

Nooksack

SEP 10 2015

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PLANNING & DEVELOPMENT

Watershed Vision and Implementation Strategies

Introduction. A number of plans related to floodplains and floodplain management have been prepared for the Nooksack River Watershed. The Comprehensive Flood Hazard Management Plan (CFHMP, 1999) examined flood issues and potential risk reduction options for the mainstem Nooksack downstream of Deming. This plan acknowledged the need to recover healthy salmon populations, including species soon to be listed under the Endangered Species Act, but did not provide specific recommendations on how this would be accomplished. The 2005 WRIA 1 Salmonid Recovery Plan provides the roadmap to recover two populations of ESA listed spring Chinook salmon and other salmonid populations and includes specific habitat protection and restoration recommendations. However, detailed assessments were not available for the river downstream of Deming. Thus, the habitat recommendations are less detailed and the potential interactions between the flood risk reduction system and desired habitat actions were not analyzed. While residential, commercial, municipal, and industrial developments are all present on the floodplain, agriculture is still the main floodplain land-use along the mainstem and lower South Fork.

BENEFITS OF INTEGRATED FLOODPLAIN MANAGEMENT

- ✓ Salmon Habitat and Floodplain Process Improvements
- ✓ Flood Risk Reduction: Rural residential, municipal, agricultural, Lummi Nation and Nooksack Indian Tribal lands
- ✓ Shellfish Bed Protection
- ✓ Agricultural Improvements
- ✓ Water Quality Improvements
- ✓ Understanding of Sediment Dynamics
- ✓ Transportation

Neither plan described above fully incorporates impacts, either positive or negative, of flood risk reduction or salmon habitat recovery actions to on-going agricultural uses or to fisheries resources. This document and the flood plan update scheduled to begin in 2016 provide the opportunity to:

- Refine our understanding of lower river habitat limitations and to develop more specific habitat restoration strategies
- Identify specific on-the-ground habitat restoration opportunities

- Identify how flood risk reduction actions can “integrate” with recovering floodplain ecosystem processes and functions
- Describe how actions for flood and fish can integrate with agricultural activities and how the greatest public benefit to all three might be derived
- Provide a forum for this community to refine how it wants to manage floodplains and to put into place the necessary policies, procedures, actions and the funding to support implementation.

This document was prepared over a three month period by members of the interagency coordination team that was assembled to develop a System-wide Improvement Framework (SWIF), a plan to address levee deficiencies along the river. Much more stakeholder coordination including resolving disparities in the policies and directions of different jurisdictions and interest groups will be needed to turn this somewhat fuzzy vision into a comprehensive plan that addresses the range of issues involved in river management along the Nooksack River. It should also be noted that the WRIA 1 Local Integrating Organization is currently preparing a 5-year Recovery Plan to identify how the Puget Sound Partnership’s Action Agenda is being implemented locally. That plan includes restoration of floodplains and will be completed in fall 2016. It is intended that this document will support that product and will provide a unified “vision” for floodplains.

Watershed Overview. Originating on the flanks of Mount Baker and the Twin Sisters Range in the Mount Baker-Snoqualmie National Forest, the upper forks of the Nooksack River converge near Deming to form the lower Nooksack River. From the confluence of the North and South forks near Deming to its outlet in Bellingham Bay, the lower river flows for approximately 37 miles across a primarily agricultural floodplain.

There are three upper forks that join to form the lower mainstem of the Nooksack near Deming. The North Fork receives drainage from the north side of Mount Shuksan (9,131’) and Mount Baker (10,781’) and flows through forest lands above a relatively confined upper valley and then through a relatively unconfined valley downstream of Maple Falls. This lower reach has some agriculture and rural residential development downstream to its confluence with the Middle Fork about four miles upstream of Deming. The Middle Fork drains forest lands on the southwestern flanks of Mount Baker and the eastern side of the Twin Sisters Range in a narrow valley and then flows through a relatively unconfined rural residential valley in the lower 5 miles. Unlike the other two forks that originate on Mt. Baker and receive glacial meltwater in the summer and fall, the South Fork is not glacially influenced as it originates in the Twin Sisters Range southwest of Mount Baker. From the Sisters, it flows southerly through forest lands in a confined valley into Skagit County, then to the west and north and back into Whatcom County, where the valley widens appreciably near the Saxon area. Commercial forestry is the dominant land-use in the upper South Fork while downstream, the floodplain is intensively farmed with areas of low-density rural

residential development and the community of Acme; few levees are present, though much of the river bank is armored to prevent channel migration.

Below its confluence with the South Fork, the mainstem Nooksack comes out of the Cascade foothills carrying a high sediment load, which is evident in the large braided sections in the lower North and Middle Forks. Downstream of Deming the valley widens and the gradient decreases as the river leaves the mountains and flows to Bellingham Bay. Although the Nooksack only ranks 4th in terms of mean annual discharge, the USGS estimates the annual sediment load for the Nooksack River at 1.4 million tons, the second largest of all the rivers draining to the Puget Sound region. This relatively large sediment volume relates to the river's origins in the steep and unstable North Cascades including the glaciated flanks of Mt. Baker and Mt. Shuksan.

The river flows through Nooksack Tribal lands, then through primarily agricultural lands from Deming down to Bellingham Bay, passing the community of Deming and the cities of Everson, Lynden and Ferndale. It then flows through the Lummi Indian Reservation before discharging to Bellingham Bay. While much of the river is leveed, the levees within the agricultural areas generally allow for overtopping during events as frequent as a 5-year flow (i.e., the flow level with a 20 percent chance of occurring during any given year). Levees adjacent to developed areas generally provide a higher level of protection, although infrastructure is still at risk due to gaps in the protection or lower levee sections upstream that allow flood flows to enter the floodplain.

There are currently 1,948 parcels with improvements and another 1,935 parcels without improvements in the Nooksack River floodplain. There are approximately 18 unmitigated repetitive loss properties and 1 severe repetitive loss property in the basin. However, essentially the entire Nooksack valley is considered at risk to flooding, and many feet of roadway and acres of agricultural lands flood several times a flood season. These numbers reflect parcels that get wet, but lateral river movement, or channel migration, is another process that poses challenges to Nooksack River management.

Channel migration is an important salmon habitat-forming process, recruiting large wood and forming and maintaining critical floodplain habitats including sloughs and side channels. Yet channel migration can also be a threat to existing public and private infrastructure, and is the reason behind many miles of bank armor already present in the forks and the lower mainstem. A critical challenge before this community will be to synthesize the technical data necessary to better understand channel migration processes and then develop a common vision on how to provide for channel migration and its positive ecological benefits while protecting existing public and private floodplain

investments where necessary, and planning for future floodplain development if appropriate.

The floodplains in the lower Nooksack River and its forks support populations of Endangered Species Act listed Chinook salmon, steelhead, and bull trout along with coho, chum, pink, and sockeye salmon, sea-run cutthroat trout.. These are Treaty protected resources of critical importance to the Tribes and to maintaining the quality of life for non-tribal members too. Populations are critically low for many of these salmonid species with recovery of both populations of Nooksack spring Chinook considered essential to delisting of the Puget Sound Chinook salmon Evolutionarily Significant Unit (ESU).

Salmon populations and shellfish growing and harvest areas in Portage Bay (in the southwest corner of Bellingham Bay) and in Lummi Bay have been impacted by the historic and current land use and the correlated effects on river system functions and floods. These changes affect both habitat and water quality. The cumulative effects of upstream management combined with heavy alteration of some reaches of the Nooksack River by the flood control system limits population productivity of the salmonids native to this river system.

Many of the levees along the lower Nooksack River are currently eligible for repair through the U.S. Army Corps of Engineers (USACE) PL 84-99 Program. An interagency coordination team has been assembled to participate in a planning process to address levee deficiencies, reduce flood risk, and generally improve salmon and shellfish habitat; this planning process is consistent with the USACE's System-Wide Improvement Framework (SWIF) policy and should be complete in the spring of 2016. While this process will result in a list of capital projects to address the SWIF goals related to levee deficiencies, the planning process supported by the interagency coordination team will continue and look more broadly at the entire lower Nooksack River floodplain. This effort presents an important opportunity to integrate flood hazard management with salmon recovery which is a key action identified in the 2005 WRIA 1 Salmonid Recovery Plan. When completed, the updated comprehensive flood hazard management plan will more fully and strategically integrate fish, flood, agricultural and other issues and objectives.

The reach numbers noted in the following descriptions are consistent with the reach designation included in the Lower Nooksack River Comprehensive Flood Hazard Management Plan, though two reaches were combined and one reach was subdivided in order to better categorize the reaches with one overall key strategy. The WRIA 1 Salmonid Recovery Plan utilizes finer reach divisions for salmon habitat restoration. Those reaches can be "lumped" together and are consistent with those proposed here.

Establishing a vision for the Nooksack River floodplain is a significant effort. Meaningful progress has been made in the management of the forested upper watershed to minimize additional impacts, yet legacy effects persist in the forks and downstream. The lower Nooksack River watershed is the most heavily altered part of the basin with respect to flood management infrastructure; this reflects the heavy investment in agricultural production and in public and private infrastructure including roads, municipal facilities, and homes. Some of these investments have likely affected the ability of the lower river to support healthy fish runs and thereby impact the tribes' abilities to exercise their treaty rights and non-tribal community members' access to the fisheries resource.

Yet, important progress has been made since the mid-1990s in the areas of salmon recovery, watershed planning, and flood hazard management. When combined with an existing interagency coordination structure, community members within the Nooksack River basin are well positioned to succeed in developing a vision that has broad public support is supported by the local policy makers, and that meets the needs of those dependent on the river and floodplain.

The Impacts of Inaction in the Nooksack River

- Continued risk to human life, property and safety for those living, working, or traveling in the Nooksack River floodplain during high water events.
- Continued decline and potential loss of salmon, char, and trout populations that are at critically low numbers; an inability to de-list the Puget Sound Chinook ESU.
- Continued decline in the ability of Lummi Nation and Nooksack Indian Tribe members to exercise their federally protected treaty rights to harvest salmon and shellfish throughout their entire usual and accustomed (U&A) grounds and stations for ceremonial, subsistence, and commercial purposes.
- Increased challenges to farming the floodplain associated with poor drainage and uncertainty regarding the state of the flood control system
- Uncertainty regarding the flood control system as some approaches in the 1999 CFHMP may no longer be the best option available or would be difficult to permit or mitigate in today's regulatory environment.
- Continued delay in the recovery of all salmonid populations and the associated economic and cultural impacts to the Lummi Nation and Nooksack Indian Tribe and to the non-tribal fishing community, both commercial and sport.
- Continued conflicts between agriculture and salmon and between salmon and other land uses.
- Continued water quality impacts to shellfish beds including downgrades and closures and economic impacts to those community members who depend on shellfish harvest for commercial, ceremonial, and subsistence purposes.
- Economic impacts associated with development in the floodplain.

For the purposes of the Nooksack River watershed vision, the river can be divided into 6 reaches.

Reach 1: Bellingham Bay to Interstate 5 in Ferndale (RM 0 to 6.5)

Reach 1 Overview:

- **Fish:** The lower river and estuary is the upstream and downstream migration corridor for all Nooksack salmon and provides essential habitat for rearing juvenile and smolting salmon that are leaving the river and making the transition to salt water. Adult salmon returning to reach spawning grounds up-river all pass through this reach. This reach is an important harvest area for the Lummi Nation and the Nooksack Indian Tribe.
- **Flood:** Assessed value of over \$320 million subject to flood risk including two water treatment plants, a wastewater treatment plant, an industrial water supply intake for the Cherry Point Heavy Impact Industrial Zone and developed areas in the City of Ferndale and on the Lummi Indian reservation
- **Agriculture:** 1,240 acres of farmland subject to relatively frequent flooding (approximate 10-year flood) when the right bank levee overtops

This reach extends from the bridge at Interstate 5 in Ferndale, downstream to the river's mouth in Bellingham Bay. The total area of the floodplain within the reach is approximately 9,600 acres, with an assessed value over \$320 million. For the first three-quarters of a mile, between I-5 and Main Street, the river flows through an un-leveed reach within the City of Ferndale; residential and commercial development and a golf course are within this section of floodplain. Downstream of Main Street, the river is leveed along most of its length except a short stretch in Hovander Park; the level of protection provided by the levee varies throughout the reach. Ferndale operates a water treatment plant and a wastewater treatment plant, and the Public Utility District No. 1 of Whatcom County has a water intake and treatment facility in the floodplain in this reach, all are at risk of flooding due to an area with lower protection on the right bank. The right (west) bank levee system also reduces flood risk to the Lummi Indian Reservation and the Silver Reef Hotel, Casino and Spa, a mini-mart, and a gas station, the main access route to the Lummi Island Ferry, a number of residences, and several thousand acres of agricultural lands. The left (east) floodplain is flooded much more frequently than the right floodplain, affecting Slater Road, a major arterial, the town of Marietta and Marine Drive a secondary east-west access to the Lummi Indian Reservation and Lummi Island. Where present, the levees limit riparian forest, affecting important functions including large woody debris recruitment potential and shade, instream habitat diversity and complexity, and channel movement that form and maintain habitat.

The Lummi River is a former distributary channel near RM 4.5 . A failing culvert at its head controls the amount of flow getting to the the Lummi River. In the long-term there is interest in restoring this connection to facilitate outmigration of spring Chinook and other salmonids smolts to the productive rearing habitats in Lummi Bay. However, existing poor water quality in the Nooksack River has resulted in the closure of shellfish growing areas in Portage Bay along the western edge of Bellingham Bay. Consequently, the Lummi Nation is concerned that the existing poor water quality in the Nooksack River, will also adversely affect their shellfish operations in Lummi Bay. Water quality improvements are needed prior to restoration this connection to estuary habitats.

The Lummi Nation has acquired approximately 593 acres within the right (west) floodplain in this reach, both on and off the reservation for ecological restoration, development of a wetland and habitat mitigation bank, and for commercial purposes. Land acquisition efforts for restoration, wetland and habitat mitigation banking, and commercial purposes within the right floodplain continue. The Washington Department of Fish and Wildlife owns 600 acres in the left (east) floodplain between Slater Road and Marine Drive. Whatcom County's Hovander Park covers 350 acres including over a mile on the left bank upstream from the Washington Department of Fish and Wildlife property providing almost 4.5 miles of riverfront in public ownership on the east side of the Nooksack River.

The Nooksack River delta is one of the fastest growing deltas along Puget Sound and has prograded over a mile and a half into Bellingham Bay since the first reliable maps were made in the 1880's. Sedimentation and wood transported to and deposited within the lower part of this reach poses several challenges for the Lummi Nation. Several of the primary channels used by fishermen both for navigation and to harvest salmon have become too shallow and snag-filled, resulting in severely limited fishing opportunities and overcrowding of the sites that are still accessible. In addition, sedimentation of the channel near the Lummi Nation's freshwater intake just downstream of Marine Drive impedes their ability to draw water for their aquaculture operation in Lummi Bay.

Although the main channel has been simplified upstream of Marine Drive with its associated simplification, disconnection, and loss of salmon habitat, the delta growth has created diverse aquatic and terrestrial habitats downstream where the delta is largely unimpeded and able to function naturally. Here the network of distributary channels is flanked by riparian forest that transition to scrub/shrub habitats and then to intertidal habitats at the bay. This channel network provides instream cover for upstream migrating adult salmon and essential transitional habitats for smolts that can spend either brief or extended periods rearing and feeding in areas with the appropriate salinity to grow and to make the adjustment to salt water. The intertidal habitats on the delta front also provide key foraging and nesting areas for waterfowl and shorebirds. It is also important to note

that the lower Nooksack River, including this reach, also supports longfin smelt spawning. These smelt are known locally as “hooligans” and are fished when abundances permit.

MODIFY

Strategies and Outcomes.

Reach 1 Key Objectives:

- **Fish:** Improved floodplain habitat forming and maintaining processes and access to and restoration of historic instream, floodplain and delta habitats
- **Flood:** Improved flood protection and/or risk reduction for existing developed areas and public infrastructure in and near Ferndale and on the Lummi Indian Reservation
- **Agriculture:** Flood risk reduction for agricultural lands and protection from non-agricultural development while improving the ability to farm by implementing appropriate flood protection and drainage management. Find “win-win” opportunities that maintain a viable agricultural land base while accommodating habitat restoration and flood hazard management on current agricultural lands.

The Lummi Nation has invested heavily in the right bank floodplain of this reach through the acquisition of properties for restoration and mitigation banking purposes. Currently approximately 431 acres are in restoration and 1945 acres will be in the mitigation bank when all phases of implementation are completed. This on-going investment and the commitment by Lummi creates additional opportunities to collaborate on projects that may yield greater flood and habitat benefits than if partners were to work individually.

Most of the left floodplain within this reach is currently in public ownership by Whatcom County Parks and WDFW; and current planning efforts are evaluating removal or lowering of portions of the left levee to improve floodplain connectivity over approximately 600 acres and restore the upstream zone of tidal influence. While this may result in storage of fine sediment in the floodplain, concerns that drawing more water out of the mainstem into the floodplain may reduce fisherman navigation and spur channel aggradation will need to be addressed before this can be implemented. In addition, completion of voluntary acquisition of flood prone properties in the Marietta area and elevation of Slater Road through the left floodplain will need to be completed before left bank floodplain reconnection can begin in earnest.

Modifications to the right bank are also being evaluated and include a minor setback and improvement to the levee near the three treatment plants at Ferndale to improve flood protection and several possible realignment of the lower 1 to 1.3 miles of levee to reconnect 400 to 800 acres of floodplain including lands both on and off the Lummi Indian Reservation. Voluntary acquisition of some additional properties may be needed to

facilitate setback of the lower levees and the current transportation corridor represented by Ferndale Road will need to be retained or replaced. Reconnection and improvements to the Lummi River are also being considered to provide channel maintaining flows, provide for juvenile outmigration to Lummi Bay and to maintain instream habitat, although water quality of the Nooksack River and the low flow navigation challenges for Treaty fishers below the confluence must improve before this can move forward. A clean water initiative involving local, tribal, and state governmental representatives is currently underway to address the water quality issues impacting shellfish and, ultimately, our ability to restore ecological flows to the Lummi River. Opportunities also exist to provide instream structure, such as engineered log structures to improve instream habitat conditions within the existing levees where setback or removal are not viable options and where this habitat benefit can be realized and not be in conflict with the exercising of treaty fishing rights.

Each of the right bank levee realignment and restoration options will involve altering or removing existing agricultural lands from production to some degree. Loss of the agricultural land base to many stressors is a challenge in Whatcom County and is not unique to this reach. Funding for tools, such as purchase of development rights, that can help maintain the land base available for agriculture in the long term while facilitating habitat restoration is needed. This also applies to other tools that can be implemented to help maintain the operability of individual farms and provide management certainty for such issues as drainage maintenance.

The estimated cost for this river reach is \$63 – 71 million

Reaches 2 and 3: 1-5 in Ferndale to Everson Bridge (RM 6.5 to RM 23.6)

Overview of Reaches 2 and 3:

- **Fish:** These reaches provide spawning habitat for steelhead, chinook, chum, and pink salmon and rearing habitat for all species. The reaches are also the migration corridor for all adult Nooksack salmon moving to upstream spawning areas, and are used by juvenile salmon prior to and during their migration to salt water. Floodplain wetlands provide essential coho overwintering habitat.
- **Flood:** Overtopping levees provide protection during the growing season to primarily agricultural lands, the Lynden water and wastewater treatment plants and the Everson wastewater treatment plant. Access to the PUD No. 1 water intake near Trigg Road is affected by overtopping flows that enter the right bank (north) floodplain.
- **Agriculture:** These reaches have intensive agricultural use of the floodplain including dairies with associated pasture or silage corn fields and an increasing shift

from dairy related crops to berries, which are higher value but more capital intensive and prone to flood damage.

From State Route 544 (Everson Road) in Everson, the mainstem flows through an intensively agricultural floodplain for ~8 miles to State Route 539 (Guide Meridian) and then for an additional 8.4 miles to Interstate 5. The floodplain ranges in width from about a mile to as much as four miles wide and includes approximately 13,137 acres. The levees are close to continuous through this reach, but many have been designed to provide protection during spring runoff and the growing season and to overtop during larger fall and winter floods. Typically the farm infrastructure is located on the higher ground, and while still subject to flood damages, they are less susceptible than the crops. Historically much of the farmland has been used for dairies and production of dairy feed; activities which could handle some flooding with little damage. However, recently many fields in the floodplain are being converted to grow raspberries and blue berries, some immediately adjacent to overflow levees. These conversions from annual to perennial crops will likely result in increases in damage to crops and to capital improvements such as irrigation and crop supports and the associated pressure to raise levees that currently overtop.

Public infrastructure within the reach includes numerous roadways, many of which are flooded frequently. and Everson's wastewater treatment plant and Lynden's water and wastewater treatment plants are located in the north floodplain while PUD No. 1 of Whatcom County operates an industrial water intake at river mile 9. The levee system has contributed to and maintained a shortened and simplified single channel with limited instream and riparian habitat diversity and complexity for salmonids and for riparian dependent species. Salmon use of this reach includes spawning by steelhead, chum, pink, and fall Chinook, rearing by juveniles of all anadromous salmon species including those that stay in the river for a year or more after hatching, and for those salmon migrating and holding on their way to spawning areas or while heading downstream to marine waters. These uses are likely diminished below historic levels due to logjam removal, riparian vegetation clearing, floodplain wetland drainage, habitat simplification, reductions in channel length and loss of connectivity to floodplain habitats such as off-channel areas and wetlands.

MAINTAIN/MODIFY

Strategies and Outcomes.

Key Objectives for Reaches 2 and 3:

- Fish: Improved processes that form and maintain floodplain habitats such as side channels and sloughs and functional riparian areas. Increased connectivity of floodplain habitat, enhanced riparian condition, increased ability of the river to

access its channel migration zone, and increased quantity and distribution of in-stream cover.

- Flood: Predictable flooding, levees designed to overtop without failure, and improved conveyance and local flood protection measures within the overflow corridors behind the levees. Assess overflow corridors for impacts on salmon and identify actions to avoid impacts or produce a net gain for salmon.
- Agriculture: Improve protection of agricultural lands from non-agricultural development while improving the ability to farm by implementing appropriate flood protection and drainage management during the growing season. Find “win-win” opportunities that help to maintain a viable agricultural land base while accommodating restoration and flood hazard management.

The main flood strategy currently identified for this reach is to improve the functioning of the flood control system by reinforcing and potentially lowering overflow levee segments and raising segments adjacent to significant infrastructure. Within the overflow corridors, local flood protection measures may be needed to reduce existing damages and mitigate the effects of lowering overflow segments. Throughout much of the reach, manmade levees, often built on top the “natural” levee, run next to the river, with farm land extending to the landward side at the base of the levee. The constructed levees limit riparian functions and habitat forming processes. Constructing overflow segments and designating overflow corridors has been identified in the flood plan as an important action to reduce flood risk without large impacts to floodplain agriculture. However, this approach has not been evaluated for effects on salmonids.

This reach may currently present limited opportunity for habitat restoration due to the high intensity agricultural use adjacent to the river and the extensive levee and bank revetment network. It is anticipated that the detailed geomorphic and habitat assessments to be done in the next couple of years may identify opportunities for limited (portions of reaches, not whole reaches) levee setbacks at strategic locations such as along floodplain tributaries, tributary confluences with the mainstem, along the insides of bends or where a broad natural levee exists and where a levee setback could support a more functional riparian zone along the river. Assessment results that demonstrate the benefits of possible actions along with having financial tools in place for programs, such as purchase of development rights or easements, will be essential to support the landowner outreach necessary to accomplish floodplain projects in this reach.

Near-term habitat improvements in this reach that are more likely to gain landowner support are localized projects like improving fish passage at flood gates to enable access to historic floodplain rearing habitats in small tributaries and floodplain wetlands, increasing

instream complexity in floodplain tributaries and where the tributaries join the mainstem, and limited restoration of riparian cover along the mainstem and tributaries. There are also some opportunities to improve the distribution of instream cover through wood structures to provide adult holding spots and provide rearing habitat juveniles. Fish stranding (adults and juveniles) and habitat connectivity in the overflow areas will be key challenges to address during overflow design and implementation. The near-term actions listed above can provide solid incremental improvements for salmon and their habitats. Yet, the more difficult challenge and vision we, as a diverse community, must still develop is this: how and where can we provide not just the habitat structure that salmon need, but how do we restore the physical and biological processes that will form and sustain river and floodplain salmon habitat into the future?

As with Reach 1 and upstream reaches with floodplain agriculture, conversion of agricultural lands to non-agricultural development affects the total land base available to support a healthy agricultural community in Whatcom County. And yet conversion of floodplain areas from fish habitats to other uses has contributed to the severe decline of salmon productivity and the fisheries that were historically supported. Community and landowner outreach and the availability of appropriate tools, such as purchase or purchase of development rights or conservation easements and the funding to back it up will be essential to as flood and habitat restoration actions are refined and where potential conflicts with agriculture are encountered. Our ability to find “win-win-win” solutions as we move forward will be essential to our success as a community in Reaches 2 and 3.

Please note that the interagency coordination team decided to classify this reach as “Maintain/Modify” to reflect that the current strategy is focused on maintaining the existing infrastructure and implementing near-term projects that provide localized habitat improvements, while recognizing that once additional technical work and assessments are complete, larger scale projects may be identified for the long-term that also are able to address habitat forming processes.

Lower Reach 4: Nugent's Corner to Everson (RM 23.6 to RM 31.0)

Overview of Lower Reach 4:

- **Fish:** The mainstem, side channels and several floodplain tributaries provide salmon spawning for Chinook, steelhead, chum, and pink salmon and provide rearing habitats for all anadromous species. The mainstem also provides a migration corridor for all upstream and downstream migrating salmon, trout, and char.
- **Flood:** Overtopping levees provide protection during the growing season to primarily agricultural lands. Levees also protect a large portion of downtown

Everson. Basin divide to the Everson-Sumas overflow corridor through the Sumas River valley is within the reach

- Agriculture: Intensive agricultural use including dairies and an ever-increasing amount of berries

Downstream of the Mount Baker Highway (SR 542) in Nugent's Corner, the river is a multi-thread channel for most of the reach to Everson Road (SR 544) in Everson. Approximately a mile upstream of the Everson Bridge, a levee and revetments constrain the river as it crosses an oil pipeline and funnels the river towards the bridge. At this location floodwaters overtop the high ground divide on the right bank and flow north through Everson, then through the Sumas River valley to Sumas, and then into Canada. This occurs at a flood magnitude of approximately a 10-year event. Flood damages resulting from the 1990 flood were estimated at over \$7 million just within the Everson-Sumas overflow corridor (CFHMP, 1999) which is considered a separate reach (Reach 5) but is technically outside the Nooksack River drainage basin and flows to Canada. An added complexity is that the "Everson Overflow" reduces flooding and flood damages farther downstream in the mainstem Nooksack, but is detrimental to salmon as those carried with the overflow are routed to the Fraser River. Reducing the frequency and volume of these overflows would be beneficial to Nooksack salmon populations.

Along most of the reach the river can migrate laterally within a half mile wide corridor, though historically revetments have been constructed along the margins of the channel migration zone to protect adjacent agricultural operations. Most of the farmland in this reach is located on historic terraces and are higher than the current 100-year flood level; flood control efforts have focused on limiting channel migration rather than constructing levees. Over the past few years, one berry farmer lost approximately 7 acres of prime berry ground to river migration at a location where the migration corridor narrowed due to a revetment that has been reconstructed numerous times over the years. Residential and commercial development is located within the floodplain at the upstream end of the reach in Nugent's Corner and at the downstream end of the reach in and around Everson. In the middle of the reach the floodplain is generally comprised of woody vegetation except where it spills out into farmland in a few locations.

This reach marks a transition from a channel pattern with multiple channels and relatively stable forested islands to the single thread channel that predominates downstream of Everson. Historically, this channel pattern supported relatively stable side channels used by salmon for spawning and rearing and with ample riparian shading and good water quality. Currently the reach continues to provide many of these attributes, but generally habitat is less plentiful, less stable, and of lower quality. There are indicators that this reach has incised over historic time into the glacial outwash terrace and old Nooksack

deposits through which it runs lessening the frequency of overbank flow to the Sumas River. This incision reflects decreased habitat diversity, such as pools formed by stable log jams, as well as increased volumes of flood waters that can scour redds and cause habitat to “turn-over” at a greater rate. Smith Creek and Anderson Creek flow along historic Nooksack River channels providing important spawning and rearing habitats and migration corridors to upstream spawning habitats.

PROTECT

Strategies and Outcomes.

Key Objectives for Lower Reach 4:

- **Fish:** Maintain and increase side channels, sloughs, and stable forested islands and the ability of the river to migrate within established channel migration limits to form and maintain instream habitat while increasing the habitat diversity in the mainstem, side channels, and floodplain tributaries. Improve riparian conditions.
- **Flood:** Maintain flow split at Everson Overflow until an alternative strategy is developed, establish limits on channel migration based on river process and habitat function and protect development near the Cities of Everson and Nooksack and unincorporated area at Nugent’s Corner
- **Agriculture:** Protect prime farmland from channel migration outside of established limits and non-agricultural development. Find “win-win” opportunities that help to maintain a viable agricultural land base while accommodating restoration and flood hazard management.

The river is incised into a post-glacial surface within this reach and has progressively disconnected from much of its historic floodplain. Yet lateral migration through time has produced a meander corridor that is almost large enough to convey the 100-year flood. Localized measures to protect the developed areas at both ends of the reach would reduce flood damages and could be implemented with little impact to habitat.

Along most of the reach, the migration corridor is likely wide enough to support habitat-forming processes although the riparian areas do not currently provide the size and numbers of trees needed to provide for adequate recruitment of functional wood to the channel. Protection of existing habitat processes and strategic restoration work at key locations to improve instream habitat diversity and complexity and riparian stand function are needed. Establishing clear limits on where channel migration will be allowed in the future and where action will be taken to retard migration will provide some confidence to salmon interests and fishers that their needs will be met and to adjacent property owners, that their farmland will be protected. As with Reaches 2 and 3, detailed geomorphic and habitat assessment work is in the process of happening and will identify specific habitat limitations and restoration actions.

As touched on above, the current strategy to maintain the existing flow split does not address flood damages along the Everson-Sumas overflow corridor, but it also does not increase damages along the Nooksack River downstream of Everson. Through ongoing work and coordination among members of the Nooksack River International Task Force, which includes agency representatives from both sides of the international border, additional alternatives continue to be investigated. These alternatives should include an evaluation of the potential impacts, or benefits, to salmon that might result.

Upper Reach 4: Deming to Nugent's Corner (RM 31.0 to RM 37.4)

Overview of Upper Reach 4:

- **Fish:** The mainstem, side channels and small floodplain tributaries provide salmon spawning and rearing habitats while the mainstem also provides a migration corridor for all upstream and downstream migrating salmon
- **Flood:** Discontinuous levees provide limited flood and avulsion protection to the town of Deming and downstream agricultural and residential properties
- **Agriculture:** Various crops including Christmas trees, berries and forage grass

The lower river comes out of the Cascade foothills carrying a high sediment load, which results in significant channel migration near the town of Deming where the gradient decreases. Levees in this reach are not connected to each other, so much of the floodplain is still accessed by the river during relatively frequent floods (~10-year event), though channel migration is limited by armored levees. The floodplain is approximately 1516 acres and there are 115 properties with improvements. Sewage treatment facilities and the bus barn for the Mount Baker School District, a drain field and offices for the Nooksack Indian Tribe and the Nooksack River Casino are located behind a levee that has inadequate protection near Deming. An added complexity is that the Burlington Northern Santa Fe rail line passes through this reach (and Lower Reach 4) and is protected by or forms the levee in places. Downstream, the river has been confined to the valley wall along the north side of Stewart Mountain, where deep-seated slope failures introduce high volumes of fine sediment and at times have blocked the river flow de-watering salmon habitat downstream and increasing the risk to residences and commercial development across the river along SR 542 near Nugent's Corner.

The levees and bank protection built within the historic occupation area of the river have severely limited the channel migration area of the river and reduced the river's ability to form and maintain functional spawning and rearing habitats and have disconnected the main channel from historically accessible and functional side channels, off channel habitats, and floodplain tributaries. These constraints limit spawning and rearing opportunities and likely lower survival of salmon eggs once they have been placed in the gravel. The right

bank hardening limits riparian functions and increases the rate at which forested gravel bars and islands “turn over” and lose maturing trees during moderate to large flood events.

The close proximity of the levees to the channel has increased the frequency of repair of the levee system and increased the habitat impacts and maintenance costs in the reach beyond that experienced in other Nooksack reaches with respect to both total expenditure and high ratio of flood expenditure to assessed value of lands protected. The current levee system in this reach has evolved over decades with construction supported by a combination of Federal (Soil Conservation Service, FEMA and the USACE), State and local (FCZD and Diking District #2) funding.

NOT DETERMINED

Strategies and Outcomes.

Key Objectives for Upper Reach 4:

- **Fish:** Reconnect stable side channels and tributaries and foster stable forested islands while increasing instream habitat diversity in the mainstem, side channels, and floodplain tributaries, ultimately leading to restoration of floodplain and riparian processes. Establish channel migration limits that protect and restore floodplain processes.
- **Flood:** Establish reasonable limits on channel migration, prevent right bank avulsion and improve flood protection to developed areas in and around Deming and Nugent’s Corner
- **Agriculture:** More reliable flood protection throughout the growing season and protection of agricultural lands from non-agricultural development. Find “win-win” opportunities that help to maintain a viable agricultural land base while accommodating restoration and flood hazard management.

The main flood strategy in this reach is to limit right bank overflows between Deming and Nugent’s Corner where the avulsion potential is high and current flood protection is insufficient to protect existing infrastructure. Design of improvements to the Deming Levee is underway to better protect the public and private infrastructure in the Deming area; construction is planned for 2016. Several alternative levee configurations from the Deming levee downstream to Nugents Corner are being evaluated through the SWIF planning process, ranging from a significant setback of the majority of the levee system to connecting the existing levees with a combination of rock and wood revetments. At this point, there is no clear consensus on what direction the final strategy will head. The CFHMP notes that the cost for flood damage repairs within both upper and lower Reach 4 is the highest of all the reaches, while the assessed value is the lowest.

The main habitat strategies in this reach are to restore the river's access to a functional portion of the historic channel migration zone. This will allow historic side channels to be reconnected and a functional riparian zone to become re-established. Currently, floodplain turnover is so rapid that trees are unlikely to grow to maturity and provide the full range of habitat benefits that are needed. This action will also increase the length of time forested islands remain relatively stable and able to retain sediment and trap mobile wood while providing edge and side channel habitats, shade, bank integrity, and long-term woody debris recruitment potential.

The estimated costs for the alternatives being evaluated under the SWIF range from \$30 million to \$60 million; the cost of future repairs to the existing levee configuration over the next 50 years is estimated to be on the order of \$50 million.

Disclaimer for Upper Forks Descriptions: A structured planning process with supporting technical analyses to evaluate flood hazards and alternative solutions has not yet been initiated for the upper forks of the Nooksack River, although extensive habitat assessment work and planning has been completed. As such the descriptions below are not as developed with respect to flood hazard mitigation and are likely more descriptive of the habitat goals in the basin. Detailed work on the Glacier/Gallop Creek system and Canyon Creek, tributaries to the North Fork, have been completed to support the integrated plans developed and being implemented in those basins.

North Fork (RM 37.4 to RM 59.0) and Middle Fork (RM 0 to RM 5.0)

Overview of North and Middle Forks:

- **Fish:** The North and Middle Fork mainstems, stable side channels and floodplain tributaries provide salmon spawning and rearing by all species, and adult holding habitats. The WDFW Kendall Creek facility is a key to the hatchery North/Middle Fork spring Chinook population supplementation program.
- **Flood:** Discontinuous bank armor and a few levees provide limited flood and avulsion protection to state and county infrastructure and to private property including homes, recreational properties, and agricultural lands.
- **Agriculture:** Various crops including Christmas trees, pasture, and horse farms reflect the agricultural activity present in these two forks.

The North and Middle Forks both originate at glaciers on Mount Baker (both forks) and Mount Shuksan (North Fork) and the adjacent high relief areas of the North Cascades. This steep terrain produces relatively high sediment loads that are delivered from the steep tributaries to lower gradient and less constrained valley bottoms. Flood management structures are limited and discontinuous and most have been installed to limit channel

migration to protect rural residential or recreational development or state and county roads.

Alluvial fans present a special challenge to flood risk management in the forks as they provide relatively flat, well drained ground that has been attractive for development. Recent work has provided a better understanding of the risks inherent to alluvial fans, but properties platted in the 1960's and 1970's present a legacy of development not easily protected from alluvial fan hazards including floods and debris flows. Whatcom County and its partners have done alluvial fan risk reduction through property buy-outs and levee setback (Canyon Creek). Streamside levees are in place along lower Glacier Creek adjacent to the Mt. Baker Rim development and the community of Glacier; another is present at The Glen at Maple Falls to protect their recreation facility (pool, clubhouse, etc.) and water supply well.

WSDOT has analyzed chronic environmental deficiencies, many related to the Mt. Baker Highway (SR 542) and located within the active channel migration area of the North Fork. Bank armor and rock "barbs" are present in multiple locations to protect the road until longer term solutions are implemented under the CED program. Whatcom County has installed bank armor to protect roads and bridge footings and relocated a section of Mosquito Lake Road several years ago where the Middle Fork had avulsed and eroded to the road shoulder.

The Williams pipeline crosses the North Fork about 0.4 miles upstream of the SR 9 bridge. The pipeline company is concerned with riverbed scour exposing this high pressure natural gas pipeline and is planning large wood structures to protect the northern floodplain while plans are finalized and permitted to bury the pipeline below projected scour depth. If buried deeply enough and for a great enough length, the need for other pipeline protections within the floodplain will be less and will provide for a larger suite of future flood management and salmon recovery opportunities and actions in this reach.

Habitat has been altered by past land use including commercial logging of the hillsides and of the riparian forest on the floodplain including clearing for agriculture or residential uses. The removal of large trees of the size to provide habitat functions has reduced habitat complexity and diversity in the tributaries and the wood present tends to be relatively small and mobile. This has decreased the number of stable log jams that are present to maintain forested islands and the associated stable side channels. Stable side channels provide greater egg survival for spawning chinook, steelhead, chum, pinks, coho, and sockeye) in comparison to relatively unstable channel braids that shift frequently and where salmon redds are likely to be scoured or buried.

Water temperatures are also high in many of the tributaries where they cross the floodplains of both the North and Middle Forks often occupying former mainstem channels.

Historic loss of riparian cover from logging or clearing for development, instream wood removal, and increased sediment loads have created relatively wide and shallow channels in places which are subject to increased exposure to the sun and heating of the water producing stress or mortality to both adults or juvenile salmonids.

Many tributaries are also subject to low flow or even complete dewatering in the lower reaches where they enter into and cross the floodplains of both forks. Often this occurs in the lower reaches where the creek crosses its alluvial fan and where multiple natural and anthropogenic factors, such as dredging to maintain flood conveyance at bridges, likely exacerbate the frequency and duration of low to no flow. The City of Bellingham Middle Fork water diversion is used to supplement water levels in Lake Whatcom where the city's municipal water intake is located. The City has modified its dam operation substantially in the last 20 years to help protect spring Chinook and other salmonids during critical flow periods such as late summer Chinook spawning or spring steelhead spawning. However, the diversion dam was constructed in the early 1960's without fish passage; the diversion dam is identified as the highest priority fish barrier in WRIA 1 with the potential to reconnect over 16 miles of historic anadromous habitat if passage is provided. Bellingham is currently evaluating their water supply infrastructure and water needs. Once that evaluation is complete, they will discuss the water supply and fish passage options they would like to pursue with the salmon co-managers and others.

IMPROVE

Strategies and Outcomes.

Key Objectives for the North and Middle Forks:

- **Fish:** Provide stable floodplain hard points (constructed log jams) to reduce frequent channel shifts and increase available stable side channels for spawning. Increase stable side channel length, riparian function, and forested island size and longevity while increasing habitat diversity and complexity in the mainstem channels of the forks and floodplain tributaries. Establish channel migration limits that protect and restore floodplain processes. Restore fish passage at the Middle Fork diversion dam.
- **Flood:** Reduce future needs for flood risk management through development review and conditioning and through public outreach and education for risk avoidance. Identify opportunities to setback, elevate, or remove existing levees and roads within a yet-to-be-established channel migration zone as part of an integrated risk reduction and salmon habitat recovery approach.
- **Agriculture:** Minimize loss of active agricultural lands outside the established channel migration zone and projected lateral river erosion and migration area.

The main flood strategy in the forks is to systematically reduce risk by setting public infrastructure back from river and alluvial fan hazards. This is combined with public education and outreach and through development permit review and conditioning to encourage private parties to avoid high risk areas. Acquisition of high risk properties and removal of existing homes along lower Canyon Creek enabled the removal of a levee and construction of a setback structure that reconnected the historically most active portion of the Canyon Creek alluvial fan. This should lower future flood risk while restoring habitat forming processes in a key stream used by spring Chinook, steelhead, and bull trout. WSDOT replaced the Boulder Creek bridge in 2008 to provide greater conveyance of future clearwater and sediment-laden floods which in the past had buried the old bridge that dated to the 1930's. They have done similar work in the community of Glacier installing a higher and wider bridge over Gallop Creek and buying out flood-prone properties adjacent to the highway. This is part of a larger project to install a much longer bridge over the active channel of Glacier Creek and the fan areas of both Glacier and Gallop Creeks.. That project and associated elements (land acquisition, water supply pipeline relocation, Gallop Creek west levee setback, Glacier Creek left bank levee removal, USFS Glacier Service Center flood protection) are not currently fully funded but will remove a major channel constriction and restore salmon habitat forming processes once completed. Local, state, tribal, and federal partners are currently working together to assemble the funding necessary for this comprehensive flood risk reduction and salmon habitat recovery project to move forward. WSDOT's Chronic Environmental Deficiency analysis of the Mt. Baker Highway corridor in the North Fork has identified multiple other locations where the highway has constrained the floodplain and could be relocated away from areas where the river consistently migrates to or floods.

The WRIA 1 Salmonid Recovery Plan and its associated restoration strategies provide a detailed set of recommended restoration actions by reach for both the North and Middle Forks of the Nooksack River. The strategies promote actions that protect properly functioning habitats and which restore the physical and biological processes necessary to form and maintain properly functioning habitats. These actions target increases in habitat diversity and complexity for both mainstem areas and tributaries and promote the formation and retention of stable mainstem forested islands and side channels. WRIA 1 salmon recovery partners have been actively implementing projects keyed to the actions such as the already completed or planned installation of over a hundred engineered log jams in the North Fork between the SR 542 bridge at Warnick downstream to Kendall with more habitat restoration projects planned for the coming years pending funding. Flood and erosion risks are considered in restoration project design and projects often incorporate features which address flood and erosion problems experienced by riverfront landowners.

In addition, the salmon co-managers have run a spring Chinook hatchery supplementation program in the North Fork since 1980 that targets increasing the number of wild Chinook pending the ability of the habitat to provide survival at a level for the population to once again be self-sustaining and able to support a fishery.

To date the salmon recovery partners working in the North and Middle Forks have had a successful history of working with agricultural landowners to accomplish critical restoration projects while providing value to the farmer, such as slowing bank erosion. These successes can help to promote participation by other landowners in future projects.

South Fork (RM 0 to RM 14.3)

Overview of the South Fork:

- **Fish:** The mainstem, stable side channels and floodplain tributaries provide salmon spawning and rearing habitats for Chinook, steelhead, chum, coho, pink salmon and steelhead and rearing for bull trout. It is also critical adult holding habitat for spring Chinook, summer run steelhead, and adult bull trout and a migration corridor to the upper anadromous extent for all naturally spawning salmonids. The South Fork spring Chinook captive brood population recovery program is based at the Lummi Nation's Skookum Hatchery and is an essential part of the WRIA 1 Salmon Recovery Plan's strategy to recover the South Fork population of spring Chinook salmon.
- **Flood:** Substantial but discontinuous bank armor and a few short levees provide some flood overflow and erosion protection to state and county infrastructure and to private property including farms, homes and recreational properties, and the community of Acme. Rock bank armor has been removed and replaced with engineered wood structures at several locations in recent years.
- **Agriculture:** Two dairies and acreage providing dairy feed (pasture and corn) along with Christmas trees, berries, and diversified small acreage farms are located on the South Fork's floodplain and reflect the mix of agricultural and rural residential activities present in the South Fork.

The South Fork originates on the east flank of the Twin Sisters Mountain Range, flows south into Skagit County where it bears westerly and eventually to the north and back into Whatcom County and the South Fork valley. The watershed upstream from Skookum Creek (RM 14.3) flows through federal, state, and commercial forest lands. Structural impingements on the floodplain within forest lands is limited to several forest road bridge approaches that are armored against erosion and scour and minor bank armor that was installed historically to protect private inholdings with cabins. The primary inholding at Elk Flats was recently purchased by Whatcom Land Trust, the buildings have been removed and the bank armor may be removed as part of future restoration work.

The South Fork enters a widening valley with increased agriculture and rural development downstream of Skookum Creek. Bank armor and the occasional levee have historically been installed to protect county and state roads and bridges, the Burlington Northern Santa Fe (BNSF) rail line, the City of Bellingham's Middle Fork water supply pipeline, the Williams natural gas pipeline, and the community of Acme, as well as agricultural lands. Generally, the bank protection has been installed at the edge of the historic migration zone in response to a period of active erosion, although there are a few exceptions, such as the City of Bellingham water pipeline, where bank protection has isolated historic river channels from the main channel. In recent years rock has been replaced at some locations with engineered log jams to mitigate flood hazards while improving instream habitat and new bank work done by the county has used "soft" engineering designs where possible. The new Potter Road bridge will improve flood conveyance over that provided by the old bridge. Some bank armor and levees, such as the right bank levee upstream from Bellingham's pipeline, may no longer be needed and could be lowered or removed in the future if the private landowners affected are in agreement. In contrast, the BNSF has continued to add rock armor where the railroad embankment is right next to the river and blocks channel migration. Numerous tributaries form alluvial fans where they enter the South Fork's floodplain. This creates an added flood issue in this reach due to the presence of state and county roads, homes, farms and on the Jones Creek's fan, the Acme community including residences, an elementary school, store, church, and fire hall.

Habitat upstream of Skookum Creek (RM 14.3) has been impacted by historic logging of the valley bottom and hillsides and the consequent increase in management related landslides from forest roads, clear cuts and from areas adjacent to the channel. Management related landslides routed sediment to the channel that filled in pools and caused channel widths to more than double in places. This produced a loss of instream habitat complexity and diversity (e.g. more glides, less pools and riffles) and contributed to increased water temperatures as the trees remaining could no longer shade a shallow, wide channel. Ironically, many reaches now show signs of channel incision (e.g. coarsening channel bed material, disconnection of the channel from the floodplain at smaller floods, etc.). This may be due to a number of factors including decreased sediment inputs due to improved forest practices, loss of key piece sized wood and a functioning riparian zone, and possible changes in the river hydrograph related to a combination of manmade and natural factors.

There are also two olivine mines, no longer in operation, which introduced fine sediment to the South Fork during operations and for some time afterward despite reclamation work on the very poor soils. The tough growing conditions has made both reclamation plantings and natural regeneration from local seed sources slow to establish and reduce surface and channelized erosion from the sites. While this document focusses on the floodplain

downstream of Skookum Creek, this background of the upper watershed provides context for many of the inputs affecting floodplain management in the Acme valley.

Habitat downstream of Skookum Creek reflects the legacy of upstream commercial logging and local conversion of a floodplain once cluttered with log jams forcing the sinuous main channel to form side channels with cool year round flow to a what is now a substantially shorter and straighter channel lined by agriculture and rural residential development. The habitat is much simpler and lacks the historic numbers and spacing of deep pools with cover and cool water adjacent to spawning substrate and and riparian functions are lacking. Summer temperatures reach potentially lethal levels most years with the potential for thermal barriers to migration to develop and pre-spawning mortality for spring Chinook and pink salmon and summer run steelhead. Juvenile rearing occurs by all species, but the thermal impairments also affect them. Summer 2015 is proving to be an extraordinarily bad year where water temperatures have exceeded 75 degrees Fahrenheit (lethal to salmonids) and flows are at record lows and reflect an amplification of habitat impacts that are present in all years.

IMPROVE

Strategies and Outcomes.

Key Objectives for the South Fork:

- **Fish:** Increase the number of complex wood formed primary pools per mile to the target identified in the recovery plan including pool formation in zones of cool water influence as a short term strategy. The long term strategy is to restore habitat and floodplain processes to meet salmon needs. Reconnect the channel to its floodplain where it has been disconnected by manmade structures or channel incision to distribute hydraulic energy, reduce redd scour, and engage stable side channel habitats. Restore functional riparian areas and set-back infrastructure to the edge of the historic migration zone.
- **Flood:** Use detailed hydraulic modeling and flood mapping products in combination with development reviews and enforcement to prevent development in high risk zones. Manage future flood risks and evaluate mitigation strategies for existing developments in the town of Acme which includes several repetitive loss properties. Integrate flood hazard management with salmon recovery objectives to restore floodplain processes where possible, including increased floodplain connectivity and increased flood storage to help reduce downstream impacts within a defined channel migration zone.
- **Agriculture:** Minimize loss of active agricultural lands outside an established channel migration zone to lateral river migration. Use “fish friendly” structures where bank erosion needs to be retarded while making full use of land swaps, conservation easements, and other mechanisms that keep agriculture viable while

also achieving salmon recovery for fishers and flood hazard management objectives for broad public benefit.

The main flood strategies are to reduce the potential for future losses on alluvial fans, protect transportation infrastructure and human life and safety on the floodplain. Work is underway at Jones Creek to reduce alluvial fan flood risk through voluntary property buyouts in high risk areas and the construction of a setback berm to mitigate future sediment laden flood impacts to the community of Acme including an elementary school, fire hall, homes, a church, post office, and store. Similar approaches could be considered for flooding on other alluvial fans present in the valley if resources and community will are available. The town of Acme is also subject to overbank flooding from the South Fork Nooksack; mitigation strategies for flooding have not been developed and analyzed yet.

Flood risk reduction strategies include improved flood mapping in support of protection or relocation of transportation infrastructure and routing of floodwaters including floodplain overflow pathways such as Black Slough. Black Slough was historically a vast wetland area that was flooded regularly by the South Fork. Much of this area has been converted to agriculture and provides an example of the need for continued coordination, outreach, and collaboration to continue to create the positive interactions between salmon recovery, agriculture, and flood management projects and build on recent successes.

Habitat restoration near-term strategies include placement of engineered log jams in areas of cool water input, reconnecting the channel to its historic floodplain where it has become disconnected, and improving riparian functions to moderate temperature impacts on salmonids. Detailed restoration strategies by reach have been developed as part of the WRIA 1 Salmonid Recovery Plan. Examples of these strategies include:

- Migration and holding habitat enhancement through the lower reaches of the river
- Acquisition of key habitat areas necessary to provide restoration opportunities or to protect properly functioning habitats
- Improving the availability and quantity of overwinter rearing habitat with the riparian and instream habitat complexity to provide lower water velocities and woody edge habitats for cover and food
- Where bank protection must be maintained, replacing rock armor with woody structures
- Restoring habitat functions to the historic meander zone plus 300' including relocation of infrastructure where necessary.

Maintaining viable agriculture, restoring fisheries, and reducing flood risk in the South Fork valley will be dependent on the many factors described above, as well as the ability to foster the collaborative relationships that have already been established and provide

support for the technical, outreach and policy efforts that will be necessary to refine our vision and achieve the objectives we have identified.

MAP: To be developed

Reach Tables – Goals, Aspirations, and Actions

Reach Goals and Visions	
Watershed	Nooksack River Basin
Reach Name	Reach 1 From Delta upstream to I5 bridge at Ferndale
River Miles	RM 0 to RM 6.5
Length (in river miles)	6.5 Miles
Key Strategy	The strategies are defined above.
Metric	Range (select a range for each metric and/or provide a specific range or number if you have one)
Context for the Reach (This information provides context for 10-year efforts)	
Floodplain Acreage in Reach	☐ 1000 or less ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>9,581</u>
Assessed Value of Reach	☐ 0 ☐ \$50 M to \$100 M ☐ \$101 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☒ Other range or specific number: <u>Total Land Value= \$144,991,562; Total Improvement Value= \$175,915,728; Total Land & Improvement Value= \$320,907,290</u>
Acres where future development is at risk of flooding or channel migration	☐ 500 or less ☐ 500 – 1,000 ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>Total acreage of parcels with no improvements= 6,197 Total acreage of parcels with improvements= 1,877</u>
Parcels where future development is at risk of flooding or channel migration	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☒ Other range or specific number: <u>Total number of parcels with no improvements= 603 Total number of parcels with improvements= 398</u>
Land use in the reach (approximate percentage)	☒ Residential: <u>10%</u> ☒ Commercial: <u>2%</u> ☒ Industrial: <u>1%</u> ☒ Agriculture: <u>78%</u> ☐ Forestry: <u> </u> % ☒ Open space: <u>9%</u> ☐ Habitat Conservation: <u> </u> % ☐ Other: <u> </u> , <u> </u> %
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
Long-Term Goals for the Reach (This information provides context for 10-year efforts)	
Time horizon for long-term planning	☐ 25 years ☐ 50 years ☐ 100 years ☐ Other: <u> </u>
Other metrics in this section	See directions under 10-Year Aspirations below.
10-Year Aspirations	
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: <u> </u>

Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee or Revetment Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes or Structures Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	

Reach Goals and Visions	
Watershed	Nooksack River Basin
Reach Name	Reach 2 From I5 bridge in Ferndale upstream to Guide Meridian bridge in Lynden
River Miles	RM 6.5 to RM 15.3
Length (in river miles)	8.8 Miles
Key Strategy	The strategies are defined above.
Metric	Range (select a range for each metric and/or provide a specific range or number if you have one)
Context for the Reach (This information provides context for 10-year efforts)	
Floodplain Acreage in Reach	☐ 1000 or less ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>5,271</u>
Assessed Value of Reach	☐ 0 ☐ \$50 M to \$100 M ☐ \$101 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☒ Other range or specific number: <u>Total Land Value= \$67,161,884; Total Improvement Value= \$45,515,742; Total Land & Improvement Value= \$112,677,626</u>
Acres where future development is at risk of flooding or channel migration	☐ 500 or less ☐ 500 – 1,000 ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>Total acreage of parcels with no improvements= 2,296 Total acreage of parcels with improvements= 2,543</u>
Parcels where future development is at risk of flooding or channel migration	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☒ Other range or specific number: <u>Total number of parcels with no improvements= 155 Total number of parcels with improvements= 224</u>
Land use in the reach (approximate percentage)	☒ Residential: <u>6%</u> ☒ Commercial: <u>1%</u> ☐ Industrial: <u>0%</u> ☒ Agriculture: <u>92%</u> ☐ Forestry: <u>0%</u> ☒ Open space: <u>1%</u> ☐ Habitat Conservation: <u>0%</u> ☐ Other: <u> </u> , <u>0%</u>
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
Long-Term Goals for the Reach (This information provides context for 10-year efforts)	
Time horizon for long-term planning	☐ 25 years ☐ 50 years ☐ 100 years ☐ Other: <u> </u>
Other metrics in this section	See directions under 10-Year Aspirations below.
10-Year Aspirations	
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: <u> </u>
Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: <u> </u>

Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee or Revetment Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes or Structures Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	

Reach Goals and Visions	
Watershed	Nooksack River Basin
Reach Name	Reach 3 From Guide Meridian bridge in Lynden to SR544 bridge in Everson
River Miles	RM 15.3 to RM 23.6
Length (in river miles)	8.3 Miles
Key Strategy	The strategies are defined above.
Metric	Range (select a range for each metric and/or provide a specific range or number if you have one)
Context for the Reach (This information provides context for 10-year efforts)	
Direction: Answer these questions based on current conditions in the reach.	
Floodplain Acreage in Reach	☐ 1000 or less ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>7,866</u>
Assessed Value of Reach	☐ 0 ☐ \$50 M to \$100 M ☐ \$101 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☒ Other range or specific number: <u>Total Land Value= \$109,760,556; Total Improvement Value= \$82,340,579; Total Land & Improvement Value= \$192,101,135</u>
Acres where future development is at risk of flooding or channel migration	☐ 500 or less ☐ 500 – 1,000 ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>Total acreage of parcels with no improvements= 3,396 Total acreage of parcels with improvements= 3,806</u>
Parcels where future development is at risk of flooding or channel migration	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☒ Other range or specific number: <u>Total number of parcels with no improvements= 257 Total number of parcels with improvements= 366</u>
Land use in the reach (approximate percentage)	☒ Residential: <u>3%</u> ☒ Commercial: <u>1%</u> ☐ Industrial: <u> </u> % ☒ Agriculture: <u>96%</u> ☐ Forestry: <u> </u> % ☐ Open space: <u> </u> % ☐ Habitat Conservation: <u> </u> % ☐ Other: <u> </u> , <u> </u> %
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
Long-Term Goals for the Reach (This information provides context for 10-year efforts)	
Time horizon for long-term planning	☐ 25 years ☐ 50 years ☐ 100 years ☐ Other: <u> </u>
Other metrics in this section	See directions under 10-Year Aspirations below.
10-Year Aspirations	
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: <u> </u>

Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee or Revetment Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes or Structures Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	

Reach Goals and Visions	
Watershed	Nooksack River Basin
Reach Name	Lower Reach 4 From SR544 bridge in Everson to SR542 bridge at Nugents Corner
River Miles	RM 23.6 to RM 31.0
Length (in river miles)	7.4 Miles
Key Strategy	The strategies are defined above.
Metric	Range (select a range for each metric and/or provide a specific range or number if you have one)
Context for the Reach (This information provides context for 10-year efforts)	
Direction: Answer these questions based on current conditions in the reach.	
Floodplain Acreage in Reach	☐ 1000 or less ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>3,432</u>
Assessed Value of Reach	☐ 0 ☐ \$50 M to \$100 M ☐ \$101 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☒ Other range or specific number: <u>Total Land Value= \$41,433,287; Total Improvement Value= \$33,925,950; Total Land & Improvement Value= \$75,359,237</u>
Acres where future development is at risk of flooding or channel migration	☐ 500 or less ☐ 500 – 1,000 ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>Total acreage of parcels with no improvements= 1,381 Total acreage of parcels with improvements= 1,148</u>
Parcels where future development is at risk of flooding or channel migration	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☒ Other range or specific number: <u>Total number of parcels with no improvements= 147 Total number of parcels with improvements= 227</u>
Land use in the reach (approximate percentage)	☒ Residential: <u>14%</u> ☒ Commercial: <u>1%</u> ☒ Industrial: <u>1%</u> ☒ Agriculture: <u>84%</u> ☐ Forestry: <u>__%</u> ☐ Open space: <u>__%</u> ☐ Habitat Conservation: <u>__%</u> ☐ Other: <u>_____, __%</u>
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
Long-Term Goals for the Reach (This information provides context for 10-year efforts)	
Time horizon for long-term planning	☐ 25 years ☐ 50 years ☐ 100 years ☐ Other: <u>_____</u>
Other metrics in this section	See directions under 10-Year Aspirations below.
10-Year Aspirations	
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: <u>_____</u>

Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee or Revetment Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes or Structures Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	

Reach Goals and Visions	
Watershed	Nooksack River Basin
Reach Name	Upper Reach 4 From SR542 bridge at Nugents Corner to SR9 bridge located SE of Deming
River Miles	RM 31.0 to RM 37.4
Length (in river miles)	6.4 Miles
Key Strategy	The strategies are defined above.
Metric	Range (select a range for each metric and/or provide a specific range or number if you have one)
Context for the Reach (This information provides context for 10-year efforts)	
Direction: Answer these questions based on current conditions in the reach.	
Floodplain Acreage in Reach	☐ 1000 or less ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>1,516</u>
Assessed Value of Reach	☐ 0 ☐ \$50 M to \$100 M ☐ \$101 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☒ Other range or specific number: <u>Total Land Value= \$15,694,462; Total Improvement Value= \$20,258,724; Total Land & Improvement Value= \$35,953,186</u>
Acres where future development is at risk of flooding or channel migration	☐ 500 or less ☐ 500 – 1,000 ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: <u>Total acreage of parcels with no improvements= 566 Total acreage of parcels with improvements= 371</u>
Parcels where future development is at risk of flooding or channel migration	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☒ Other range or specific number: <u>Total number of parcels with no improvements= 130 Total number of parcels with improvements= 115</u>
Land use in the reach (approximate percentage)	☒ Residential: <u>21%</u> ☒ Commercial: <u>12%</u> ☐ Industrial: <u>__%</u> ☒ Agriculture: <u>68%</u> ☐ Forestry: <u>__%</u> ☐ Open space: <u>__%</u> ☐ Habitat Conservation: <u>__%</u> ☐ Other: <u>_____, __%</u>
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
Long-Term Goals for the Reach (This information provides context for 10-year efforts)	
Time horizon for long-term planning	☐ 25 years ☐ 50 years ☐ 100 years ☐ Other: <u>_____</u>
Other metrics in this section	See directions under 10-Year Aspirations below.
10-Year Aspirations	
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: <u>_____</u>

Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee or Revetment Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes or Structures Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: ____% ☐ Commercial: ____% ☐ Industrial: ____% ☐ Agriculture: ____% ☐ Forestry: ____% ☐ Open space: ____% ☐ Habitat Conservation: ____% ☐ Other: _____, ____%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	

Reach Goals and Visions	
Watershed	Nooksack River Basin
Reach Name	Middle Fork of Nooksack River From North Fork Nooksack RM 40.5 Upstream to Mosquito Lake Road Bridge
River Miles	RM 0.0 to RM 5.0
Length (in river miles)	5 Miles
Key Strategy	☐ Maintain in a Highly Modified Reach ☐ Modify in a Highly Modified Reach ☐ Improve in a Slightly Modified Reach ☐ Protect in a Slightly Modified Reach ☐ Not determined
Metric	Range (select a range for each metric and/or provide a specific range or number if you have one)
Context for the Reach (This information provides context for 10-year efforts)	
Floodplain Acreage in Reach	☒ 1000 or less ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: 725
Assessed Value of Reach	☐ 0 ☐ \$50 M to \$100 M ☐ \$101 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☒ Other range or specific number: \$18,801,309 (Land Value: \$10,490,729 Improvement Value: \$8,310,580)
Acres where future development is at risk of flooding or channel migration	☒ 500 or less ☐ 500 – 1,000 ☐ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: Total acreage of parcels with <u>no</u> improvements: 332 Total acreage of parcels with improvements: 94
Parcels where future development is at risk of flooding or channel migration	☐ 0 ☒ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☒ Other range or specific number: Total number of parcels with <u>no</u> improvements: 59 Total number of parcels with improvements: 67
Land use in the reach (approximate percentage)	☒ Residential: 82% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☒ Forestry: 18% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
Long-Term Goals for the Reach (This information provides context for 10-year efforts)	
Time horizon for long-term planning	☐ 25 years ☐ 50 years ☐ 100 years ☐ Other: _____
Acres of Floodplain (estuarine)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+

and freshwater) Restored	☐ Other range or specific number: _____
Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B +

	☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
10-Year Aspirations	
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____

Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	

Reach Goals and Visions	
Watershed	Nooksack River Basin
Reach Name	North Fork of Nooksack River From Valley Highway 9 Bridge Upstream to east edge of Snowline development in Glacier
River Miles	RM 37.4 to RM 59.0
Length (in river miles)	21.6 Miles
Key Strategy	☐ Maintain in a Highly Modified Reach ☐ Modify in a Highly Modified Reach ☐ Improve in a Slightly Modified Reach ☐ Protect in a Slightly Modified Reach ☐ Not determined
Metric	Range (select a range for each metric and/or provide a specific range or number if you have one)
Context for the Reach (This information provides context for 10-year efforts)	
Floodplain Acreage in Reach	☐ 1000 or less ☒ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: 3,600 acres
Assessed Value of Reach	☐ 0 ☒ \$50 M to \$100 M ☐ \$101 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☒ Other range or specific number: \$67,255,002 (Land Value: \$39,302,535 Improvement Value: \$27,952,467)
Acres where future development is at risk of flooding or channel migration	☐ 500 or less ☐ 500 – 1,000 ☒ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: Total acreage of parcels with <u>no</u> improvements: 1699 Total acreage of parcels with improvements: 419
Parcels where future development is at risk of flooding or channel migration	☐ 0 ☐ 1 to 100 ☒ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☒ Other range or specific number: Total number of parcels with <u>no</u> improvements: 338 Total number of parcels with improvements: 316
Land use in the reach (approximate percentage)	☒ Residential: 68% ☒ Commercial: <1% ☐ Industrial: ____% ☐ Agriculture: ____% ____% ☒ Forestry: 31.6% ☐ Open space: ____% ☐ Habitat Conservation: ____%

	☐ Other: _____, __%
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
Long-Term Goals for the Reach (This information provides context for 10-year efforts)	
Time horizon for long-term planning	☐ 25 years ☐ 50 years ☐ 100 years ☐ Other: _____
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+

	☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
10-Year Aspirations	
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%
Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 +

improvements, installation of critter pads, etc.)	☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	

Reach Goals and Visions	
Watershed	Nooksack River Basin
Reach Name	South Fork of Nooksack River From confluence with the North Fork Upstream to the Confluence of Skookum Creek and the South Fork
River Miles	RM 0 to RM 14.3
Length (in river miles)	14.3 Miles
Key Strategy	☐ Maintain in a Highly Modified Reach ☐ Modify in a Highly Modified Reach ☐ Improve in a Slightly Modified Reach ☐ Protect in a Slightly Modified Reach ☐ Not determined
Metric	Range (select a range for each metric and/or provide a specific range or number if you have one)
Context for the Reach (This information provides context for 10-year efforts)	
Floodplain Acreage in Reach	☐ 1000 or less ☐ 1,000 – 5,000 ☒ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: 5878
Assessed Value of Reach	☐ 0 ☒ \$50 M to \$100 M ☐ \$101 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☒ Other range or specific number: (Land Value: \$55,331,174 Improvement Value: \$24,748,974)
Acres where future development is at risk of flooding or channel migration	☐ 500 or less ☐ 500 – 1,000 ☒ 1,000 – 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☒ Other range or specific number: Total acreage of parcels with <u>no</u> improvements: 2390 Total acreage of parcels with improvements: 2493

Parcels where future development is at risk of flooding or channel migration	☐ 0 ☐ 1 to 100 ☒ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☒ Other range or specific number: Total number of parcels with <u>no</u> improvements: 246 Total number of parcels with improvements: 235
Land use in the reach (approximate percentage)	☒ Residential: 21.8% ☒ Commercial: <1% ☐ Industrial: <u> </u> % ☒ Agriculture: 59.7% ☒ Forestry: 16.2% ☐ Open space: <u> </u> % ☐ Habitat Conservation: <u> </u> % ☐ Other: <u> </u> , <u> </u> %
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
Long-Term Goals for the Reach (This information provides context for 10-year efforts)	
Time horizon for long-term planning	☐ 25 years ☐ 50 years ☐ 100 years ☐ Other: <u> </u>
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: <u> </u>
Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: <u> </u>
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: <u> </u>
Lineal Feet of Levee Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: <u> </u>
Homes Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: <u> </u>
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: <u> </u>
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: <u> </u>
Land Use of Acres Acquired	☐ Residential: <u> </u> % ☐ Commercial: <u> </u> % ☐ Industrial: <u> </u> % ☐ Agriculture: <u> </u> % ☐ Forestry: <u> </u> % ☐ Open space: <u> </u> % ☐ Habitat Conservation: <u> </u> % ☐ Other: <u> </u> , <u> </u> %
Acres of Farmland Protected (through conservation easements, acquisition, or	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: <u> </u>

flood protection)	
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	
10-Year Aspirations	
Acres of Floodplain (estuarine and freshwater) Restored	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Acres of Estuarine Floodplain Restored (a subset of acreage above)	☐ 0 ☐ 1 to 50 ☐ 51 to 500 ☐ 501 to 1,000 ☐ 1000+ ☐ Other range or specific number: _____
Miles of River Function Improved	☐ 0 ☐ 0.1 to 1 ☐ 1.1 to 3 ☐ 3.1 to 5 ☐ 5.1 to 10 ☐ 10+ ☐ Other range or specific number: _____
Lineal Feet of Levee Improved	☐ 0 ☐ 1 to 1,500 ☐ 1,501 to 2,500 ☐ 2,501 to 5,000 ☐ 5,001 to 10,000 ☐ 10,001 + ☐ Other range or specific number: _____
Homes Removed from the Floodplain	☐ 0 ☐ 1 to 10 ☐ 11 to 50 ☐ 51 to 100 ☐ 101 + ☐ Other range or specific number: _____
Features with Improved Flood Protection (features could include roads, homes, agricultural facilities, water supply, hospitals, bridges, etc.)	☐ 0 ☐ 1 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ 21 to 50 ☐ 51 to 100 ☐ 100+ ☐ Other range or specific number: _____
Acres Acquired for restoration, flood improvements or both	☐ 0 ☐ 1 to 50 ☐ 51 to 100 ☐ 101 to 250 ☐ 251-500 ☐ 501 to 1,500 ☐ 1500+ ☐ Other range or specific number: _____
Land Use of Acres Acquired	☐ Residential: __% ☐ Commercial: __% ☐ Industrial: __% ☐ Agriculture: __% ☐ Forestry: __% ☐ Open space: __% ☐ Habitat Conservation: __% ☐ Other: _____, __%

Acres of Farmland Protected (through conservation easements, acquisition, or flood protection)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Acres of Farmland Improved (through drainage improvements, installation of critter pads, etc.)	☐ 0 ☐ 1 to 100 ☐ 101 to 500 ☐ 501 to 1,000 ☐ 1,001 + ☐ Other range or specific number: _____
Trails Opened to the Public (miles)	☐ 0 ☐ 0.1 to 0.5 ☐ 0.6 to 1 ☐ 1.1 to 2 ☐ 2+ ☐ Other range or specific number: _____
Area Opened to the Public (acres)	☐ 0 ☐ 1 to 25 ☐ 25 to 50 ☐ 50 to 100 ☐ 100 + ☐ Other range or specific number: _____
Cost Estimate (may include actions not noted in these metrics)	☐ 0 ☐ \$1 M to \$10 M ☐ \$11 M to \$20 M ☐ \$21 M to \$50 M ☐ \$51 M to \$100 M ☐ \$101 M to \$250 M ☐ \$251 M to \$500 M ☐ \$501 M to \$1B ☐ \$1B + ☐ Other range or specific number: _____
Other Local Measures (such as improvements to water quality, quantity, recreation, economic development, etc.)	

