5. STRATEGIES AND RECOMMENDATIONS FOR FLOOD HAZARD REDUCTION

One of the first tasks of the Dungeness River Management Team after it was founded in 1988 was to serve as the advisory body for the 1990 Comprehensive Flood Management Plan. Since then several recommendations of the plan were implemented, including the modification of County critical areas and building codes, and the purchase of numerous parcels for the dual purposes of habitat restoration and the reduction of flood hazard. Additionally, many technical studies of fish habitat and river processes were completed, and the community has experienced several more floods and learned from them. After 20 years, the DRMT members and partner organizations have an extensive “institutional memory” and are now better prepared to make long term recommendations about flood hazard reduction as it relates to the risk to property owners, impact on fish habitat, and other river activities. In accordance with the goals and objectives described in Section 3, and experience and information gained over 20 years, these recommendations for flood hazard reduction generally emphasize the use of non-structural alternatives because they represent long term solutions and do not negatively impact river processes that affect threatened species or downstream property owners.

Nonstructural solutions refer to actions designed to reduce the susceptibility to flooding, and do not include structural measures that may alter natural river processes. Nonstructural solutions may result in physical changes in the river or watershed that restore natural processes, including wetland restoration. Nonstructural solutions include land ownership change, land use management, regulations, monitoring, maintenance,

emergency response, enforcement, and intergovernmental agreements. They can include habitat reclamation activities like wetland restoration, riparian revegetation, septic system removal, and structural removal or setback.

Structural alternatives for flood hazard management include a variety of physical changes to structures and the river environment, including flood proofing, relocation of existing structures, bank reinforcement, levees, deflection structures, and other modifications. Structural alternatives have varying levels of impact to river processes, fish and wildlife habitat, and the extent of flood hazard reduction. Structural alternatives are subject to numerous requirements for design, permitting, and construction on a site-specific basis. B describes structural measures for flood hazard management in general.

Section 5.1, General Recommendations, describes a number of proposed non-structural actions to reduce flood hazard in the Dungeness which are summarized in Table 5-1. Section 5.2 contains a reach-by-reach description of specific flood hazards in the lower Dungeness, and recommended actions. With the exception of structural removal or setback as described in section 5.2, structural measures are generally not recommended as long term solutions in the Dungeness River. Property owners who intend to undertake new development (including wells and septic systems), remove vegetation near the river, or construct structural flood control measures are advised to contact the Clallam County Department of Community Development for a full list of permits and requirements prior to initiating work.
<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Actions</th>
</tr>
</thead>
</table>
| 5.1.1 Utilize best available science to update maps of flood hazard areas and the channel migration zone. | • Update maps of the Channel Migration Zone.  
• Request update to FEMA maps of the 100-Yr Flood Plain.  
• Continue modeling and mapping studies and incorporate into land management activities. |
| 5.1.2 Protect people and property from erosion and flood hazards and protect habitat functions by updating and amending land use and related regulations. | • Incorporate flood hazard management into amendments of Critical Areas Code and Shoreline Master Program.  
• Direct development away from the CMZ  
• Establish aquatic habitat conservation area buffers from the edge of the CMZ  
• Establish mitigation policies for upgrading degraded habitat in the CMZ and buffer areas.  
• Meet or exceed FEMA requirements.  
• Review and update regulatory standards applicable to levees, and conduct a comprehensive levee inventory. |
| 5.1.3 Improve ongoing education and outreach to existing and potential landowners along the Dungeness related to land development and stewardship. | • Develop and implement an ongoing outreach program for property owners along the river about development and land clearing constraints in and adjacent to the CMZ  
• Continue and improve procedures to notify prospective buyers about potential flood hazards and land development requirements.  
• Continue and expand technical assistance programs to improve stewardship. |
| 5.1.4 Provide education and outreach about flood hazards and emergency preparedness. | • Conduct public education programs about flood risk and emergencies regularly through a variety of media, including the County’s website and annual mailings.  
• Emphasize implementation of the Map Your Neighborhood program along the river. |
| 5.1.5 Continue programs to purchase high risk flood hazard and high value habitat areas. | • Seek and support funding programs to purchase properties at flood hazard risk.  
• Continue to implement the 2003 Dungeness Land Protection Strategy.  
• Enhance public access, parks, and recreational opportunities along the river. |
| 5.1.6 Continue and expand monitoring and code compliance programs along the Dungeness River corridor. | • Conduct monitoring of land use and land cover along the Dungeness, particularly in high risk flood areas.  
• Emphasize outreach and education activities in the implementation of monitoring programs.  
• Continue annual airphoto and other monitoring actions of the Dungeness River corridor, and share among cooperating agencies for adaptive management. |
5.1 General recommendations

5.1.1 Utilize best available science to update maps of flood hazard areas and the channel migration zone.

Recommended Actions:

5.1.1.1 Update Clallam County Dungeness River Channel Meander Hazard Maps based on the report: “Delineation of the Dungeness River Channel Migration Zone (River Mouth to Canyon Creek),” prepared by the Jamestown S’Klallam Tribe (Rot and Edens, 2008). (Appendix C)

5.1.1.2 Request updates of the FEMA floodplain maps incorporating new information and mapping technology as it becomes available, such as Bureau of Reclamation models and reports, and LiDAR analysis.

5.1.1.3 Continue modeling and mapping studies to improve flood hazard analysis and incorporate into codes and land management activities.

Discussion of Recommended Actions in 5.1.1: Several studies and LiDAR flights have been completed in the last 5-10 years by Clallam County, Bureau of Reclamation, US Geological Survey, and the Jamestown S’Klallam Tribe that provide a more accurate delineation of the Dungeness Channel Migration Zone and floodplain than the information presently being used in land development permit processes and the FEMA flood insurance program. The September, 2008 Biological Opinion from NMFS related to the National Flood Insurance Program and the Endangered Species Act requires FEMA to expedite the update of flood hazard maps and to prioritize updates where sensitive species of salmon are present.

5.1.2 Protect people and property from erosion and flood hazards and protect habitat functions by updating and amending land use and related regulations. Regulations should reflect the natural constraints, hazards, and habitat values of the Dungeness River floodplain, channel migration zone, and riparian habitat.

Recommended Actions:

5.1.2.1 Prevent additional construction of dwellings in harm’s way from flooding and erosion as well as loss of critical habitat function through updates or changes to Clallam County codes. In particular, consider new data and studies and the information and strategies in the Dungeness River Comprehensive Flood Hazard Management Plan when updating the Clallam County Shoreline Master Program and Clallam County Critical Areas Codes.

4 All recommendations in section 5 that refer to the channel migration zone refer to the delineation by Rot and Edens, 2008.
5.1.2.2 Direct development to locate outside of the delineated Dungeness River Channel Migration Zone and associated upland buffers in order to protect people and property from flooding and erosion hazards and to conserve important fish and wildlife habitat functions.

5.1.2.3 Establish aquatic habitat conservation area buffers standards from the delineated Dungeness River Channel Migration Zone to further protect people and property from flooding and erosion hazards and to conserve important upland fish and wildlife habitat and movement corridors.

5.1.2.4 Establish mitigation policies and regulations for new development on lots where prior human activities have eliminated or significantly degraded native shoreline vegetation and/or habitat within the channel migration zone and upland buffer areas.

5.1.2.5 Review and update, if needed, land use, critical area, habitat management plan, and shoreline regulations to meet or exceed FEMA and NMFS guidance for meeting the requirements of the Federal Endangered Species Act and the National Flood Insurance Program.5

Discussion of Recommended Actions in 5.1.2.1 through 5.1.2.5:
Land use activities along the Dungeness River are regulated by Clallam County through the Critical Areas Code and the Shorelines Master Program. New information and studies regarding Dungeness River flooding, channel migration, and fish and wildlife habitat have been completed since the last major amendment of the County’s critical area regulations and shoreline master program. Scheduled updates of the CAC and SMP present an opportunity to incorporate new information and implement flood hazard reduction policies and strategies specific to the Dungeness River shoreline.

Clallam County has established a Shoreline Master Program under the requirements of the Washington State Shoreline Management Act (SMA), RCW 90.58. The original plan was adopted in 1976, and was last amended in 1992. Clallam County is scheduled to review and update the Shoreline Master Program by December 1, 2011, which provides an opportunity to make specific changes to the policies and regulations affecting shoreline development along the Dungeness River. For example, state rules to guide updates of local government SMPs state that: “applicable shoreline master programs should include provisions to limit development and shoreline modifications that would result in interference with the process of channel migration that may cause significant adverse impacts to property or public improvements and/or result in a net loss of ecological functions associated with the rivers and streams” (WAC 173-26-221 (3)).

5 Note that FEMA guidance for communities is undergoing review and revision in 2009 per the NMFS Biological Opinion.
Clallam County is also required to evaluate and update (if needed) its critical area development regulations (last major updates 2001 & 2005) by December 1, 2011, for consistency with the Washington State Growth Management Act (GMA). The County’s upcoming SMP update must provide a level of protection to critical areas within the shoreline area that is at least equal to that provided by the local government’s critical area regulations adopted pursuant to the GMA.

The Dungeness River Flood Hazard Advisory Committee has recommended that updates and amendments to county codes incorporate provisions to prevent additional construction of new structures in harm’s way or that impair the function and value of fish and wildlife habitat along the Dungeness River. The erosive forces of the Dungeness make it hazardous for property owners to develop in or in proximity to the Channel Migration Zone. As described in Chapter 6, the Committee is also concerned about current provisions of the Critical Areas Code that measure Aquatic and Wildlife Habitat buffers from the Ordinary High Water Mark rather than the Channel Migration Zone. The OHWM is subject to change over time and channel migration can lead to legally-established non-conforming uses within the habitat conservation buffers. Please see Chapter 6 for more information about codes and ordinances related to flood hazard management. The Flood Hazard Advisory Committee also emphasized the need to prevent site clearing and excavation activities in, or in proximity to, the Channel Migration Zone as these activities may exacerbate erosion processes and damage habitat. As noted earlier, permits and other requirements apply to clearing and vegetation removal as well as structures.

5.1.2.6 Review and update the standards and definitions applicable to levees for purposes of permit and regulatory review. Determine what constitutes a legal levee for establishing the Channel Meander Hazard Area.

5.1.2.7 Conduct a comprehensive inventory of levees along the Dungeness River specifying when and how they were constructed, by whom, the degree of flood protection provided, and maintenance records. Maintain the inventory in Clallam County DCD.

Discussion of Recommended Actions in 5.1.2.6 through 5.1.2.7:
Critical Areas Code section 27.12.410(1)(a)(x) indicates that areas protected by “permanent levees or infrastructure improvements such as roads and bridges constructed and maintained by public agencies” are considered to be excluded from the Channel Meander Hazard Area. Numerous privately constructed and maintained levees are located throughout the lower 11 miles of the Dungeness River that provide inadequate long-term protection from flood hazard and impair river habitat functions. Properties behind such levees may be at risk, and should be considered as part of the Channel Meander Hazard Area for purposes of permit review and regulation, despite the presence of an existing structure. See also recommended action 5.1.1.1, action 5.1.2.1, and action 5.1.2.2.
A comprehensive inventory of levees along the Dungeness will provide improved information related to liability, flood hazard, and maintenance responsibilities for public and private landowners. An inventory will also provide information to County staff to use in evaluating development proposals and the applicability of codes and standards.

5.1.3 Improve ongoing education and outreach to existing and potential landowners along the Dungeness related to land development and stewardship.

**Recommended Actions:**

5.1.3.1 Develop an on-going public outreach program to increase and maintain awareness of property owners along the Dungeness River regarding the importance of: (a) avoiding development and disturbance (clearing, grading, excavation) within and adjacent to the channel migration zone; (b) conserving shoreline vegetation and corridors for fish and wildlife; (c) restoring and enhancing degraded shoreline areas; and (d) obtaining required permits and approvals from county, state, and federal agencies. The targeted geographic outreach area should include the channel migration zone, aquatic habitat conservation areas, and other areas along the river within the jurisdiction of Clallam County’s Shoreline Master Program. The public outreach program should utilize a variety of methods, including, but not limited to direct mailings, web sites, informational workshops, press releases, displays or brochures at the Department of Community Development office, and other measures. Near-term outreach efforts should include informing property owners of the updated Dungeness River Channel Migration Zone Maps and information about flood hazards and erosion processes in the Dungeness River.

**Discussion of 5.1.3.1:** Clallam County offers several opportunities for landowners to access information about the location of critical areas and land management regulations and requirements on-line or at the permit counter. While these are important educational resources and should be maintained, the Flood Hazard Advisory Committee also seeks targeted outreach programs specifically for Dungeness River property owners.

5.1.3.2 Continue and expand efforts to inform potential and new buyers of parcels along the Dungeness River about the presence of Frequently Flooded Areas, the Channel Migration Zone, Habitat Conservation Areas, and other provisions in County codes related to critical areas and standards for setback, building elevation, excavation, vegetation removal, and other development activities. (a) Maintain maps and regulations on-line. (b) Develop information about flood hazards specific to the Dungeness that can be used at the permit counter, and an on-line site. (c) Inform realtors, builders, contractors, clearing and grading operators, and designers of standards and procedures and changes to the delineation of the Channel Migration Zone. (d) Develop a detailed
map and letter about the CMZ and distribute to realtors operating in the Sequim area for them to use to advise clients; request that buyers be referred to the Clallam County Department of Community Development prior to undertaking clearing, design, or construction activities.

Discussion of 5.1.3.2: Notice to title under the Clallam County Critical Areas Code is required only after a development permit application has been submitted. Prior to 2007, no disclosure or notice to title was required to inform prospective buyers that a parcel was subject to limitations as a flood hazard or critical area. Since 2007, RCW 64.06.020 has required that property transactions include a mandatory disclosure statement. The seller must complete a disclosure checklist that requires the seller to check “Yes,” “No,” or “Don’t know” to a series of questions, including, “Are there any shorelines, wetlands, floodplains, or critical areas on the property?” Although the disclosure form provides some notification to prospective buyers, new landowners and buyers may not be fully aware of the applicable standards and protective restrictions. Clallam County maintains critical areas and shorelines maps and regulations on-line but prospective buyers and new landowners may need assistance from realtors and County staff to view and understand these materials.

5.1.3.3 Provide outreach and education to existing landowners to foster stewardship. (a) Encourage property owners to exceed minimum buffer standards and setback requirements for critical areas. (b) Continue technical assistance programs to assist and encourage riparian property owners with stewardship activities that will minimize the risk of flood hazard and disruption of river processes as they manage their property. (c) Continue to work with property owners on habitat restoration projects.

Discussion of 5.1.3.3: Technical assistance and outreach programs to landowners along the river are conducted by the Clallam Conservation District and others, but funding for outreach and education is limited and sporadic.

5.1.4 Conduct public education programs about the risk of flood hazard on the Dungeness River, tsunami hazard areas, and procedures for emergency preparedness and management. See Chapter 7 for more information on emergency management.

Recommended Actions:

5.1.4.1 Continue to provide information on flood preparation on the Clallam County website, including planning and readiness, what to do before, during and after a flood, and contact/link information for radio stations, emergency message centers, and real-time flow information.
5.1.4.2 Prepare and mail out annual newsletters or flyers (if funding available) to property owners in flood hazard and tsunami hazard areas with emergency information.

5.1.4.3 Emphasize the implementation of Map Your Neighborhood programs for areas along the River and in tsunami hazard areas (see Chapter 7).

Discussion of 5.1.4: Information about emergency programs and contacts on the web and via mail needs to be updated and re-distributed annually for residents so that it is easily accessible during emergency situations.

5.1.5 Continue and support programs to fund and implement the purchase of parcels at high risk of flood hazard and/or high habitat value.

Recommended Action:

5.1.5.1 Seek and support programs and funding sources to purchase property or conservation easements in areas at high risk of flood hazard along the river, particularly frequently flooded areas and areas within the channel migration zone, even where the properties do not currently exhibit high habitat functions and values.

Discussion of 5.1.5.1: Although public and private funds have been obtained and utilized for land purchases associated with habitat protection and restoration, securing funding for the purchase of residential properties at risk of flood damage remains challenging, especially those parcels which currently do not have high habitat values. A funding strategy is needed to make funds available for opportunities to acquire high risk properties and remove structures or development potential in flood hazard areas.

5.1.5.2 Implement the 2003 Dungeness River Comprehensive Land Protection Strategy recommendations for acquisition, conservation easements, and stewardship.

Discussion of 5.1.5.2: The Land Protection Strategy identifies high value areas for habitat protection and/or for the restoration of wetlands, riparian forests and side channels that also provide buffer areas for flood waters. As used in the report, acquisition is the fee simple purchase of property at fair market value. Where properties are acquired in fee simple, it is the intent of the strategy that all structures be removed and septic systems pumped or removed and decommissioned on purchased property. This allows for more rapid restoration and eliminates future water quality challenges during flood events. A conservation easement is a legal mechanism to conserve the natural resource values of a land parcel in perpetuity. Stewardship, as used in the report, refers to the continued management of the property by the owner, with an opportunity for
technical assistance on retaining or enhancing habitat functions and values.

5.1.5.3 Enhance public access, parks, and recreational opportunities along the Dungeness River.

Discussion of 5.1.5.3: As properties are acquired to remediate or protect from flood hazards, there may be opportunities to enhance public access for parks and recreation. With appropriate design and coordination with adjacent landowners, public access and parks provide a land use opportunity that is compatible with flood hazard mitigation.

5.1.6 Continue and expand monitoring and code compliance programs to prevent the placement of structures in harm’s way and/or the degradation of fish and wildlife habitat along the Dungeness River corridor.

Recommended Actions:

5.1.6.1 Develop and implement a land use/land cover monitoring program for the Dungeness River Channel Migration Zone and adjacent lands, particularly for areas at high risk of flood hazard and channel movement. High risk areas include Kinkade Island, areas immediately upstream and downstream of the Highway 101, Old Olympic, and Woodcock Road bridges, and River’s End Road. Monitoring programs should include training of County staff for reporting and follow-up, mechanisms for resolving identified problems and hazards, and partnerships with other agencies and governments.

5.1.6.2 Emphasize outreach and education activities as initial steps in contacting landowners as monitoring programs are implemented.

5.1.6.3 Seek partnerships and opportunities to continue to take high resolution airphotos of the Dungeness River corridor (such as those taken by the Jamestown S’Klallam Tribe) and share with cooperating agencies and governments for monitoring, adaptive management, and to assist in permit review.

Discussion of 5.1.6 recommended actions: Monitoring programs are operated in the Dungeness watershed for a variety of purposes including habitat protection and restoration, code compliance, and analyzing physical changes to the river channel over time to improve scientific information and predictive capability. The rate of change and development in the Dungeness River corridor necessitates frequent (annual) monitoring as a source of information for adaptive management. Monitoring programs should be coordinated and data shared among partner agencies. Land use and land cover monitoring activities are particularly relevant for managing flood hazards in the future in order to prevent placement of structures in harm’s way, reduce flood hazard for adjacent landowners, and/or retain fish and wildlife habitat functions and
values. Occasional violations of County codes have occurred in the past with respect to unpermitted structures, clearing and excavation, and failure to comply with requirements to limit the size of the building footprint (see the discussion in section 6.5.3). In some cases, the failure to comply with codes results from the lack of information. County staff indicate their preference for improving outreach to landowners as preliminary steps, and using code enforcement as a last resort if other approaches fail. The Flood Hazard Advisory Committee is particularly concerned about ensuring that high risk areas are monitored proactively to prevent additional flood hazard and harm.

5.2 Analysis of alternatives and Reach-by-Reach Recommendations

The following table contains a summary of the flood hazards for the lower 10.8 miles of the Dungeness River, along with flood hazard reduction alternatives that were considered, and the site specific recommendations of the Dungeness River Flood Hazard Advisory Committee. For the purpose of this analysis, the table and corresponding maps are broken into four reaches:

- River Mile 0.0-3.3: River Mouth to Woodcock Road (Ward Bridge)
- River Mile 3.3-6.5: Woodcock Road to Highway 101 Bridge
- River Mile 6.5-8.6: Highway 101 to the Bonneville Power Lines
- River Mile 8.6-10.8: Power Lines to Canyon Creek

This table corresponds to the set of airphotos in Figure 4-5 which show the Channel Migration Zone (Rot and Edens, 2008) and the 100-Year Flood Plain as delineated by FEMA as of January, 2009. The letters on the maps correspond to the letters in the column labeled “location” which also provides the river mile and bank direction (east or west) for each of the identified flood hazards.

Unless otherwise noted, the Flood Hazard Advisory Committee did not include reach-by-reach recommendations for undeveloped parcels in the lower 11 miles. Recommendations related to new development are described in section 5.1. However, the Committee noted that new development, if permitted, in several locations along the lower river would be at substantial flood risk. The recommendations in section 5.1 describe the importance of setting new development back from the Channel Migration Zone to reduce future flood hazard.
### Table 5-2: Analysis of alternatives and reach-by-reach recommendations

**Reach 1: River Mouth upstream to Woodcock Road (RM 0 - 3.3):** The most heavily modified section of the Dungeness River, this river delta area is constricted to a narrow channel by levees on both sides. A 2.6 mile USACOE levee on the east side was constructed in the 1960s to prevent flooding from reaching the town of Dungeness. Increased flooding to the west side resulted in construction or expansion of levees at the Olympic Game Farm and Rivers End Road. Other major manmade structures include Schoolhouse Bridge. Downstream from the Schoolhouse Bridge, levees are present on 60% of the east bank and 37% of the west bank. Upstream, levees are present on 97% of the east bank and 65% of the west bank.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Location Map Ref</th>
<th>Analysis of Present Conditions</th>
<th>Flood Hazard Reduction Alternatives Considered</th>
<th>Recommended Actions for Flood Hazard Reduction</th>
<th>Additional Notes</th>
</tr>
</thead>
</table>
| Rivers End residences and berm | West 0-0.7 B | - 7 residences are subject to risk of repeated flood damage  
- Bem overtops at 2 yr flood level and is subject to erosion  
- High flood hazard area  
- High risk to human well being  
- Program to buyout and remove structures in progress  
- Identified as high priority habitat restoration project | - No action  
- Acquisition of properties and berm removal  
- Construction of ACOE-like levee on west side | - Continue property acquisition from willing sellers  
- Removal of houses, wells, septic, from flood plain  
- Implement re-vegetation program | - Future removal of berm subject to property acquisition  
- Interim damage to levee and road to be addressed on case-by-case basis, subject to applicable permits. |
| ACOE levee from mouth to SH Bridge | East 0-0.7 B | - Sediment deposition into Bay  
- Model runs do not indicate flood hazard potential | - No action  
- Remove last 200-500'  
- Set levee back 100' | - No action | |
| Schoolhouse Bridge | 0.7 C | - BOR analysis indicates that the bridge does not increase upstream flood hazard/backwater. | - No action  
- Lengthen bridge span  
- Culvert modifications west of bridge | - No acquisition or structural action  
- Review maintenance procedures for bridge and culverts. | |
| ACOE Levee from SH Bridge to RM 2.6 | East 0.7-2.6 D | - BOR analysis indicates potential for overtopping levee at 100-yr flood  
- Moderate flood hazard on west bank due to erosion downstream from Game Farm levee | - No action  
- Alternatives for levee setback have had preliminary modeling (BOR 2007) | - Continue analysis of Corps levee setback alternatives in this reach.  
- Proceed with property acquisition from willing sellers  
- Proceed to design phases from Bridge to Brown property. | |

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<table>
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<tr>
<th>Hazard</th>
<th>Location Map Ref</th>
<th>Analysis of Present Conditions</th>
<th>Flood Hazard Reduction Alternatives Considered</th>
<th>Recommended Actions for Flood Hazard Reduction</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympic Game Farm Levee West 1.5-2.5 E</td>
<td>• Low risk flood hazard under present configuration</td>
<td>• No action • Acquisition and removal • Move levee to Ward Road • Extension of levee</td>
<td>• Consider as part of continued analysis of Corps levee setback alternatives in this reach. • Property acquisition/easement from willing sellers (Land Strategy 2003)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residences upstream from GF levee West 2.6 – 3.0 F</td>
<td>• High flood hazard area; present development is within or near CMZ</td>
<td>• No action • Acquisition and removal</td>
<td>• Property acquisition/easement from willing sellers • Interim recommendation to prevent additional development due to flood hazard potential. • Continue riparian stewardship programs for property owners.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undeveloped properties u/s from GF levee Both 2.6 - 3.0</td>
<td>• High flood hazard area if parcels are developed.</td>
<td>• Prevention of potential structures in floodplain</td>
<td>• Riparian stewardship • Set back from CMZ</td>
<td>At least one parcel on east bank is proposed for development; continued development in close proximity to CMZ should be discouraged or precluded.</td>
<td></td>
</tr>
<tr>
<td>Ward Road West 3.0-3.3 G</td>
<td>• Erosion presently controlled with rip rap</td>
<td>• No action • Set Ward Road Back to edge of floodplain</td>
<td>• Acquire property west of Ward Rd. for future road relocation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Reach 2: Ward Bridge (Woodcock Road) upstream to Highway 101 (RM 3.3-6.5):** This reach includes the bridges at Woodcock Road, Old Olympic Highway and the Railroad Bridge. Between Woodcock Road and Old Olympic Highway, an estimated 17% of the east bank has been modified and 40% of the west bank. The reach has active channel migration zones with areas of development close to or within the CMZ. The salmon-productive Anderson side channel is located upstream from Woodcock Road on the west bank. The relatively low gradient of this area of the river has resulted in lower stream velocity and active sediment deposition areas. The Burlingame Bridge (Old Olympic) was rebuilt in 1998-9 and the opening was widened from 130 to 430'. From Old Olympic Highway to the 101 bridge, the river is characterized by a wide active channel with vegetated and unvegetated gravel bars and side channels on both sides of the river. The river still accesses most of the historic flood plain except near the bridges, and there is less development and less bank protection than in other parts of the lower river. There is an embankment upstream of the Railroad Bridge that was constructed following flooding in the 1960s and has been repeatedly repaired. Significant erosion occurs downstream of the bridges, and vegetation clearing downstream of Hwy 101 has increased bank erosion and the risk to houses. Implementation of engineered log jams has been occurring in this section in 2007-2009. Highly productive side channels for salmon are present in this reach associated with forested areas.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Location</th>
<th>Analysis of Present Conditions</th>
<th>Flood Hazard Reduction Alternatives Considered</th>
<th>Recommended Actions for Flood Hazard Reduction</th>
<th>Additional Notes</th>
</tr>
</thead>
</table>
| Ward Bridge (Woodcock Road) | Both 3.3 | • Areas u/s of bridge are riprapped to protect abutments  
• Flood waters enter side channels and under culverts along Woodcock Road. | • No Action  
• Widen Ward Bridge | Include bridge widening in County roads plan | |
| Residential structures near Woodcock Road | Both 3.0-3.75 | • Active CMZ u/s and d/s from Woodcock Road  
• Development close to CMZ or Anderson side channel.  
• High flood hazard area  
• High habitat quality areas | • No Action  
• Property acquisition  
• Conservation easement  
• Prevent potential structures in floodplain | Riparian stewardship  
Revegetation  
Set back from CMZ  
Conservation easements | |
| Burlingame Bridge (Old Olympic Highway) | Both 4.0 | • Bridge widened in 1998-9  
• Armoring has occurred on both sides of bridge upstream. | • No Action  
• Extend east end by 130’ (would require property acquisition) | No structural action until channel migration makes it necessary to reevaluate expansion.  
Property acquisition from willing sellers upstream of bridge | Bridge was designed to accommodate easterly expansion. |
<table>
<thead>
<tr>
<th>Hazard</th>
<th>Location Map Ref</th>
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</tr>
</thead>
</table>
| Residential structures between Burlingame Bridge and Railroad Bridge  | Both 4.0-4.5 J   | • Erosion occurring along Grandview on west bank. Some houses at risk on both sides of river.  
• Development close to or within CMZ  
• High flood hazard area  
• Riparian forest has been removed near houses                                                                                       | • No Action  
• Map flood channels  
• Conservation easement  
• Revegetation  
• Bank protection with wood  
• Acquisition-low priority                                                                                                           | • Acquisition and removal of house closest to Burlingame Bridge on west bank.  
• Riparian stewardship  
• Revegetation  
• Set back from CMZ  
• Conservation easements                                                                                                                   | • Preventive strategy to avoid continued development in or near CMZ                                                                                           |
| Small privately-owned undeveloped properties                           | Both 3.0-5.8 K   | • Present level of development is low, but flood hazard potential would increase if developed.  
• High quality forested riparian habitat                                                                                                   | • No Action  
• Property acquisition  
• Conservation easements  
• Prevent potential structures in flood plain                                                                                           | • Riparian stewardship  
• Set back from CMZ and forest edge  
• Retain riparian forest  
• Conservation easements                                                                                                                   |                                                                                                                                                             |
| Large undeveloped parcels RM 4.6 to Hwy 101                          | Both 4.6 - 6.4 K | • Large single-owner property along west bank with high quality riparian forest habitat  
• Erosion history hayfield area on west bank and d/s 101 bridge  
• Active erosion to east bank and Hendrickson road. Occasional flooding of parking area  
• Active channel migration u/s of Railroad Bridge and high hazard to trestle.  
• Bridge embankment restricts flood plain area.                                                                                          | • No Action  
• Acquisition  
• Conservation easement  
• Prevent potential structures in flood plain                                                                                               | • Mixed easements and acquisition for east bank; purchase of west bank  
• Riparian stewardship  
• Revegetation                                                                                                                                  | • Emphasize preventive strategy to avoid continued development in or near CMZ  
• High priority acquisition area due to habitat value                                                                                         |
| Railroad Bridge Park/ Hendrickson Road                                 | Both 5.7-6.5 L   | • Active erosion to east bank and Hendrickson road. Occasional flooding of parking area  
• Active channel migration u/s of Railroad Bridge and high hazard to trestle.  
• Bridge embankment restricts flood plain area.                                                                                          | • No Action  
• LWD placement  
• Relocate Hendrickson road and parking lot eastward  
• Remove or set back embankment  
• Modify trestle                                                                                                                                  | • LWD placement in progress 2008-2009 for habitat restoration  
• Property acquisition  
• Analysis of bridge and embankment modification  
• Potential damage to trestle and embankment will require replacement options that accommodate flood flows. | • O&M plan for RR bridge in process (2009)  
• Relocation of parking/road will require property acquisition.                                                                                     |
<table>
<thead>
<tr>
<th>Hazard</th>
<th>Location Map Ref</th>
<th>Analysis of Present Conditions</th>
<th>Flood Hazard Reduction Alternatives Considered</th>
<th>Recommended Actions for Flood Hazard Reduction</th>
<th>Additional Notes</th>
</tr>
</thead>
</table>
| Kaiser Road residences d/s of 101 | East 6.4 M | • Riparian vegetation has been removed  
• Active erosion and loss of property and infrastructure; owners are actively installing wood and bank hardening.  
• High flood hazard area due to channel migration and active erosion d/s of 101 bridge | • No Action  
• LWD placement  
• Bank hardening  
• Acquisition and removal of structures | • Property acquisition of high hazard parcels (long term)  
• Short term bank hardening (interim/ short term)  
• Prevent additional development due to flood hazard potential.  | |
| Other residences d/s of 101 | East 6.0-6.4 N | • Old flood channel (swale) exists to the east of Kaiser Road area. | • No action | • Notify property owners that swales and elevation differences result from presence of old channel. | • Risk that channel will reactivation is low due to configuration of 101 bridge |
### Reach 3: Highway 101 Bridge to Bonneville Power Lines (RM 6.5 to 8.6): Due to levee building and bank armoring, this reach has become straightened and entrenched and the channel shifts frequently due to levees and sediment deposition. Extensive gravel mining occurred from 1992-1996. The Dungeness Meadows dike was constructed by the USACE in 1972 and extended north in 1993. Spring Creek and other east side channels are disconnected from the river by the levee. Bank armoring across from the Dungeness Meadows dike has been extensive to protect CCD irrigation outtake, residences, and Taylor Cutoff Road. It is estimated that levees line approximately 1/3 of this reach on each side of the river.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Location</th>
<th>Analysis of Present Conditions</th>
<th>Flood Hazard Reduction Alternatives Considered</th>
<th>Recommended Actions for Flood Hazard Reduction</th>
<th>Additional Notes</th>
</tr>
</thead>
</table>
| Residential properties u/s of 101 to DM dike | Both 6.4 - 7.0 O | • High flood hazard area u/s of 101 bridge  
  • Erosion potential west bank; some log revetments were installed  
  • Productive Dawley side channel on east bank | • No Action  
  • Bank hardening -east  
  • Conservation easement  
  • Acquisition | • Re-vegetation  
  • Conservation easements  
  • Acquisition of side channel property  
  • Riparian stewardship | Several parcels have already been purchased or have easements on east bank. |
| SP Tri outtake | East 6.5 P | • Sediment deposition at outtake | • No Action  
  • Maintain outtake | • Maintenance of outtake structures  
  • Re-evaluate irrigation outtakes if/when irrigation infrastructure is modified. |
| Residence property along Taylor-Cutoff Road | West 7.0-8.0 Q | • High risk of bank erosion and flooding of residential homes and property  
  • Extensive bank armoring | • No action  
  • Bank Amoring  
  • LWD placement  
  • Building setback  
  • Acquisition | • LWD placement  
  • Conservation easements and acquisitions on selected properties  
  • Prevent additional development in high risk areas | Flood hazard on T-C Road was likely exacerbated by extension of Dungeness Meadows dike. |
| CCD Irrigation Outtake | West 7.6 R | • CCD outtake was rebuilt in 1994 with new fish screen. Repeatedly damaged from active channel movement and debris during flood. | • No action  
  • Maintain armoring  
  • Build log jam  
  • Relocate | • No action on CCD outtake | |
| Independent Outtake | East 8.5 T | • High potential for channel avulsion into Independent ditch outtake on east bank at RM 8.5.  
  • Independent requires high maintenance due to deposition at outtake. | • No action  
  • Maintain armoring  
  • Build log jam  
  • Relocate | • Relocate Independent outtake and evaluate need for modification of remaining structures to prevent channel avulsion u/s and behind Dungeness Meadows dike. | CIDMP recommends elimination of Independent outtake and combine with Highland. |
### Dungeness River Comprehensive Flood Hazard Management Plan 2009

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Location Map Ref</th>
<th>Analysis of Present Conditions</th>
<th>Flood Hazard Reduction Alternatives Considered</th>
<th>Recommended Actions for Flood Hazard Reduction</th>
<th>Additional Notes</th>
</tr>
</thead>
</table>
| Dungeness Meadows Dike | East 7.5-8.5 S   | - Dike was extended d/s in 1993. Flood hazard across and downstream on west bank is high due to increased velocity and flood stage from DM dike  
- Spring Creek side channel complex is blocked by dike  
- Extensive development behind dike.  
- Property acquisitions near d/s end of dike as recommended in Land Strategy have mostly been implemented. | - No action  
- Remove lower portion of DM dike  
- Set back DM dike  
- Install culvert in dike to feed side channel complex | - No action for major portion of dike.  
- Acquire property near north end for potential removal of extension (most are already acquired by NOLT) | - Extension appears to have put houses and roads at risk along T-C Road.  
- Potential removal of north portion of dike would require analysis of flood hazard, but has potential habitat benefit.  
- J S’KT flood modeling in progress. |
Reach 4: BPA Powerlines to Canyon Creek (RM 8.6 - 10.8): This reach is heavily wooded and characterized by complex and single channel structure. Kinkade Island is formed by the mainstem river and the Kinkade Creek side channel. Flooding in 2002 eliminated one of two bridges to access the island and one home was destroyed. There is spot bank protection throughout the reach and along Kinkade Creek; levees in this section include the Lower Haller Dike, berms protecting the WDFW Fish Hatchery, and the City of Sequim levee. Two irrigation outtakes are located in this section—one on each side. In the main channel, approximately 25% of the west bank and 20% of the east bank are lined by levees, and another 5% of each bank has been subject to other man-made modifications.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Location</th>
<th>Analysis of Present Conditions</th>
<th>Flood Hazard Reduction Alternatives Considered</th>
<th>Recommended Actions for Flood Hazard Reduction</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Haller Dike</td>
<td>West 8.6-8.9 U</td>
<td>• Dike failed in March 1997 and was reconstructed by NRCS.</td>
<td>• No action</td>
<td>• Riparian stewardship</td>
<td>• Removal of structures would have high value for both reduction of flood hazard and habitat function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Two houses are protected by the dike.</td>
<td>• Acquire all properties and remove dike</td>
<td>• Conservation easements on selected properties</td>
<td>• LWD placement considered to be uncertain as an effective strategy.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Houses on west side d/s of LH dike to Clover Lane are at potential risk of avulsion.</td>
<td>• Acquire portions of property d/s of houses and remove portions of dike.</td>
<td>• Evaluate flood risk potential for downstream properties and homes.</td>
<td>• Flood modeling study in progress by JS’KT.</td>
</tr>
<tr>
<td>Kinkade Island</td>
<td>East 9-9.75 V</td>
<td>• 6 residences are located on island along with ~6 RVs</td>
<td>• No Action</td>
<td>• Acquisition and removal of structures</td>
<td>• Berms are presently vegetated and do not appear to impair habitat functions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Single bridge access</td>
<td>• Add LWD at entrance to Kinkade Creek to control volume of water entering channel</td>
<td>• Interim recommendation to prevent additional development due to extremely high levels of flood hazard.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High risk that mainstem will avulse into Kinkade Creek, putting residents of island and Kinkade Creek at risk.</td>
<td>• Other levees or armoring</td>
<td>• Enforcement of CAO provisions and codes should be emphasized in this location due to the high risk to human well being.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Highly erodible area at high risk of flood hazard</td>
<td>• Acquisition and removal of structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WDFW Fish Hatchery</td>
<td>West 10.6 W</td>
<td>• Rearing ponds are located in flood plain (1914 channel) and there is an avulsion hazard.</td>
<td>• No Action</td>
<td>• Analyze feasibility and impact of removing berms.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Berms protect floodplain d/s of Canyon Creek</td>
<td>• Relocate ponds</td>
<td>• Relocate ponds.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Outtake and access road to Agnew intake are armored.</td>
<td>• Remove berms and set back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazard</td>
<td>Location Map Ref</td>
<td>Analysis of Present Conditions</td>
<td>Flood Hazard Reduction Alternatives Considered</td>
<td>Recommended Actions for Flood Hazard Reduction</td>
<td>Additional Notes</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Fish Hatchery Road</td>
<td>West Y</td>
<td>• Bank undercut on Fish Hatchery Road&lt;br&gt;• County relocated road to the west, with heavy armoring.</td>
<td>• No Action</td>
<td>• No action at this time.</td>
<td></td>
</tr>
<tr>
<td>Fish Hatchery Road</td>
<td>East 10.9 Z</td>
<td>• Agnew outtake and pipeline heavily armored at canyon&lt;br&gt;• Highland outtake is heavily armored and connected to the dike protecting Sequim water system.</td>
<td>• No Action</td>
<td>• No action&lt;br&gt;• Re-evaluate irrigation outtakes if/when irrigation infrastructure is modified.</td>
<td>• CIDMP has recommendations to modify diversion structures.</td>
</tr>
<tr>
<td>City of Sequim water supply</td>
<td>East 10.8 X</td>
<td>• Ranney system and building located behind a dike.</td>
<td>• No action</td>
<td>• No action&lt;br&gt;• Re-evaluate dike and structures if water system infrastructure is modified.</td>
<td></td>
</tr>
<tr>
<td>Other residential properties</td>
<td></td>
<td>• Active erosion occurring on east bank at RM 9 across from May Road&lt;br&gt;• Rock placement and logs have been placed along both banks, particularly along the outside of meanders.&lt;br&gt;• Property owner at RM 10 has installed log revetments and spur dikes</td>
<td>• No Action</td>
<td>• Riparian stewardship&lt;br&gt;• Set back from CMZ&lt;br&gt;• Conservation easements</td>
<td></td>
</tr>
</tbody>
</table>
5.3 Summary of estimated costs for recommended actions

The estimated costs for implementing the recommendations in the Dungeness River Comprehensive Flood Hazard Management Plan are approximate estimates based primarily on recent plans and studies related to riparian land protection and salmon recovery. Expenditures for flood hazard management fall into five general categories and are summarized in Table 5-3: 1) purchase of land or conservation easements from willing sellers for habitat protection/restoration and/or flood hazard abatement; 2) levee removal/setback; 3) re-vegetation of riparian parcels; 4) large-scale engineered log jams; and 5) programs to provide stewardship education, technical assistance, monitoring, or outreach to riparian landowners.

Table 5-3: Summary of estimated costs at 2009 levels. These are approximate estimates. See source documents and description following table.

<table>
<thead>
<tr>
<th>Reach</th>
<th>Assessed Value of parcels recommended for purchase or conservation easement</th>
<th>Estimated Market Value at 150% of assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>River Mouth to Woodcock Road</td>
<td>$2,854,110</td>
<td>$4,281,165</td>
</tr>
<tr>
<td>Woodcock to Hwy 101</td>
<td>$12,105,984</td>
<td>$18,158,976</td>
</tr>
<tr>
<td>Hwy 101 to Power line</td>
<td>$2,870,105</td>
<td>$4,305,023</td>
</tr>
<tr>
<td>Powerline to Hatchery</td>
<td>$1,261,390</td>
<td>$1,892,085</td>
</tr>
<tr>
<td><strong>TOTAL LAND VALUE</strong></td>
<td><strong>$19,091,499</strong></td>
<td><strong>$28,637,249</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reach/Location</th>
<th>Levee recommended for setback</th>
<th>Estimated project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>River Mouth to Woodcock Road</td>
<td>ACOE and Game Farm levee setback</td>
<td>$9,250,000</td>
</tr>
<tr>
<td>Hwy 101 to Power line</td>
<td>Remove lower 2,000 LF DM dike</td>
<td>$1,100,000</td>
</tr>
<tr>
<td>Powerline to Hatchery</td>
<td>Lower Haller Dike Setback</td>
<td>$2,200,000</td>
</tr>
<tr>
<td><strong>Others scattered constriction abatement</strong></td>
<td></td>
<td>$2,000,000</td>
</tr>
<tr>
<td><strong>subtotal</strong></td>
<td></td>
<td><strong>$14,550,000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Estimated project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.52 linear miles planting, maintenance, monitoring, and re-planting</td>
<td>$150,000</td>
</tr>
<tr>
<td>Control of invasive plants ($25,000 for 5 years)</td>
<td>$125,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$275,000</strong></td>
</tr>
</tbody>
</table>
### ENGINEERED LOG JAMS

<table>
<thead>
<tr>
<th>Activity</th>
<th>Estimated project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reach scale engineered log jam projects above Highway 101</td>
<td>$2,500,000</td>
</tr>
</tbody>
</table>

### STEWARDSHIP, TECHNICAL ASSISTANCE, AND MONITORING

<table>
<thead>
<tr>
<th>Activity</th>
<th>Estimated project cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part time staff at County, Conservation District and annual mailings for a 5-year period, education workshops at Dungeness River Center.</td>
<td>$350,000</td>
</tr>
<tr>
<td>High resolution airphotos 1:6,000 scale ($10,000/yr for 5 yrs)</td>
<td>$50,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$400,000</strong></td>
</tr>
</tbody>
</table>

**TOTAL ESTIMATED PROJECT COSTS, EXCLUDING LAND PURCHASES**

**$17,725,000**

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**Sources for cost estimates:**

**Land values:** Recommended Land Protection Strategies for the Dungeness River Riparian Area (Hals, Dungeness River Restoration Work Group; 2003) and Clallam County Assessor website. The Hals/DDRWG report provides detailed tables of parcels that were recommended for purchase or conservation easement for habitat or flood hazard abatement. Current assessed values were obtained for these parcels, where available, from the Assessor’s office and tabulated <www.clallam.net/>. More information on the land value estimate is located in Tables 5-4 and 5-5.

**Riparian Restoration Projects:** The Dungeness Chapter of the Puget Sound Salmon Recovery Plan (Shared Strategy, 2005) and three-year work list included over $40 million in projects for salmon recovery in the Dungeness watershed. Many of these projects are unrelated to flood hazard reduction (such as water conservation and hatchery upgrades) but several would directly or indirectly contribute to flood hazard management. In particular are projects to set back or remove levees, revegetation of cleared riparian areas to prevent erosion and improve habitat function, and placement of large woody debris in areas where it may direct flow away from eroding banks.

- **Levee removal or setback:** These projects will require separate engineering analysis and cost estimates prior to construction. Cost estimates used in the Puget Sound Salmon Recovery Plan were based on communication with the Washington Department of Ecology which established a range of $500 to $1400 per linear foot, excluding engineering and land acquisition. A review of recent (2006-2008) projects in Hood Canal and South Puget Sound indicated that this range is still valid for rough estimation purposes. Costs for large projects (>500 LF) were based on $500 per LF, while smaller constriction abatement projects were based on $1,000 per LF.

- **Re-vegetation:** Estimates were based on the need to plant an estimated 30 acres (4.52 linear miles x 50 feet) at a cost of $5,000 per acre, including re-planting, maintenance, and monitoring for 5 years (linear estimate from airphoto analysis by...
Invasive species in the Dungeness riparian corridor include butterfly bush and Japanese knotweed which require expensive, labor intensive treatments including individual stem injections.

**Engineered Log Jams:** The Jamestown S’Klallam Tribe has recently completed reach-scale large woody debris placement in the area near Railroad Bridge Park at a cost of over $1.5 million. Similar work is anticipated in the area upstream of Dungeness Meadows (pers. comm. with B. Rot).

**Technical assistance, monitoring, outreach, and public education:** These are ongoing programs operated by the County, Conservation District, or other appropriate entity, funds permitting. The Clallam Conservation District 5-year work plan estimates the program costs for staff, technical assistance, and cost share for working with urban and forest landowners and conducting education programs at $800,000 (excludes agricultural work which is substantially higher). The Conservation District work plan is available at [www.clallam.scc.wa.gov/reports.htm](http://www.clallam.scc.wa.gov/reports.htm). Approximately 20% of this effort applied to the Dungeness would be $160,000 ($32,000 per year). Similar costs have been estimated for land use monitoring and flood hazard/emergency preparedness education for Clallam County. Recommended annual mailings to 300 Sequim-Dungeness property owners are estimated to cost $3,000 per year for staff time, layout, printing and postage (x 5 years = $15,000). Workshops at the Dungeness River Audubon Center related to land management (e.g. Septics 101) have been successful educational events for reaching property owners. A cost of $3,000 per year (x 5 years) is also included for facility costs and advertising. Total estimated cost for education and technical assistance is $350,000 for a 5-year period.
### Table 5-4: Estimated Dungeness River Riparian Land Values

| Estimated Values for Dungeness River Riparian Land -- Potential Purchases Identified from 2003 Land Protection Strategy (Hals/DRRWG) | Total |
|---|---|---|---|---|---|
| # of riparian parcels | Mouth to Woodcock | Woodcock to Hwy 101 | Hwy 101 to Powerlines | Powerlines to Hatchery | Mouth to Hatchery |
| 66 | 69 | 42 | 29 | 206 |
| # acres riparian parcels | 565 | 357 | 516 | 50 | 1488 |
| # parcels in protected status | 34 | 17 | 5 | 0 | 56 |
| # acres protected status | 289 | 41 | 375 | 0 | 705 |
| # additional parcels recommended for acquisition or easement in Land Protection Strategy for HABITAT protection or restoration (and flood hazard abatement) | 26 | 35 | 15 | 3 | 79 |
| Assessed value of these parcels for HABITAT protection and restoration | $2,753,400 | $7,814,783 | $2,870,015 | $430,875 | $13,869,073 |
| # additional parcels recommended for acquisition primarily for FLOOD HAZARD abatement | 3 | 17 | none listed specifically in 2003 plan | 12 | 32 |
| Assessed value of parcels primarily for FLOOD ABATEMENT | $100,710 | $4,290,665 | 0 | $830,515 | $5,221,890 |
| TOTAL of assessed value for Habitat and Flood Hazard Abatement | $2,854,110 | $12,105,984 | $2,870,015 | $1,261,390 | $19,091,499 |
| TOTAL estimated market value at 150% of assessed value | $4,281,165 | $18,158,976 | $4,305,023 | $1,892,085 | $28,637,249 |

**Notes:**

- Approximate estimate based on assessed values obtained on-line in January 2009 compared to tables of recommended actions in the 2003 Land Protection Strategy. Several parcel numbers from 2003 were no longer listed in on-line records. Estimate is based only on the records available via on-line parcel search. Estimates used full assessed value whether acquisition or easement was prescribed, or whether it was high, med, or low priority.

- Protected status means a parcel is owned by Clallam County, Washington State (WDFW or DNR), Jamestown S’Klallam Tribe, has a protected easement (e.g. North Olympic Land Trust), or is identified as having a high level of protection by the private property owner in the 2003 report.

- River mouth to Woodcock: Land acquisition in process at this time (Jan 2009)

- Woodcock to Old Olympic Hwy: Most of the riparian land area in this section is already protected via easement.
Old Olympic to Hwy 101: Significant portion of the area recommended for habitat acquisition on west bank is in one ownership with high value habitat. Most of the flood abatement parcels are located by bridges, especially 101 (Kaiser Road area).

Powerline to Hatchery: Most of the flood abatement parcels are located at Kinkade Island area.

Table 5-5: Additional breakout of land value estimates for selected portions of the Dungeness River riparian area

<table>
<thead>
<tr>
<th>Selected breakout areas</th>
<th>Reach 1 without Rivers End</th>
<th>Rivers End</th>
<th>Reach 1 Total</th>
<th>Woodcock to Old Oly</th>
<th>Old Olympic to Hwy 101</th>
<th>Reach 2 total</th>
</tr>
</thead>
<tbody>
<tr>
<td># of riparian parcels</td>
<td>34</td>
<td>32</td>
<td>66</td>
<td>13</td>
<td>56</td>
<td>69</td>
</tr>
<tr>
<td># acres riparian parcels</td>
<td>494</td>
<td>71</td>
<td>565</td>
<td>32</td>
<td>325</td>
<td>357</td>
</tr>
<tr>
<td># parcels in protected status</td>
<td>14</td>
<td>20</td>
<td>34</td>
<td>10</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td># acres protected status</td>
<td>226</td>
<td>63</td>
<td>289</td>
<td>22</td>
<td>19</td>
<td>41</td>
</tr>
<tr>
<td># additional parcels recommended for acquisition or easement in Land Protection Strategy for HABITAT protection or restoration (and flood hazard abatement)</td>
<td>14</td>
<td>12</td>
<td>26</td>
<td>2</td>
<td>33</td>
<td>35</td>
</tr>
<tr>
<td>Assessed value of these parcels for HABITAT protection and restoration</td>
<td>$2,341,445</td>
<td>$411,955</td>
<td>$2,753,400</td>
<td>$387,175</td>
<td>$7,427,608</td>
<td>$7,814,783</td>
</tr>
<tr>
<td># additional parcels recommended for acquisition primarily for FLOOD HAZARD abatement</td>
<td>3</td>
<td>na</td>
<td>3</td>
<td>0</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Assessed value of parcels primarily for FLOOD ABATEMENT</td>
<td>$100,710</td>
<td>na</td>
<td>$100,710</td>
<td>0</td>
<td>$4,290,665</td>
<td>$4,290,665</td>
</tr>
<tr>
<td>TOTAL of assessed value for Habitat and Flood Hazard Abatement</td>
<td>$2,442,155</td>
<td>$411,955</td>
<td>$2,854,110</td>
<td>$387,175</td>
<td>$11,718,273</td>
<td>$12,105,448</td>
</tr>
<tr>
<td>TOTAL estimated market value at 150% of assessed value</td>
<td>$3,663,233</td>
<td>$617,933</td>
<td>$4,281,165</td>
<td>$580,763</td>
<td>$17,577,410</td>
<td>$18,158,172</td>
</tr>
</tbody>
</table>

Estimates for land values are approximate and were based on the data available without in-depth GIS analysis.