PROJECT PROPOSAL SUMMARY SHEET

PROJECT TITLE: NORTH DAKOTA RIPARIAN ECOLOGICAL SITE DESCRIPTION DEVELOPMENT PROJECT: PHASE II

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WATERSHED: Little Missouri River Watershed, Park River Watershed, Knife River Watershed, Little Muddy River Watershed, Willow Watershed, Apple Watershed

PROJECT TYPES: Staffing & Support, Watershed, and I & E.

WATERBODY TYPES: Rivers, Streams, and Wetlands.

NPS CATEGORY: Agriculture.

PROJECT LOCATIONS: Lotic riparian ecosystems throughout the state of North Dakota.

SUMMARIZATION OF MAJOR GOALS:
The goals of this project is to improve and strengthen the ability of resource managers and landowners to restore and/or properly manage riparian ecosystems through the development of riparian complex ecological site descriptions (RCESDs) and state-and-transition models (STMs).

PROJECT DESCRIPTION:
The development of ESDs and STMs for riparian ecosystems is a relatively new endeavor, to date 13 drafts been completed for the entire nation of which only two have been peer reviewed and approved. Five RCESDs were developed as part of the North Dakota Riparian Ecological Site Description Development Project (Phase I), including the two approved drafts. Within North Dakota a RCESD and associated STM have been drafted for three perennial and two intermittent streams within three Major Land Resource Areas (MLRAs) including: the Little Missouri River (MLRA 58C), Knife River/Spring Creek (MLRA 54), the James River (MLRA 55B), Beaver Creek (MLRA 55B) and Baldhill Creek (MLRA 55B). However, RCESDs have not been developed for streams in MLRAs 53A, 55A, 56, 58D, 60B, 63A and 102A. RCESDs describe potential states and phases associated with a stream and describe drivers of transitions between states and phases; allowing landowners and/or land managers to 1) identify, 2) assess, 3) predict change, 4) manage, 5) restore, 6) and monitor riparian ecosystems under their management.

FY 2016 funds requested: $110,783 **Non-federal match: $73,892**

Total Project Cost: $184,676

2.0 STATEMENT OF NEED

2.1

E. coli and fecal coliform have been identified as the leading cause of impairment to surface water in North Dakota. A secondary source of impairment in North Dakota streams and rivers is sedimentation. The leading source of these impairment has been identified as non-point source pollution from livestock grazing, specifically grazing of riparian ecosystems. Livestock manure has been identified as the primary source of e. coli and fecal coliform; however, management practices can be implemented to reduce and/or prevent contamination from manure and manure runoff. Riparian grazing management practices can reduce the amount of fecal material reaching water bodies and reduce sediment loads, helping to improve water quality across the region.

The maintenance of healthy watersheds and riparian systems is critical to surface water quality. Riparian ecosystems are transitional ecosystems occurring between terrestrial ecosystems, where hydrology has little influence, and aquatic ecosystems where hydrology has a significant impact on ecosystem function and formation (Gregory et al. 1991; Naiman et al. 1993). Riparian ecosystems are comprised of the stream channel and its associated floodplain that is influenced by the stream's hydrology, specifically the water table and high flow events. In addition to hydrology, riparian ecosystems are also influenced by geomorphology, climate, soils, vegetation, ecological processes, and management (Gregory et al. 1991; Naiman et al. 1993; Svejcar 1997; Lytle and Poff 2004).

Hydrogeomorphic processes that occur within a valley influence the formation of the stream channel (Gregory et al. 1991). The fluvial surfaces that are present within a valley are a function of geology within the valley and in the adjacent uplands, hydrology, and vegetation. Types of fluvial surfaces commonly associated with riparian ecosystems are floodplains, terraces, streambanks, natural levees, and oxbows (Kovalchik and Chitwood 1990). The stream type formed within the valley is a function of valley geomorphology and valley type, as each valley type supports a specific suite of stream channels (Rosgen 1985; Rosgen 1994). Stream types can be classified using a system developed by Rosgen (1985; 1994), which groups streams based on entrenchment ratio, width to depth ratio, sinuosity, gradient, and channel materials.

The various fluvial surfaces associated with a stream and stream hydrology are reflected in the mosaic of plant communities supported by riparian ecosystems including trees, shrubs, and herbaceous vegetation (Kauffman et al. 1985; Kovalchik 1987; Gregory et al. 1991; Naiman et al. 1993; Svejcar 1997; Toner and Keddy 1997). Kauffman et al. (1985) reported the occurrence of 60 plant communities and over 250 species within a two mile reach of a stream in northeastern Oregon. Kovalchik (1987) listed 234 plant species as common riparian species within the classification guide for central Oregon. The distribution and composition of riparian plant communities is a function of natural and anthropogenic disturbances, of which variations in stream flow are the most influential (Gregory et al. 1991; Merritt et al. 2009). Communities in close proximity to the stream are located upon younger fluvial surfaces and thus are occupied by younger plant communities, while those located further away from the stream channel are older and more developed (Gregory et al. 1991; Shafroth et al. 2002).

Riparian plant species have morphological and life history traits that are important for the functioning and maintenance of riparian ecosystems. The extensive root systems associated with riparian vegetation increase resistance to erosion and aid in bank stabilization (Gregory et al. 1991; Svejcar 1997; Winward 2000; Shafroth et al. 2002). Riparian vegetation plays a critical role in maintaining water quality by trapping sediment, nutrients, and other pollutants before they enter the stream (Svejcar 1997; Winward 2000). The increased ability to entrap sediment and seeds by riparian vegetation within the greenline aid in floodplain development (Winward 2000). Riparian vegetation promotes infiltration, storing water in the groundwater system and replenishing aquifers during peak flows, lessening the impacts of spring floods and releasing water back into the stream in the form of recharge, minimizing fluctuations in streamflow (Svejcar 1997).

In order to develop best management practice that will enhance the health and water quality within riparian ecosystems it is critical to understand the ecological processes taking place with the system and their responses to management and various disturbances. This information is often summarized in ecological site descriptions (ESDs) are reports that characterize a site by documenting the sites resources (USDA, NRCS 2003; Bestelmeyer and Brown 2010). Resources documented within an ESD include, physiographic features, climate, water features that are influence the management of the site, soil features that are representative of the site, ecological dynamics of the site in the form of a state-and-transition model (STM), vegetation dynamics, and supporting information (USDA, NRCS 2010a). In addition ESDs should describe the ecological benefits provided by the site, which include grazing use and wildlife habitat (Moseley et al. 2010). There are two primary components that comprise an ESD, a description of the ecological site and its associated STM (USDA, NRCS 2003; Bestelmeyer et al. 2003; Bestelmeyer et al. 2004; Bestelmeyer and Brown 2010). The most important component of an ESD is a description of the influences of management on the ecological functions of the site (Bestelmeyer and Brown 2010; Moseley et al. 2010).

The NRCS (2003) defines an ecological site as, “a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.” Physical characteristics that make an ecological site unique are soil, hydrology, and the plant community (USDA, NRCS 2003; Bestelmeyer et al. 2003; Bestelmeyer et al. 2009). These features are intertwined and evolve with specific disturbances influencing the development of a unique ecological site. Each ecological site is located with a land resource unit or major land resource area (MLRA) defined according to climate. Within a MLRA ecological sites are often further delineated by soil map units (USDA, NRCS 2003; Bestelmeyer et al. 2003; Bestelmeyer et al. 2009), as a site’s soils are influenced by a unique set of parent material, climate, position within the landscape, and biota which determines ecological functionality of the site (Stringham et al. 2001a; Strignham at al. 2003). STMs are developed in conjunction with ecological site descriptions, defining alternative plant communities occurring within a site and possible drivers of transitions between both states and communities (Bestelmeyer et al. 2003; Bestelmeyer et al. 2004; Bestelmeyer et al. 2009; Bestelmeyer and Brown 2010; USDA, NRCS 2010a). STMs are used to explain ecological processes and vegetation dynamics responses to disturbances and make management recommendation for a particular ecological site (Westoby et al 1989; Stringham et al. 2001a; NRCS 2003; Stringham et al. 2003; Bestelmeyer et al. 2003; Bestelmeyer et al. 2009).

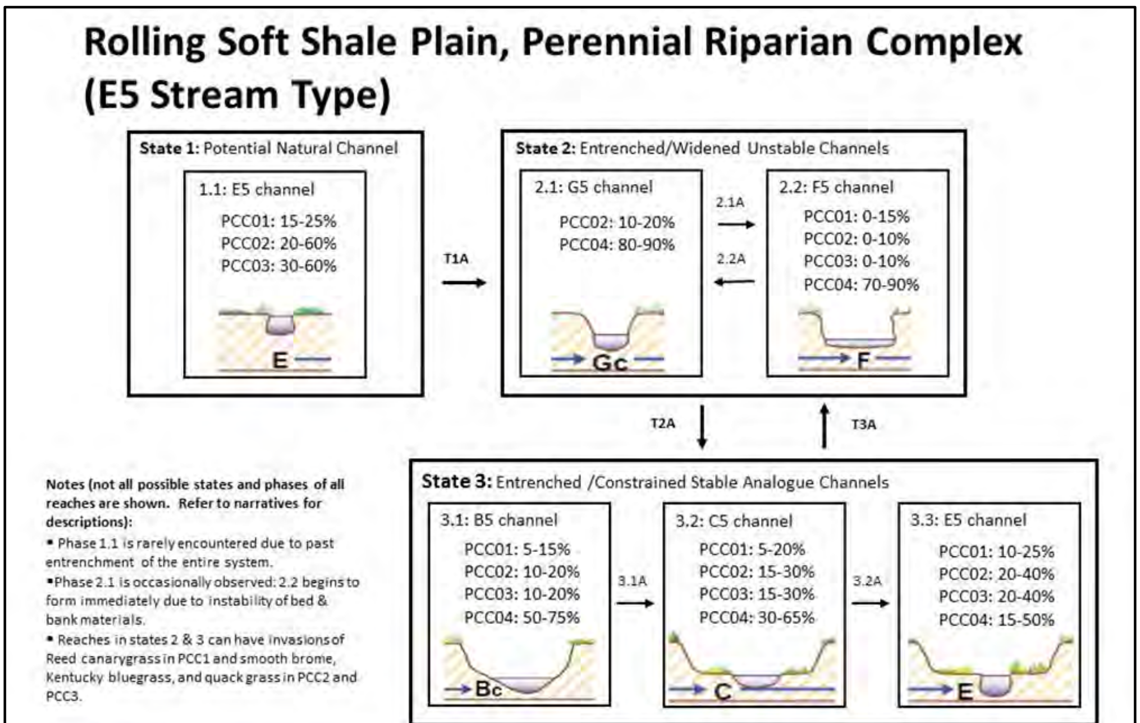
Standard upland ecological site descriptions (ESDs) fail to adequately describe the complex ecological processes and vegetative dynamics of riparian ecosystems (Leonard et al. 1992). In order for ESDs to adequately describe riparian systems riparian geomorphology, specifically valley type and stream channel classification (Leonard et al. 1992; Stringham and Repp 2010), and the riparian complex need to be incorporated (Winward 2000; Stringham and Repp 2010). These modifications meet the criteria of a riparian ecological site being a geomorphic unit comprised of a valley and stream type with a specific set of physical characteristics that differ from other sites and produces a unique riparian complex composed of a mosaic of interacting biotic communities, as defined by Stringham et al. (2008). The hydrologic processes of riparian ecosystems are driven by geomorphology and are responsible for the development of the mosaic of plant communities associated with these sites (Stringham and Repp 2010). Riparian ESDs need to describe the multiple plant community types found within one site and the ability of these plant communities to transition within the site.

The geomorphic features of a riparian ecosystem in combination with the complex vegetation make up a riparian complex (Winward 2000). A riparian complex is defined by valley type, stream gradient, substrates, fluvial surfaces, and vegetation patterns. The multiple plant communities that occur simultaneously within a riparian ecosystem are plant community components (Stringham and Repp 2010). Plant community components are structural components of the ecosystem and are not indicative of successional processes taking place. The reference state within a RCESD is comprised of multiple plant community components and includes a description of their distribution within the ecosystem, and the fluvial surface with which they are associated. Plant community components may change location within the riparian ecosystem in response to stream dynamics; however, the proportion of community components remains relatively constant (Leonard et al. 1992; Winward 2000; Stringham and Repp 2010).

Similar to standard STMs, riparian STMs are used to describe ecosystem dynamics (Stringham and Repp 2010). However, due to the influence of hydrology in riparian ecosystems some adaptations must be made to adequately describe ecological processes and predict responses to disturbance. According to Zweig and Kitchens (2009) hydrology is the major factor driving transitions between states within riparian ecosystems. Riparian STMs need to include channel classification, channel evolution models, description of fluvial landforms, plant community phases comprised of multiple community components, and soil-water-vegetation dynamics taking place within the ecosystem.

Channel evolution models describe the potential changes in channel morphology that can occur in response to disturbances that result in changes in flow, sediment loads, and bank stability of the current channel (Rosgen 1994; USDA, NRCS 2010b). In response to disturbance the channel goes through a sequential set of adjustments, resulting in a change in stream type. Channel evolution models allow us to predict a stream's response to disturbance as similar stream types respond in the same way disturbance. The stream systems starts to degrade when disturbed, resulting first in changes in the width to depth and entrenchment ratios caused by bank instability. This is followed by a period of aggradation and the development of a new floodplain within the entrenched channel. The final stage is the formation of a new channel that functions the same as the original channel, but within the constraints of the entrenched floodplain, this channel has been termed the stable analog.

Within a riparian STM the various stream types that comprise the channel evolution model are the building blocks and not the plant communities (Stringham and Repp 2010). Stream channels are grouped in states based on channel morphology and stability. State one, the reference state, is comprised of the stable historic channel types. The channels in state two are unstable and are going through the process of channel incision and/or widening. The channels in state three are characterized by channel stabilization and the formation of a new, constrained floodplain, and the stream types in this state are the stable analogs of the state one channels.



I.D.	Plant Association	Fluvial Surface/Landform
1	Prairie cordgrass/ Obligate sedge sp.	Floodplain
2	Big bluestem/ Switchgrass/ Wheatgrass	Floodplain Step
3	Big bluestem/ Needlegrass/ Forb/ Shrub	Low Terrace
4	Western wheatgrass/ Needlegrass	High Terrace

Draft 2: 12/2014

Figure 1. State-and-Transition Model for a Riparian Complex Ecological Site.

The stable stream channels that make up the reference state and the stable analogs are said to be in a state of dynamic equilibrium (Rosgen 1994; USDA, NRCS 2010b). In stable riparian ecosystems the stream is able access the floodplain when the system meets or exceeds bankfull discharge, and sediment load and erosion rates are at equilibrium (USDA, NRCS 2010b). These systems are highly resilient; despite the fact these systems are continuously undergoing shifts in the locations of the channel, fluvial landforms, and plant community components within the valley in response to natural disturbances (USDA, NRCS 2010b). Resilience of the state is maintained as long as the system functions without crossing a critical threshold (Stringham 2001b; USDA, NRCS 2010).

The unstable channels that make up state two are unable to access the floodplain as a result of entrenchment, subjecting streambanks to increased force during flood events resulting in increased erosion, sediment loads, and channel down cutting and widening (Rosgen 1994; USDA, NRCS 2010b). Due to the lack of floodplain connection to the stream these channels do not support riparian species capable of stabilizing banks, trapping sediment and filtering runoff.

As in standard upland STMs, once a critical threshold has been crossed in a riparian STM it is difficult if not impossible to recover the previous state (Stringham et al. 2001b). The shifts that take place between channel types are ecosystem drivers and indicate that the community is at-risk of crossing a threshold (Rosgen 1994). According to Rosgen (1994) the following measurements; cross-section, erosion rates, sedimentation, and vegetation can be used to determine if the channel is at risk of transition in systems where the reference state has been determined.

The main factor driving transitions within riparian ecosystems is hydrology (Rosgen 1994; Stringham et al. 2001b; Zweig and Kitchens 2009; USDA, NRCS 2010b; Stringham and Repp 2010). Stringham et al. (2001b) reported that entrenchment of streams in the western United States has resulted in a drop in the water table and loss of riparian vegetation within the original floodplain. The loss of riparian vegetation, compromises the state of the riparian ecosystem by decreasing bank stability (Manning et al. 1989; Gregory et al. 1991; Svejcar 1997; Winward 2000; Karrenberg et al. 2002; Shafroth et al. 2002) and water quality (Lowrance et al. 1984; Svejcar 1997; Winward 2000; Fleming et al. 2001). In addition to changes in hydrology, loss of riparian vegetation can also result from other disturbances. Specifically the impacts of overgrazing can result in riparian vegetation being replaced by shallow-rooted upland species (Sedgwick and Knopf 1991; Clary 1999; Clary and Leininger 2000; Winward 2000). Winward (2000) found overgrazing of riparian ecosystems to promote the growth of Kentucky bluegrass (*Poa pratensis*) and redtop (*Agrostis stolonifera*). The development of RCESDs and STMs is critical for describing the ecological processes taking place in riparian ecosystems and the impacts of both natural and anthropogenic disturbances on stream stability and riparian vegetation helping to direct the management of these ecosystems (Stringham and Repp 2010).

Changes in riparian vegetation induced by grazing can result in decline in soil health, loss of biotic diversity, degradation of wildlife habitat, reduced water quality, and alterations in stream hydrology (Blanks et al. 2006). However, proper grazing management is critical for the proper functioning of many riparian zones (Elmore and Kauffman 1994). Implementation of proper grazing management practices are required to prevent overgrazing by livestock, enhancing watershed stability and water quality.

The development of ESDs and STMs for riparian ecosystems is a relatively new endeavor, to date 13 drafts been completed for the entire nation of which only two have been peer reviewed and approved. Five RCESDs were developed as part of the North Dakota Riparian Ecological Site Description Development Project (Phase I), including the two approved drafts. Within North Dakota a RCESD and associated STM have been drafted for three perennial and two intermittent streams within three Major Land Resource Areas (MLRAs) including: the Little Missouri River (MLRA 58C), Knife River/Spring Creek (MLRA 54), the James River (MLRA 55B), Beaver Creek (MLRA 55B) and Baldhill Creek (MLRA 55B). However, RCESDs have not been developed for streams in MLRAs 53A, 55A, 56, 58D, 60B, 63A and 102A. RCESDs describe potential states and phases associated with a stream and describe drivers of transitions between states and phases. The development of RCESDs and STMs will provide guidance to land managers, including but not limited to agency personnel and private landowners, by explaining how a particular stream is expected to respond to various disturbance and management strategies, specifically grazing management strategies that will enhance stability and resilience within a particular riparian system. RCESDs allow landowners and/or land managers to 1) identify, 2) assess, 3) predict change, 4) manage, 5) restore, 6) and monitor riparian ecosystems under their management.

Improved information on the dynamics of riparian ecosystems and best management practices for these ecosystems contained with the RCESDs will lead to enhanced water quality in North Dakota streams and rivers. The information in the RCESDs can be utilized to direct management and restoration efforts and monitor whether these efforts are achieving the desired outcomes. To set management objectives it is important to know the current state of the resources being managed. The information in the RCESDs will aid in the identification of stable healthy riparian ecosystems and unstable riparian ecosystems. If the stream type were determined to be stable you would likely continue current management; however, if the stream type is determined to be unstable or at-risk of becoming unstable then changes in management may be required. In addition to guiding management, the information in RCESD can be utilized in riparian restoration efforts in determine stream and floodplain dimension and/or selecting the appropriate species for riparian plantings.

Monitoring stream morphology and riparian plant communities is critical to determine if changes in management are needed or if management objectives are being achieved. Changes in the stream’s width and depth outside the ranges outlined in the RCESDs are early indicators of potential changes in stream type. Shifts in the size and number of plant communities within a riparian complex are often indicative of changes in stream type. The greenline plant community is critical for bank stabilization, trapping sediments and nutrients and filtering runoff before it enters the stream. It is important to monitor changes in species composition and ground cover within this community; when this community has elevated levels of upland plant species and bare ground it is at-risk of increased erosion and transitioning to an unstable stream type.

RCESDs will benefit water quality by through improved riparian management and monitoring. Incorporation of best management practices for grazing riparian ecosystems will reduce e. coli and fecal coliform by reducing the time livestock spend in riparian ecosystems. Proper grazing management within riparian ecosystems promotes the growth of deep rooted riparian species within the floodplain. These species stabilize banks reducing erosion and sediment loads within stream. In addition proper grazing management prevent over-use of riparian species. Maintaining adequate stubble height of these species help trap sediment and nutrients in runoff before they enter the stream. Careful monitoring of riparian ecosystems will help reduce the potential for unstable stream reaches and will help maintain a healthy riparian plant community.

2.2

Land managers responsible for the management of riparian ecosystems within the state of North Dakota are the target audience for this project. Land managers include land owners that will be targeted through their local soil conservation districts and grazing associations, who are aware of the importance of riparian ecosystems, but are in need of new tools for their management. Land managers within North Dakota state and United States federal agencies (NRCS, Soil Conservation Districts, Forest Service, Extension) will also be targeted, who are aware of how riparian ecosystems function and the services they provide, but are lacking the assessment and monitoring tools to aid in making management decisions.

The NRCS has identified eight MLRAs within the state of North Dakota (Figure 2). Three MLRAs with watersheds in which agricultural uses (grazing and crop production) have impacted riparian health were inventoried during Phase I: 1) MLRA 54, 2) MLRA 55B, and 3) MLRA 58C. Phase II will focus on riparian ecosystems in 1) MLRA 54, 2) MLRA 53A, 3) MLRA 55A, 4) MLRA 56 and 5) MLRA 58D. Figure 3 illustrated the MLRAs and streams included in both phases of the project. Within each of these MLRAs a minimum of two streams will be assessed 1) a primary stream with perennial flow and 2) a tributary with intermittent flow with the exception of MLRAs 54 and 58D. In both MLRAs 54 and 58D RCESDs have been developed for perennial streams. Efforts will focus on streams that have been listed as impaired by the US Environmental Protection Agency (EPA), streams that have active 319 projects, and streams that have been the focus of previous ESD work in North Dakota (Figure 4). Within MLRA 54 efforts would be focused on the Knife River watershed, specifically Antelope Creek and Goodman Creek. Two stream within the Apple Watershed (Longlake Creek and Goose Creek) will be assessed in MLRA 53B. Within MLRA 55A the Willow watershed will be studied, specifically Willow Creek and Snake Creek. In MLRA 56 the North Branch of the Park River and Cart Creek within the Park River Watershed will be inventoried. Efforts within MLRA 58D will be focused on the watershed of the Little Missouri River (Spring Creek, Skull Creek, Horse Creek, Sevenmile Creek and Fivemile Creek).

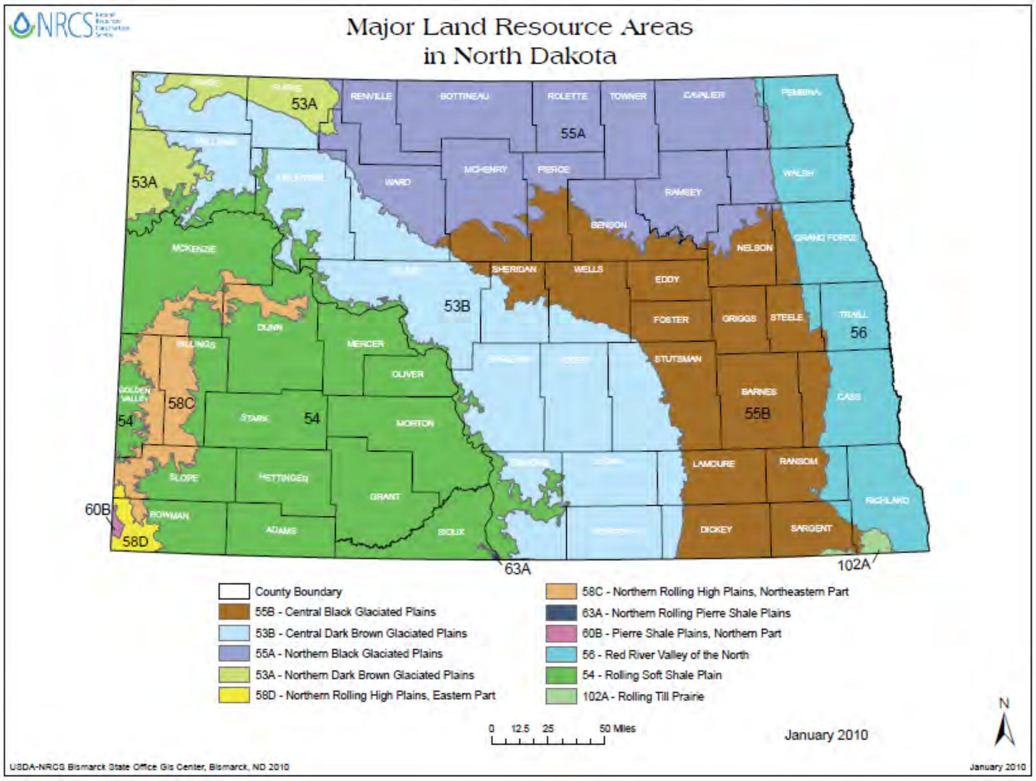


Figure 2. Major Land Resource Areas in North Dakota (USDA, NRCS 2010).

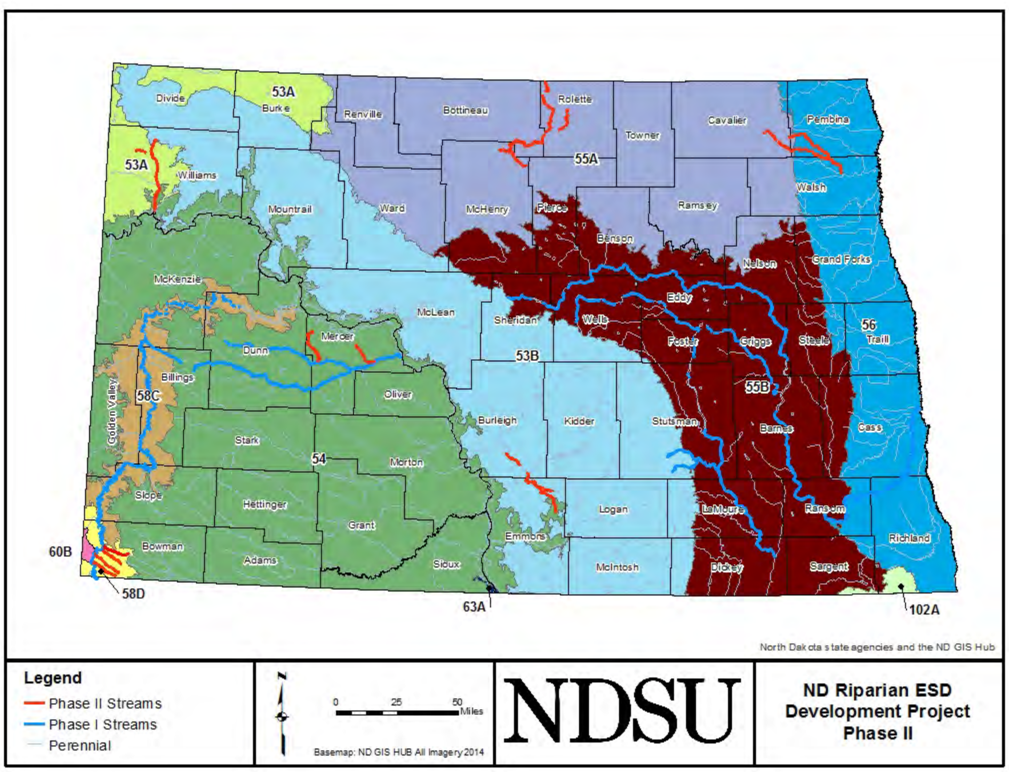


Figure 3. Phase I and Phase II of the ND Riparian ESD Development Project

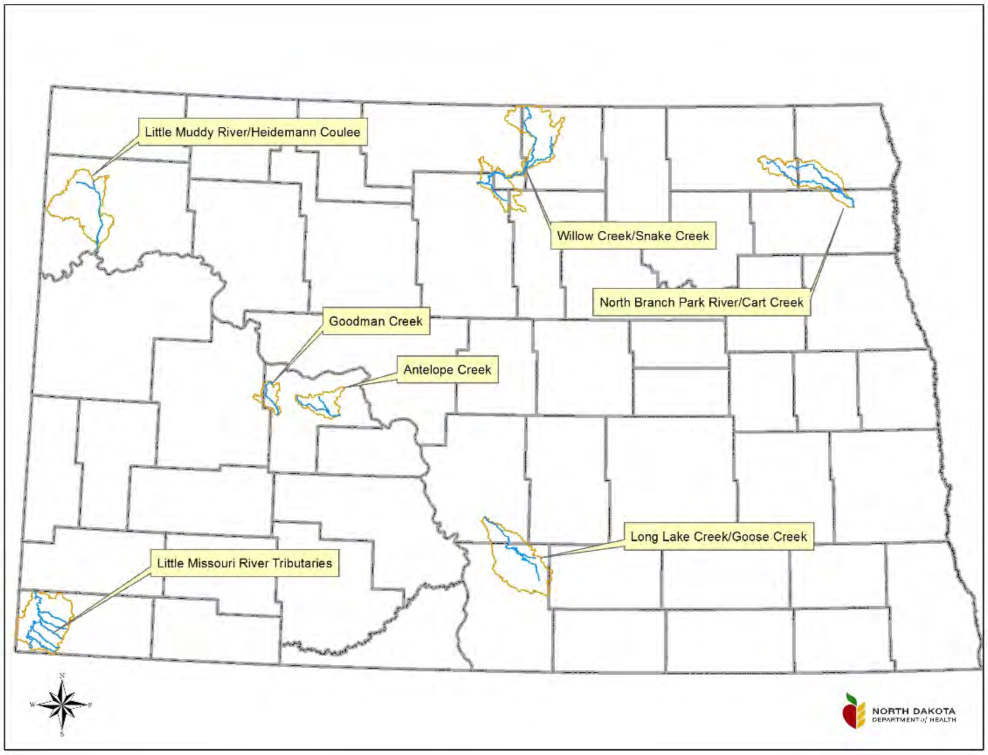


Figure 4. Watersheds that ESD efforts will be focused on in North Dakota.

3.0 PROJECT DESCRIPTION

3.1 Goals

The goal of this project is to improve and strengthen the ability of resource managers and landowners to restore and/or properly manage riparian ecosystems through the development of riparian complex ecological site descriptions (RCESDs) and state-and-transition models (STMs) for riparian ecosystems.

3.2 Objectives and Tasks

Objective 1: Develop riparian complex ecological site descriptions (RCESDs) and the associated state-and-transition models (STMs) that will be made available to land managers through the NRCS Field Office Technical Guide (FOTG) and/or Ecological Site Information System (ESIS) once they have been peer reviewed and approved. See Appendix C for instructions to access the approved RCESD developed during Phase I of the project. Identify existing states, transitions, and stream succession scenario being carried out along streams in North Dakota. A detailed methodology used for the development of riparian ESDs and STMs is located in Appendix D.

Task 1: Identify the current state of natural streams in North Dakota using Rosgen's classification of natural streams to classify channels (potential states).

Products: Draft RCESD and STM for the 6 riparian ecosystems identified in section 2.2 for which an RCESD and STM have not already been drafted for, to predict changes in riparian ecosystem in relationship to disturbance and management. In 2016 ESDs and STMs will be developed for 58D (Spring Creek, Skull Creek, Horse Creek, Sevenmile Creek and Fivemile Creek) and the Park River Watershed. ESDs and STMs will be developed for MLRA 54 (Antelope Creek and Goodman Creek) and the Little Muddy River Watershed in 2017. The 2018 efforts would result in the development of RCESDs and STMs for the Willow and Apple Watersheds. RCESDs and STMs will be considered as drafts until they have been reviewed and approved by the NRCS, and then either entered into the ESIS or posted on the NRCS FOTG.

Estimated Costs: $75,411

Task 2: Have NRCS Soil Scientist classify soils associated with various geomorphic features within the riparian ecosystem.

Products: Descriptions of soils associated with the fluvial surfaces that comprise the riparian ecosystem to incorporate in the draft ESDs.

Estimated Costs: $14,300 (NRCS contribution)

Task 3: Inventory and map vegetative communities associated with riparian ecosystems.

Products: Descriptions of the vegetative communities (plant community components) composition and production associated with the fluvial surfaces that comprise the riparian ecosystem and map vegetation communities associated with each state to incorporate in the draft RCESDs and STMs.

Estimated Costs: $45,179

Task 4: Inventory wildlife species that utilize riparian ecosystems.

Products: Descriptions the wildlife species that utilize the riparian ecosystem to incorporate in the draft RCESDs and STMs

Estimated Costs: $10,293

Task 5: Coordinate with local 319/Soil Conservation Districts to monitor riparian ecosystems to determine drivers of transitions and ecosystem responses to changes in the environment and/or management utilizing Rosgen's classification system to monitor changes in hydrogeomorphology and the Bank Erosion Hazard

Index (BEHI), riparian vegetation and Proper Functioning Condition (PFC) assessment to monitor changes in riparian health.

Products: Identification of potential drivers of transition within the riparian ecosystem to incorporate into the ESDs and STMs to help develop BMPs and management strategies for riparian ecosystems.

Estimated Cost: $22,500

Objective 2: Coordinate with local 319/Soil Conservation Districts to monitor riparian ecosystems to identify BMPs for grazing riparian ecosystems in North Dakota.

Task 6: Evaluate the impacts of various grazing strategies on channel stability, soils, and vegetation within riparian ecosystems and identify BMPs.

Products: Identification of potential drivers of transition within the riparian STM and of BMPs for grazing management within riparian ecosystems.

Estimated Costs: $22,500

Objective 3: Provide technical assistance and education on proper management of riparian ecosystems within North Dakota.

Task 7: Provide in-service training for extension and agency personnel to train them how to interpret and utilize the information in RCESDs and STMs for the assessment, management and monitoring of riparian ecosystems. The in-service will give attendees the technical skill and knowledge to help land owners manage riparian ecosystems.

Products: Coordinate with NRCS, Soil Conservation Districts, NDSU Extension and other relevant agencies to conduct 1 In-service on Riparian Management.

Estimated Cost: $2,125

Task 8: Coordinate with Soil Conservation Districts and NDSU Extension to put on field tours to educate land managers on riparian assessment, management, monitoring and the implementation of BMPs for grazing management within riparian ecosystems.

Products: Coordinate with NDSU Extension and Soil Conservation Districts to put on 6 field tours.

Estimated Cost: $8,448

Task 9: Provide technical assistance including consultations with ranchers to develop of grazing management plans aimed at improving the health and functioning of riparian ecosystems.

Products: Grazing management plans (6 plans) that improve the health and functioning of riparian ecosystems.

Estimated Cost: $9,000

Task 10: Provide technical assistance through the development of educational media (handbooks and bulletins) and development of riparian range management recommendations aimed at improving the health and functioning of riparian ecosystems.

Products: Revision of educational media including the North Dakota Riparian Ecological Site Description Manual and the current series of NDSU Extension Service Riparian Fact Sheets based on increased knowledge gained from assessment of additional riparian ecosystems (1 handbook and 6 fact sheets).

Estimated Cost: $2,000

Task 11: Provide additional training to graduate student by attending Rosgen's stream hydrology course.

Products: Acquire more technical expertise required for riparian sampling

Estimated Cost: $2,500

Task 12: Present current research at inter-national range meetings.

Products: Generate interest and share knowledge on the functioning of riparian ecosystems in North Dakota by presenting research and attending sessions.

Estimated Cost: $3,000

3.3 Milestone Table (See Appendix A).

3.4 North Dakota State University is the land grant institution for North Dakota, and has been a leader in agricultural and rangeland management research. The personnel involved have extensive backgrounds in developing and delivering best management practices for rangeland communities throughout North Dakota, especially through extension and peer reviewed publications, professional meetings, workshops, and other media. The personnel have also developed assessment techniques and conducted assessments for natural areas throughout the state which include forests, rangeland, wetlands, and riparian areas. Personnel have been involved in the development of RCESDs and STMs throughout North Dakota.

4.0 COORDINATION PLAN

4.1 North Dakota State University will be the lead project sponsor. In addition North Dakota State University will also provide range technical assistance to Soil Conservation Districts and land managers, recommend best management practices, and coordinate and disperse educational materials. North Dakota State University will be responsible for data collection, monitoring, and the development of RCESDs and STMs. “The Handbook for Rangelands,” and applicable vegetation sampling technique in the NRCS database for inventory, monitoring, and assessment (DIMA) will be referenced for sampling protocol. Data will be collected using methodologies developed by ARS and adapted by the NRCS, USFS, and BLM, and developed for lotic riparian ecosystems, specifically the “Lotic Riparian Complex Ecological Site Descriptions: Guidelines for Development,” “Interagency Ecological Site Handbook for Rangelands”. The North Dakota Natural Resource Conservation Service, The North Dakota Department of Health, and local Soil Conservation Districts will provide technical assistance for the project.

4.2 Local support will be provided by the Natural Resource Conservation Service area offices, Soil Conservation Districts, Watershed Boards, NDSU Extension agents and by cooperating land owners.

4.3 The project will coordinate with local 319 projects being carried out by local soil conservation districts. The project will coordinate with the following 319 projects: Red River Basin Riparian Project, Spring Creek Watershed, Walsh County Homme Dam Watershed, Beaver Creek/Seven Mile Watershed, Little Missouri Tributaries Riparian & Stream Stability Assessment and Development Phase Projects in districts included in both phases of the project.

4.4 The projects that are listed in the previous section are using 319 funds to help improve water quality within their respective watershed and within the state of North Dakota by implementing BMP that reduce non-point source pollution. The proposed project will complement these projects through the development of BMPs for grazing riparian ecosystems and by describing the ecosystems processes and responses to management within RCESDs and STMs for the watersheds being assessed. The in-service training will provide hands-on education on assessment, management and monitoring of riparian ecosystems for 319 coordinators working on these projects.

5.0 EVALUATION AND MONITORING PLAN

5.1 The primary goals of the project will be met when the 1) 10 RCESDs and STMs have been drafted for the riparian systems indicated in section 2.2, 2) when in-service training has been completed educating agency personnel how to interpret and utilize the information in RCESDs and STMs for the assessment, management and monitoring of riparian ecosystems and 3) field tours to educate land managers on riparian assessment, management, monitoring and the implementation of BMPs for grazing management within riparian ecosystems have been held. The in-service and field tours will be evaluated by attendance and exit survey results. The secondary goal of demonstrating BMPs for grazing management will be evaluated by attendance at field tours, the number of rancher consultations, and the publication of educational materials.

5.5 Any data gathered during this project will be housed on the network drive, a minimum of three computers, and back-up files created. Results from any analysis will be conveyed in annual reports and relevant publications. Data relevant to the EPA STORET program will be entered into the database by technicians.

6.0 BUDGET

6.1 (See Appendix B)

Appendix A. Milestone Table for North Dakota Riparian Ecological Site Description Development: Phase II.

Tasks/Responsible Organizations	**Output**	**2016**	**2017**	**2018**
Objective 1 Task 1 - Identify stream hydrology of riparian ecosystems (states).	Draft ESDs and STMs	2	3	4
Task 2 - Classify soils associated with riparian ecosystems.	Description of soils for ESDs	3	3	4
Task 3 - Inventory vegetative communities of riparian ecosystems.	Description of vegetative communities	3	3	4
Task 4 - Inventory wildlife species utilizing riparian ecosystems.	Description of wildlife species	3	3	4
Task 5 - Monitor riparian ecosystems	Management strategies for ESDs			
Objective 2 Task 6 - Evaluate impacts of grazing strategies	Identification of BMPs			
Objective 3 Task 7- Educate extension and agency personnel on development and use of ESDs	Riparian ESD workshop	1		
Task 8 – Provide education to land owners on riparian assessment, management, monitoring and the implementation of BMPs for grazing management within riparian ecosystems	Field tours	2	2	2
Task 9 – Provide technical assistance to ranchers	Develop grazing management plan	2	2	2
Task 10- Development of educational media	1 Manual and 6 Fact Sheets		3	4
Task 11 - Rosgen's training course	Knowledge of riparian sampling	1		
Task 12 - Present research at international meetings	Interest in research		1	1

APPENDIX B. BUDGET TABLE FOR NORTH DAKOTA RIPARIAN ECOLOGICAL SITE DESCRIPTION DEVELOPMENT PROJECT: PHASE II

PART 1: FUNDING SOURCES	2016	2017	2018	Total
EPA SECTION 319 FY2016 FUNDS	32,533	42,364	43,219	110,783
STATE/LOCAL MATCH 1) NDSU (FA,TA)	34,145	19,485	20,262	73,892
TOTAL BUDGET	66,678	61,849	63,481	184,675

TA: Technical Assistance
FA: Financial Assistance
NDSU: North Dakota State University

BUDGET TABLE FOR NORTH DAKOTA RIPARIAN ECOLOGICAL SITE DESCRIPTION DEVELOPMENT PROJECT: PHASE II

PART 2: FUNDING

SECTION 319 FUNDS	**2016**	**2017**	**2018**	**319 FUNDING**	**MATCHING FUNDS**	**TOTAL COSTS**
1) PERSONNEL						
Salaries and Wages						
Graduate Student (Ph.D.)	18,000	18,000	18,000	42,000	12,000	54,000
Undergraduate Student	5,000	5,000	5,000	15,000		15,000
Stewardship Specialist	950				950	
Stutsman County Agent	1,514				1,514	1,514
Bowman County Agent		1,452			1,452	1,452
Walsh County Agent			2,380		2,380	2,380
Fringe Benefits						
Graduate Student (Ph.D.) - 3%	540	540	540	1,620		1,620
Undergraduate Student - 10%	918	676		1,594		1,594
Stewardship Specialist - 35%	333				333	
Stutsman County Agent - 48%	723				723	723

Bowman County Agent - 48%		697			697	697
Walsh County Agent - 48%			554		554	554
Graduate Tuition Waiver	17,000	17,000	17,000		51,000	51,000
2) TRAVEL	6,640	12,088	10,857	29,585		29,585
3) EQUIPMENT/SUPPLIES	800	500	500	1,800		1,800
4) TRAINING	2,500			2,500		2,500
5) IN-SERVICE TRAINING						
Facility Fees	500			500		500
Printing	200			200		200
6) PROFESSIONAL MEETINGS		1,500	1,500	3,000		3,000
7) EDUCATIONAL MATERIALS			2,000	2,000		2,000
SUBTOTAL (Total 319 Funds)	29,347	38,128	38,897	99,705	71,603	171,308
Indirect Costs (10%)	3,186	4,236	4,322	11,078	2,289	
TOTAL (319 Funds)	**32,533**	**42,364**	**43,219**	**110,783**		
TOTAL	**66,678**	**61,849**	**63,481**	**110,783**	**73,892**	**184,675**

PART 3: ESTIMATED FUNDING ALLOCATION BY OBJECTIVE

SECTION 319 FUNDS	**2016**	**2017**	**2018**	**TOTAL COSTS**
Stream Classification	23,561	26,245	25,605	75,411
Soil Classification (NRCS TA)	4,550	4,550	5,200	14,300
Vegetation Inventory (Includes NRCS TA)	13,879	15,514	15,786	45,179
Wildlife Inventory	3,110	3,655	3,528	10,293
Monitoring	7,500	7,500	7,500	22,500
Identify BMPs	7,500	7,500	7,500	22,500
In-service Training	2,125			2,125
Field Tours	2,578	2,676	3,194	8,448
Rancher Meetings	3,000	3,000	3,000	9,000

Educational Materials			2,000	2,000
Training	2,500			2,500
International Meetings		1,500	1,500	3,000

PART 4: ADDITIONAL SOURCES OF FEDERAL FUNDING

NRCS Contributions	**2016**	**2017**	**2018**	**Total**
Salaries and Wages				
Range Conservationist	3,500	3,500	4,000	11,000
Soil Scientist	3,500	3,500	4,000	11,000
Fringe Benefits				
Range Conservationist @ 30%	1,050	1,050	1,200	3,300
Soil Scientist @ 30%	1,050	1,050	1,200	3,300
Total	**9,100**	**9,100**	**10,400**	**28,600**

APPENDIX C. Instructions for Accessing Riparian Complex ESD Developed for North Dakota

1. Click this link https://efotg.sc.egov.usda.gov/
2. Select the state of North Dakota
3. Select any county
4. In the navigation bar on the left select Section II in the drop down menu.
5. Select the "Upland and Riparian Ecological Site Descriptions and Reference Worksheets" folder in the navigation bar on the left.
6. Select the "Riparian Complex Ecological Site Descriptions" folder in the navigation bar on the left.

APPENDIX D. Lotic Riparian Complex Ecological Site Descriptions: Guidelines for Development