# Skagit Flood Risk Management Working Group
# Facilitation Meeting Notes
## September 14, 2000

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# Facilitation Meeting Notes

The second meeting of the Skagit Flood Risk Management Working Group was held on Thursday, September 14, 2000 from 9:00 AM to 4:30 PM at the Skagit Valley College in Mount Vernon. A copy of the agenda is included in Attachment 1 and the attendance list is included in Attachment 2. The meeting began at 9:15 after the attendees had an opportunity to sign in, acknowledge others and take their seats.

## I. Introduction

**Jackie Vander Veen** started the meeting with a brief joke and informed the group of a salmon workshop in Everett on September 26th.

## II. Adoption of July 18, 2000 Draft Meeting Notes

**The facilitator** recapped the Working Group process. The July 18th meeting established the framework for the group to move forward. The group now had moved to a portion of the process during which substantive information will be analyzed. During the last meeting the group created a list of potential topics on which they would like to receive additional information. The intent of creating the list was to 1) find out what people were interested in learning more about, and 2) establish a starting point for moving forward in evaluating options for flood control. The facilitator informed the group that during the morning session information on specific topics selected by the group would be presented. During the afternoon session the group will decide whether or not they want the Army Corps of Engineers (Corps) to further model and analyze the various alternatives discussed.

**The facilitator** then moved to adopt the notes from the previous meeting. She noted the suggested revisions by the participants regarding the notes and asked if anyone objected to these changes. No one objected to the current changes or had any additional. The notes were adopted by all participants.

## III. Presentation of Information

**Sky Miller** addressed the group. He explained the dilemma of wanting to make the best use of time with the prodigious brains in the room by addressing the more pressing topics but not wanting to categorically exclude a topic if someone wanted a discussion of it. Sky wanted to focus the discussions for the day on overtopping levees, levee setbacks, dredging, dams, bypasses, and the affects of these approaches on salmon.

For the morning, Sky proposed that the topics be presented in depth by various experts with differing points and provide examples of where they have worked (or not worked). In addition, a consideration of these topics and their affects on habitat and salmon lifecycles would be addressed. In the afternoon, Sky proposed that a brainstorming session be held to begin an open dialogue on concepts and strategies of what might be

done with excess floodwaters in order to minimize damages. Sky explained that these discussions may be uncomfortable. He reminded the group that his first approach may be viewed as cavalier, of being one step removed but that he was looking at the situation solely from an engineering standpoint. Once technically feasible solutions are identified, the process can then consider social and personal impacts. Since we don't have the luxury of time, Sky would rather be frank and forthright.

Sky wanted to make the group aware that Puget Sound Energy who operates the dams on the Baker River is in the process of negotiating the dam re-licensing. One concern is that they may be negotiating to raise the level of the dam during the winter resulting in a reduction of flood storage. Sky stated there needs to be a balance between the fish and flood control.

Sky talked to the group about the importance of a historical perspective for the development of a flood management plan. He clarified that history should not be examined in order to place blame, but instead to figure out where and how to move forward.

Sky then introduced Larry Kunzler to address the group. Mr. Kunzler has studied the Skagit River and its historical records for many years and has been sharing this information with a large variety of groups around the region since 1995. He has recently taken an interest in the volcanic activity that is largely responsible for the morphology of the coastal region of the state as we know it today. His talk today, however, he mentioned will be focused on what he has learned through his research on the Skagit River.

## A. Larry Kunzler

**Larry Kunzler** thanked the group for inviting him to talk on flood history. Larry stated that the three things that one needs to know about water are:

Water is wet,
Water flows downhill, and
Water seeks the path of least resistance.

### Flood Risk

Larry reiterated that Skagit County has the largest potential for catastrophe on the coast. He presented some basic facts about Federal Emergency Management Agency (FEMA) contributions to the area and indicated that in 1995, 25% of the money that FEMA spent statewide was distributed to Skagit County and in 1990, 47% went to the county. Larry stated that for the rest of the state, only 6% of the population lives in a floodplain. Here in Skagit County roughly 30% of the population lives in the floodplain.

Larry has found research on the flood history of the Skagit River of two very large floods that occurred about 1815 and 1856. Larry believes that these floods were related to volcanic activity. He also related that the Indians have tales of a great flood in which half

of the population perished and food and shelter were destroyed making their survival upon the aftermath grim at best.

Larry expressed that the County is now being pushed in a direction that it should have been headed before. He rebutted a misconception that the river has not previously been studied. Larry handed out from his book on flooding in the Skagit that cites more than 70 studies ranging over 103 years. The Army Corps of Engineers have produced a large portion of those studies. He noted that every time the Corps held a public meeting it was recorded; there have been public meetings in the Skagit area regarding flooding since 1937. Larry stated that there is little that the group could talk about which has not been discussed previously, except for the overtopping of levees.

**Dams**

Larry indicated that dams are an environmental disaster with respect to the impact on fish. He presented an example of the impact that the Baker River dams have made on the fish populations there. Construction of a dam is a legislative nightmare, cost prohibitive and has significant legal issues. Larry suggested that Mother Nature dictates the natural course of rivers. The fact that the Sauk was historically connected to the Stillaguamish River and had its course altered by Glacier Peak eruptions is suggestive that this may occur again. Larry asked the group to think about what impacts to society would be if this type of event were to occur now? Dams on the Sauk River have been discussed throughout the 1900s. In 1949, a Sauk River dam was proposed which resulted in a letter from the Department of Game stating that it would significantly impact the fish run on that river. The Department of Game also warned against a second dam on the Baker River. Even back then, the impact of dams on fish was recognized. A dam for the Skagit River would only be harmful and salmon would not be able to maintain their runs.

He also noted the impacts of volcanic activity on the feasibility of a dam. In the past Glacier Peak has erupted and altered the coarse of the Skagit River and it will probably do it again. Individuals did not know that Glacier was a volcano until there was activity and the entire reservoir filled with silt.

**Dredging**

Larry then moved onto the topic of dredging as a means of flood control. Larry proposed that dredging defied the three E's, economics, environment, and engineering. Dredging would require continual maintenance that would be cost prohibitive. Dredging would also remove important riverine elements that are critical to salmon survival. But probably most importantly, dredging would not accomplish the desired affect due to the physics of sediment transport and bank stability.

The history of dredging on the Skagit River was for navigation purposes. Larry produced a graphic with statistics on the years that the river was dredged and the amount of material that was removed. He calculated that the Corps removed 1,500,000 cubic yards over 40 years. When compared to the 20,000,000 cubic yards of sediment the Sauk

contributed to the system, there is no way that the dredging had an affect on flooding. Another concept to consider is to observe that the floodplain of the river above Sedro Woolley is a mile to three miles wide. Our current levee system is only 300 – 800 feet wide. The depth of the river between the levees would have to be very deep to accommodate 1 – 3 miles wide of floodplain water in order to safely route it through to the bay. This, frankly, is not possible due to the sea level.

Dredging the river for flood control has been addressed for many years. As early as 1910, public meetings have been held to discuss dredging. In 1925, the Army Corps of Engineers explained that channel enlargement alone was not a feasible form of flood control. This reiterates that the Corps was not dredging for flood control but simply to facilitate navigation.

### Levees – A False Sense of Security

Larry stated that the levees have provided the area with a false sense of security. He indicated that roughly $50,000,000 has been spent on building and maintaining the system and it will be catastrophic when it fails. He also claims that NEPA and SEPA apply to this system and that it requires mitigation of any impacts to the floodplain. Modeling that was done for litigation showed that the levees caused water to stack up in other areas. Although dikes protect valuable lands they are often improperly located and are weak. It was noted very early that the levee system was too confining for the river. A report from 1912 states that the Skagit River was confined by the levees and their improper location and construction would cause overtopping and failure. A report from 1918 indicates that the levees would cause flooding elsewhere and a report from 1919 suggests that the levees were built too close to the river.

A report prepared by Robert Herzog of the Great Northern Railway Company in 1922 indicates that the railroad bridge between Mount Vernon and Burlington will fail if floodwater reaches the platform. Another report from 1925 states that the levee system has been improperly designed and is too close to the river bank. In 1956, the City of Burlington moved its levee 4000 feet closer to the river. Larry believes that floodplain management here has failed. This is further emphasized by observing the development that has occurred from 1970 to 1994. Larry's opinion is that the only people that belong in the floodplain are farmers. It is also Larry's opinion that there should be no more studies.

### Looking Ahead

Larry is a proponent of a flood management plan that includes engineering and land-use responsibility as well as non-structural improvements. He noted that this type of plan has failed in the past because of the local regulations and unwillingness of local citizens. As Larry sees it, there are two possibilities for proper flood management in the Skagit Valley. One is the Avon Bypass. The bypass will allow water to go to the same place that it did in 1922, to the bay. Larry expressed that the future of the valley is in the hands of the Working Group. The time to act on what has been learned is now.

Larry also noted that he would be happy to act as the historian for the Working Group.

### Questions on Larry's Presentation

#### Dredging Discussion

**The facilitator** asked if anyone had questions for Larry. She informed the group that when Environment International Ltd. was conducting the scoping interview one solution that they repeatedly heard from those interviewed was dredging the river.

**Chuck Bennett** said that the last time Larry gave this presentation Larry stated that the channel of the Skagit would have to be 250 feet deep in order to hold a 100-year flood. **Larry** stressed that dredging simply does not work. **The facilitator** asked Larry to display his overheads that explained why dredging is not a viable flood control alternative for the Skagit River. **Larry** responded that dredging is not feasible because the channel would have to be too deep and it would cost too much.

**Will Roozen** asked if dredging would make the river move faster even if it could not hold all of the water. He asked if the speed at which the water moves would help the flood management effort. **Ron Malmgren** replied that even if the capacity of the river was doubled by dredging 40 to 50 feet deep with an 800-foot channel width, one would still see a tidal effect at Mount Vernon. Because the tide holds the water back, dredging simply won't be that helpful. Additionally, the dredged area will be filled in about 5 years and all of the fish habitat will have been destroyed.

**Sky Miller** informed the group that for the Snohomish River the problem was how narrow the river was versus the width of the flood plain. He stated that a very tall dike would have to be built or a huge channel dug because the volume of water is so large. Sky pointed out that the other issue for the Skagit is that the bottom of the river is below sea level. As a result, the level of conveyance that is needed to have the water move out during high tide is not being achieved. **The facilitator** asked why removing the snags and bridges makes a difference for floods but not dredging. **Sky** replied that dredging does not work because conveyance is a concern at the bottom of the river, at ground zero. The bridged and snags are above ground zero.

Questions turned to how much dredging can be done before the integrity of the levees is compromised. **Sky** replied that one cannot dig below 40 feet.

**Curt Wylie** mentioned that for every foot over flood stage, the river scours a foot deeper into the riverbed. **Sky** confirmed this statement and added that the river moves around and dredges a hole in the riverbed. When the river slows down it drops its sediment load, which will fill in any holes that were created through dredging. Additionally, clean water flows faster and will pick up more soil increasing the level of erosion.

### Dam Discussion

**Dave Burdick** asked about using dams for flood control. **Sky** noted that in 2006 the Baker dam is up for relicensing. The group can talk about renegotiations with the dam but should not count on any specific renegotiations being approved. **Rich Johnson** added that a lower lake level may have an adverse impact on fish. Radical changes in the reservoir and river levels would be detrimental to fish.

### Flood Management Options

**Mike Scuderi** asked Larry to clarify his two options for flood management. **Larry** replied that there are three options: the bypass, overtopping of levees and dike setbacks. He stated that the group should be creative with their planning. The river is 13,000 years old and has moved 3 times because of volcanic activity.

**The facilitator** introduced Ron Malmgren to give the next presentation. Ron is the Corps modeler for the Skagit Flood Risk Management Project.

## B. Ron Malmgren Presentation

**Ron Malmgren** informed the group that he has been working on the Skagit River since 1992 or 1993. During that time he has been the main hydraulic modeler. He has been involved with the flood risk management project for the last year in a full time capacity. Ron explained that in his presentation he was going to answer some questions that either he or the County had received regarding the modeling and flood control efforts. Ron's handouts containing the questions and answers are found in Attachment 3.

***Question 1: What happens if the Mount Vernon revetment flood fight efforts fail – say before the levee by the Mount Vernon sewage treatment plant? Any ideas on how that would change the economics?***

Ron Malmgren explained that downtown would flood and the high velocity of water could tear out the first floor of the buildings along the revetment. He stated that when compared to a back flood of downtown the revetment failure would only add a few additional costs and damages.

**Fred Buckenmeyer** asked if the velocity of a revetment failure would undermine the foundations of the downtown buildings. **Ron** replied that he would have to look at that more closely with the new modeling effort. Previously, it was assumed that the flood fighting efforts at the revetment would be successful and the fighting efforts at the treatment plant would fail. He explained that the group would have to wait for the economic model to be run to determine the actual increase in cost for a failed flood fight effort.

***Question 2:What is the storage volume of the Nookachamps? How much of the crest of a flood could we get in there?***

Ron estimated that the Nookachamps Storage would be 8 square miles in size. **Larry Kunzler** pointed out that this was not a natural storage area. **Ron** replied that the area was a great storage but it took water off of the river at the wrong time. Currently, the area fills as the water level rises and not when the flood is at its highest point. The area fills in when the water level reaches 100,000 c.f.s., which creates a pinch point. **Leonard Halverson** noted that there are two pinch points in the river: Strawberry Bar and the Burlington Northern railroad. He also agreed with Ron that Nookachamps area is filled before flood stage is even reached in Mount Vernon.

**Sky Miller** explained that for the Nookachamps to be an effective storage area it will need to take water when Mount Vernon reaches flood stage. If a dike is constructed at Nookachamps, then the area would fill up only when water is needed to be taken off of the river. Sky illustrated on the flip charts how the Nookachamps storage would take water only when it is needed (Graph 1). Sky noted that the County recognizes they are talking about people's property for the storage area. **Ron** also explained that previously this alternative had not been simulated in a hydraulic model. It was only examined briefly in 1993 or 1994.

**Ron Malmgren** described the two types of models that the Corps runs for the Skagit River. One type is a simple model that takes 30 seconds to model from Concrete to the mouth. The floodplain model is much more complex. This model is actually broken into three units: the right bank, Mount Vernon and Fir Island. The right bank model can take up to four days to run, while the other two take only a few hours. The floodplain model is broken into numerous 400 ft x 400 ft elements. This model includes a lot of detail for each element, such as the number of buildings, elevation of roads and elevation of houses. The final water depth, maximum velocity, velocity direction and time sequence is modeled for each element. This model is then fed into the economic model to determine the total cost of damages. **Will** asked if the group could get copies of the model. **Ron** explained that a small model's output or input could be placed on a disk. He also explained that the Corps could run models on specific alternatives in which the group is interested.

**Bob Boudinot** asked how long it would take the Corps to run models on the various proposed alternatives. **Ron** explained that it would depend on the type of alternative that needed to be modeled; some scenarios are easier than others. He estimated that it would probably take a couple of months.

***Question 3:***

***(A) How do levee setbacks affect the flooding between Mount Vernon and Burlington?***

***(B) How far would the levees need to be setback in order to accommodate a 100-yr event?***

***(C) Give us some examples of various scenarios and how much water could be accommodated by them. Including lengthening the railroad bridge.***

**Ron Malmgren** stated that the entire river system does not have to be set back and that some areas should be setback farther than others to reduce flood risk. **Jackie Vander Veen** stated that the final plan could include a variety of alternatives. **Ron** noted that the mixing of alternatives was a good idea. The group could easily come up with 2 to 300 plans by mixing and matching alternatives. Ron further explained that even the types of setbacks can vary, such as setbacks with or without excavating the riverbank. If a riverbank is excavated then the levee does not have to be moved as far back in order to hold the same amount of water. **Will Roozen** asked about the possibility of leaving the inside levee standing to create a type of storage. **Sky Miller** suggested that Will's idea could work for overtopping levees. **Ron** pointed out that the districts would have twice the operation and maintenance costs for the two levees. Sky Miller explained that in a 50 – 100 year flood, there would be ~25,000 – 30,000 c.f.s. moving through a failure. This amount of water would fill the space between the two dikes very quickly. If the water continued to move, there might be some benefit but it could possibly be stagnant. There would be no net benefit. **Larry Kunzler** informed the group that the Corps examined this alternative in 1917 but considered it too costly.

**Ron Malmgren** further informed the group that in addition to the levee setback they would also need to widen the 3 bridge corridors, although they potentially may not have to widen I-5.

**Bob Boudinot** asked what distance the levees would have to be setback to accommodate flooding. **Ron** answered that they would have to be moved 500 to 1,000 feet depending on the capacity. The Burlington Northern railroad is the biggest constriction of the river. **Bob** noted that it was the shore side spans of the railroad bridge that caused the constrictions and not the piers. Therefore, they should only have to add short spans between the piers close to the shore.

***Question 4: What happens if you eliminated all of the dikes on the river and bays? Can you show the group?***

**Ron Malmgren** stated that everything would be under water and there would be frequent flooding of the valley.

***Question 5: Table 4 on page 34 of the Skagit River reconnaissance report shows that the flow for the 100-yr flood at Mount Vernon is 180,000 c.f.s. Please explain why we are considering for 235,000 c.f.s. for the 100-yr event here.***

Ron explained that it is 235,000 c.f.s. at Sedro Woolley by the Hwy 9 bridge but the maximum amount of water that should actually reach Mount Vernon is only 180,000 c.f.s. depending on levee and dike failures. The amount of water actually going in the

direction of the bridge corridor would be 180,000 c.f.s max. The rest of the water will go somewhere else, i.e., overbank.

**Chuck Bennett** asked what amount of water would fit through the bridge corridor without a break. **Ron** replied that it would be 145,000 to 150,000 c.f.s. **Sky Miller** stated that the Working Group must plan for 235,000 c.f.s.

**Larry Kunzler** informed the group that in 1990 the river reached 152,000 c.f.s. **Ron Malmgren** replied that the amount also included a levee break but **Larry** disagreed with that. Larry wanted to know why the water continued to rise in the Sedro Woolley area once there was a levee break. **Ron** explained that the flood had not yet peaked when the levee broke. As the levee broke, there was a sudden change in the slope of the river water surface that allowed more water to flow. Because of the volume of water upstream of Sedro Woolley, the water level continued to rise in that area.

There was a brief debate over the flow of the river during the 1995 flood. There was also a discussion regarding the accuracy of the river volume measurements at different points along the Skagit. In response to **Bob Boudinot's** question regarding the accuracy of the measurements, **Sky Miller** estimated that the flood measurements have an error of approximately 10 percent. He stated that a well-calibrated model shows more information. **Ron Malmgren** added that the best information was coming from Concrete because of its confined channel. **Ed Capasso** asked about the use of Doppler for measuring floods. **Chuck Bennett** noted that the use of Doppler was still being refined. **Sky Miller** added that the Doppler helps to increase the accuracy in the flow estimates.

**The facilitator** inserted that the group is going to have to be thinking in a variety of different ways. This is a 4-D problem. She stressed that the group needs to build a common base of knowledge. To do that they have to have a common understanding of the flood and modeling terminology. She suggested the creation of a glossary for the group and then asked for a morning break.

**◆◆ 15-Minute Break ◆◆**

During the break **Pat Massey** handed out a sheet that listed the FEMA expenditures in 1990. This did not include federal or local money, only FEMA funding.

> ***Question 6 requested an examination of how channeling water off of the river at various locations would affect the overall flood scenario.***

**Ron Malmgren** clarified that overtopping at various sites might be different. Ron explained that for the reconnaissance study they made the depth of water the same for all areas in the flood plain. It was a quick and dirty approach to the modeling. Therefore, they are not accurate. He explained that overtopping levees does not prevent flooding in the floodplain, instead it induces flooding. Therefore, the wrong location could be problematic. **Stephen Pierce** asked what the benefits of overtopping are. **Ron** responded that the rural areas get wet and not the urban areas.

**Chuck Bennett** asked if they could develop a plan in which the set backs hold 190,000 to 200,000 c.f.s. and overtopping areas take the rest of the floodwaters. He noted that the set backs are more of a controlled system as opposed to the overtopping. **Ron Malmgren** informed him that it was possible.

**Will Roozen** asked if they could still have massive failure of the dikes and levees even with overtopping. **Ron** replied that overtopping helps to release pressure. He also pointed out that, no matter what they do, dike and levee failure is always a possibility.

> ***Question 7: If Gages Slough were to be reconnected and used to conduct water through the city, what volume could it handle and not cause too much damage?***

**Ron Malmgren** explained that they need to get over 50,000 c.f.s. through the city area. Gages Slough cannot come close to handling that amount of water. **Chuck Bennett** estimated that, at the most, Gages Slough could handle 10,000 c.f.s. He also noted that in the past once water has entered the Slough it had to be pumped out. **Jackie Vander Veen** added that Gages Slough could take 20,000 c.f.s. safely. **Chuck Bennett** replied that 20,000 c.f.s. would cause damages to the structures of the area. **Larry Kunzler** added that it all depends on what you perceive Gages Slough to be. When Larry thinks of Gages Slough, it's the area that is covered with churches and buildings.

**Ron Malmgren** stated that they could do a lot with the various alternatives. However, he is focusing on a big flood and having to get water around Burlington. **Chuck Bennett** noted that there are houses located on Fairhaven and that people are living along the Slough. These houses would need to be removed if they were to flood Gages Slough.

> ***Question 8: Dredging the mouth of the river is a very popular belief. Can you simulate the effects of dredging there to demonstrate whether or not it will help? Is there a project there that would help move sediment farther out into the bay?***

Ron Malmgren noted that with dredging there would be operation and maintenance costs and limited benefits. He clarified that dredging on the south fork of the river has no benefits and dredging on the north fork has only limited benefits. The problem is the upper corridor above Fir Island, which acts as the bottleneck. There was a discussion about how the river forks have changed over time due to filling and erosion.

> ***Question 9 focused on the impact of the rock jetty that partitions Swinomish Channel from the North Fork of the Skagit. There has been some concern that the jetty is compounding the flooding problem.***

Ron does not believe that the jetty causes sedimentation to occur. He explained that the river is well confined and has a high velocity. When the velocity drops so does the sediment. Ron said that they could study the jetty more. **Chuck Bennett** noted that the jetty should be removed because a boat cannot fit through that area. **Ron** replied that

while a boat cannot get through water can. There was a discussion regarding the composition of the jetty and its impacts to flooding. Ron noted that in a large flood the jetty does not have much of an effect. Dredging the jetty will not help the flood fighting efforts in Burlington. At most it will affect no more than two miles up river.

**Will Roozen** asked about the bridge over the north fork. **Ron Malmgren** responded that the bridge is not the bottleneck.

**Chuck Bennett** asked if the jetty was more like a cork with a hole for the flood. **Ron** clarified that the jetty was not even affecting the river level at the top of Fir Island. He did not think that much money should be spent on studying the jetty as it will not help anything above the north fork. **Chuck** asked if it there was a cumulative effect up to Burlington. **Ron** was doubtful of this but said that it could be studied more later. He also mentioned that the jetty is actually helping to keep the Swinomish Slough open and if it is removed it might close up the slough. There was a brief discussion regarding the construction of the jetty during the log and pulp boom.

***Question 10 asked for design concepts for sea dikes.***

**Ron Malmgren** began a group discussion concerning the sea dikes in the bay. Ron asked which alternative the group wanted to explore. If the flood cannot be contained then there will be overflow. An outlet from the dikes has to exist to see an impact on the flood. Either the sea dikes have to be dynamited again or an engineered control structure has to be built. The group discussed the impacts of salt intrusion on the land behind the dikes. The economics of the two solutions were also discussed. Ron mentioned that they have to compare the operation and maintenance costs of raising and lowering an engineered sea dike versus blowing up a dike and then constructing a new one.

Ron asked the group what they wanted to see at the mouth. **Stephen Pierce** described an outlet structure that was constructed on the Lummi Indian Reservation that is comprised of 5 culverts, each with a 6-foot flap gate. The gates open by pressure from the landward side (i.e., water). This structure is as big as a semi with 5 parallel drains. It only drains 1,000 acres.

**Ron Malmgren** stated that he would like to add an additional alternative to those being examined, which is a bypass. Ron suggested a route north of Bay View Ridge as a possible bypass. It would have to be about a half mile wide and could be farmed. The bypass would also pick up the Samish River. A channel through Burlington would require large structures. It would also require levee maintenance and is the most costly alternative. Another alternative would be to ring-dike the cities and forget about everything else. **Dave Hedlin and Will Roozen** objected to the ring-diking of the cities.

**The facilitator** recognized the hard work that the group had done that morning and suggested that they break for lunch.

**◆◆ Lunch ◆◆**

## C. Rich Johnson and Jeff McGowan Presentation

**Jackie Vander Veen** reconvened the group and introduced Rich Johnson of Washington Fish and Wildlife and Jeff McGowan from Skagit County Public Works Department who were the next presenters. Jeff and Rich's presentation followed a handout that depicted the impacts of the various flood management alternatives to fish, focusing on endangered salmonides.

### Dredging and Channelization

**Jeff McGowan** informed the group that disturbs the riverbed, reduces water quality, undermines adjacent banks, removes large woody debris and destroys the food source. He cited evidence from Canada that showed dredging affected fish because fish that spawned in the rivers disappeared after dredging. After dredging, a river bottom is homogeneous. **Lou Ellyn Jones** added that the destabilization of sediment that occurs with dredging is not confined to the area of dredging. The destabilized material moves downstream creating a larger impact.

### Bypass and Overtopping Dikes

**Jeff McGowan** explained that the positive aspect of bypass and overtopping alternatives would decrease channel scour and create a large movement of sediment along the riverbank. The negative aspect of overtopping is it would divert fish out to the flood plain and prevent them from returning to the river. The fish could go down the Samish as a result of the bypass and not be able to find their way back, thus becoming stranded. Additionally, sediment and chemicals from the farmlands would enter the river. **Lou Ellyn Jones** noted that the bypass to Padilla Bay could have major impacts to the eelgrass beds that serve as a nursery for crabs and salmon. As for overtopping the levees, she stated that it would be hard to model the number of fish that would be stranded. She emphasized the need to make conservative estimates when determining the number of fish that would be stranded from overtopping.

**Chuck Bennett** asked which species of fish run in November. **Jeff McGowan** replied that November is the primary migration period for steelhead salmon. Rich Johnson added that salmon, steelhead, and trout are coming up the river from October through November. Out-migration occurs in the April/May time frame.

**Ed Capasso** asked Sky if fish were considered in the development of Snohomish's flood plan. **Sky Miller** replied that they worried about stranding fish from overtopping, but they were more concerned with having dike breaks that would spray fish onto fields.

**Rich Johnson** asked for clarification of the types of dikes that they were discussing. **Sky Miller** stated that there were two types of dikes used for overtopping: long stretches that overtop with a shallow flow and can withstand the pressure, and notched dikes that

concentrate the flow. **Rich** pointed out that when there are notched dikes, the fish go over the dike with the water. The fish will try to follow the receding water back to the river but will have a dike in their way and will not be able to return to the stream. **Sky** replied that Snohomish had several hundred acres of broken dikes that recreated a tidally influenced habitat. He agreed that with overtopping fish would be stranded.

**Larry Kunzler** asked if the fish were normally at the bottom of the river. **Lou Ellyn Jones** answered that juveniles stay around the edges of the river and not in the middle. The fish do not have much to hide behind in a flood and so they are flushed down the river. **Larry** again asked if the fish would be at the bottom of the river under the current. **Rich Johnson** stated that there is a high velocity near the bottom of the river. The fish will move to seek the lower velocity.

**Jeff McGowan** noted that a log in the channel could create a safe area for the salmon. **Larry Kunzler** suggested that they build logs into the dikes and then the fish will remain there and are less likely to be swept over the top of dikes.

The presenters stressed that the important thing to keep in mind is that it is not known how many fish will be stranded as a result of overtopping**. Mike Scuderi** stated that they must assume a 100% mortality rate for the fish that are displaced. They explained that when overtopping occurs, the water might not go back to the river directly; it may go to a slough. As a result, one cannot assume that the fish are able to return to the river naturally.

### Dike Setbacks with a Riparian Buffer

**Jeff McGowan** noted that a setback with a riparian buffer could have many positives. He explained qualities required for such an alternative. He said that the dike must be far enough from the bank to allow the river to meander. Floodgates are needed to let the fish go into side streams.

### Sea Dike Removal or Modification

**Jeff McGowan** mentioned that with the removal of sea dikes there is inundation of salt water resulting in an estuarine environment. Estuarine habitats are good places for salmon rearing. The self-regulating tide gates allow more fish passage than the older methods. **Chuck Bennett** noted that the removal of the sea dikes would result in flooded farmlands. **Jeff** replied that he was only analyzing the alternatives from the standpoint of the salmon impacts and benefits. **Sky Miller** added that dikes did not have to be removed, but only modified, to allow water out to sea. The dikes can be designed to let the tides in and out of the channels but not into the fields. **Chuck** noted that salt seeps into the fields from the sides of ditches, which hurts farming. He gave Padilla Bay as an example where the tide gate either failed or leaked. Some fields had crystal salt on the ground and crops would not grow on these fields.

**Levees – general with little or no buffer**

**Jeff McGowan** moved the discussion to levees. He explained that some participants maintained that they grew mature riparian areas behind their levees, but he is not convinced that will work for salmon habitat.

**Lou Ellyn Jones** noted that by preventing water from spreading laterally, ground water recharge is lost. Additionally, erosion leap-frogs down the river. If one individual builds a hard area, it causes another, softer area further downstream to erode.

**River Bank Armoring – Riprap Bank Protection**

**Leonard Havlerson** asked if there was a difference between dikes that had riprap and those that did not. He noted that vegetation grows in the riprap areas around his property. **Rich Johnson** replied that riprap is usually added to prevent erosion. Bank vegetation could be used to perform the same task as the riprap. Rich cautioned the group that the list that Jeff and he had put together simply listed some of the pros and cons for the various alternatives, but should not be considered to be an encyclopedia of information. They have not covered all of the alternatives, only some of the more prominent ones. Rich passed around a chart of the various life history stages of the salmon and asked if anyone had any questions.

**Lou Ellyn Jones** added in response to Rich's answer regarding trees in riprap that fish prefer older rock areas that have a lot of vegetation. She also informed the group that the Skagit River has been the largest producer of Chinook salmon and has the largest population of bull trout in the Puget Sound region. **Chuck Bennett** noted that he had not seen any bull trout in the area. **Rich Johnson** responded that bull trout are there and that the entire Puget Sound area is currently listed for bull trout. He also explained that the Skagit River is part of the Puget Sound region because under the Endangered Species Act the fish in Puget Sound and the Skagit River are considered to be genetically one population. However, there has been some talk of separating out the two.

## IV. Skagit Flood Risk Video

**Jackie Vander Veen** introduced the Skagit Flood Risk Video. She explained that the video was still in its draft form. The County wanted input from the group before they finalized the video. The purpose of the video is to increase flood risk awareness in the valley. **Sky Miller** also noted that the video will be used to show what the Working Group is doing and how the County is managing flood risk. He stated that the public involvement is a three-step approach. This video is step one, education. In step two the County will explain the options that the Working Group considered. In step three the County will explain what the action plan is and why this plan was chosen.

**Reactions to the Video**

**Larry Kunzler** noted that because the three county commissioners are displayed in the video, it could be interpreted that the commissioners had already made up their minds and that the Working Group and the video were just for show. **Ed Capasso** interjected that he did not think that because they were commissioners they gave up their rights as landowners to be involved and concerned.

**Stephen Pierce** requested that the video include the fact that the County and the Corps had gone through a study in 1993 that preceded the feasibility study.

**Corey Schmidt** asked for clarification from Larry Kunzler regarding his earlier comment about the appearance of fairness. **Larry Kunzler** responded that in the past the mayor had gotten in trouble regarding the mall. The issue had been raised that the mayor had already made up his mind about the mall before it was approved or investigated. **Mike Scuderi** suggested that more private citizens be displayed in the video instead of County Commissioners. He noted that it should be someone who is at risk and not an elected official.

**Rich Johnson** brought up the fact that there is another side of flooding that supports a natural productive environment. In a natural world flooding is not a bad thing. Flooding is natural; the "catastrophic" event occurs because we developed in the flood plain.

**The facilitator** noted that there appeared to be the possibility of crafting a plan that is win-win for salmon and flood protection. She informed the group that when the video was shown to the Flood Control Committee (FCC), the FCC wanted to see more doom and gloom in the video. It is delicate balance between educating the audience and scaring them.

**Chuck Bennett** added that the video should give people a realistic view of the costs and damages that are caused by flooding. He mentioned providing a history of damages and impacts from floods. **Larry Kunzler** suggested displaying FEMA figures. **Chuck** also noted that the damages should include those from up river in Hamilton.

There appeared to be consensus among those in the Working Group that the video was a proper length. The discussion moved to whether or not the viewers understood flood risk. **Mike Scuderi** suggested having red lines on a building to display the height of the floodwaters during previous flood events. He even suggested putting up signs around the county that displayed the height of floodwaters. **Larry Kunzler** stated that Dave Brookings was going to put up signs like that, but the County lawyer was opposed to the idea. The establishment of sign markers has been done in Kitsap and Lewis County. It cost them about $50,000 per sign.

**◆◆ 5-Minute Break ◆◆**

## V. Brainstorming Session

**Jackie Vander Veen** gave a brief presentation on the flood management plan that was developed for the Napa Valley. The Napa Valley plan recreated a living river. The plan also included a direct path for the water flow across an oxbow, which might work for the Skagit River.

In the late afternoon the Working Group had a brainstorming session regarding the potential flood control alternatives that the Working Group would like to explore further. **Sky Miller** explained that this was the first brainstorming session and other alternatives can still be investigated as the process unfolds. Moreover, the purpose of this effort was to be over-inclusive rather than under-inclusive. The participants were informed that the Corps would be able to model those alternatives that the group would like to explore further. Below are the various alternatives that the Working Group participants discussed during the Brainstorming Session. **Sky Miller** began the session by telling the Working Group that an effective flood plan must manage the additional 100,000 c.f.s. of water associated with a 100-year flood event as compared to the flood events recently experienced in the 1990's. The total flow associated with a 100-year flood event is assumed to be about 230,000 c.f.s. (i.e. about 100,000 c.f.s. more than the 1990's floods).

### A. Nookachamps Storage

**Sky Miller** suggested one idea was to have the Nookachamps take 5,000 c.f.s by constructing a set of dikes to act as storage for the water. This was done for Snohomish County using the French Slough and gave the county an additional 20 hours before the flood hit. Sky projected that this type of storage would give the downstream residents an additional 6 hours to prepare for flood waters.

**Jackie Vander Veen** added that this storage area would also give the Nookachamps flood protection during smaller flood events.

**Larry Kunzler** noted that while in smaller events the Nookachamps area may not get flooded if storage was created, they would still get as wet as they do now in the larger flooding events.

**Sky Miller** noted that the difficult part for storage is they need to remove the water from that area without being too expensive.

It was discussed and noted that a storage area would not interfere with emergency vehicles on the South Skagit Highway.

The possibility of storage or storage and overtopping should be explored further by the Corps.

### B. Strawberry Bar & Burlington Northern Railroad

**Leonard Halverson and Larry Kunzler** mentioned Strawberry Bar and the Burlington railroad bridge as two major pinch points for the floodwaters. At the Strawberry Bar the river loses its velocity and drops sediment.

**Sky Miller** noted that if flow is taken from the river upstream of the bridge then the flow does not have to "squeeze" through the Burlington Northern railroad bridge. If the Working Group is able to divert 100,000 c.f.s. from the river upstream, then a flood plan will not have to accommodate the 100,000 c.f.s. downstream. He suggested that the water taken off of the river early could be metered out to the bay.

**Leonard Halverson** upon further thought suggested that the Corps not spend the time analyzing the removal of Strawberry Bar.

### C. Samish Bypass

The possibility of sending water to the Samish was briefly discussed. The group decided that the idea would never be approved.

### D. Levees

**Larry Kunzler** suggested the group discuss the possibility of a levee to push the water through faster. **Bob Boudinot** noted that many people would be opposed to a levee, but **Leonard Halverson** did not think that levees would receive opposition from the Nookachamps area because it protects against small floods. **Bob** noted, however, that for the farms of the area it is new water. **Dave Hedlin** noted that in general anywhere water is placed there would be political and economic considerations.

### E. Gage's Slough

**Sky Miller** noted that floodwaters have a tendency to push toward Gages Slough. As a result he suggested that an alternative worthy of further analysis might be to direct water to Gages Slough.

### F. Dikes and Dike Setback

**Chuck Bennett** noted that his dike district is currently looking to acquire land for dike setback along the bend in the river. He is hoping to set the dikes back 500 ft. **Sky Miller** noted that with this setback 150,000 c.f.s. could safely move through northern Mount Vernon.

**Bob** asked that the scenario of diking along the bend be modeled. He thought that the diking will make the situation more "unfriendly." Bob suggested removing the revetment

in Mount Vernon and converting the lower area, which would be flooded, into a park. He also suggested moving the dike to Main Street or increasing the capacity of the river in that area.

**Sky Miller** noted that downstream of Mount Vernon the tide influences the flood. In this area increased river width and more setbacks are needed because the water is not moving as fast. The water gets stored in the channel when it needs to move out to reduce flood risk. Sky suggested dike overtopping or setbacks to Britt Slough. However, he also noted that once the water has left the river channel it eventually needs to return.

A smaller group began a discussion regarding Dike District #12's current activities to buy property for dike setbacks. **Chuck** informed the smaller group that he expected to purchase all of the required land in the next two to three years. He stated that a large portion of the landowners were happy to sell their property. **Lou Ellyn** noted that the creation of setbacks was great for fish.

### G. Bypass

**Sky Miller** noted that the dikes after the bend are likely to break and the area will fill up like a bathtub. Therefore, another alternative that could be analyzed is a bypass. Sky explained that the bypass would consist of a series of dikes out to the bay to allow water to flow there.

The group discussed the various constraints and benefits of a bypass. **Larry Kunzler** thought that many farmers would be opposed to a bypass through their property. **Bob Boudinot** thought that the feasibility of a bypass mainly hinged on planning issues and money. **Sky** noted that with the setback of dikes that are used to create a bypass, fish could win from an increase in habitat. **Will** stated that he did not like diverting any floodwater near West Mount Vernon. **Stephen** asked if the water in a bypass would be contained. **Sky** said that the group had a range of options including diking a canal or letting the water dissipate or a combination of both.

**Will** asked how much water could squeeze through Burlington and Mount Vernon. **Sky** replied that it could hold 153,000 c.f.s. without overtopping the dikes. It was noted that a bypass could be built to take up to 250,000 c.f.s., which would manage a 200-year flood event. **Will** thought that they would be able to meter the water out to the bay to maintain a channel that would support fish. He also stated that if the water was slow moving, siltation would not occur in the Padilla Bay.

The group discussed the need to alter Hwy 20. A bypass would go through an area of Hwy 20; therefore, the road would have to be rerouted or a bridge would have to be built over a bypass. They also discussed the need to either lease or buy property from farmers for a bypass. **Dave** stated that if the land is to be used for habitat it could not be leased for farming activities.

**Chuck** mentioned that a bypass would cut Dike District #12 in half. He also stated that as a result he would prefer to have set backs instead of a bypass. The group discussed the different flood fighting possibilities for Dike District #12 if a bypass were constructed. Identifying the entity that would be responsible for the operations and maintenance of the bypass dikes was also discussed. Included in the alternatives discussed were reformation of Dike District #12 and the use of bridges to allow effective transportation for flood fighting efforts. In addition, there was also a brief discussion of the impacts to utilities in the area if a bypass were created.

**Bob Boudinot** mentioned that if not all parts of the county are taking some of the water from a large flood event, then the bypass is less likely to be supported by the people who own the land in the bypass area.

### H. Ring Dikes

The group briefly discussed construction of a ring dike around West Mount Vernon. Several individuals wanted to know how the ring dike would alter the area's designation as a flood plain. Specifically, they were concerned that the dike might promote urban growth in that area.

### I. Sea Dikes

**Curt Wylie** told the group that in 1990 they breached a dike on Fir Island. As a result, the North Fork of the Skagit went up and down with the tides, but the South Fork did not. **Larry Kunzler** inquired as to why there was even a dike on South Fork if that was the case. **Rich Johnson** noted that the Corps was of the opinion that removing the sea dikes would not help manage floodwaters. He and Lou Ellyn also mentioned that the area is being used as game habitat for duck hunters.

### J. Additional Comments

**Rich Johnson** noted that the Corps needs to look at three options: diverting water through Gages Slough, levee set backs and the bypass.

**Corey Schmidt** revisited Jackie's point that the final plan could be a combination of various elements with the end result being the reduction of the amount of water that reaches the lower end of the river.

**The facilitator** brought the group back to discuss how they wanted to analyze the various alternatives mapped out during the brainstorming session. She suggested that the Corps collect information on all of the alternatives laid out unless anyone had a strong objection to one of the alternatives. No one had an objection to any of the alternatives being modeled further. **Dave Burdick** noted that each alternative could have different designs, such as the bypass could be structured to contain a wide range of water volumes or the dike could be overtopped with various amount of water. **Sky** suggested that the Corps

generate a matrix that contains information, such as amount of flow accommodated, the land required, cost and what segment of the population are involved or affected.

It was decided that before the November meeting the Corps would begin to analyze some of the alternatives generated during the brainstorming session. The Corps would send the modeling results along with copies of maps to the participants for their review. It was also suggested that the group reconvene in October for a brief meeting that would clarify the alternatives that the Corps would model. However, this meeting was not finalized.