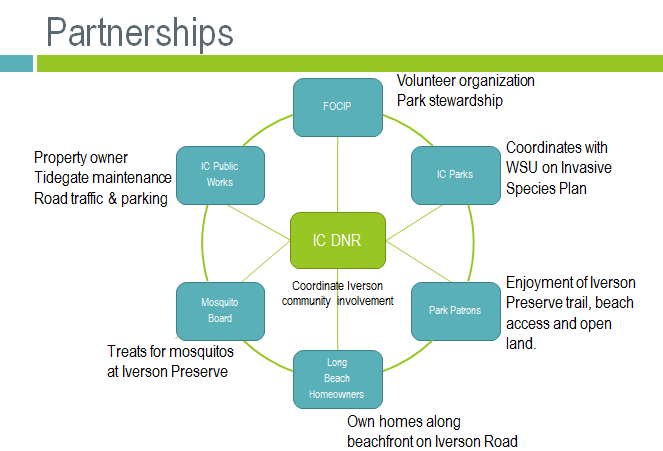
Iverson Task Force Recommendations

## Background

The main goal for the Iverson Project was to evaluate the possibilities of a balanced approach to scoping a multi-benefit project that balances the needs of community members with a habitat gain for listed species. The stakeholder integration phase of the project was intended to define the most successful alternative of conceptual design for consideration in improvement plans for this site. Concurrently with the Iverson Task Force meetings, a consultant gathered data, created models and characterized patterns of the sediment and groundwater at Iverson to assess the effects on current drainage issues to determine acceptable alternatives for restoration at this site.

Island County Public Works will make the final decision on any upcoming drainage improvements at Iverson Marsh. The community-led conversation revealed what would be/would not be supported if and when Island County decides work will need to be completed on the aging infrastructure (tidegate and berm) at Iverson Marsh.

The Iverson Task Force is a self-selected group of 27 members comprised of park patrons, Long Beach residents, Island County Public Works/Parks Department, Audubon/birding interest, Friends of Camano Island Parks, Island County Public Works and the Mosquito Board. The group was formed to assess community values, vet concerns, and discuss creative potential multi-benefit solutions that could be possible at Iverson Preserve. The group came together for 12 meetings to gather relevant information for discussions on potential solutions for drainage/habitat improvements. The recommendations from this process are laid out in this report.



The dike at Iverson Marsh was built in the 1940’s to improve farming conditions. The land behind the dike is owned and managed by Island County Public Works, Parks Department, and held as open field space and freshwater wetlands. The land form that is now Iverson Preserve and the Long Beach Community is the result of both a natural buildup of a spit as well as the accumulation of silt from Livingston Bay and erosion of the island itself. An early sketch of the area shows inlets and channels consistent with a salt marsh habitat. In the 1940’s dikes were installed and drainage channels were dredged to make the area behind the spit suitable for farming. More drainage work was done in the 80’s with tiles and the resulting land became a mix of farmland, and brackish wetlands. Island County purchased about 300 acres for purposes of habitat conservation in 1999. Studies were commissioned in 2001 to determine the potential to recover marine saltmarsh habitat while preserving flood protection for Long Beach homeowners. Island County is interested in balancing the community’s concerns and maintaining the area for the enjoyment of park patrons with improving habitat for listed species and water quality.

## Iverson Task Force Meetings’ Summaries (Jan-July 2017)

### Sedimentation - Eric Grossman, PhD, USGS

Studies in the Skagit and Stillaguamish Rivers show there is more sediment being moved out from the upper watersheds. This is likely due to changes in rain/snow patterns and lack of glaciers (more surface area for rain water to be collected from, which means more volume of water in a shorter amount of time). The deltas of both rivers are growing and more sediment is moving in to the bays, including Port Susan. Oso did have an impact on the amount of sediment coming out of the Stilly, but it is likely smaller than we thought it might be.

### Ground Water Dynamics – Doug Kelly, IC Public Health

The group learned that water wells near Iverson tend to be 6-7 ft above Mean Sea Level (MSL) and the top driver of salt water intrusion is the level of water in the aquifer. When water level is high, salt water is pushed out. The numbers are low enough in this area (ft MSL) that the area is at risk for salt water intrusion. MSL below 4ft is the level where salt water intrusion becomes a concern. The preserve area is considered a groundwater discharge area. When the tide goes in and out the water type changes (shifts) with the flux (saltwater influx). Precipitation recharge also affects the low lying areas. Water level distribution is governed by how much flow is in the aquifer, how easily water flows through, and the elevation of the boundary condition. Sea level rise will change the boundary (aquifer system shifts upward). This will not result in a collapse in the system, the aquifer will respond with a shift.

### On-site Septic Systems Discussion – Kathleen Parvin & Heather Kortuem, IC Public Health

The Task Force heard about on-site septic sand filters and additional secondary treatment structures. Drain fields are compromised if/when the groundwater level rises and reduces the depth of filtration from drain fields. It was discussed that the 30 ft between drain fields and the ditch at Iverson provides enough distance that it isn’t a concern. The road bed is quite solid for a significant depth and likely acts as a barrier to horizontal water movement from drain fields to the ditch.

Jefferson County has a group system which is an example of a successful project where a community worked together to solve individual on-site septic issues with an off-site group treatment system. Juniper Beach (on Camano Island) investigated off-site group treatment options. It never was implemented. Initial engineering was completed. Some communities are using common drain fields. Each house has their own collection tank/sand filter system that is connected to a common distribution system that pumps to an off-site common drain field. Any solutions that involve a community partnership will take time and may need the help of outside facilitation and design. It is better to start discussions prior to an emergency due to the complexity of the discussions

### Sea Level Rise and Coastal Flood Risk Assessment – Ian Miller, PhD, UW Sea Grant

Probability models for sea level rise and storm surge were created to assess potential restoration/ecosystem recovery projects. The Sea Level Rise maps created for Island County are elevation based –and mapped both changes to average sea level and annual extreme water level. Modifications, not reflected by LIDAR data, are not included (engineering solutions for flood control like tide gates or drainage channels may not be included). These maps should be approximate to the FEMA flood maps but exclude the effects of waves on coastal flooding. Looking at patterns of how things react over time. Extreme events, coastal flooding, high tides, and storm surge are variables which are not incorporated into to the maps. Waves, erosion, groundwater (salt water intrusion), bluff erosion, critical habitat are not factored into these maps. The March 10th event was partially a wave-driven event. Waves were not included on these maps.

Homeowners can look at this issue as a community; 15 parcels on the Dungeness River Delta did a collective project to evaluate options as a community. Ian shared that in Connecticut, residents are lifting their homes to be able stay longer in their homes on the shoreline. Special purpose districts can be created to raise money to do projects for the people who are affected. There are RCWs to explain how citizens form this.

### Marsh Habitat & Functions Management Considerations – C.K. Eidem, Ducks Unlimited

Ducks Unlimited (DU) balances restoration potential with wetland aging (succession) and subsidence (sinking freshwater marsh) to provide bird habitat. At some point it becomes unfeasible to farm these areas due to subsidence. Iverson Task Force discussed that Iverson Marsh is fighting nature on several fronts and would ideally like to figure out a management plan for this site that takes into consideration all these barriers (increased water from rain, sedimentation, sea level rise, subsidence). Sedimentation models can be used to help predict what kind of battles we need to fight so that we can create some strategies about what can be done to manage this area into the future; use nature to do the work for you.

Crop and Agriculture land is important to migratory birds because of the feed it provides them. Estuaries are also important because they provide different type of food sources and alternate timing to crops. Over 120 species of birds have been seen at Iverson: including Shorebirds, mallards, gadwall, widgeon, herons, geese, eagles, harriers, swans (in NW corner of field and natural emergent marsh).

The expense to dredge the old ditches may be cost prohibitive. And if the perimeter ditch drains, the field may stay drier. Ducks Unlimited (DU) management of wetlands/croplands in other areas include controlling when the field floods to target migration (will flood with standing water to help a certain species when they are expected to be flying through), and farm/grow crops the rest of the year.

Moist Soil Management and grow native vegetation using farming techniques. Plow and leave bare, then add water at right time and get native plants growing through natural recruitment and seed bank in soil. Keep land wet and growing natural veg for 3 years then grow a crop every 4th year. This helps build the soil and marsh level over time. Naturally, these systems get succession reset through disturbance (e.g. storm flooding in areas near water, fire in eastern forests). Now these disturbances have to be manmade/created since we don’t allow natural processes to happen uncontrolled. Very general succession of wetlands – wetland to bog to field to disturbance, back to wetland.

When the marsh was diked off, it prevented the mechanism that enables the natural maintenance of marsh land processes. No salt water flooding to kill of vegetation and dropping sediment and maintaining native vegetation species. Results in subsidence. (e.g. 41” at Leque, 12’ in central basin in California near Bay area).

The group discussed a beneficial crop that can be grown at Iverson that would be good for birds and did not have known allergy issues. The crop would have to be profitable for company to grow. Corn/Swiss chard has been grown in the past. Duck clubs do grow crops on wetlands and then harvest part for profit and leave some standing for ducks.

DU uses gravity to maintain drainage whenever possible and often lets these sites go back to saltwater (cheaper to maintain, easier to permit, better for birds). They try not to use pumps due to expense. Island County tried one and it couldn’t keep up to amount of water because there is so much that comes off Camano and into the recharge area/field.

Saltwater marshes can only be placed next to salt water. Freshwater sites more flexible where they are sited and can be located farther inland; easier to replicate than social saltwater. Saltwater marshes harder to replace. Lots of small ponds make for better nesting sites. Freshwater to salt water will increase the number of birds; more but different species.

Projects like Leque are done by partnerships with agencies and groups that look at cumulative impacts, regional resources and diversity and funding and long term maintenance. Determine what kind of species you want to see and build the habitat for that. Beaver deceivers manage the water level around dams to trick beavers into not building dams higher. This is inexpensive, but would still need the flow out of the wetland to work. Reed Canary has to be shaded out (with trees) or flooded out (beavers and willow)

### Fisher Slough and Fir Island - Restoration as a Drainage and Flood Reduction Tool

Fisher Slough, by The Nature Conservancy, created new set back dikes, inundated a previously farmed field for freshwater habitat and installed self-regulating tidegates between the wetland and the Skagit (South Fork). There were flood control measures also installed in order to direct flood waters from the stream system into the irrigation water system. The irrigation ditches (parallel to the road) are a separate system from the natural water body and are used for flood relief receiving. The neighboring farmed fields had drain tiles and wells installed to extend the growing season for those fields. The wells are used to monitor success of drainage system. If predicted water levels are exceeded (fields are wetter), there is an adaptive management plan in place.

It was noted that the field next to the dikes that had the drainage system in place was starting to grow crops, as opposed to the wet field on the other side that was not part of the overall project and still had ponds. Fir Island, by the Dept. of Fish and Wildlife, installed new setback dikes, a runoff retention pond for the neighboring field and a pump system to drain the pond into the estuary as necessary. The old dikes were breached fall 2016. This system is more similar to Iverson in its proximity to the bay and tidal water. The Task Force members were impressed by the pumps – magnitude and technology. May be too early to tell how much it costs to run the pumps but could check back again in the summer after they’ve gone through a winter of rain. After the pump was turned on, the resulting volume and velocity of water coming out was moving sediment effectively out of the channel. The scouring was doing the same job that manual dredging was doing.

### Sediment and Ground Water Studies - Preliminary Findings, Jim Johannessen , Coastal Geologic Services

CGS was analyzing sediment core dating information (from the lab in B.C.), analyses of groundwater data from Skillings Connolly, and hydrodynamic data analysis from USGS. They also gathered historic, accurate bathymetry data for Livingston Bay. The shore change and other work shows that things are changing and drainage from the large marsh and field areas are more impeded over time due to shore changes, spit progradation and sedimentation north of the spit. Historical maps (1886, 1958, 1990, 2014 and 2016) were compared to see the differences to the shoreline. Primarily, the indent a third of the way up the spit has been filled in and straightened out and the north tip of the spit has grown in length further to the north. The channel out of the field has changed direction and length as a result. The spit grew 100ft between 1958 and 2014. The channel was 1700 ft longer in 2014 than in 1958. Accretion rate tripled between 1954-2014 (16.3 ft/yr). 1886-1954 (6.3 ft/yr). Bathymetry Change along the beach and at the lower intertidal to shallow subtidal shows an elevation loss but the bay farther out has gotten shallower.

Sediment sampling was done with surface grab samples (12 along the outside of the beach, and 2 in the lagoon) and sediment cores (1 farther away towards the bay from spit, 1 at the tip of the spit, 2 by the tidegate and 1 in the field). They range between 3-6 ft deep. It was finer grained and muddier as they moved north. Big gravel is not getting to the tip and around the spit because there is not enough wave energy. Only pea gravel is found at the tip of the spit. The upper core levels were as follows: outside spit (north east) is coarser; the cores from behind the spit are similar and finer; the mid – upper core samples were the coarsest is by tide gate; and the deep core 2 sites (6’) were one just inside of tidegate and one deeper in the bay were fairly similar to each other. The radiocarbon dates – using wood and shell – will be rough estimates only.

Groundwater sampling is being done by Skillings Connolly. They found fluctuating water levels consistent throughout the field, which is as expected as water disperses. High water is shown to occur once a month. Mid -field is sandier which quickly responds to tides, gauges back against the hill top of spit are not as sandy and do not change as fast as other places. More results to come.

Hydrodynamics/Sediment Flux is being studied by USGS. They have not completed their sampling or analyses but provided some preliminary information. Sediment flux into lagoon is causing aggradation, causing reduced drainage. Calm settings like Iverson are the principal deposition centers for sediment out of nearby systems (Stilly, Oso). Elevated marine water level correlated to reduced drainage out of the field. The spit/marsh benefit from storm surge and the sediment it brings; however they also have increased vulnerability to sea level rise.

Topographic measurements west to east across lagoon and channel and spit were taken. Velocimeter in channel showed slightly higher velocities during flood stage tide. River effects can be seen at tidegate and channel. Winter storms bring lower salinity and cooler water (more river water). Approximately 3,500 tons flux into the lagoon between early Sept and mid-October (48 days), which is less than 0.14% of Stilly annual load [i.e. sounds like a lot but compared to how much is actually moving, it’s little]. Over half of this was delivered in mid-October with increased river discharge and rain events.

Suspended sediment load could be overestimate/biased because of location of meter (being in the channel) and also because of temporary influence of Oso. Total sediment flux needs to include delivery of coarser sediment (sands) that overtop spits in storms (more than 2kg of sand found on the equipment after floods in October). The drainage is likely affected by tidal flat aggradation, reduced hydraulic gradient, increased channel length

It is not yet clear if the tidegate is muting the high tide or amount of water flushing. The lengthening of spit makes it more difficult to get sediment out preventing sediment from coming out from the field and then the tidegate is restricting flow; it is likely fines are being exchanged back and forth. Without flow from the field going out, there would be less scouring of channel and it would fill in with sediment. The current trend is increased sedimentation. We don’t know if it would fill in all the way, but the marsh would grow and plants would fill in and sedimentation deposition increases. If the tidegate was closed off, you would see increased sedimentation. Conversely, if you were to move the tidegate back, you would get more flushing through the channel.

The task force shared that they have noticed changes to the spit since the Oso slide. The mud has been worse and it is more solid out farther into intertidal area but with pockets of mud. There is a new grass (reddish in color; maybe pickleweed) growing in front of the houses. A channel avulsion may affect drainage because the channel would be shortened. These systems have been known to avulse.

## Iverson Task Force Recommendations

The Task Force had two brainstorm sessions to discuss general thoughts and possible solutions for drainage and habitat improvements. A map of the Iverson Preserve was used to write down ideas and sketch out potential solutions. Jim Johannessen with Coastal Geologic Services provided feedback on some of these ideas from an engineering perspective.

* Assumptions about the drainage issues seems to be being confirmed by the preliminary CGS data.
* Tidegate through the Iverson Park to Port Susan from parking lot (West to East) may be a good drainage solution.
* Use the old tidegate (~pre 1980s) on south tip (probably hadn’t worked since 1950s) to drain out water to the south.
* Remove material from the front of the beach and put it back into the marsh.
* Channel along bluff toe to intercept water from Island/bluff and drain it out before it gets farther east
* Jay Lawrence shared droned photography of the Iverson march flooded fields and beaver dam from Friday, May 18th.
* The channel needs the flow behind to be able to flush.
* One of the ideas for getting rid of beavers was to increase the tidal influence. Dawn did some research and found that there are tidal tolerant beavers therefore increasing tidal activity will not repel them.
* The beaver dam causes more flooding in the fields causing more mosquitos. Usually, in an ecosystem you would have fish predating on mosquito larvae. The current tidegate is blocking the fish from getting in. Since within a week the larvae become adults. If you separate the ditches, and dredge it out so that it will hold more water. Engineer the area to be a more natural habitat that would take care of the mosquitos.
* ½ the road is blocked by a berm. The ditch is filled with the water from the field. Ditches need to be cleaned out.
* The area behind the dike is a fresh water catch basin which makes it more attractive for beavers.
* If you can build some ditches and re-shrub the field, you would improve the drainage and prevent invasive species from growing.
* In the NW corner there is quite a bit of ponding. We could make the pond deeper and the beavers would like this area and fish would like it. Improve habitat and help field drainage.
* The ditch at the base of the bluff should be fixed to help the drainage.

• There is potential to shoot some gradients and add functional drainage. This would allow for increase fish and improved habitat.

• The spit has extended so the outfall must travel further to drain into Port Susan. CGS has found that there is significant increase in sedimentation since 1954.

• The difference in the sand is drastic. It used to be that you didn’t sink when you walked out to the spit. Now you sink in mud very quickly.

• Instead of dredging the area in front of the tidegate, you could dredge a ditch at the park parking lot (IC property). There is so much sand and mud along the shoreline, it would clog the ditch.

• Support for maintaining flow in the marsh, and having a back-up system that flows out near the parking lot.

• Cover the “front ditch” and have drainage flow the direction of the park. You would need to educate the residents to not throw grass clippings into the ditch.

* There are mosquito control grants that could help pay for this project.
* Island County Conservation Futures Maintenance and Operations funds could be used for some of the pieces but this type of project could be $9 million. It is unlikely that Salmon money would pay for this unless the tidegate is opened to increase salmon habitat. DU would only be interested in funding this if increasing hunting capacity. NOAA has funding for community resiliency for protecting from coastal flood risk.
* The purpose of the ditch was to get the water out when flooded. Since it is no longer working, it could be filled to remove the mosquito problem.

## Conclusions (section under development)

The project team integrated community concerns of surface water drainage into recommendations for r a conceptual alternative for consideration to improve habitat, drainage and/or water quality at Iverson Preserve. Coastal Geologic Services developed an alternative analysis to evaluate drainage issues with considerations for potential habitat improvements at this site.