BLACKBIRD-SOLDIER CREEK
RAPID WATERSHED ASSESSMENT PROJECT PROPOSAL

Lincoln Nebraska
March 1, 2006

Typical upland view

Typical bottomland view

2. PROJECT ABSTRACT

a. Project title: Blackbird-Soldier Creek Rapid Watershed Assessment

b. Project objectives and scope: The primary objective of this project is to assist the Omaha Indian Nation (reservation) to identify natural resource concerns and impediments within the Nebraska portion of the selected Hydrologic Unit (HU), that impact areas of soil, water, agriculture air quality, plants, animal and human resources. The Rapid Watershed Assent (RWA) will be conducted throughout HUC 10 23001, and with particular focus on the Indian lands. Approximately 33 percent of this HU in Nebraska is made up of tribal lands belonging to the Omaha and Winnebago Indian Nation. The primary sponsor of the RWA is the Omaha Indian Nation. The HU is known to be highly susceptible to wind and water erosion. The RWA area is located along the Loess (wind blown) Uplands and Missouri River Bluffs of Nebraska. These soils are commonly referred to by locals as sugar soils and are extremely erosive when wet, and easily wind blown when dry and not protected. Specific project objectives are: To identify significant erosion problems, to develop a pilot process incorporating new technologies (e.g. digital elevations models, geographic information systems,) for identifying and targeting watershed erosion problems, and evaluate the potential for implementing stream corridor restoration methods for erosion and sediment control to augment or replace existing traditional structural conservation practices.

c. 8-digit HUC watershed to be assessed and its importance to conservation: Blackbird-Soldier. This HU comprises fourteen sub watersheds in Nebraska, each draining directly into the Missouri River. Two landscape features predominate in these sub watersheds, the Missouri River bluffs and Missouri River floodplain. The bluffs areas generally have short, steep slopes with highly erodible loess soils. The Missouri River floodplain, because of poor drainage, has had a history of stream straightening and channelization to prevent flooding and to make the flat bottomlands farmable. .

d. Summary of the work to be performed during the project assessment phase and anticipated in the project implementation phase: Planning will last eleven months and will be carried out in two phases:

1) Collection and Analysis: Identify problems, determine objectives, inventory resources and analyze the data.

2) Decision Support: formulating and evaluating alternatives and finally making decisions. GIS (Geographical Information Systems) technology backed by field observations and public input will be used to inventory and analyze the information. Public involvement through the project partners will be used in the decision making process. We will seek funding sources for implementation from local, state, and national programs depending upon the degree and extent of specific problems identified in the HU.

e. Name of the State Conservationist(s) cooperating on the project:
Stephen K. Chick, State Conservationist, Nebraska

f. Names and affiliations of project partners and collaborators: 1) Omaha Indian Tribe, 2) Papio-Missouri River Natural Resources District, 3) Loess Hill Resource Conservation & Development Council, 4) Bureau of Indian Affairs, 5)Army Corps of Engineers, 6) Nebraska Fish and Wildlife Service, 7) Nebraska Department of Roads, 8) Winnebago Indian Reservation, 9) USDA Farm Service Agency

g. Projected estimates of agricultural producer participation in the conservation efforts: Partners will primarily serve in a support role by providing coordination, data sharing, local history and local contacts information.

h. Duration of project planning phase and anticipated duration of the project implementation phase (beginning and ending dates): Project planning phase will be for 11 months; July 2006 to June 2007 and Project implementation phase will be for 5 years, 2007 to 2011.

i. Total cost of the project planning phase and the anticipated needs during the project implementation phase:

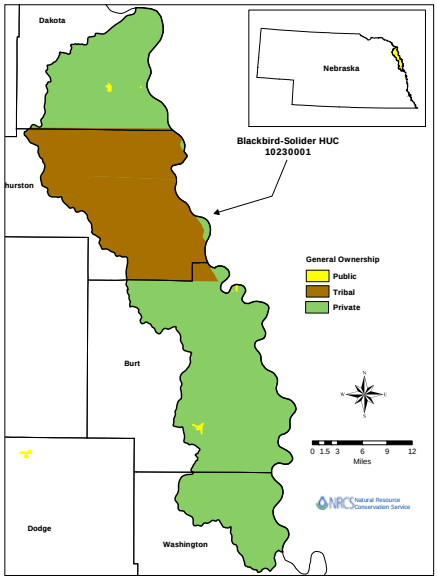
Technical **A**ssistance for Planning
$257,400
Financial **A**ssistance for planning
(**None)**

Technical **A**ssistance during Implementation
$**375,000.00**
Financial **A**ssistance for Implementation:
Estimate $2.5 million

j. Total Federal funds requested for the project planning phase: $100,000

k. Name, address, telephone, email, and other contact information for the Project Director:
Leroy Stokes, Resource Planning Specialist, NRCS, 100 Centennial Mall N. Rm. 152, Lincoln NE 68508
lstokes@ne.usda.gov (402) 437-4116

3. PROJECT DESCRIPTION



a. Project Background: Small sub watersheds that drain directly into the Missouri River in northeastern Nebraska have two distinctive physiographic features, the Loess Hills-Missouri River Bluffs and the Missouri River floodplain. These sub watersheds have their headwaters in the rolling hills and bluffs with their mainstem tributaries flowing across the floodplain bottomlands to the Missouri River. The headwaters area is highly-dissected, loess-covered, glacial till plain with short, steep slopes, and highly erodible loess soils that can generate significant amounts of sediment if cultivated without adequate conservation practices. In contrast, the Missouri River floodplain is a comparatively flat expanse, which, because of poor drainage, has seen a history of tributary stream channelization to prevent flooding, improve drainage, and make these bottomlands better for cultivation. Unfortunately, stream channelization has had adverse consequences. Channelization and straightening of tributary streams on the Missouri River floodplain has resulted in channel incision and headcutting progressing upstream into the watershed headwaters. According to the Nebraska Department of Roads, many bridges in this area are undermining and will be subject to failure in the future. Channelization and stream downcutting have undoubtedly increased sediment delivery ratios and the amount of sediment delivered to the Missouri River due to elimination of connectivity between streams and floodplain sediment storage locations. Similarly, elimination of these floodplain buffers more readily allows sediment eroded from upland fields to be delivered to the stream system.

The 810 mi^2 of HUC 10230001 in Nebraska is estimated to contribute about 2.7 million tons of sediment annually to the Missouri River, or approximately 5.2 tons/acre/year. The results of this effort will be to devise a methodology for identifying which approaches and programs can most cost-effectively address these issues.

b. Project Objectives: The primary goal of this project would be to reduce sediment production in an area highly susceptible to erosion contained within a HU that feeds directly into the Missouri River. In addition to this primary project purpose, the project would also be used as a test bed for integrating new technologies into a holistic approach to planning. Three specific objectives of the project are presented below.

Objective 1: To identify the types and locations of sediment sources in several sub watersheds where erosion and sediment control would provide local watershed benefits and would result in improvements in water quality in HUC 1023001, the mainstem Missouri River.

Objective 2: To develop a pilot process incorporating new computer technologies for identifying and targeting watershed erosion problems and selecting programs to address these problems within HUC 1023001.

Objective 3: To evaluate the potential for implementing buffer protection/creation and stream corridor restoration methods for erosion and sediment control in lieu of traditional PL-566 grade stabilization methods.

c. Project Methods

During the project planning phase, we will test the applicability of a watershed-based approach for data collection, modeling, and analysis. The proposed approach would utilize watershed spatial structure as compared with field- and farm-scale analysis methods typically employed within NRCS. The adoption of a watershed-based approach is founded upon the concept that

sediment, solutes, and water link watershed headwater conditions to downstream water quality, stream, and riparian conditions.

Because of the spatial nature of watershed data, a geographic information system provides a logical tool for mapping and presenting watershed information at the HU planning size. Our specific approach is to use GIS grids and grid math to build and evaluate this type of model for further application to rapid watershed assessment, as discussed below.

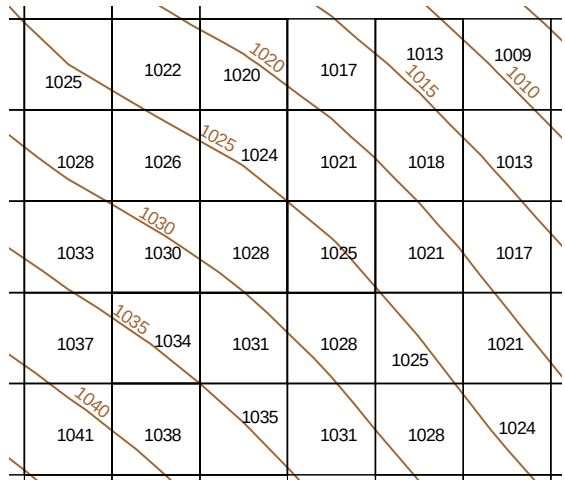


Figure 1. A grid digital elevation model divides the landscape into grid cells, with each cell assigned an elevation. In the map above, the relationship of contour lines (brown lines) to grid cells is illustrated.

The foundation of GIS-based landscape modeling and analysis will be high-resolution GIS data. The most fundamental data used for describing the landscape will be the elevation field depicted by a grid digital elevation model (DEM). Grid DEMs consist of a matrix data structure with the topographic elevation of each grid cell stored in a matrix node (Figure 1). The state of Nebraska, including that portion in the Blackbird-Soldier HU, have high-resolution, 10-meter DEMs available that well define the landscape of this area.

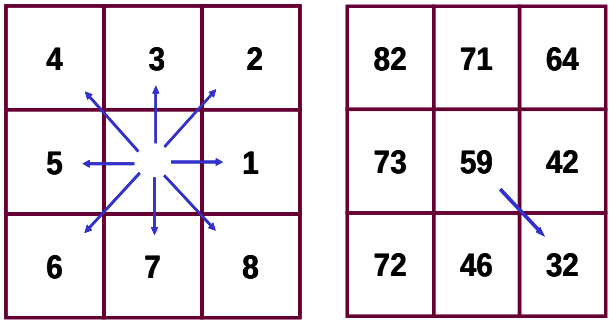


Figure 2. Grid concept of the D8 pour point model, in which water and sediment flow from a grid cell to one of eight surrounding grid cells (left). Flow is to the grid cell of steepest slope descent based upon grid cell elevations (right).

Several landscape characteristics can be derived from a DEM elevation grid. Algorithms for deriving land slope, flow direction, upstream contributing area, and even the delineation of drainage networks and

watersheds have been devised and incorporated into commercial GIS software. Downslope or downstream flow direction from one grid cell to another is typically based upon the steepest slope to one of the eight neighboring grid cells (Figure 2). By connecting all grid cells using a flow-direction grid, a flowpath or grid network can be generated that makes each grid cell the outlet of a sub watershed containing the grid network upstream from the cell (Figure 3). Using recursive algorithms that accumulate or otherwise modify landscape characteristics down each network flowpath, various accumulative terrain characteristics (e.g., contributing area, sediment load) can be calculated for any position along a flowpath within a watershed (Figure 4). In essence, every grid cell becomes a watershed outlet, so specific watersheds need not be delineated to calculate landscape parameters required for watershed analyses. Using the grid concepts illustrated in Figures 1 through 4, erosion and sediment transport will be modeled from watershed headwaters to outlets on the Missouri River.

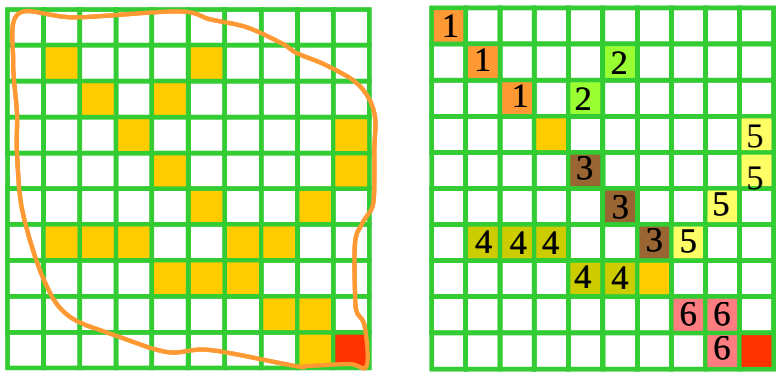


Figure 3. Once drainage network connectivity is defined, a watershed can be defined for any grid cell (left). Stream segments can also be readily delineated by choosing a threshold drainage area for a stream head (right).

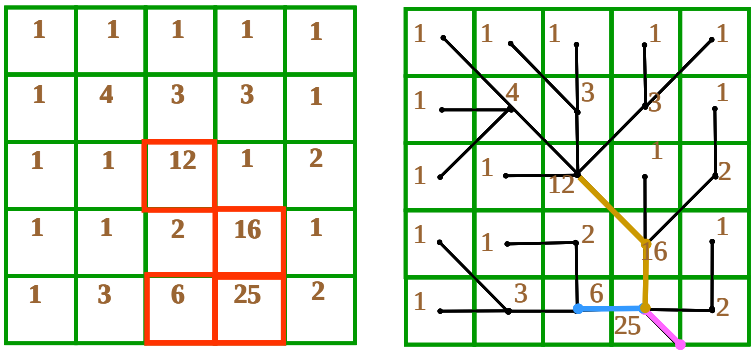


Figure 4. After drainage network connectivity is established, drainage area, or any other parameter such as sediment load, can be accumulated for all cells in the grid.

In addition to DEM Grid Analysis, GIS will be used to analyze resource data that includes soils, landuse, land cover and land treatment data. Socio-economic data as well as progress data will also be analyzed to show trends and current conditions within the HU.

Because of the developmental nature of the planning protocol multiple approaches could be used to reduce erosion and lower sediment production in the Missouri River tributaries under a variety of NRCS programs, such as:

- Construction of reservoirs as sediment basins (Watershed Protection and Flood Prevention)
- Stream and wetland restoration projects to improve stream-floodplain connectivity and sediment deposition processes (Wetlands Reserve Program; Watershed Protection and Flood Prevention)
- Saving and restoring riparian buffers (Wetlands Reserve Program)
- Implementing conservation practices (Conservation Technical Assistance)
- Removing highly erodible lands from production (Conservation Reserve Program).

d. Scope: The Blackbird-Soldier HU (HUC 10230001) occupies both sides of the Missouri River between Sioux Falls, South Dakota and Omaha, Nebraska. Blackbird-Soldier HU consists of a number of smaller sub watersheds that drain directly into the Missouri River. This project will evaluate that part of the HU that is located in Nebraska, an area of approximately 512,536 acres (Figure 1). The HU contains 14 sub watersheds and many small ones 1,722 miles of rivers and streams. With few exceptions, these sub watersheds drain to the Missouri River across the river's floodplain via a series of drainage ditches and straightened channels.

e. Project Partnership: The partnership consists of the following: 1) Omaha Indian Tribe, 2) Papio-Missouri River Natural Resources District, 3) Loess Hill Resource Conservation & Development Council, 4) Bureau of Indian Affairs, 5) Army Corps of Engineers, 6) Nebraska Fish and Wildlife Service, 7) Nebraska Department of Roads, 8) Winnebago Indian Reservation, 9) USDA Farm Service Agency

Natural Resources Conservation Service: The Rapid Watershed Assessment will be carried out by a team effort of NRCS State Office Staff with the Water Resources Planning Staff as the lead staff with support from local NRCS field office staff.

Omaha Indian Tribe: The Omaha Indian Tribe will serve as the principal local sponsor, as they made the initial request for the RWA. A copy of their letter is included as an attachment.

Papio Missouri Natural Resources District: The HU is primarily within jurisdiction of the Papio Missouri River Natural Resources District (PMRNRD). NRDs in Nebraska are synonymous with Soil and Conservation District in most states. The district provides coordination among counties within its boundary on natural resources issues. They will be instrumental in coordinating meetings and contacts for information and education.

Loess Hills Resources Conservation District Council (RC&D): The Loess Hills RC&Ds is instrumental in community development, facilitating meetings and developing partnerships. They will provide coordination and help facilitate some of the public meetings and disseminate information to the partners involved with the RWA.

Bureau of Indian Affairs (BIA): Thirty three percent of the HU is on tribal land. BIA will be the liaison with tribal officials. They will also provide historical data, to help us with the RWA.

US Army Corps of Engineers: The HU in which the RWA will be carried out is within the Missouri River basin which also is within the US Army Corps of Engineers administrative jurisdiction. As we conduct the RWA the Corps will be involved in a partnership role to share their institutional knowledge and studies on the portion of the Missouri River where the RWA is conducted.

US Fish and Wildlife Service: FWS will have a vital role with conducting the RWA and in their responsibility for the Endangered Species Act.

Nebraska Department of Roads: Several bridges, culverts, roads and road ditches are affected by erosion, siltation, aggradation and degradation within the RWA HU. The partnership will explore ways to address solutions that will be beneficial to both agencies. We will share resource information and studies.

Winnebago Indian Nation: As previously mentioned, the RWA HU is within both the Omaha and Winnebago Indian Nation. Consultation will be carried out with the Winnebago tribal leaders as the assessment is conducted.

f. Project Milestones and Timeline: The RWA will be conducted utilizing phase one and two of the planning process. We will not address implementation at this phase, as one of the purposes of the RWA is to identify appropriate funding sources for implementation. The following steps will be carried out with the applicable partners involved with the RWA.

Phase I - Collection and Analysis (Understanding the Problems and Opportunities)

1. Identify Problems and Opportunities
   (When) July and August (Who) All stake holders
2. Determine Objectives
   (When) September (Who) All stake holders
3. Inventory Resources
   (When) October November (Who) Partners as determined by step 1 and 2 above
4. Analyze Resource Data
   When) December (Who) NRCS lead

Phase II - Decision Support (Understanding the Solutions)

5. Formulate Alternatives
   (When) February March (Who) NRCS lead
6. Evaluate Alternatives
   (When) (Who) Partnership
7. Make Decisions
   (When) April May (Who) Partnership

Phase III - Application and Evaluation (Understanding the Results)

8. Implement the Plan
   To be determined
9. Evaluate the Plan
   To be determined

g. Project Management

The project will be carried out under the supervision of the Assistant State Conservationist for Water Resources. A highly skilled diverse technical staff will be responsible for conducting the project. The project will consist of a team leader who assures that milestones are accomplished and assures quality control.

Key project planning staff will include the following

NAME	TITLE	EDUCATION	YEARS EXPERIENCE
Leroy Stokes	Natural Resources Planning Specialist	BS Ag Education	35
Craig Goodwin	Sedimentation Geologist	MS Geology	27
David Griffith	Natural Resources Planning Specialist	BS Natural Resources	25
Kelly Klenke	GIS Resource Analyst	MS GIS Cartography	15

Two Natural Resource Planning Specialists will participate in the planning process to assure the RWA is conducted according to NRCS National Planning Procedures Handbook. A Sedimentation Geologist will provide technical expertise on cause and effect sedimentation, erosion and related concerns. The Geographic Information Specialist will assist with providing spatial data, analysis, information and visuals on socio economic and resource trends within the RWA HU. Other supporting staff will be utilized as the RWA progresses. To include but not limited to Hydrologic Engineer, Planning Engineer, National Environmental Policy Act (NEPA) Specialist, Economist, Biologist, Cultural Resource Specialist and other specialties, as required..

h. Anticipated Results and Benefits: The project will include partners form a variety of the RWA HU to include individuals, town and county governments, Indian tribes, conservation groups, government agencies at all levels, etc. The expected outcome will be to deliver resource alternatives that will lead to improved environmental resources which lead to better economic, social and environmental conditions within the area.

i. Limited Resource and Beginning Farmers and Ranchers, and Tribes: This project is partially located in Thurston County Nebraska. Thurston County is one of the poorest counties in Nebraska according to US Census Bureau figures. The Omaha reservation and Winnebago reservation make up 33 percent of the RWA HU. We will plan the RWA on a broad scale to include the entire RWA HU in Nebraska. While doing so, we plan to address specific issues as it relates to Indian lands. According to the EQIP definition, the project area meets the definition of a limited resource area and by its population of Omaha and Winnebago Indians meets the definition of tribal lands.

4. **Budget Information**

Total Projected Spending

Category	**Projected Cost (see explanation below)**	
	Labor	**Materials/Equipment Supplies**
Assessment and Coordination (Technical Assistance)	**$250,900 NRCS (TA)**	**$ 500 (incidental)**
GIS	**Labor included with NRCS TA**	**$1,000 (printing copies and etc.)**
Outreach		**$1,000 (news paper ads etc.)**
Publication and Distribution		**$4,000 printing and delivery**
Related Travel Costs	**$2,200 (20 nights lodging@ $110 per night for diem and lodging)**	
Sub Total	**$203,500**	**$6,500**
Total 250,900 **6,500** **$257,400**		

The following is as estimated breakdown of cost for planning based on average annual salary and support cost in Nebraska, which is approximately $99,000. This figure includes such things as office space, equipment, insurance, incidentals and etc for each employee.

Four principal staff each planning @ 35% of a staff year cost =
$138,600..(4X $99,000 = $396,000 X 35% **=$138,600)**

Eight support staff each planning 15% of a staff year cost =
$118,800 (8X $99,000 = $792,000 X 15% = **$118,800)**

Support staff to include but not limited to cultural resources specialist, NEPA specialist, biologist, planning engineer, hydrologic engineer, economist, field staff and etc.

TOTAL $138,600 + 118,800 = $257,400

Federal conservations programs available for project implementation:

- EQIP, CRP, WRP, CCRP, PL-566,

State conservations programs available for project implementation:

- Nebraska Development Fund, Nebraska Soil and Water Conservation Program

Local conservations programs available for project implementation:

- Conservation District Cost Share available from the Papio-Missouri River NRD

5. State Conservationist's Statement and Signature

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Steve Chick
State Conservationist, Nebraska