VI. Recommended Plan of Action

This section relies on the culmination of the previous chapters informing the selection of recommended actions to reducing flooding risk in Wahkiakum County. It incorporates the management ideas from the previous chapter in addition to providing broader non-structural approaches such as program development, information needs, education, land use policy recommendation, and long-term watershed management recommendations. Accordingly, the Action Items are organized under the following Flood Hazard Mitigation themes:

Programmatic/Capacity (P/C) -Recommendations that support coordinated programs to increase the County's capacity to address flood related issues as they arise;

Structural Projects (SP) – Recommendations for instream work intended to offset and/or prevent the impacts of flooding;

Future Studies (FS) –Recommendations for initiatives intended to gather more information that can assist in the planning, engineering and design of structural projects as well as be utilized as a public education tool;

Watershed Management Considerations (WM)- Recommendations targeted toward longer term management actions addressing larger watershed processes currently contributing to flood hazard risk.

Each recommended action includes a discussion of *rationale* behind the selected action item, *ideas for implementation*, the *short-term* and *long-term* objectives ***(from Chapter II)*** it is intended to achieve, and a proposed *timeline*. In addition a section is dedicated to the *cost-effectiveness* of each action for P/C and SP themes.

A. Programmatic/Capacity Action Items (P/C)

P/C Action Item #1: Reduce flood insurance premiums by participating in the National Flood Insurance Program's (NFIP) Community Rating System (CRS)

Rationale: Wahkiakum County is currently undertaking flood hazard mitigation activities that can contribute to reducing flood insurance rates for its citizens. In addition the CRS program details a variety of additional activities that can advance the County's rating for discount rates up to 45%. These include public information, mapping and regulations, and flood preparedness. Another CRS category titled "Flood Damage Reduction" directly applies to the development and adoption of this plan. Once the plan is finalized and adopted, the county can get "credit" under the CRS that is added with other flood hazard mitigation activities to achieve a CRS "class"/or category which triggers a corresponding discount on insurance. Additional Action Items identified below can potentially contribute to the County CRS ranking:

Ideas for Implementation:

- ✓ Research existing CRS research center @ http://training.fema.gov/EMIWeb/CRS/ and newly designed NFIP site @ http://www.floodsmart.gov/ to investigate to scope of flood hazard mitigation activities applicable to Wahkiakum County;
- ✓ Schedule a community assessment visit with FEMA to verify compliance with the National Flood Insurance Program;
- ✓ Schedule a meeting with Certified Flood Manager to assist county through CRS application process;
- ✓ Have County staff and diking district members attend FEMA training sessions about the CRS rating system;
- ✓ Train existing staff to become a certified floodplain manager;
- ✓ Hire a full time position to implement CRS activities and administrate flood insurance applications for Wahkiakum Counties citizens;
- ✓ Investigate the feasibility of installing a land acquisition/relocation program for areas of repeatable loss under the CRS guidelines ***(related to SR #3)***;
- ✓ Conduct outreach through flood insurance information mailings to residents and property owners who live in a floodplain, and real estate offices;
- ✓ Utilize an annual publication/inserts of flood hazard awareness in the Wahkiakum County Eagle.

Implementation Timeline: 2-3 years

Management Objectives Addressed:
Short Term: #2, #4, #6
Long Term: #1, #4, #5, #6

Cost-Effectiveness of Action P/C #1:
Since the inception of this plan's development, flood hazard management activities have been taking place that could help the County increase its status in the National Flood Insurance Program. A coordinator is needed to tabulate these activities that include meetings, public outreach, workshops, project development, etc. Since these activities are ongoing, this action is likely to have very little initial cost and may be conducted with existing capacity at the County. Hiring additional staff to conduct educational activities ***(see P/C Action Item #2)*** can complement this position and incorporate education related CRS activities for further reduction in flood risk and flood insurance rates for a minimum amount of cost to the County.

Estimated Cost: $40,000 / year

P/C Action Item #2: Develop a comprehensive flood hazard mitigation education program

Rationale: Identified as a priority need and as an overall Goal of this plan, an outreach program is needed to educate the public about flood issues and hazard mitigation activities. Through the development of variety of materials and interactive maps, the public is informed of the nature of flooding events in their watershed as well as innovative approaches to reducing flood risk to their property. Program scope may need further refinement but should include activities defined under the Community Rating System (CRS):

-Organize technical training workshops about flood protection;
-Perform demonstrations of floodproofing design on houses;
-Update public information brochures and design informational signs/kiosks;
-Work closely with the County's schools in the development of flood preparedness curriculum.

Ideas for Implementation:

- ✓ Hire an Education Coordinator to implement education activities while getting credit under the CRS;
- ✓ Update existing educational materials at the County to reflect current FEMA programs and watershed conditions of County watersheds;
- ✓ Acquire education materials through FEMA and apply to fit the needs of Wahkiakum County's citizenry;
- ✓ Incorporate ideas from *Pierce County Water Program Awareness* site: www.piercecountywa.org/swm for flood hazard education relating to: Flood Warning Systems, Floodplain Management, Flood Preparedness and Response, as well as their curricula for schools.

Implementation Timeline: 1-3 years

Management Objectives Addressed:

Short Term: #5, #6, #7
Long Term: #5, #6

Cost-Effectiveness of Action P/C #2:
Related to P/C #1, education and outreach can have long-term benefits if sustained over time. Innovative tools are being developed both at the state level and nationwide to assist in informing the public about the nature of flooding events and what communities can do to reduce future flooding risk. The hiring of a coordinator that is able pull these resources together and design information about flood hazard mitigation materials increases awareness and design of solutions that are consistent with the unique flooding issues of the County.

Estimated Cost: $25,000 (.5 FTE Education Coordinator)

P/C Action Item #3: Expand the capacity of groups like the Stakeholders Group, Grays River Habitat Enhancement District and other Special Districts in the County.

Rationale: Embodying the tenants of Goal 3 in this plan, a new dialogue of collaboration has begun from the outset of the River Summit in February 2004. Citizen-based groups are advancing their capacity to collectively address the complexities of flood hazard mitigation and watershed restoration. The recently formed "Stakeholders Group" is an excellent example of a coordinated, open process to generate project ideas with multiple interests within a given watershed area. This includes sharing information and working with regulatory agency representatives early in the planning process of a project. For example, information being generated from the Grays River Habitat Enhancement District on erosion issues can benefit other similar projects being planned in the area. Ideally, one collective body would be developed to serve as a forum for discussing the success and "lessons learned" from flood hazard related issues and projects. Such a body could serve as the implementation arm for the proposed actions of the CFHMP and be a liaison between community members and land management agencies. This would maintain the dialogue that has already been established toward a permitting process that is iterative and adaptive to local conditions of a given project. Such an entity can also serve as the lead on giving trainings/workshops on capacity building for existing special districts (i.e. diking districts) in the County.

Ideas for Implementation:

- ✓ Hold workshops to increase the leadership and organizational capacity of existing special districts in the County;
- ✓ Develop mechanisms to inventory and rank flood hazard mitigation projects;
- ✓ Generate a funding catalog to match project inventory with existing funding guidelines;
- ✓ Work with the County to continue momentum generated from the River Summit through additional forums that promote constructive discussion of instream projects in light of local, state, and federal regulations.

Implementation Timeline: 6 months - 1 year

Management Objectives Addressed:

Short Term: #5, #7
Long Term: #5, #6

Cost-Effectiveness of Action P/C #3:
Like P/C #1, these activities are ongoing to coordinate flood hazard mitigation activities and implementation of this plans actions. Developing a process for prioritization would assist in developing a criteria for higher quality cost-effective flood hazard mitigation projects offsetting the cost required to implement the ideas identified above. In addition, developing a monitoring strategy for these projects will help in framing a "lessons learned" database that could be applied in the design of future flood hazard mitigation projects. This action would need to work seamlessly with the CRS Coordinator and Education Coordinator described above.

Estimated Cost for P/C #3: $20-$30,000 (additional staff time and trainings)

B. Structural Recommendations (SR)

SR Action Item #1: Implement innovative streambank protection structures incorporating designs that slow down erosion-causing velocities

Rationale: Given the extreme lateral migration and erosion of private property in identified stream reaches of Wahkiakum County (see ***Appendix a-2***), alternative management measures identified in Chapter 5 should be considered. In the Pacific Northwest, successful examples exist that incorporate natural materials and processes to protect streambanks. The placement of woody material and/or plantings in combination with conventional measures can help diffuse stream energies thereby reducing erosional forces downstream. The use of natural materials can also serve to hold sediment that may otherwise contribute to constraining channel conveyance capacity downstream. Woody debris can also provide important refuge and foraging habitat functions for a diversity of aquatic species. Engineering the successful design of woody debris requires a thorough understanding of the watershed characteristics and how they manifest on the project site. It should be evaluated on a case-by-case basis and is by no means considered as a single solution to an erosive environment. There are places in the County where erosion is so severe that conventional practices such as rip-rap placement and rock barbs may be needed as a short term , lower cost measure to protect private lives and property. In cases like this the use of natural planting should be viewed as a complimentary measure.

(Note: Puget Island issues are distinct from the rest of the areas of Wahkiakum and are given a separate action item in this plan *(see **WM #2)***).

Ideas for Implementation:

- ✓ Work with Stakeholders Group to present in-stream projects concepts and recruit input from local community and regulatory agencies;
- ✓ Investigate funding sources that match projects objectives;
- ✓ Monitor implementation of ongoing streambank protection projects occurring at the PUD site and Loop Rd. for effectiveness with respect to erosion control and stream velocity reduction;
- ✓ Continue investigation of project alternatives at Gorley Springs for private property protection and fish habitat restoration.

Implementation Timeline: 1- 3 years

Management Objectives Addressed: Short Term: #4 Long Term: #6

Cost-Effectiveness of Action SR #1:
The costs associated with the planning, engineering, and design of innovative streambank measures can add to the cost of a project. Conventional designs may be less expensive and have demonstrated effectiveness at the site-specific level. However the uncalculated cost of these measures in terms of flood risk downstream is worthy of consideration. Well-designed approaches that address the nature of erosive process rather than deflecting it downstream may in the end be a longer term and cost-effective solution because it can have added benefits for reducing risk downstream. Close coordination with other groups and budgeting some funds for project effectiveness monitoring can help in a better calculation of this action's "cost-effectiveness".

SR Action Item #2: Inventory existing tidegate structures and prioritize them for potential retrofits

Rationale: There are a number of tidegates in Wahkiakum County that are old and in need of replacement. Older tidegates were usually constructed with heavier, iron lids that effectively hold back water behind them, increasing flooding risk for private property and public infrastructure upstream. New tidegate designs offer opportunities to increase connectivity to the tidal floodplain. Through increased connectivity, previously cut-off side channels become available to off set high flow events compounded by high tides. Side channels also serve as temporary sediment sinks lessening the risk of further siltation downstream. Furthermore, replacing tidegate lids with lighter, aluminum lids, can increase drainage rates for backwater channels reducing flooding risk. Finally, tidegate replacements elsewhere in the Columbia River Estuary have shown measured improvements to water quality and access for migrating anadromous fish (Figure 6.1 and 6.2). Current planning and engineering of newer gates is already underway in areas of Skamokawa Creek, Grays River, and Deep River.

Ideas for Implementation:

- ✓ Build on completed tidegate work completed by County at Steamboat Slough;
- ✓ Apply WDFW protocols and habitat data to assess passability of existing structures and available upstream habitat;
- ✓ Work with local groups (i.e. Wahkiakum-Cowlitz Conservation District) to prioritize existing structures for replacement based on local landowner cooperation and existing capacity to maintain structures;
- ✓ Recruit engineering expertise to detail designs and specifications of newer structures;
- ✓ Seek a prioritized approach to funding tidegate replacement.

Implementation Timeline: 1-2 years

Management Objectives Met:
Short Term: #4, #6
Long Term:

Figure 6.1: Older, heavier lid design

Figure 6.2: Lighter design with fish passable opening

Cost-Effectiveness of Action SR #2:
Tidegate retrofits are occurring in many places in the Columbia River Estuary. Results have shown both increased drainage and enhanced water quality. At the same time they may offer some increased opportunity for migrating aquatic species. Costs vary for a given design, but with the multiple benefits for flood mitigation in terms of floodplain connectivity, drainage, and habitat, this action is cost-effective. Like many projects, monitoring should be a component to measure flood elevation and other changes (i.e. water quality, fish use) resulting from these structural replacements. Estimated cost for each replacement: $25,000

SR Action Item #3: Explore projects that increase water storage and conveyance capacity in both fluvial and tidal areas of the Grays River Watershed.

Rationale: Diking, dredging, and conventional flood control measures have been useful at controlling localized flood elevations. However these activities can also disconnect flow patterns from utilizing side channels of the entire floodplain, thereby confining flow patterns to the mainstem channel. This can raise elevations and velocities, increasing the risk of flooding and erosion elsewhere along the stream channel. Activities such as dike breaching, creating set back levees, and bank shaping can expand the area needed to carry the volume of flow patterns and offsetting impacts on private property downstream. Reconnecting previously diked areas also increases access to important habitat types such as tidal marshes and swamps (see ***Appendix a-6***). These areas have been identified as critical areas for multiple species in the Columbia River Estuary including migrating chinook, steelhead, coho, and chum salmon. Similar to conventional streambank measures, engineered solutions such as gravel removal should not be immediately discarded, especially in areas of extreme aggradation such as Grays River. Because of the amount of extreme channel bar development in some of these areas, it should be evaluated as a potential short-term measure. This plan recommends that such an action should be compared with an array of alternatives that articulate both cost and benefit to flood hazard reduction.

Ideas for Implementation:

- ✓ Inventory existing opportunities for land acquisition that can be used for restoration activities such as dike breaching, set back levees, bank shaping, etc;
- ✓ Match land acquisition opportunities with appropriate entities based on local sensitivities and projected uses (i.e. recreation, enhancement, restoration, education);
- ✓ Work with willing landowners to explore securing easements on their property to increase area and capacity of streams channel network during high flow events;
- ✓ Through the Stakeholders Group, work with existing conservation groups to give input to restoration designs that promote both habitat needs and flood hazard mitigation;
- ✓ Monitor the effectiveness of restoration treatments for habitat function gained, water quality enhancement, flood volume and sediment storage;

Implementation Timeline: 1-5 years

Management Objectives Met:

Short Term: #1, #2, #3, #4, #6
Long Term: #6

Cost-Effectiveness of Action SR#3: Given the range of activities that can take place under this action, it is difficult to assess the cost-effectiveness of this action. Land acquisition and restoration are expensive activities and no local data exists for their effectiveness on flood volume retention and sediment storage. However, restoring natural floodplain process through acquisition of property, channel reconnections, etc. in conjunction with watershed management practices (see below), will lead to long term stability of the floodplain and less pronounced flood events over time. For that reason alone, monitoring efforts on land acquired for conservation should be supported that can further justify this action in terms of flood hazard reduction for residents of a given watershed. Monitoring should also include tracking stream response from completed gravel removal projects on Grays River that can help determine the how much flood risk was reduced or increased resulting from the project. Results will assist in measuring the cost-effectiveness of future project designs.

SR Action Item #4: In conjunction with local groups and the County, develop a riparian planting program that identifies areas to enhance riparian areas in order to reduce flow velocities, store sediment, and protect streambanks from erosion.

Rationale: The loss of woody debris in Wahkiakum's watersheds contributes to the "flashiness" of the Counties watersheds. Shoring up areas of the floodplain with plantings dissipates flow, stores sediment, and binds soil particles together making them less prone to erosion. Working with local groups, the County should work closely with existing programs with the Conservation District that identifies critical areas in the watershed to apply riparian treatments, complementing other flood hazard mitigation projects. This action also directly supports Goal 2 of the overall plan through enhancing critical habitat corridors for both aquatic and terrestrial species.

Ideas for Implementation:

- ✓ Apply for funding under the Lower Columbia Fish Recovery Board and other resources for a County-wide Riparian Plantings Coordinator;
- ✓ Work with school groups to organize planting parties in cooperation with willing landowners and following guidelines established by the Wahkiakum-Cowlitz Conservation District;
- ✓ Monitor results of plantings in terms of survival, growth patterns, and changes in flow patterns at the particular site as well as downstream;
- ✓ Based on monitoring results, adapt existing planting strategies to improve effectiveness of future projects

Implementation Timeline: 1-5+ years

Management Objectives Met:

Short Term: #3, #6
Long Term: #6, #7

Cost-Effectiveness of Action SR #4

Tree planting can be an effective means to protecting against streamside erosion. Through a strategic approach critical reaches can be targeted for protection while overtime preventing against future flooding events through the emulation of natural floodplain structure and processes. Critical to its effectiveness is a maintenance program that can direct treatments to ensure plant survival and lessen fatalities. Volunteers can be recruited in coordination from local schools to lesson costs and add an education benefit, increasing the cost effectiveness of the program. Once again monitoring would be an additional cost but a critical component to inform the effectiveness of future plantings that would improve survival rates for future riparian planting failures.

SR Action Item #5: Seek funding to support the planning, engineering, and design of measures protecting public infrastructure (i.e. roads, bridges, facilities)

Rationale: Several areas exist where public infrastructure is exposed to regular flooding risk. It is common for roads to flood because of limited capacity for flow conveyance due to undersized culverts or constrained channels at bridges. This plan can help leverage sources of funding through State of Washington (FCAAP) or the federal government (i.e. Army Corps of Engineers, FEMA) to develop long-term solutions for areas experiencing repetitive loss.

Ideas for Implementation:

- ✓ Work with County staff to design a geo-referenced list of conceptual solutions for frequently flooded public infrastructure sites like Foster Road, Loop Road, Altoona-Pillar Rd, Risk Road, etc;
- ✓ Inspect conditions of existing infrastructure (i.e. bridges, culverts under public access, etc.) to expand project inventory and assess countywide level of flooding risk;
- ✓ Develop cost estimates for priority projects in these areas and research sources for funding of project planning, engineering, design, construction, and monitoring of project success.

Implementation Timeline: 1-5 years

Management Objectives Met:

Short Term: #1, #2
Long Term: #7

Cost-Effectiveness of Action SR #5:
Public infrastructure improvements are expensive yet deemed a high priority because of the amount of use by citizens of Wahkiakum County. Therefore activities such as culvert retrofits, bridge improvements, and road elevations will always be legitimate activities for reducing flood risk in the County. Planned in conjunction with an understanding of larger watershed processes and with proper engineering will ensure the long-term effectiveness of these projects while providing protection for the needs of local citizens and important activities for the regions economy.

C. Future Studies (FS)

While a significant amount of watershed information ***(see Chapter III)*** has been compiled for Wahkiakums watersheds, more precise information is needed to reduce the margin of error for conducting flood hazard mitigation work in Wahkiakum. This section targets future investigations benefiting flood behavior patterns and respective planning, engineering, and design of future instream work. While impossible to quantify, it is assumed that all of the studies below will have long-term benefits contributing toward cost-effective projects for reducing flood hazard risk.

FS Action Item #1: Re-install stream gauges in all of the major watersheds of Wahkiakum County

Rationale: Stream gauge information previously compiled allows probability analyses to occur that can more precisely determine the range and frequency of discharges for the Grays, Elochoman, and Skamokawa Creek watersheds. This information is critical for not only land use planning in the floodplain, but for the design of instream structures. Relationships can be also be inferred linking flow data to other sets of data including vegetation, soils, and land use. This can help paint a more precise picture of current watershed behaviors and used as a foundation for future trend analyses.

Ideas for Implementation:

- ✓ Contact USGS to assess level of feasibility and cost to re-activate existing gauge stations;
- ✓ Insert and monitor staff gauges in selected areas to measure variation in elevation throughout the water year;
- ✓ Work in concert with existing groups to develop outreach tools to access information compiled by gauges;
- ✓ Correlate information with past gauge data to assist in pinpointing the *recurrence interval* ***(defined in Chapter III)*** of flooding events.

Implementation Timeline: 2-5 years

Management Objectives Addressed:

Short Term: #2
Long Term: #4

FS Action Item #2: Support studies that provide information on sediment sources and transport capacity for Wahkiakum Counties Watersheds

Rationale: As identified in Chapter III, erodible soils and steep slopes can increase the risk of slope failures in the upper reaches of the watershed, thereby increasing the amount of sediment available for transport. Road building, timber harvesting, and other ground disturbing activities can trigger already unstable conditions and increase the frequency and extent of sediment inputs in the watershed. The Bonneville Power Administration (BPA) is currently supporting a study by Pacific Northwest National Laboratories (PNNL) on Grays River to assess sediment source and transport patterns and their affect on habitat forming processes for salmon. PNNL has organized a team to assess the existing sediment sources and transport capacity for the stream reaches above the State Highway Bridge.

Datasets produced from this study can benefit on the ground flood hazard mitigation project development. In the first year of the project historic photos are going to be compiled and compared with current air photos to help better understand channel migration patterns. Additional analyses will be conducted that identifies a specific landforms vulnerability to slope failure for given set of conditions. This can be useful in generating channel responses to these failures and should be incorporated in any long-term instream design work for reducing flooding risk.

Ideas for Implementation:

- ✓ Install information sharing linkages that work in concert with products from PNNL study and flood hazard mitigation project managers;
- ✓ Organize community forums that support the presentation of interim products from the Gray River study;
- ✓ Enhance opportunities for future partnerships between multiple interests of the watershed through studies findings and recommendations.

Implementation Timeline: 1-3 years

Management Objectives Addressed:

Short Term: #3
Long Term: #4, #5, #6

FS Action Item #3: Recommend a Flood Insurance Re-Study for Priority Areas of Wahkiakum Counties Watersheds

Rationale: Previous FEMA studies of the County have coarsely characterized the 100- year floodplain for Wahkiakum's watersheds. However the scope was limited to specific segments of stream. Given this limitation, 100-year floodplain delineations remain very vague and without the precision needed to develop land use policies in the floodplain. This information is critical to determine base flood elevations to assure development occurs at a low enough risk for landowners. Like other studies, a more refined 100-year floodplain would benefit not only land use policies, but other flood hazard mitigation planning processes as well. The County may also go through a process to request a Letter of Map Amendment (LOMA) or Physical Map Revision (LOMR PMR) that makes revision to the existing studies rather than republish an entire map.

Ideas for Implementation:

- ✓ Work with County staff and local landowners to identify areas of map inaccuracies;
- ✓ Place a request with FEMA that amend existing maps in Wahkiakum (form located @ http://www.fema.gov/fhm/frm_form.shtm);
- ✓ Research Wahkiakum Counties status with FEMA's MAP modernization program (http://www.fema.gov/fhm/mm_main.shtm);
- ✓ Leverage FCAAP funds to help underwrite the cost.

Implementation Timeline: 1-3 years
Management Objectives Addressed

Short Term: #2
Long Term: #2, #4, #5

D. Watershed Management Considerations (WM)

Consistent with the theme of this plan, it is important to address larger, watershed processes in a management setting for any of the previously discussed measures to be effective in the long term. Listed below are broader landscape considerations that, if successful, contribute to reducing flood risk for landscape variables impacting flooding in Wahkiakum County watersheds.

WM Action Item #1: Work with multiple interests of the watershed to develop a variety of sediment reducing strategies for each of Wahkiakum's watersheds.

Rationale: Land use practices in Wahkiakum County's watersheds have increased the amount of sediment delivery to streams affecting the conveyance capacity of stream channels. The current BPA funded study being conducted by Pacific Northwest National Laboratories (PNNL) in Grays River provides important information on sediment sources and transport dynamics that can inform the types of projects needed at the watershed scale. Forest management companies have implemented a variety of measures to reduce the impact of ground disturbing activities and their effect on sediment transport into the stream channel in compliance with Forest and Fish requirements. The County and local groups should work collaboratively with upland forestry interests to develop joint projects for continued sediment abatement.

Ideas for Implementation:

- ✓ Work closely with Pacific Northwest National Laboratories (PNNL) to develop interim products that can lead to instream projects to reduce sediment loads into Grays River;
- ✓ Schedule field visits in partnership with timber company representatives to demonstrate existing sediment reduction projects in the Wahkiakums upper watershed;
- ✓ Invite timber company representatives to Stakeholder Group meetings to assess potential partnerships and joint project ideas to further reduce sediment delivery potential in the watershed (i.e. road maintenance and closures).
- ✓ Using the results from the PNNL study, identify critical areas in the watershed for replanting in conjunction with Action Item SR #4 (Riparian Planting Program) to reduce sediment loads into Wahkiakums' watersheds.

Implementation Timeline: 2+ years

Management Objectives Addressed:

Short Term: #1, #2, #3
Long Term: #3, #6

WM Action Item #2: Work with federal action agencies to develop long-term strategies to address erosion areas on Puget Island Shoreline

Rationale: Maintenance of the Columbia Navigation Channel is related to the erosion of the shoreline around Puget Island. Project ideas are being developed for short-term measures to stop further erosion of the shoreline. However, longer-term strategies need to be discussed for any instream project to be successful and cost effective. This includes evaluating the condition and potential modification of existing pile dikes intended for Navigation Channel maintenance. Working closely with the Corps toward the development of a variety of management and project design alternatives will lead to longer term solutions that reduce flooding risk for Puget Island residents. This requires a level of involvement in on- going regional discussions related to beneficial use of dredge material in the Columbia River Estuary in light of potential impacts to endangered salmonid species. Networking and coordinating with state and federal regulatory entities will assist in developing longer-term solutions to Puget Island's erosion issues.

Ideas for Implementation:

- ✓ Coordinate with the Columbia River Solutions Group to present issues specific to Puget Island in the context of existing dredge material management of the Lower Columbia River and Estuary;
- ✓ Work closely with Army Corps of Engineers and NOAA Fisheries to assess the feasibility of erosion control project designs that incorporate dredge material disposal along Puget Island's shoreline in light of current Endangered Species Act regulations;
- ✓ Explore funding opportunities within the Army Corps of Engineers Continuing Authority Programs to assist in the designs and specifications for chosen project alternatives that meet regulatory compliance and reduce existing erosional processes of the shoreline;
- ✓ Develop tools to monitor project effectiveness to inform future design modifications and test hydraulic assumptions outlined in 2003 technical memorandum produced by Coast and Harbor ***(Appendix G).***

Implementation Timeline: 2-15 years

Management Objectives Addressed:

Short Term: #1, #2
Long Term: #1, #2, and #3

WM Action Item #3: Strengthen Land Use Planning Policies relevant to development in the floodplain.

Rationale: Concurrent with recommended studies identified above, new land use policies should be enacted that reflect existing and projected demographics for the County. Several policy mechanisms exist to minimize the flooding risk of new development in the floodplain ***(Appendix B)***. Ideally these policies incorporate more accurate information about Base Flood Elevations from FEMA studies ***(FS Action Item #3).*** In addition, housing design standards can be updated for future development in the context of Wahkiakum unique rural lifestyle while reducing flooding risk to private property. Using existing off site methods such as aerial photo interpretation a preliminary risk assessment can be conducted for areas currently at risk. This can help inform new zoning for these areas and/or areas of repetitive loss.

Ideas for Implementation:

- ✓ Using new aerial photos, County tax assessor's data, and existing FEMA maps, begin a Vulnerability Assessment that inventories the number of structures currently at risk for flooding and their current assessed value;
- ✓ Incorporate new mapping information from FEMA to refine findings of Vulnerability Assessment;
- ✓ Prioritize areas of high risk and associated land use;
- ✓ Draft proposals for rezones and model ordinances using language from other counties and additional resources from the State of Washington (i.e. Floodplain Management Local Government Regulations url: http://www.mrsc.org/subjects/pubsafe/emergency/ps-flood.aspx);
- ✓ Coordinate with "Stakeholders Group" and Planning Commission to design public forums for land use policy changes.

Management Objectives Addressed:

Short Term: #2

Long Term: #1, #4, #5