Hangman (Latah) Creek Watershed
Riparian Action Plan

Bi-State Water Quality Team

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Sponsored by:
The Spokane Conservation District
210 N. Havana
Spokane, WA 99202

Introduction

Hangman Creek, also known as Latah Creek, is a trans-boundary watershed located in both Idaho and Washington, with a drainage area of approximately 689 square miles (Figure 1.). The watershed covers most of southern Spokane County and part of the northeast corner of Whitman County in Washington, and parts of Benewah and Kootenai Counties in Idaho. Stream channel and shoreline modifications over the last 100 years have had lasting impacts to water quality, riparian communities, and aquatic habitats. This plan is designed as an adaptive document to address the riparian issues, develop priority reaches, propose corrective recommendations, and implement strategies.

Riparian Areas and Shorelines

In 2004-5, the SCCD completed a shoreline assessment within Spokane County. These assessments included both the hydrological and ecological conditions of the riparian areas within the Hangman Creek Watershed. The shorelines were delineated into 25 distinct reaches based on changes in plant community type, valley form, surficial geology, land use, geomorphology, or a combination of these.

Hangman Creek is the most critical system in Spokane County. Sixty three percent of its shorelines were rated to be “at-risk” and it is the only waterway that contains any nonfunctional river miles (3.3). Major anthropogenic influences such as agriculture, development, and encroachment on the shorelines by residences and road systems are responsible for maintaining the current conditions.

Streambank erosion and bank slumping is symptomatic throughout the basin. There are various reasons for these conditions, but the general lack of woody vegetation (trees and shrubs) is a primary issue. Erodible soils and the dominance of reed canarygrass promote streambank instability. Continued toe erosion perpetuates bank slumping and widening. Overall, this combination produces an unstable system trying to regain equilibrium.

Ecological Conditions

The ecological conditions of the Hangman Creek system are also distressed. It has the most river miles of poor ecological shoreline conditions in Spokane County (22.9). Reed canarygrass is dominant throughout a significant portion of the reaches and contributes to the lack of plant and associated habitat diversity

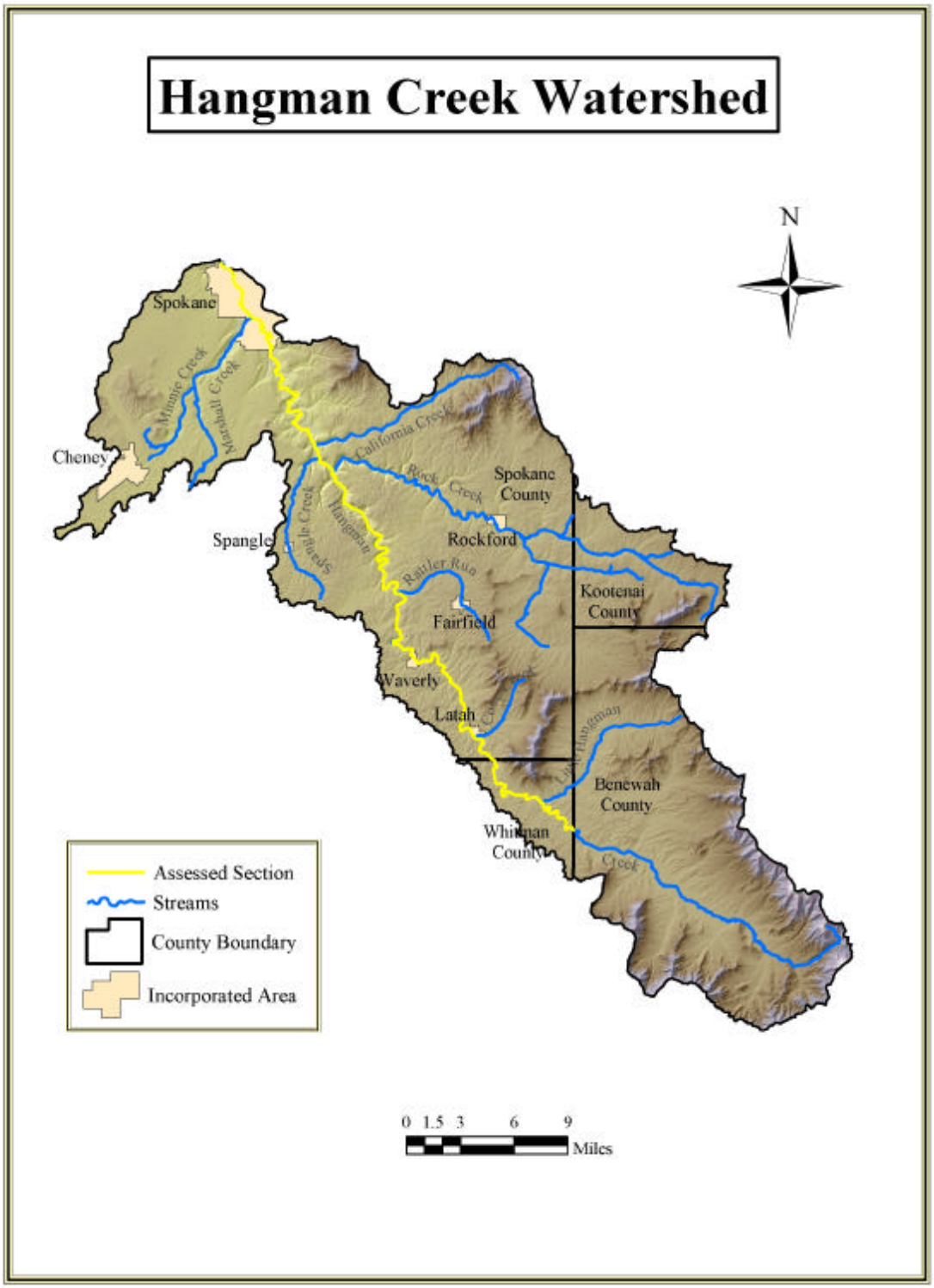

Figure 1. Hangman Creek Assessment Area

Habitat Classifications and Plant Associations

Riparian habitats above the canyon area (RM 34.2 – RM 50.3) are dominated by palustrine emergent reed canarygrass (*Phalaris arundinacea)* associations and scattered scrub-shrub communities of black hawthorn (*Crataegous douglasii)*, red-osier dogwood (*Cornus stolonifera*), willows (*Salix spp*.), and occasional black cottonwoods (*Populus trichocarpa*). The current status of these habitats provides little diversity and value for the wildlife and fisheries.

The basalt canyon area of Hangman provides some of the best quality and diversity of habitats in the system. Well established stands of black cottonwoods (*Populus trichocarpa)*, hardstem bulrush (*Scirpus acutus),* quaking aspen (*Populus tremuloides*), mountain alder (*Alnus incana*) and various scrub-shrub communities are abundant.

Figure 2. Riparian plant community near Duncan

Table 1. Hangman Creek Potential Plant Associations

Common Name	Scientific Name
Palustrine Emergent	
Baltic rush	*Juncus balticus*
Beaked sedge	*Carex rostrata*
Reed canarygrass	*Phalaris arundinacea*
Hardstem bulrush	*Scirpus acutus*
Palustrine Scrub-Shrub	
Black hawthorn	*Crataegous douglasii*
Black hawthorn/starry solomonplume	*Crataegous douglasii/Smilacina stellata*
Coyote willow	*Salix exigua*
Coyote willow/reed canarygrass	*Salix exigua/Phalaris arundinacea*
Drummond willow	*Salix drummondiana*
Mountain alder	*Alnus incana*
Mountain alder/mesic forb	*Alnus incana/mesic forb*
Mountain alder/reed canarygrass	*Alnus incana/Phalaris arundinacea*
Red-osier dogwood	*Cornus stolonifera*
Red-osier dogwood/reed canarygrass	*Cornus stolonifera/Phalaris arundinacea*
Willow spp./reed canarygrass	*Salix spp./Phalaris arundinacea*
Palustrine Forested	
Black cottonwood/mesic forbs	*Populus trichocarpa/mesic forbs*
Black cottonwood/red-osier dogwood	*Populus trichocarpa/Cornus stolonifera*
Black cottonwood/reed canarygrass	*Populus trichocarpa/Phalaris arundinacea*
Box elder/red-osier dogwood	*Acer neguda /Cornus stolonifera*
Ponderosa pine/common snowberry	*Pinus ponderosa/Symphoricarpos albus*
Pondersoa pine/common chokecherry	*Pinus ponderosa/Prunus virginiana*
Quaking aspen	*Populus tremuloides*
Quaking aspen/mesic forb	*Populus tremuloides/mesic forb*

Notes:
1. Habitat classifications follow Kovalchik and Clausnitzer 2004.

Below the canyon, there are several excellent palustrine scrub-shrub and forested communities. Notable communities of mountain alder and cottonwood exist in reaches 14-A, 15, and 21-C. However, they are often narrow and discontinuous due to natural limitations and current land uses.

Hangman Creek Stream Sections

For the purposes of this riparian plan, Hangman Creek has been delineated into four major stream sections (characterized according to geologic and geomorphic conditions). Corresponding reaches can be found in the SCCD's Shoreline Inventory Report. These areas are defined below.

Stream Section	River Miles	Reach(es)	Percent of Watershed
1. Upper Hangman Area	RM 58.5 – RM 34.2 (24.3)	1 - 11	42
2. Hangman Canyon Area	RM 34.2 – 17.9 (16.3)	12 - 17	28
3. Valley Floor Area	RM 17.9 – 14.6 (3.3)	18	5
4. Lower Hangman Area	RM 14.6 – 0.0 (14.6)	19 - 22	25

Dominant fluvial geomorphic conditions and processes within these stream sections are distinct and defined by a combination of geologic and human influences. These conditions have associated impacts to the present and potential riparian vegetative communities. Further, it is important to note that the soils throughout the Hangman Watershed are diverse and formed from many sources and materials.

Upper Hangman Creek

Geologically, The Upper Hangman Creek area is defined by rolling loess hills and reworked channel sediments. Bedrock outcrops can be found throughout these upper reaches. Dryland agricultural operations are dominant throughout this portion of the watershed. The riparian communities in this section have been subjected to a variety of detrimental activities such as; channel widening and clearing. Past agricultural production practices drained wetland areas and removed riparian vegetation. Above Rock Creek, the soils are derived from volcanic ash, silty loess, glacial deposits, alluvium deposited by streams, and material weathered from basaltic, granitic, and metamorphic bedrock. In the upper Hangman Creek area, much of the farmed soil is derived from loess deposits. The loess was windblown soil that settled in the eastern Washington area approximately 100,000 years ago. The loess deposits were up to 200 feet thick and formed dune-like hills. Significant areas of the loess deposits were removed with the glacial flooding. The present day loess deposits are areas where sheet and rill erosion tends to account for almost 90 percent of the soil loss from cropland (USDA, 1978).

Figure 3. Agricultural influence in Upper Hangman Area

Hangman Canyon Area

A deep basalt canyon that confines the vertical and lateral movement of the stream characterizes the Hangman Canyon Area. The basalt is highly resistant to erosion and where the channel bed has cut through overlying materials and exposed the basalt, a vertically stable condition has resulted. The basalt formations create a laterally stable condition when the channel contacts the valley walls. Talus material weathered from basalt contributes bedload material to the channel. There are no intensive types of land use within this portion of the watershed. Riparian areas within these reaches are relatively intact. The lack of access and land uses has allowed the riparian vegetation to remain undisturbed in most areas.

Figure 4. Hangman Canyon Area

Valley Floor Area

The Valley Floor Area contains former lake bottom fine-grained sediment deposits known as the Latah Formation. The Latah Formation has a low resistance to bank erosion. Channel meander development within the valley floor areas is active. Remnant floodplains, channel scars and high flow channels and chutes are common within this formation. Agricultural operations and some limited building construction have been practiced on these former lake bottom surfaces. The Latah Formation contains active and historic flood plains and low terraces. These areas are highly subject to channel change and are completely within the active meander migration belt. The low terrace areas represent former flood plains that were abandoned during the process of base level lowering. Riparian disturbance in this section is significant in some areas due to land uses.

Figure 5. Unstable streambanks in Hangman Valley Floor Area

Lower Hangman Creek

High sandy bluffs characterize the Lower Hangman Creek Area. Base level lowering of the channel has been active throughout this area. Glacial Lake Missoula flood related sediments were deposited within this area as many as 40 times during the Quaternary Period (US Government Printing Office 1974). Over the last ten to 12 thousand years, Hangman Creek has been vertically downcutting through these sediments. As the channel bed lowers it eventually approaches a new state of vertical equilibrium. Much of the project area appears to have largely completed this downcutting process and has entered a phase of lateral adjustment and meander development. Significant impacts to channel banks have occurred throughout this reach. Bridge constrictions, confinement by road construction, and residential development are a few of the existing issues. Many riparian communities throughout this entire section have been severely impacted as the channel continues to readjust during higher flows.

The easily erodible stream bank material influences the Hangman Creek flow regime below the confluence with Rock Creek. The unconsolidated material generally consists of one or more of three major alluvial deposit types. The deposits are the Latah Formation, consisting of lake deposits; Glacial Lake Missoula flood deposits of sand, gravel, and cobbles; and post-Missoula flood alluvium (SCCD, 1994).

The Latah Formation consists of fine laminations of silts and clays with low permeability that tends to perch water above the formations. Slumping can occur as water removes sediment from above the confining silt and clay layers. The silts and clays generally form resistant bands when they are near the water edge with steep banks above them. If unconsolidated sands and gravels underlie the Latah Formation, then the sands and

gravels tend to wash out undercutting and exposing the silt and clay layers. This undercutting results in block slumps and rapid bank loss.

The Glacial Lake Missoula flood deposits consist of sorted to unsorted, silt, sands, gravels, cobbles, and boulders. The unconsolidated material erodes easily along streams, producing steep unstable slopes over 100 feet high. The major type of erosion is toe failure caused by the stream removing the material at the base of the stream bank. Once the toe material is removed, the bank is over-steepened. The over-steepened bank fails and deposits large amounts of material directly into the stream. The newly deposited material is then available to be mobilized under most flow conditions.

Post-Missoula flood alluvium generally overlies all the other sediment layers. The post-Missoula flood material is unconsolidated and easily eroded. The erosional characteristics are similar to the Glacial Lake Missoula flood deposits discussed above.

Figure 6. High sandy bluffs near Highland Park Development

Technical Inventories

In order to assist in develop priorities for restoration and rehabilitation of riparian areas along Hangman Creek various past technical inventories were utilized. These inventories included erosion, proper functioning condition (riparian), water quality wildlife, and fisheries.

Erosion Inventory (Spokane County Conservation District 2004)

As part of a larger Shoreline and Inventory Project on Hangman Creek, actively eroding sites were measured and documented. The average height and length of eroded bank

were documented using a Garmin™ global positioning system (GPS). All erosion data can be found in table below.

Erosional areas were delineated into five height classes:

Erosion Class	Bank Height
I	3 – 9
II	10 – 28
III	29 - 65
IV	66 – 125
V	126 – 300

Upper Hangman Creek Area (Approximately 24.3 miles, Reaches 1-11)
This portion of the watershed is located higher in the watershed and is not as adversely affected by the high flow events that significantly damage the lower sections of the watershed. The channel banks are typically erosion class I. Bare vertical banks and slumping banks are common. The first twelve miles has approximately 2,145 ft of erosion (down to RM 46.7). The next twelve miles contains almost 10,000 feet of Class I erosion. There is a general lack of riparian vegetation throughout this area with a mix of livestock and agricultural influences. The riparian areas are dominated by reed canarygrass and common tansy. The last reach (# 11) has a small amount of erosion Class II (211 ft).

Hangman Canyon Area (Approximately 16.3 miles, Reaches 12-17)
This area has approximately 8,870 feet of Class I erosion, 3,941 feet of Class II erosion, and a minor area of Class III erosion (106 feet). The area contains a deep basalt canyon where the lateral migration is confined by valley walls. The gradient is steeper through the canyon and erosional processes appear to be natural. Reach 16 and 17 are just out of the canyon and contain no erosion.

Valley Floor Area (Approximately 3.3 miles, Reach 18)
This reach is considered the only non-functional reach in Spokane County. It is aggressively migrating across the valley floor. It contains 739 ft of class I erosion, 2218 ft of class II erosion, 686 ft of class III erosion, and 1426 ft of class IV erosion (total of 5,105 ft). This area contains more erosion than any other reach. Approximately 30 % of it is eroding. The land uses are passive farming and pasture, but the riparian vegetation is absent. Bedrock is sparse throughout the reach.

Lower Hangman Area (Approximately 14.6 miles, Reaches 19-22)
The lower channel of Hangman contains the tallest sand bluffs within the watershed. This area has had major channel modifications and impacts by humans. The construction of Highway 195 removed ¾ of a mile of stream meander. This activity artificially constrained the creek, increased the gradient and stream energy. The stream has difficulty transporting its sediment load and is actively seeking equilibrium through lateral migration into the tall sand bluffs. It has a total of 11,034 feet of active erosion. The area has approximately 422 feet of Class I erosion, 4,223 feet of Class II erosion, 1,600 feet of Class III erosion, 3,749 feet of Class IV erosion, and 2,482 feet of Class V erosion.

Table 2. Hangman Creek Erosion Inventory

Reach Id	Reach Length (mi)	Erosion Class I 3-9 (ft).	Erosion Class II 10-28 (ft)	Erosion Class III 29-65 (ft)	Erosion Class IV 66-125 (ft)	Erosion Class V 126-300 (ft)	Total Erosion length (ft.)
1	4.7	456	0	0	0	0	456
2	0.4	211	0	0	0	0	211
3	2.6	422	0	0	0	0	422
4	0.5	158	0	0	0	0	158
5	3.6	898	0	0	0	0	898
6	5.3	3,115	0	0	0	0	3,115
7	1.4	1,478	0	0	0	0	1,478
8	2.0	1,742	0	0	0	0	1,742
9	1.5	2,323	0	0	0	0	2,323
10	1.1	475	0	0	0	0	475
11	1.2	845	211	0	0	0	1,056
12	2.1	1,320	0	0	0	0	1,320
13	7.4	2,376	370	0	0	0	2,746
14A	1.9	1,531	264	0	0	0	1,795
14B	1.1	2,059	106	106	0	0	2,295
15	2.3	1,584	3,221	0	0	0	4,805
16	0.8	0	0	0	0	0	0
17	0.7	0	0	0	0	0	0
18	3.3	739	2,218	686	1,426	0	5,105
19	4.1	0	950	475	370	0	1,795
20	2.4	0	1,214	475	0	0	1,673
21A	1.3	0	1,056	0	475	1,056	2,587
21B	1.0	0	264	0	0	0	264
21C	3.8	211	739	650	792	1,426	3,818
22	2.0	211	0	0	686	0	897
Totals	**58.5**	**22,154**	**10,613**	**2,392**	**3,749**	**2,482**	**41,434**

Notes: Blue reaches are designated as the Upper Hangman Area Red reaches are designated as the Valley Floor Area
Green reaches are designated as the Hangman Canyon Area Area Black reaches are designated as the Lower Hangman

Table 3. Erosion Summary

Watershed Area	Reach Length (mi)	Erosion Class I 3-9 (ft)	Erosion Class II 10-28 (ft)	Erosion Class III 29-65 (ft)	Erosion Class IV 66-125 (ft)	Erosion Class V 126-300 (ft)	Total Erosion length (ft)
Upper Hangman	24.3	12,123	0	0	0	0	12,173
Canyon	16.3	8,870	3,961	106	0	0	12,937
Valley Floor	3.3	739	2,218	686	1,426	0	5,105
Lower Hangman	14.6	422	6,441	2,286	3,749	2,482	15,380
Total							45,595

Water Quality

Potential point and non-point source pollution locations were documented for the main stem of Hangman Creek. Ground observations were completed using canoes to float the length of Hangman Creek from the State Line to the mouth. Aerial photos and global positioning system (GPS) units were used to locate and document sources and degree of degradation, as well as existing riparian vegetation and bedrock outcrops. Field notes were taken to accompany the GPS points.

Point sources included actively flowing ditches, culverts, pipes, tile drains, and stream crossings for the stream flow and weather conditions during the observation period. However, ditches, culverts, and pipes that were inactive could be active during snowmelt or large rain events, therefore the number of point sources could vary from the number reported. Springs, tributary, and pump suctions were also noted.

Point sources were defined as:

Crossing – a stream crossing that could cause some water quality degradation.

Culvert – any culvert that discharged to Hangman Creek. The source for the culvert was not investigated, but they were generally small streams or ditches diverted under roads.

Ditch – any drainage that was artificially channeled to Hangman Creek.

Pipe – any pipe that, if flowing, would discharge to Hangman Creek. It is not known if the pipes are currently being used. Wastewater treatment facilities were included.

Tile – discharges for field tile operations were marked when found.

Table 4. Water Quality Pollution Potential

Reach	Non-Point Sources			Point Sources					Reach Pollution Potential
	Erosion		Ag Impact	Crossing	Culvert	Drainage or Ditch	Pipe	Tile Drain	
	Total Length (mi)	Average Height (ft)							
1	456	7.0	AG,T,L	10	0	8	1	1	High
2	198	6.0	AG	0	0	1	0	0	Low
3	401	7.0	AG, T	0	3	2	0	0	Moderate
4	177	7.0	AG	1	0	2	0	0	Low
5	914	4.4	AG,T,L	2	2	1	0	0	Moderate
6	3,011	6.6	AG, L	1	6	10	1	3	High
7	1,152	5.0	None	0	0	0	0	0	Low
8	1,758	5.5	AG, L	1	1	1	0	0	Moderate
9	2,432	5.2	AG, L	1	0	0	0	0	Moderate
10	483	5.1	AG, T	1	1	1	0	0	Low
11	1,017	5.7	L	0	0	1	0	0	Low
12	1,298	5.0	AG, L	1	0	2	0	0	Moderate
13	3,735	5.2	None	2	0	5	0	0	Moderate
14A	1,802	7.1	AG, L	1	0	1	0	0	Moderate
14B	2,295	7.9	L	0	0	0	0	0	Moderate
15	4,731	11.4	AG, L	1	0	2	0	0	Moderate
16	0	0	L	1	0	1	0	0	Low
17	0	0	None	0	0	1	0	1	Low
18	5,105	40.3	AG, T	0	0	2	0	0	High
19	2,169	48.1	AG, T	2	0	1	0	0	High
20	1,673	38.2	None	0	0	1	0	0	High
21A	2,563	134	None	1	0	0	0	0	High
21B	249	15.2	None	1	0	0	0	0	Low
21C	4,091	139	None	5	1	2	2	0	High
22	903	80.2	None	4	2	2	0	0	Moderate

Notes:

1. Reaches are for the Hangman Creek main stem as described in the Proper Functioning Condition section.
2. Erosion lengths are the total of all erosion segments noted in the reach. The average erosion height is the weighted average for the erosion segments.
3. Agricultural impacts are AG if agriculture is predominant in the reach, T if tillage is to the stream bank edge, and/or L if livestock has access to the creek.
4. Blue reaches are designated as the Upper Hangman Area
5. Green reaches are designated as the Hangman Canyon Area
6. Red reaches are designated as the Valley Floor Area
7. Black reaches are designated as the Lower Hangman Area

Non-point sources were limited to stream bank erosion areas. The eroding banks were identified, and the length and average height of the erosion noted. Tall sediment banks or bluffs (typical in the lower third of the watershed) were evaluated for the erosion

height using the scree slope. The scree slope is the material accumulating at the base of, and obviously derived from the cliff or bluff. It was assumed that the scree slope would erode similar to a cut bank. The erosion heights ranged from approximately four to 300 feet. The lengths of the erosion varied from approximately 50 to 1,450 feet.

Pollution potential was estimated for each reach based on the number of point sources and/or the extent of non-point pollution sources. The pollution potential was considered high if there were more than 10 possible point source inputs, or if the average erosion height was greater than 30 feet (ie. reaches 18-21A). The pollution potential was considered low if the number of possible point source inputs was less than three, or the erosion length was less than 300 feet (except for Reach-7 that had an erosion length of 1,152 feet but no point source inputs or agricultural impacts). All other reaches were considered moderate for possible pollution potential.

Proper Functioning Condition (Spokane County Conservation District 2005)

Although the system has the lowest percentage of PFC in the County (30 percent), it does contain a large area (7.4 river miles) of contiguous PFC rating in reach 13 (RM 32.1 – RM 24.7). This area is a deeply eroded basalt canyon that is protected from most land uses such as agricultural production and residential development. There are a few other small areas of PFC within the system.

However, the majority of the system has land uses that are generally incompatible with highly erodible soils. This combination produces an unstable system trying to regain equilibrium. Streambank erosion is symptomatic (to a degree) in most reaches.

Ecologically, the Hangman Creek system is very fragmented. It has the most river miles of poor ecological shoreline conditions in the County (22.9). The majority of the system is characterized by the absence of woody riparian trees and shrubs and highly eroding vertical banks. Reed canarygrass is dominant throughout a significant portion of the reaches and contributes to the lack of plant and associated habitat diversity.

The basalt canyon area of Hangman Creek provides some of the best quality and diversity of habitats in the system. Well-established stands of black cottonwoods (*Populus trichocarpa)*, hardstem bulrush (*Scirpus acutus),* quaking aspen (*Populus tremuloides*), mountain alder (*Alnus incana*) and various scrub-shrub communities are abundant.

Below the canyon, there are several excellent palustrine scrub-shrub and forested communities. Notable communities of mountain alder and cottonwood exist in reaches 14-A, 15, and 21-C. However, they are often narrow and discontinuous due to natural and anthropogenic limitations (Bedrock areas, vertical eroding banks, and agricultural land uses).

Table 5. Hangman Creek Proper Functioning Condition Summary

Reach	Length (river miles)	Sinuosity	W/D Ratio	PFC Rating	Ecological Rating	Restoration Potential	Development Risk
1	4.7	Moderate	Moderate	FAR	Poor-fair	Fair-good	N/A
2	0.4	Moderate	Moderate	FAR	Poor-fair	Good	N/A
3	2.6	High	High	FAR	Poor	Good	N/A
4	0.5	Low	Moderate	FAR	Poor-fair	Fair	N/A
5	3.6	Moderate	Low	FAR	Poor	Fair-good	N/A
6	5.3	Moderate	Low	FAR	Poor-fair	Fair-good	Low
7	1.4	Moderate	Moderate	PFC	Fair-good	N/A-fair	Low
8	2.0	Moderate	Moderate	FAR	Poor-fair	Fair	Low
9	1.5	Moderate	Moderate	FAR	Poor	Fair-good	Low
10	1.1	Moderate	Moderate	FAR	Poor-fair	Fair-good	Low
11	1.2	Moderate	High	FAR	Poor-fair	Fair	Low
12	2.1	Moderate	Low	FAR	Fair-good	Fair	Low
13	7.4	High	Low	PFC	Good	N/A	Low
14A	1.9	Low	Moderate	PFC	Fair-good	N/A	Medium
14B	1.1	Moderate	Moderate	FAR	Poor-fair	Fair-good	Medium
15	2.3	Moderate	Moderate	FAR	Fair	Fair	Medium
16	0.8	Low	Moderate	PFC	Good	N/A	Medium
17	0.7	Moderate	Moderate	PFC	Good	N/A	Medium
18	3.3	Moderate	Low	NF	Poor	Fair-good	Medium
19	4.1	Moderate	High	FAR	Fair	Fair	Medium
20	2.4	Moderate	High	FAR	Fair-good	Fair-good	High
21A	1.3	Moderate	High	FAR	Fair	Fair-N/A	High
21B	1.0	High	Moderate	PFC	Good	N/A	High
21C	3.8	Moderate	Moderate	FAR	Poor-fair	Fair-good	High
22	2.0	Low	Moderate	PFC	Fair-good	N/A	Low

Notes:

1. W/D is width/depth ratio.
2. PFC is proper functioning condition.
3. FAR is Functional-At-Risk
4. NF is Nonfunctional
5. NA is not applicable for proper functioning and nonfunctional reaches.
6. Reaches 14 and 21 were re-evaluated by the PFC team and split to better represent portions of the original reaches.
7. Red text indicates a priority reach for protection.
8. Blue reaches are designated as the Upper Hangman Area
9. Green reaches are designated as the Hangman Canyon Area
10. Red reaches are designated as the Valley Floor Area
11. Black reaches are designated as the Lower Hangman Area

Wildlife and Fisheries

The typical wildlife of the Hangman Creek area include various waterfowl, neotropical migrants (birds), ring-necked pheasant, white-tailed deer, belted kingfisher, Great-horned owls, and coyotes. Other species noted by local residents include elk, moose, and an occasional black bear.

Locally significant or priority habitat species consist of Great-blue heron, river otters, beavers, and osprey (found in reaches 7-8; 12-22). Priority Habitat Species of bald eagles, white-throated swifts, and peregrine falcons were located in reaches 21C-22. These species, according to local residents have increased over the last several years.

The local salmonid fisheries within the Hangman Creek system are depressed. Habitat conditions are lacking throughout the majority of the mainstem. No spawning beds have been identified. However, the system does currently support speckled dace, longnose dace, northern pikeminnow, chiselmouth, sculpin, various suckers, squawfish, tench, eastern brook trout, and rainbow trout in many of its tributaries. Genetic analysis has confirmed isolated populations of native interior redband trout in tributary streams (McClellan 2005).

Riparian Restoration Action Prioritization and Implementation

In order to develop priorities for restoration and rehabilitation of riparian areas along Hangman Creek, the Watershed Implementation Team (WIT) reviewed and utilized various technical and socio-economic criteria. Technical evaluation included geomorphological processes, past physical inventories, water pollution potential, and wildlife and fisheries. Socio-economic evaluation was also included in this process as cooperative landowners are essential to implementation and long-term maintenance of sites. The final prioritization was categorically based on levels of importance (High, Medium, and Low)

High Importance:

- Length of time protection can be reasonably assured.
- Water quality benefits/pollution prevention potential.

Medium Importance

- Technical considerations (physical inventory work).
- Low hanging fruit (easy and inexpensive efforts)/restoration potential.
- High value restoration.

Low Importance

- Socio-economic values.

In general terms, the Hangman Creek Watershed can be divided into 4 main geomorphic sections (Lower Hangman, Valley Floor, Canyon, and Upper Hangman). These sections were prioritized for restoration utilizing the criteria described above. A reach basis prioritization was also completed for the watershed.

Priority 1:

The Valley Floor Area was chosen as the top priority due to its non-functional status, potential for sediment contribution, and cooperative landowners. Furthermore, it constitutes the beginning of major erosion sites after the stream leaves the canyon. Addressing these areas and moving downstream will benefit the entire system. This area can be addressed through riparian corridor management, revegetation, sediment reducing structures and selected bank shaping.

The Valley Floor - $250,000 to 350,000.

$15-20/ft for revegetation and sediment structures. Additional bank shaping costs may increase the project costs substantially ($100 – 200K)

Priority # 2:

The Upper Hangman Area was chosen as the second priority because the erosion can be addressed primarily through revegetation and some sediment reducing structures. The problems are not as serious as in the lower reaches. The establishment of riparian woody shrubs and trees will further stabilize the banks and provide habitat and shade to the stream.

The Upper Hangman Area – $300,000 – 400,000

$2-3/ft – revegetation, sediment structures, barbs, bioengineering techniques

Priority # 3:

The Canyon Area is the third priority because it is mostly stabilized. Reach 15 has some erosion issues that need to be addressed. This would constitute sediment reducing structures, live fascines, and other revegetation techniques.

The Canyon Area - $225,000 -350,000

$15-20/ft – revegetation, sediment structures, live fascines. Additional bank shaping costs may increase the project costs substantially ($100 – 200K)

Priority # 4:

The Lower Canyon Area is most problematic and expensive. The largest single problem is toe erosion. High flows, ice, trees and other debris constantly remove the toe of the bank. It is often difficult to work with these banks due to their unconsolidated and unstable nature. Hundreds of thousands of dollars have been previously spent with minor to moderate success. These areas may be addressed, but it may consist of high priced engineering to reduce the sediment inputs.

The Lower Hangman Area - $3 – 5 million.

The total costs to implement a riparian restoration are approximately $4 – 5 million dollars based on estimates for revegetation costs, materials, and labor. This amount takes into consideration that the majority of the projects will primarily involve

revegetation efforts. Projects that include structural components (engineering, heavy machinery, bank sloping) will be considerably more expensive.

Table 6. Reach Based Prioritization

Reach	Length (river miles)	Protection Assurance	Water Quality Pollution Potential	Low Hanging Fruit	Technical Considerations	High Value Restoration	Socio-Economic
1	4.7	M	H	M-H	M	M	M-L
2	0.4	M-H	L	H	M-L	M-H	M-L
3	2.6	M-H	M	H	L	M-H	M
4	0.5	M-H	L	M	L	M	M-L
5	3.6	M-H	M	M-H	M	M-H	M-L
6	5.3	M-H	H	M-H	M	M-H	M
7	1.4	M-H	L	M	L	M-L	M
8	2.0	M	M	M	L	M	M-H
9	1.5	M	M	M-H	L	M-H	M
10	1.1	M	L	M-H	M	M-H	M
11	1.2	M	L	M	M	M	M-H
12	2.1	M-H	M	M	M	H	M-L
13	7.4	M-H	M	N/A	M-H	H	M-L
14A	1.9	M	M	N/A	M	H	M-L
14B	1.1	M	M	M-H	L	H	M-L
15	2.3	M	M	M	H	H	M-L
16	0.8	M	L	N/A	M-H	H	M
17	0.7	M	L	N/A	L	H	M
18	3.3	M	H	M-H	M	H	M
19	4.1	M	H	M	M-H	H	M-H
20	2.4	M	H	M-H	M	M	M-H
21A	1.3	M-L	H	M-L	M-H	M	M-H
21B	1.0	M-L	L	N/A	M-H	M	M-H
21C	3.8	M-L	H	M-L	M-H	M	M-H
22	2.0	M-L	M	L	M-H	M	M-H

Notes:

1. Levels of Importance (H – High, M –Medium, L – Low)
2. Blue reaches are designated as Upper Hangman Area
3. Green reaches are designated as Hangman Canyon Area
4. Red reaches are designated as Valley Floor Area
5. Black reaches are designated as Lower Hangman Area
6. N/A designates that area does not require restoration

Implementation Strategy

Implementation of riparian restoration/enhancement projects throughout the Hangman Creek Watershed is occurring every year. Many different natural resource groups, local governments, private entities, and concerned residents are working towards this common goal. However, there is not a considerable amount of coordination or communication of these projects. These projects may have good intentions, but do not consider a broader outlook for the watershed. Localized flooding and erosion concerns often become part of an effort to protect in the short-term. Hard fixes involving considerable rock placement may have significant impacts to downstream sites and landowners.

To be successful, this Riparian Action Plan should consider the following recommendations for implementation:

1. Appoint a central entity to coordinate and approve projects that involve the shoreline immediately above and below the ordinary high water mark.

2. Support projects, funding and grant applications through the central entity.

3. Develop a long-term cost-share program for residents and landowners

4. Provide/seek long-term funding for Riparian Restoration Program.

5. Develop Riparian Education/Awareness Program.

6. Develop and maintain a native plant nursery for revegetation projects.

Projects:

All projects that occur in the watershed are subject to the Spokane County Shoreline Master Program. They must adhere to the Washington State Department of Fish and Wildlife's "Integrated Streambank Protection Guidelines". The goal of the guidelines is to educate landowners, state and local governments on alternative ways to protect property and infrastructure from bank erosion while allowing for natural, habitat-forming processes to occur.

Effective, creative solutions to streambank erosion require a clear understanding of why the erosion is occurring. Integrating this information with habitat considerations, full mitigation requirements, levels and types of risk, project objectives, and design criteria is the most effective way of selecting appropriate, habitat-friendly streambank-protection treatments. These guidelines provide instruction on how to assess these key factors and how to use the results from the assessments to select appropriate streambank-protection solutions (Integrated Streambank Guidelines, 2003).

Site and reach assessments must be completed for individual projects. This will aid in identifying suitable streambank protection alternative and gaining an understanding of the mechanisms of failure and the true causes of erosion at the site. Careful selection of the appropriate bank protection solution will depend upon detailed assessment to determine the cause of erosion (site or reach based process).

Implementation Plan

The techniques and approaches to riparian restoration along Hangman Creek are wide and varied. Some project sites can be as simple as annual woody plantings whereas others may require full engineering plans for soil lifts and bank shaping. Each site will be different and require assessment and inventory work.

The proposed schedule works with the highest priority sites first. These sites are based on current need, protection and/or prevention factors, and other aspects. Project implementation may be altered as needed based on landowner cooperation and available funding. The following table provides guidance on implementing riparian projects within the watershed on a reach by reach basis.

Table 7. Riparian Action Implementation Plan

Reach	Potential Riparian Action Technique	Proposed Schedule
1	Floodplain roughness, riparian buffer management, woody plantings, barbs, coir logs	2014-2020
2	Woody plantings, bioengineering, fascines, coir logs, barbs	2009-2020
3	Floodplain roughness, riparian buffer management, woody plantings, barbs, coir logs	2009-2020
4	Woody plantings, bioengineering, fascines, coir logs, barbs	2010-2020
5	Woody plantings, bioengineering, fascines, coir logs, barbs	2010-2014
6	Woody plantings, bioengineering, fascines, coir logs, barbs, livestock improvement	2010-2014
7	Floodplain roughness, riparian buffer management, woody plantings, barbs, coir logs	2010-2014
8	Floodplain roughness, riparian buffer management, woody plantings, barbs, coir logs	2010-2014
9	Livestock improvements, woody plantings, bioengineering, fascines, coir logs, barbs,	2010-2014
10	Floodplain roughness, riparian buffer management, woody plantings, barbs, coir logs	2014-2020
11	Livestock improvements, woody plantings, bioengineering, fascines, coir logs, barbs	2009-2014
12	Livestock improvements, riparian buffer management, woody plantings, barbs, coir logs	2014-2020
13	N/A	
14A	N/A	
14B	Woody plantings, bioengineering, fascines, coir logs, barbs, livestock improvements	2020-2025
15	Woody plantings, bioengineering, fascines, coir logs, barbs, bank sloping, engineering	2014-2020
16	N/A	
17	N/A	
18	Barbs, bank shaping, woody plantings, herbaceous cover, coir logs, riprap, rock toes	2010-2014
19	Woody plantings, bioengineering, fascines, coir logs, barbs	2020-2025
20	Woody plantings, bioengineering, fascines, coir logs, barbs	2020-2025

21A	Woody plantings, bioengineering, fascines, coir logs, barbs, bank sloping, engineering	2025-2030
21B	N/A	
21C	Woody plantings, bioengineering, fascines, coir logs, barbs, bank sloping, engineering	2020-2025
22	N/A	

Notes:.

1. Blue reaches are designated as the Upper Hangman Area
2. Green reaches are designated as the Hangman Canyon Area
3. Red reaches are designated as the Valley Floor Area
4. Black reaches are designated as the Lower Hangman Area
5. Lower case letters denote prioritization ranking among reaches within a section.
6. N/A is not applicable

Potential Funding Opportunities

There are a number of funding opportunities available to local governments and qualifying agencies/entities for riparian restoration, easement, and acquisition purposes. These programs change requirements and may not have funding available over the long-term. Each program should be consulted for current applications, funding availability, and new requirements and potential restrictions.

- Ecology, 319/Centennial Clean Water Fund – The Washington State Department of Ecology administers these funds for various water quality related projects. The Department has limitations regarding Best Management Practices, but allows most riparian improvement projects. Awards range up to $250,000 and higher if cash matching funds are available.

- Ecology, Flood Control Assistance Account – These funds are available to the Hangman Creek Watershed under the Comprehensive Flood Management Plan developed in 2000. Please see section below for more details.

- Ecology, Terry Husseman Fund – The Washington State Department of Ecology utilizes this funding program for smaller water quality related projects. Projects usually range between $10-20,000. Riparian improvement projects are acceptable.

- Ecology, Watershed Planning Grants; Phase IV. – The Washington State Department of Ecology offers additional funding through the Phase IV Implementation grants. Up to $400,000 is available to each WRIA.

- Washington State Conservation Commission Grants – The commission grants local Conservation Districts up to $40,000/year to implement water quality projects in their county. Most of these programs utilize a cost-share rate.

- Spokane County Conservation District Assessment Funds – The SCCD receives a $5 assessment per parcel in Spokane County (participating authorities). A portion of these funds could be utilized for funding a riparian restoration program.

- Spokane County Conservation Futures Program – This fund could be utilized to purchase high priority riparian parcels. Projects need to be submitted and ranked. Please see section below for more details.

- Spokane County Shoreline Master Program Restoration Plan – Currently, the county's SMP is undergoing an update. The update requires a restoration plan. Implementation funding may be required to fulfill SMP.

- Environmental Mitigation Funds – New projects that result in impacts to wetlands may require mitigation. These funds could be utilized towards riparian projects or used as match for larger grant project applications.

Easements & Acquisition Programs

Land Trusts

Land Trusts are private, nonprofit organizations that work cooperatively with private landowners to conserve land for its natural, recreational, scenic, historical or productive value. Properties sought for conservation include farms, wetlands, wildlife habitats, ranches, forests, urban gardens and parks, coastline, watersheds, river corridors and trails.

Inland Northwest Land Trust: Conservation Easements

A conservation easement is a legal agreement between a private landowner and the Inland Northwest Land Trust. The conservation easement specifies what activities are allowed, which can include farming, forestry, recreation, and limited construction. The conservation easement also defines what activities are permanently restricted, such as development, subdivision, surface mining, dredging, and other actions that would damage the conservation values of the property, in order to protect wildlife habitat, scenic vistas, productive farmland, and important wetlands or forests.

Each conservation easement is tailored to meet the specific needs and conservation purposes of the landowner and the Inland Northwest Land Trust. It is a way for landowners to protect their land while retaining ownership. The easement stays with the property no matter who owns it. It is like a road or utility easement in that respect. Future owners of the property are bound by the easement's terms. The Inland Northwest Land Trust ensures compliance with the terms of the easement by committing to regular monitoring and annual visits to the property.

Conservation Futures Program: Spokane County

Conservation Futures is a property tax on all lands within Spokane County. Enabled by the Washington State Legislature in 1971, Spokane County adopted and began a local program in 1994. The Program levies a $6.00 tax per $100,000.00 value on all properties within Spokane County. This equates to approximately $1 million dollars a year.

Spokane County's Conservation Futures Program is intended to protect, preserve, maintain, enhance, restore, limit the future use of or otherwise conserve selected open space land, farmland, forests, wetlands, wildlife habitats, and other lands having significant recreational, social, scenic or aesthetic values within the boundaries of Spokane County. Acquired properties will not be developed but kept in an enhanced natural area consistent with the Revised Code of Washington (RCW Chapter 84.34).

Conservation Futures funds are used towards acquisition of property and/or property easements that ensure public access and enjoyment of our greatest resources in perpetuity. To date, more than 3,300 acres of open space lands have been acquired in Spokane County with Conservation Futures funds. Most recently, Spokane County Voters supported an additional 5-year extension (through 2007) of the Conservation Futures Tax.

North American Wetlands Conservation Act (NAWCA); United States Fish and Wildlife Program

The North American Wetlands Conservation Act (Act, or NAWCA) of 1989 provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands conservation projects in the United States, Canada, and Mexico for the benefit of wetlands-associated migratory birds and other wildlife.

There is a Standard and a Small Grants Program. Both are competitive grants programs and require that grant requests be matched by partner contributions at no less than a 1-to-1 ratio. Funds from U.S. Federal sources may contribute towards a project, but are not eligible as match.

The Standard Grants Program supports projects in Canada, the United States, and Mexico that involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats. In Mexico, partners may also conduct projects involving technical training, environmental education and outreach, organizational infrastructure development, and sustainable-use studies.

The Small Grants Program operates only in the United States; it supports the same type of projects and adheres to the same selection criteria and administrative guidelines as the U.S. Standard Grants Program. However, project activities are usually smaller in scope and involve fewer project dollars. Grant requests may not exceed $75,000, and funding priority is given to grantees or partners new to the Act's Grants Program.

Ducks Unlimited has been the lead entity in the Spokane Region in applying for NAWCA grant funding. They have partnered with many local agencies and governments to acquire matching funds for wetlands preservation in the Channeled Scablands Project Area.

Flood Control Assistance Account Program (FCCAP): Washington State Department of Ecology

The FCAAP was established by the state Legislature in 1984 to help local jurisdictions reduce flood hazards and flood damages. Matching grants are available to counties, cities, towns, and other special districts for comprehensive flood hazard management plans, specific projects or studies, and emergency flood-related activities. The program is administered by Ecology (Chapter 86.26 RCW – State Participation in Flood Control Maintenance and Chapter 173-145 WAC – Flood Control Assistance Account Program).

To be eligible for FCAAP grants, the flood plain management activities of a local jurisdiction must be approved by Ecology. FCAAP is a statewide financial assistance program. Applicants must participate in the National Flood Insurance Program (NFIP), have certification of the local emergency response plan by the State Department of Emergency Management, and have jurisdictional authority over land uses within the river's meander belt or floodway. A Shoreline Master Program (SMP) may also be required. Towns, cities, counties, special districts, and qualified tribes throughout the state are eligible. Special districts (as described in Chapter 85.38 RCW) include:

Conservation Districts

Diking Districts

Drainage Districts

Diking/Drainage Districts

Inter-county Diking and Drainage Districts

Consolidated Diking, Drainage, Diking Improvement or Drainage Improvement Districts

Flood Control Districts

Matching grants are available on a reimbursable basis for three primary activities.

Comprehensive Flood Hazard Management Plans (CFHMP) (referred to as Comprehensive Flood Control Management Plans in Chapter 86.26 RCW) – Grants up to 75% of cost help local jurisdictions prepare comprehensive plans. A plan must determine the need for flood hazard management work, assess alternatives, analyze environmental impacts, evaluate problems and proposed solutions, and prioritize recommendations. Other elements of a comprehensive plan are described in Ecology's *Comprehensive Planning for Flood Hazard Management* (Ecology Publication #91-44). Approved plans meet federal and state requirements for local hazard mitigation.

Flood Damage Reduction Projects and Studies – Grants up to 50% of costs are available for projects that preserve or restore natural conditions, or restore or enhance facilities or structures. Maintenance projects must be consistent with a flood hazard management plan. Grants may also be used for funding up to 50% of the non-federal share of US Army Corps of Engineers feasibility studies. Proposals for projects that are identified in a CFHMP are given higher priority for FCAAP funds than projects that are not identified in a plan. (Note: Projects identified in comprehensive plans are also more likely to receive funds from other grants sources as well, such as the Hazard Mitigation Grant Program and the Community Development Block Grant Program.)

Emergency Flood-Related Projects – A limited number of grants up to 80% of cost, are available for flood-related work that must be done immediately to protect lives and property. An emergency must be declared by the local jurisdiction and the work must be approved by Ecology. Up to $150,000 is available for all jurisdictions in any one county in addition to non-emergency funds, subject to availability.

Other eligible projects are:

Flood warning systems (state share up to 75% of total project cost)

Bioengineered bank stabilization projects (state share up to 50% of total project cost)

Public awareness programs (state share up to 75% of total project cost)

To obtain funds for flood control maintenance through FCAAP, jurisdictions must prepare a CFHMP that, as discussed in RCW 86.26.15 and Chapter 173-145-040 WAC, accomplishes the following basics. (Note: This is only a brief excerpt of required elements.)

Describes the watershed and identifies flood and erosion problems

Identifies the river's meander belt or floodway

Establishes the need for flood control work

Considers alternatives to instream flood control work

Identifies and considers potential impacts on instream flood control work on the state's instream resources

The CFHMP must also incorporate public participation to develop an understanding of land management, zoning, and potential impacts among private citizens, local and federal governmental agencies, and industry. Furthermore, the CFHMP must establish and prioritize appropriate structural and nonstructural measures to reduce flood damages. The purchase of flood-prone properties or

land to convey floodwaters is an acceptable option provided under Engrossed Substitute Senate Bill (ESSB) 5411, enacted in July 1991. The study area may include the entire watershed or, at a minimum, the 100-year flood plain within a reach of the watershed. The reach must be of sufficient length that a comprehensive evaluation can be made of its flood and erosion problems. The final CFHMP provides the technical guideline for future structural and nonstructural flood hazard management measures (KCM 1995).

State law requires that a CFHMP describe the area and locations of proposed projects and existing flood problems. A complete description of the information that a CFHMP must include is contained in WAC 173-145-040. The law allows up to three years for local authorities to complete and adopt a plan. Applications for project funding under the FCAAP program require the county engineer to certify whether a CFHMP plan has been completed and adopted or is in preparation. Ecology must approve the final CFHMP and the municipality must adopt the plan subsequent to approval (KCM 1995).

Natural Resources Conservation Service (NRCS)

Wetland Reserve Program

The Wetlands Reserve Program (WRP) is a voluntary program. It provides technical and financial assistance to eligible landowners to address wetland, wildlife habitat, soil, water, and related natural resource concerns on private lands in an environmentally beneficial and cost-effective manner. The program provides an opportunity for landowners to receive financial incentives to restore, protect, and enhance wetlands in exchange for retiring marginal land from agriculture. WRP was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill). The Natural Resources Conservation Service (NRCS) administers the program. Funding for WRP comes from the Commodity Credit Corporation.

Landowners and Tribes may file an application for a conservation easement or a cost-share restoration agreement with the U.S. Department of Agriculture (USDA) to restore and protect wetlands. Participants voluntarily limit future use of the land, but retain private ownership.

The program offers three enrollment options:

1. *Permanent Easement.* This is a conservation easement in perpetuity. Easement payments for this option equal the lowest of three amounts: the difference in the appraised fair market value of the larger parcel before the easement is in place and the appraised fair market value of the larger parcel after the easement is in place, an established payment cap, or an amount offered by the landowner. In addition to paying for the easement, USDA pays up to 100 percent of the cost of restoring the wetland.

2. *30-Year Easement.* Easement payments through this option are 75 percent of what would be paid for a permanent easement. USDA also pays up to 75 percent of restoration costs. For both permanent and 30-year easements, USDA pays all costs associated with recording the easement in the local land records office, including recording fees, charges for abstracts, survey and appraisal fees, and title insurance.

3. *Restoration Cost-Share Agreement.* This is an agreement (generally for a minimum of 10 years) to re-establish degraded or lost wetland habitat. USDA pays up to 75 percent of the cost of the restoration activity. This enrollment option does not place an easement on the property.

Continuous Conservation Reserve Program

Environmentally desirable land devoted to certain conservation practices may be enrolled at any time under CRP continuous sign-up. Certain eligibility requirements still apply, but offers are not subject to competitive bidding.

Eligible Producers

To be eligible for CRP enrollment, a producer must have owned or operated the land for at least 12 months prior to close of the CRP sign-up period, unless:

- The new owner acquired the land due to the previous owner's death;
- The ownership change occurred due to foreclosure where the owner exercised a timely right or redemption in accordance with state law; or
- The circumstances of the acquisition present adequate assurance to FSA that the new owner did not acquire the land for the purpose of placing it in CRP.

Eligible Land

To be eligible for placement in CRP, land must be either:

- Cropland (including field margins) that is planted or considered planted to an agricultural commodity 4 of the previous 6 crop years from 1996 to 2001, and which is physically and legally capable of being planted in a normal manner to an agricultural commodity; or

- Certain marginal pastureland that is enrolled in the Water Bank Program or suitable for use as a riparian buffer or for similar water quality purposes.

Additional Cropland Requirements

In addition to the eligible land requirements, cropland must meet one of the following criteria:

- Have a weighted average erosion index of 8 or higher;

- Be expiring CRP acreage; or

- Be located in a national or state CRP conservation priority area.

CRP Payments

FSA provides CRP participants with annual rental payments, including certain incentive payments, and cost-share assistance:

Rental Payments

- In return for establishing long-term, resource-conserving covers, FSA provides annual rental payments to participants. FSA bases rental rates on the relative productivity of the soils within each county and the average dryland cash rent or cash-rent equivalent. The maximum CRP rental rate for each offer is calculated in advance of enrollment. Producers may offer land at that rate or offer a lower rental rate to increase the likelihood that their offer will be accepted.

Maintenance Incentive Payments

- CRP annual rental payments may include an additional amount up to $5 per acre per year as an incentive to perform certain maintenance obligations.

Cost-share Assistance

- FSA provides cost-share assistance to participants who establish approved cover on eligible cropland. The cost-share assistance can be an

amount not more than 50 percent of the participants' costs in establishing approved practices.

Other Incentives

- FSA may offer additional financial incentives of up to 20 percent of the annual payment for certain continuous sign-up practices.