAL MEASURES									
Fifty two Floodwater Retarding Structures	2,725,000	545,000		272,500	3,542,500		89,000 2/	89,000	3,631,500
Subtotal-Structural	2,725,000	545,000		272,500	3,542,500		89,000	89,000	3,631,500
LAND TREATMENT									
Terraces, Fencing, Livestock Watering Systems, Woodland Improvement, Pasture and Hayland Planting, Contour Farming, Stripcropping, Conservation Tillage, Tree Planting, and Waste Management Systems	1,235,100		166,000		1,401,100	676,900		676,900	2,078,000
Subtotal-Land Treatment	1,235,100		166,000		1,401,100	676,900		676,900	2,078,000
TOTAL PROJECT	**3,960,100**	**545,000**	**166,000**	**272,500**	**4,943,600**	**676,900**	**89,000**	**765,900**	**5,709,500**

1/ **Price Base 1996**
2/ **Includes $26000 for surveys, legal fees, appraisals, and other costs**

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TABLE 3 - STRUCTURAL DATA - DAMS WITH PLANNED STORAGE CAPACITY[1]

Bear Creek Watershed, Iowa and Minnesota

		Structure Number			
Item	Unit	04	16	21	22
Class of Structure		a	a	a	a
Seismic Zone		1	1	1	1
Drainage Area[2]	mi^2	0.58	0.46	0.37	0.09
Runoff Curve Number (1-day) (AMC II)[3]		70	70	70	70
Time of Concentration (Tc)	hours	0.7	0.7	0.7	0.5
Elevation					
Top of Dam	feet	1125.6	1092.8	1008.1	1003.3
Crest Emergency Spillway	feet	1123.6	1090.8	1006.1	1001.3
Crest High Stage Inlet	feet	1114.7	1079.2	997.5	996.7
Emergency Spillway					
Type[4]		Veg	Veg	Veg	Veg
Bottom Width	feet	20	20	20	20
Exit Slope	% slope	4	4	4	4
Maximum Height of Dam	feet	25.6	32.8	29.1	23.3
Volume of Fill	yd^3	30,410	13,170	17,630	4,830
Total Capacity at Crest of Emergency Spillway					
Sediment Submerged	ac-ft	29.6	23.1	19.6	4.6
Sediment Aerated	ac-ft	7.4	6.2	5.1	1.0
Floodwater Retarding	ac-ft	52.2	35.8	30.5	2.9
Surface Area					
Sediment Pool-Submerged	acres	4.4	2.5	2.8	0.7
Floodwater Retarding Pool	acres	9.3	5.0	5.8	1.0
Principal Spillway Design					
Rainfall Volume (1-day)	inches	5.1	5.1	5.1	3.8
Runoff Volume (1-day)	inches	2.1	2.1	2.1	1.2
Capacity at High Stage (max)	cfs	12.1	14.8	13.0	4.0
Dimensions of Conduit	inches	15	15	15	10
Type of Conduit[5]		CMP	CMP	CMP	CMP
Frequency Operation-Emergency Spillway	% chance	4	4	4	20
Emergency Spillway Hydrograph					
Rainfall Volume	inches	5.6	5.6	5.6	5.6
Runoff Volume	inches	2.5	2.5	2.5	2.5
Storm Duration	hours	24	24	24	24
Velocity of Flow (Ve)	ft/sec	2.8	3.0	2.7	4.2
Maximum Reservoir Water Surface Elevation	feet	1124.2	1091.4	1006.6	1002.3
Capacity Equivalents					
Sediment Volume	inches	1.2	1.2	1.2	1.2
Floodwater Retarding Volume	inches	1.7	1.5	1.5	0.6

1. Data for Table 3 were developed during plan formulations. Quantities, elevations and dimensions are subject to refinement at time of final design and prior to installation.
2. Structure locations are dependent on geologic and physiographic features. Specific locations may vary within the regions indicated in Appendix D, Project Map.
3. Runoff Curve Numbers (RCN) are representative areas of the watershed in which the sample structures are located. Final design RCN's for specific sites may differ from the listed values.
4. Veg - vegetated, sod-forming grass only.
5. CMP - Corrugated Steel Pipe.

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TABLE 3 - STRUCTURAL DATA - DAMS WITH PLANNED STORAGE CAPACITY[1] (Continued)

Bear Creek Watershed, Iowa and Minnesota

		Structure Number			
Item	Unit	30	37	45	52
Class of Structure		a	a	a	a
Seismic Zone		1	1	1	1
Drainage Area[2]	mi^2	0.21	0.23	0.75	0.29
Runoff Curve Number (1-day) (AMC II)[3]		68	68	67	67
Time of Concentration (Tc)	hours	0.7	0.7	0.7	0.6
Elevation					
Top of Dam	feet	1062.2	1013.7	1071.4	961.8
Crest Emergency Spillway	feet	1060.2	1011.7	1068.4	959.8
Crest High Stage Inlet	feet	1053.2	1005.0	1060.1	952.0
Emergency Spillway					
Type[4]		Veg	Veg	Veg	Veg
Bottom Width	feet	20	20	20	20
Exit Slope	% slope	4	4	4	4
Maximum Height of Dam	feet	32.2	25.7	31.4	21.8
Volume of Fill	yd^3	9,050	8,930	22,030	7,150
Total Capacity at Crest of Emergency Spillway					
Sediment Submerged	ac-ft	10.7	12.0	38.3	13.2
Sediment Aerated	ac-ft	2.6	3.0	10.4	4.4
Floodwater Retarding	ac-ft	10.4	11.7	61.1	18.0
Surface Area					
Sediment Pool-Submerged	acres	1.4	1.6	5.2	2.1
Floodwater Retarding Pool	acres	2.4	2.7	11.8	3.7
Principal Spillway Design					
Rainfall Volume (1-day)	inches	4.4	4.4	5.1	5.1
Runoff Volume (1-day)	inches	1.5	1.5	1.9	1.9
Capacity at High Stage (max)	cfs	6.0	6.2	12.8	11.6
Dimensions of Conduit	inches	10	12	15	15
Type of Conduit[5]		CMP	CMP	CMP	CMP
Frequency Operation-Emergency Spillway	% chance	10	10	4	4
Emergency Spillway Hydrograph					
Rainfall Volume	inches	5.6	5.6	5.6	5.6
Runoff Volume	inches	2.3	2.3	2.2	2.2
Storm Duration	hours	24	24	24	24
Velocity of Flow (Ve)	ft/sec	2.4	4.0	2.8	2.8
Maximum Reservoir Water Surface Elevation	feet	1061.2	1012.6	1069.3	960.2
Capacity Equivalents					
Sediment Volume	inches	1.2	1.2	1.2	1.2
Floodwater Retarding Volume	inches	0.9	1.0	1.5	1.2

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3. Runoff Curve Numbers (RCN) are representative areas of the watershed in which the sample structures are located. Final design RCN's for specific sites may differ from the listed values.
4. Veg - vegetated, sod-forming grass only.
5. CMP - Corrugated Steel Pipe.

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TABLE 3 - STRUCTURAL DATA - DAMS WITH PLANNED STORAGE CAPACITY[1] (Continued)

Bear Creek Watershed, Iowa and Minnesota

		Structure Number				
Item	Unit	33	43	47	41 Add'l	Total
Class of Structure		a	a	a		
Seismic Zone		1	1	1		
Drainage Area[2]	mi^2	0.91	1.41	1.61		
Runoff Curve Number (1-day) (AMC II)[3]		70	67	67		
Time of Concentration (Tc)	hours	0.8	0.9	0.9		
Elevation						
Top of Dam	feet	991.8	1068.7	1076.2		
Crest Emergency Spillway	feet	988.8	1065.7	1073.2		
Crest High Stage Inlet	feet	977.4	1056.1	1063.5		
Emergency Spillway						
Type[4]		Veg	Veg	Veg		
Bottom Width	feet	30	30	30		
Exit Slope	% slope	4	4	4		
Maximum Height of Dam	feet	41.8	32.6	35.4		
Volume of Fill	yd^3	39,260	28,760	38,520	553,540	773,280
Total Capacity at Crest of Emergency Spillway						
Sediment Submerged	ac-ft	46.9	72.5	81.1	825.3	1,176.9
Sediment Aerated	ac-ft	11.3	17.3	22.8	214.3	305.8
Floodwater Retarding	ac-ft	73.2	114.0	130.1	1,270.3	1,749.2
Surface Area						
Sediment Pool-Submerged	acres	4.7	9.5	10.6	148.3	192.4
Floodwater Retarding Pool	acres	10.6	20.8	22.5	218.0	313.6
Principal Spillway Design						
Rainfall Volume (1-day)	inches	5.1	5.1	5.1		
Runoff Volume (1-day)	inches	2.1	1.9	1.9		
Capacity at High Stage (max)	cfs	22.3	21.4	22.3		
Dimensions of Conduit	inches	18	18	18		
Type of Conduit[5]		CMP	CMP	CMP		
Frequency Operation-Emergency Spillway	% chance	4	4	4		
Emergency Spillway Hydrograph						
Rainfall Volume	inches	4.6	4.6	4.6		
Runoff Volume	inches	1.7	1.5	1.5		
Storm Duration	hours	6	6	6		
Velocity of Flow (Ve)	ft/sec	5.3	5.5	5.8		
Freeboard Hydrograph						
Rainfall Volume	inches	7.1	7.1	7.1		
Runoff Volume	inches	3.7	3.4	3.4		
Storm Duration	hours	6	6	6		
Maximum Reservoir Water Surface Elevation	feet	991.8	1068.7	1076.2		
Discharge Per Foot of Width (Qe/b)	ac-ft/ft	3.3	4.8	5.6		
Capacity Equivalents						
Sediment Volume	inches	1.2	1.2	1.2		
Floodwater Retarding Volume	inches	1.5	1.5	1.5		

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4. Veg - vegetated, sod-forming grass only.
5. CMP - Corrugated Steel Pipe.

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TABLE 4 - ESTIMATED AVERAGE ANNUAL COSTS

Bear Creek Watershed, Iowa and Minnesota

(Dollars)[1/]

Item	PROJECT OUTLAY		
	Amortization of Installation Cost [2/]	Operation, Maintenance, and Replacement Costs	Total Costs
LAND TREATMENT			
Terraces, Fencing, Livestock Watering Systems, Contour Farming, Stripcropping, Pasture and Hayland Planting, Waste Management Systems, Conservation tillage, Woodland Improvement, and Tree Planting	248,400	53,600	302,000
STRUCTURAL MEASURES			
Fifty two Floodwater Retarding Structures	275,200	9,500	284,700
GRAND TOTAL	**523,600**	**63,100**	**586,700**

1/ **Price Base 1996, amortized over 50 years at a discount rate of 7 3/8 percent.**

2/ **Cost of technical assistance to install accelerated land treatment is included.**

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Bear Creek Watershed, Iowa and Minnesota

(Dollars)1/

Item	Estimated Average Annual Damages		Damage Reduction Benefits
	Without Project	With Project	
FLOODWATER			
Enhancement	208,900	114,100	94,800
Flooding(rec)	149,700	81,700	68,000
Flooding (other)	11,600	6,300	5,300
Recreation Facilities	5,000	2,700	2,300
Crop and Pasture	15,600	10,600	5,000
Road and Bridge	16,200	9,800	6,400
Other Agricultural	13,100	6,800	6,300
IMPAIRED WATER QUALITY			
Sediment Deposition	53,600	29,300	24,300
Turbidity	137,500	75,100	62,400
GRAND TOTAL	**611,200**	**336,400**	**274,800**

1/ **Price Base 1996, Current normalized prices for crop, pasture and recreation; 1996 Prices for all others.**

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TABLE 5A - ESTIMATED AVERAGE ANNUAL WATERSHED PROTECTION DAMAGE REDUCTION BENEFITS

Bear Creek Watershed, Iowa and Minnesota

(Dollars)1/

	Damage Reduction Benefits Average Annual	
Items	**Agriculture Related**	**Non-Agricultural**
ONSITE		
Depletion	36,000	
Annual Sheet and Rill Erosion	28,800	
Ephemeral Crop Gully Erosion	53,500	
Increased AUM's	156,400	
Firewood	9,900	
Sawlogs	17,900	
Nutrients	8,400	
Subtotal	310,900	
OFFSITE/PUBLIC		
Sedimentation		17,200
Turbidity		51,400
Subtotal		68,600
GRAND TOTAL	**310,900**	**68,600**

1/ **Price Base 1996, Current normalized prices for crop, pasture and recreation; 1996 Prices for all others.**

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS

Bear Creek Watershed, Iowa and Minnesota

(Dollars)1/

Evaluation Unit	Agriculture-related		Non-Agricultural		Average Annual Benefits	Average Annual Costs 2/	Benefit Cost Ratio
	Damage Reduction	Intensifi-cation	Public Facilities	Recreation			
Land Treatment Measures		310,900		68,600	379,500	302,000	1.3:1.0
Floodwater Retarding Structures	11,300		8,700	254,800	274,800	284,700	1.0:1.0
GRAND TOTAL	**11,300**	**310,900**	**8,700**	**323,400**	**654,300**	**586,700**	**1.1:1.0**

1/ **Price Base 1996**
2/ **From Table 4**

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GLOSSARY

CONSERVATION TILLAGE: Any tillage and planting system that maintains a level of residue cover on the soil surface to adequately reduce water and/or wind erosion.

CONTOUR FARMING: Farming sloping land in such a way that preparing land, planting, and cultivation are done on the contour.

FENCING: Enclosing or dividing an area of land with a suitable permanent structure that acts as a barrier to livestock.

FLOODWATER RETARDING DAM: A dam designed primarily for temporary storage of floodwater and for its controlled release, other functions may include dry hydrants and fish and wildlife.

LAND TREATMENT MEASURE: A practice necessary to improve watershed protection.

LIVESTOCK EXCLUSION: Excluding livestock from an area NOT intended for grazing.

(LIVESTOCK) WASTE MANAGEMENT SYSTEM: A planned system with all necessary components for management and disposal of liquid and solid wastes without degrading air, soil or water resources.

PASTURE AND HAYLAND PLANTING: Establishing long-term stands of adapted species of perennial, biennial and/or reseeding forage plants.

PIPELINE: A pipeline installed for conveying water for livestock.

STRIPCROPPING, CONTOUR: Growing crops in a systematic arrangement of strips or bands on the contour to reduce water erosion. The crops are arranged so that a strip of grass or close-growing crop is alternated with a strip of clean-tilled crop or fallow or a strip of grass is alternated with a close growing crop.

TERRACE: An earth embankment, channel or combination of both, constructed across the slope.

TREE PLANTING: Setting tree seedlings or cuttings in the soil, to establish a stand of trees, conserve soil, protect a watershed, and/or produce timber products.

WATER SUPPLY: Developing or supplying an adequate volume and quality of water for the planned use.

WOODLAND IMPROVEMENT: Managing a stand of trees to improve the quality and quantity of marketable timber products.

REFERENCES

Stream Improvement Work Plan Bear Creek, Allamakee County, Iowa, 1995.

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Habitat Suitability Index Models and Instream Flow Suitability Curves: Brown Trout. Biological Report 82 (10.124) September 1986 Revised.

LIST OF PREPARERS

This watershed plan was prepared by an interdisciplinary team composed of the following specialists representing the USDA Natural Resources Conservation Service and Forest Service.

Name	Present Title	Education	Experience
Richard L. Weist	Forester	BS Forestry	Forester 25
Martin Adkins	Planning Team Leader	BS Agronomy	Planning leader 3 EWP Coodinator 2 RC&D Coordinator 5 Farm manager 2 Dist. Cons. 5 Soil Cons. 1
Todd Duncan	District Conservationist	BS Animal Science	Soil Con Tech 2 Eng Draftsman 1 Soil Cons. 2 Dist. Cons 5
Greg Yakle	District Conservationist	BS Agronomy MS Soil Management	Soil Cons 2 Dist. Cons 12
Dennis Miller	Economist	BS Agr Econ	Economist 29
Robert Makowski	Rural Development Forester	BS Forestry	Forest Mgmt 10 Environ. Mgmt 4
James F. Schneider	Geologist	BA Geology	Soil Con Tech 2 Geologist 6
Roger Link	Water Quality Specialist	BS Agronomy	Soil Con. 12 District Con 9 WQ Spec 8
James M. Phillips	Civil Eng Tech	BS General	State Tech 1 Civ Eng Tech 8
Mark D. Lindflott	Biologist	BS Animal Ecology	Soil Cons 2 Dist Con 2 Biologist 11
Laurel Foreman	Hydrologist	BS W'Shed Hydrology	Hyd Tech 5 Hydrologist 8

Name	Present Title	Education	Experience
Jeff Porter	Hydraulic Eng	BS Agr Eng MS Agr Eng	Civil Eng 1 Agr Eng 2 Area Eng 5 Hydr Eng 2
Richard A. Rogers	Archeologist	BA Anthropology MS Anthropology PHD Anthropology	Archeologist 25
Pat Wild	Secretary	Business	Secy 20

APPENDIX A

LETTERS, COMMENTS and RESPONSES

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

May 28, 1998

Mr. Leroy Brown
State Conservationist
Natural Resources Conservation Service
Federal Building
210 Walnut St., Ste. 693
Des Moines, IA 50309-2180

Dear Leroy:

Thanks for providing the draft watershed plan/environmental assessment for the Bear Creek Watershed for our review. We have been supportive of this effort to improve the watershed since planning began in 1989.

North and South Bear Creeks are our most popular coldwater streams, ranking one and two in angler trips in the 1996 Survey of Iowa Trout Anglers. We agree with the conclusion reached in the plan that sediment and animal waste threaten viability of the creeks to support trout populations in the future. The Bear Creek Watershed project represents an opportunity to not only protect the creeks from future degradation but to also significantly improve trout fishing and maximize recreational benefits by reducing flooding, bank erosion and nutrification from animal wastes. Biggest benefits will come from the constructed dams in the watershed and livestock exclusion through fencing.

I look forward to signing on to the final plan as a participating sponsor and especially to the implementation.

Sincerely,

LARRY J. WILSON
DIRECTOR

WALLACE STATE OFFICE BUILDING / DES MOINES, IOWA 50319 / 515-281-5145 / TDD 515-242-5967 / FAX 515-281-8895

United States Department of Agriculture | Forest Service | Northeastern Area State and Private Forestry | 100 Matsonford Road 5 Radnor Corp. Ctr., Ste. 200 Radnor, PA 19087-4585

File Code: 3000

Date: May 29, 1998

Mr Leroy Brown
State Conservationist
USDA Natural Resources Conservation Service
Federal Building
210 Walnut Street, Suite 693
Des Moines, IA 50309-2180

Dear Mr. Brown:

We have reviewed Bear Creek Watershed Plan-Environmental Assessment. The Recommended Plan contains a good balance between structural and land treatment measures to solve the flooding and stream habitat problems. I am especially pleased to see the use of forest management, tree planting, and livestock exclusion from forest land to reduce soil erosion and improve watershed health. It is through the stewardship of all natural resources that watersheds produce clean water and productive trout streams.

Thank you for the opportunity to review the draft plan and environmental assessment. Upon completion, the sponsors and landowners in Bear Creek will have less flooding damages and a more productive place to live.

Sincerely,

MICHAEL T. RAINS
Area Director

IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rock Island Field Office (ES)
4469 - 48th Avenue Court
Rock Island, Illinois 61201
Tel: 309/793-5800 Fax: 309/793-5804

May 28, 1998

Mr. Leroy Brown
State Conservationist
USDA Natural Resources Conservation Service
Federal Building
210 Walnut St., Suite 693
Des Moines, Iowa 50309-2180

Dear Mr. Brown:

The Fish and Wildlife Service (Service) has reviewed the draft watershed plan-environmental assessment (Plan-EA) prepared for the Bear Creek Watershed, Iowa and Minnesota, prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566) by the Natural Resources Conservation Service (NRCS) and provides the following comments for your consideration.

General Comments

We strongly support the objectives of the proposed Bear Creek Watershed project. Of particular interest from the standpoint of fish and wildlife resources is the planned reduction of environmental damage to land and water resources and the resultant water quality improvements. Important benefits to fish and wildlife resources will accrue as a result of proposed actions on forested areas as well as exclusion of livestock from several miles of stream corridor.

We appreciate the innovative approach taken to protection and improvement of the trout streams, particularly the livestock exclusion and off stream watering measures. During the multi-agency review, we were impressed by the improvements shown in demonstration projects of the above measures. We note that improvement of the trout fishery beyond the project goals is a strong possibility through a partnership of government and non-government conservation groups.

We have several suggestions for general descriptions and points of emphasis in the document as follows:

To achieve the stated objectives, improvements in hydrology will be needed that involve widespread implementation of land treatment, particularly vegetated (upland habitat) buffers, that may or may not be associated with structural measures. The buffers may be promoted and created through programs other than PL 566, but they need to be more prominent in the document to stress the importance of increased buffering.

The Project Setting Chapter may benefit from a discussion of pre-settlement vegetation as well as the historic transformation in land cover and drainage patterns that resulted from the steady intensification of land use that occurred over the past 150 years. The fact that conservation practices since the 1930's have helped sustain water quality and fish and wildlife in diversified small family farming areas like the Mississippi River Blufflands should be emphasized, but a description of resource needs, particularly in areas that are intensively row cropped, overgrazed or industrially confined should be included.

Originally, natural and Indian set fires maintained a dynamic tension zone here between the tall grass prairies to the west and the woodlands clinging to bluff slopes and bottoms along the Mississippi. Most of the watershed was blanketed with thick, deep rooted native tall grass, grassy oak savannas, goat prairies and brush prairies in various stages of succession. Runoff was captured and filtered by a complete network of marshy swales and floodplain meadows. Natural buffers were built into the entire landscape.

Today, the tall grass sod -- and even some of the woodland -- has been converted to productive cropland. There is little protective grass left, even on steep slopes or in swales and floodplains. Ditches and tiles, diversions and waterways all help speed runoff that contributes to floods. Building dams to capture this runoff may partly compensate for the loss of natural wetlands, but interconnecting habitat buffers are essential for restoration of healthier hydrology and conservation of biodiversity. Tables and text should include buffer and filter treatment measures.

An education, information, and public participation section or objective might help clarify how various practices will be publicized, promoted, explained, and evaluated. The weak links in many programs seem to be in the areas of public relations and monitoring, which can have a huge bearing on the effectiveness of treatment measures and perceptions of success.

Specific Comments

On the Introduction Page, the Service is abbreviated as FWS in the second to last paragraph, but is abbreviated USFWS elsewhere in the document. For consistency, we suggest using USFWS throughout the document.

page 7. The comment about farm consolidation and industrialization near the bottom of the page needs to be qualified with possible alternatives and remedial recommendations,

including the option of more hybrid, hobby, or recreational farm options for rural residents.

pages 18 and 42. The identical paragraph on USFWS involvement should be reworded to read: The USFWS continues to provide limited funding through cooperative agreements with the conservation districts for corridor protection and stream habitat enhancement measures, as well as wetland or native grass restoration where appropriate.

pages 19 and 20. The issue of family farm viability needs to be given more prominence in the text and on the table of identified concerns. This could be addressed under both economic and social factors. A high degree of significance should be attached to this concern because it is the principal determinant of land use and land cover in the most sensitive and critical portions of the blufflands

page 25. Managed or rotational grazing systems can be specifically included to facilitate transition to more grass-based farming systems for small producers.

page 41. Recommended guidelines for grazing on the corridor should include an "after July 15" provision to allow for undisturbed bird breeding and nesting. Corridor width should also be flexible, as with the RP filter strip provision, to allow for inclusion of critical riparian habitat or to reduce the likelihood of fence damage.

page 74. The statement is made that "the team did agree that monitoring to insure that the land treatment measures should be installed as planned was needed." Aside from the need to mitigate in the event of shortfalls in anticipated habitat benefits at project sites, we recommend a continuing multi-agency effort to track progress and to provide additional incentives and assistance with establishment of habitat buffers throughout critical runoff networks.

There are several references to threatened and endangered species in the Plan-EA that we recommend modifying for clarity relative to the federally listed species.

page 31. In the Environmental Quality Account table under Threatened and Endangered Species, reference is made to critical habitat for listed species. Because critical habitat has a specific meaning for federally listed species, and there is no designated critical habitat for any of the federally listed species in Iowa or Minnesota we recommend that the wording of the statements be changed. We suggest utilizing the following: "No effect on listed species is foreseen." or "Not likely to adversely affect listed species.

page 38. The Plan-EA states that "Project measures will be altered to minimize negative impacts on threatened and endangered species. Efforts to improve or increase habitat and minimize negative impacts will be pursued at the planning and design stage for each contract." From the standpoint of the Endangered Species Act, if an action may or will have an adverse affect, the Service must be consulted. If the planned action can be modified to

avoid impacts, the consultation can be concluded informally. However, if the planned action cannot be modified to avoid impacts, formal consultation will be necessary, including the preparation of a biological assessment by the NRCS and a biological opinion by the Service which may include measures to minimize impacts. While our discussions and correspondence with NRCS on this project lead us to believe that NRCS intent is to avoid affecting federally threatened and endangered species, the above referenced statements do not state that intent. Because each of the structural element sites will be evaluated individually prior to final design and construction, the potential to avoid affecting Federal and State listed species is maximized. Therefore, we recommend that the wording be modified to indicate that negative impacts to threatened and species will be avoided.

page 74. Threatened and Endangered Species. This discussion confirms the foregoing comments about threatened and endangered species statements on page 38.

The Service has a continuing interest in working with the Natural Resources Conservation Service on this project. For continued coordination with the Service, please contact the Field Supervisor, U.S. Fish and Wildlife Service, 4469 48th Avenue Court, Rock Island, Illinois 61201, Telephone: (309) 793-5800. For technical assistance, contact McGregor District of Upper Mississippi River National Wildlife and Fish Refuge at P.O. Box 460, McGregor, IA 52157 and Refuge Headquarters (Attn: Watershed Biologist) at 51 East 4th Street, Winona, MN 55987.

Thank you for the opportunity to provide these comments.

Sincerely,

Richard C. Nelson
Supervisor

cc: USFWS (AES, TCFO, Hawkins, Munson)
IADNR (Joens, Wunder)

State Historical Society of Iowa

The Historical Division of the Department of Cultural Affairs

April 30, 1998

In reply please refer to:
R&C#: 980400069

Leroy Brown
State Conservationist
Natural Resources Conservation Service
United States Department of Agriculture
Federal Building
210 Walnut Street, Ste. 693
Des Moines, IA 50309-2180

RE: NRCS – WINNESHIEK AND ALLAMAKEE COUNTIES – BEAR CREEK WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT

Dear Mr. Brown,

We have received and reviewed the above referenced watershed plan - environmental assessment. Two previously identified archaeological sites (13WH67 and 13WH35) have been were identified as existing within the project area. Based on the information you provided, we find that there has been no survey or attempt to evaluate historic properties that might be affected by the proposed undertaking and no attempt to assess the significance of sites 13WH67 and 13WH35 with regards to their potential for listing on the National Register of Historic Places (NRHP).

It is recommended that a Phase 1 archaeological survey including archival research, pedestrian surface survey, and subsurface testing be conducted within the project area prior to any construction or earthmoving activities. If not previously accomplished, a Phase 1 survey should be conducted for sites 13WH67 and 13WH35 to assess their potential for listing on the NRHP. If any future proposed project work is planned for this property, please forward additional information to our office for further comment prior to any construction activity.

If any proposed project work uncovers an item(s) which might be of archeological, historical or architectural interest, or if important new archeological, historical or architectural data come to light in the project area, you should make reasonable efforts to avoid or minimize harm to the property until the significance of the discovery can be determined.

Should you have any questions please contact me at the number below.

Sincerely,

K Kaufmann

Kira E. Kaufmann, Archaeologist
Community Programs Bureau
(515) 281-8744

☐ 402 Iowa Avenue
Iowa City, Iowa 52240-1806
(319) 335-3916

☐ 600 E. Locust
Des Moines, Iowa 50319-0290
(515) 281-6412

☐ Montauk
Box 372
Clermont, Iowa 52135-0372
(319) 423-7173

MINNESOTA HISTORICAL SOCIETY

May 11, 1998

Mr. Leroy Brown
USDA-NRCS
Federal Building
210 Walnut Street, Suite 693
Des Moines, IA 50309-2180

Re: EA; Bear Creek Watershed Plan
Houston & Fillmore Counties
SHPO Number: 98-2767

Dear Mr. Brown:

Thank you for providing us with a copy of the Environmental Assessment for the above referenced project.

We look forward to working with you in reviewing the various aspects of this initiative.

Sincerely,

Dennis A. Gimmestad
Government Programs & Compliance Officer

345 KELLOGG BOULEVARD WEST / SAINT PAUL, MINNESOTA 55102-1906 / TELEPHONE: 612-296-6126

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING – P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO ATTENTION OF:

Planning Division

June 4, 1998

Mr. Leroy Brown
State Conservationist
U.S. Department of Agriculture
Natural Resources Conservation Service
Federal Building
210 Walnut Street, Suite 693
Des Moines, Iowa 50309-2180

Dear Mr. Brown:

I am writing in response to your letter dated April 21, 1998, with the attached Environmental Assessment (EA) concerning the draft watershed plan-environmental assessment (Plan-EA) for the Bear Creek Watershed, Iowa and Minnesota.

Rock Island District staff have reviewed your EA and have the following comments:

a. While some of the lands involved are within our regulatory boundaries, all of the lands are outside the civil works boundaries of the Rock Island District. You must coordinate with the St. Paul District to determine if your project involves any Corps of Engineers administered lands. The address is as follows:

District Engineer
U.S. Army Engineer District, St. Paul
Army Corps of Engineers Centre
190 - 5th Street East
St. Paul, Minnesota 55101-1638

b. Any proposed placement of fill or dredged material into waters of the United States (including wetlands) requires Department of the Army (DA) Section 404 authorization. Your project's floodwater retarding structures may require DA authorization if they impact waters of the United States. Please submit detailed plans to the Rock Island District when they are available. If you require assistance in this matter, please contact Ms. Donna Jones of our Regulatory Division. You may reach Ms. Jones by writing to her at our address above, or by calling her at 309/794-5371.

No other concerns surfaced during our review. Thank you for the opportunity to comment on your EA. If you need more information, please call Mr. Randy Kraciun of our Environmental Analysis Branch, telephone 309/794-5174.

Sincerely,

Patrick T. Burke

Patrick T. Burke, P.E.
Acting Chief, Planning Division

USDA

Natural
Resources
Conservation
Service

375 Jackson Street - Suite 600
St Paul, Minnesota 55101-1854

Subject: PDM - Bear Creek Watershed Date: May 5, 1998

To: Leroy Brown
State Conservationist
Des Moines, IA

File Code: 390

Attached are comments we are providing to you on the Bear Creek Watershed Project. Please note that there are also comments made in the text of the two attached reports.

If there are any questions relating to our comments please give me a call at 612-602-7886.

Sincerely,

William Stokes Jr.

WILLIAM STOKES, JR.
Water Resources Team Leader

COMMENTS ON BEAR CREEK WATERSHED PLAN-EA
by Vic Ruhland, RES. Con.

The report represents a lot of hard work by many people. It is much improved over an earlier draft. I have several suggestions:

1. The discount rate to use in water resource project planning and evaluation for FY 1998 is 7 1/8 percent. This applies to all projects including Bear Creek Watershed which have not yet been signed by sponsors and NRCS. This report used 7 3/8 percent. The project should use 7 1/8 % or have a 1 page Addendum at the beginning of the report which reflects the current interest rate and 1998 price levels.

2. Land treatment measures were evaluated over their useful life. The amortized cost included is $248,400. This suggests that the average life of all measures is about 14 years ($248,400/$2,078,000 = 0.1195 - The amortization rate for 14 years @7 3/8 % is 0.11693). A replacement cost is needed to assure accrue of the stream of benefits claimed for the project 50 year evaluation period. In this manner both land treatment and structural measures have a common evaluation period. The replacement cost is the difference between the amortizing for 14 years and for 50 years. Therefore: $248,400 minus $157,700 ($2,078,000 @ 50 year amortization) = the replacement cost or $90,700. The OMR cost included in the plan of $53,600 is not large enough to include the replacement cost of $90,700.

3. An installation period of 15 years is planned. The National Watershed Manual states "all LTC's must be signed within 5 years of the date on which the plan is approved (in section on contracting on page 504-41).

4. page 42 - second paragraph under Costs. Add: Funding for technical assistance estimated at $166,000 ------ in the project. About six ------ of the project. Additional staff is needed primarily in the Minnesota portion of the watershed. Of the six staff-years, 3 to 4 will be in Minnesota.

5. page 46 - second and third paragraph under Cost-Share. Add: Engineering services cost estimated at $545,000 include ------- inspection. Of this amount approximately $250,000 will be for staffing in Minnesota and $295,000 in Iowa.

Project administration costs payments The NRCS ---------- each incurs. The NRCS costs amount to about $272,500 of which about $110,000 is in Minnesota and $162,500 is in Iowa.

No amount is included for project administration cost by the Sponsors. Their time should be reflected with a $ value.

6. OMR is discussed in 3 different location; page 43, 46 and 48-49. Suggest combining these discussions into one section on page 48 and 49.

7. page xii - Include a signature block for William Hunt, State Conservationist, Minnesota.

Minor comments are also recorded in the draft document I reviewed

Vic

Vic Ruhland 5-28-98

BEAR CREEK WATERSHED - COMMENTS

1. Page 65 lists the preparers of this plan. No one from Minnesota is listed. Should the local District Conservationist be included?

2. On page 42, it is stated that each state will be individually responsible for obtaining PL-566 funding for works of improvement to be installed in their state. It is our understanding that originally, all of this was to be handled through Iowa as the lead state. There need to be some discussion between Iowa and Minnesota on this issue.

3. This is a 15-year project with NRCS committing to 100% of the costs for engineering services and 100% of the costs for technical assistance. Yet, there is no mention of staff to complete this work. Winneshiek County has five full-time NRCS staff. Houston County has 29% of the watershed land treatment and 41% of the structure workload and yet only one staff person. The plan needs to spell out who in going to do what and the staff needed to implement the plan. Iowa and Minnesota NRCS need to discuss this issue in more detail.

4. The plan calls for the local SWCD to be the local contracting officer. We are asking the SWCD for a commitment. Do they know what NRCS is committing to this project? Commitments aren't spelled out very well. It is as if each state from here on out functions on it's own. Assumptions are that each state has adequate staff to deal with this project. NRCS (Iowa and Minnesota) should get together and discuss these issues.

JTN

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ARMY CORPS OF ENGINEERS CENTRE
190 FIFTH STREET EAST
ST. PAUL, MN 55101-1638

REPLY TO
ATTENTION OF

August 21, 1998

Construction-Operations
Regulatory (98-07180-SF-JMO)

Mr. Dennis Miller
Natural Resources Conservation Service
Suite 693
Federal Building
210 Walnut Street
Des Moines, Iowa 50302

RE: Bear Creek Watershed Plan; Section 404
Clean Water Act Concerns

Dear Mr. Miller:

We received the subject assessment on May 6, 1998 regarding the Bear Creek Watershed Plan and Environmental Assessment. We understand that this is a three-million dollar proposal located in the counties of Winneshiek and Allamakee Counties, Iowa; also, Houston and Fillmore Counties, Minnesota.

It is our understanding that the intent of this proposal is to resolve flooding and sedimentation problems, control manure runoff in streams resulting in loss of trout habitat, and to generally improve water quality and wildlife habitat within the Bear Creek watershed which is primarily an agricultural watershed.

The following concerns are forwarded for response by your agency and pertain to Section 404 waters of the United States in the state of Minnesota.

Page 3: Aquifers. How will the proposal improve negative impacts on the Cambrian-Ordovician aquifer located within the agricultural watershed as the aquifer is very susceptible to contamination from human impacts? What is the quality of the aquifer at present?

Page 5: Trout Habitat. The current trout habitat suitability index values and projected index values show that sediment and animal waste will reduce Bear Creek's ability to support both rainbow and brown trout in the future if current trends continue. According to the assessment, sediment and animal wastes are the major pollutants delivered to the streams.

The intent of Clean Water Act is to maintain the biological, chemical and physical integrity of the nations waters. Under the chosen alternative, what provisions will be implemented by the agricultural community to prevent animal wastes from entering the watershed other than fencing?

Page 70: Watershed Hydrology Model Project Formulation/Structure Spillway. We understand that all hydrological activities and structures associated with this proposal were reviewed for flow frequency and elevations using the TR-20 Watershed Hydrology Model Project Formulation. It appeared from the assessment that the 100-year storm event was a main issue of concern. Under the chosen alternative, was there any analysis for the 10, 20 and 50 year storm event and how would these events affect upstream and downstream landowners? If there was a negative impact to a downstream landowner due to an impoundment structure, what recourse would that landowner have for compensation? Were rainfall and precipitation factors included in the hydrology formulation model?

Page 70: Turbidity. The proposal notes that there will be structural control of 43% of the total watershed drainage area and intensive land treatment on the entire watershed for prevention of sedimentation and turbidity concern. Where will the control structures be located and what design would be utilized? Please provide a structure design drawing, wetland impact assessment for each structure, and location of each structure. Who will be responsible for the maintenance of the structures proposed?

Page 72: Roads and Bridges. According to the assessment, one of the benefits of this project was defined as a reduction in costs for maintenance, repair, and replacement of roads and bridges. Road and bridge construction/repair impacting waters of the United States requires a Department of the Army permit from this office.

Page 73: Wetlands. The environmental assessment for this proposal indicated that wetland impacts would be identified from soil and topographic maps and reference to the county FSA wetland inventory and certified determinations. Further, the assessment noted that areas that meet wetland criteria will be identified and investigated during field work by the Natural Resource Conservation Service; it is not expected that selected structure locations would impact wetlands at or downstream of the structure.

It is recommended that sites be field investigated to determine wetland impacts as soil, topographic and FSA wetland inventory maps are not always accurate in determining wetland impacts.

If there was a negative impact to a wetland resource, what type of mitigation would be proposed? Have avoidance and minimization measures toward water resources been implemented in the design of this proposal? If so, what measures have been taken?

In Minnesota, Department of the Army permits are generally required when an activity involves the discharge of dredged or fill material into waters of the United States, including wetlands; or, if excavation in waters/wetlands of the United States involve redepositing of the soil.

It appears that this proposal will possibly involve the alteration of waters of the United States to include excavation or discharge of fill. An application for a Department of the Army permit for the work within the State of Minnesota is enclosed for your convenience.

This agency reviews proposals such as this one in its entirety; e.g. the total wetland impacts for the total project/watershed. Perhaps this information has not been finalized yet. However, should the total cumulative impacts from this proposal exceed three acres in size, a Department of the Army individual permit would need to be applied for by your agency. Processing time of an individual permit could take up to 120 days as the proposal is reviewed by several agencies and the public.

Further, it needs to be determined if any ditches would be realigned or channelized in conjunction with this proposal. A Department of the Army permit from the St. Paul District would be required for these activities in Minnesota.

We appreciate the opportunity to comment on this proposal. We would appreciate any responses to the above issues as soon as possible so that we may continue our review and determine what type of permit, if any, would be required from this office.

Should you have any questions, please contact Jan O'Malley in our LaCrosse office at (608) 784-8236. In any correspondence or inquiries, please refer to the Regulatory number shown above.

Sincerely,

Encls

Jan O'Malley
Project Manager

Minnesota

1620-01 **LOCAL - STATE - FEDERAL WATER RESOURCE PROJECT NOTIFICATION / APPLICATION FORM**

this form to notify/apply to the U.S. Army Corps of Engineers, the Minnesota Department of Natural Resources, and your Local Government Unit proposed water/wetland project or work which may fall within their jurisdiction. These agencies should advise you of their jurisdiction or permit rements within 45 days. Some LGU's may also require submission of their own application forms. Fill out this form completely and mail a copy, plans, maps, etc. to each of the agencies listed on the reverse of the form. Keep a copy for your records. YOU MUST OBTAIN ALL REQUIRED HORIZATIONS BEFORE BEGINNING WORK.

NCY USE ONLY: LGU NUMBER:_____ MDNR NUMBER:_____ CORPS NUMBER:_____

Applicant's Name (Last, First, M.I.) | Authorized Agent, if any | Area Code, Telephone ( )

Address (Street, RFD, Box Number, City, State, Zip Code)

Location of proposed project (attach drawing showing how to get to site)

COUNTY | QUARTER SECTION(s) | SECTIONS(s) No. | TOWNSHIP(s) No. | RANGE(s) No. | Lot, Block, Subdivision

STREET No., BOX No., OR PROJECT ADDRESS | NAME OF WATERBODY AFFECTED and NUMBER (IF KNOWN)

ESTIMATED PROJECT COST: $ | LENGTH OF SHORE AFFECTED (in feet):

VOLUME OF FILL OR EXCAVATION (Cubic Yards): *(NOTE: You may substitute dimensions)*
AREA FILLED OR EXCAVATED IS Acres, OR Square Feet

TYPE OF WORK AND AREA (CHECK ALL THAT APPLY):

☐ CONSTRUCT ☐ DRAIN ☐ EXCAVATE ☐ ACCESS PATH ☐ BRIDGE ☐ CULVERT ☐ DAM
☐ FILL ☐ REMOVE ☐ REPAIR ☐ DOCK ☐ RIPRAP ☐ SANDBLANKET
☐ LAKE ☐ SHORELINE ☐ WATERWAY ☐ WETLAND

OTHER (DESCRIBE):_____

WETLAND TYPE(S) AND ACREAGE(S) PROPOSED TO BE FILLED/DRAINED:_____

Attach applicable drawings, plans, and ASCS crop photos. Include a description of any proposed compensatory mitigation. Important: Identify any disposal and borrow areas. Describe the work below: how it would be done; what equipment would be used.

PROJECT PURPOSE (why is this project needed—what benefits will it provide?):

ALTERNATIVES (describe any other sites or methods that could be used to achieve the purpose of your project while avoiding or minimizing wetland/water impacts: Attach additional sheets, if needed).

DATES: Proposed start of activity: Proposed completion:

(Identify any completed work on an attached drawing)

ADJOINING PROPERTY OWNERS (Attach list if more than two)

Name | Address | City | State | Zip

PERMITS have been received (enter an R) or already applied for (enter an A) from: ___ DNR ___ ARMY CORPS OF ENGINEERS ___ COUNTY
___ TOWN/CITY ___ WATERSHED DISTRICT ___ MN POLLUTION CONTROL AGENCY

Has an archaeological survey of the project site been done? _____ If so, by whom:_____

by notify the recipients of this form of the project proposed herein and request that I be advised of any permits or other determinations concerning roject that I must obtain. I understand that proceeding with work before all required authorizations are obtained may subject me to Federal, State, r local administrative, civil and/or criminal penalties.

_____ DATE:_____
Signature of Person Proposing Project or Agent

<<< PLEASE CAREFULLY READ AND COMPLETE BACK OF FORM >>>

INSTRUCTIONS—PLEASE READ CAREFULLY

,of this form, with copies of all plans, drawings, etc., should be sent to each agency indicated below. Please check the ,riate spaces below to show everywhere you are sending this form. *Remember to keep a copy for your records.*

__ LOCAL GOVERNMENT UNIT (LGU): city, county, or watershed management organization.
Specify the LGU to which you are sending the form:______________________________

____ The local SOIL AND WATER CONSERVATION DISTRICT (SWCD) for the project.
Specify the county SWCD:______________________________

____ WATERSHED DISTRICT (if one exists for the project area).
Specify the Watershed District:______________________________

____ MINNESOTA DEPARTMENT OF NATURAL RESOURCES (MDNR) regional off--

____ U.S. ARMY CORPS OF ENGINEERS (ACOE). Send the ACOE copy to:

Ms. Jan O'Malley
U.S. Army Corps of Engineers
425 State Street, Room 219
P.O. Box 1445
LaCrosse, Wisconsin 54602-1445

lote: The above agencies may provide a copy of your completed form to the Minnesota Pollution Control Agency (MPCA). MPCA water quality rules may apply to your proposed project.

TTENTION (FROM USDA): Any activity including drainage, dredging, filling, levelling or other manipulations, including naintenance, may affect a landuser's eligibility for USDA benefits under the 1985 Food Security Act as amended. Check with your local USDA office to request and complete Form AD-1026 prior to initiating activity.

MPORTANT: Some agencies, including the Corps of Engineers and the MDNR accept this form as a permit application form. If 'ou wish this form to constitute an application to the Corps and/or MDNR for any necessary permits for your project please carefully read the following information and sign where indicated.

IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

Application is hereby made for a permit or permits to authorize the activities described herein. I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities or I am acting as the duly authorized agent of the applicant.

____________________ ________ / ____________________ ________

Signature of Applicant   Date   Signature of Agent   Date

Note: The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the information requested below is provided.

Agent's Name and title: ____

Agent's address: ____

____

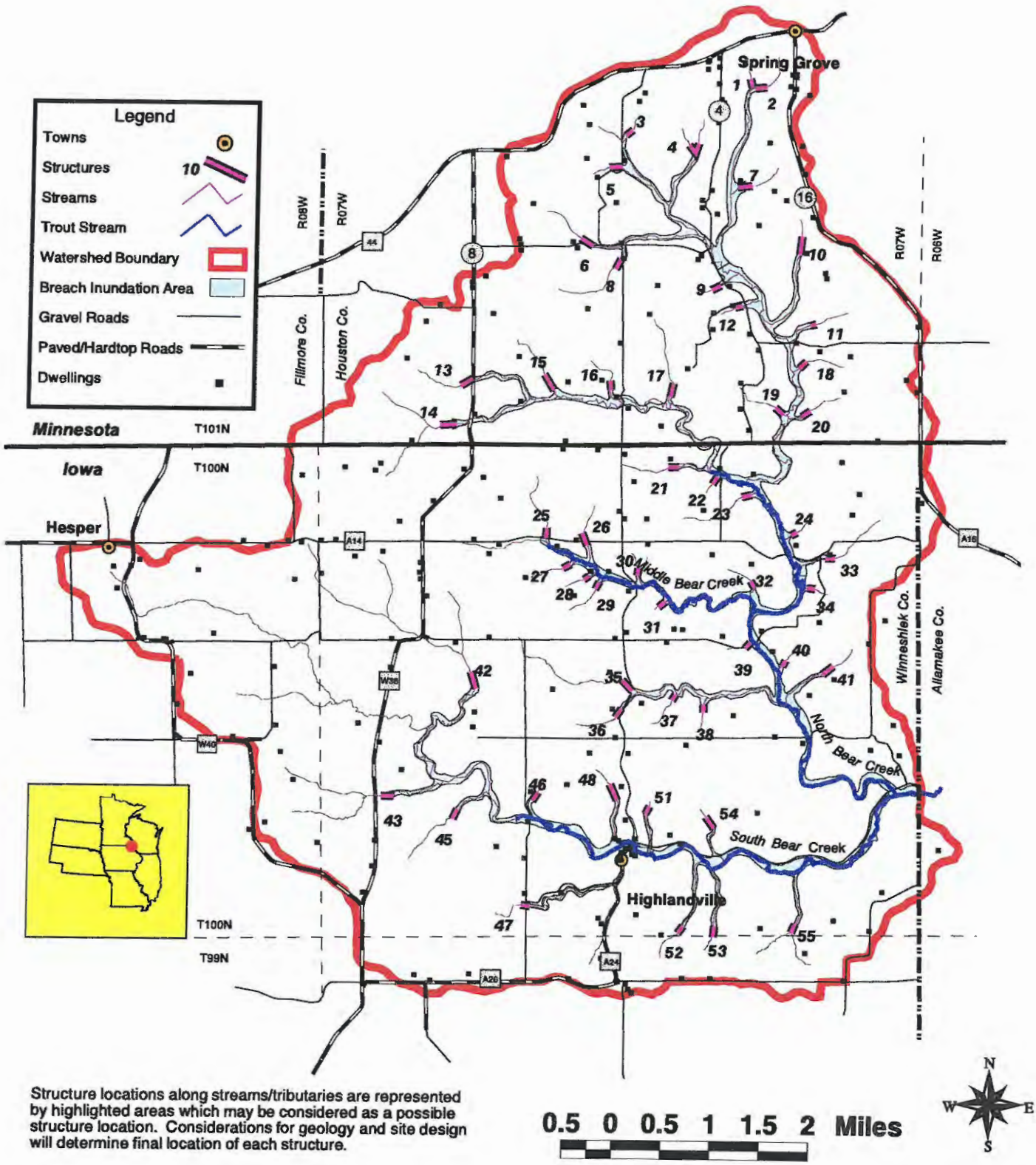
Agent's telephone: (_____) __________________________

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of The United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious, or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both.

SEE ATTACHMENT ABOUT MDNR PERMIT FEES

Bear Creek Watershed
Breach Inundation Map

Allamakee & Winneshiek Counties, Iowa
Fillmore & Houston Counties, Minnesota



Structure locations along streams/tributaries are represented by highlighted areas which may be considered as a possible structure location. Considerations for geology and site design will determine final location of each structure.

Map created using ArcView 3.0
USDA-NRCS, Des Moines, IA
December 22, 1997

APPENDIX C

INVESTIGATIONS AND ANALYSES REPORT

Geology

Preliminary field investigation in Bear Creek Watershed consisted of visual observation and hand probing. Foundation material is predominantly alluvium containing clays, silts, and sands, with some cobbles and boulders present. Abutments consist of residual colluvial, and loess soils with bedrock outcrops. The soils are generally a CL/CH material with numerous cobbles and boulders. The larger cobbles and boulders will need to be removed from core trenches and material used as fill during construction of structural flood and erosion control measures. Foundation drainage may be required at some sites. The bedrock is mostly a highly fractured dolomite, with very high secondary permeability. Where possible, location of structure fill should be adjusted up-and-down stream to avoid bedrock outcrops. Construction of emergency spillways may require rock removal. Borrow material will be obtained from the pool area and surrounding ridges and hillslopes. A detailed investigation will need to be done to determine specific site conditions.

Sediment delivered to Bear Creek was projected by identifying sediment sources, determining rates of erosion and then routing sediment through the watershed. Major sources of sediment include sheet and rill, ephemeral, and gully erosion, erosion from feedlots and unstable streambanks resulting from livestock traffic. Rates of erosion were determined using the Universal Soil Loss Equation for sheet and rill erosion and the direct volume method was used for ephemeral cropland gully, classic gully, erosion from feedlots, and erosion caused by livestock traffic. Routing of sediment was done using a sediment delivery ratio (SDR) method. Location within the watershed and the source of erosion were the main factors in determining the SDR. This allowed the quantity of sediment delivered to proposed structure locations and to the main stream to be determined.

Hydrology and Hydraulics

Traditional methods were used to determine stage - discharge and flow-frequency for future without-project condition and for future with-project alternatives tested.

Stream Hydraulics

Water surface profiles were developed using the NRCS Technical Release 61 (TR-61), WSP2 computer program. Cross-section surveys at 44 valley and channel locations were used to represent 22 evaluation reaches. Four-foot contour interval topography was useful for stage-storage and cross-section data at structure sites. Bedrock is exposed at numerous locations in the stream bed and also in stream banks at several locations. Bedrock control is a dominant factor in variability of stream size, shapes, and roughness.

Hydraulic characteristics were measured from quadrangle sheets and aerial photographs. Manning's "n" was evaluated using the technique outlined in National Engineering Handbook Series Part 634, Supplement B (formerly National Engineering Handbook, Section 5, Supplement B).

Rainfall-Runoff-Peak Flows

National Weather Service Technical Paper 40, and Climatology of Iowa, Series 2, were sources for rainfall depth-frequency data. Hydraulic Runoff Curve Numbers were computed based upon soils, land use, and treatment practices. Times of Concentration for local drainage areas were based on the travel time method.

Watershed Hydrology Model Project Formulation - Hydrology (TR-20) was used to compute flow frequency - discharge - flood elevation data for nine floods ranging from a 100 year event to the average four times per year event. Results of present condition TR-20 modeling were consistent with regional analysis flow-frequency guidelines provided by the U.S. Geological Survey.

Structure Spillways

Hydrologic and hydraulic structure design was completed using Technical Release 48 (TR-48) Structure Site Analysis Computer Program (DAMS2). Principal spillway and emergency spillway hydraulic design parameters were obtained from Technical Release 60, Practice Standard 378, and other NRCS engineering publications.

Turbidity

Turbidity, or cloudiness of water, is caused by suspended material in the water. Contributors to turbidity include: sediment, organic matter and algal constituents. Within the Bear Creek Watershed, turbidity is primarily caused by suspended sediment consisting of clay, silt and fine sand sized particles. Sediment is derived from sheet and rill, ephemeral gully, classic gully and streambank erosion.

This project includes structural control of 43 percent of the total drainage area and intensive land treatment on the entire watershed. These practices assist in the reduction of turbidity throughout the Bear Creek Watershed.

The structural practices dramatically reduce the amount of sediment delivered to the stream from the controlled drainage areas. Coarse grained silts and sands are effectively trapped behind these structures. Fine grain deposition is dependent on structure detention time and release rate. Some dilution of the sediment concentration from the uncontrolled areas will occur due to cleaner water being released from the structures.

Flood detention structures reduce peak flows in the stream, and also reduce the average stream velocity. With reduced velocities, the relative carrying capacity of a stream and its erosive potential are decreased, thus reducing turbidity. Streambank soil detachment and consequent turbidity are also lessened.

Land treatment alternatives will have a greater impact on turbidity from clays and fine silts than structural practices. Intensive land treatment of at least 75 percent in Iowa or 50 percent in Minnesota is required for subwatersheds located above a structure site. Land treatment practices will also be applied on the uncontrolled regions of the watershed. Because clays and fine silts are very hard to remove from the transport system once they are in suspension, land treatment provides the advantage of reducing detachment of fine textured materials.

In-stream turbidity is dependent on surface runoff. With the implementation of land treatment practices, the initial abstraction of rainfall (losses before runoff begins) increases. With project runoff conditions will be less than without project runoff for rainfall events of similar magnitude and duration. Increased initial abstraction will reduce turbidity, especially for small storms. The relative effectiveness of each factor which reduces turbidity will vary with depth and duration of runoff events.

Land Use and Treatment

Land use, land treatment, and erosion rates were determined by sampling representative portions of the project area. Seventeen percent of the area was sampled. Sheet and rill erosion rates were determined by use of the Universal Soil Loss Equation. Ephemeral cropland gully erosion, "C" and "P" factors were determined by field investigations. Gully erosion and streambank erosion were also determined by field studies.

The 1985 Food Security Act has affected producer's land management. Nearly all of the cropland fields in Iowa are Highly Erodible Land (HEL). The Minnesota portion is 80 percent HEL cropland. About 50 percent of the compliance plans in Iowa and 70 percent of the plans in Minnesota are planned to the tolerable soil loss level. The balance are planned to Alternative Conservation System criteria.

Cultural Resources

An historic property survey of Bear Creek Watershed was done by the archeologist on the Iowa NRCS staff. The NRCS has determined that there are no historic properties in the sample areas surveyed. The NRCS will examine all unsurveyed dam sites and borrow areas prior to construction. Analysis suggests that historic, rather than prehistoric sites, are most likely to be encountered. The NRCS cultural resources research was based on sample areas that are representative of the range of topographic positions and structure sizes in the area of project effect.

Economics

Crop and Pasture

Crop and pasture damage were evaluated using the NRCS ECON II computer program. Input for the program came from numerous sources. Storm frequencies studied included the 100, 50, 25, 10, 5, 2, 1, .5, and .25 year events. The 100 year frequency flood was the maximum analyzed as watershed damages are mostly agricultural. Distribution of floods throughout the year came from the study of stream gage and National Weather Service records.

The value for agricultural commodities are current normalized. The price for pasture is ten dollars per animal unit month.

The depth/damage factors by months were developed for this area from interview data. Replanting cost and alternative crops were considered in developing the factors.

Economic reaches for floodplain analysis were selected to aggregate the area of comparable cropping pattern and productivity. Distribution of crops by reaches was determined from field observation and noted on aerial photos. The cropping system and land use data were tabulated by reach for input in the NRCS ECON II program. The land use distributions and cropping systems were used in the flood damage analysis.

Yields by crops for flood-free conditions under present conditions were determined. These yields were used for the future-without-project conditions.

Other Agricultural

An inventory was made to determine the type of other agricultural property located in the flood plain. The inventory revealed the principal other agricultural damage was to fences. Another major damage category was debris removal. Fence cost used in the analysis was obtained from

the Field Office Technical Guide. Costs for debris removal are from the crop budget system. Information needed for farm fences and farm crossings were obtained from field observation. Information needed for debris removal was obtained from interviews.

Roads and Bridges

Information for roads and bridges was obtained by field observation, and use of information from other watersheds. Reduction in costs for maintenance, repair, and replacement were considered as a benefit to the project. The ECON II program was used for the flood damage analysis.

Recreational Facilities

Information for the recreational facilities in the watershed were obtained from interview and inventory. Estimated damages for without and with project were based on judgmental planning involving the planning staff and representatives of the sponsors. Recreational facilities include roads, parking lots, crossings, camping sites, picnic sites, and sanitary facilities.

Recreation Opportunities

Recreation visitor days were used to estimate the amount of damages and benefits that would accrue to the project as a result of water quality improvement. Recreation visitor days were used to measure the effects of sediment delivered, sediment deposited, turbidity, enhancement, fishing, and campground use. Present condition use of the facilities were determined from historical data. Projected conditions and enhancement of the resources was based upon projections made by the Planning staff in coordination with Iowa Department of Natural Resources (IDNR) technicians. The value of a recreation visit was based upon the procedure as outlined in Economic and Environmental Principles and Guidelines for Water and Related Land Resources-Implementation Studies.

Off-site

Offsite damages to the resource base were evaluated based on their relationship to land treatment measures relating to erosion control. Those categories of offsite damages include sedimentation, and turbidity.

These categories of damages were evaluated based on recreation visits. Erosion rates without and with project were used to determine sediment delivery rates to the trout stream. Benefits to the project were based on the estimated difference of recreation visits without and with project.

On-site

The installation of land treatment measures will result in increased production and protection of the resource base. On-site categories include additional wood production, additional forage production, depletion, annual sheet and rill erosion, ephemeral cropland gully erosion, and nutrients from animal waste. Each of these categories were evaluated based on changes in output as provided by the NRCS technical guide. Current normalized prices or current 1996 prices were used to estimate the economic effects.

Biology

Stream Habitat

Stream habitat quality was analyzed for both trout species stocked by the Iowa Department of Natural Resources (IDNR). The U. S. Fish and Wildlife Service (FWS) Rainbow and Brown Trout HSI models were used for the analysis (FWS/OBS-82/10.60, January 1984 and Biological Report 82 (10.124), September 1986 Revised).

Twelve representative areas along the eight miles of trout water of Middle, North, and South Bear Creeks were sampled during September 1990. Each sample section was 0.05 miles in length and included a riffle-run and pool segment. Data were gathered for water temperature, dissolved oxygen, water velocity in spawning gravels, thalweg depth, in-stream cover, substrate size classes for spawning, winter cover and food production, percent pools, pool classes, streambank vegetation, stable streambanks, percent fines in spawning and riffle runs, and midday stream shade.

Annual peak flow and average daily flows were estimated by hydrological modeling. IDNR indicates that minimum and maximum pH values and late season nitrate nitrogen were not a problem and these factors were not used in completing comparative HSI values. In addition, 30 other 0.5 mile sample areas were visually checked, rated, and substrate samples collected. These areas were compared to the twelve fully sampled sites to validate the 30 samples. Using the sample data, all 42 sampled sites had an HSI calculated for them. Then all HSI values for the South Bear Creek were combined to give an average HSI for that stream. This was repeated to get an average HSI value for North Bear and Middle Bear Creeks. Individual stream reach HSI values as well as the average HSI values for each of the three streams were used to aid in identifying habitat problem areas and for a comparison of effects among No Project Action, NED, and Recommended Plan Conditions.

Wetlands

Potential wetland areas will be identified from soil and topographic maps and reference to the county FSA wetland inventory and *certified* determinations. Areas that meet wetland criteria will be identified and investigated during field work by the NRCS. The tri-agency biology team will discuss potential impacts to wetland *functions and values* during field investigations. It is not expected that structure locations selected for the alternatives considered would impact wetlands either at, or downstream of, the sites.

Wildlife

The four-agency team representing the FWS, IDNR, MDNR, and NRCS conducted a field review of the project area in the fall of 1997. Wildlife habitat was divided into three broad resource categories; cropland, pastureland and forest land. Iowa models for Fox Squirrel, Red-headed Woodpecker, and White-tailed Deer were selected to quantify impacts to wildlife from the alternative plans. These models were used as inputs to run the 1980 Habitat Evaluation Procedures system developed by the FWS. The species models were used to develop a present, future without project, and future with project HSI for each of the three species evaluated. The calculated HSI values for future without conditions used the projected land use trends for the next 25 years. The future without project HSI was calculated for each species based upon the proposed structural measures and land treatment practices for cropland, pastureland, and forest land. A sample of the 52 proposed structures was used to determine average HSI values and the average HSI values were used for the remaining structures.

The effects of the future without and future with project conditions were quantified for each of the species evaluated. That was done by multiplying the changes in HSI values by the affected acres and the results expressed in terms of habitat units for each species.

Cropland habitat is not critical to wildlife in the Bear Creek Watershed. Cropland habitat exists in surplus in the watershed and, therefore, it is not a limiting factor to wildlife populations. Analysis showed that cropland habitat units would actually increase with installation of the additional, required, non-P.L.-566 cost-shared project measures. These measures include reduced tillage practices that leave more residue and waste grain on the surface, hence more food for wildlife.

The team decided to investigate both grassland and forest land habitat impacts of the alternatives, and if any net losses occurred then mitigation would be required. It is expected that the Plan-EA will produce a net increase in both grassland and forest land HU's since land treatment gains should more than offset HU's lost to structures. Since there will be a net gain of HU's no mitigation should be required for the project. However, the team did agree that multi-agency monitoring to ensure that the land treatment measures would be installed as planned was needed. The minimum quantities required to offset habitat losses are shown in the Recommended Plan under the Mitigation Section. If the forest land and grassland improvement measures are not installed above these minimum quantities, then formal mitigation will be required to replace any shortfall in HU's.

Threatened and Endangered Species

The IDNR and MDNR were contacted prior to the four-agency field review concerning any state listed threatened or endangered species that might be impacted by the proposed project actions. No records indicated any species in the area of impact. IDNR and MDNR stressed that the records may be incomplete and numerous species of concern do occur in this region of Iowa and Minnesota.

During the field review, the multi-agency team also discussed whether any habitat critical to the survival of any state or federally listed species would be impacted. The team agreed that no negative impacts to any species would be expected. However, the potential does exist to encounter rare plant or animal species at structure sites. Sites will be checked at time of final design with state DNR and/or USFWS personnel in an informal consultation and if any protected species are encountered the practice will be altered to avoid the impact, relocated to avoid the site, or not be installed if no options exist to avoid the negative impacts as the appropriate state DNR or USFWS personnel deem appropriate..

Engineering Design and Cost Estimates

Structural Measures

Aerial photographs, soils maps, and USGS topographic maps were studied to select potential floodwater retarding structure sites. Other information and criteria used in selection of sites included drainage area, property lines, wildlife habitat, farm field crossings, and proximity to public roads.

Fifty-five potential structure sites were identified in the Bear Creek Watershed project area. Field investigations revealed that three sites were unsuitable for construction due to physiographic limitations.

The basis and criteria for planning and design of the structural measures are contained in the following documents, manuals, and guides:

NRCS Field Office Technical Guide, Section IV, Practice Standards and Specifications
National Watershed Manual
National Engineering Manual
NRCS Engineering Field Handbook
Economic and Environmental Principles and Guidelines for
Water and Related Land Resources Implementation Studies
Technical Release No. 20
Technical Release No. 48
Technical Release No. 60
Technical Release No. 61
Technical Release No. 66
National Engineering Handbooks

Eleven representative structure sites were flood routed and designed using stage-storage-area developed from available topographic information. These sites represented various drainage areas and different topography in the watershed.

All structures were designed under the Floodwater Retarding Dams Standard (402) and meet or exceed the criteria as called for in the Pond Standard (378) or Earth Dams and Reservoirs (TR-60). Preliminary breach inundation studies indicate structure classification "a" for all involved sites. Provisions were made for a 50-year sediment volume for all structures. For structure routings, eighty percent of the sediment was considered to be below the crest of the principal spillway.

For wave erosion protection, large structures designed with TR-60 criteria were planned with 20 feet or larger sloping berms on the front slope at the principal spillway elevation. Ten feet wide downstream slope stability berms were planned for all structures. All structures were also planned with vegetated emergency spillways.

Construction cost estimates were made by reviewing recent bid abstracts for similar work. Fifteen percent was added for contingencies. Engineering services costs include the expenses for surveys, geologic investigations, designs and constructions inspection which was estimated at 20 percent of the construction cost. Project administration includes managing bid letting, monitoring contract performance, and paying for completed work. This was estimated at 10 percent of the construction cost. Land rights costs were estimated at $350 per acre.

Where available, topographic maps with four-foot contours developed by photogrammetric methods from low level flights were used to compute and plot stage-storage data for principal and emergency spillway planning designs. Topography for remaining structure sites was obtained from 20-foot USGS quadrangle maps.

Structure sites were assessed for habitat destruction in the earthfill, emergency spillway, and pool areas. Where possible, structure location and pool drawdown facilities will be utilized to minimize habitat damage. The earth fills and pool areas were located so as not to disturb any known archaeological sites.

Geologic borings and surficial investigations indicated that satisfactory fill materials are available for each dam. Abutments consist of colluvium, loess, or bedrock. Prior to final design, a geologic investigation will be made for each structure. Investigation of foundation conditions indicated a positive cutoff core trench may be needed on some sites. Trench drains may be needed on the larger drainage area dams. This need will be determined on a site-by-site basis at

time of final design. For planning purposes an estimated trench drain cost was included for all structures.

Land Treatment Measures

Costs for terraces and livestock waste systems were developed from recent data supplied by the NRCS field offices. Pasture and tree planting costs were obtained from Extension Service and NRCS sources. Technical assistance cost for land treatment application includes expenses for planning, surveys, designs, and installation oversight. Estimated technical assistance cost was 10 percent of land treatment construction cost.

A suggested procedure for prioritizing animal waste operations in the watershed follows. This procedure is adopted from Iowa Animal Waste Management System Open Feedlot System Evaluation.

Evaluation of Animal Waste Operations for Bear Creek

Operation: _____ County: _____

Location: _____ State: _____

Size of Operation (AU)[1]: _____ Facility Distance to Trout Stream (ft): _____

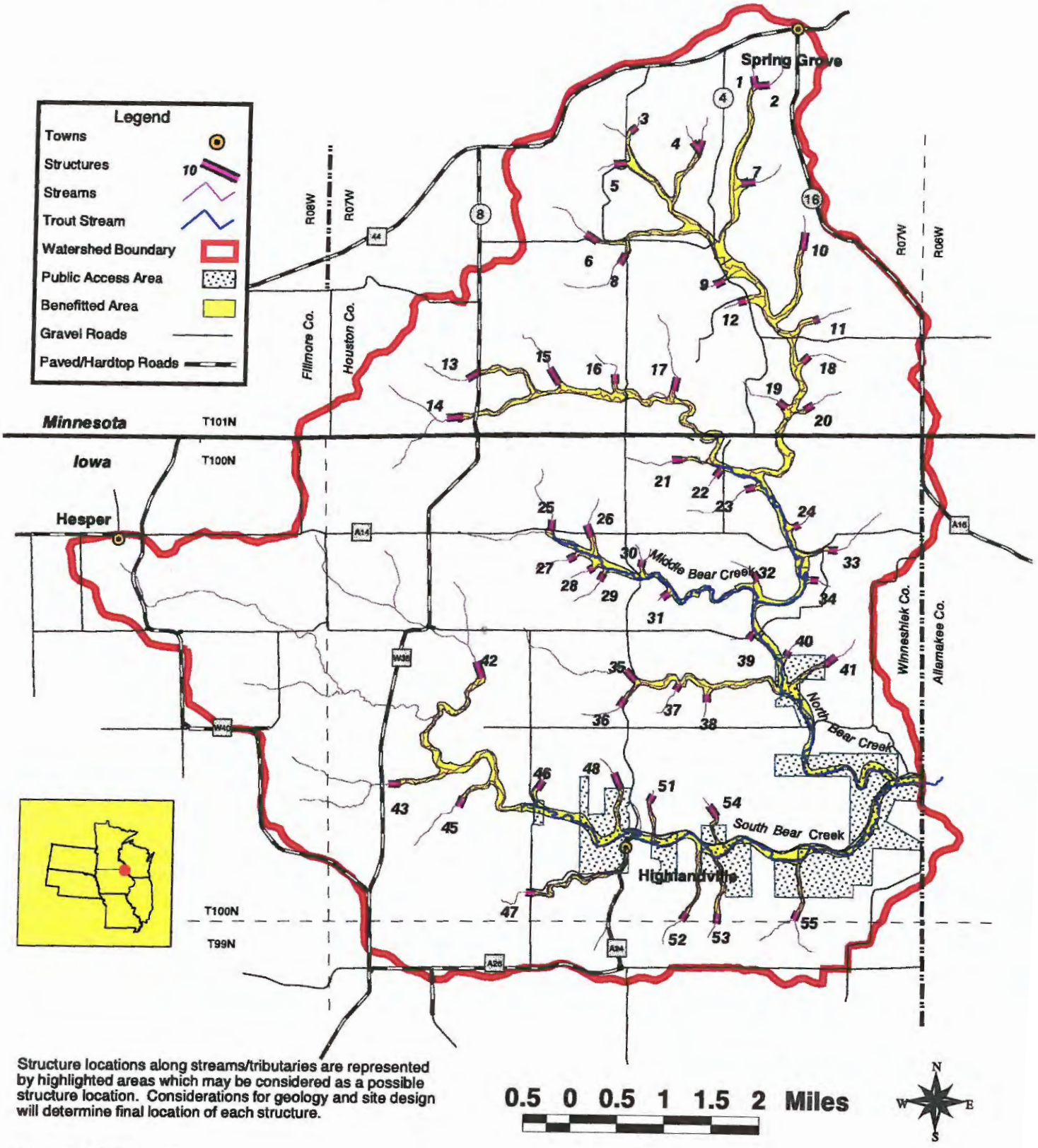
Land Application Distance to Trout Stream (ft): _____

Item	Evaluation Factor	Points	Score
Size of Operation	1-100 AU[1]	1	
	101-200 AU	2	
	201-300 AU	3	
	301-500 AU	4	
	501-1000 AU	6	_____
Facility Distance to Trout Stream	0-500 ft	18	
	501-1000 ft	12	
	1001-2000 ft	8	
	2001-5000 ft	5	
	>5000 ft	2	_____
Land Application Distance to Trout Stream	0-500 ft	12	
	501-1000 ft	8	
	1001-2000 ft	5	
	2001-5000 ft	3	
	>5000 ft	1	_____
		Total	_____

1) AU-animal unit

Bear Creek Watershed Project Map

Allamakee & Winneshiek Counties, Iowa
Fillmore & Houston Counties, Minnesota



Structure locations along streams/tributaries are represented by highlighted areas which may be considered as a possible structure location. Considerations for geology and site design will determine final location of each structure.

Map created using ArcView 3.0
USDA-NRCS, Des Moines, IA
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