Nebraska

Elm Creek Watershed
Section 319
National Monitoring Program Project

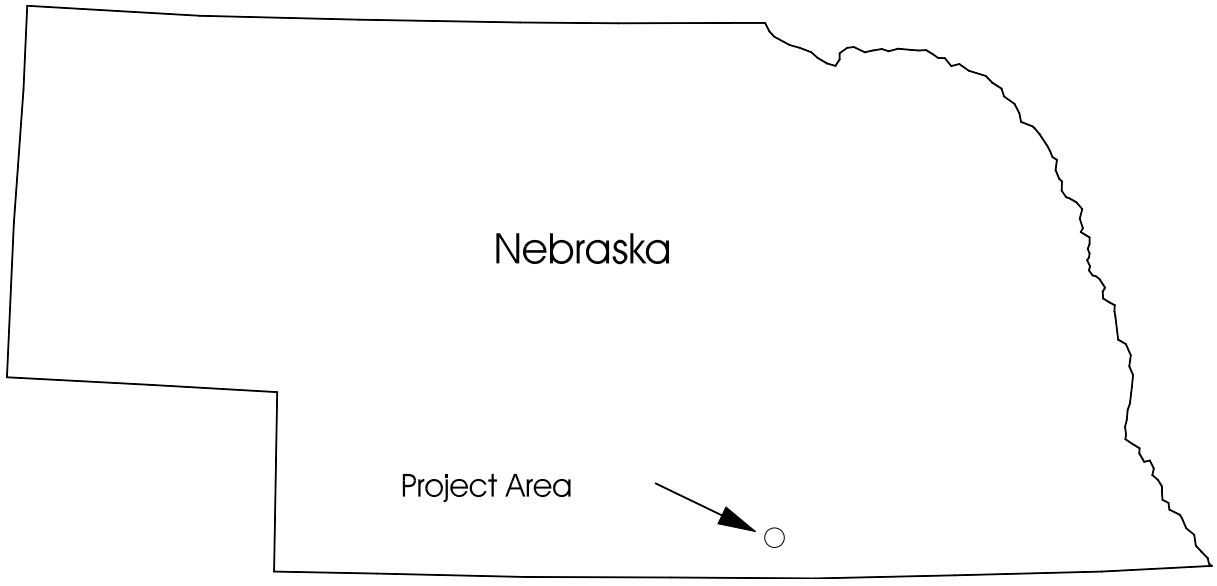

Figure 28: Elm Creek (Nebraska) Watershed Project Location

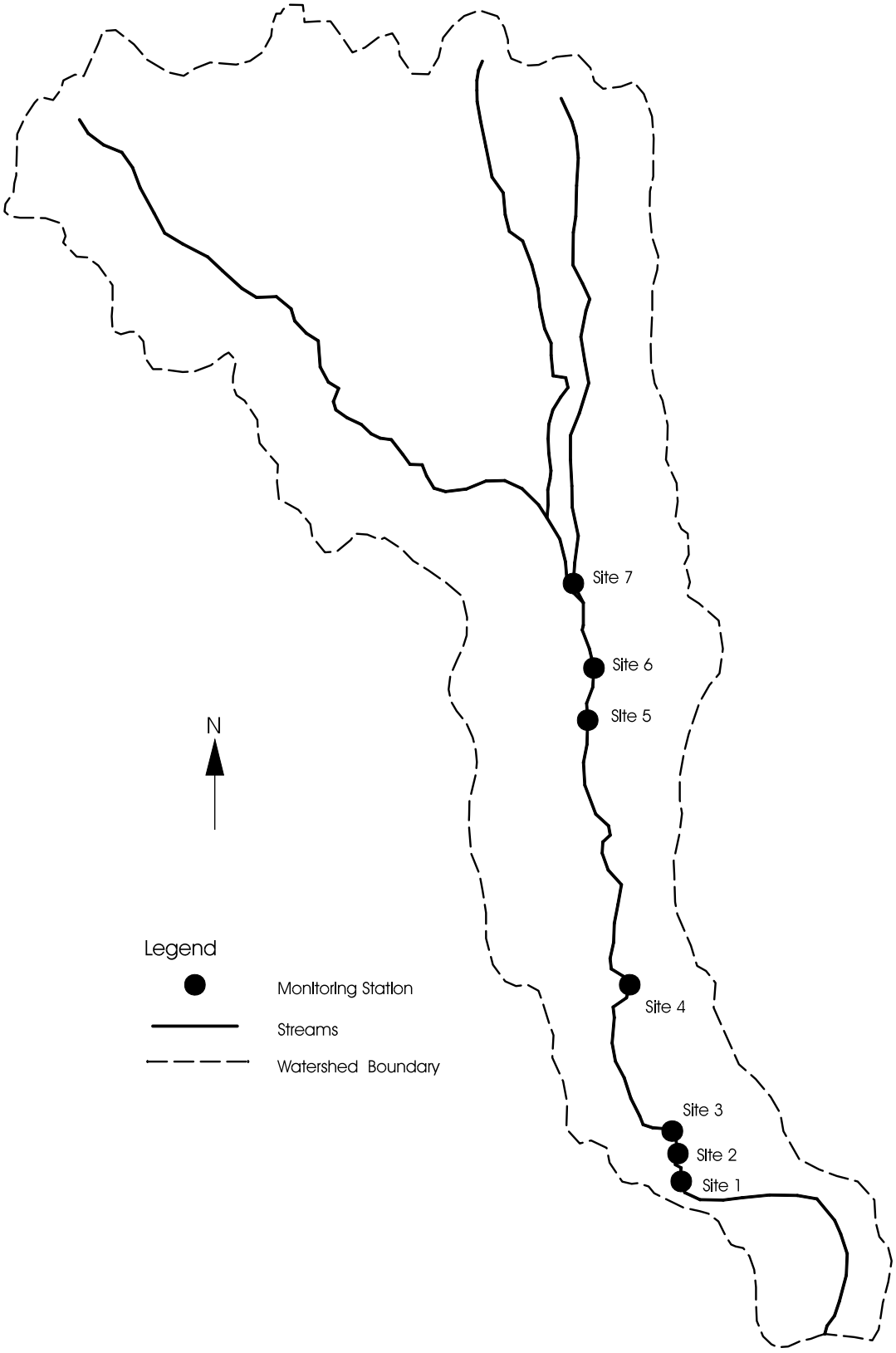

Figure 29: Water Quality Monitoring Stations for Elm Creek (Nebraska) Watershed

PROJECT OVERVIEW

Elm Creek is located in south central Nebraska, near the Kansas border within Webster County, NE (Figure 28). Elm Creek is a tributary to the Republican River. The creek flows in a southerly direction through agricultural lands of rolling hills and gently sloping uplands. The creek has a drainage area of 35,800 acres, consisting mainly of dryland crops of wheat and sorghum and pasture/rangelands with some areas of irrigated corn production.

A primary water use of Elm Creek is recreation, particularly as a coldwater trout stream. Loss of riparian area vegetation and streambank erosion have increased water temperatures, stream sediment aggregation, and high peak flows, thus impairing aquatic life by destroying habitat, which reduces the creek's recreational use due to lowered trout productivity.

Land treatment for creek remediation includes non-conventional best management practices (BMPs) such as streambank stabilization and livestock exclusion, water quality and runoff control structures, water quality land treatment such as tree planting and permanent vegetative cover, and conventional water quality management practices (see section on Nonpoint Source Control Strategy). Many of these BMPs were funded as part of an U.S. Department of Agriculture (USDA) Hydrologic Unit Area (HUA) project, which ended September 30, 1997. Water quality monitoring included an upstream/downstream design as well as a single station downstream design for trend detection. Grab samples were collected weekly from March through September to provide water quality data. Additional biological and habitat data were also collected on a seasonal basis.

Post project water quality monitoring and implementation of "best management practices" for the Elm Creek project concluded in late 1999.

PROJECT BACKGROUND

Project Area

The project area, in south central Nebraska, consists of 35,800 acres of rolling hills, gently sloping uplands, and moderately steep slopes.

Relevant Hydrologic, Geologic, and Meteorologic Factors

The Elm Creek watershed, which receives 25.9 inches of rainfall per year, lies in a sub-humid ecological region. Seventy-five percent of this rainfall occurs between April and September. The average temperature is 52 degrees Fahrenheit with averages of 25 degrees in January and 79 degrees in July.

The soils are derived from loess and the predominant soil types are highly erosive.

The base flow in Elm Creek is derived from a combination of ground and surface water sources.

Land Use

Wheat and sorghum are the primary dryland crops produced. Corn is the primary irrigated crop. Range and pasture dominate the more steeply sloping lands.

Land Use	Acres	%
Agricultural		
Dryland	14,630	42
Irrigated	2,680	7
Pasture/Range	16,170	44
Forest	650	2
Other	1,670	5
Total	35,800	100

Source: Elm Creek Project, 1992

Water Resource Type and Size

Elm Creek flows through cropland and pasture/range into the Republican River Flow in the creek is dominated by inflow springs. The average discharge of Elm Creek is 21.4 cubic feet per second and the drainage area is 56 square miles.

Water Uses and Impairments

Elm Creek is valued as a coldwater aquatic life stream, as an agricultural water supply source, and for its aesthetic appeal. It is one of only two coldwater habitat streams in south central Nebraska. Sedimentation, increased water temperatures, and peak flows are impairing aquatic life by destroying stream habitat of the macroinvertebrates and trout. Problems arise when pulses of sediment generated by storm events arrive at the lower reaches of the channel. Gravel beds are covered, water temperatures raised, and the streambed widens. These negative impacts on the stream result from farming practices that cause excessive erosion, loss of riparian area vegetation, streambank erosion, and overland water flow.

Pollutant Sources

Sources of nonpoint pollutants included streambank erosion, sheet and rill erosion, gully erosion, irrigation return flows, cattle access, and cropland runoff.

Pre-Project Water Quality

A thorough water quality analysis of Elm Creek conducted in the early 1980s indicated that the water quality of Elm Creek was very good under base-flow conditions.There was, however, short-term degradation of water quality following storm events. In addition, water temperatures measured during the summer of 1980 regularly exceeded 20^{o} C and approached levels lethal to salmonids. The coldwater habitat use assignment of Elm Creek appeared to be attainable if it was not impaired by nonpoint source (NPS) pollution, particularly sedimentation and scouring of streambank vegetation during storm events.

The Agricultural Non-Point Source Pollution Model (AGNPS) estimated that 8,009 tons of sediment was delivered into the Elm Creek project area during a 10-year 24-hour storm with an peak flow of 2,854 cfs.

An inventory of sediment pollution sources was conducted in a nine-mile stretch of Elm Creek.

Streambank Erosion:

Severe	3.1 miles
Moderate	1.4 miles
Slight	0.4 miles

Gullies/Overfalls:
Greater than 5 feet – 5 sites
Less than 5 feet – 43 sites

Adjacent Cropland Filter Strip Potential – 8.3 miles

Grazing Damage – 3.5 miles

Tree Snags/Debris Jams – 24 sites

Water Quality Objectives

The NPS management objective in the Elm Creek watershed was to implement appropriate and feasible NPS pollution control measures for the protection and enhancement of water quality in Elm Creek by reducing runoff, sediment, pesticides, fertilizers, and animal waste reaching the creek.

Project goals were to:

- Reduce sediment load in Elm Creek by 50 percent
- Reduce maximum summer water temperature
- Reduce in-stream sedimentation
- Reduce peak flows by 30 percent
- Improve in-stream aquatic habitat

Project Time Frame

Monitoring activities began in April 1992 and continued through the fall of 1999.

The project was approved under the Section 319 National Monitoring Program in 1992.

PROJECT DESIGN

Nonpoint Source Control Strategy

Pre-BMP implementation period was from 1981 to 1992. Most of the BMPs were installed by 1994, but some practices continued to be installed through 1997.

Four types of structural and non-structural BMPs were implemented throughout the Elm Creek watershed. These BMPs have been divided into four BMP types. The Elm Creek Hydrologic Unit Area project funded most BMPs.

Non-conventional
Vegetative Filter Strips
Permanent Vegetative Cover on
Critical Areas
Streambank Stabilization, including the
use of lunkers to stabilize the toe
Livestock Access & Exclusion
Ground Water Recharge
Abandoned Well Plugging
Trickle Flow Outlets
Sediment Barriers
Grade Stabilization

Water Quality & Runoff Control Structures

Water Quality Land Treatment
Tree Planting
Permanent Vegetative Cover
Terraces
Stripcropping

Conventional Water Quality Management Programs
Irrigation Management
Conservation Tillage
Range Management
Integrated Pest Management

Non-conventional BMPs were funded under the Section 319 National Monitoring Program. Other BMPs were funded with 75% cost share funds from the HUA project. Finally, selected BMPs were cost shared at 100% [75% from the Section 319 National Monitoring Program and 25% from Lower Republican Natural Resource District (LRNRD)]. The number and types of BMPs implemented was totally dependent on voluntary farmer participation.

Water Quality Monitoring

Upstream/downstream: The two sampling sites (sites 2 & 5) were located two miles apart (Figure 24)

The downstream station (site 5) was also used for trend monitoring.

Variables Measured

Biological
Macroinvertebrates
Fish collection
Creel survey

Chemical and Other
Water temperature
Dissolved oxygen (DO)
Substrate samples (% Gravel, % Fines)
Total suspended solids (TSS)
Atrazine/Alachlor
Stream morphological characteristics (width, depth, velocity) and habitat
Water temperature (June – September)

Explanatory Variables (Covariates)
Stream discharge (United States Geological Survey gauging station)
Monthly precipitation collected near Red Cloud, NE.

Sampling Scheme

Qualitative and quantitative macroinvertebrate sampling spring, summer, fall, and winter (sites 2 and 5).

Fish collections spring and fall (sites 2,3, &5).

Creel survey (passive).

DO (sites 2, 5): Weekly grab samples from April through September. Monthly samples from October through March.

Substrate samples spring and fall at sites 2, 4, and 5.

TSS (sites 2,5): Weekly grab samples from April through September and monthly samples, October through March. Selected runoff samples are collected April through September.

Stream morphological characteristics (width, depth, velocity) and habitat: spring/summer (sites 2, 5).

Continuous recording thermograph (hourly water temperatures for at least 60% of the period June through September and at least 80% of the period July through August) (sites 2, 5).

Monitoring Scheme for the Elm Creek Section 319 National Monitoring Program Project

Design	Sites	Primary Parameters	Covariates	Frequency of WQ Sampling	Frequency of Habitat/Biological Assessment	Duration
Upstream/ downstream	2, 5	Macroinvertebrate survey	Stream discharge		2 times/yr spring & fall	0 yrs pre-BMP 5 yrs BMP
	1, 2, 3, 4, 5, 6	Fish survey			passive	3 yrs post-BMP
Single downstream	2, 5	Creel survey				
	2, 4, 5	Water temperature				
	2, 5	Substrate samples		Spring & fall		
	2, 5	DO		Weekly (April-Sept.) & monthly (Oct.-March)		
	2, 5	TSS				
	2, 5	Stream morphological characteristics		Spring		
	2, 5			Spring/summer		
	2, 5	Water temperature				

Land Treatment Monitoring

Land use was inventoried. Cropping patterns and BMP implementation were tracked over the life of the HUA project. Tracking was based on the 40-acre grid system used for AGNPS modeling.

Field Surveys were conducted to determine the extent of conservation tillage and residue cover

Modifications Since Project Start

Land use in the project area changed from rangeland to cropland due to sodbusting. Total estimated acreage sodbusted during the project period of 1990-1997 is over 1,000 acres.

Artificial salmonid redds (live egg baskets) were initially used to monitor trout reproduction. However, the redds have been discontinued because initial monitoring results indicate substrates are not suitable for salmonid spawning because of the high fines content.

Plans to place a recording rain gauge in the Elm Creek watershed have been cancelled because of the variability associated with its large size. For the same reason, the volunteer network for recording rainfall amounts has also been discontinued.

As originally proposed, land use and BMP implementation were to be tracked based on a 40-acre grid system of the Agricultural Nonpoint Source (AGNPS) model. This scheme was to be used since a pre-project inventory of current land uses had been completed by the Natural Resource Conservation Service (NRCS) to run the AGNPS model. The goal was to then rerun the model with updated land use and BMP implementation data. However, once the Section 319 and HUA projects were initiated, staff quickly realized that annual tracking of land use changes and BMP implementation on a 40-acre basis in such a large watershed could not be accomplished with the resources available.

Disruption of stream hydrology in the upper reaches of the watershed occurred due to railroad construction and stream modification activities in July 1996. The Burlington Northern and Santa Fe railroad upgraded a track that runs approximately parallel to Elm Creek. Concurrently they removed the riparian vegetation, realigned, and channelized a section of Elm Creek above of Monitoring Station 5, just above wildlife management area. They also constructed a 10-foot high rock dike along the west side of the stream for a linear length of approximately 0.75 miles about 0.5 miles above Monitoring Station 5. The result was an inability of the stream to effectively utilize its floodplain area, downstream streambank instability, and downstream stream bedload scouring.

Land Treatment Progress to Date

Conservation tillage was used on seventy-five percent of crop acres by 1997, up from forty percent (3,850 acres) in 1990.

178 cooperators installed installation of erosion or sediment control practices.

Significant strides were made in implementing NPS control measures throughout the watershed (see following table). It is estimated by NRCS that (Elm Creek Water Quality Report, 9/87):

- Gully erosion was reduced, saving 7,897 tons of soil per year
- Ephemeral erosion was reduced, saving 4,999 tons of soil per year
- Sheet and rill erosion was reduced, saving 24,995 tons of soil per year
- Total soil savings of 37,891 tons per year

Installation of Erosion Control Practices in the Elm Creek Watershed (9-30-97).

NRCS PRACTICE/ACTIVITY NUMBER AND CODE	#UNITS	INSTALLED
Conservation Cropping Sequence (328)	acres	7,822
Reside Mgt. - Conservation Tillage (329)	acres	7,290
Contour Farming (330)	acres	3,200
Critical Area Planting (342)	acres	115
Crop Residue Use- seasonal (344)	acres	532
Dam, Multiple Purpose	number	2
Sediment Basin (350)	number	1
Deferred Grazing (352)	acres	169
Dike (356)	feet	1,609
Diversion (362)	feet	6,323
Pond (378)	number	40
Windbreak/Shelterbelt Establishment (380)	feet	9,080
Fencing (382)	feet	61,400
Field Border (386)	feet	35,952
Filter Strip (393)	acres	5
Grade Stabilization Structure (410)	number	13
Grassed Waterway (412)	acres	14
Irrigation System-Sprinkler, Meter (442)	number	21
Irrigation System-Surface, Meter (443)	number	9
Irrigation Water Conveyance Pipeline (430EE)	feet	3,150
Irrigation Water Management (449)	acres	2,619

NRCS PRACTICE/ACTIVITY NUMBER AND CODE (cont'd)	#UNITS	INSTALLED
Livestock Exclusion (472)	acres	318
Mulching (484)	acres	4
Pasture and Hayland Management (510)	acres	339
Pasture and Hayland Planting (512)	acres	105
Pipeline (516)	feet	2,732
Proper Grazing Use (528)	acres	4,587
Range Seeding (550)	acres	214
Planned Grazing System (556)	acres	2,700
Streambank Protection/Habitat Restoration	feet	800
Stripcropping – Contour (585)	acres	2
Nutrient Management – Irrigated (590)	acres	2,141
Nutrient Management – Dryland (590)	acres	924
Pest Management – Irrigated (595)	acres	2,115
Pest Management – Dryland (595)	acres	924
Terrace (600)	feet	208,701
Tree Planting (612)	acres	4
Trough or Tank (614)	number	13
Underground Outlet (620)	feet	3,536
Water & Sediment Control Basin (638)	number	7
Well (642)	number	10
Wildlife Upland Habitat Management (645)	acres	295

Source: Elm Creek Water Quality Project. SCREC 98/4. 9/97.

In 1992, the Nebraska Game and Parks Commission (NGPC) installed cedar tree revetments on a stream segment to reduce stream bank erosion and provided additional trout habitat. In the spring of 1996, 'lunker' structures were placed in the same site to stabilize the toe of the streambank. In the fall of 1996, to partially mitigate habitat destruction by the local railroad project, additional habitat improvements were installed by NGPC and NDEQ (lunkers, double wing deflectors, and boulder/ rock clusters).

DATA MANAGEMENT AND ANALYSIS

Data Management and Storage

Ambient water quality data are entered into USEPA STORET. Biological data are stored in USEPA BIOS. Other data are stored and analyzed using Microsoft Excel 5.0 spreadsheet program and USEPA NonPoint Source Management System (NPSMS). Water quality data are being analyzed using SAS statistical software. These data were managed by the Nebraska Department of Environmental Quality (NDEQ).

Data assessment and reporting consisted of quarterly activity reports, and yearly interim reports focusing on BMP implementation.

NPSMS Data Summary

ANNUAL REPORT WQ PARAMETER FREQUENCIES

YEAR: 1995
STATION TYPE: Upstream Station

CHEMICAL PARAMETERS

	QUARTILE VALUES							
Parameter Name	**-75-**	**-50-**	**-25-**	**Counts/Season:**	**1**	**2**	**3**	**4**
FLOW, STREAM, INSTANTANEOUS, CFS	13.3	12.0	10.7	Highest	6	5	0	0
				High	1	0	0	0
				Low	1	0	0	0
				Lowest	7	1	0	0
OXYGEN, DISSOLVED (METER)	8.7	7.75	6.9	Highest	6	5	0	0
				High	10	1	0	0
				Low	8	0	0	0
				Lowest	1	0	0	0
SUSPENDED SOLIDS, TOTAL	51.0	16.5	2.0	Highest	3	1	0	0
				High	2	0	0	0
				Low	20	5	0	0
				Lowest	0	0	0	0
TEMPERATURE, WATER (DEGREE CENTIGRADE)	15.7	14.3	11.5	Highest	4	0	0	0
				High	6	0	0	0
				Low	9	0	0	0
				Lowest	6	5	0	0

BIOLOGICAL PARAMETERS (Non-Chemical)

	INDICES							
Parameter Name	**Fully**	**Threatened**	**Partially**	**Scores/Values**	**1**	**2**	**3**	**4**
INDEX OF BIOLOGICAL INTEGRITY	30	—	22		29	—	29	—
INVERTEBRATE COMMUNITY INDEX	31	—	17		18	30	—	32
TROUT HABITAT QUALITY INDEX	—	—	—		—	—	4.1	—

STATION TYPE: Downstream Station

CHEMICAL PARAMETERS

	QUARTILE VALUES							
Parameter Name	**-75-**	**-50-**	**-25-**	**Counts/Season:**	**1**	**2**	**3**	**4**
FLOW, STREAM, INSTANTANEOUS, CFS	13.3	12.0	10.7	Highest	6	5	0	0
				High	1	0	0	0
				Low	1	0	0	0
				Lowest	7	1	0	0
OXYGEN, DISSOLVED (METER)	9.9	8.85	8.5	Highest	6	5	0	0
				High	9	1	0	0
				Low	6	0	0	0
				Lowest	4	0	0	0
SUSPENDED SOLIDS, TOTAL	65.3	20.75	6.0	Highest	4	0	0	0
				High	10	2	0	0
				Low	10	3	0	0
				Lowest	1	1	0	0
TEMPERATURE, WATER (DEGREE CENTIGRADE)	16.6	14.8	11.2	Highest	8	0	0	0
				High	3	0	0	0
				Low	8	0	0	0
				Lowest	6	6	0	0

BIOLOGICAL PARAMETERS (Non-Chemical)

	INDICES							
Parameter Name	**Fully**	**Threatened**	**Partially**	**Scores/Values**	**1**	**2**	**3**	**4**
INDEX OF BIOLOGICAL INTEGRITY	30	—	22		35	—	31	—
INVERTEBRATE COMMUNITY INDEX	31	—	17		28	26	32	32
TROUT HABITAT QUALITY INDEX	—	—	—		—	—	2.2	—

Quartile data for all chemical and physicochemical parameters indicate water quality conditions were relatively good. The values presented reflected water quality under baseflow conditions, but not necessarily impacts caused by runoff events. After heavy rainfall events, the stream is often subject to high flows and the associated NPS pollutants seemingly have only a short-term degrading impact on

the in-stream chemical and physiochemical water quality However, long-lasting impacts not reflected in the data are the scouring and sedimentation resulting from these events that impair designated aquatic life uses.

Project Findings

Monitoring results indicated that overall water quality of Elm Creek is excellent under base flow conditions, but continues to be degraded under runoff conditions. Monitoring data failed to show much, if any, improvement in water quality due to the implementation of nonpoint source control measures.

Water temperature data did not indicate a significant reduction in maximum summer levels as a result of implementing nonpoint source management measures. Although it appears that periods of elevated water temperatures are relatively short in duration, periods of warmer temperatures brought about by runoff events or low flow would most likely be lethal to salmonids.

No significant reductions in maximum suspended solids concentrations were observed as a result of implementing BMPs. It is likely that as long as Elm Creek is subject to high floes, suspended solids concentrations will continue to be high.

Significant reductions in peak streamflow did not result from project implementation. Maximum precipitation levels during the post-project monitoring period were lower than during the pre-project period, but discharge peaks were still quite high.

No significant changes in stream substrate composition or condition were documented over the project. There is no indication that the percent fines in the stream substrate decreased as a result of nonpoint source controls. Given the sandy nature of Elm Creek's substrate, it is unlikely that it could ever support salmonid spawning to a great extent.

The *fish and macroinvertebrate* communities fluctuate in response to habitat degradation caused during runoff events. Trout stocked in Elm Creek appear to do quite well under base flow conditions, but after heavy runoff events few, if any, were ever collected. It is theorized that they get flushed downstream, or the warmer, turbid water forces them to migrate or induces death.

Although monitoring was conducted successfully, a few problems were encountered. Preliminary evaluation of the project monitoring design (upstream-downstream and single downstream) and water quality data suggests that the large size of the watershed above the upstream monitoring station (approximately 31,142 acres) inhibits documentation of water quality improvements due to land treatment implementation. More specifically, this problem can be attributed to the variability associated with regional and watershed conditions. The majority of non-structural BMPs recommended by the NRCS implemented in the Elm Creek watershed are designed only to control runoff from one-in-ten year storm events. When such storm events occur in the watershed, water quality (including in-stream habitat) remains good. However, with such a large watershed area above the perennial stream reach (which starts within a mile above the upstream monitoring station), even slightly larger storm events generally contribute to high flows, which degrade water and habitat quality, making it difficult to detect improvements.

Increased streambank erosion and decreased biological habitat has been observed at Site 5 due to recent railroad construction and stream modification activities.

Post project water quality monitoring and implementation of "best management practices" for the Elm Creek project concluded in late 1999. An interim water quality assessment was included in a report published by the University of Nebraska Cooperative Extension in 1998.

INFORMATION, EDUCATION, AND PUBLICITY

Information and education (I&E) activities have been developed and were implemented as part of the Elm Creek HUA Project. The University of Nebraska and Cooperative Extension in Webster County were in charge of I&E activities. I&E activities include newsletters, an NPS video, slide shows, programs, questionnaires, fact sheets, demonstration sites, field days, and meetings.

The process of addressing nonpoint source issues in the Elm Creek watershed through information and education activities was coordinated by the University of Nebraska Cooperative Extension as part of the USDA HUA effort. In addition to those activities listed below, a newsletter promoting implementation of NPS pollution prevention practices was developed and delivered to owners/ operators in the watershed.

I&E activities implemented in the Elm Creek watershed included the following:

- Several producers agreed to host field days and BMP demonstration plots.
- A no-till drill was made available for rent at $8.00 per acre in order to encourage no-till practices.
- Videotapes on no-till crop planting practices and on rotational grazing were completed.
- Two newsletters were produced for the project. A quarterly newsletter was sent to all landowners and operators in the project area and included articles on BMPs, cost share funds available, and updates on project progress and upcoming events. The second newsletter was an irrigation-scheduling newsletter. This monthly newsletter gave updates on pests, and crop-irrigation needs based upon an automated weather station.
- An end-of-season survey indicated that irrigators were saving a total of about $18,000 from reduced irrigation water and pesticide applications.
- A series of educational programs have been held to provide producers with background information to encourage the adoption of BMPs. Other program topics included new tools for pasture production, rotational grazing tour, and a prescribed burn workshop.
- An eco-farming clinic was held where no-till drills were demonstrated. Topics of discussion for the program included winter wheat production and weed control, diseases, cultivar selection, insect control, and soil fertility.
- Sixteen demonstration plots exhibiting various BMPs were used as an educational tool. Practices being demonstrated include: fertilizer management, integrated crop management - irrigated, integrated crop management - dryland, no-till milo production, no-till winter wheat drilling, ridge-till, gravity irrigation, pivot irrigation, range management, plugging an abandoned well, permanent cover, conservation tillage wheat production, terraces, cedar revetments for streambank protection, and sediment retention basin restoration.
- Youth programs on conserving and managing natural resources were given to 1,000 participants each years at the Earth Jamboree.
- Webster County 4-H clubs participated in tree planting days.
- Numerous news stories, articles, meeting announcements and updates have been published in local newspapers.

TOTAL PROJECT BUDGET

The estimated budget for the Elm Creek Watershed Section 319 National Monitoring Program project for the life of the project is:

Project Element	Funding Source ($)				
	Federal				
	HUA/WQIP	319	State	Local	Sum
Proj Mgt	0	11,200	0	0	11,200
I&E	0	0	0	3,400	3,400
Reports	0	6,300	0	0	6,300
LT	260,000	115,000	0	101,600	476,600
WQ Initiative Program (WQIP)	30,000	0	0	0	30,000
WQ Monit	0	100,000	0	15,000	115,000
Post-Project Monit	0	30,000	0	0	30,000
TOTALS	290,000	262,500	0	120,000	672,500

Source: Elm Creek Project, 1991

Time frame for funding sources:

- Section 319(h) funds in the amount of $30,000 have been secured to continue post-BMP implementation monitoring activities for an additional three years (1999)
- Local/Section 319 — April, 1992 to October, 1996
- HUA — May, 1990 to October, 1997 (The HUA project was scheduled to end in September, 1995, but has received a three year extension)
- WQIP — Contracts were written for cropping years 1992, 1993, and 1994. All funds were allocated in 1992
- Final report — December, 2003

IMPACT OF OTHER FEDERAL AND STATE PROGRAMS

The Elm Creek Watershed Section 319 National Monitoring Program project provided the water quality monitoring for the area HUA project. USDA program funding was used for approved, conventional BMPs.

OTHER PERTINENT INFORMATION

The HUA activities were jointly administered by the University of Nebraska Cooperative Extension and the USDA NRCS. Employees of these two agencies work with local landowners, Farm Service Agency (FSA) personnel, personnel of the Nebraska Department of Environmental Quality (NDEQ), Nebraska Game and Parks Commission, and personnel of the Lower Republican Natural Resource District (LRNRD). Section 319 National Monitoring Program project activities are administered by the NDEQ.

Agencies or groups involved in the project are listed below.

- USDA FSA
- Landowners
- Lower Republican Natural Resources District: Monitoring
- Little Blue Natural Resources District

- Nebraska Game and Parks Commission
- USDA NRCS
- Nebraska Department of Environmental Quality
- Nebraska Natural Resources Commission
- U.S. Geological Survey
- University of Nebraska Cooperative Extension
- U.S. Environmental Protection Agency
- Webster County Conservation Foundation (WCCF)
- Future Farmers of America Chapters and 4-H Clubs
- Center for Semi-Arid Agroforestry and Nebraska Forest Service
- Webster County Board of Commissioners

PROJECT CONTACTS

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