

## **WRIA 1 IMPLEMENTATION PROGRAM: 2007-2010**

### **ACTION DESCRIPTIONS**

**The following descriptions are arranged by geographic area and align with the accompanying spreadsheet, which provides details on funding for 2007-2010 and the project priority. The “Overview Memo Category” below each project name and in the spreadsheet corresponds to the categories discussed in the Overview Memo.**

#### **South Fork Nooksack**

##### **South Fork Captive Brood Supplementation Program run at Kendall Hatchery**

Overview Memo Category: 1

Objective: To increase the abundance of the South Fork Nooksack River Early Chinook population, currently at risk of extinction, through raising a portion of the offspring from each mated pair without release to the wild, and transferring ripening adults back to Skookum Hatchery. (Target of approximately 250 juveniles per year with the program running for approximately 8 years.)

Offspring from Skookum Hatchery South Fork broodstock that meet the desired microsattelite DNA stock assignment will have a small portion of each family group transferred as eyed eggs or fry to WDFW’s Kendall Hatchery, where they will be raised until maturing adults. Ripening adults will be transferred back to Skookum Hatchery to be spawned, with offspring reared and released as described in the Skookum Chinook Supplementation. Very recent microsattelite DNA analysis indicates approximately 20-30% of recently sampled wild adults were assigned to the South Fork spring chinook baseline.

Benefit: Increased short-term abundance of this population, which will transition to a traditional hatchery population rebuilding program upon completion and while degraded habitat conditions are addressed such that natural population productivity increases.

Cost: One time capitol improvements of \$944,000 to improve water supply and for tanks, and while required to run this program for its duration, this is not required for the first year. Additionally, annual costs are \$13,000, \$19,000, \$38,000, and \$51,000 for years 1-4 respectively, and \$51,000 annually for years 5-8.

##### **South Fork Captive Brood Supplementation Program run at NOAA Fisheries Manchester Research Station**

Overview Memo Category: 1

Objective: To increase the abundance of the South Fork Nooksack River Early Chinook population, currently at risk of extinction, through raising a portion of the offspring from each mated pair to adulthood without release to the wild, and transferring ripening adults back to Skookum Hatchery. (Target of approximately 250 juveniles per year with the program running for approximately 8 years.)

Offspring from Skookum Hatchery South Fork spawned broodstock that meet the desired microsatellite DNA stock assignment will have a small portion of each family group transferred as smolts (approximately 3 months old) to NOAA Fisheries Manchester Facility (Port Orchard, WA), where they will be raised until maturing adults. Ripening adults will be transferred back to Skookum Hatchery to be spawned with offspring released as described in the Skookum Chinook Supplementation. Very recent microsatellite DNA analysis indicates approximately 20-30% of recently sampled wild adults were assigned to the South Fork spring chinook baseline.

Benefit: Increased short-term abundance of this population, which will transition to a traditional hatchery population rebuilding program upon completion and while degraded habitat conditions are addressed such that natural population productivity increases.

Cost: \$250,000 per year and facility needs no improvements.

### **South Fork Acme-Confluence Reach: Active Channel Logjams**

Overview Memo Category: 3a

Objective: restore deep pools with complex cover, promote development of temperature refuges

This project includes construction of stable log jams in the main channel in areas of known cool water influence (groundwater recharge or tributary inputs). The objective of the project is to increase habitat diversity, quantity of deep pools with cover, and availability of temperature refuges. Locations and proposed number of log jams include: (1) Todd Creek confluence and downstream, 4 log jams; (2) confluence of Caron Creek and Tawes Creek and downstream, estimate 8 log jams; (3) near Standard Creek confluence, estimate 6 log jams; and (4) near confluence of Hardscrabble Creek, estimate 4 log jams. Conservatively estimate cost of \$150,000 per structure, \$100,000 per location for design and permitting, and \$10,000 per location for monitoring. Phase 1 (Todd Creek) design and permitting is scheduled for 2007, construction for 2008, and monitoring for 2009. Total Phase 1 cost: \$700,000. Phase 2 design and permitting is scheduled for 2008, and construction for 2009, with monitoring in subsequent years. Total estimated Phase 2 3-year cost: \$1,300,000. Phase 3 design and permitting is scheduled for 2009, and construction and monitoring in subsequent years. Total estimated Phase 3 3-year cost: \$200,000. Projects are contingent on landowner willingness to proceed.

Benefit: 22 log jams engaged with low flow channel, 12 main channel pools, 13 temperature refuges during summer low flow (2°C difference from thalweg)

Cost: Estimated 3 year cost for Phase 1 is \$710,000, Phase 2 is \$1,300,000, and Phase 3 is \$200,000.

### **South Fork Acme-Confluence Reach: HMZ Reconnection**

Overview Memo Category: 3a

Objective: Reconnect disconnected floodplain to reduce mainstem velocities and restore channel migration processes that create habitat diversity, reduce fine sediments by promoting overbank deposition of sediments

This project includes removal or setback of bank hardening that blocks HMZ to restore habitat-forming channel migration processes. The objectives of the project are to encourage greater

interaction between the river and the HMZ in order to increase the availability of off-channel habitat, reduce mainstem velocities, and encourage floodplain deposition of fine sediment. Locations, HMZ area made accessible, and length of bank hardening removed/setback include: (1) Caron Creek area, up to 57 acres of HMZ reconnected, up to 625 feet of bank hardening removed/setback; (2) Standard Creek area, up to 39 acres of HMZ reconnected, up to 560 feet of bank hardening removed/setback; (3) River Farm area, up to 40 acres of HMZ reconnected, up to 340 feet of bank hardening removed/setback; and (4) McCarty Creek area, up to 40 acres of HMZ reconnected some secondary channel development. Projects are contingent on landowner willingness to proceed with project or sell conservation easement (see Acquisition of Priority Habitats action). Estimate \$100/foot for removal and \$300/foot for setback.

Benefit: up to 176 acres HMZ reconnected; up to 1525 feet of bank hardening removed or set back

Cost: Estimated 3-year project cost is \$120,000 and total estimated cost of \$417,000.

### **Lower South Fork Tributary Riparian Restoration**

Overview Memo Category: 3a

Objective: Restore riparian shading to provide temperature refuges in low-gradient floodplain tributaries for juvenile salmonids, including chinook, rearing in the South Fork mainstem

This project involves riparian planting in unforested or poorly stocked riparian areas of low-gradient tributaries (100 foot buffer widths) within ½ mile of the lower South Fork (downstream of Saxon Rd bridge). The planting will be 500 trees per acre and include layout, 3-year maintenance and beaver protection. Estimate 70 acres in the Acme-Confluence reach and 53 acres in the Acme-Saxon reach that have not already been restored, at \$4,400/acre, or \$541,200. Projects are contingent on landowner willingness to proceed with project.

Benefit: restore 123 acres of riparian buffer along lower South Fork tributaries to increase shading and wood recruitment to tributaries and the South Fork downstream of the tributary confluence.

Cost: Estimated 3-year project cost is \$541,200 (\$180,400 per year).

### **Lower South Fork HMZ Riparian Restoration**

Overview Memo Category: 3a

Objective: Increase wood recruitment potential, ultimately to improve habitat diversity (i.e. cover, habitat unit diversity) and key habitat quantity (deep meander bend pools) in the lower South Fork

This project involves riparian planting in unforested areas in and within 260 feet of the accessible Historic Migration Zone (1880-present) of the South Fork in this reach. In this context, “accessible” refers to areas open to channel migration, i.e. not isolated from the active channel by bank hardening. The planting will be 500 trees per acre and include layout, 3-year maintenance and beaver protection. Estimate 161 acres in the Acme-Confluence reach and 62 acres in the Acme-Saxon reach that have not already been restored at \$4,400/acre, or \$981,200. Projects contingent on willingness of landowners of properties likely to be affected by the project.

Benefit: Restore approximately 223 acres of riparian forest within the South Fork HMZ to increase wood recruitment potential and shading of the South Fork. This action will have longer-term benefits to channel stability, habitat diversity and water temperature in the South Fork.

Cost: Estimate for 3-year project is \$981,200 (\$327,067 per year)

### **Lower South Fork Wetland Water Storage Improvement**

Overview Memo Category: 3a

Objective: Restore temperature and baseflow maintenance function of lower South Fork floodplain wetlands, to address low flow and high temperature in the lower South Fork

This project encompasses actions that promote water storage in historical and potential wetlands of the lower South Fork to restore temperature and baseflow maintenance functions to the mainstem South Fork. Activities to promote water storage include, plugging, backfilling, and/or re-meandering drainage ditches and re-creating micro-impoundments similar to beaver dams. An estimated 5500m of straight ditchline and 1900m of stream length in the historically important Black Slough wetland complex could be improved (approximately 1/3 of its length), plus additional ditchline and stream length in other wetlands in the lower South Fork valley. Estimated cost of water storage improvement is \$70/m, for a total \$518,000. Project is contingent upon landowner willingness to proceed.

Benefit: promote water storage along 7.4 km of ditchline and/or stream length to restore an estimated 180 acres of wetland, with associated improvements in wetland functions, such as flood storage, increased summer baseflow, and decreased summer temperature in the lower South Fork Nooksack River.

Cost: Estimated cost for 3-year project is \$518,000 (Phase 1 implementation \$259,000; Phase 2 implementation \$259,000)

### **Acme-Saxon Reach Active Channel Logjams**

Overview Memo Category: 3a

Objective: Increase habitat diversity (number and persistence of pools, complex cover) in a cooler water section of the South Fork. This group of projects includes stabilization of log jams in the active channel of the South Fork between Acme and Saxon Road bridge. Projects are contingent on landowner willingness to proceed with project. Projects include:

- Stabilization of existing log jams near Nessel's Slough. The objective of the project would be to increase the stability of logjams, increase the number of pools and promote floodplain connectivity through local aggradation and scour. It is estimated that there would be 8 log jams in the reach that will be stabilized, using ballasted wood structures, pilings, or a similar approach. The project cost would vary depending on method (ballasted log structures, pilings, etc.) and engineering design but estimated costs are \$215,000.

Benefit: Benefit: 8 log jams (4 associated with channel at any one time), at least 4 pools

Cost: Estimated cost for 3-year project is \$215,000

- Stabilization/augmentation of existing log jams below Saxon Road bridge. The goal of the project is to stabilize the split flow downstream of the bridge and create holding habitat in a

cooler section of the reach. The project includes augmenting existing wood accumulations to encourage the stability of the mid-channel island. It is estimated that the project will require landowner participation in setting project objectives and allowable scope of the project. It is expected that the ~five instream structures would cost \$400,000 to design, permit and construct, although only \$70,000 is needed in the 3-year time frame for design and permitting.

Benefit: 5 log jams, 5 pools with complex cover, 5 cooler water areas local to the logjams during summer low flow (2°C difference from thalweg)

Cost: Estimated 3-year cost is \$70,000 and total estimated cost is \$400,000.

### **Upper South Fork 30 Mile Reach Restoration**

Overview Memo Category: 3a

Objective: Slow channel incision, increase habitat diversity, and buffer South Fork from large landslides

The 30 Mile Reach Restoration Project includes the removal of a bridge, associated fill and riprap, removal of a blocking culvert on the southern access road, and the installation of several instream structures designed to slow channel incision in the reach and buffer the channel from several large stream-adjacent landslides. Project will be completed in 2007. Ongoing costs will be limited to monitoring.

Benefit: removal of bridge and associated 400 feet of riprap, reconnect 5 acres of HMZ, buffer ~18,000 square yards of actively eroding landslides from the active channel.

Cost: Estimated 3 year cost \$350,000

### **Skookum Reach Restoration**

Overview Memo Category: 3a

Objective: Remove channel constrictions, add LWD structure to the river channel, provide access to thermal refugia.

The Skookum Reach project will consist of removing bank protection, installing active channel logjams near the mouth of Skookum Creek re-locating Saxon Road from the river bank to upland areas owned by Whatcom Land Trust and Lummi Nation and restoring riparian buffer stands along the South Fork channel. An additional benefit of the project would be providing better road access control to Skookum Creek, Skookum Hatchery and the South Fork Weir.

Benefit: removal of 1800 feet of bank protection, installing 2 active channel logjams, re-locating ½ mile of Saxon Road to upland areas and restoring 11.8 acres of riparian buffer stand.

Cost: Estimated 3 year cost \$940,000

### **Upper South Fork Orphan Road Assessment**

Overview Memo Category: 3a

Objective: Identify areas potentially in need of corrective action to reduce erosion and prevent slope failures

The orphan road assessment will use the coming LiDAR (Fall 2006) that will include coverage of the state managed and private timberlands of Whatcom County to identify forest road grades that are not currently covered under forest practice road management rules. Once the extent of these existing roads is determined, the assessment will include field surveys to determine if and where drainage improvement and fill removal is necessary to reduce erosion and prevent slope failures. Orphan Road Abandonment projects resulting from the assessment will be contingent on landowner willingness to proceed with projects. Based on the costs of previous road assessment work, it is estimated that the assessment would cost \$120,000. Orphan road surveys conducted as a part of the upper SF assessment results will give us an indication of the extent that these roads are a problem.

Benefit: assessment of orphaned roads, with prescriptions for drainage improvement and pullback of landings and sidecast for several road miles. These projects will reduce sediment input into the South Fork and its tributaries.

Cost: Estimated 3-year cost \$120,000

### **South Fork Orphan Road Abandonment**

Overview Memo Category: 3a

Objective: Treat areas in need of corrective action to reduce erosion and prevent slope failures

The work will interrupt a historic pattern of chronic mass wasting events triggered by roadbed failures that have been delivering significant amounts of sediment into the south fork of the Nooksack River. Project will treat orphan roads in Seattle City Light South Fork property along the 200 Road corridor. During summer 2007, Lummi Natural Resources will remove drainage structures, install cross drains, waterbars and tank-trap barriers on three orphan road spurs held in conservation status by City of Seattle's City Light Division. The orphan spurs will have drainage structures removed by heavy equipment, and with hand labor. Triple tank traps will be installed at the junctions of the roads with active roads to prevent future offroad vehicle use.

Benefit: The project will remove drainage structures, install cross drains, waterbars and tank-trap barriers on three road spurs totaling over 1 mile of orphan road. The work will interrupt a historic pattern of chronic mass wasting events triggered by roadbed failures that have been delivering significant amounts of sediment into the south fork of the Nooksack River

Cost: Estimated 3-year cost \$ 30,000

The project is fully funded through partnerships with City of Seattle and U.S. Fish and Wildlife

### **South Fork Forest Forever**

Objective: Protect habitat diversity, reduce sediment loading and reduce extreme temperatures

This project will protect habitat diversity of native forest riparian over 2,500 acres along 7 ¾ miles of the South Fork Nooksack by acquiring a conservation easement that eliminates all residential and recreational development rights. If residential and recreational development were allowed along this reach of the South it would lead to the cutting of riparian forests for view sheds and landscaping, it increase human activity in the reach leading to increased poaching and

damage to salmon spawning, increase the inputs of landscaping chemicals, increasing off road vehicle traffic in and through streams, wetlands and the main stem of the South Fork, and quite likely increases in bank hardening and flood protection structures that are harmful to fish. The conversion of economically marginal forestland, such as riparian areas, to rural recreational tracts is a growing trend in the Northwest. The Weyerhaeuser Company has successfully developed and is selling 20 acre forest home sites in a 70 unit development called Forest Glen along the Nisqually River. Current land use and forest practice regulations are not sufficient to protect salmon habitat because local governments and DNR allow for conditional uses, variances, administrative approvals, exemptions from the adopted rules and lower standards for small landowners. From January 1, 2002 to February 5, 2007 Whatcom County allowed 22 Administrative approvals, 117 Conditional Uses, 34 Shoreline Conditional Uses, 73 Shoreline Substantial Development Permits, 32 Shoreline Variances, 469 Shoreline Exemptions and 22 Variances. In Skagit County residential development is allowed in the Industrial Forest zone creating the threat of recreational or remote residential subdivision and housing development. For these small landowners DNR Forest Practice rules have much lower stream and wetland buffer standards, sometime as narrow as 26 feet. Without greater protections afforded by outright acquisition or conservation easements along salmon bearing streams WRIA #1 will not be able to provide the size or quantity of large woody debris to create instream habitat diversity, reduce sediment inputs and lower temperature regimes on local salmon streams. Protection of this reach is listed as "Protection Category A" in Table C-1 of the WRIA#1 Salmon Recovery Plan. Sierra Pacific Industries, the landowner, has given preliminary approval of the project at a March 19<sup>th</sup> 2007 meeting. The project is ready to proceed. The elimination of residential impacts will allow riparian forest to recover to maturity and be recruited to the river as large woody debris, increasing habitat diversity, reducing temperatures and moderating sediments loads, all limiting factors for this reach of the South Fork.

Cost Estimate: Estimated cost of the project is \$500,000. Project completion expected by 6/1/2009.

### **USFS Road Network Monitoring and Maintenance**

Overview Memo Category: 3a

Objective: reduce sediment production from sites with known deficiencies

The SF/MF Watershed Analysis found that, regarding reduction of sediment production from roads, most roads have been improved, but several sites have known deficiencies and need correcting. Specific findings include the need to: (1) monitor the road network; (2) correct remaining drainage and stability problems on USFS Road 12 between Mileposts (MP) 7 and 9; and (3) Road 1260 will require periodic maintenance from MP 0.8 to 2.2, including brushing and ditch line cleaning due to raveling cut banks.

Benefit: reduced sediment delivery, stream pirating associated with USFS roads in upper South Fork

Cost: Estimated 3-year project cost \$90,000

### **Years 3 and 4 of Skookum Chinook Supplementation**

Overview Memo Category: 1

Objective: To increase the natural spawning population of the South Fork Nooksack River Early Chinook population, currently at risk of extinction, while minimizing the effects of hatchery

intervention on the genetic integrity of the stock. (Target release of 200,000 sub-yearlings by year 4 of the program)

This activity will continue the program funded by the Pacific Salmon Commission Southern Endowment Fund that will expire in 2008 without additional funding. The requested support will cover the expenses of hatchery staff and operations essential to the supplementation program and hatchery improvements required to ensure safe and effective achievement of program goals. Brood Stock selected from adults diverted into the hatchery by a weir across the South Fork and identified to stock by microsatellite DNA analysis. Protocols have been developed to minimize risk from disease and the nature of operations in an isolated location. Hatchery production will be Coded Wire Tagged under the Pacific Salmon Commission Indicator Stock Program to evaluate survival and contribution to fisheries. The sub-yearlings will be released voluntarily in mid-May.

Benefit: established South Fork early chinook program and, ultimately, improved abundance of South Fork early chinook

Cost: Estimated 3-year project cost \$510,054

### **Skookum Creek Hatchery Water Supply**

Overview Memo Category: 1

Objective: To insure a steady supply of water and provide the redundancy appropriate to the rearing of native early chinook at the Skookum Creek Hatchery.

Skookum Creek Hatchery utilizes two sources of water for its operations, Skookum Creek and wells on the hatchery property. Well water is required for the incubation and early rearing because its temperature is well above that in the creek water and promotes accelerated growth during winter months. Water from the creek is required for the final grow out to release for purposes of improved growth as the season progresses and to ensure imprinting to the hatchery entrance upon their return. The current water supply requires an additional measure of redundancy to ensure the safety of the chinook supplementation program while meeting the other objectives of the hatchery. Additional water will be required when the chinook program reaches its full production. The intake in Skookum Creek must be modified to reduce the impact of sediment loads and changes in bed elevation on the intake, minimize the transport of sediment into the hatchery, to meet appropriate screening criteria and provide for improved passage in the creek for bull trout and native chinook. The production of the existing wells has deteriorated in recent years and rehabilitation of the existing wells and location of new wells is necessary to ensure the margin of safety required for safe and effective implementation of the chinook supplementation program as well as meeting other hatchery objectives. Project is contingent on landowner willingness to proceed.

Benefit: stable water supply sufficient to support Skookum hatchery operations

Cost: Estimated 3-year project cost \$700,000

### **Skookum Cr Riparian Forest Conservation Easement**

Objective: Protect riparian forests and the functions they provide to Skookum Creek.

This project will protect through acquisition of either easement or fee purchase of 300-600 acres of riparian forest along Skookum creek, from the mouth upstream 5 miles. This reach has been identified in the WRIA #1 Salmon Recovery Plan as "Protection Category A". Protection of the riparian forests along this reach will address the limiting factors of low habitat diversity by protecting maturing riparian forests and allowing them to reach an older age and be recruited into Skookum Creek to serve as large woody debris and thereby increase diversity of habitat within the Skookum Creek channel. For larger landowners, some selective timber harvest is allowed even within the 200 shoreline buffer along Type 1 fish bearing streams, and further timber harvest is allowed within even smaller buffers along smaller streams. These buffer sizes and partial harvest restrictions are not at all sufficient to provide the size and volume of native trees that have historically provided large woody debris to WRIA#1 streams and rivers. Furthermore, a recent study by DNR of the recently approved Forest and Fish rules found that only 60% of logging operations followed the forest practice rules. This result raises concern for the impact of forest practice regulations on endangered salmon habitat and points out once again the need to simply acquire critical habitat for species recovery rather than relying on the ability of individual landowners to understand and follow the complex set of forest practice rules and on an understaffed DNR Forest Practices Division to enforce the rules. Project is in preliminary design phase and expected to ready to proceed by July 2007. Estimated cost is \$1,000,000.

### **South Fork Spawning Channel Feasibility and Design**

Overview Memo Category: 1

Objective: To determine conclusively the feasibility of constructing a chinook spawning channel in the South Fork Nooksack River with a capacity for 100 spawning pairs.

Preliminary studies of chinook redds in the South Fork have documented many problems with the ultimate survival of the spawn from those adults that return to the river. The supplementation program at the Skookum Creek hatchery is one approach to ensuring a higher productivity from returning adults, but still entails a level of risk that could be further reduced if it were possible to create an area protected from the erosional and sedimentation risks existing in the currently degraded channel conditions found in the South Fork. An additional benefit would be the ability to regulate the entry into the channel of non-native chinook later in the season. The objective would be to duplicate the success of the spawning channels for pink and sockeye salmon which allow for natural mate selection and controlled water quality and quantity as well as controlled sediment levels and yield high potential egg deposition to fry production. Similar success has not been encountered in the few spawning channels established to replace lost chinook spawning areas. This project would be staged in a series of phases that would progress as information supported continuation of the work. Phase 1: Analysis of critical chinook spawning habitat data, evaluation and critique of attempts to create controlled chinook spawning areas, and specification of requirements for a successful chinook spawning channel. Phase 2: Identification of locations within the South Fork meeting the specification of requirements for a successful chinook spawning channel, development of preliminary design options for the most likely locations, evaluate options with objective ranking criteria, prepare preliminary design and specifications for a channel at the highest ranking site and prepare initial cost estimates and construction schedule for a spawning channel. Landowner willingness will ultimately be required to evaluate sites and proceed with project.

Benefit: Protected spawning habitat for 100 pairs of native early chinook under natural conditions eventually resulting in 100,000 to 150,000 fry from naturally mated parents and reared under natural conditions.

Cost: Estimated 3 year project cost for Phases 1 and 2 is \$250,000

### **Lower South Fork Flood/Salmon Coordination (Below Hutchinson Creek)**

Overview Memo Category: 3a

Objective: Increase habitat diversity, reducing poaching impact

This project seeks to develop coordinated salmon habitat and flood management projects for the South Fork in a location near Acme.

This project includes working with Whatcom County Public Works and Parks Departments to address the right bank erosion at the Acme Farm and the failing rock revetment at the Roos property (Dozer Hole). Accomplishing these objectives may include attempting to split flow on the left bank floodplain upstream adjacent to the Roos property to enhance floodplain connections and side channel formation and maintenance to enhance rearing opportunities.

Benefit: The project will improve habitat diversity in the reach through increasing side channel areas, increasing the number of pools in the reach, and providing improved cover to existing pools. It is expected that the project could lead to 3600 feet of secondary channel through relict floodplain channels. The project will also improve woody cover on a riprap pool that is currently subject to poaching of Threatened species.

Cost: The project will cost an estimated \$300,000.

### **Acme Early Chinook Restoration**

Overview Memo Category: 5b, 3a

Objective: Increase habitat diversity, improve floodplain connectivity, reduce flood hazard to Acme.

This project seeks to develop coordinated salmon habitat and flood management projects for the South Fork in a location near Acme.

Habitat objectives of this project include improving South Fork floodplain connections and fine sediment storage at the former RV Park, improving habitat diversity and complexity, and maintaining connectivity for juvenile salmonids accessing the slough in Riverview Park and Landingstrip Creek. Reducing flood risk for the community of Acme is a primary flood management goal of this project. It should be noted that existing infrastructure currently limits floodplain functions in this area and that changes to infrastructure extend considerably beyond the 3-year planning horizon for this exercise. Planning and design costs are estimated at ~\$85,000. Construction costs are to be determined and are estimated at ~\$725,000.

Benefit: Improved complex pool habitat and thermal refugia; improved floodplain connectivity on one or both banks of the South Fork; community springboard for reach-scale discussions of salmon recovery and flood hazard management.

Cost: Estimated 3 year project cost \$810,000.

## **Acme to Confluence Restoration Acquisitions (2-5 parcels key for future restoration)**

Objective: Acquire properties in the Acme to Confluence reach of the South Fork that are necessary to implement planned priority restoration projects.

This project will acquire fee simply interest in 2-5 properties where habitat restoration projects are planned. This project address the limiting factors of habitat diversity, temperature and sediment load by acquiring key restoration properties and keeping them in conservation status perpetually inorder to fully control and restore key salmon habitat structures. Possible sites include the Todd Creek confluence, the junction of Caron Creek and Tawes Creek, property near Standard Creek confluence and the confluence of Hardscrabble Creek. These sites have been discussed in the South Fork Nooksack River Acme-Confluence Reach Restoration Planning: Analysis of Existing Information and Preliminary Restoration Strategies as possible locations of large, instream woody log jams. Other sites include wetland and potential properties that will support the *Lower South Fork Wetland Water Storage Improvement* project. Acquisition of these sites will provide willing landowner support for construction, monitoring and maintenance of the restoration projects.

Cost: Estimated cost of the project is \$2,000,000. Preliminary design of acquisition sites is underway with initial consultation with Nooksack Natural Resources and Lummi Natural Resources. Estimated date for completion is 6/2010.

## **Lower South Fork Joint Transportation/Restoration Planning**

Overview Memo Category: 5b, 3a

Objective: Develop habitat restoration projects in conjunction with possible replacement or relocation of existing transportation infrastructure.

Whatcom County is currently planning to replace Potter Road Bridge and improve drainage on Potter Road east and west of the bridge to increase public safety and access during flood events and to improve flood routing and salmon habitat functions. A second planning area lies between the State Route 9 (SR9) Acme Bridge (RM8.5) and the Burlington Northern Sante Fe Railroad (BNSF) Bridge (RM7.7). SR9 near the BNSF Bridge is considered a chronic maintenance problem by WSDOT (1999 Highway Concerns Review). Whatcom County is currently developing a hydraulic model for the South Fork Nooksack River which will help determine the extent to which the two bridges (BNSF and SR9) might be contributing to flooding concerns. This restoration planning project would complement the transportation planning process to optimize benefits for transportation and fish. Desired restoration elements include: (1) construction of instream logjams in an area of cool water influence to increase quantity of thermally-stratified deep pools with cover; and (2) construction of logjams along the margins of the HMZ to encourage greater connectivity with these surfaces, to increase the availability of off-channel habitat, reduce mainstem velocities and encourage floodplain deposition of fine sediment. The project will be implemented in two phases by area, with an estimated planning cost of \$100,000 for each area. Projects are likely to require landowner willingness to proceed with implementation.

Benefit: Two restoration plans coordinated with transportation plans

Cost: Estimated 3-year project cost \$200,000

### **Perpetual CREP**

Objective: Acquire perpetual conservation easements or fee simple acquisition of existing CREP Lease areas in the Lower South Fork Nooksack.

The Perpetual CREP project addresses the limiting factors of habitat diversity, temperature, and flow by taking the 15 year CREP leases of riparian habitat restoration and extending the term of the habitat protection in perpetuity. The USDA CREP program leases areas along salmon streams from willing landowners and pays the landowner to plant and maintain native vegetation along these streams in-order to provide shade and instream habitat diversity for salmon. While the concept of the project is very good and is adding significantly to habitat restoration the length of the lease is only 15 years. Once the lease term is completed the landowner is released from the restrictions to maintain the riparian plantings and could cut, thin, or remove the plantings entirely. Some farm landowners may be economically compelled to convert riparian planting areas back to farmland if prices for commodity prices remain high, especially for such items as corn for bio-fuel. By acquiring perpetual conservation easements over established CREP projects in the South Fork Valley, existing significant investment in salmon recovery will be allowed to mature and provide habitat. The Perpetual CREP project will focus on CREP projects along Black Slough and riparian areas of the South Fork Nooksack.

Cost: Estimated project cost is \$ 500,000. Estimated time of completion is 6/2011.

### **Bell Creek Road Crossing (Upper South Fork)**

Overview Memo Category: 8a

Objective: Allow bedload transport and migration

The Road 12 crossing of Bell Creek in the upper South Fork watershed is a partial bedload barrier and a complete fish barrier which fragments an isolated population of genetically identified, native Dolly Varden. This project involves replacing a culvert with a bridge. Because this road currently provides access to the SnowTel site and may not be maintained, the bridge will be designed to be easily removed if necessary. The project objective is to allow for bedload transport and migration of resident Dolly Varden. Likely sponsors for the project are Whatcom County or the U.S.D.A. Forest Service. This project is estimated to cost \$95,000. All permitting and NEPA compliance has been completed.

Benefits: restored fish passage at 1 resident fish barrier

Costs: Estimated 3 year project cost \$95,000

## **Middle Fork Nooksack**

### **Middle Fork Reach Assessment and Restoration Planning**

Overview Memo Category: 3c

Objective: Develop comprehensive restoration plan for Lower Middle Fork to address Nooksack chinook limiting factors

This project will assess limiting habitat conditions and plan restoration projects in the lower Middle Fork Nooksack River from the confluence with the North Fork upstream to the gaging station upstream of the Mosquito Lake Road bridge (RM 0-5.5). Objectives include: (1) synthesis of existing information and collection of new data to characterize limiting habitat conditions and habitat-forming processes; (2) identify and prioritize project concepts that address limiting habitat conditions. Similar efforts have been completed and/or are underway for 3 reaches that comprise the anadromous extent of the South Fork Nooksack (RM 0-8, 8-14.3, 14.3-31) and for much of the anadromous extent of the North Fork Nooksack (RM 36.5 – 57). Restoration of the lower Middle Fork is expected to benefit early chinook spawning and rearing success.

Benefit: comprehensive plan for restoration of lower Middle Fork that addresses limiting factors for early chinook and other species.

Cost: Estimated 3-year cost is \$150,000

### **Middle Fork Diversion Dam**

Overview Memo Category: 2

Objective: To restore anadromous fish passage at Middle Fork diversion dam

Restoration of anadromous fish passage at the diversion dam on the Middle Fork Nooksack River at RM 7.2 will restore access to at least 10.2 miles of Middle Fork and 6.9 miles of tributary habitat. The 90% feasibility study for a new intake structure and partial dam removal has been completed, and a Charrette/Value Engineering Study completed. This revised the cost estimate for this option to \$22,300,000. The fish ladder design option to restoring passage is complete through 90% feasibility, and it is anticipated to also go through a Charrette/Value Engineering Study to review the design and associated costs. Permits are being obtained, and construction could occur in 2008, pending funding availability. The project is expected to improve the abundance, productivity, spatial structure and diversity of NF/MF Nooksack early chinook.

Benefit: Restored passage at MF diversion dam to 17.1 miles of potential chinook habitat

Cost: Estimated 3 year project cost \$22,300,000 for the revised intake and partial dam removal option and approximately \$12,000,000 to \$16,000,000 for the ladder option.

### **Middle Fork Diversion Dam: Lake Whatcom Kokanee Program**

Overview Memo Category: (2)

Objective: To develop alternative kokanee production facilities to the Lake Whatcom program

The Lake Whatcom Hatchery is the primary source of kokanee (non-anadromous *Oncorhynchus nerka*) for Washington State, used to stock 36 lakes and reservoirs and supporting recreational fisheries valued at over \$20 million yearly. While the risk of virus transfer to Lake Whatcom through the pipeline from the Middle Fork is low, the Lake Whatcom Hatchery will lose its pathogen-free water certification once anadromous fish use upstream of the diversion dam is restored. Loss of pathogen-free status will necessitate testing of all adults from which eggs or offspring are intended to be transferred out of the local fish or egg health management zone, a level of testing which is considered to be infeasible. The Legislature funded WDFW to initiate a feasibility study to identify sites that could be used to replace the Lake Whatcom kokanee egg supply, and the recommended option was for multiple brood lakes plus construction of additional hatchery capacity. WDFW supports the restored anadromous use to the Middle Fork above the diversion, with the understanding that kokanee brood facilities to replace Lake Whatcom production needs to be funded and constructed as close as possible to restoring passage to avoid or minimize the duration of kokanee hatchery production reductions. The WRIA 1 Salmon Recovery Board supports the WDFW efforts to obtain funding from the state legislature, although acquiring the funding is not a prerequisite to restoring passage.

Benefit: N/A

Cost: Estimated 3 year project cost \$6,164,000.

### **Upper Middle Fork Spawner Surveys**

Overview Memo Category: 9a

Restoring passage to the Middle Fork is anticipated to result in natural colonization by steelhead, coho, and anadromous bull trout, and by early chinook returns from the ongoing off-station Kendall Hatchery releases that have occurred above the existing dam. Effective spawn survey coverage of this habitat is needed to monitor habitat recolonization, North/Middle Fork chinook population size, including natural and hatchery origin abundances, and to collect coded wire tags essential for use in estimating harvest rates for this Pacific Salmon Treaty Indicator Stock. With passage scheduled in 2007, surveys should begin in 2007. Due to the stream sizes and remoteness, spawn surveys will primarily be conducted in two person crews.

Benefit: improved escapement estimate for Nooksack early chinook; improved understanding of species use to reconnected habitat

Costs: Estimated 3 year project cost is \$150,000

### **North Fork Nooksack**

#### **Lower North Fork Reach Stable Side Channel Restoration**

Overview Memo Category: 3b

Objective: wood placement to improve channel stability, promote and protect forested island formation, and protect side channels for early Chinook spawning

This suite of projects seeks to protect and restore stable, off-channel spawning and rearing habitat to improve egg-to-emergence and juvenile rearing survival. The project concepts are being

developed through an ecological assessment of the lower North Fork (Nooksack Tribe, in progress) that identifies lack of wood and loss of forested islands, in addition to higher and more frequent peak flows, as the most important factors in the channel instability that has been observed there. Preliminary strategies proposed include:

- (1) Install stable logs and log structures at the upstream extents and lateral margins of existing or incipient channel islands, to encourage island growth, maturity, and stability. Design structures to collect and trap additional wood;
- (2) Fortify entrances to back channels with stable wood structures that scour a narrow flow aperture, ensuring low-flow inundation but preventing major avulsion into the off-channel habitat;
- (3) Construct new or augment existing wood accumulations to promote formation of new forested channel islands by encouraging fine sediment deposition and tree seedling establishment and growth to maturity;
- (4) Add wood structures to braids and younger back channels to provide instream cover and promote habitat diversity.

Preliminary project concepts, costs, and phasing have been proposed and are currently under technical review. Projects are contingent on landowner willingness to proceed. 2007-2009 cost estimates vary by site and treatment and are likely to change as site plans develop: (1) Phase 1 (start 2007): Wildcat/MacDonald Slough, \$300,000; Warnick Reach, \$800,000; (2) Phase 2 (start 2008): Hatchery Reach Island Enhancement, \$1,200,000; The Glen, \$1,500,000; Maple Creek Mainstem, \$450,000; (3) Phase 3 (start 2009): Kenny Slough, \$50,000; Lone Tree, \$50,000.

Benefit: increased stability, low flow connectivity of side channels; increased key habitat quantity (complex edge, backwater habitat) in side channels

Costs: Estimated 3 year project cost estimate \$4,350,000.

### **Lower North Fork Reach Tributary Restoration**

Overview Memo Category: 3b

Objective: improve habitat conditions in lower tributary reaches and at mainstem-tributary junctions

This suite of projects seeks to restore tributary spawning and rearing habitats that can provide refugia from mainstem floods by: (1) placing logjams on mainstem floodplains to encourage side channel development in association with tributary junctions; (2) placing wood in tributary reaches to improve habitat complexity and diversity; and (3) restoring historic channel configuration in reaches that have been straightened and simplified. Preliminary concepts and costs have been developed for three sites: (1) Boulder Creek confluence, \$190,000; (2) Gallop Creek, \$200,000; (3) Bell Creek/Spruce Roost, \$95,000.

Costs: Estimated 3 year project cost estimate \$485,000.

### **Lower North Fork Floodplain Riparian Restoration**

Overview Memo Category: 3b

Objective: Increase wood recruitment potential to improve channel stability and habitat diversity in the lower North Fork floodplain and increase shading to moderate temperatures in side channels

This project involves riparian planting in unforested or understocked areas in and within 260 feet of the North Fork floodplain in this reach. Rough preliminary estimate of \$100,000. Projects contingent on willingness of landowners of properties likely to be affected by the project.

Cost: Estimate for 3-year project is \$100,000

### ***Lower North Fork Tributary Riparian Restoration***

Overview Memo Category: 3b

Objective: Increase wood recruitment potential to improve channel stability and habitat diversity in the lower North Fork floodplain and increase shading to moderate temperatures in side channels

This project involves riparian planting in unforested or understocked areas along tributaries to the lower North Fork. Rough preliminary estimate of \$100,000. Projects contingent on willingness of landowners of properties likely to be affected by the project.

Cost: Estimate for 3-year project is \$100,000

### **Lower Canyon Creek Design and Restoration**

Overview Memo Category: 2,3b

Objectives: to improve adult passage and restore processes that create habitat diversity and complexity for early chinook and pink salmon, bull trout, and other salmonids

Restoration objectives that factor in geomorphic, habitat, alluvial fan flood risk, and public outreach goals will be defined in the on-going assessment. These will shape project design and sequencing. Habitat priorities include providing long-term passage at a recognized barrier to upstream spawning areas for early chinook, pinks, bull trout, steelhead, and other salmonids and providing improved in-stream habitat structure and diversity while habitat forming processes recover in both the stream and adjacent riparian areas.

Benefit: restore passage to 4.1 miles of chinook habitat; increased pool quantity, spawning gravel availability, backwater habitat, cover availability, channel stability (i.e. less redd scour, channel shifting) in 0.9 miles of early chinook tributary habitat.

Cost: Estimated 3 year project cost \$1,750,000

### **North Fork Restoration Acquisitions**

Objective: Acquire properties on the North Fork Nooksack that have been identified as necessary to implement planned priority restoration projects.

This project will purchase fee simple interest in 2-5 properties where fishery biologists and unpublished analysis have identified key habitat restoration project sites. This project address the limiting factors of channel stability, habitat diversity and sediment transport by acquiring key sites and keeping them in conservation status perpetually in order to fully control and restore

planned salmon habitat structures. Possible sites include Boulder Creek confluence, Gallop Creek, and additional lands near Bell Creek and Big Spruce Roost/The Glen, Warnick Reach, Hatchery Reach Island Enhancement Kenny Slough and the Lone Tree Island reach. These sites are possible locations of large, instream woody log jams and riparian forest restoration. Acquisition of these sites will provide perpetual and willing landowner support for construction, planting, monitoring and maintenance.

Cost: Estimated cost of the project is \$2,000,000. Preliminary design of acquisition sites is underway with initial consultation with Nooksack Natural Resources and Lummi Natural Resources. Estimated date for completion is 10/2010.

## **Mainstem Nooksack River**

### **Invasive Weed Control**

Overview Memo Category: 3a-d

Objective: to inventory and control invasive weed infestations to foster recovery of natural riparian plant species and riparian functions in priority chinook recovery areas which are currently limiting.

This project will inventory and control invasive weed infestations that dramatically alter riparian species composition and jeopardize long-term riparian functions such as shading and large woody debris recruitment. The focus is on the Knotweed family in riparian areas of the Nooksack River and its forks. Specific targets include Japanese knotweed (*Polygonum cuspidatum*), Giant (*P. sachalinense*) and Himalayan (*P. polystachyum*). Existing inventories will be completed. Areas along the active channel and isolated populations where knotweed is established and is most likely transported to form new colonies downstream will be prioritized for treatment. Projects are likely to be contingent on landowner willingness.

Benefit: decreased occurrence, rate of spread of knotweed

Cost: Estimated 3 year project cost \$315,000.

### **Mainstem Reach Assessment and Restoration Planning**

Overview Memo Category: 3d, 5c

Objective: Develop a comprehensive restoration plan for Mainstem Nooksack River to coordinate with flood management planning

The purpose of this project is to assess limiting habitat conditions (habitat diversity, quantity of key habitat like pools and off-channel habitat) and plan restoration projects in the Mainstem Nooksack River from the upper extent of the estuary to the Forks confluence (RM 36.5).

Objectives include: (1) synthesis of existing information and collection of new data to characterize limiting habitat conditions and habitat-forming processes; (2) identify and prioritize project concepts that address limiting habitat conditions; (3) work with County River and Flood to evaluate project feasibility; and (4) conduct education and outreach to affected landowners. Similar efforts have been completed and/or are underway for 3 reaches that comprise the

anadromous extent of the South Fork Nooksack (RM 0-8, 8-14.3, 14.3-31) and for much of the anadromous extent of the North Fork Nooksack (RM 36.5 – 57). Restoration of lower Nooksack River habitats is expected to benefit early chinook oversummer and overwinter rearing.

Benefit: comprehensive plan for restoration of Mainstem Nooksack that addresses limiting factors for early chinook, including identification of several projects that are feasible under current floodplain management context

Cost: Estimated 3 year project cost \$300,000

### **Lower Bertrand Creek Levee Setback- LWD Placement**

Overview Memo Category: 3d, 5a

Objective: Provide for habitat connectivity and in-stream habitat diversity and complexity in Lower Bertrand Creek.

The levees in lower Bertrand Creek were to be setback in the summer of 2006 to provide for restoration of riparian areas and to improve instream habitat functions and connectivity for rearing early chinook and other salmonids. Additional goals are to improve fall/winter flood storage and to reduce spring flooding of agricultural lands. The goal of this phase of the project is placement of large woody debris in the lower creek to improve habitat complexity and diversity for juvenile early chinook rearing, bull trout foraging, and utilization by multiple other salmonid species and lifestages. Conservation easements are in place to protect the restored riparian areas, and placed LWD will improve habitat while the CREP planted areas grow.

Benefit: increased availability of off-channel refugia, tributary rearing habitat

Cost: Estimated 3 year project cost \$150,000

### **Sande Bar Levee and ‘Clay Bank’**

Overview Memo Category: 3d, 5b

Objective: to reduce a fine sediment input that degrades water quality (i.e. turbidity) in the Nooksack River mainstem and estuary to modify a channel confining structure that alters floodplain connectivity, and to improve in-stream habitat complexity.

The project scope is to analyze alternatives and risks, prepare feasibility designs and costs, prepare final design, implement, and monitor a project(s) to reduce or eliminate toe erosion at the ‘Clay Bank’ in the mainstem Nooksack River. Failure of the ~200’ tall slope introduces large volumes of fine-grained sediment to the river chronically impairing water and habitat quality. Historic catastrophic slope failures have also temporarily blocked and diverted the river onto the floodplain to the north. A ‘hook’ in the right bank levee directs flow toward the slide, exacerbating slope failure. A combination of instream structures, levee setback, acquisition or easements on key properties, and design of a controlled overflow path are among the options to be considered to reduce long-term habitat impacts and need for more extensive and confining flood infrastructure. Projects are likely to be contingent on landowner willingness to proceed.

Benefit: improved habitat diversity (wood cover), backwater and complex edge habitat, reduced velocities during flood flows; decreased turbidity, fine sediment downstream of slide

Cost: Estimated 3 year project cost \$3,300,000

## **Piling Jam, 4 Sites**

Overview Memo Category: 3d

Objective: Demonstrate an economical and effective method to improve channel roughness, cover and water refuge particularly applicable to the single thread reaches of the main stem of the Nooksack and beneficial to salmonid stocks.

Install log piling arrays (similar to structures installed in early 1900's to protect river banks) to collect and hold wood debris, roughening the channel margins, creating fish cover and backwater habitat. Targeted species and life stage include both adult and juvenile stages of all salmonid species of the Nooksack River but in particular those species with extended freshwater adult holding and juvenile rearing stages. Projects are likely to be contingent on landowner willingness to proceed.

Benefit: increased cover and backwater habitat along 400-1200 feet of mainstem edge habitat

Cost: Estimated 3 year project cost \$100,000

## **Estuary and Adjacent Waters**

### **Modeling of Currents in Bellingham Bay**

Overview Memo Category: 4a

Objective: Configure COHERENS hydrodynamic software to model physical processes in Bellingham Bay under different conditions of tide, creek and river discharge and wind, and collect data allowing calibration and validation of the computer model to provide a basis for identifying potential estuarine habitat limiting factors.

There has been much speculation on the nature of the currents in Bellingham Bay that may be a factor in the distribution of salmonids migrating from the Nooksack River through the passages to the open ocean. The COHERENS model will allow provide knowledge and information about water circulation, stratification, and distribution under typical, unusual and hypothetical conditions. This information will facilitate the sampling of chinook in the estuarine area of the Nooksack River to identify potential limiting factors associated with near shore and upland anthropogenic influences.

Benefit: increased understanding of current patterns that may affect juvenile chinook distribution in Bellingham Bay

Costs: Estimated 3 year project cost \$216,000

### **Chinook Habitat Use Assessment in Bellingham Bay and Adjacent Areas**

Overview Memo Category: 4a

Objective: To identify habitat factors associated with the distribution and abundance of early Chinook in the areas adjacent to the mouths of the Nooksack River and identify anthropogenic impacts on ecosystem processes that may affect the productivity of the early Chinook runs to the Nooksack river.

Building on information generated from beach seine and open water salmonid surveys, implement a two year program to identify the habitats most frequented by Chinook leaving the Nooksack river. The project would regularly sample on shore and off shore habitats from Chuckanut Bay to Point Whitehorn, estimate the origin of hatchery and natural Chinook encountered and characterize the habitats sampled. The programs would provide a test of current hypotheses concerning the importance of near shore habitats on chinook use and abundance. The three year program will involve two years of sampling and sufficient time for analysis of results and communication of the results.

Benefits: increased understanding of distribution and abundance of chinook in Bellingham Bay and adjacent areas

Costs: Estimated 3 year project cost \$250,000

### **Smuggler's Slough Acquisition and Reconnection**

Overview Memo Category: 4c

Objective: Restore access to historic estuarine habitat, improve water quality, restore tidal and saltwater influence to evaluate improved utilization and productivity of chinook.

The goal of this project is to reconnect Smuggler's Slough to the Nooksack River and Lummi Bay. The project includes acquisition and restoration of wetland areas adjacent to the channel that will likely be affected by reconnecting the slough. The reconnection will include removal or alteration of tide gates at multiple locations in the estuary, as well as improving channel connectivity under roads and in ditches. The project will also remove portions of the Lummi Bay seawall to allow tidal inundation and salt marsh habitat in the area between the southern distributary channel of the Lummi River and setback levees formed by Kwina and Hillaire Roads. Riparian planting of the channels will follow design. Fresh water wetlands restoration will be accomplished in later project phases. It is estimated that the initial project will cost \$2,100,000 over four years with the first phase of property acquisition and design to take place in 2007 at a cost of \$300,000. The planning of the project will require landowner participation in setting project objectives and allowable scope of work.

Benefit: 250 acres of wetland acquired and 500 acres of flood plain wetland restored, restored passage to 6-8 miles of tidal slough and Lummi Bay

Cost: 3-year project cost estimate is \$2,100,000

### **Squalicum Creek Estuary Restoration**

Overview Memo Category: 4d

Objective: Restore estuarine marsh and intertidal mudflat in the Squalicum Creek delta.

Project elements include: (1) Removal of a derelict pier and associated creosote pilings, as well as over 200 additional creosote pilings; (2) restore 0.4 acres of estuarine fringe marsh; (3) restore 0.4 acres of riparian buffer; and (4) use clean dredge spoils to increase the area of shallow water intertidal habitat. Such habitat restoration is expected to benefit Nooksack early chinook fry and parr migrant life stages by restoring rearing habitat for physiological transition and feeding and refuge in a nonnatal estuary within 5 miles of the Nooksack River delta. Funding is needed for

estuarine and riparian buffer restoration; removal of derelict structure and pilings will likely occur as mitigation for redevelopment in the area.

Benefit: restore 0.4 acres of estuarine fringe marsh, 0.4 acres riparian, increased shallow intertidal area associated with Squalicum Creek estuary

Cost: Estimated 3 year project cost \$875,000

### **Cliffside Beach Wood Debris Removal**

Overview Memo Category: 4d

Objective: Assess the wood debris at Cliffside Beach for potential removal to restore the natural habitat and processes necessary to support native marine and upland vegetation, benthic organisms, juvenile salmonids, and shoreline wildlife in the Nooksack delta.

Project elements include: (1) investigate wood debris accumulation trends; (2) prepare field sampling plan; (3) conduct wood debris assessment; (4) develop options for wood debris removal and disposal/reuse; (5) prepare cost estimates for two removal and disposal/reuse options; and (6) prepare final report. The information obtained from this assessment and feasibility study will aid in determining whether or not removing the wood debris will provide an ecological benefit.

Benefit: The potential benefit of removing the wood debris is to restore nearshore habitat in the Nooksack delta.

Cost: \$85,000 for assessment and feasibility. The cost for the implementation phase will be estimated after completion of the assessment and feasibility.

### **Lower Nooksack Tributaries**

#### **Instream Flow Enhancement Project(s)**

Overview Memo Category: 7b

Strategies for achieving an adequate water supply for varied uses are part of the instream flow negotiations described in the Overview document. The strategy for meeting all water demands includes defining and installing facilities intended to augment instream flows at critical low flow periods. Identified projects include:

- Bertrand Creek well and surface storage system (locally termed “pump and dump”) that will provide water to augment instream flows in critical reaches during low flow periods. This program is to be operated by the Bertrand Watershed Improvement District. Estimated total cost: \$725,000.
- Bertrand Creek wetlands enhancement to increase water storage and infiltration to increase discharge to and augmentation of baseflow to Bertrand Creek. Additional projects will be identified that are intended to support the specific water demand needs, instream flow needs and hydrology of the subject watershed as the negotiations proceed. Estimated 3-year cost: \$55,000

Benefit: increased instream flow in Bertrand Creek

Cost: Estimated 3 year combined project cost \$780,000

## **Main Stem Nooksack- Fish Trap Creek**

Overview Memo Category: 3d, 5a

- Relocate Double Ditch and Benson watercourses between Main and Badger to new corridor to improve habitat and reduce flooding associated with these streams. Project involves purchasing a 5,000' by 200' foot easement between the Benson and Double Ditch Roads, constructing a new channel and restoring the riparian corridor. Estimated three year cost \$1,000,000 which includes the purchase of a 22 acre easement and construction of channel.
- Improve stream crossing on Fish Trap and Double Ditch Creeks. Project involves replacing two undersized crossings, one on Fish Trap at main and a second on Double ditch at 17<sup>th</sup> Street to improve fish passage and flow conveyance. The Double Ditch project will be constructed in the summer of 2007 while design and engineering work of the Fish Trap project will begin in 2008 with construction planned for 2010. Total three year cost is estimated to be \$2,000,000.
- Improve habitat, storage, and drainage along the Border to Badger reach of Fish Trap Creek. Project involves completing hydrologic analysis of channel, design and engineering, in channel work and riparian restoration along a three mile reach of the creek to improve fish habitat and drainage. Total three year cost \$850,000 of which \$300,000 is in hand.
- Establish Instream flows for the Fish Trap basin. It is envisioned the Fish Trap basin will be the site of the next pilot in stream flow effort given the basin shares many of the same issues with the Bertrand. Work is underway to form a watershed improvement district to effectively deal with instream flow, flood and drainage issues. No estimate has been made for the three year cost...
- Levee set back along lower Fish Trap Creek. Project involves setting an existing levee back along 2 miles of lower Fish Trap Creek. Project actions include acquiring approximately a 40 acre easement to provide the footprint to accommodate a 200 foot levee setback along the two mile reach of Fish Trap Creek, design and engineering, relocation of the levee, and in channel habitat improvement. Costs during the three year period are estimated to be \$300,000 for acquisition and engineering.

## **Schneider, Whiskey, Cougar, Creeks Ditch Flood Gate Improvements**

Overview Memo Category: 8a

Objective: Improve fish access to 20an estimated 10 miles ,000 feet of flood plain tributary channel, associated wetlands, and ponds.

Modify existing flood gates to improve flow connectivity and fish passage between river and floodplain habitats on the Schneider, Whiskey, and Cougar Creek systems. . The proposed action is to complete an assessment of options, design and engineering, and construct preferred option. The targeted species and life stage are juvenile chinook expected to use the transition flood plain habitats between the Nooksack River and Schneider Ditch; adult and juvenile coho, steelhead, and cutthroat expected to use the entire Schneider ditch drainage. An added benefit to this project

is the community outreach and good will that can be gained. Projects are likely to be contingent on landowner willingness to proceed.

Benefit: restored passage to floodplain habitats through range of flows

Cost: Estimated 3 year project cost \$150,000

## **Other Geographic Areas and Programs**

### **Update Small Cities SMP/CAO**

Note: The spreadsheet that accompanies this program description document includes a separate entry for the Sumas plan update due to the different priority tier assigned for efforts in this watershed. The project description below and estimated 3-year cost is inclusive of all planning updates.

Overview Memo Category: refer to individual bullets

The Whatcom County and City of Bellingham Critical Areas Ordinances were adopted in 2005, and the Whatcom County and Bellingham Shoreline Master Program updates are scheduled for completion/adoption by the end of 2006. Salmon recovery staff are participating on the Technical Advisory Committee for both updates to ensure salmonid habitat is protected to the maximum extent possible. Small cities are in the progress of updating their CAO and SMPs. The updated Whatcom County CAO and SMP are expected to serve as models for those updates. The following updates (with associated funding needs) are planned for the 3-year time frame:

- Update Ferndale SMP (90% complete, 6-9 months of work remaining, need additional \$30,000) Category Memo Overview: 6a
- Update Lynden SMP (scheduled for 2008, need \$60,000) Category Memo Overview: 6a
- Update Blaine CAO (may occur in 2008, need \$18,000) Category Memo Overview: 6a, 4f
- Update Blaine SMP (in progress, need \$15,000) Category Memo Overview: 6a, 4f
- Update Everson SMP (planned, estimated need \$60,000) Category Memo Overview: 6a
- Update Nooksack SMP (planned, estimated need \$60,000) Category Memo Overview: 6a
- Update Sumas SMP (planned, estimated need \$60,000) Category Memo Overview: 6a

Benefit: no net loss of ecological function in city jurisdictional areas

Costs: Estimated 3 year project cost for all planning efforts \$303,000

### **Restoration Plan and Watershed Management Plan Implementation**

Overview Memo Category: 9b

Objective: Provide the resources required to provide broader community involvement and institutional support in the implementation of the Salmonid Recovery Plan and WRIA 1 Watershed Management Plan to facilitate achievement of the plans' objectives in the most effective manner.

WDFW currently provides minimum support for Lead Entity functions, primarily salmon recovery grant process with minimal salmon habitat project development through a grant of approximately \$65,000 per year. Additional resources are required to more fully support project list development and to achieve community vesting of the WRIA 1 Salmonid Recovery Plan and the specific actions proposed that affect agriculture, forestry and flood hazard management. This community vesting is essential for the successful implementation of the restoration of habitat forming and maintaining processes. Additional resources are also required to coordinate and support the progress on all 8 early action items set out in the WRIA 1 Salmonid Recovery Plan as well as providing the necessary institutional support for the reporting on plan implementation. The additional resources would allow the Lead Entity to ensure that the needs for salmonid recovery WRIA 1 are not overlooked in the state-wide and regional support for salmonid recovery.

Institutional support for the WRIA 1 Watershed Management Plan is also needed to ensure coordination and implementation of the salmon-recovery and protection actions. In particular, continued support for negotiation and legal mediation of the pilot projects is needed in 2007.

Benefit: local participation in regional, state salmon recovery forums; timely progress on implementation, all H-integration of WRIA 1 Salmon Recovery Plan

Costs: Estimated 3 year project cost \$645,000

### **WRIA 1 Implementation of Instream Flow Negotiations**

Note: The spreadsheet that accompanies this project description document includes two entries for the Instream Flow Negotiations due to the different priority tiers assigned to Bertrand and Middle Fork. The project description below and estimated 3-year cost is inclusive of both drainages.

Overview Memo Category: 7a

Negotiations between affected parties, water rights holders, local governments, tribal governments, and the Washington Departments of Ecology and Fish and Wildlife are underway as part of the WRIA 1 Watershed Management Project. The objective of the negotiations in two pilot areas is to determine a management system for water use that supports both instream ecological functions and out-of-stream uses such as agricultural production municipal water supply, and commercial and industrial uses. Bertrand Creek and the Middle Fork Nooksack River are two sub-watersheds of the twenty-two that were defined for WRIA 1. These two pilot negotiations are scheduled to produce draft agreements for each watershed by late 2006 and will establish a template for negotiation in subsequent watersheds including those with a priority due to utilization by ESA listed early chinook salmon. Successful participation by affected parties and negotiation of revisions to agreement in 2007 will lead to formal adoption of an agreed flow and management regime for each pilot area via appropriate state and federal procedures. A key element of the pilots and for future negotiations is the use of a skilled mediator that can facilitate reaching agreements acceptable to all the parties and that are in compliance with Indian water law, federal law and state water law.

Benefit: instream flows, flow management regime established for Middle Fork, Bertrand Creek; negotiations for other watersheds initiated

Cost: Estimated 3 year project cost \$1,725,000.

### **Habitat Monitoring to Support Adaptive Management**

Overview Memo Category: 9a

This program will collect the data in Nooksack early chinook habitats required to (1) evaluate the effectiveness of voluntary habitat projects and regulatory habitat protection programs (Forest and Fish, Northwest Forest Plan, Shoreline Master Programs, Critical Areas ordinances) to the reduction of chinook habitat limiting factors, and (2) quantify the linkages among watershed processes, land use, habitat, and salmonid population response, in conjunction with information from other watersheds. The adaptive management program will be developed by late 2006 and will specify what habitat and watershed attributes will be monitored. Limited habitat data has been collected in recent years through reach assessments and project-associated monitoring, but funding is needed to build a rigorous habitat monitoring program. Adaptive management is critical to ensuring recovery strategies will be effective over the long term at restoring abundance, productivity, spatial structure and diversity of Nooksack early chinook

Benefit: development and beginning implementation of habitat component of adaptive management plan

Costs: Estimated 3 year cost \$300,000

### **Expand Monitoring and Stock Identification of Nooksack Chinook Population**

Overview Memo Category: 9a

- Increased spawn survey frequency will to improve estimates of population abundances for both early chinook populations by increasing survey frequency throughout the distribution area to record live and dead adults, redds, and to collect the essential biological data including sex, fork length, coded wire tags, scales, otoliths, look for mass marks, and opercle punches (indicating hatchery turnbacks), and tissue samples. Present survey efforts are good, but inadequate to effectively cover all areas at the desired frequency, and to recovery carcasses and coded wire tags throughout the entire distribution area.
- Increase smolt trap sampling rates at the mainstem and South Fork smolt traps, to improve outmigration estimates, and by taking and analyzing DNA from non-hatchery chinook, estimate proportions attributable to the two populations and fall chinook at both traps. Smolt trap operation requires two person crews.
- Starting with the 2004 brood, the fall chinook at Samish Hatchery were otolith marked with unique marks for the groups destined for release on station in the Samish, in Lummi Bay, and in the lower Nooksack River. Beginning in 2007 we will have the first returns (3 year olds), and will need additional funding to consistently spawn survey the habitat, with emphasis on the South Fork, and to analyze the otoliths that are recovered.

Benefit: improve accuracy of early chinook escapement (including natural-origin recruits) and juvenile production estimates

Costs: Estimated 3 year project cost \$600,000

### **Fish Passage Barrier Removal Program**

Overview Memo Category: 8a

Objective: to remove artificial barriers to fish passage and restore connections to historic salmonid habitats to benefit multiple salmonid species

The WRIA 1 drainage structure inventory identified 478 drainage structures that block salmonid access to 227 miles of historic habitat. An additional 423 miles are blocked by the state highway system. Whatcom County currently budgets \$250,000/year to replace barriers under county roads. The purpose of this program is to supplement that program to treat barriers, including those on private lands or in the cities of WRIA 1. Barriers providing the greatest fish benefit if removed are prioritized and will be systematically repaired.

Benefits: Restored passage at 10-15 salmonid habitat barriers per year; ~60 miles of access to historic habitats restored.

Costs: Estimated 3 year program cost \$750,000

### **Riparian restoration program support: project match, conservations easements**

Overview Memo Category: 8b

Objective: to restore riparian functions such as shade, future large woody debris recruitment, nutrient inputs, and bank cohesion in mainstem and tributaries of WRIA 1.

Programmatic funding for riparian restoration will provide the mechanism to continue and enhance on-going riparian restoration efforts throughout WRIA 1. Funding would be used to provide match or direct project funding to restore riparian areas or obtain conservation easements for existing or proposed riparian restoration in areas with salmonid use. WRIA 1 recovery plan species priorities would be applied.

Benefits: restore 55 acres of riparian habitat along WRIA 1 salmonid streams annually

Cost: Estimated 3 year program cost \$750,000

### **Monitor and Establish DNA baselines for Nooksack Bull Trout Populations**

Overview Memo Category: 9c

- Establish Nooksack bull trout spawn survey index reaches that are consistently surveyed through the spawning period in each fork to establish trends to be established over time. The North Fork should have multiple indexes, while the Middle and South Forks may need fewer.
- Conduct snorkel surveys in bull trout streams, including Hutchinson Creek with established brook trout populations to determine current brook trout distribution limits, to later determine whether distributions are still expanding.
- Collect tissue samples from within bull trout local population areas and run micro-satellite DNA to establish baselines, and test assumptions with core local population areas. Collect and run tissues from bull trout passed upstream at the South Fork weir.

Benefit: established bull trout index reaches; improved knowledge of brook trout distribution; established DNA baseline for Nooksack bull trout

Cost: Estimated 3 year program cost \$300,000

## **Steelhead Spawn surveys and DNA Analysis**

Overview Memo Category: 9c

Collect tissue samples and run DNA from native summer run steelhead collected and passed upstream at the South Fork weir. Increase spawning ground surveys to a minimum establish trends, and optimally to develop escapement estimates for winter steelhead.

Benefit: improved escapement estimate, baseline for summer steelhead

Cost: Estimated 3 year program cost \$450,000

## **Coho Spawn Surveys**

Overview Memo Category: 9c

Develop an improved coho escapement methodology and implement resulting increased spawn survey coverage to improve understanding of natural and hatchery origin returns, and to refine our understanding of the geographic extent of what appear to be native Nooksack coho.

Benefit: improved accuracy of coho escapement estimate, improved understanding of coho distribution

Cost: Estimated 3 year program cost is \$120,000

# WRIA 1 SALMON RECOVERY BOARD

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## Summary of Changes to 2006 WRIA 1 3-Year Project List

- Projects that are not likely to be initiated in 2007 were shifted to a projected 2008 start date.
- Projects were removed that were considered infeasible to initiate or complete within the projected timeframe. These projects include:
  - Lower South Fork Slough Reconnection (Curtis and Rothenbuhler Slough),
  - Floodplain Reconnection Upstream of COB Water Pipeline,
  - Peat Bog Side Channel
  - Acquisition of Priority Habitats (updated with more specific acquisition projects, which are included in the list below).
- Projects were added that were considered priorities and/or feasible to implement within the projected timeframe. These projects include:
  - South Fork Captive Brood Supplementation Program at NOAA Fisheries Manchester Research Station
  - South Fork Captive Brood Supplementation at Kendall Hatchery
  - Skookum Reach Restoration Project
  - South Fork Orphan Road Abandonment
  - South Fork Forests Forever (acquisition project)
  - Skookum Cr Riparian Forest Conservation Easement (acquisition project)
  - Acme to Confluence Restoration Acquisitions
  - Lower South Fork Perpetual CREP (acquisition project)
  - Lower North Fork Reach Stable Side Channel Restoration (3 Phase Project)
  - North Fork Restoration Acquisitions
  - Lower North Fork Reach Tributary Restoration
  - Lower North Fork Floodplain Riparian Restoration
  - Lower North Fork Tributary Riparian Restoration
  - Schneider, Whiskey, and Cougar Creek flood gate fish passage improvement (expands previous project)
  - Mainstem Nooksack/Fishtrap Creek Category (Four Individual Projects)
  - Cliffside Wood Debris Removal (Multi-phase project based on feasibility report)
- Project costs were updated as appropriate to reflect new information such as revised project cost estimates, funding obtained, and engineering and/or design work completed.
- Project names were reviewed for consistency between the 3-year project spreadsheet, project narrative document, and the WRIA 1 capital project list (2007-2009 biennial budget request), which resulted in two project name changes in the spreadsheet: Black Slough Wetland Water Storage Improvement changed to Lower South Fork Wetland Water Storage Improvement and Lower South Fork Flood/Salmon Coordination (Riverview Park) changed to Acme Early Chinook Restoration.

Geographic Area	Priority Tier	Action	Likely sponsor	Project or program?	Project/ program status	Total cost estimate 2007-2010	Funding in Hand		Funding Needed*		2007	2008	2009		2010		2011+		Likely end date	Primary Limiting Factors Addressed	For Habitat projects (see key for categories)						
							Funding in hand	Source of funding in hand	Total Need	Proposed source of other funds			Year 1 Scope	Year 1 Cost	Year 2 Scope	Year 2 Cost	Year 3 Scope	Year 3 Cost			Year 4 Scope	Year 4 Cost	Future Scope	Future Cost	Acquisition	Restoration type, if applicable	Location w/in watershed
South Fork Nooksack (lower)	1A	Acme-Confluence Reach: Active Channel Logjams (Phase 1)	NNR	Project	Contract for design late 2007	\$710,000	700,000	SRFB	10,000	BIA, EPA	Project Design & permitting	100,000	Construction	600,000	Monitoring	10,000	Monitoring				1, 3, 5	n/a	I	Mainstem		Capital	Habitat Capital Projects
South Fork Nooksack (lower)	1A	Acme-Confluence Reach: Active Channel Logjams (Phase 2)	Tribes	Project	Planned	\$1,300,000	0		1,300,000	SRFB, Gov Pkg		Project Design & permitting	100,000	Construction	1,200,000	Monitoring				1, 3, 5	n/a	I	Mainstem		Capital	Habitat Capital Projects	
South Fork Nooksack (lower)	1A	Acme-Confluence Reach: Active Channel Logjams (Phase 3)	Tribes	Project	Planned	\$200,000	0		200,000	SRFB		Project Design & permitting		200,000	Monitoring					1, 3, 5	n/a	I	Mainstem		Capital	Habitat Capital Projects	
South Fork Nooksack (lower)	1A	Acme-Confluence Reach HMZ Reconnection	Tribes	Project	Planned	\$417,000	0		417,000	DOE, BIA, USFWS, EPA		Work with landowners on project scope.			Project Design & permitting (Caron, River Farm sites): work with landowners on scope for McCarty, Standard sites	120,000			297,000		1, 3	n/a	F	Mainstem		Capital	Habitat Capital Projects
South Fork Nooksack (lower)	1A	Lower South Fork Tributary Riparian Restoration	Tribes; NRCS-WCD; NSEA	Program	Ongoing	\$541,200	0		541,200	CREP/USFW S/DOE		Implement Phase 1	180,400	Implement Phase 2	180,400	Implement Phase 3	180,400	Monitor and maintain.		3, 5	n/a	R	Tributaries		Capital	Habitat Capital Projects	
South Fork Nooksack (lower)	1A	Lower South Fork HMZ Riparian Restoration	Tribes; NRCS-WCD; NSEA	Program	Ongoing	\$981,200	0		981,200	CREP; USFWS; DOE		Implement Phase 1	327,067	Implement Phase 2	327,067	Implement Phase 3	327,067	Monitor and maintain.		3, 5	n/a	R	Mainstem		Capital	Habitat Capital Projects	
South Fork Nooksack (lower)	1A	Lower South Fork Wetland Water Storage Improvement	Tribes; NRCS	Project	Planned	\$518,000	0		518,000	DOE; BIA; USFWS; EPA	Work with landowners on project scope	Implement Phase 1	259,000	Implement Phase 2	259,000	Monitor and maintain.				5, 6	n/a	W	Tributaries		Capital	Habitat Capital Projects	
South Fork Nooksack (lower)	1A	Acme-Saxon Reach Active Channel Logjams (Nesset's Slough)	Tribes	Project	Planned	\$215,000	0		215,000		Work with landowners to develop preliminary plan.	Project Design and permitting	50,000	Construction	150,000	Monitoring	15,000		2012	1, 3, 5	n/a	I	Mainstem		Capital	Habitat Capital Projects	
South Fork Nooksack (lower)	1A	Acme-Saxon Reach Active Channel Logjams (Saxon Bridge)	Tribes	Project	Planned	\$400,000	0		400,000			Design and Permitting	70,000	Construction and monitoring		330,000		2014	1, 3, 5	n/a	I	Mainstem		Capital	Habitat Capital Projects		
South Fork Nooksack (upper)		Skookum Reach Restoration	LNR	Project	Planning	\$940,000	0		940,000	SRFB USFWS	Landowner discussions, Preliminary design	Detailed Design	70,000	Construction	855,000	Monitoring	15,000	Monitoring	5,000	2012							
South Fork Nooksack (upper)	1A	30 Mile Reach Restoration	LNR	Project	Implementation	\$350,000	350,000	City of Seattle USFWS		Seattle CCW USFWS	Design, Permitting, Construction	340,000	Monitoring	5,000		Monitoring	5,000		2011	1, 3	n/a	I	Mainstem		Capital	Habitat Capital Projects	
South Fork Nooksack (upper)	1A	Orphan Rd. Project Assessment	Tribes	Project	Pilot Study	\$120,000	0		120,000	City of Seattle USFWS	GIS analysis	20,000	Field assessment & prescriptions	100,000				2008	4, 6	n/a	N/A	Headwaters		Non-capital	Future Habitat Project Development		
South Fork Nooksack (upper)		Orphan Road Abandonment	LNR	Project	Implementation	\$29,000	30,000	City of Seattle USFWS	-1,000		Design, Permitting, Construction	28,000	Monitoring	500		Monitoring	500		2010								
South Fork Nooksack (upper)	1A	USFS Road Network Monitoring and Maintenance	USFS	Program	Ongoing	\$90,000	50,000	USFS	40,000			Monitoring and maintenance	30,000	Monitoring and maintenance	30,000	Monitoring and maintenance	30,000			4, 6	n/a	U	Headwaters		Non-capital		
South Fork Nooksack		South Fork Forests Forever: Purchase of Development Rights from Sierra Pacific Industries (>2,500 ac along 7 3/4 mi of SF)	WLT	Program	Ongoing	\$500,000	75,000	cash	425,000	SRFB	Negotiate and acquire easement >2,500 ac	500,000															
South Fork Nooksack	1A	Years 3 and 4 of Skookum Chinook supplementation project	Lummi; Co-Mgrs	Project	Implementation	\$510,054	170,018	Lummi, WDFW, PSC-SEF	340,036	US DOI, ?		Rear and Release 2006 brood, collect and rear 2007 Brood	170,018	Rear and Release 2007 brood, collect and rear 2008 Brood	170,018	Rear and Release 200 brood, collect and rear 2009 Brood	170,018	Continue Supplementati on until NORs sustainable	170,018 per year	2018	N/A	n/a	n/a	Mainstem		Non-capital	Hatchery
South Fork Nooksack		Captive Brood program run at WDFW's Kendall Hatchery	Co-managers	Program	Planning and HGMP development	\$1,014,000			1,014,000	possibly Legislature	capitol improvements	944,000	Rear 250 fry from 2007 brood	13,000	Rear 250 fry from 2009 brood and 250 juveniles from 2007 brood	19,000	Rear 250 fry from 2009 brood and 500 juveniles from 2007 and 2008 broods	38,000		51,000 annually	2015						
South Fork Nooksack		Captive Brood program run at Manchester Research Station	Co-managers	Program	Planning and HGMP development	\$750,000			750,000				Rear 250 fry from 2007 brood	250,000	Rear 250 fry from 2008 brood and 250 juveniles from 2007 brood	250,000	Rear 250 fry from 2009 brood and 500 juveniles from 2007 and 2008 broods	250,000		250,000 annually	2015						

Geographic Area	Priority Tier	Action	Likely sponsor	Project or program?	Project/program status	Total cost estimate 2007-2010	Funding in Hand		Funding Needed*		2007	2008	2009	2010	2011+	Likely end date	Primary Limiting Factors Addressed	For Habitat projects (see key for categories)							
							Funding in hand	Source of funding in hand	Total Need	Proposed source of other funds								Year 1 Scope	Year 1 Cost	Year 2 Scope	Year 2 Cost	Year 3 Scope	Year 3 Cost	Year 4 Scope	Year 4 Cost
South Fork Nooksack	1A	Skookum Cr Hatchery Water Supply	LNR	Project	Preliminary Design for intake, Initial funding	\$700,000	200,000	DOI BUREC	500,000		Complete Design, Permits and land access, locate new well field, rehab old wells	150,000	Construction of new intake and additional wells	550,000			N/A	n/a	n/a	Mainstem		Capital	Hatchery Capital Projects		
South Fork Nooksack		Skookum Cr Riparian Forest Conservation Easement	WLT	Program	Ongoing	\$1,000,000	150,000	cash	850,000	SRFB	negotiate and acquire easement over 300-600 ac of Skookum Cr riparian forest areas	1,000,000													
South Fork Nooksack	1A	Spawning Channel Feasibility and Design	LNR	Project	Planning	\$250,000	0		250,000		Identify necessary parameters, field investigation/GIS representation of results, ranking criteria	60,000	Identification of suitable locations, measure parameters, availability of land, cost estimates	60,000	Engineering design of facility and preparation of permits	130,000	1, 3, 4, 5	n/a	I	Mainstem		Non-capital	Future Habitat Project Development		
South Fork Nooksack (lower)	1B	Lower South Fork Flood/Salmon Coordination (below Hutchinson Creek)	Tribes; WCPW	Project	Planning	\$300,000	0		300,000	Whatcom County Flood	Design and permitting, construction	285,000	Replanting	12,500	Monitoring	2,500	Monitoring	5,000	2010	1, 3	n/a	I, F	Mainstem	Capital	Habitat Capital Projects
South Fork Nooksack (lower)	1B	Acme Early Chinook Restoration	WCPW	Project	Planning/Design	\$810,000	235,000	EPA; SRFB	575,000	Whatcom County Flood, SRFB	Final Designs and permitting; materials acquisition	235,000	Construction	575,000	Monitoring								Capital	Habitat Capital Projects	
South Fork Nooksack (lower)		Acme to Confluence Restoration Acquisitions (2.5 parcels key for future restoration)	WLT	Program	Not started	\$2,000,000	300,000	cash	1,700,000	SRFB	Negotiate and acquire river front properties for future restoration work	2,000,000													
South Fork Nooksack (lower)	1B	Lower South Fork Joint Transportation/Restoration Planning	WCPW; Nooksack	Project	Planned	\$200,000	0		200,000	Whatcom County/BIA/WSDOT/AAC OE	Work with landowners and transportation interests on project scope.	30,000	Project Design & permitting	170,000	Construction, monitoring								Non-capital	Future Habitat Project Development	
South Fork Nooksack (lower)		Perpetual CREP	WLT	Program	Ongoing	\$500,000	75,000	Cash	425,000				Acquire perpetual conservation easements (~250 ac CREP planting in the SF Nooksack)	500,000											
South Fork Nooksack (upper)	4	Bell Creek Road crossing	WCPW; USFS	Project	Permitting and design complete	\$95,000	0		95,000	USFS	Construction	95,000				2008	7	n/a	€	Tributaries		Capital	Habitat Capital Projects		
<b>Subtotals- South Fork</b>	<b>All</b>					<b>\$15,440,454</b>	<b>\$2,335,018</b>		<b>\$13,105,436</b>																
					Projects	\$8,064,054	\$1,685,018		\$6,379,036			\$783,000	\$2,549,518	\$3,896,518											
					Programs	\$7,376,400	\$650,000		\$6,726,400			\$2,444,000	\$2,806,467	\$1,306,467											
Middle Fork Nooksack	1A	Middle Fork Reach Assessment and Restoration Planning	LNR	Project	Not started	\$150,000	0		100,000		Data collection, analysis and synthesis	105,000	Identify and prioritize projects, write report	45,000					2009	1, 3	n/a	n/a	Mainstem	Non-capital	Future Habitat Project Development
Middle Fork Nooksack	1A	Middle Fork Diversion Dam	COB	Project	Feasibility study, assessments, permit applications, and design initiated	\$22,300,000	6,125,000	PWTF; WA; SRFB w/ Match; FRIMA	16,175,000		Permitting; value engineering		construction	22,300,000									Capital	Habitat Capital Projects	
Middle Fork Nooksack	1B	Middle Fork Diversion Dam (Kokanee Program)	WDFW	Project	Not started	\$6,164,000	0		6,164,000	State legislature												Capital	Hatchery Capital Projects		
Middle Fork Nooksack	1C	Upper Middle Fork Spawner Surveys	Co-mgrs	Program	Not started	\$150,000	0		150,000		Spawn surveys, DNA and otolith analyses	50,000	Spawn surveys, DNA and otolith analyses	50,000	Spawn surveys, DNA and otolith analyses	50,000	Spawn surveys, DNA and otolith analyses					Non-capital	Stock Monitoring Support		
<b>Subtotal-Middle Fork</b>	<b>All</b>					<b>\$28,764,000</b>	<b>\$6,125,000</b>		<b>\$22,639,000</b>			<b>\$0</b>	<b>\$22,455,000</b>	<b>\$95,000</b>											





Geographic Area	Priority Tier	Action	Likely sponsor	Project or program?	Project/ program status	Total cost estimate 2007-2010	Funding in Hand		Funding Needed <sup>1</sup>		2007		2008		2009		2010		2011+		Primary Limiting Factors Addressed	For Habitat projects (see key for categories)						
							Funding in hand	Source of funding in hand	Total Need	Proposed source of other funds	Year 1 Scope	Year 1 Cost	Year 2 Scope	Year 2 Cost	Year 3 Scope	Year 3 Cost	Year 4 Scope	Year 4 Cost	Future Scope	Future Cost		Likely end date	Acquisition	Restoration type, if applicable	Location w/in watershed	Performance	Capital or Non-capital	Subtype
Schneider, Cougar, and Whiskey Creek	4	Flood gate Modification	WCPW; NSEA	Project	Preliminary assessment underway	\$250,000	30,000	Diking district, NSEA	150,000		Assessment, design, Construct Schenider	50,000	Complete Schneider, Design Courgar	50,000	Complete Courgar, Design Whiskey	50,000	Daylight creek, install new flood gate	100,000			7	n/a	P	Tributaries	Improve passage to estimated 10 miles of tributary habitat	Capital	Habitat Capital Projects	
<b>Subtotal- Lower Nooksack Tributaries</b>	<b>All</b>					<b>\$5,130,000</b>	<b>\$340,000</b>		<b>\$4,420,000</b>			<b>\$990,000</b>		<b>\$935,000</b>		<b>\$2,105,000</b>		<b>\$1,100,000</b>										
				Projects		\$5,130,000	\$340,000		\$4,420,000			\$990,000		\$935,000		\$2,105,000		\$1,100,000										
Lower Nooksack watershed	1A	Update Lynden SMP	City of Lynden	Program	scheduled for 2007	\$60,000			60000			SMP update	60,000								N/A	n/a	N/A	Tributaries		Non-capital	protection - participation in	
Lower Nooksack watershed	1A	Update Ferndale SMP	City of Ferndale	Program	~90% complete, 6-9 months more work	\$30,000			30000			SMP update	30000								N/A	n/a	N/A	Mainstem, Tributaries		Non-capital	protection - participation in policy or regulatory	
Lower Nooksack watershed	4	Update Nooksack SMP	City of Nooksack	Program	planned	\$60,000	0		60000			SMP update	60000								N/A	n/a	N/A	Tributaries		Non-capital	protection - participation in policy or regulatory	
Lower Nooksack watershed	1A	Update Everson SMP	City of Everson	Program	planned	\$60,000	0		60000			SMP update	60000								N/A	n/a	N/A	Mainstem, Tributaries		Non-capital	protection - participation in	
Drayton Harbor watershed/Strait of Georgia	3	Update Blaine CAO/SMP	City of Blaine	Program	SMP update in progress, CAO planned	\$33,000			33000			SMP update	15000	CAO update	18000						N/A	n/a	N/A	Marine shorelines		Non-capital	Habitat protection - participation in policy or regulatory updates	
Watershed	1A	Restoration Plan and Watershed management plan implementation	Joint policy boards of WRIA 1 WMP and Salmon Recovery Program	Program	expansion	\$645,000	200,000	DOE; EPA	495,000	WDFW; DOE; DOI		Assist in Implementation of pilots, and coordination of participating partners and sponsors	315,000	Assist in Implementation of pilots, and coordination of participating partners and sponsors	165,000		Assist in Implementation of pilots, and coordinate any adaptive management actions	annual requirement			2025	N/A	n/a	N/A	Throughout		Non-capital	Watershed plan implementation
WRIA 1	1A	WRIA 1 Instream Flow Negotiations (Early chinook habitats)	WRIA 1 Policy Boards; ISF Negotiation Parties	Program	Ongoing	\$875,000	90,000	City of Bellingham/Participating governments/ot hers	285,000		Middle Fork negotiation; public notifications, communications and meetings	75,000	Middle Fork: flow adoption. Begin next priority area	400,000		Other subwatersheds: facilitate renegotiation, evaluate agreement compliance with Indian water law, federal law and state water law	400,000	Continue flow selection and adoption process in priority areas.	150,000/yr			6	n/a	N/A	Mainstem, Tributaries		Non-capital	Habitat protection - participation in policy or regulatory updates
WRIA 1	4	WRIA 1 Instream Flow Negotiations (Other salmonid habitats)	WRIA 1 Policy Boards; ISF Negotiation Parties	Program	Ongoing	\$850,000	147,000	Whatcom County/ Participating governments	703,000		Finalize Bertrand flow agreements; seek state and federal adoption	50,000	Finalize adoption of Bertrand; begin instream flow adoption process in next priority area	400,000		Continue flow selection and adoption process in priority areas.	400,000	Continue flow selection and adoption process in priority areas.	150,000/yr			6	n/a	N/A	Tributaries		Non-capital	Habitat protection - participation in policy or regulatory updates
Nooksack early chinook habitats	1C	Habitat monitoring to support adaptive management	Tribes	Program	Some monitoring underway; adaptive management program needs to be developed.	\$300,000	0		300,000			Habitat monitoring to support adaptive management	100,000	Habitat monitoring to support adaptive management	100,000		Habitat monitoring to support adaptive management	100,000	Habitat monitoring to support adaptive management	\$100,000/year	2106	N/A	n/a	N/A	Mainstem, Tributaries, Estuary, Marine shorelines		Non-capital	Habitat Project Monitoring
Nooksack chinook habitats	1C	Expand Monitoring and Stock Identification of Nooksack Chinook Populations	Co-mgrs	Program	Existing population monitoring ongoing; but needs expansion	\$600,000	0		600,000			Spawn surveys, smolt trapping, DNA and otolith analyses	200,000	Spawn surveys, smolt trapping, DNA and otolith analyses	200,000		Spawn surveys, smolt trapping, DNA and otolith analyses	200,000	Spawn surveys, smolt trapping, DNA and otolith analyses			N/A	n/a	N/A	Mainstem, Tributaries		Non-capital	Stock Monitoring Support

