Project Number	14-1075
Project Name	Feeder Bluff Assessment and Armor Removal ID
Sponsor	Northwest Straits Marine Conservation Foundation
Planning Type	Assessment and Preliminary Design

2014 Project Proposal for Planning Projects

1. Problem Statement

Provide an overview of fish resources, current habitat conditions, site or reach conditions, gaps in knowledge, and other key salmon recovery problem(s) in the watershed that this project is intended to address.

This project targets restoration of sediment supply from feeder bluffs to restore habitat and habitat forming processes for the benefit of salmonids and other species using the nearshore waters of WRIA6.

Historically, WRIA6 has served as an important harvest area for commercial and sport salmon fisheries. Nearshore surveys of WRIA6 for juvenile salmon have been used to forecast the number of adult pink and chum salmon returning to the Snohomish and Stillaguamish Rivers. WRIA6 nearshore habitats provide important refuge habitats and feeding habitats for salmonids and are presumed to be important refuge along a major migratory corridor for six of the 22 Puget Sound Chinook ESU populations (WA Conservaton Commission 2000).

Like all Puget Sound beach habitats, WRIA6 beaches are composed primarily of sediment derived from feeder bluff erosion (Keuler 1988). Depending on the characteristics of the feeder bluff, a single reach of bluff can supply sediment for miles of down-drift shore and contribute to several valuable habitats found therein (Johannessen and MacLennan 2007). Bluff erosion can sustain down-drift forage fish spawning beaches. In addition, bluff erosion builds down-drift barriers that then create barrier estuaries or embayments (or 'pocket estuaries'). These embayments provide important sheltered habitats and are heavily utilized by juvenile salmonids in WRIA6 for foraging, rearing and refuge (Beamer, 2003, Fresh 2007). Chinook salmon fry prefer pocket estuary habitat and these habitats are also important rearing habitats for surf smelt. Sampling results documented significantly higher juvenile Chinook densities (on average 52% higher) than adjacent nearshore habitats across 19 different pocket estuary sites found throughout the Whidbey Basin (and Skagit County bays) (Beamer 2006).

Without ample sediment supply, barriers forming these pocket estuaries can breach, potentially resulting in major degradation of these sheltered habitats.

Shoreline habitats benefiting from feeder bluff functions are important habitats benefiting salmonids and other species:

Armoring feeder bluffs interferes with sediment transport and degrades down-drift habitats, starving them of sediment needed to build barriers and other habitat structure. (Johannessen and MacLennan 2007). Shoreline bulkheads and other types of armor are significant stressors on Puget Sound nearshore ecosystem and species. Armor affects beaches and other coastal habitats, alters coastal ecology, and reduces the resilience of the coast to rising sea level

(Shipman et al. 2010, Johannessen and MacLennan 2007). Negative impacts of shoreline armoring to juvenile salmonid migratory pathways, forage and habitat structure include:

- Forcing migrating salmonids into deep water where they are potentially more vulnerable to predation (Toft et al. 2010). This affect is amplified where shore armor infringes further waterward down the beach profile.
- Loss of natural beach substrate that can reduce the aerial extent of forage fish spawning areas, and epibenthic and benthic invertebrate species richness and density (Toft et al. 2010).

Because of this pervasive degradation and the importance of nearshore habitats to juvenile Chinook salmon, the WRIA6 Salmon Recovery Plan (2005) identifies the nearshore and pocket estuaries of Whidbey Basin as an immediate priority for conservation and restoration.

Throughout Puget Sound, over 950 miles of shoreline consists of bluff-backed beaches of which over 33% are armored (Simenstad et al. 2011). The shoreline of WRIA6 makes up about 13% of the shorelines of Puget Sound. It is broken up between parcels both publicly and privately owned. Preliminary findings from project partner Coastal Geologic Services (CGS) (2014) identify close to 250 armored feeder bluff sites in private ownership in WRIA6. Of those sites, 47 have no dwelling currently built on them. Most of those sites also have documented forage fish spawning activity.

Another challenge addressed with this project is the perception amongst landowners that armoring is needed to protect their property. Private land owners do not typically view armor removal as an acceptable option and consistently identify 'erosion' as their main concern (CGS landowner needs assessment 2010, NWSF landowner needs assessment 2012). While permit applications for new armoring are generally not granted; permits for rebuilding existing armoring that is failing are always granted. Without educational opportunities and/or incentives, landowners are unaware of alternatives to armoring and the benefits of these alternatives.

The shoreline of WRIA6 provides an excellent opportunity for strategic project outcomes to be met due to their rural character, the quality of data sets, and the history of successful restoration projects. The less degraded character of the shoreline and the lower parcel density (relative to South and Central Puget Sound) also provides greater opportunity to achieve bluff restoration projects. The higher turnover of shoreline parcels and new owners' concerns about the costs associated with maintaining old and failing bulkheads provide opportunities to engage landowners and discuss the range of site specific options available, and the costs and benefits of armor removal.

Models for landowner outreach and education, along with clear incentives for positive action, are needed to effectively pursue restoration of sediment supply processes on privately owned land. The messaging and content of the proposed project's targeted outreach will reflect the values and concerns identified in landowner needs assessment surveys conducted by the Northwest Straits Foundaiton (NWSF) in other recent shoreline landowner education projects.

2. Project Purpose

A. State the project goal(s).

The goal of this project is to restore habitat forming sediment supply processes from feeder bluffs throughout WRIA6 for the benefit of juvenile salmonids and other species. The eventual

result of the project will be a number of feeder bluffs freed of armoring, feeding down-drift habitats with sediment supply.

B. List the project's objectives.

- Assess the feasibility and benefit of armor removal at all public and 5,831 private parcels (137 miles of shoreline residential).
- Build a prioritized list of private and publically-owned armor removal projects that are feasible and will restore feeder bluff sediment supply processes to benefit down-drift shoreforms and habitats.
- Educate 80 feeder bluff parcel landowners of the importance of sediment supply processes, feeder bluffs, and shoreline habitat values.
- Produce 3-5 peliminary (permit ready) designs for feeder bluff sediment supply restoration projects in WRIA6 that will restore sediment supply to shoreline process units and have willing landowners.

3. Project Context

A. Describe the location of the project in the watershed

The proposed study area includes the feeder bluffs, shorelines and drift cells of WRIA6.

B. List the fish resources present at the site and targeted by this project.

Species	Life History Present (egg, juvenile, adult	Current Population Trend (decline, stable, rising)	ESA Coverage (Y/N)	Life History Target (egg, juvenile, adult)
Chinook salmon	Juvenile, adult	Varies by run (Good et al 2005)	Y	Juvenile, adult
Chum salmon	Juvenile, adult	Varies (Fresh 2006)	Y	Juvenile, adult
Pink salmon	Juvenile, adult	Varies (Fresh 2006)	N	Juvenile, adult
Coho salmon	Juvenile, adult	Varies	N	Juvenile, adult
Sockeye salmon	Juvenile, adult	Varies	N	Juvenile, adult
Surf smelt	Egg, juvenile, adult	Unknown (Pentilla 2007)	N	Egg, juvenile, adult
Pacific herring	Egg, juvenile, adult	Unknown (Pentilla 2007)	N	Egg, juvenile, adult

Historical studies conducted by the state and tribes documented use of the nearshore by chum, pink, Chinook, coho, sockeye, steelhead and char at several locations in WRIA6 (WA Conservation Commission 2000).

C. Discuss how this project fits within your regional recovery plan and local lead entity's strategy to restore or protect salmonid habitat in the watershed

This project is included in the recently updaated *Three-Year Watershed Implementation Priorities for Island County / WRIA6* as a habitat project aimed at protecting and enhancing the food web for migrating salmon. This proposed project will enhance forage fish spawning habitat and improve nearshore habitat for adult and juvenile salmon. The project will achieve three of the four stated goals of the WRIA6 Salmon Recovery Plan (2005):

- Over the long term, achieve a net increase in salmon habitat through protection, enhancement, and restoration of naturally-functioning ecosystems that support self-sustaining salmon populations and the species that depend on salmon.
- Develop understanding of habitat functions and the distribution of forage fish species, salmonids, and marine mammals in WRIA 6.
- Engage an informed community in identifying, protecting, enhancing, and restoring salmon-supporting ecosystem processes and habitats.

This project will achieve the first goal by restoring habitat forming sediment supply processes at feeder bluffs. Fifty-one drift cells are found in WRIA6, 44 of which were identified in Cereghino et al. (2012) as areas in which beach restoration were recommended. Twenty of those same drift cells were identified as "high restoration" priorities. These shores fall primarily in Geographic Area 1 and Geographic Area 2 of the WRIA6 Salmon Recovery Plan (2005), reflecting their importance for salmon recovery in the WRIA. Please see attached map of Coastal geomorphic shoretypes of Island County, Washington (MacLennan et al. 2013). Also see attached photos of armored feeder bluffs from Camano Island (Area 1) and East Whidbey Island (Area 2).

The WRIA6 Salmon Recovery Plan (2005) identifies the nearshore and pocket estuaries of Whidbey Basin as an immediate highest priority for conservation and restoration. This project aims to restore sediment supply processes necessary to build and sustain barrier embayments and other nearshore habitats important for forage fish and nearshore habitat for salmon and forage fish by restoring habitat forming feeder bluff sediment supply processes.

The project will achieve the other goals of the salmon recovery strategy by educating owners of feeder bluff properties about the functions that feeder bluffs play in the shoreline and their importance to salmonid and forage fish habitats. And the project will enlist the support of property-owners to remove armoring at feeder bluff sites, thus restoring salmon-supporting ecosystem processes.

Consistent with the Guiding Principles of the WRIA6 Salmon Recovery Plan (2005), this project uses newly emerging science and data recently developed to assess the feasibility of armoring removal at feeder bluff sites. By assessing structure setbacks, and recognizing and honoring landowners' concerns about their property, this project will further cultivate support for salmon restoration in the community.

This project also addresses one of Island County's Local Integrating Organization's approved Near Term Actions (NTAs). It supports the NTA2.3.ISL5 "Remove hard shore armor" identified in the 2012 Puget Slund Partnership Action Agenda.

D. Explain why it is important to do this project now instead of at a later date..

Recent analysis of permit data by Carman et al (2010) noted that new armor continues to be constructed along Puget Sound shores at a rate of approximately 1.5 miles per year. The

shoreline of WRIA6 makes up about 13% of the shorelines of Puget Sound. It is broken up between parcels both publicly and privately owned. Preliminary findings from CGS (2014) identify close to 250 armored feeder bluff sites in private ownership in WRIA6. Of those sites, 47 have no dwelling currently built on them. Most of those sites also have documented forage fish spawning activity. There is the possibility that those sites could be built upon in the near futures. This project will help to prevent future armoring on those sites and will help avoid repairs of bulkheads on the other armored sites. Once property owners spend thousands of dollars on armoring, it will be much more difficult to optain willingness to remove armoring.

E. If any part or phase of this project has previously been reviewed or funded by the SRFB, please fill in the table below.

Project partner CGS has conducted several feeder bluff related projects that have received SRFB funding. CGS mapped current and historic feeder bluffs in San Juan County for Friends of the San Juans in 2010 (MacLennan et al. 2010) and has performed a number of site-specific armor removal feasibility assessments and designs. These included: The Powell Shoreline Restoration on Bainbridge Island for the Bainbridge Island Land Trust, the Brown Island Bulkhead Removal Project for Friends of the San Juans and the Beaconsfield on the Sound Bulkhead Removal Feasibility Study for the Cascade Land Conservancy.

Project # or Name	Status		Status of Prior Phase Deliverables and Relationship to Current Proposal?
Feeder Bluff Assessment & Armor Removal ID 06-NP-(004-003)	●	Completed	Project dissolved.
	○	In Process	
	○	Not Funded*	
San Juan County Feeder Bluff Mapping (09-1594)	●	Completed	This is the final phase of a 3-phase project, in which the geomorphic shoretypes have been mapped prior to MacLennan et al. 20130.
	○	In Process	
	○	Not Funded*	
Brown Island Historic Feeder Bluff Restoration (13-1177)	○	Completed	This project continues to progress and will be implemented this fall (2014). This project is unrelated to this project proposal.
	●	In Process	
	○	Not Funded*	

* If previous project was not funded, describe how the current proposal differs from the original.

4. Project Description

A. Provide a detailed description of the proposed project and how it will address the problem described above.

The proposed project will be conducted in three distinct phases, though Phase 2 and Phase 3 will overlap in time. The project will address sediment supply degradation to shoreline process units in Island County by identifying and prioritizing feasible armor removal projects at historic feeder bluffs (sediment source bluffs) and implementing project development models at high priority sites to achieve landowner willingness to participate in restoration activities. The project employs a three-phase approach to achieve 3-5 preliminary designs for armoring removal at feeder bluffs and a list of other 'ready to proceed' feeder bluff restoration projects

Phase One The feasibility and benefits of armor removal will be assessed for every parcel that includes a feeder bluff in WRIA6. The assessment functions as a screening tool and no additional analysis will be applied to parcels in which armor must be maintained to prevent a direct threat to structures. However, in the case where a structure is in need of realignment, the property may still remain in the analysis, but would be categorized separately and highlighted as a potential realignment projectFeeder bluff mapping data will be linked with parcel data and attributed with supporting data relevant to the feasibility of armor removal. Building setback distances will be measured using LiDAR data, which will require a complex series of tasks to create a building layer and delineate the bluff crest, the details of which cannot fit in this proposal. Fetch and shore-orientation will be identified as well as the length of armor along the parcel. Where setback distances are sufficient for a given set of conditions (based on fetch and shore orientation), a parcel will be flagged as feasible for armor removal.

The potential benefit associated with each armor removal project will be assessed by applying a series of metrics. Benefit metrics will entail physical characteristics of the site that would inform the level of sediment potentially supplied to the local beach system, such as bluff height, geologic composition (where available), and length of restored shoreline. Benefit metrics will also be applied to capture potential benefits off-site including: length of shore down-drift, presence of down-drift barrier beach, presence of down-drift barrier embayment/coastal wetland, and presence of down-drift forage fish spawning areas. Additional metrics associated with land-use patterns will also be scored – such as the occurrence of an adjacent armor removal project or conservation area, or if the armor was the only reach of degraded shoreline for a contiguous stretch of shoreline. Parcel-scaled data would also be linked with PNSERP degradation, stream mouth density, and recommended strategy data to allow for larger scale prioritization ranking, where necessary. Additional analyses that could result in greater benefit will also be performed such as: areas where the spatial extent of armor could be reduced, clustering adjacent highly ranked parcels, adjacency to conservation areas, and identifying parcels with exceptionally low setbacks in which erosion threats may be imminent and realigning infrastructure could be applied. These data sets will be available when the project commences and the tools to efficiently utilize them are currently in place. Parcels would then be ranked for the relative benefit that the project could provide, based on a cumulative measure of benefit at multiple scales.

Parcels will be sorted by ownership type: public, commercial, or private residential. Parcel data will link with an ownership database that will be used to conduct targeted outreach activities including needs assessment surveys, educational workshop promotion, and direct landowner contacts for Phase Two.

Phase Two High ranking sites in public ownership will be brought forward by meeting with the residing agencies and working to advance projects toward implementation. Similarly, outreach to high ranking commercial owners will be conducted. Similar strategic, science-based outreach efforts to shoreline landowners have been highly successful in generating armor removal and soft shore protection projects in the San Juan Islands by Friends of the San Juans and CGS.

Project development with private landowners will begin at the community level, through focused educational workshops for shoreline landowners. Additional outreach to top ranking

private sites would entail direct communication with specific landowners and the opportunity to have a free site consultation by a licensed engineering geologist with expertise in soft shore protection design and armoring removals for private property owners. Workshops will be followed by targeted meetings with landowners.

Phase Two project development reflects EPA's Guidelines for Excellence in Non-formal Environmental Education (NAAEE, 2009). EPA guidelines for non-formal outreach programs are designed to move target audiences in a logical progression from 1) awareness of an issue to 2) concrete knowledge to 3) personal action. The steps of the proposed project outreach design process are: identification of a clear goal (bluff armor removal on high priority sites); identification of a target audience (shoreline landowners in high priority areas); needs assessment of target audience and existing resources; delivery of resources; and evaluation based on identified outcomes. The first step in obtaining landowner willingness is direct outreach that provides opportunities to learn about coastal processes, impacts of armoring and sea level rise, and site specific feasibility regarding the application of alternatives to hardening.

Phase Three The final outcomes would be a list of feasible, highly beneficial sediment supply restoration projects with expressed landowner willingness. The final project sites will be assessed to the level required and 3-5 preliminary restoration designs (following SRFB Manual 18 guidelines) will be developed. This will result in projects ready to fund for implementation. IN addition, a list of potential sediment supply restoration projects will be compiled. Periodic reviews will determine if landowner willinghalong with a longer list of feasible projects from the analysis.

B. Clearly list and describe all products that will be produced (i.e., project deliverables).

The following deliverables will be produced:

- Ranked list of potential feeder bluff armoring removal sites sorted by benefit to down-drift habiats and sorted by ownership
- Report of landowner workshops and outreach
- List of 'ready to proceed' feeder bluff armoring removal projects that have achieved landowner willingness
- 3-5 completed preliminary designs for feeder bluff armoring removal projects with landowner willingness

C. If the project will occur in phases or is part of a larger recovery strategy, describe the goal of the overall strategy, explain individual sequencing steps and which steps are included in this application.

This project includes development of 3-5 preliminary feeder bluff armore removal designs. Subsequent steps not funded under this grant proposal include final design and construction of these restoration projects.

D. If your proposal includes an assessment or inventory (NOTE: project may extend across a wide area and cover multiple properties):

i. **Describe any previous or ongoing assessment or inventory work in your project's geographic area and how this project will build upon rather than duplicate completed work.**

There are several existing projects that this project will build on including: the Puget Sound Feeder Bluff Mapping (MacLennan et al. 2013), the Puget Sound Shoreline Parcel geodatabase (CGS in prep) and recently completed bluff crest and structure data developed for the Island County Local Implementing Organization (LIO). The Puget Sound Feeder Bluff Mapping data will be used to identify armored shores and feeder bluffs throughout the County. The Puget Sound Shoreline Parcel geodatabase will be used to identify parcels with feeder bluffs along residential shores. The database was recently developed by CGS and includes considerable data at the parcel-unit scale for all residential parcels in the Puget Sound region including the presence of armor, shoretypes, forage fish spawning and regional restoration/protection/enhancement priorities

ii. **Describe how the assessment or inventory addresses the stages and elements in Guidance on Watershed Assessment for Salmon (Joint Natural Resources Cabinet, May 2001,** www.digitalarchives.wa.gov/governorlocke/gsro/watershed/watershed.pdf**).**

This project is taking advantage of previous work done to identify the problem of degeraded shoreline habitats (Stage 1, Habitat Conditions) and its causes (Stage 2, Causes), feeder bluff armoring and the use of these habitats by salmon (Stage 4, Salmon Response) (WA Joint Resource Cabinet 2001). This project takes the next step beyond assessment and moves to habitat restoration.

E. If your proposal includes developing a design:

i. **Will the project design be developed by a licensed professional engineer?**.

Design alternatives developed in Phase 3 will be completed by CGS.

ii. **For final design projects, if you do not intend to apply for permits as part of this project's scope of work, please explain why and when permit applications will be submitted.** N/A

iii. **Has Washington Department of Natural Resources confirmed that your project is or is not on state-owned aquatic lands?** *N/A*

F. If your proposal includes a fish passage or screening design: N/A

G. Describe other approaches and design alternatives that were considered to achieve the project's objectives and why the proposed alternative was selected. N/A

H. Describe your experience managing this type of project.

Northwest Straits Foundation is the non-profit arm of the Northwest Straits Initiative and works collaboratively with the county based Marine Resources Committees to identify and design outcome based priority projects, seek project funding through grants and contributions, manage grants and contracts, and implement projects with regional scope. The Foundation has a proven record of successful project completion with federal, state, and private grant funders. This includes the derelict fishing gear removal program, which has removed over 4,000 derelict fishing nets from Puget Sound since 2002, as well as completion of restoration projects at Cornet Bay and March's Point in Island and Skagit Counties respectively. The Foundation is currently overseeing a partnership project with the Island and Snohomish County MRCs through WDFW's Marine and Nearshore Grant Program with a goal of preventing shoreline hardening in the Port Susan Marine Stewardship Area. The Foundation was the lead for conducting needs assessment surveys of planners and shoreline landowners, coordinating and evaluating educational workshops for planners and landowners, and implementing a free site visit program for shoreline landowners to receive management recommendations from qualified professionals.

CGS has completed over 45 nearshore restoration and enhancement projects in the Puget Sound region since 1993 (Figure 5). The projects have typically included all stages of project development: coastal processes assessment, project concept, field mapping, landowner negotiations, design, construction oversight, and monitoring when required. CGS' experience includes designing and overseeing implementation of armor removal projects on both private and public lands in Skagit, King, and San Juan Counties.

CGS conducted feeder bluff or sediment source mapping along 750 miles of Puget Sound shore between 1999 and 2010 and is currently completing sound-wide feeder bluff mapping for WA Ecology. The mapping protocols were developed with leading regional experts such as Hugh Shipman of Ecology and Ralph Haugerud of USGS, and are described in the peer-reviewed *Puget Sound Shorelines and the Impacts of Armoring-Proceedings of State of the Science Workshop* (Johannessen 2010). Mapping was led by Jim Johannessen and later by Andrea MacLennan, who will lead the armor removal prioritization and other GIS portions of this project. Ms. MacLennan was an integral part of the PSNERP *Change Analysis* study as well as the *Strategic Needs Assessment Report* as second author. Completion of Soundwide feeder bluff mapping in the spring of 2013 will be an integral data set for the proposed analysis.

CGS has also completed a series of outreach programs for coastal landowners and nearshore restoration prioritizations and since 1996.

I. Explain how the project's cost estimates were determined.

Costs were determined by the project partners based on previous experience with developing and ranking parcel databases, feeder bluff set back assessments, community workshops, landowner site visits, and designing armoring removal projects. Please see attached detailed budget breakdown attached in PRISM.

J. List Project Partners and their role and contribution to the project.

The project will be led by the Northwest Straits Foundation (NWSF, Joan Drinkwin, Robyn du Pre and Lisa Kaufman) in collaboration with CGS (CGS, Jim Johannessen and Andrea MacClennan)

and the Island Marine Resources Committee. Staff from the Whidbey Camano Land Trust (Pat Powell, Executive Director) will also participate as an advisor to the project.

Mr. Johannessen will lead the project feasibility, technical support for outreach, and design elements of the proposed project.

NWSF will lead the Phase 2 community landowner workshops and focused outreach to landowners.

The Island Marine Resources Committee will assist in workshop planning and promotion.

Whidbey Camano Land Trust will inform and review the assessment and prioritization of restoration sites, offering local knowledge and insight.

K. List all landowner names. Landowners are not known at this time.

L. Contingency Planning: State any constraints, uncertainties, possible problems, delays, or additional expenses that may hinder completion of the project. Explain how you will address these issues as they arise and their likely impact on the project.

There is always uncertaintly when seeking landowner willingness to remove armoring along the shoreline. However, we believe we will have a large enough list of potential projects to ensure the 3-5 permit-ready designs for willing landowners. If, after Phase 2, it becomes clear that we do not have that number of willing landowners, then we will not be able to proceed to Phase 3.

M. List and describe the major tasks and schedule you will use to complete the project. (Planning projects should typically be completed within two years of funding approval).

Proposed project tasks and timeline

Phase	**Task**	**Notes**	**Date**
Phase One: Feasibility Assessment	Feasibility, benefits ranking	GIS analysis (geologic, ecologic)	Start date 1/1/15) Winter, spring 2015
	Technical report		Completed April 2015
	Ranked Parcel database	Feasible armor removal sites	Completed April 2015
Phase Two: Project Development	Broad scale (High rank) outreach	Landowner surveys, Workshops	Spring, summer 2015
	Outreach to public, private	Direct contact, meetings	Summer, fall , 2015
	Fine-scale (Top rank) project development	Meetings, site visits	Fall 2015, Winter, spring 2016
Phase Three: Design	Preliminary designs (3-5)	Sites with landowner willingness	Winter, spring 2016 (end date 6/30/16)