SKAGIT WILDLIFE AREA
FISH PASSAGE AND DIVERSION SCREENING SCOPING REPORT

HABITAT PROGRAM
TECHNICAL APPLICATONS DIVISION (TAPPS)

BY
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Washington Department of FISH and WILDLIFE

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WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
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FISH PASSAGE AND DIVERSION SCREENING SCOPING REPORT

TECHNICAL APPLICATIONS DIVISION (TAPPS)-HABITAT PROGRAM
JANUARY 2007

Introduction

This report is a review of work on the Skagit Wildlife Area (SWA) to identify and correct fish passage barriers and unscreened diversions. Correction of these barriers is part of a continuing effort to bring WDFW owned lands into compliance with RCW 77.57.030 which states that "a dam or obstruction across or in a stream shall be fitted with a durable and efficient fishway…" and RCW 77.57.010 which states that "a diversion device used for conducting water from a lake, river, or stream for any purpose shall be equipped with a fish guard…"

The inventory effort to initially locate and describe all structures on streams and channels of the SWA was completed in 2003 (Kunz et al. 2003). Barrier status for each was determined using the protocol of the Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual (WDFW 2000). All metric and location information was entered into the Fish Passage and Diversion Screening Inventory (FPDSI) database, the department managed repository for data on structures in streams statewide.

The inventory information was field reviewed for accuracy with corrections made to FPDSI as needed. Options were identified that have, can or will correct or address those with barrier status including upgrades and removals. These are discussed below.

TAPPS has been working with regional staff and the District Team to develop and review the SWA management plan, now undergoing revision, to ensure fish passage problems have or will be corrected. TAPPS has also been working with other stakeholders on several projects that will be incorporated into the management plan to restore natural estuary and riverine processes that address some fish passage issues.

Background

The SWA is not one single property but a number of separate parcels generally located around the perimeter of the greater Skagit Delta (Figure 1) and isolated from Padilla Bay and Skagit Bay by the "coastal dike". A few parcels are islands in the bays and several are located up the Skagit River. Most were agricultural lands that have continued to be either farmed or managed under a moist soil management regime for wintering waterfowl. They are generally contiguous with private lands that are commercially farmed.

The coastal dike was built in the late 1800's to eliminate tidal inflow to the delta and allow agriculture and commercial development. The dike and/or river bank armoring extend up the Skagit River on both sides to Sedro Woolley (~RM 25) to further protect the area from tidal inundation and flooding by the river. The diking effort was accompanied by grading and filling of the delta to accommodate development and construct a channel and canal network for drainage. The drainage network directed water to the bays either through tide gates or pump stations along the dike.

Generally, all of the SWA properties on the delta (most of the SWA) were once private agricultural lands that are now open for public use with crop plantings to support wildlife, especially waterfowl. When acquired, WDFW inherited the associated infrastructure that includes drainage ditches, drains, canals, tide gates and portions of the coastal dike, along with crossing structures such as bridges and culverts. Many of these crossings were agricultural field crossings that are still used and maintained to move farm equipment between fields separated by the ditches and drains. Today, with these parcels located along the coastal dike, the principal means to correct fish passage barriers is either to develop projects that improve fish passage at the tide gates and upstream in the drainage canals/ditches and/or restore the estuary through dike set-back. Where dike set back is feasible, any infrastructure including fish barriers would be entirely removed in the restored area.

Restoration of the estuary and/or access to the old distributary channel network (that is now largely used for drainage inside the coastal dike) is desirable because it has been recently identified as providing critical habitat for salmonids especially Chinook salmon. In the Skagit Basin, the estuary (or its substantial loss to diking) is now viewed as the principal limiting factor for recovery of this federally listed threatened species (Smith 2003)(Beamer et al. 2003).

The key issues with dike setback are 1) high cost of dike deconstruction and reconstruction to protect surrounding lands, 2) conversion of lands farmed/enhanced for specific wildlife species to natal estuary that may not be as beneficial and 3) changes in public use.

The key issues with improved passage at tide gates (typically through replacement with self-regulating tide gates (SRT's)) are usually the 1) reduced drainage capability the replacement structures may provide (depending on how they are adjusted) coupled with the general subsidence inside the dike, 2) quality of the habitat in the drainage network, and 3) affect on adjacent private properties with which the drainage network is continuous whether real and measurable or perceived. The subsidence and reduced drainage throughout the delta is already compromising how some lands can be used and management of SRT's will have to be carefully coordinated with the private community to ensure current levels of drainage are maintained. Furthermore, the habitat quality in the drainage network for salmonids is often marginal with high levels of silt, farm chemicals and excessive temperatures. Additionally, the network can be a trap with fish unable to leave when tide gates are closed for long periods and/or drainage outflows temporarily cease.

In the Skagit Delta, the preferred alternative is to set back dikes where possible to achieve full estuary recovery. It produces the highest salmonid benefit and avoids many of the issues associated with operation of SRT's that require constant monitoring to be effective.

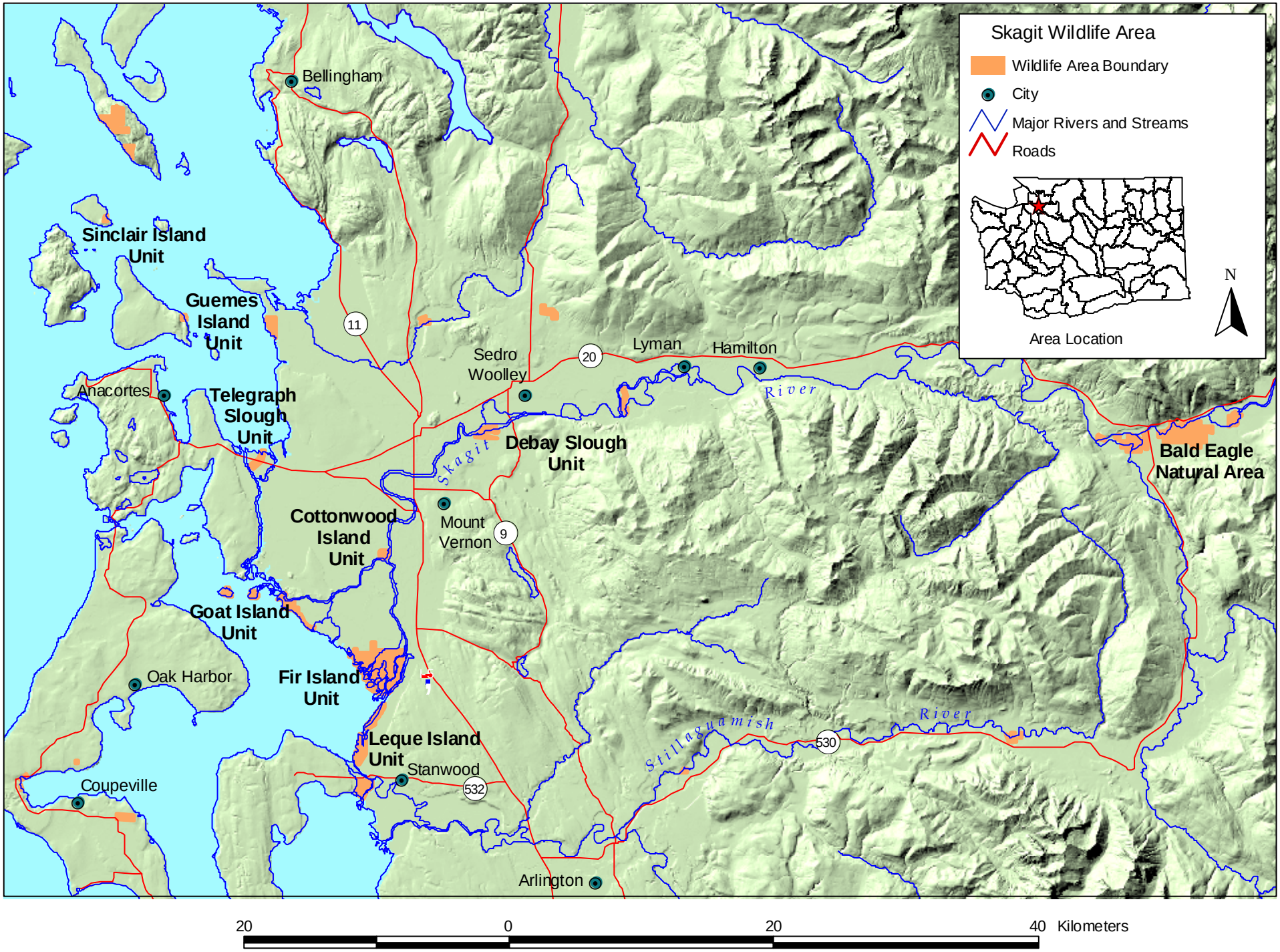


Figure 1. Management Units of the Skagit Wildlife Area.

Skagit Wildlife Area Units

As mentioned above, the SWA is not a single geographic area but a series of properties or management "units" distributed from near Rockport on the upper Skagit River to the greater Skagit River delta on Puget Sound. The locations of these widely distributed units in the basin are shown in Figure 1. Among all the units, only four currently have fish bearing waters for salmonids. Opportunities exist to restore fish access and habitat to these four and several others.

For those units with fish bearing waters, the following table summarizes the findings of the inventory crew in 2003:

Table 1. Fish passage and water diversion structures identified in the Skagit Wildlife Area IN 2003.

	Wildlife Area Unit							
	Bald Eagle Natural Area		Fir Island		Leque Island		Samish	
Structure Type	**No. Found**	**Barriers**	**No. Found**	**Barriers**	**No. Found**	**Barriers**	**No. Found**	**Barriers**
Culvert w/ tide gate	0		9	9[a]	3	3[c]	0	
Culvert w/o tide gate	5	0	22	2[b]	11	2[d]	17	All unknown[e]
Fishways	5	0	0		0		0	
Pump diversions	0		1	1[f]	0		0	

[a] FI15-33%, FI19-33%, FI9-33%, FI41-33%, 981897-33%, 981874-33%, 981875-33%, 981923-0%, 981876-0%.
[b] 982033-0%, 982035-0%.
[c] 981926-0%, 981903-33%, 981908-33%.
[d] 981904-33%, 981902-0%.
[e] Unknown because the sites are dry, flooded or at least partially buried so one end of the culvert could not be found.
[f] Unscreened

All of the structures were found to be correctly inventoried and assessed for fish passage. With the exception of one pump diversion, all the fish passage problems on the SWA were culverts, some associated with tide gates.

Review By Management Unit

Bald Eagle Natural Area

This unit near Rockport is comprised of two adjacent groundwater-fed sloughs that have been separately diked. Barnaby Slough drains out both directly to the Skagit River and down Lucas Slough (see Figure 2). Harrison Slough generally drains out to Lucas Slough only. However, a portion of its flow can be directed to Barnaby Slough via a pipeline controlled by a flashboard riser. Lucas Slough is a natural remnant left bank channel of the Skagit and flows into it near Rockport. Barnaby Slough has 3 cross dikes

down its length plus an inner dike connected to the upper side of the second cross dike (Figure 2). The inner dike area is used for rearing steelhead from late fall to late spring and excludes access by fish from the remainder of the slough. When steelhead are being reared, a portion of flow out of Barnaby Slough is through this inner dike area and out though a drum screen structure to Lucas Slough. When the steelhead rearing area is not used (summer-early fall), it is drained and kept dry. The purpose of the pipeline from Harrison Slough to Barnaby Slough is to provide supplemental water to aid in the steelhead rearing operation. It is only operated intermittently.

In working with the Fish Program that manages this unit, TAPPS has constructed fishways in all three cross dikes of Barnaby Slough and at the outlet of Harrison Slough. Formally, all these sites were barriers. All four of these fishways have been durable and efficient and only need to be adequately maintained to ensure free and unobstructed use by native salmonids.

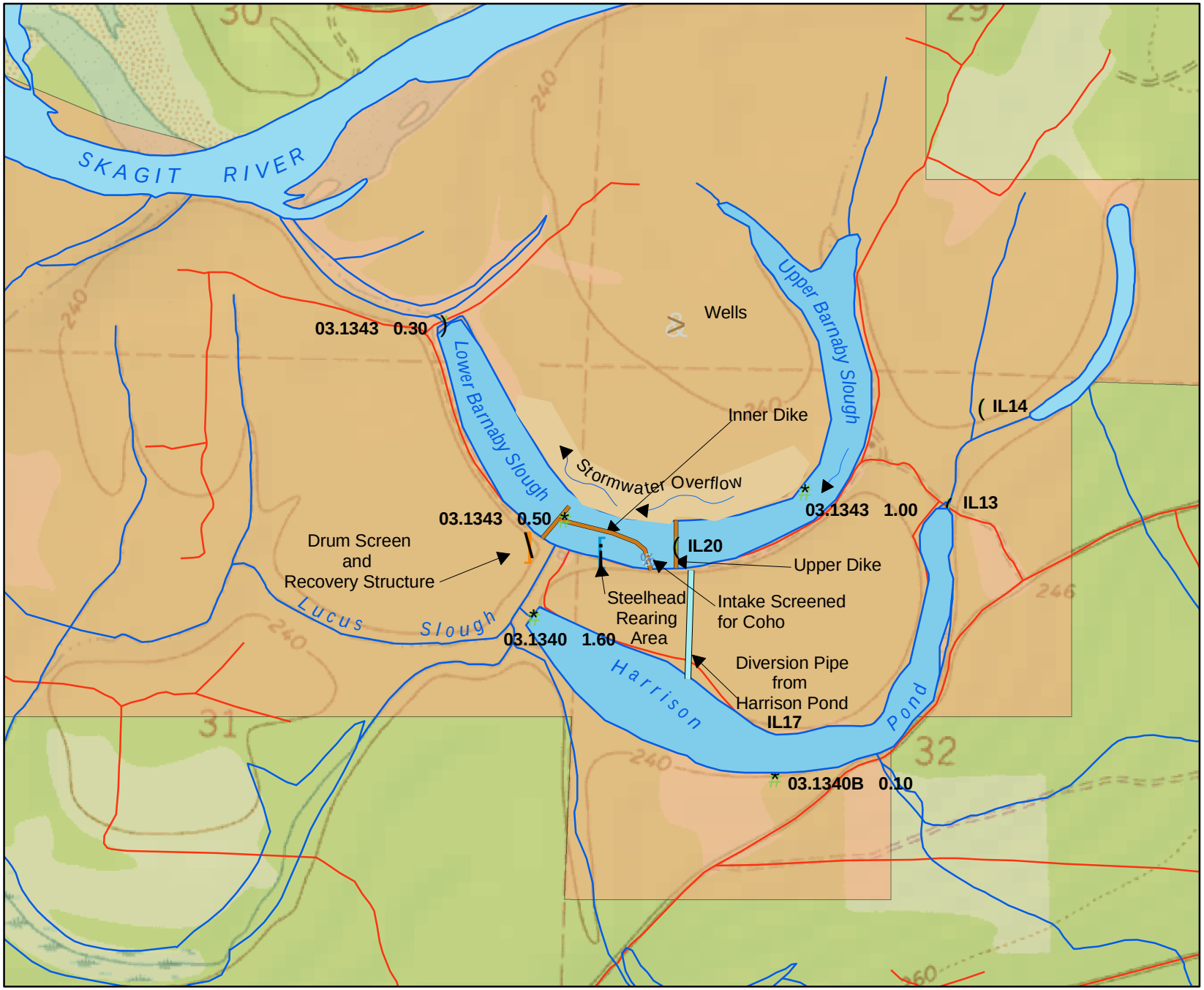
The standpipe riser diversion from Harrison Slough to Barnaby Slough (IL20) may divert fish to Barnaby Slough but this is not likely a problem. (Fish migration is probably only one way because the fall of water into the vertical riser from Harrison Slough is probably impassable to upstream migrants) The diversion outlet into Barnaby Slough is outside the steelhead rearing area.

The culvert at the upper end of Harrison Slough (IL13) is an old concrete box structure originally built for a drum screen but is large and durable creating no problems for fish passage. It supports the road crossing into the Barnaby Slough residence and complex.

The old fishway into Harrison from the adjacent un-named tributary (13.1340B 0.10) built prior to the outlet fishway (03.1340 1.60) is now inoperable and no longer needed for fish use of the pond.

There has been a deliberate effort to exclude native salmonids, especially rearing coho, from the steelhead rearing area when it is watered. Many of the coho parr that could be diverted would likely be lost to predation and also be at risk of disease. Additionally, they would add to the loading rate for the pond area and required flow that is already maximized. The small amount of flow from Barnaby Slough and occasionally Harrison Slough diverted through this sub-area does not diminish habitat quality elsewhere in either slough. Nearby wells are also used to supplement water when extra flow is needed.

The amount of habitat restoration possible in this unit has been done. Removal or reactivation of the old Harrison Slough fishway (13.1340B 0.10) would not provide any further benefit. Reactivation would necessitate constant maintenance that is not available and only duplicate the function the newer more efficient outlet fishway (03.1340 1.60) that has been generally maintenance free. Restoring heavy equipment access across the newer concrete fishway and brushing the old road along Harrison Slough to the site would now cause more damage to the recovered riparian zone along the slough than is probably justified.



Skagit Wildlife Area

Culverts
- Barrier
- Barrier with Tidegate
- Unknown
- Non Barrier
- Removed
- Repaired

Dams
- Barrier
- Unknown
- Non Barrier
- Repaired

Others
- Barrier
- Unknown
- Non Barrier
- Removed
- Repaired

Fish Screening Features
- Unscreened
- Unknown
- Screened

Fishways
- Barrier
- Unknown
- Non Barrier

Other Map Features
- WDFW Managed
- Lakes/ Reservoirs
- Roads
- Rivers/ Streams

1

The Wildlife Area boundaries are intended as a generalized reference only. Please, refer to the legal descriptionsfor specific boundary locations.

Figure 2. Skagit Wildlife Area, Bald Eagle Natural Area, Barnaby Slough Subunit showing physical infrastructure elements.

1

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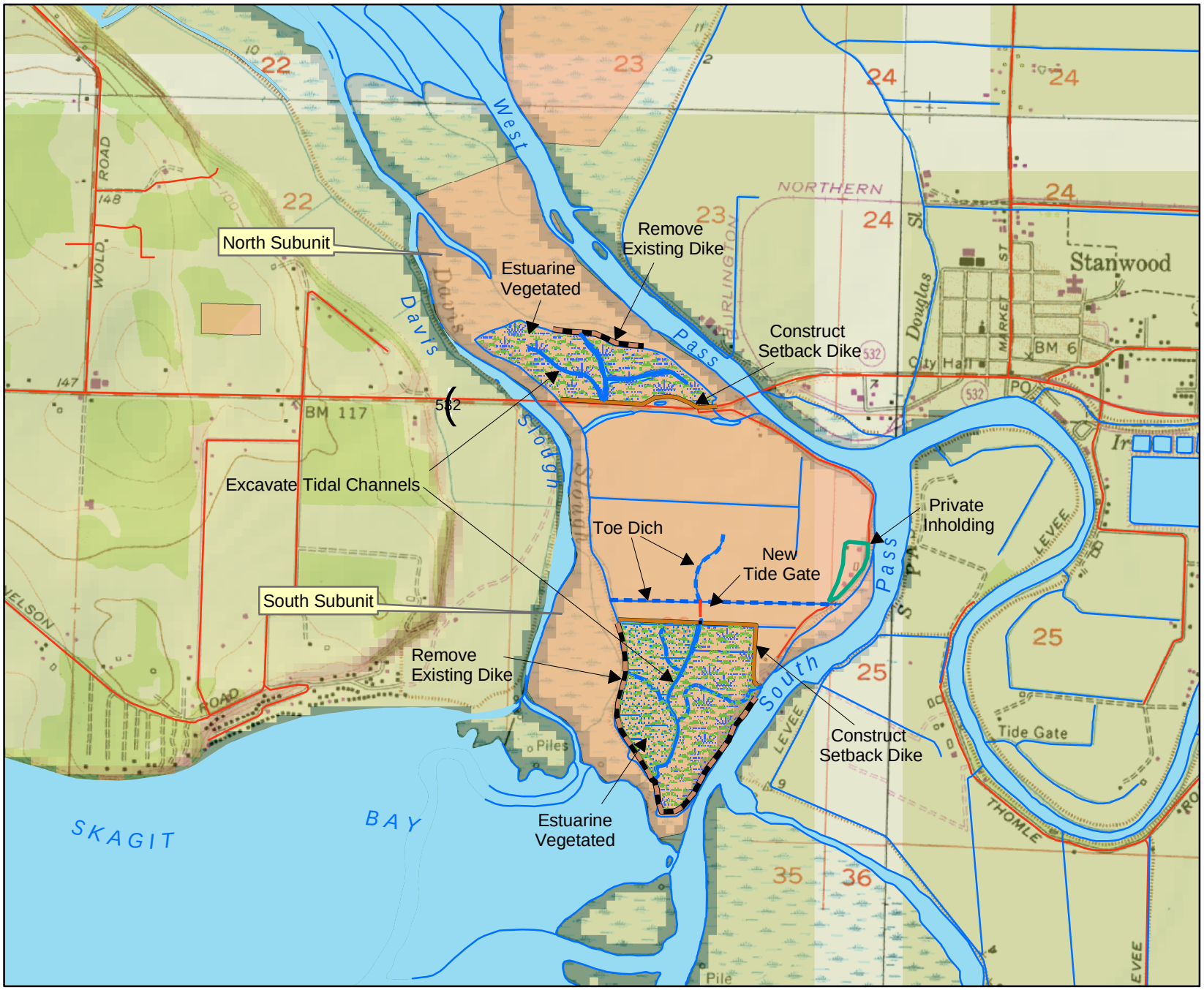
Figure 3. Skagit Wildlife Area, Leque Unit.



Skagit Wildlife Area

Culverts
- Barrier
- Barrier with Tidegate
- Unknown
- Non Barrier
- Removed
- Repaired

Dams
- Barrier
- Unknown
- Non Barrier
- Repaired

Others
- Barrier
- Unknown
- Non Barrier
- Removed
- Repaired

Fish Screening Features
- Unscreened
- Unknown
- Screened

Fishways
- Barrier
- Unknown
- Non Barrier

Other Map Features
- WDFW Managed
- Lakes/ Reservoirs
- Roads
- Rivers/ Streams

1

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Figure 4. Skagit Wildlife Area, Leque Island Estuary Restoration.

Leque Island Unit

The Leque Island Unit was part of a large tidal emergent marsh between Skagit Bay and Port Susan prior to diking for agriculture in the 1930's. The north and south segments are divided by SR-532 (Figure 3). Dikes around the perimeter of each segment join the road fill prism at the east and west sides for complete protection of the inner areas. There is one tide gate on the north segment and three on the south segment that prevent salt water intrusion and allow drainage of accumulated freshwater. Culverts not associated with the tide gates that were identified in the inventory serve as farm equipment crossings of interior drainage ditches. WDFW acquired these properties in their current condition and has farmed all or most of both segments for waterfowl most years. There is one private inholding on the southeast side of the south segment.

The dike on the north segment is beginning to fail in several places and without maintenance will soon allow tidal inundation. The tide gate is also in need of replacement. The dike on the south side is generally secure but has one weak location and 2 of the 3 tide gates need replacement. WDFW has responsibility for management and maintenance of the tide gates and both dikes except the short section along the inholding.

Since the late 1990's, there has been considerable management review of this unit by the Wildlife and Habitat Programs at the regional level to evaluate opportunities for dike removal/setbacks to recover estuarine habitat. The principal issues have been protection of SR-532, loss of grain production for wintering waterfowl and accommodation for the inholding where there is an active private residence. Virtually all of both segments could be restored if new levees were built along both sides of SR-532 and there was a levee extension down along the southeast side of the south segment to protect the inholding and its access if it could not be purchased.

During this management review, the department worked with Ducks Unlimited (DU) and the Salmon Recovery Funding Board (SRFB) to obtain a grant to restore all of the north segment and the south end of the south segment to natural estuary. The proposal was funded in 2005 and layout of the approved plan is shown in Figure 4. Survey work has begun and construction is scheduled for 2007. Although grain production or a combination of grain production and moist soil management will continue on the reduced diked area of the south segment, there will be an ongoing effort over time to move all of this activity to a nearby upland site and acquire the inholding. When this is done, there will be opportunity to recover the remainder of the south segment as estuarine habitat. Meanwhile, a significant portion of this unit will be restored. It was believed by the Programs that waiting to move the remainder of the waterfowl program upland and acquire the inholding would delay any recovery of the south segment indefinitely.

This plan eliminates the need to replace tide gates 981915 & 981916, repair of the dike on the north segment and repair of the weak dike section on the south segment (located in the dike section to be removed). It protects the highway on the north side with a new levee and avoids the immediate expense of acquiring the inholding. The two old remaining tide gates (981912 & 981908) on the south segment were not part of the DU plan and will still need replacement by WDFW. At this time, Habitat Engineering Technical Assistance staff is evaluating the potential to replace these with SRT's. Culvert sites 981913, 981902, 981903, 981905 and 981906 will be eliminated in the dike

setback. The remaining culvert sites 981907, 981909, 981911 and 981910 will be retained as interior drainage crossings.

The new tide gate shown in Figure 4 (replacing 981904) may be a self-regulating tide gate to better accommodate fish access to the interior drainage ditches. A SRT could provide opportunity to further study their value in passing fish. Any study would necessarily involve seasonal and tidal sampling of fish on both the inside and outside and effects on the soils inside. The baseline for inside soils would need to be established immediately if implementation of the project were to occur in 2007. Soil assessment would be an important part of the study since this diked area, like most of the Skagit delta, has subsided (Hood, pers. comm.) and reduced drainage could worsen already increasing salinities that are slowly making these diked agricultural lands less productive restricting species that can be planted. Additionally, there needs to be a review of the fish benefits by allowing increased access to the remaining interior diked area. The available habitat inside is only a series of shallow drainage ditches with little flow most of the year. Water temperatures are excessive much of the time for salmonids and can be silt laden when farming is underway. Only rearing area could be provided, there is insufficient flow to maintain or promote use of spawning gravel. Reducing the area available for farming by providing buffers along the ditches would probably be less valuable than setting the dike back further and recovering more natural estuary marsh.

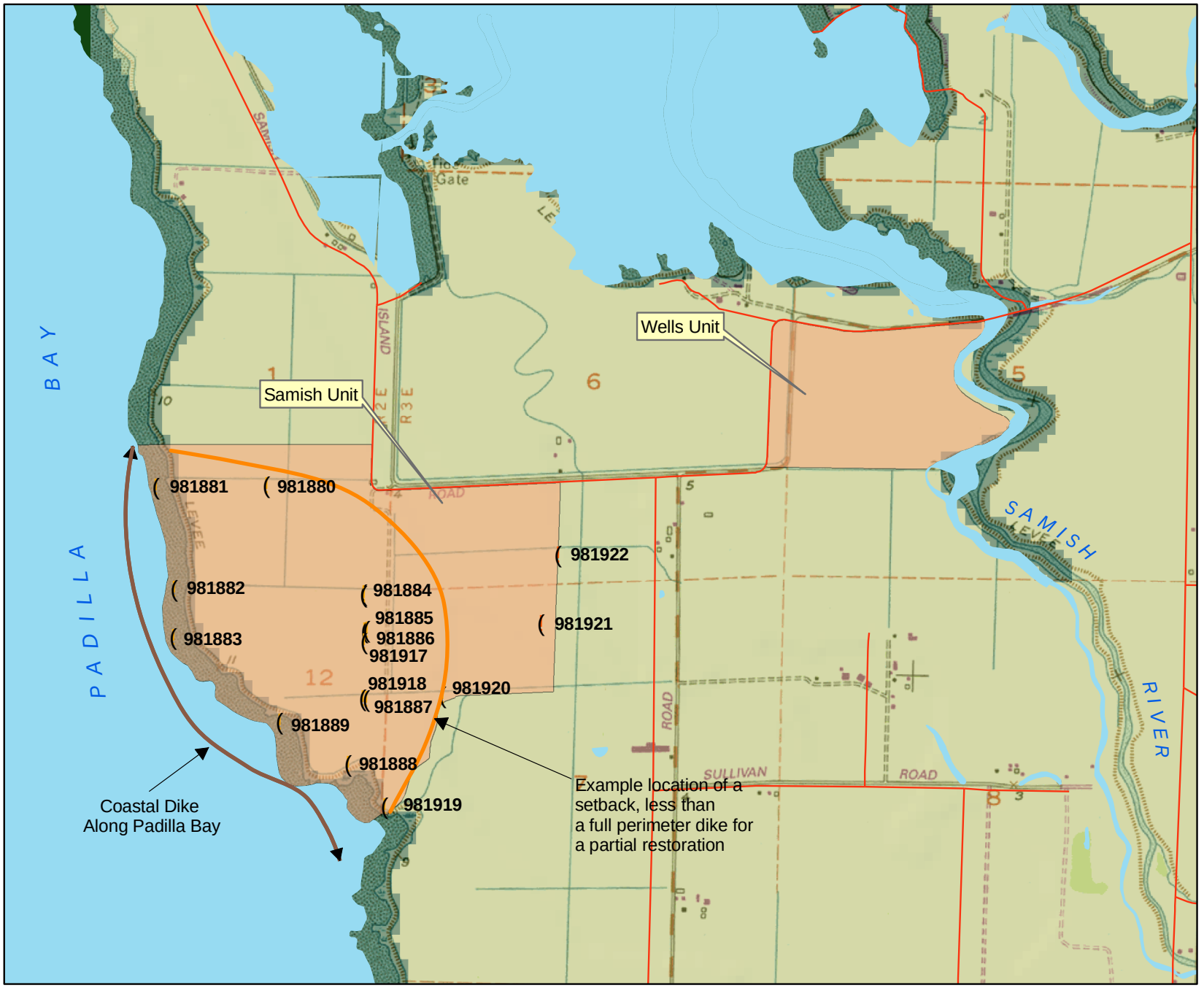
There has been no detailed plan developed for how the restored estuarine areas will be managed for recovery. One possible scenario would be to use old maps and LIDAR images to excavate the original distributary channels using the spoils to create higher marsh that would be planted with appropriate species. Another would be more passive letting a distributary network re-establish itself. Passive recovery, though, could be slow without the connectivity to the rest of the historical Leque marsh.

Samish Unit

The Samish Unit is adjacent to Padilla Bay but entirely inside the coastal dike that extends continuously along the Bay north and south of department property. The entire unit is now either farmed by WDFW or otherwise managed for waterfowl. Culverts identified in the inventory are all field crossings of drainage ditches, some of which may have historically been part of the distributary slough network. There is no direct connection between these channels and the bay on department property (i.e. open channels or tide gates). All drainage off the unit is directed by gravity flow to a collection ditch along the inside of the coastal dike south to where it is eventually pumped or drained to the bay in tide gate(s).

Current plans are to continue agricultural activities for waterfowl with possible conversion of the whole area to a moist soil management regime.

The maximum opportunity for estuarine recovery would be to construct a new levee along the north, east and south boundaries of the property tying into the coastal dike and remove the coastal dike section along the bayfront. The new levee would become the coastal dike and would have to meet approval of the Diking District. A lesser option that would require a considerably shorter dike (and less restoration) would be of the arched orientation shown in Figure 5. Whatever option is chosen, field culverts outside of any setback dike would likely be removed so as not to interfere with distributary channel



Skagit Wildlife Area

Culverts
- Barrier
- Barrier with Tidegate
- Unknown
- Non Barrier
- Removed
- Repaired

Dams
- Barrier
- Unknown
- Non Barrier
- Repaired

Others
- Barrier
- Unknown
- Non Barrier
- Removed
- Repaired

Fish Screening Features
- Unscreened
- Unknown
- Screened

Fishways
- Barrier
- Unknown
- Non Barrier

Other Map Features
- WDFW Managed
- Lakes/ Reservoirs
- Roads
- Rivers/ Streams

1

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Figure 5. Skagit Wildlife Area, Samish and Welts Units.

recovery. Please refer to the inventory report for specific culvert identities that would be affected by any specific recovery plan.

Planning, design and construction of a setback dike of any design would likely cost two to three million dollars based on projected costs for a project of similar length and design components at Wiley Slough discussed below (scheduled for 2007-2008).

At a minimum, under the current management strategy, culverts along the inside of the coastal dike on the perimeter drainage ditch need to be made fully passable. To the extent fish can pass tide gates in the vicinity, this ditch provides the only potentially useful habitat generally being deeper and having more flow than the field drains. The field drains that feed the perimeter ditch seldom, if ever, provide useful habitat.

Compared to estuarine restoration at Leque and the Fir Island Unit (discussed below) that are on Skagit Bay, benefits to salmon along Padilla Bay will be less. Chinook (estuary rearing of juveniles) would be the target beneficiary but migrant fry and parr from the Skagit are now all directed to Skagit Bay. The direct connection of the Skagit to Padilla Bay, where some of these downstream migrants used to go, was eliminated when the lower river was diked in the late 1800's (Dames and Moore 1982). For reasons not entirely known, these migrants are not known to distribute north through the Swinomish Channel to any significant extent. The Channel is either creating a thermal or salinity constraint and/or the spur dike on the south end built to direct Skagit sediment away from the channel could be creating a physical barrier. Research is underway to more carefully evaluate this problem to identify possible correction measures but there are no specific proposals to date. Apparently, the Chinook in the Samish system do use the estuary/delta/nearshore area to a limited extent (Beamer pers. comm.) but since these fish are managed entirely as a hatchery stock, they are released as fully developed smolts that probably move into deeper water quickly.

Welts Unit

The Welts Unit on the lower Samish River (Figure 5) was recently acquired from the Natural Resources Conservation Service (NRCS). It is currently isolated from the river and Samish Bay by the Samish River and coastal dikes (continuous). No part of the area is currently aquatic habitat.

Along with this acquisition came a Warranty Easement Deed that prevents the property from being farmed or managed any longer for agricultural purposes. The intent is to restore the property to as near its original condition as possible. To that end, W.G. Hood of the Skagit River System Cooperative (SRSC) analyzed the original condition of the land from old maps and aerials in 2005 and evaluated probable restoration outcomes from removal of the riverside dike (Hood 2005).

Removal of the riverside dike will necessitate construction of a new perimeter dike around the south, west and north sides to protect the county road and adjacent private property. As Hood suggests, if the riverside dike was removed, pilot channels may have to be excavated from the remnant distributaries to direct drainage east to the river. Flow cannot likely be returned north to the bay as originally occurred because the parcel north of the property between the county road and the bay is privately owned and used for a residence.

WDFW is currently working with NRCS to develop a restoration plan and secure funding for implementation. Both agencies would like to begin constructing a project by 2007-08.

Telegraph Slough Unit

This unit is located at the south end of Padilla Bay immediately east of the Swinomish Channel (Figure 6). It is divided into a north section continuous with the bay and a south section that is totally isolated by the road fill for SR-20 (shown in blue). There is no culvert, bridge or other structure providing an aquatic connection from the bay south across the highway.

WDFW does not own this property but only has an access easement from Dept. of Natural Resources (DNR). Restoration of the southern piece will require new dikes around the perimeter as well as a probable bridge at SR-20. It will also require coordination with DNR. Although restoration is included in the Skagit Chinook Recovery Plan, WDFW and Skagit River System Cooperative (July 2005) have it listed as a "long-term" project (10 years+). Altogether, it is estimated to cost several million dollars. It may be more practical, cost efficient and effective to restore some of the target acquisitions in the immediate vicinity (Figure 6). None of these would require major highway bridges and in some cases only minor construction of setback dikes (and perhaps combined with other restoration projects). WDFW is now working to acquire all these properties. Restoration at Telegraph Slough will be re-evaluated by SRSC and WDFW based on what target parcels are actually secured in the next few years.

DeBay Swan Reserve Unit

The DeBay Unit is entirely an upland site along the lower Skagit River at about river mile 22. It does not have any interior fish habitat but only frontage along the river. Efforts are underway to expand the size of the unit by purchasing several adjacent parcels immediately upstream also with river frontage (Figure 7).

A mapped inventory of bank armor along the Skagit indicated both the parcels we already own and the prospective purchase were protected with large rip-rap rock. However, in a recent boat survey, it appears most of the rock along the currently owned section has washed away. This most likely occurred in the flood of October 2003 (20-30 year event in this reach). The inventory had been conducted previously. The adjacent prospective purchase property is still armored with a significant amount of large rock. If obtained, removal of this rock would help restore floodplain function and be acceptable to the Wildlife Program (Mike Davidson, pers. comm.). Grant funds to get this done could be pursued through the SRFB or the Tribes.

In the Skagit River watershed, natural riverbanks have been found to support significantly greater numbers of rearing juvenile salmonids of all species especially Chinook than those that are hardened (Beamer and Henderson 1998).

Skagit Wildlife Area

Culverts
- Barrier
- Barrier with Tidegate
- Unknown
- Non Barrier
- Removed
- Repaired

Dams
- Barrier
- Unknown
- Non Barrier
- Repaired

Others
- Barrier
- Unknown
- Non Barrier
- Removed
- Repaired

Fish Screening Features
- Unscreened
- Unknown
- Screened

Fishways
- Barrier
- Unknown
- Non Barrier

Other Map Features
- WDFW Managed
- Lakes/ Reservoirs
- Roads
- Rivers/ Streams

1

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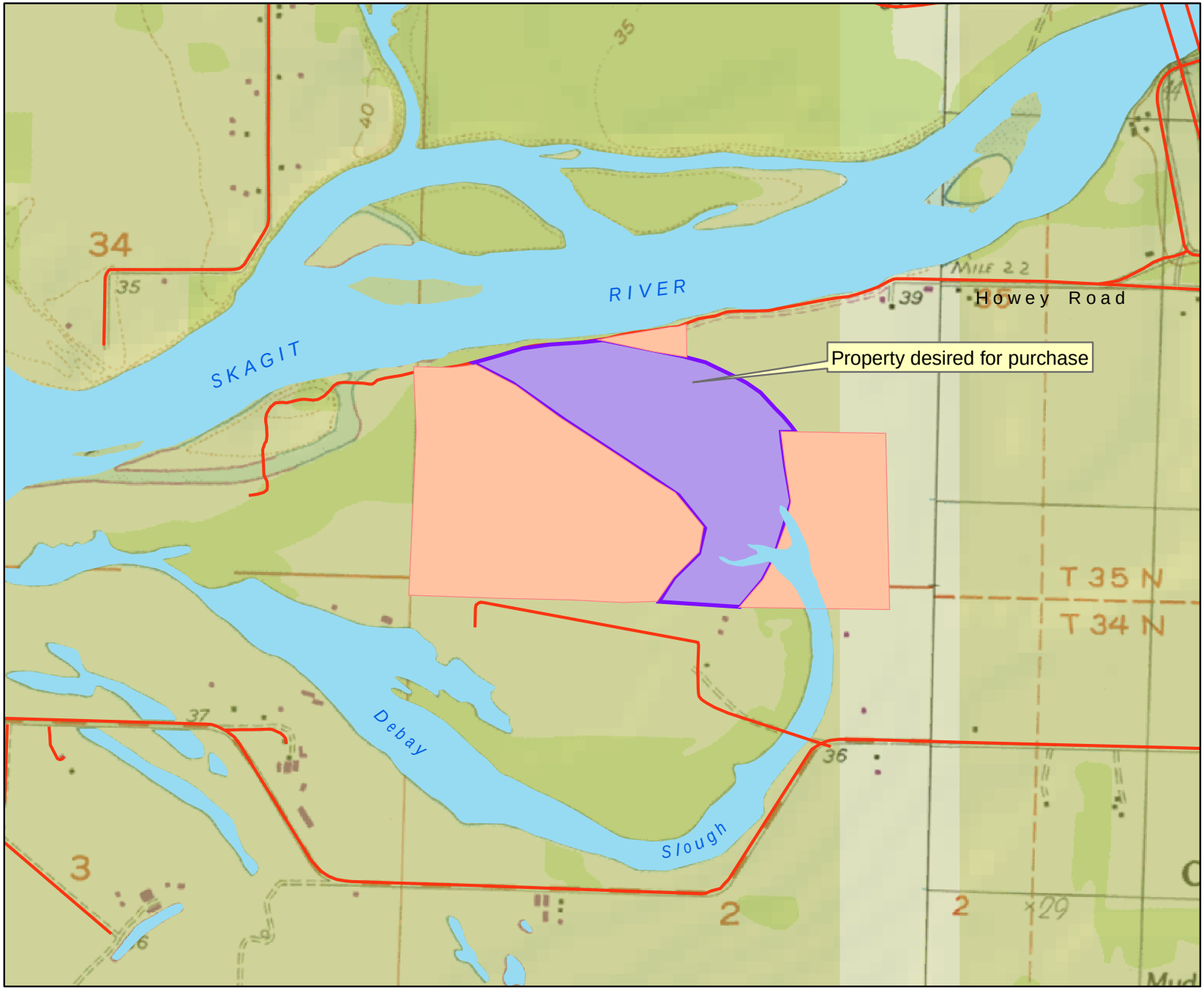
Figure 6. Skagit Wildlife Area, Telegraph Slough Unit and Target Aquisition Areas.



Skagit Wildlife Area

Culverts
- Barrier
- Barrier with Tidegate
- Unknown
- Non Barrier
- Removed
- Repaired

Dams
- Barrier
- Unknown
- Non Barrier
- Repaired

Others
- Barrier
- Unknown
- Non Barrier
- Removed
- Repaired

Fish Screening Features
- Unscreened
- Unknown
- Screened

Fishways
- Barrier
- Unknown
- Non Barrier

Other Map Features
- WDFW Managed
- Lakes/ Reservoirs
- Roads
- Rivers/ Streams

1

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Figure 7. Skagit Wildlife Area, Debay Unit.

Skagit Wildlife Area

Culverts
- Barrier
- Barrier with Tidegate
- Unknown
- Non Barrier
- Removed
- Repaired

Dams
- Barrier
- Unknown
- Non Barrier
- Repaired

Others
- Barrier
- Unknown
- Non Barrier
- Removed
- Repaired

Fish Screening Features
- Unscreened
- Unknown
- Screened

Fishways
- Barrier
- Unknown
- Non Barrier

Other Map Features
- WDFW Managed
- Lakes/ Reservoirs
- Roads
- Rivers/ Streams

0 0.5 1 2 3 4 Kilometers

1

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Figure 8. The Four Subunits of the Fir Island Management Unit of the Skagit Wildlife Area.

Skagit Wildlife Area

Culverts
- Barrier
- Barrier with Tidegate
- Unknown
- Non Barrier
- Removed
- Repaired

Dams
- Barrier
- Unknown
- Non Barrier
- Repaired

Others
- Barrier
- Unknown
- Non Barrier
- Removed
- Repaired

Fish Screening Features
- Unscreened
- Unknown
- Screened

Fishways
- Barrier
- Unknown
- Non Barrier

Other Map Features
- WDFW Managed
- Lakes/ Reservoirs
- Roads
- Rivers/ Streams

1

The Wildlife Area boundaries are intended as a generalized reference only. Please, refer to the legal descriptionsfor specific boundary locations.

Figure 9. Skagit Wildlife Area, Fir Island Unit, Snow Goose Subunit.

Fir Island Unit

The Fir Island Unit is comprised of the Snow Goose, Wiley Slough, Deepwater Slough and Milltown Island segments (Figure 8). All are located on the south side of Fir Island near the confluence of the South Fork Skagit River with Skagit Bay. Each segment will be discussed separately.

Snow Goose Segment:

This segment is bordered by Dry Slough on the east, Fir Island Road on the north and Browns slough on the west. The coastal dike runs along the south side. Currently, the whole unit is inside the coastal dike with drainage through a tide gate at the outlet of Dry Slough. It is entirely managed for wintering snow geese through planting of cereal grain.

Restoration of the entire segment to estuary would prevent its active management for wintering geese and the grain-planting program would have to be moved to a nearby upland site not yet identified. Full estuarine restoration would require a setback dike be constructed along Dry Slough and the Fir Island Road connecting with the dike along Browns Slough (see Figure 9). The existing coastal dike would be removed and the new dike would become the "coastal dike". Although this opportunity could recover some remnant distributaries and emergent marsh, it would not include Dry Slough, the most valuable habitat piece. To include Dry Slough, a band of property would have to be purchased along the east side for the new setback dike to be located since the current WDFW ownership boundary is down the middle of the channel.

Negotiations with the private landowner on the east side to purchase the needed property have been ongoing for the last year. Depending on what agreement can be reached, several options exist for restoring this segment. The full restoration option would be possible if enough property could be bought to bring up the dike along the east side to location "A" shown on Figure 9. The tide gate now at the existing coastal dike (FI9) would be brought up to this location. The adjacent culvert FI10 would be eliminated. The other tide gate (FI41) and associated culverts FI42 and FI43 would also be eliminated. The new setback dike would then follow WDFW ownership boundary around to Brown's Slough as mentioned above.

A lesser option would relocate the eastside dike to a distance less than "A" and the new setback dike would have to cross over to Brown's Slough in some configuration that would allow recovery of as many old distributaries as possible. One possible scenario would be to bring up the eastside dike to a location like "B" with a crossover dike in locations "a", "b" or "c". With one of these options, FI9 would be brought up to "B" and FI41 up to wherever the crossover dike intercepted the drainage channel. Whether the associated field crossing culverts would be needed would have to be determined. New tide gates could be of the self regulating type depending on their plan of operation, adjustment and acceptance to adjacent private landowners.

Ultimately, the amount of estuarine area that can be recovered will depend on internal negotiations between the Wildlife and Habitat Programs about how many acres of the reserve will be kept in grain production if any. Decisions may also be driven by the amount of money that can be obtained for setback dike construction and necessary property purchase. Moving some or all of the grain production upland will be an additional expense. Since any construction will be expensive, several million dollars at

least, the goal of any project will be to recover as much estuary and remnant distributary channels as possible for the least amount of new dike and property purchase.

At a minimum, without any dike setback, culverts along the inside of the coastal dike on the perimeter drainage ditch need to be made fully passable. To the extent fish can pass tide gates in the vicinity, this ditch provides the only potentially useful habitat generally being deeper and having more flow than the field drains. The field drains that feed the perimeter ditch seldom, if ever, provide useful habitat.

Wiley Slough Segment:

Wiley Slough is located east of the Snow Goose Reserve along the same section of coastal dike. Similar to the Reserve, the entire segment is inside the coastal dike and currently farmed for wildlife, primarily waterfowl. It also serves a variety of outdoor interests including wildlife viewing, hunting, dog training and boat launching.

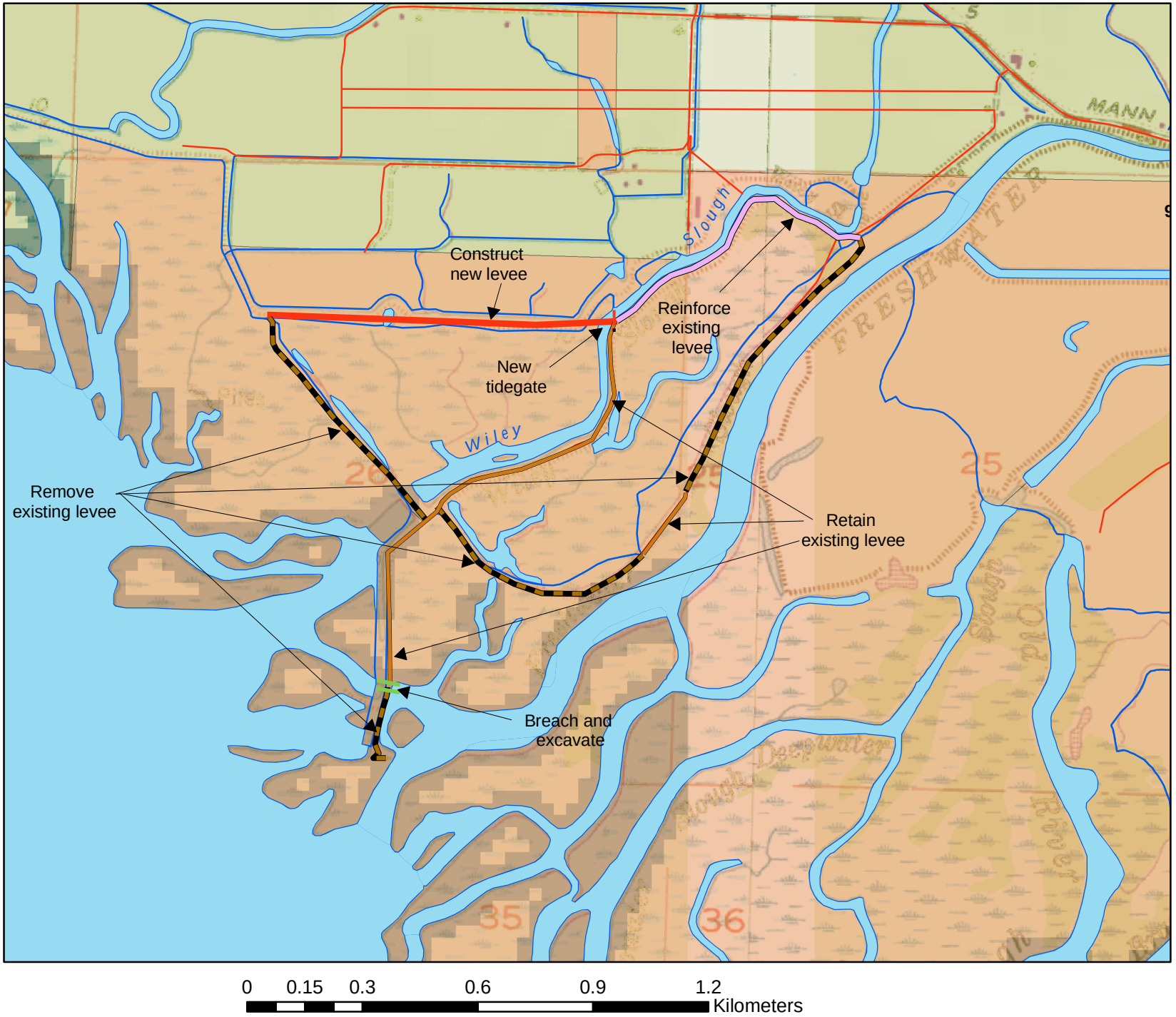
Since Wiley was only diked as recently as 1956 compared to other areas that were generally diked in the late 1800's, it has come under close scrutiny for estuarine recovery. To that end, a Wiley Slough Design Team was formed several years ago to seriously investigate a recovery plan. That Team is comprised of many stakeholders including WDFW. The Team determined restoration of most, if not all, of the segment was possible and competed successfully in the last SRFB round for funding a feasibility study that was completed in June 2005.

The feasibility study, The Wiley Slough Estuarine Restoration Design Report (Version 3.1), provides a detailed history of the site, study of hydrology and design elements, and proposal for full restoration of the segment to estuarine habitat. It is sufficiently complete to seek funding for implementation.

Version 3.1 of the design report was approved by WDFW in July 2005 and that approval enabled the Team to pursue construction money immediately. Key elements of the draft and now final plan are shown in Figure 10. Since it is unlikely the total proposed cost of $3.8 million can be obtained at one time, the construction will probably be staged over several years. The tide gate FI15 will be moved up to where Figure 10 shows the new tide gate location. It will not be a SRT by agreement between the Department and the local drainage district. FI19 will be eliminated and the other culverts retained since they are inside what will become the coastal dike (shown as levee to be reinforced in Figure 10). Work is scheduled to begin in 2007.

Deepwater Slough Segment:

This segment is a large island immediately east of Wiley Slough across Freshwater Slough. It is bounded by Freshwater Slough on the west and Steamboat Slough on the east. It covers an area of about 1421 acres. About 450 acres of the island were diked for agriculture in a series of projects from the late 1800's to early 1900's. The department obtained the property in the late 1940's-early 1950's and managed the diked section for grain production to attract wintering waterfowl. Interest in restoring as much of the diked area as possible to estuary in the early 1990's eventually led to a final project design in 1998 that was implemented in 1999. That project recovered about 204 acres of estuarine habitat through dike breaching, new dike construction, dike rehabilitation and several new drainage structures. The remaining diked area now exists



Skagit Wildlife Area

Culverts
- Barrier
- Barrier with Tidegate
- Unknown
- Non Barrier
- Removed
- Repaired

Dams
- Barrier
- Unknown
- Non Barrier
- Repaired

Others
- Barrier
- Unknown
- Non Barrier
- Removed
- Repaired

Fish Screening Features
- Unscreened
- Unknown
- Screened

Fishways
- Barrier
- Unknown
- Non Barrier

Other Map Features
- WDFW Managed
- Lakes/ Reservoirs
- Roads
- Rivers/ Streams

1

The Wildlife Area boundaries are intended as a generalized reference only. Please, refer to the legal descriptionsfor specific boundary locations.

Figure 10. Skagit Wildlife Area, Fir Island Unit, Wiley Slough Subunit Restoration Draft Design.

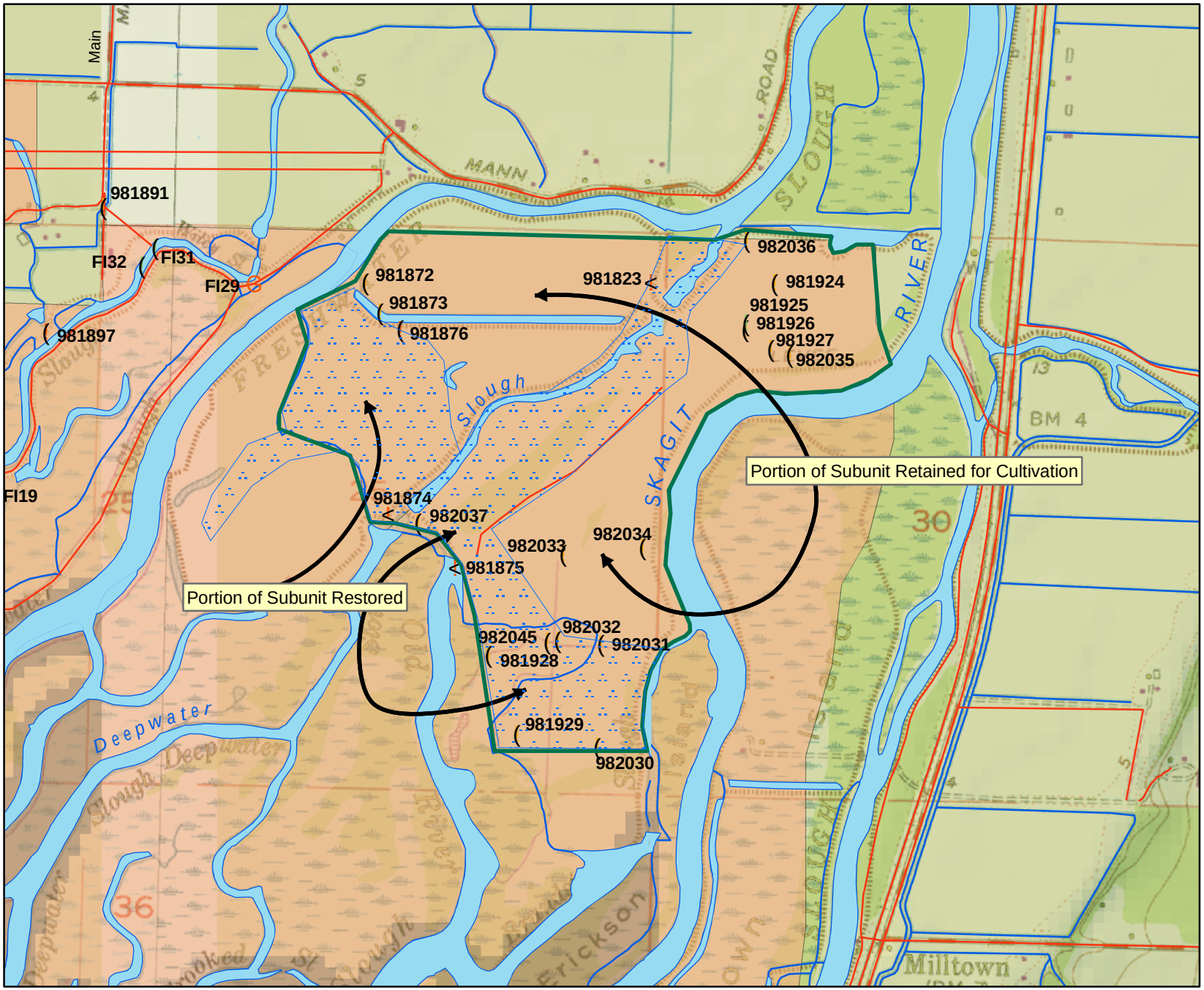


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Figure 11. Skagit Wildlife Area, Fir Island Unit, Deepwater Slough Subunit - Restored and Unrestored Areas.

in two sections as shown in Figure 11. The remaining area continues to be farmed for waterfowl.

Currently, with completion of the recent restoration effort, there is little interest or support in the near-term for additional work at Deepwater. However, the department recognizes that salmon habitat recovery effort, especially for threatened Chinook, will focus on public lands first in the greater Skagit delta and eventually this site may be completely restored to provide the maximum estuary area obtainable.

Full restoration would breach the recently rebuilt and new dikes to allow the river to develop/restore a distributary network channel complex as originally existed or would occur under current hydrology and sediment processes. Grain production for waterfowl would either have to cease or be moved to an undetermined upland site. Culverts and other structures would be removed as part of the restoration.

Partial recovery would probably breach the dikes on one of the remaining sections. This option would likely be much less expensive than constructing new dikes to further reduce the size of one section or the other or both. It would also be easier to manage grain production on only one larger section than two smaller ones. Again, on whichever segment was abandoned, culverts and any infrastructure would be eliminated as part of the restoration. Refer to the inventory report for specific culvert identities that would be affected with a specific plan.

Full restoration of the Deepwater Slough segment (Phase 2) is a listed as a long-range (10 year+) opportunity in the Skagit Chinook Recovery Plan with an estimated cost of $2-3 million dollars. Whether full, partial or any restoration is done at Deepwater Slough will probably depend on what other projects have been completed in the interim and how well they have been colonized by salmonids as documented by monitoring evaluations. A ten-year horizon is probably reasonable. In the interim, the available funds from various sources and staff from several agencies will be occupied implementing Leque, Wiley, Welts, Milltown (discussed below) and ideally a project on the Snow Goose Reserve along with possible land acquisitions around Telegraph Slough.

Milltown Island Segment:

The Milltown Island segment is located due east of Deepwater Slough (Figure 8). Work by the CORPS in the early 1900's to establish a single navigation channel in the South Fork of the Skagit River spoiled much of the excavated material on Milltown Island. The spoiled material was later shaped into a perimeter dike so the interior area could be farmed. The navigation project was maintained until the 1950's and "de-authorized" in 1978.

The perimeter dikes were partially breached during floods in the 1970's and the department has done no active management since that time. Those breaches, however, did little to restore natural tidal channels and much of the diked area remained fallow, dominated by reed canary grass. Several *ad hoc* breaches were done after work at Deepwater Slough in 2000 but they made little improvement in restoration processes. About 212 acres of the island remain within the diked area. (see Figure 12)

In the fifth round of SRFB grants (2004), the Skagit River System Cooperative (SRSC) obtained funding to investigate and implement full restoration of the diked area to

estuary habitat. Planning is complete and they will be removing significant sections of the remaining dikes with blasting. They will also be implementing a vegetation management plan including mowing and planting to eliminate extensive stands of reed canary grass to hasten recovery of native marsh shrubs and emergent vegetation. They predict a minimum of 19 tidal channels can be recreated totaling about 15 acres of wetted slough. Work is to be completed in 2006/2007. Total cost of the restoration is $455,000. (Skagit River System Cooperative 2004)

Cottonwood Island Unit

Cottonwood Island is a recently acquired parcel from DNR located immediately upriver from the divergence of the North and South Forks of the Skagit River. River flow to and around this island is not affected by dikes. As recently as 70 years ago, the river actively flowed around the north side of the island maintaining an excellent length of off-channel habitat (Figure 13). Since that time, the channel has largely been filled with sediment for a variety of reasons including changed sediment loads of the river, changes in hydrology, reorientation of levees and other land use activities. It now only functions as salmonid habitat during flood events.

The Cottonwood Island Unit was one of many sites considered in an overall review of opportunities to recover habitat outside the existing levee network of the lower river (Miller Consulting 2004). Using this review in 2005, various stakeholders (including WDFW) began to focus on specific restoration opportunities in the Forks area. However, before any one project was seriously planned, these interest groups agreed more information was needed about the local and current hydrology, sediment loading etc. That information will be required to drive a logical sequencing of projects, identify properties not currently dedicated to restoration that must be part of the plan, and key construction elements to achieve the desired result. Funding for this study is currently being sought in the next round of the SRFB grant cycle. If funding can be obtained, project planning could begin in 2007 for possible implementation beginning in 2008/2009. Where restoration at the Cottonwood Island Unit will fall in the proposed sequencing is not known. Indications are that it may not be the best project to implement first but final evaluation will depend on the outcome of the study and flow modeling. As can be seen in Figure 13, restoration will require some type of land exchange/purchase for the WDFW parcel section behind the levee for the DeVries Investments section on the river-side.

Summary

Restoration at the Leque Island Unit and the Wiley Slough and Milltown Segments of the Fir Island Unit are now partially or completely funded and work on all three areas is scheduled to begin in 2006-07. A recovery plan is being prepared between WDFW and NRCS for the Welts Unit with probable work to begin in 2008. Negotiations are underway with the landowner adjacent to the Snow Goose Segment of the Fir Island Unit to resolve issues that will allow the coastal dike to be set back. Funding for the Cottonwood Island study is being sought in the next round of the SRFB funding cycle. Estuarine recovery on the remaining segments and units will be evaluated by WDFW in discussion with stakeholders after the currently planned work is complete.

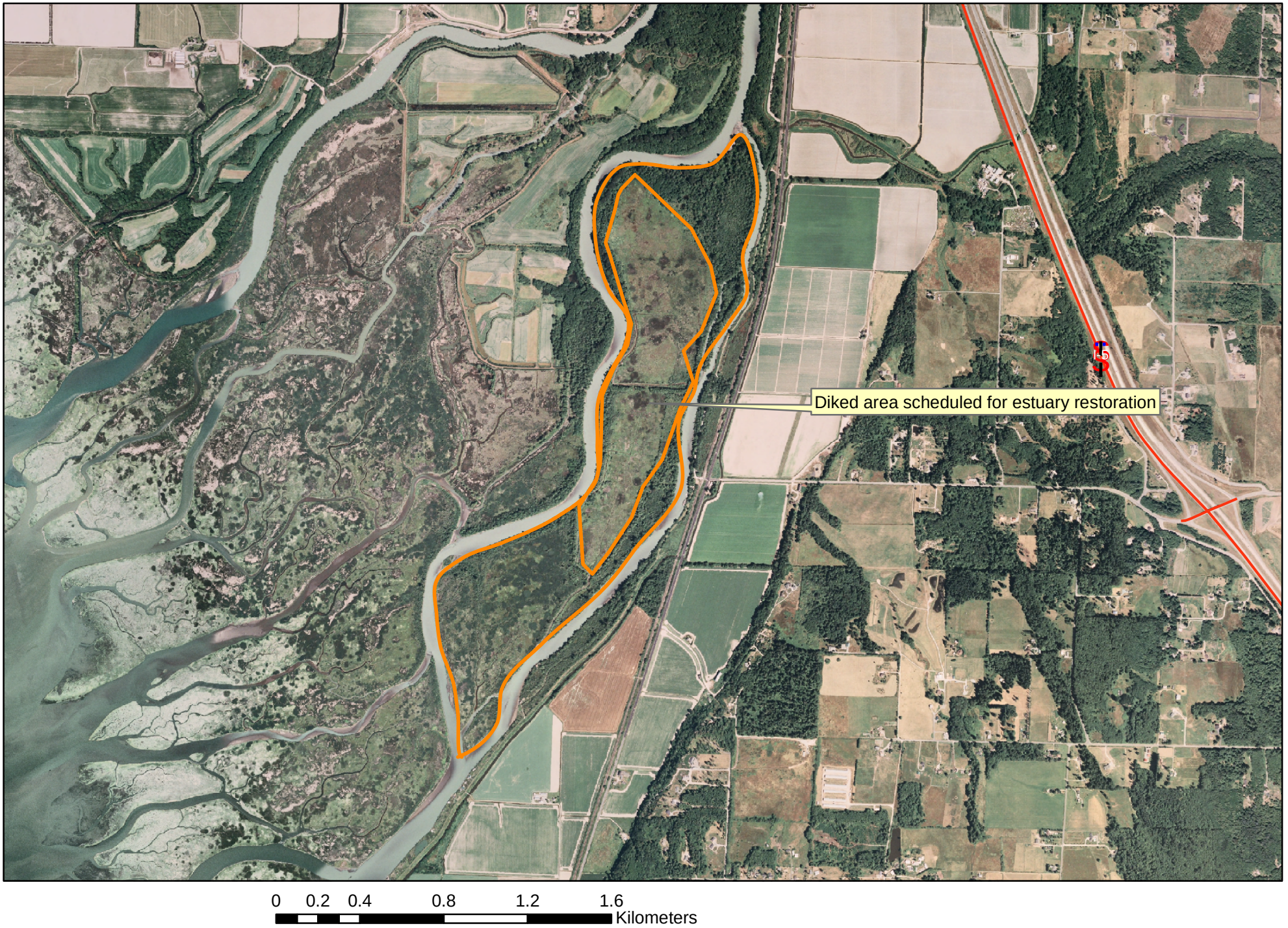
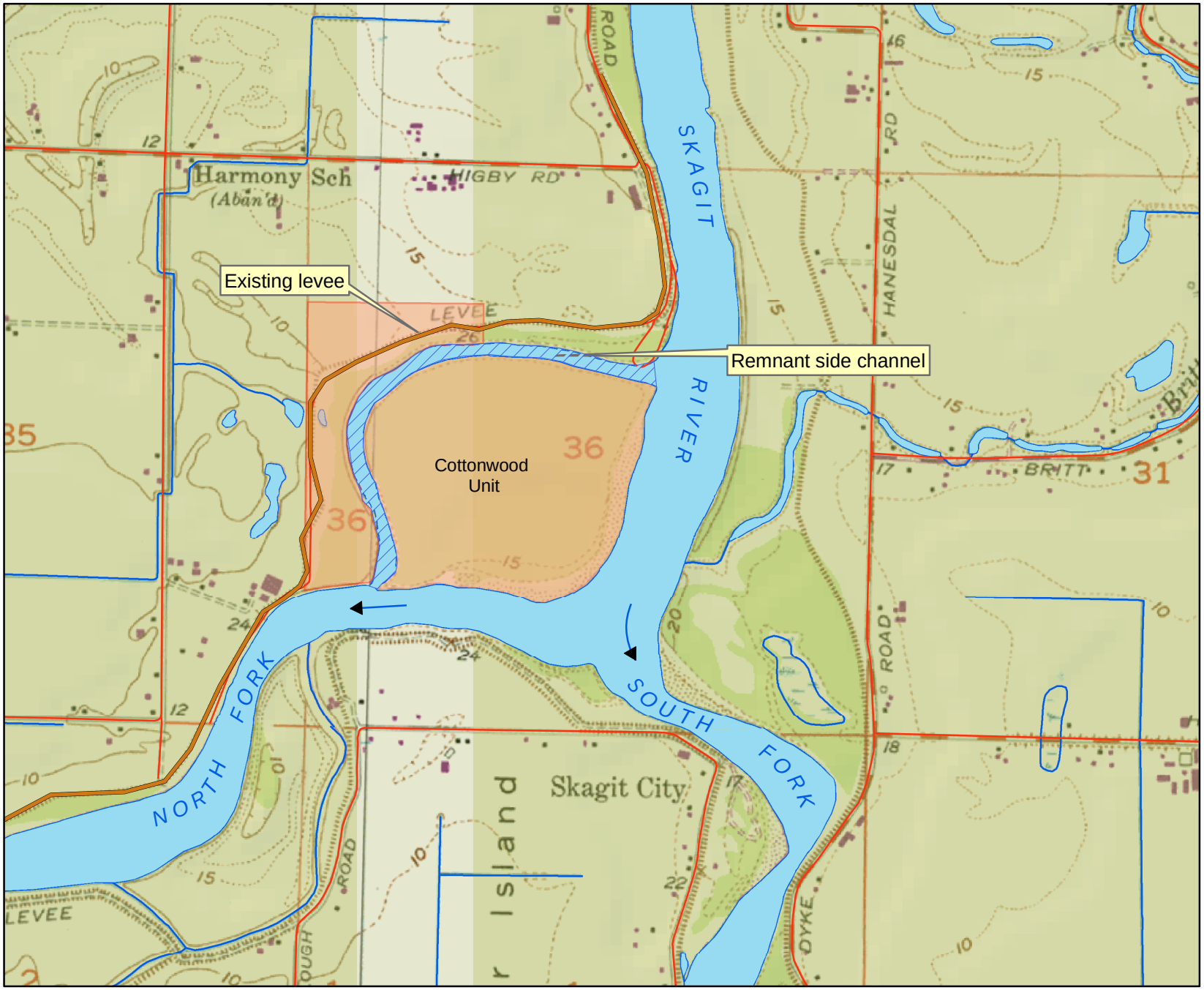


Figure 12. Skagit Wildlife Area, Fir Island Unit, Milltown Island Subunit.



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1

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Figure 13. Skagit Wildlife Area, Cottonwood Unit.

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