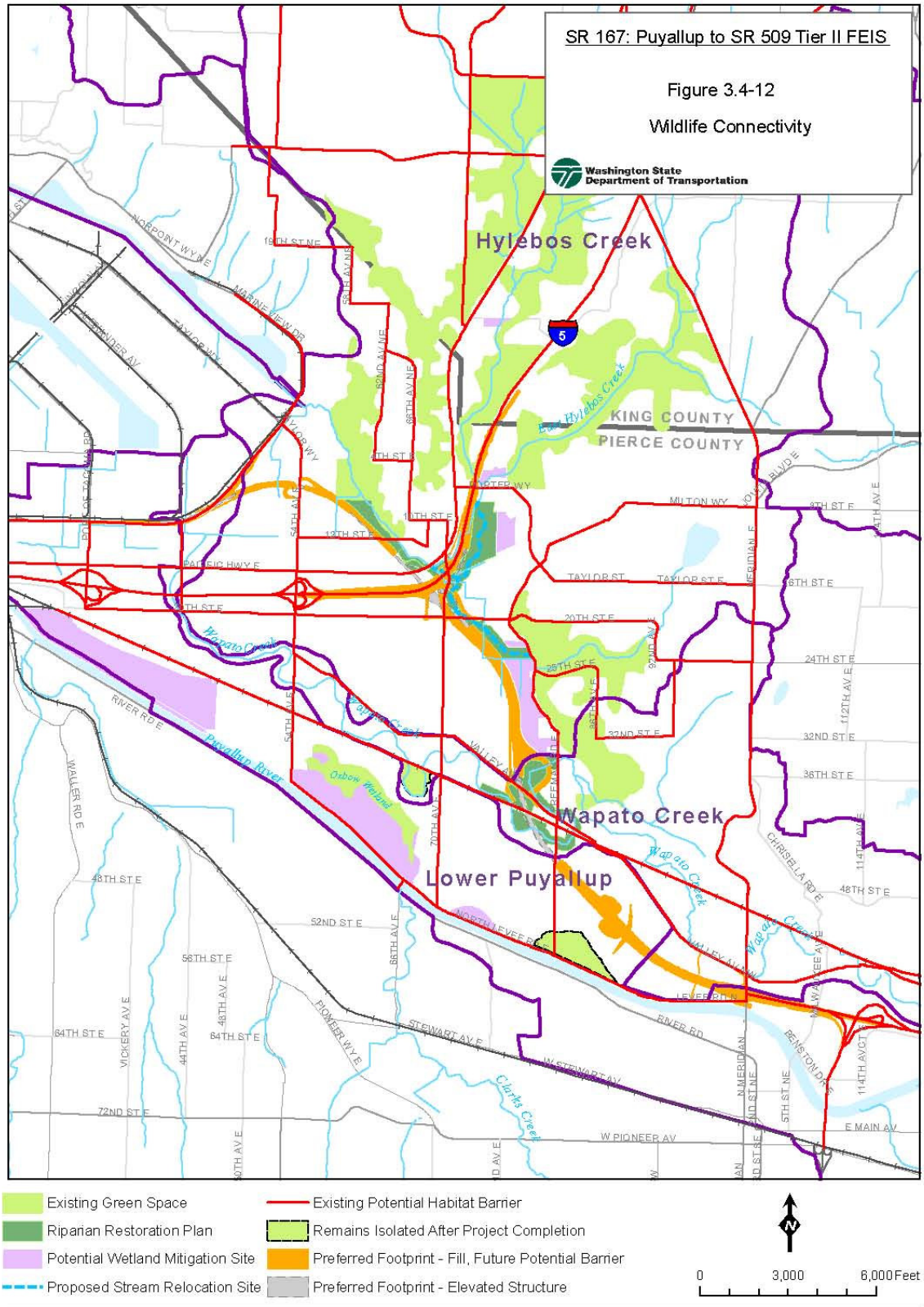

SR 167: Puyallup to SR 509 Tier II FEIS
Figure 3.4-12
Wildlife Connectivity
Washington State Department of Transportation
Hylebos Creek
KING COUNTY
PIERCE COUNTY
Wapato Creek
Lower Puyallup
Existing Green Space
Riparian Restoration Plan
Potential Wetland Mitigation Site
Proposed Stream Relocation Site
Existing Potential Habitat Barrier
Remains Isolated After Project Completion
Preferred Footprint - Fill, Future Potential Barrier
Preferred Footprint - Elevated Structure
N
0
3,000
6,000 Feet

The full potential of the area as restored wildlife habitat would take a number of years to be realized. Long-term benefits for wildlife are described in Section 3.4.4. It would take some time for wildlife to "discover" the habitat and take a number of years until the plantings have matured and the creek has stabilized enough for the area to support certain species. Some species, typically the more urban adapted ones or highly mobile species such as birds, would relocate to the area soon after construction. Other species with limited mobility or small home ranges may take many years to colonize the area provided suitable habitat is achieved.

Hylebos Basin. Approximately 86.5 acres of vegetation will be cleared and grubbed and up to 70.7 acres of temporary vegetation impact will occur in the basin. Approximately 21.7 acres of permanent and 9.4 acres of temporary wetland impact will occur in the Hylebos basin. Approximately 116 acres of riparian habitat will be established by the RRP. Due to the isolated and degraded conditions of most of these wetlands, they offer only low to moderate habitat value for wildlife. Four potential wetland mitigation sites occur in the basin and ample opportunity to replace lost function and values exists in these sites.

Approximately 0.50 acre of Hylebos Creek channel and 0.14 acre of Surprise Lake Drain channel will be filled as a result of the proposed relocations. Portions of the Hylebos Creek channel that will be impacted by the project currently support western pearlshell mussels, river otter, raccoon, weasel, common merganser, mallards, and northwestern salamanders (DEA 2004). Sediment generated during construction could smother freshwater mussels in Hylebos Creek. If present, freshwater mussels in the segment of Hylebos Creek proposed for filling will be relocated prior to commencement of work. The Temporary Erosion and Sediment Control (TESC) plan will be designed to manage and prevent erosion and to keep sediment from leaving the construction site or entering streams. TESC Best Management Practices (BMPs) are expected to minimize sedimentation impacts to aquatic organisms throughout the duration of project construction.

The corridor intersects two forested wildlife habitat areas in the Hylebos basin, consisting of a plantation cottonwood stand in the middle of an agricultural area and a small deciduous forest located just east of 54th Avenue East, which is surrounded by development. The plantation cottonwood stand is providing limited habitat connectivity, as it is isolated in an agricultural field. Removal of vegetation will displace wildlife using these already fragmented habitats.

Lower Puyallup Basin. The project will impact a small deciduous forest located north of the Puyallup River near the terminus of the corridor. This forest is completely isolated from similar habitat patches, primarily surrounded by development and a small pocket of agricultural land. Removal of vegetation will displace wildlife using this already fragmented habitat. Approximately 7.4 acres of wetland impact will occur in the Lower Puyallup basin.

Potential wetland mitigation opportunities in the basin are all adjacent to the Puyallup River. Therefore, hydrologic linkage could be established, but each potential site is isolated from the other, limiting the potential for substantial improvement to habitat connectivity.

Wapato Basin. Approximately 2.7 acres of wetland impact will occur in the Wapato basin. Wildlife habitat in the Wapato basin will primarily be impacted by the Valley Avenue Interchange and proposed RRP occurring in the vicinity of the interchange. The RRP will develop approximately 73 acres of riparian habitat.

The majority of impacted habitat at the Valley Avenue Interchange consists of agricultural fields, which have limited habitat connectivity value for the surrounding forested and riparian habitats. The best opportunity for habitat connectivity in the area is to provide habitat linkage in the riparian corridors, wetlands, and forested habitats. Such linkage would potentially benefit salmon, amphibians, some bat species, forest/riparian birds, and mammals.

The Valley Avenue option would result in the most direct habitat impacts—3.22 acres of grassland/shrub and 15.69 acres of agriculture. However, the Valley Avenue option would span Wapato Creek with a bridge at the Valley Avenue off-ramp. This placement is possible because the roadway is elevated on fill. This would allow for wildlife passage beneath the off-ramp within the creek corridor. Small mammals, amphibians, and reptiles are expected to cross under bridges as they move between habitat (Singleton and Lehmkuhl 2000). Installation of the bridge will improve access to downstream RRP areas. However, access out of the interchange area would be limited by the next downstream culverted crossing of Wapato Creek. Species expected to utilize the bridge crossing to access this RRP habitat would likely include aquatic-oriented small mammals such as river otter and raccoons, birds, amphibians, reptiles, and aquatic invertebrates.

The Freeman Road option will result in less direct habitat impacts, compared to the Valley Avenue option. Approximately 3.31 acres of grassland/shrub and 12.79 acres of agriculture habitat will be permanently impacted. However, the road widening work at Freeman Road and Valley Avenue will contribute to habitat fragmentation between the forested slope to the east and the RRP areas associated with the Freeman Road option. This is due to the potential impediment to wildlife passage imposed by roads that are wider than two lanes and the position of Freeman Road relative to the forested slope and the Wapato RRP. The Freeman Road Option would create a barrier between the potential Freeman Road Mitigation Site and the Wapato RRP due to the road widening and off ramp location.

The Valley Avenue Realignment option will result in the least amount of direct habitat impacts, 5.32 acres of grassland/shrub and 6.44 acres of agriculture habitat. However, the realigned Valley Avenue would essentially divide the RRP area on the east side of SR 167, decreasing the effectiveness of habitat corridor establishment.

Fisheries

Potential reductions in water quality associated with project construction are expected to have impacts on fish in the project area if TESC, stormwater water quality treatment, and flow control BMPs are not sufficiently implemented to minimize such impact. These potential impacts could extend over many years due to the large scale of the project. Wapato Creek, Hylebos Creek, the Puyallup

River, and Surprise Lake Drain are located in the immediate vicinity of the corridor, and the potential exists for construction activities to increase runoff and sedimentation to these waterways. Reductions in water quality due to project construction would be temporary and would not permanently reduce fish spawning and rearing habitat. The project will be constructed in stages, sometimes with concurrent work on more than one stage. Due to this approach, in- or over-water work in a particular basin would not be expected to occur for the construction life of the project. This work would be coordinated to minimize "cumulative" impacts of fisheries resources to the greatest extent possible.

Potential in-water and over-water work associated with the project could result in additional habitat impacts and harm and disturbance to fish species should they be present during construction. New culverts and bridges will result in fill placement within the floodplain and permanent vegetation removal at the crossing locations.

New stream crossings will be designed to pass the 100-year storm event at a minimum. When practicable, these structures will support natural stream processes by minimizing channel constriction and riprap placement.

The potential also exists for increases in chemical pollutants from construction materials and roadway runoff to lower water quality. A Stormwater Pollution Prevention Plan will be fully implemented before, during, and after construction, therefore reducing the likelihood of pollutants to reach any water body within the project area.

FHWA and WSDOT are proposing to infiltrate, where possible, in the road fill. This method can provide both water quality and flow control treatment (SCA 2001). Additional potential water quality treatment and flow control methods include constructed wetlands, vegetated roof systems, biofiltration swales, underground detention systems, riparian restoration, and limited use of sand and compost filters. Water quality runoff treatment and flow control will be consistent with the 2004 WSDOT *Highway Runoff Manual* (WSDOT 2004). Long-term benefits for fish habitat will result from the proposed RRP and wetland mitigation (described further in Section 3.4.4).

The timing of various activities will be determined during final design. Restoring the riparian areas adjacent to Hylebos Creek will be pursued as one of the early components to be constructed on this project. The timing of the stream relocations will be carefully planned to minimize impacts to fish and other aquatic organisms and to avoid relocating streams to locations that could be disturbed by construction. It is estimated that the RRP will take a minimum of five years to stabilize.

Hylebos Basin. In- and over-water work will be necessary during bridge widenings, replacements, and removals on Hylebos Creek. New bridges will likely be designed to avoid direct substrate displacement. Two bridges at I-5 will be widened and two others at this interchange would be replaced. An undersized culvert at 12th Street will be replaced with a bridge. Two temporary crossings over Hylebos Creek may be necessary for equipment access and temporary work trestles may be necessary for the I-5 and SR 99 bridge replacements. Hylebos

Creek will experience temporary impacts should pile driving below the ordinary high water mark (OHWM) be necessary for the work trestles. Potential salmon spawning habitat should be avoided during this work.

Approximately 86.5 acres of vegetation will be cleared and grubbed (permanently impacted) and up to 70.7 acres of temporary vegetation impact will occur from equipment access and operation, staging, and RRP establishment in the basin. There will be 21.7 acres of permanent and 9.4 acres of temporary wetland impact in the basin. The wetlands can provide beneficial water quality function, such as sediment, nutrient, and toxicant removal and flood storage. They do not provide rearing or over-wintering habitat for juvenile salmonids, but riparian wetlands may provide limited refuge to juvenile salmonids during high flow events.

There will be direct impacts associated with filling approximately 0.50 acre of Hylebos Creek channel and 2.50 acres of stream buffer; and 0.14 acre of Surprise Lake Drain. Filling in of these stream segments will not result in impacts to salmonid spawning habitat. The impacted segment of Surprise Lake Drain currently serves as a drainage ditch and the Hylebos Creek segment is highly degraded with little riparian habitat and a silt-dominated substrate.

In addition to the direct habitat impacts, impacts could occur to individual fish in these areas. Construction of a temporary diversion channel is proposed for the segment of Hylebos Creek from Highway 99 to Porter Way. The temporary diversion channel will be constructed in the dry and may include some LWD and other habitat structure placement. Due to the anticipated timing of construction, the new Hylebos Creek segment may not receive flow for a period of time, therefore the temporary diversion channel may be utilized for two to three years, depending on project staging. Every practicable method for minimizing streambank erosion in the temporary channel will be employed. Although channel construction will likely be timed to avoid adult salmon and steelhead spawning migrations and juvenile outmigrations, coho and steelhead juveniles will be the most susceptible to effects from these activities since they could be in the project area at all times of the year. Salmonid life histories and migration periods will be closely considered when planning the timing of in-water work. Potential impacts to individual fish during and immediately following construction include

- Exposure to increased sediment and turbidity due to the clearing and grading of vegetation and resultant exposure of soils and the in-water work;
- Exposure to increased sediment and turbidity due to the diversion of Hylebos Creek into a temporarily constructed channel;
- Exposure as a result of pollutant loading due to the operation of heavy equipment adjacent to Hylebos Creek and from increased stormwater runoff resulting from new impervious surface following construction;
- Exposure to dewatering, fish exclusion, and fish handling for the in-water work;
- Exposure to temperatures, or low dissolved oxygen;

- Exposure to elevated sound pressure waves should in-water pile driving be necessary for work trestle installation;
- Exposure to lights as a result of construction activities.

Elevated turbidity levels can cause stress by impairing the salmonid's ability to locate predators, find prey, or defend territories, or by creating uncomfortable conditions for gill functioning. The presence of suspended sediments can inflict gill trauma. Increased turbidity can also cause increased respiration, resulting in the acidification of metals (if present), intensifying the toxicity to fish. Sedimentation as a stressor can also result in displacement of invertebrates. Juvenile salmonids have indicated a sensitivity to total suspended solids during the smolt transformation process. Elevated sediment and turbidity levels can result in stress affecting growth rate, susceptibility to predation, competition, and susceptibility to disease (Bash et al. 2001). High turbidity levels may also affect social behavior by altering the aggressive interactions between fish that relate to the establishment of territory. Elevated sediment and turbidity levels can affect the benthic community by filling interstitial spaces such as cobble, gravel, sand as well as silt and covering substrates where the benthic organisms live. Sedimentation is not expected to have detrimental effects on fish habitat in the basin. Salmon and steelhead spawning habitat occurs upstream of the project area and the existing substrate down-stream of the project area is dominated by silt and sand. Diverting flow into the new Hylebos Creek and Surprise Lake Drain channels will result in an initial flush of suspended material, temporarily increasing turbidity and sedimentation. Additional pulses of sediment could occur following the first rain events after the diversion and until the channel stabilizes, which could take up to five years. A temporary diversion channel may be in place for up to two years, prior to directing flow to the new Hylebos channel. The diversion channel would experience similar sediment pulses throughout its use.

Lower Puyallup Basin. Most notable potential impact to fisheries resources in this basin are associated with new, temporary, and modified bridges. The existing steel bridge over the Puyallup River (northbound SR 161) will be removed and replaced. The existing concrete bridge (southbound SR 161) will be widened. Demolition of the steel bridge on SR 161 crossing the Puyallup River has the potential to cause adverse impacts to fisheries resources due to debris entering the water, especially due to the presence of lead-based paint. However, full containment during demolition activities will be provided. Some piers may be placed beneath the OHWM of the river to support the widened bridge. Construction of a new Puyallup River bridge also has the potential for adverse impacts, as it is likely that some piers will be placed beneath the OHWM of the river for the new bridge. Pier placement below the OHWM may displace cobble/gravel substrate habitat, potentially used by spawning salmon. Such use is undocumented and would likely not include Large numbers of fish. Additionally, a temporary traffic detour bridge and work trestles will result in pile placement below the OHWM of the Puyallup River. Pile support for the temporary bridges may be left in place for two construction seasons, resulting in potential temporary spawning habitat impacts for two years. Temporary substrate impacts would result from these activities and potential salmon spawning habitat may be impacted until the piles are removed and the substrate is

restored. Bull trout spawning habitat does not occur in or downstream of the project area and would not be affected by the project.

In-water work will be timed to avoid adult salmon, bull trout, and steelhead migration, juvenile outmigration, and alevin emergence. Juvenile coho salmon and foraging bull trout would be exposed to sedimentation and turbidity from in-water work. Adult salmon, bull trout, and steelhead would also be exposed to increased sediment and turbidity due to the approximately 100.4 acres of permanent and 8.5 acres of temporary vegetation impact. Additionally, juvenile coho salmon and foraging bull trout would be exposed to the sound pressure waves generated from in-water pile driving for temporary detour and work trestles during the replacement and widening of the Puyallup River bridges. Such exposure could result in injury, increased predation on coho juveniles, and mortality. Seasonal restrictions will be applied to work conducted within or below the OHWM as required by the Hydraulics Project Approval (HPA) issued by the WDFW and as agreed upon by the Services to minimize potential impacts to listed species. At this location, the anticipated allowed in-water work window is July 15 to August 31.

The Lower Puyallup River and Commencement Bay are not expected to realize measurable improvements to aquatic habitat from the RRP. However, bull trout prey species that utilize Hylebos and Wapato Creeks and Surprise Lake Drain will benefit from the RRP and as a result, bull trout foraging opportunities in these areas and within Commencement Bay, are expected to improve over time.

Wapato Basin. The number of crossing structures (culverts and bridges) associated with Wapato Creek in the Valley Avenue vicinity depends on the option selected. The impacts of the new and/or modified structures can vary depending on the design. Generally, higher and wider structures have less impact on fisheries resources in the creek as well as upon the riparian zone and associated wildlife linkage corridors.

Numbers of new and/or proposed structures at Wapato Creek are shown in Table 3.4-5.

Table 3.4-5: Crossing Structures Associated with Wapato Creek

Option	New Crossings	Modify Existing	Remove Crossing	Total Crossings
No Build	0	0	0	0
Freeman Road	1	3	6	10
Valley Avenue	3	2	6	11
Valley Avenue Realign	2	2	7	11
Mainline Crossing Near Alexander	1	0	0	0

Due to the work associated with the crossing structures, the Freeman Road option would result in a maximum of 0.72 acre of permanent and 2.31 acres of temporary impact to the Wapato Creek riparian habitat. The Valley Avenue option would result in a maximum of 0.57 acre of permanent and 2.62 acres of temporary impact to Wapato Creek aquatic priority habitat (streambed and

riparian buffer). The Valley Avenue Realignment would result in a maximum of 0.34 acre of permanent and 2.01 acres of temporary impact to Wapato Creek aquatic priority habitat.

While the Valley Avenue option has the most overall temporary riparian impact. The Freeman Road option has the most permanent riparian impact because the Valley Avenue option will span Wapato Creek with a bridge at the off-ramp. The Valley Avenue option results in the least amount of new impervious surface (4.4 acres) compared to the Freeman Road (7.9 acres) and Valley Avenue Realignment (9.1 acres) options.

Coho salmon and cutthroat trout juveniles are the species and life stages most likely to be in the project area during in-water work. Dewatering may be required at all or some of the crossing structure locations. Due to existing habitat conditions, fish abundance in lower Wapato Creek is relatively low. Impacts to individual fish related to in-water work associated with culverts and bridges are similar to those described for Hylebos Creek. Impacts to wildlife and fish are summarized in Table 3.4-6 and Table 3.4-7.

No Build Alternative – Vegetation

No project-related construction effects on vegetation are expected to occur under this option. Impacts to vegetation are currently occurring, and are expected to continue to occur, as non-project related urban developments occur in the project area. Additionally, Surprise Lake Drain and Hylebos Creek would not be relocated and the RRP would not be implemented. Thus, the long-term habitat improvements associated with the RRP would not occur under the No Build Alternative.

Build Alternative (Preferred) – Vegetation

The removal of up to 221.1 acres of vegetation during construction (excluding vegetation in developed areas [landscaping, etc.]) would be expected to cause temporary increases in soil exposure and soil erosion. Removal of vegetation also would result in a reduction of plant species diversity and increased dispersal of invasive species. Clearing and grading during construction would remove vegetation from wetland areas in agricultural fields and open spaces. Removal of vegetation lining the ditches and channelized waterways intersected by the corridor would cause a temporary increase in soil erosion potential and a decrease in bank stability. Most of the impacted vegetation in the vicinity of the proposed corridor is in agricultural fields and residential/commercial/industrial areas. Proposed riparian restoration would develop approximately 189 acres of native riparian buffer, partially offsetting the permanent vegetative impacts. Native riparian plantings will replace areas largely dominated by invasive weed species which offer diminished habitat value for fish and wildlife. Native vegetation will improve shelter and food sources for wildlife species and will offer long-term benefits to fish habitat such as shading and LWD sources. Additionally, approximately 94.2 acres of vegetation would be temporarily impacted during construction, primarily from equipment access and staging; and from the staging of materials. Temporarily impacted areas will be reseeded and/or replanted with appropriate native seed mixes/species to the greatest extent possible.

Table 3.4-6: Primary Salmonid Effects Summary for all Affected Locations

Action Component	Where	Exposure					Response to Stressor	Conservation Measures	Resulting Effects of the Action
		When	Length of time	Frequency	Life History Form	Stressor			
Up to 397.6 acres of clearing and grading	Wapato RM 1-3, Hylebos RM 2-4, Puyallup RM 3.2-5, wetlands	April-October during years of construction	Approx. 12-13 years for entire project	Stormwater runoff	Juvenile, adult. Low potential for eggs/fry	Sedimentation, erosion, and turbidity, stormwater quantity	Avoidance, habitat degrade, reduced feeding oppor., delayed migration, gill trauma, decreased feeding efficiency, physio stress, filling of pools, interstitial spacing.	TESC, SPCC, RRP after stabilized	Complete and successful implementation of the conservation measure will minimize sediment inputs and stormwater quantity, implementation of HRM.
Approx. 57 acres of effective impervious surface attributed to the SR 167 corridor	WapatoRM 1-3, Hylebos RM 2-4, Puyallup RM 3.2-5, wetlands	Following construction for as long as the impervious surface is present	Indefinite	Stormwater runoff	Juvenile, adult, low potential for eggs/fry	Contaminants in runoff, sedimentation, erosion, and turbidity, stormwater quantity	Habitat degrade, increased stress, impaired swimming, schooling interruption, temperature increase, delayed spawning, fecundity and abundance.	SPCC, RRP after stabilized (116 acres of protectiom and NIS removed), Infiltration where possible	Complete and successful implementation of the conservation measure and successful establishment of restored riparian areas will minimize contaminant inputs and stormwater quantity, implementation of HRM.
In-water pile driving	SR 161 Puyallup River Bridge, Potentially Hylebos Creek at I-5 and SR 99	As required by HPA	Depends on size of structures	During traffic detour and work trestle construction	Juvenile, adult, low potential for eggs/fry	Sound waves (acoustic pressure, particle velocity, energy flux)	Stress resulting in increased predation, temp. and/or perm. Hearing loss, damage to eggs if within 20 m, avoidance, migration disruption, barotraumas (organ rupture), rectified diffusion, lack of predation response avoidance	Utilize vibratory hammer whenever possible, time work outside of peak outmigration/ migration, other impact min. meas.	Complete and successful implementation of conservation measures will minimize effects on fish, consideration of all reasonable measures to reduce noise
In-water pier placement	SR 161 Puyallup River Bridge (new and widened bridges)	As required by HPA	Life of structures	Initial pier placement, short-term habitat modification downstream	Juvenile, adult, low potential for eggs/fry	Potential direct spawning habitat displacement for coho and Chinook salmon	Habitat degrade, decreased spawning success and abundance	Locate piers (if possible) to avoid potential spawning habitat	Spawning habitat impacts will be minimized by selective pier placement
De-watering activities	Wapato RM 1-3, Hylebos RM 2-4, SR 161 Puyallup River Bridge	As required by HPA	Duration of in-water work (unknown at this time)	1 location at Puyallup R. Bridge, 8 locations Hylebos Creek, 11 locations Wapato Creek	Juvenile, adult, low potential for eggs/fry	Fish Handling and stranding	Elevated stress levels, death, physical trauma	Time work to avoid peak juvenile outmigration and adult migration, follow fish handling protocols	Complete and successful implementation of conservation measures will minimize effects of dewatering activities on fish

Table 3.4-6: Primary Salmonid Effects Summary for all Affected Locations (Continued)

		Exposure							
Action Component	**Where**	**When**	**Length of time**	**Frequency**	**Life History Form**	**Stressor**	**Response to Stressor**	**Conservation Measures**	**Resulting Effects of the Action**
New channel creation: 4,010 feet at Hylebos Creek, 5,340 feet at Surprise Lake Drain	Hylebos Creek, Surprise Lake Drain	As required by HPA	5 years until stabilized	Stormwater runoff	Juvenile, adult.	Sediment	Avoidance, habitat degrade, reduced feeding oppor., delayed migration, gill trauma, decreased feeding efficiency, physio stress, filling of pools, reduced interstitial space	TESC Plan	Complete and successful implementation of the conservation measure will minimize sediment inputs.
In-water work associated with culvert/bridge replace, remove, install, equipment operation in/over water	Wapato RM 1-3, Hylebos RM 2-4, Puyallup RM 3.2-5, wetlands	As required by HPA	Likely 1 or 2 construction seasons at each crossing	1 location at Puyallup R. Bridge, 8 locations Hylebos Creek, 11 locations Wapato Creek	Juvenile, adult, low potential for eggs/fry	Sediment, contaminants, disturbance	Avoidance, habitat degrade, reduced feeding oppor., delayed migration, gill trauma, decreased feeding efficiency, physio stress, filling of pools, reduced interstitial space	TESC, SPCC, timing to avoid peak outmigration/ migration periods, dewatering where appropriate	Complete and successful implementation of the conservation measure will minimize sediment/ pollutant inputs.
Removal of steel bridge with lead-based paint	Puyallup River at Puyallup River Bridge	As required by HPA	1 construct. season	One-time removal	Juvenile, adult, low potential for eggs/fry	Contaminants (lead-based paint)	Stress, migration interruption, impaired swimming	SPCC, Full containment	Complete and Successful implementation of the conservation measure will minimize pollutant inputs.

Table 3.4-7: Primary Wildlife Effects Summary for all Project Locations

		Exposure							
Action Component	**Where**	**When**	**Length of time**	**Frequency**	**Species Affected**	**Stressor**	**Response to Stressor**	**Conservation Measures**	**Resulting Effects of the Action**
395.8 acres of clearing and grading	Wapato RM 1-3, Hylebos RM 2-4, Puyallup RM 3.2-5, wetlands	April - October during years of construction	Approx. 12-13 years for entire project	Stormwater runoff	All species utilizing affected habitats	Sedimentation, erosion, and turbidity, and increased volume of stormwater runoff	Habitat degrade, reduced survival	TESC, SPCC, RRP after stabilized	Complete and successful implementation of the conservation measure and the HRM will minimize sediment inputs.
220.9 Acres of new impervious surface	Wapato RM 1-3, Hylebos RM 2-4, Puyallup RM 3.2-5, wetlands	Following Construction for as long as the impervious surface is present	Indefinite	Stormwater runoff	All species utilizing affected habitats	Sedimentation, erosion, turbidity, contaminants in runoff and increased volume of stormwater runoff	Habitat degrade, reduced survival, impaired growth	SPCC, RRP after stabilization, Infiltration where possible	Complete and successful implementation of the conservation measures and HRM and successful establishment of restored riparian areas will minimize contaminant inputs.
Pile driving	SR 161 Puyallup River Bridge, SR 99 and I-5 Hylebos Bridges, soldier pile retaining walls	As required by HPA and timing restrictions if appropriate for eagles	Depends on size of structures	During traffic detour and work trestle construction, during soldier pile retaining wall construction	all species utilizing affected habitats (Habitats exposed to noise/vibration impacts)	Noise above ambient levels	Temporary avoidance, reproduction and foraging disruption	Utilize vibratory hammer whenever possible, time work outside of sensitive periods if concentration or nesting locations within 1 mile of activity	Consideration of all reasonable measures to reduce noise will minimize effects on wildlife
New major highway construction	Project Footprint (Lower Puyallup, Wapato, Hylebos subbasins)	Estimated 12-13 years of construction	Indefinite	During approx. 12-13 years construction and life of highway	All species utilizing affected habitats	Noise, barrier to movement, lights and air quality, increased stormwater quality/quantity impacts	Reduced genetic exchange, population isolation, reduced foraging success	Repl. culverts w/ bridges where practicable, RRP	The RRP will perm. protect wildlife corridor along streams and wetlands, linking forested areas
Channel segment filling	Hylebos Creek and Surprise Lake Drain	As required by HPA	1 month	One-time perm. impact	All species utilizing affected habitats	Habitat loss	Decreased abundance and diversity, foraging opportunities, and habitat loss	New and enhanced habitat developed from the RRP, if present, mussel relocation	Implement cms for relocating mussels, establishment of RRP will increase habitat complexity, connectivity, and area

The "Carson" chestnut tree is located between the off-ramp at the existing terminus of SR 167 and the proposed continuation of SR 167. This tree is considered to be the oldest and largest chestnut tree in Washington. All options at the SR 161/SR 167 interchange were designed to avoid this historic tree. Efforts to minimize additional detrimental impacts to the tree will be made during design and construction.

3.4.4 Impacts of Operation

No Build Alternative

No direct, project-related operational effects on wildlife, wildlife habitat, migratory birds, fisheries, fish habitat, or vegetation would occur under this option. Impacts are expected to occur as non-project related urban development pressure continues in the project area. Impacts on species and habitat include loss of habitat due to conversion of rural and open space lands to urban lands, displacement of wildlife in development areas, impacts to fish due to work in and near water bodies, changes in aquatic habitat quality due to increased runoff from new impervious surface, and degradation of habitat due to increased human and automobile traffic. Impacts on vegetation include loss due to conversion of rural and open space lands to urban lands and degradation of vegetated areas due to introduction and spread of invasive species. This option would not include the RRP and associated multiple habitat benefits.

Build Alternative (Preferred)

Operational impacts of the proposed project on wildlife and migratory bird species could include displacement, disturbance mortality, road avoidance, movement impairment, increased animal-vehicle collisions, light and glare impacts, and noise disturbance. Impacts on fish could potentially include disturbance mortality, avoidance, and changes in aquatic habitat from water quality degradation, stormwater runoff, and altered hydrology. Noxious weed species proliferation could also increase.

Wildlife and Wildlife Habitat

Vehicle-wildlife collisions can contribute to population impacts on a species. Juvenile birds are very susceptible to collision with vehicles immediately after fledging due to a reduced capacity for flight. In addition to the direct loss of wildlife including migratory birds, due to vehicle-animal collisions, automobiles contribute to air, water, noise, light, and soil pollution. The potential for these sources of pollution to impact wildlife varies with distance from the road and the amount and density of vegetation adjacent to the road.

Increased noise and activity during project operation would be expected to displace some birds, including migratory birds, and mammals that currently use the forested habitats adjacent to the corridor. Wildlife leaving habitats disturbed by project operation would move to similar habitat elsewhere, causing increased pressure for food and nest sites in the new habitat. A reduction in the project area's wildlife population levels may result. Impacts to wintering bald eagles would not be anticipated since any eagles potentially using the stretch of Puyallup River adjacent to the road likely would be accustomed to noise and

human activities. Because the distance of existing nests from the proposed project footprint is greater than 1 mile, seasonal maintenance restrictions are not anticipated (USFWS 1986).

The effect of roads as barriers to wildlife is well documented, especially for small animals such as squirrels and mice and slow-moving animals like amphibians and reptiles. Many amphibians are particularly vulnerable because their annual life cycles require migration between habitat with different ecological properties. For medium sized animals such as raccoons, the presence of the road does not necessarily inhibit crossing, but the level of traffic and number of lanes has a direct effect upon the success of those animals crossing the road. A highway wider than two lanes can inhibit some carnivore species movement (Claar et al. 2003). The impacts of roads are substantial factors affecting the long-term persistence of wildlife populations (Jackson 2000).

Primary wildlife habitat in the immediate vicinity of the proposed corridor is limited to larger blocks of abandoned agricultural lands and shrub lands, the limited undisturbed riparian corridors along Wapato and Hylebos Creeks, and upper Surprise Lake Drain; and to a certain extent, vegetation communities in developed areas. The project vicinity currently has a high density of roads and existing habitat consists of fragmented patches across the landscape (Figure 3.4-12). Effects from roads that bisect habitat can extend out up to 0.5 mile, depending on habitat type. If this concept of road effects was applied to the existing landscape, very little existing habitat is not currently affected due to the presence of numerous roads. The agricultural and grassland habitats in the valley floor are zoned for industrial, commercial, and residential development. Long-term habitat connectivity has the greatest chance of being maintained in the riparian corridors. Steep slopes, existing restoration areas, and the future RRP will provide long-term viability in most of the forested areas mapped in Figure 3.4-12.

Existing connectivity between forested habitats occurs largely in the upper reaches of West and East Hylebos Creeks and Surprise Lake Drain. Connectivity is severely restricted in the valley floor due to urban and residential development, agricultural activity, and major road corridors like I-5, Valley Avenue, SR 99, and 54th Avenue East (Figure 3.4-12). Some east-west connectivity, especially for aquatic-oriented species such as river otters, amphibians, birds and small mammals such as raccoons, still exists along the Wapato and Hylebos Creek corridors and various agricultural drainage ditches in the valley.

The project will contribute to the existing fragmented nature of grassland/shrub and agricultural habitat and could continue to fragment riparian habitat. Opportunities for low-cost wildlife crossings will be considered, such as amphibian and reptile tunnels at appropriate areas throughout the alignment. Maintaining streambed conditions within oversized culverts could facilitate use by salamanders, frogs, small mammals, and aquatic invertebrates at stream crossings (Jackson and Griffin 2000). The culverts installed for the project at stream crossings will comply with the project HPAs and will, at minimum, be designed to pass the 100-year storm event. Where viable, culverts and clear-spanning structures will be considered for enhancement or facilitation of wildlife mobility.

Following project completion, there will be new major highway segments, which could be migration barriers to wildlife. However, due to the location of existing forest habitat fragments, SR 167 would have little effect on forest habitat that is currently linked (Figure 3.4-12). It could inhibit travel between different habitat types, primarily forest and agriculture. This would have the greatest impact on species that utilize both habitat types (foxes, skunks, and opossum). However, there is also the potential for tremendous improvement to habitat corridors. The RRP would result in corridor linkage from the upper to the lower stream reaches of Hylebos and Wapato Creeks and Surprise Lake Drain. Also, potential wetland mitigation areas could provide additional linkage between the RRP areas.

The RRP will result in 189 acres of improved wildlife and fish habitat within the project area, it will establish wildlife linkages between fragmented upland habitats, and will protect a substantial amount of adjacent wetlands by creating wetland buffers. Figure 3.4-12 shows existing forest habitat fragments, highway barriers, and potential linkage areas following project construction, including RRP and potential wetland mitigation sites. The RRP for the preferred options will link multiple fragmented habitats together resulting in over 1,000 acres of contiguous habitat.

Operation of the project would have the potential to affect water quality in wetlands and stream courses adjacent to the corridor (see Sections 3.2, Water Resources, and 3.3, Wetlands). Water quality degradation and increased human activity associated with the project may affect wildlife that use these water resources. Degradation of water quality in the wetlands may result in reduced diversity and an increase of tolerant species.

No habitats that are potentially used as primary resources by listed, threatened, and endangered wildlife species would be affected by the proposed project.

Coordination with USFWS will continue as the project is prepared for bid and construction in conformance to the requirements of the ESA. FHWA and WSDOT will ensure that the BA conclusions are not affected by any change in ESA species designation or any change in the use of the action area by threatened or endangered species.

Hylebos Sub-Basin. The project will result in new highway, generally running in a southeast to northwest direction through the basin. The new roadway will be constructed on fill through the majority of this segment and could inhibit wildlife passage along much of its length. However, the remaining forested habitat in the basin is all located on the north and east side of the proposed highway and is associated with steep slopes and the riparian corridors of East and West Hylebos Creeks and Surprise Lake Drain (Figure 3.4-12).

Exposure to sediment flushes prior to stabilization of the new channel could result in mortality or harm to freshwater mussels that are present in Hylebos Creek. Following channel stabilization and riparian establishment, habitat conditions should improve as LWD is added to the system, additional shade is provided, and addition channel area is available for colonization. It may be necessary to relocate mussels during channel filling and new channel creation. Relocated mussels may be at risk due to sedimentation and flushing downstream.

Monitoring may be necessary to maximize survival. The relocation of mussels and potential subsequent monitoring will occur as specified in the project HPA.

The substantial potential for improvement to wildlife mobility and habitat connectivity in the basin lies in reestablishing riparian corridors, forested buffer areas, and wetlands. The RRP combined with potential wetland mitigation in the Hylebos basin could, over time, establish additional forest and wetland habitat and better linkage between existing forest fragments in the upper stream reaches and restored habitat in the lower reaches (Figure 3.4-12). The RRP is expected to restore and protect 116 acres of riparian habitat in the basin. The proposed restoration will also link with approximately 860 acres of habitat along West Hylebos Creek and 260 acres of habitat along East Hylebos Creek. The restoration of the Surprise Lake Drain channel will link with approximately 220 acres of habitat and Wapato Creek restoration will provide additional opportunities for habitat linkage.

The proposal would increase the ability of wildlife to travel in a north-south direction along Hylebos Creek. The project would still contribute to impeding east-west travel for species utilizing agricultural areas due to the SR 167 extension being placed on fill instead of bridge structure.

Wapato Sub-Basin. There are some differences in the effects to habitat and habitat connectivity per interchange option. The RRP will not improve connectivity between upper Wapato Creek and the lower reaches but connectivity between the Wapato RRP and potential wetland mitigation in the Hylebos sub-basin will improve. The RRP will develop approximately 73 acres of riparian habitat.

Modification and fragmentation of habitat could alter species composition in the study area. Species that utilize flooded pasturelands and agricultural lands would be displaced and/or forced to compete for reduced resources elsewhere, while species better adapted to urbanized landscapes such as crows, rock doves, starlings, and house finches would become increasingly abundant.

Fisheries

Operation of the project would have the potential to affect water quality in fish bearing waters in and adjacent to the corridor. Water quality degradation associated with the project will be minimized by the proposed stormwater quality and flow treatments. Hydrologic modeling has indicated that flooding impacts from impervious surfaces are more than compensated for by the RRP and new stream channel designs. Large base flow alterations due to increased evaporation in the summer and lower discharge to streams are not expected because base flows in the project area are primarily influenced by upstream sources. Project impacts on base flows and flooding are described in greater detail in the *Water Resources Discipline Report* (2005).

Maintenance activities such as removing trees located directly adjacent to bridges reduces the value of the riparian community adjacent to the creeks. However, establishment of forested riparian buffers and improvements to 63 acres of wetlands are expected to increase infiltration and contaminant filtration, and provide shading to maintain cooler water temperatures. Reconverting developed

areas back to wetlands and forested areas will reduce surface runoff and increase aquifer recharge.

Water quality treatment will be provided at a level sufficient for compliance with the 2001 Ecology Stormwater Technical Manual. Pollutant loading in the study area, especially metals, is expected to increase in the future. Less than 1 percent of the increase in metals is attributed to the project. This increase from impervious surfaces associated with the project is likely over-estimated because it does not take into account potential water quality improvement due to filtration effects of the RRP. Therefore, impervious surface created by the project is not expected to result in degradation of water quality.

Hylebos Sub-Basin. Exposure to sediment flushes prior to the stabilization of the new channel could result in acute, chronic or sublethal effects to fish present within or downstream of the affected segment. However, The RRP would address many of the limiting factors of the Lower Hylebos Creek's ecosystem, and restore many of those natural ecosystem functions. Some of those limiting factors include substrate fines, pool quantity and quality, refugia and side channel habitat, increased flow resulting in erosion and sedimentation, lack of riparian forests, and LWD in the channels, reduced macroinvertebrate diversity, juvenile salmon rearing areas and increases in water temperature.

As the riparian forest matures, many of the trees are expected to fall into the stream providing substrate and habitat for aquatic macro invertebrates, cover for fish, and will add complexity to the channel morphology by allowing the opportunity for a series of riffles and pools to develop within reaches. Pool quality will improve with the cover provided by restored riparian habitat. Channel meandering and the removal of fill and impervious surface will improve floodplain connectivity which will likely result in backwater areas for juvenile fish to utilize during high flows. As Hylebos Creek salmon populations increase, a co-dependent nutrient cycle would develop between the salmon and the riparian ecosystem. After spawning the salmon die, releasing marine derived nutrients. These nutrients are recycled into the ecosystem through consumption and decomposition helping to support a diverse riparian habitat. The RRP will reduce streambank erosion by rehabilitating streambanks with native riparian vegetation.

The RRP would restore the lower reach of Surprise Lake Drain, which offers an excellent opportunity for off-channel rearing habitat. This is because Surprise Lake Drain is from a spring fed source of water, which remains relatively stable during summer months. Additional overwintering habitat would be provided by preserving 600 linear feet of Hylebos Creek channel. Hydrology for the remnant channel would be provided by adjacent hillside springs and outflow from stormwater treatment facilities. The relocation of Hylebos Creek will result in approximately 4,010 linear feet of channel, an increase of 1,000 linear feet.

The new stream banks will be revegetated with native vegetation to provide future shading and bank stabilization. LWD will be placed to increase bank stability, allow for the development of pools for refugia, provide favorable substrate for invertebrate colonization, and shade. An undersized bridge and bank armoring will be removed at the 8th Street East crossing. This crossing is adjacent to the south end of the City of Fife's Milgard restoration site,

complementing other restoration efforts in the system. It also links to approximately 110 acres of upland, forested habitat along the bluff. An additional undersized bridge will be removed at the 62nd Avenue East crossing, just upstream of the 8th Street East crossing.

Approximately 1,000 linear feet (0.14 acre) of the 3-foot-wide Surprise Lake Drain will be filled as a result of highway placement. The fill would occur in two locations, the first about 700 feet downstream of Freeman Road and the other just upstream of 20th Street East. A new channel will be created with a depressed floodplain corridor to the north of the SR 167 extension to convey the Surprise Lake Drain from Freeman Road to a new confluence with the relocated Hylebos Creek to the east of I-5. Similar to Hylebos Creek, the new stream banks will be revegetated and the channel will have meanders, increasing capacity and length.

Although proposed as a stormwater facility, RRP will restore many of the riparian ecosystem functions that were lost or impaired as a result of human encroachment and urbanization. The RRP will protect a substantial amount of wetlands by creating wetland buffers and will allow for more natural floodplain processes to occur within a channel migration zone. Fill materials that were placed in the floodplain will be removed in some areas to improve floodplain capacity and fish habitat within channel migration zone.

Wapato Sub-Basin. Restoration of the Wapato riparian zone over the long-term would increase shading, foraging habitat, and reduce stream bank erosion. The RRP would restore approximately 9,000 linear feet of Wapato Creek and would convert approximately 73 acres of developed land back to riparian habitat. The RRP would reestablish riparian buffers, averaging 200 feet wide on each side of the stream. The project will remove six crossings and replace up to three crossings at the Valley Avenue interchange to meet current WDFW fish passage criteria, which will potentially aid in the recovery of the species. With consideration of site-specific design constraints and practicability, sizing and location of stream crossings will complement the functions of the RRP by supporting channel-forming processes, floodplain functions, and habitat connectivity in the RRP.

Three potential wetland mitigation sites were identified adjacent to the Lower Puyallup River. Should one or more of these sites be utilized, the opportunity to re-establish floodplain connectivity, off-channel habitats, and channel migration exists. Such improvements would directly benefit salmon, bull trout, and steelhead.

Coordination with USFWS and NOAA Fisheries would continue as the project is prepared for bid and construction in conformance to the requirements of the ESA.

No Build Alternative – Vegetation

No direct, project-related operational effects on vegetation would occur under this alternative. Impacts to vegetation are expected to occur as non-project related urban development pressure continues in the project area. Impacts on these resources include loss of vegetation due to conversion of rural and open

space lands to urban lands and degradation of vegetated habitat due to fragmentation resulting in an increase of invasive species. Additionally, Surprise Lake Drain and Hylebos Creek would not be relocated and the RRP would not be implemented. Thus, the long-term habitat improvements associated with the RRP would not occur under the No Build Alternative.

Build Alternative (Preferred) – Vegetation

Increases in sediment, nutrient, and petroleum-based chemical pollution associated with operation of the project would be expected to adversely affect diversity in some roadside wetlands and vegetation communities. In areas immediately adjacent to the roadway, dust and other particulates could reduce plant vigor. However, establishment of riparian buffers, improvements to 63 acres of wetlands, and development of an undetermined amount of wetlands from streambank stability and improved stream morphology in riparian areas are expected to offset these impacts. Reconverting developed areas back to wetlands and forested areas will improve floodwater storage and potentially provide enhanced water quality treatment. Water quality treatment will be provided at a level sufficient for compliance with the 2004 WSDOT *Highway Runoff Manual* (WSDOT 2004).

3.4.5 Screening Criteria Analysis

This section provides more detail on the screening criteria introduced in Chapter 2.

Endangered Species Act (ESA)

The Biological Studies prepared for the TIER II EIS identified eight species of plants and animals that potentially qualify for protection under the Endangered Species Act (ESA). The environmental screening criteria measure applied in the Tier II EIS is based on the likelihood that the project would affect ESA protected species.

Table 3.4-8 shows protected species and critical habitat that may occur in the study area.

Table 3.4-8: Listings for ESA Species and Critical Habitat within the Action Area

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS
Bald eagle	*Haliaeetus leucocephalus*	Threatened
Marsh Sandwort	*Arenaria paludicola*	Endangered
Golden Paintbrush	*Castilleja levisecta*	Threatened
Water Howellia	*Howellia aquatilis*	Threatened
Chinook Salmon	*O. tshawytscha*	Threatened
Chinook Salmon Critical Habitat		Proposed
Bull Trout	*Salvelinus confluentus*	Threatened
Bull Trout Critical Habitat		Proposed

Aquatic Priority Habitat and Life

This criterion rates impact using the area of stream/creek plus buffer (riparian) habitat likely to be affected by the project and options and the number of priority species potentially using the impacted area. Riparian zone was estimated as a 50-foot buffer along any impacted stream bank. This presents a worst-case scenario, as no actual riparian zone in the study area is that wide.

The weighted impacts (in acres) for the Valley Avenue Interchange were 2.85 acres for this criterion. The weighted impacts for the Freeman Road and Valley Avenue Realignment options were 3.60 and 1.70, respectively (Table 3.4-9). As described in Chapter 2.0, although the Valley Avenue Interchange option has slightly more impacts in this criterion, it results in the least amount of new impervious surface. Although the Valley Avenue Realignment option has the least amount of aquatic priority habitat impacts, it has the most wetland impacts. The overall scoring of each alternative was very similar.

Wildlife Habitat

The relative impact of the project options on wildlife habitat depends upon the amount of habitat affected, and whether or not it requires mitigation. Table 3.4-9 shows the weighted wildlife habitat impacts for intersection options. As described in Chapter 2.0, although the Valley Avenue Interchange option results in the highest amount of wildlife habitat impacts, the habitat is primarily agricultural and provides limited habitat connectivity value for the surrounding forested and riparian habitats (Figure 3.4-13). The Freeman Road option would create a barrier between future RRP areas at Valley Avenue and Surprise Lake Drain.

Table 3.4-9: Environmental Screening Scores for Habitat (Weighted Impacts [acres])

Interchange/ Option	Aquatic Priority Habitat and Life	Wildlife Habitat
54th Avenue		
Loop Ramp	0	3.24
Half Diamond	0	3.76
Valley Avenue		
Freeman Road	3.60	33
Valley Avenue	2.85	38.6
Valley Avenue Realignment	1.70	25
SR 161		
Urban	0	1.68
Low Diamond	0	2.64
Medium Diamond	0	2.64

3.4.6 Regulations and Permit Requirements

Current laws affecting fish and wildlife include NEPA, the ESA, the Federal Fish and Wildlife Coordination Act, the Magnuson-Stevens Act, the State Environmental Policy Act, MBTA, HPA, the Salmon Recovery Planning Act,

and the Salmon Recovery Funding Act. Terms and conditions from the ESA Biological Opinion will be incorporated as Tier II commitments in the Record of Decision. Other legislation would be addressed in the process of complying with wetland and water resources regulations (see Sections 3.2, Water Resources, and 3.3, Wetlands). All pertinent laws will be considered and complied with during further design and construction.

3.4.7 Indirect Impacts

Color aerial photos taken in June 2002 by the USGS were used to interpret the extent of recent development within the project area (TerraServer 2004). The geographic boundary considered when addressing indirect impacts for the project includes the area up to 0.5 mile from the ROW boundaries of the intersection options.

Indirect impacts including development and associated impacts to wildlife, fish, T&E species, and their habitats are assumed to be the result from new direct local access provided by the proposed project. Indirect impacts are discussed for each basin and interchange below.

Hylebos Sub-Basin

- **SR 509 / SR 167 Connection**. Indirect impacts to wildlife, fish, and T&E species within the vicinity of the proposed SR 509 / SR 167 connection are not expected. The area within 0.5 mile of the proposed connection is generally developed.

- **54th Avenue East Partial Interchange**. The 54th Avenue East interchange is expected to provide direct local access that could promote development and result in some indirect impacts to wildlife, fish, and T&E species. Within 0.5 mile of the interchange are some wetlands mapped by WSDOT (1998) and the Hylebos Creek floodplain. However, much of this area is already developed, has direct local access from I-5, and the land use is predominantly industrial. As part of the proposed project, 8th Street East, east of SR 167, would be closed, thus limiting local access somewhat in this case.

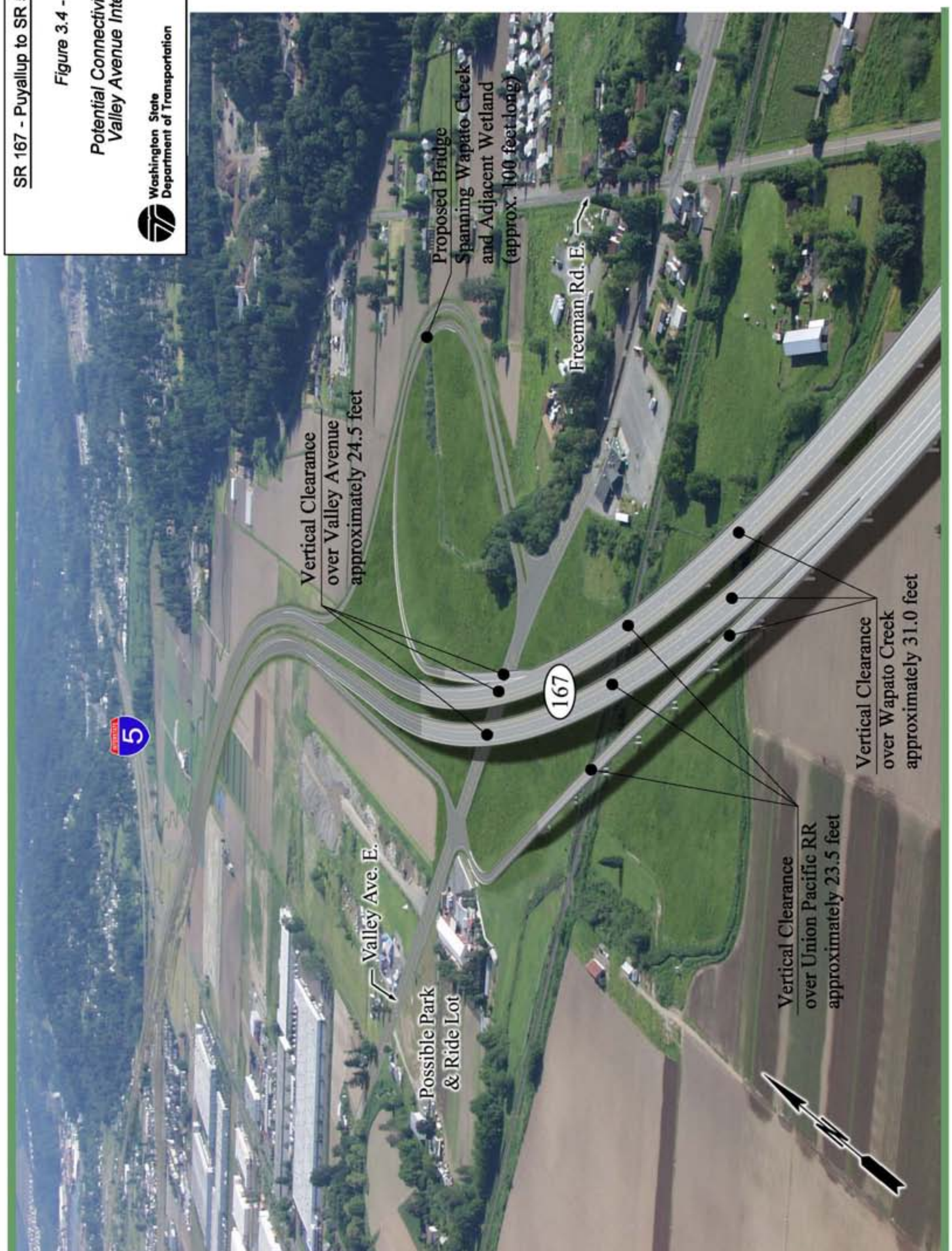
- **Interstate 5 Interchange**. Indirect impacts to wildlife, fish, and T&E species within the vicinity of the proposed I-5 interchange are not expected because no direct local access will result. Approximately 29 acres along the Surprise Lake Drain (a tributary to Hylebos Creek) just north along Freeman Road would also be acquired in FHWA and WSDOT's proposed 116-acre Hylebos Creek Riparian Restoration Area. The effect of restoring undeveloped uplands and wetlands to riparian habitat should result in a net environmental benefit that would not result from the No Build Alternative.

SR 167 - Puyallup to SR 509 Tier II FEIS

Figure 3.4 - 13

Potential Connectivity Barriers Valley Avenue Interchange

Washington State Department of Transportation



Wapato and Lower Puyallup Basins

- **Valley Avenue Interchange**. The Valley Avenue interchange is expected to provide direct local access that could promote development and result in some indirect impacts to wildlife, fish, and T&E species. Wetlands mapped in the area are generally associated with Wapato Creek, which is protected under Fife's Critical Areas Ordinance. Indirect effects to isolated wetland habitat in the area could result if not for the fact that FHWA and WSDOT are proposing to acquire 73 acres in the vicinity of Valley Avenue and Freeman Road as part of the Wapato Creek Riparian Restoration Area.

- **SR 161 / SR 167 Interchange**. Indirect impacts to wildlife, fish, and T&E species within the vicinity of the proposed SR 161 / SR 167 interchange are not expected. The area within 0.25 mile of the proposed interchange is generally developed.

The proposed project, by substantially improving travel and accessibility, may serve to accelerate planned development along the proposed corridor, especially in the vicinity of new freeway interchanges. Some indirect impacts to wildlife, fish, and T&E species related to development in the vicinity of the proposed interchanges could likely result. The Build Alternative may speed up the rate of development in the area. Based on historic trends, additional development is likely to result in loss of upland, riparian, and wetland habitat.

The magnitude of indirect impacts to species and habitat is unknown. Increased impacts from noise and light are expected for habitat in close proximity to the proposed roadway. Increased light and noise can affect wildlife behavior and species composition. However, wildlife currently using habitat in the project area would appear to have become tolerant of disturbance.

Under the Build Alternative, market forces, economic conditions, the availability of suitable land and adequate utilities and public services, would continue to be major factors in determining the rate of growth and development. Through the growth management process, local and regional jurisdictions have planned for future growth within the study area by defining the location and allowable intensity (density) of growth and development within, and adjacent to the project area. The Build Alternative would likely accelerate the planned transition of the North Fife area from residential/agricultural to industrial/commercial use and the Fife/Puyallup valley from agricultural/vacant to mixed commercial-residential and industrial.

The indirect effect of the Build Alternative may be considerably less than the indirect effect associated with commercial, industrial, and residential development under the No Build Alternative because the environmental mitigation would likely be more extensive and more successful than under the No Build Alternative. Unlike the No Build Alternative, the Build Alternative would provide substantial high quality wetland, stream, and riparian restoration from existing habitats that are substantially disturbed. The scope and scale of habitat proposed to be restored or enhanced at one or more of the potential wetland mitigation sites will be a substantial benefit to wildlife in the area. The realignment and associated benefits from riparian restoration at Hylebos Creek,

Wapato Creek, and Surprise Lake Drain may not otherwise occur. Finally, WSDOT owns, maintains, monitors, and ensures success of their mitigation sites, which according to Johnson et al. (2002) has not been the case for private developers.

The RRP would convert a substantial area of agricultural lands, zoned for industrial and commercial development, into riparian areas and wetlands, which would be protected from development. The wetland mitigation, stream mitigation, and riparian restoration offer opportunities to connect to other habitat restoration projects occurring in the Puyallup River valley. The establishment of a large, contiguous block of riparian restoration area that links to adjacent habitat and restored areas such as the Milgard site will likely increase the overall effectiveness of mitigation efforts in the basins and encourage future restoration efforts in the vicinity.

3.4.8 Cumulative Impacts

The environmental conditions and direct impacts on wildlife, fish and T&E Species from this project are identified in the previous sections. The geographic boundary for impact analysis generally includes the habitat adjacent to the project footprint within the Urban Growth Area for Pierce County. However, areas outside of the Urban Growth Area which drain to the lower Puyallup River, Hylebos Creek, and Wapato Creek likely contribute to the cumulative impacts on water quality and quantity in these systems. Cumulative impacts to water quality are described in greater detail in the *Water Quality Discipline Report* (2005). The temporal analysis spans from 1996, when quantitative data could be obtained, to expected changes resulting from planned development through 2030.

Cumulative Impacts Evaluation

Trends

Land use in the Puget Sound lowlands has resulted in the conversion of over 50 percent of the area from natural vegetation to other types of groundcover (concrete, asphalt, and non-native vegetation) (WDNR 2003). Much of the remaining habitat has experienced qualitative changes to habitat such as soil compaction, hydrologic changes, and non-native weed proliferation. Spatial pattern shifts have reduced habitat patch sizes and increased the distance between patches. This fragmentation isolates remnant species and decreases the chances of long-term survival (WDNR 2003). Approximately 50 percent of wetlands along major rivers in the Puget Sound lowlands have been lost due to development and other land use activities (Ecology 1997). It was estimated that 100 percent of the Puyallup River's historical wetlands have been lost due to commercial and residential development. Commencement Bay, once a highly productive estuarine environment, has lost in excess of 98 percent of its historical intertidal and subtidal habitat (Kerwin 1999).

The analysis area has experienced substantial change from historic conditions (pre-European settlement). Broad scale removal of LWD, riparian clearing, culverting streams, channelization and diking for flood control, forest clearing and wetland draining for agriculture; impervious surface creation associated with

transportation corridors and commercial, industrial, and residential development; and the introduction of non-native species, are primary factors resulting in wildlife, fish, and T&E species habitat removal and degradation in the study area. These actions have also reduced the range, viability, and/or health of populations and species. As previously described in Section 2, wetlands, streams, and other habitats in the study area are generally considered degraded or not properly functioning.

Several organizations are involved with planning and implementing habitat restoration projects in the project study area. These organizations include local governments, the Puyallup River Watershed Council, and the Pierce County Conservation District, and citizen groups such as the FOHW. These organizations are responding to the declining conditions in the basin. In 1991, King County completed a Hylebos Creek basin plan that described actions that could be taken to control flooding and restore habitat. The City of Federal Way has constructed four regional stormwater detention ponds and implemented project to stabilize the stream channel and replant native vegetation. These projects have solved much of the flooding problems in the West Branch and improved water quality.

In the East Branch of Hylebos Creek, King County has strengthened slopes that were eroding into the creek, constructed stormwater control facilities, improve fish passage, and replanted native vegetation. FOHW is also facilitating the restoration of the Hylebos through projects that restore LWD, native plants, weed control, and bank stabilization. FHWA and WSDOT continue to coordinate with the FOHW as plans for mitigation of the project impacts are developed.

Pierce County developed a biodiversity plan that identifies a network comprised of core biodiversity management areas (BMAs) and BMA connecting corridors. The intent of the plan is to better incorporate a biodiversity planning methodology into their long-range open space plans and land use regulations.

To avoid and minimize impacts to wildlife, fish, and T&E Species from the SR 167 and other future development, Pierce County also developed a Habitat Protection and Regulatory Package. The regulations contain a new critical fish and wildlife chapter which adds additional species and habitat types to be regulated, a new habitat assessment process, and standards for development within critical fish and wildlife habitat areas. The required buffers for riparian areas were changed to a fish and non-fish system. Required buffer distances along riparian areas, lakes, ponds, and Puget Sound marine waters have generally been increased based upon best available science on the functions and values of elements within these environments. Incorporated areas of Pierce County (cities of Fife, Milton, Puyallup, Edgewood, and Tacoma) have critical areas ordinances in place that provide protection to wetlands, streams, and other sensitive areas. FOHW recently developed the Hylebos Creek Conservation Initiative that identifies areas for acquisition and/or restoration to connect stream and streamside habitats throughout the Hylebos Basin. Completion of the initiative would result in a 740-acre riparian reserve of protected stream and wetland habitat including more than 10 miles of Hylebos Creek. The RRP for Hylebos Creek associated with the Build Alternative is a key element for restoring stream and wetland habitats.

Some of the wetland and riparian restoration projects currently planned in the vicinity of the proposed SR 167 Extension Project include:

Hylebos Basin

- **Lower Hylebos Nature Park (Jordan Site)**. The City of Fife in cooperation with the Commencement Bay Natural Resources Trustees is developing a 15.3-acre stream and wetland restoration project adjacent to Hylebos Creek.

- **Spring Valley Ranch**. As mitigation for the I-5 HOV-lane construction project from Port of Tacoma Road to the King-Pierce County Line, WSDOT acquired in late 2004 a 27-acre site along the West Branch of Hylebos Creek. FHWA and WSDOT are working with project partners to develop a restoration plan for this site.

Lower Puyallup Basin

- **Frank Albert Site**. The Puyallup Tribe of Indians in cooperation with the Commencement Bay Natural Resources Trustees are developing a 20-acre intertidal freshwater off-channel wetland next to the Puyallup River.

- **Gog-Le-Hi-Te Expansion**. The Puyallup Tribe of Indians is developing plans to expand the existing Gog-Le-Hi-Te site by approximately 9 acres. The site is connected to the Puyallup River.

Vegetation

A variety of plant communities occur within and adjacent to the project boundary and were previously described. Because this area is zoned as urban industrial, many of the plant communities will be displaced or converted. The specific acreage that will be converted is not known at this time as the actual footprint and landscaping of planned development is not consistently available. In addition, road projects and development related to the Port of Tacoma expansion will result in the conversion of vegetative communities. The remaining isolated patches of native vegetation will be subject to noxious weed invasion. The RRP will result in long-term protection of 189 acres of riparian and wetland habitat in the study area. Native riparian plantings will replace some areas largely dominated by invasive weed species, which offer diminished habitat value for fish and wildlife. Native vegetation will improve shelter and food sources for wildlife species and will offer long-term benefits to fish habitat as the tree plantings mature. Proposed wetland mitigation can result in additional restoration and protection of wetland habitat (Port of Tacoma 2004).

Wildlife and Fish

Habitat in the immediate vicinity of the proposed corridor is primarily large blocks of abandoned agricultural lands and shrub lands, with limited riparian corridors along Wapato and Hylebos Creeks and some vegetative communities within developed areas. The continued impact to wildlife could include disturbance mortality, road avoidance, movement impairment, increased animal-vehicle collisions, light and glare impacts, and noise disturbance. Impacts on fish

could include disturbance mortality, avoidance, and water quality degradation from stormwater runoff.

In addition to the operational impacts, construction impacts to fish and wildlife could include loss of connectivity between habitat locations, changes in wetlands and other aquatic habitat from water quality degradation, and altered hydrology including increased stormwater volumes, and altered hydrology. Noxious weed species invasions could also increase in the project area. While specific site impacts are difficult to quantify at this level of detail, information on land use change is presented to provide a comparison of impacts.

Both operational and construction changes would result in a higher likelihood of moving fish and wildlife species from their current habitat to other functional habitat which may be occupied by the same or other species. This would increase competition for forage species, nesting/breeding sites, and migration corridors. Increasing densities in a given location can result in reduction in species populations through easier spread of disease, injury caused by aggressive behavior, or forcing animals into marginal habitat. Animals forced into marginal habitat experience lower productivity, higher levels of disease, and increased, sometimes deleterious, intra-and inter-species competitive interactions due to limited resource availability.

The ability to incorporate effective stormwater water quality treatment and flow control measures in densely developed or rapidly developing areas is hampered by the limited available undeveloped land to use for potential mitigation or restoration areas. Restoring degraded riparian areas can result in substantially improved hydrologic conditions; however, the RRP is not expected to completely offset impacts of other development that is likely to occur within the study area within the 2030 timeframe (PSRC 2001). Even with implementation of standard water quality treatment and flow control measures for all new development, increases in summer stream temperatures and toxicants are likely to result in further degradation of water resources if it is not combined with other measures such as riparian restoration. This is expected to be a substantial adverse cumulative effect on salmonids and the Western pearlshell mussel. Metals contamination in sediments tends to increase once impervious surface in an urbanized watershed approaches 40 percent (Horner and May 1997). When impervious surface exceeds 50 percent pollutant concentrations tend to rise rapidly with substantial deleterious impacts to biota. Thus it is expected that at the point this threshold is met in WRIA 10, the cumulative impacts to biota will be substantial.

In natural watersheds where forest cover persists and forest duff provides adequate storage of precipitation, a subsurface-flow hydrologic regime is dominant (Horner and May 1997). Development typically removes this absorbent layer and canopy layer, compacts the underlying soil, and exposed underlying till, resulting in lost interception storage and evapo-transpiration potential (Horner and May 1997). Urbanization also affects watershed drainage in the winter by increasing impervious surface which in turn reduces the ability of stormwater runoff to infiltrate into the soils thereby increasing runoff volumes such that erosion and sedimentation impact natural stream morphology (typically first-order or ephemeral). Increased road crossings, channelization of streams,

and stormwater outfalls further contribute to water quantity and quality impacts (Horner and May 1997).

Despite the effort to manage biodiversity and minimize impacts to sensitive areas, it can be expected that there will be some decline in ecological function in the study area due to the conversion of existing forested, agricultural, and vacant land to urban development (commercial, industrial, transportation). The continued loss of ecological function will be offset to some extent through compensatory mitigation. The effectiveness of mitigation could be maximized through a coordinated effort to restore wetland and riparian habitat in the study area. Most federal, state, and local regulations advocate the maintenance of much of the existing ecological function in the study area through impact avoidance, minimization, and mitigation. However, movement towards historic conditions will best occur through coordinated, large-scale restoration planning and implementation.

The incremental effect to wildlife, fish, and T&E species from this project along with other land use effects and transportation improvement projects in the region (i.e., Canyon Road extension project and Valley Avenue reconstruction project) would increase the rate of build out for high-density uses within the project area. The conversion to higher intensity land uses is consistent with and supports the policy framework for future development as identified in the comprehensive plans and development regulations adopted by valley jurisdictions (Fife and Puyallup).

Most of the land to be used for stream and wetland mitigation and riparian restoration is being farmed within urbanizing areas. The majority of which is in the city limits of the city of Fife. Both the cities of Fife and Puyallup have determined that the highest and best use of the property located within the project area is commercial or industrial use and has zoned the land as such. The jurisdictions feel that these designations are a large part of its growth, tax base, and allure for development, which will contribute more to the economy than the current farming use. The urbanization of the surrounding area, particularly within the city limits of Fife has made it hard for farmers economically farm in this area. Even under the No Build Alternative it is expected that the impacted farmland and its associated wetlands would convert to long-term commercial/industrial uses.

Riparian conditions are strongly influenced by the surrounding level of development (Horner and May 1997). Wide riparian buffers do not typically occur in urbanized watersheds. However, the riparian buffers greatly influence the environmental conditions in stream ecosystems. Wide, continuous, riparian buffers and wetlands, if maintained, appear to substantially mitigate some of the adverse effects of development. Instream LWD, which provides habitat for salmonids and juvenile freshwater mussels and flow mitigation, cannot be maintained if an intact riparian buffer is not in place. Critical Areas regulations provide some measure of protection to riparian buffers. However, in many locations within the study area, the riparian buffer is so degraded, it provides minimal function (LWD input, flow control, shade, etc.). Increased development in the study area could further fragment riparian areas, primarily by adding new stream crossing structures or by replacing existing structures with wider ones,

resulting in riparian encroachment. Development will also potentially reduce available restoration areas where floodplain connectivity and forested riparian habitat could be reestablished. Development could also provide restoration opportunities through mitigation and partnership building such as Watershed Planning.

The RRP would result in the restoration and preservation of approximately 189 acres of riparian and wetland habitat. Forested buffers would be established along 4.4 miles of streams within the project area. Approximately 63 acres of existing wetlands would be improved and an undetermined amount of wetlands would be established due to streambank stability and restored hydrology in riparian areas. The restored areas would provide linkage to over 1,450 acres of surrounding riparian and upland habitats. Restoring this large, contiguous area and reconnecting habitats is highly unlikely without a sizeable capital improvement project such as SR 167. This project would provide the resources to achieve broad-reaching restoration goals.

Mitigation for unavoidable impacts to wetlands will consist of wetland creation, restoration, and/or enhancement on one or more potential wetland mitigation sites. These sites were selected due to their location in the watershed, ability to replace lost functions and values, and ability to provide habitat connectivity, among other reasons. Increased channel capacities in Surprise Lake Drain and Hylebos Creek, removal of floodplain fill and existing development, and restoration of riparian hydrology, will improve floodplain storage. Wetland and riparian restoration is expected to provide some level of contaminant filtration, stormwater infiltration, aquifer recharge, and hyporheic flow. The restoration and mitigation areas will exhibit long-term improved habitat conditions for fish and wildlife (described in previous sections), providing refuge as surrounding areas continue to develop.

Increased pressure for growth along major transportation corridors with the Urban Growth Area should relieve pressure and minimize adverse impacts on the rural areas that contain the most functional fish and wildlife habitat.

Threatened and Endangered Species

Land use changes have impacted the biological processes necessary for the natural production of salmon and trout in the Puyallup River Basin. Existing habitat conditions for the Puyallup River, Hylebos Creek, Wapato Creek and Surprise Lake Drain and the species that likely use this habitat are described in Section 3.2, Water Resources.

The Puyallup and White Rivers are the only source population of Bull Trout in lower Puget Sound. Based on information gathered at the Corps of Engineers fish trap on the White River near Buckley, the average for the years from 1987 to 2002 is 27 fish. Historically, 693 bull trout were trapped by the Washington Department of Fisheries on the bypass leading from the screens to the White River in 1953. Total abundance for this subpopulation is believed to be less than 5,000 individuals or 500 adults. Based on research by Rieman and Allendorf (2001) it appears that these low numbers are likely threatening the genetic variation of the lower Puyallup subpopulations, which can lead to inbreeding. This research concluded that an average of 1,000 adults spawning annually

would be necessary to maintain genetic variation indefinitely. Inbreeding of small populations can lead to an accelerating decline toward extinction (Soulé and Mills 1998).

Development in the study area is expected to continue to degrade foraging, migration, and wintering habitat for bull trout prey species. The loss of prey may negatively impede bull trout recovery. However, the primary factors limiting the species recovery in the Puget Sound region are habitat degradation and habitat access. Bull trout spawning habitat occurs upstream of the study area and is not expected to experience cumulative impacts from the project. Bull trout migration will not be interfered with, other than potential temporary disruption associated with any in-water work in the Puyallup River.

Some project actions are likely to result in habitat improvement. While no fish passage barriers were identified within the proposed alignment for the build alternative, all impacted culverts will be replaced with structures designed in accordance with Fish Passage Design at Road Culverts. This will provide for a more natural stream environment. The RRP is expected to provide infiltration potential for roadway-generated stormwater runoff. Infiltration represents Ecology's preferred method of flow control. Restored riparian vegetation and wetlands is expected to filter pollutants from stormwater runoff. On-going and planned restoration efforts on Hylebos Creek are expected to increase suitable over-winter habitat and rearing habitat for bull trout prey (juvenile salmonids). Chinook salmon will experience similar cumulative impacts as non-listed fish species. The RRP and proposed wetland mitigation are expected to provide long-term improved habitat conditions for Chinook salmon.

Low numbers of wintering bald eagles currently use portions of the study area for foraging. Increased development leads to increased levels of disturbance, which could affect potential foraging areas. Bald eagle foraging primarily occurs along the Puyallup River and occasional use along Hylebos Creek during salmon spawning is possible. Due to the prevalence of developed conditions within the study area, increases in noise and disturbance are not expected to have an impact on foraging eagles. On-going and planned restoration efforts on Hylebos Creek, including proposed riparian restoration associated with the project, are expected to improve riparian corridors, eventually provided suitable bald eagle perch trees and potentially suitable nest trees. The proposed riparian restoration plan will also improve floodplain connectivity and allow farmed wetlands to return to a more natural state. Such improvements could attract higher numbers of waterfowl, bald eagle prey, to the study area. Riparian restoration will also provide future perching trees and foraging habitat for bald eagles. Habitat improvements are expected to benefit bald eagle prey species including waterfowl and salmonids.

In summary, the most notable cumulative effects on wildlife, fish, and T&E species include increases in summer stream temperatures and toxicants, conversion of existing habitats (forested, agricultural, vacant land), hastened build out of high-density uses, further fragmentation of riparian and other habitat areas, and a reduction in available mitigation and restoration areas. The RRP will restore and protect a large area of riparian and wetland habitat, connect over 1,450 acres of riparian and upland habitat, and improve stream habitat conditions

in Hylebos and Wapato Creeks and Surprise Lake Drain. However, the RRP is not expected to completely offset cumulative impacts. The degree of cumulative impact minimization is largely dependant on successful coordination of large-scale restoration planning and implementation and the availability of mitigation and restoration sites in the future.

3.4.9 Determination of Effects on Threatened and Endangered Species

The preceding discussion and analysis contains a considerable amount of information describing impacts, both direct and cumulative, to both T&E and non-T&E species. The U.S. Fish and Wildlife Service and NOAA Fisheries primary concern are T&E species. The following discussion focuses on T&E species and the potential effect on them attributed to the project.

Table 3.4-10 shows Threatened and Endangered Species and critical habitat that may be affected in the study area as well as a preliminary determination of effects. As can be seen, only Chinook salmon, Bull Trout, and their respective habitat is potentially or likely to be adversely affected. The other species of plants (Marsh Sandwort, Golden Paintbrush, and Water Howellia) and the Bald Eagle will not be effected. The reasons why these species are either affected or not affected are given following Table 3.4.10.

Table 3.4-10: Determination of Effects on Threatened and Endangered Species

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	EFFECT DETERMINATION
Bald eagle	*Haliaeetus leucocephalus*	Threatened	NLTAA
Marsh Sandwort	*Arenaria paludicola*	Endangered	NE
Golden Paintbrush	*Castilleja levisecta*	Threatened	NE
Water Howellia	*Howellia aquatilis*	Threatened	NE
Chinook Salmon	*O. tshawytscha*	Threatened	LTAA
Chinook Salmon Critical Habitat		Proposed	LTAA
Bull Trout	*Salvelinus confluentus*	Threatened	LTAA
Bull Trout Critical Habitat		Proposed	LTAA

NE = No Effect NLTAA = Not Likely To Adversely Affect
LTAA = Likely to Adversely Affect

Note: The above table and following information was summarized from the project Biological Assessment (BA) dated September 2005 and subsequent consultation with U.S. Fish and Wildlife Service and NOAA Fisheries. Some of the data in this FEIS may differ from what was reported in the BA because of the subsequent consultation.

T&E Plants

Marsh sandwort, although historically documented in Pierce County, is assumed extirpated from the State of Washington. Therefore the project will have "no effect" (NE) on marsh sandwort.

Currently, populations of golden paintbrush are not documented in Pierce County. The golden paintbrush typically exists in native prairie habitat. Pockets of native prairie habitat exist south of the project area in Pierce County. However, none of these areas are within 10 miles of the project area, therefore, native prairie habitat will not be impacted by the proposed project and the project will have "no effect" (NE) on golden paintbrush.

Water howellia occurs within Pierce County at Fort Lewis, in ephemeral ponds associated with Oregon ash (*Fraxinus latifolia*) trees. Ephemeral ponds suitable for water howellia will not be impacted by the project, therefore the project will have "no effect" (NE) on water howellia.

T&E Mammals

No known Threatened and Endangered (T&E) species of mammals are known to exist in the project area.

T&E Birds

Bald Eagle

The proposed project may affect, but is **not likely to adversely affect (NLTAA)** bald eagles. This project **may affect** bald eagles because foraging bald eagles occur along Hylebos Creek and the Lower Puyallup River within the project area.

This project is not likely to adversely affect bald eagles because:

- no nesting or roosting habitat will be impacted;
- only low numbers of wintering eagles occur in the project area;
- the project will likely improve foraging areas within the project area along Hylebos Creek with the RRP;
- suitable foraging areas with lower disturbance levels are available in the project vicinity;
- the nearest nest is approximately 1.6 miles from the project area;
- impacts to prey habitat will be minimized.

Due to riparian habitat improvements related to the RRP, the project will have a beneficial effect on bald eagles by increasing available perching and nesting habitat in the long-term, and by improving in-stream habitat for salmonids (potential bald eagle prey).

T&E Fish

Review of existing literature and data, results from the field investigation, and interviews with experts indicate that rearing Puget Sound Chinook salmon may be present in the action area throughout the year. Migrating anadromous bull trout may also occur in the action area throughout the year.

Chinook Salmon

The proposed project may affect, and is **likely to adversely affect (LTAA)** Chinook salmon. This determination is based on the following:

- Pier placement may occur in potentially suitable spawning habitat.
- Juvenile Chinook salmon potentially occur in the Puyallup River throughout the year and fish handling may be necessary.
- In-water work, including pile driving and potential dewatering, is proposed in the Puyallup River and Hylebos Creek, which may result in harm and behavioral disruption to the species.

Chinook Salmon Critical Habitat

The project is **likely to adversely affect (LTAA)** Chinook salmon critical habitat because:

- the project could possibly affect some critical habitat Primary Constituent Elements (PCE).

Bull Trout

The proposed project may affect, and is **likely to adversely affect (LTAA)** bull trout. This determination is based on the following:

- Migrating anadromous bull trout potentially occur in the Puyallup River throughout the year and fish handling may be necessary.
- In-water work, including pile driving and potential dewatering, is proposed in the Puyallup River that may result in harm and behavioral disruption to the species.

Bull Trout Proposed Critical Habitat

The project is **likely to adversely affect (LTAA).** bull trout critical habitat because:

- the project could possibly affect some critical habitat PCEs.

Summary of Determination of Effects

In summary, the preliminary effect determination is that the proposed SR 167 project is not expected to jeopardize the continued existence of any federal or state threatened or endangered species, and will not result in the destruction or adverse modification of critical habitats. This determination is based on the information contained in the Biological Assessment (BA) and close and consistent coordination with both U.S. Fish and Wildlife Service and National Marine Fisheries Service (collectively referred to as the Services). FHWA and WSDOT submitted the BA to the Services in September 2005. Since the BA submittal, FHWA and WSDOT have worked collaboratively with the Services,

providing several supporting documents to assist with the development of the Biological Opinion (BO). This process is nearing completion.

During the Consultation process, several issues of concern were resolved to the Services' satisfaction. These included indirect and cumulative impacts, stormwater pollutant loading, and in-water pile driving. The Services initially indicated that the indirect and cumulative impacts needed further clarification. Working with the Services, WSDOT and FHWA resolved this issue to the Services' satisfaction. A collaborative process was also used to address stormwater issues, particularly the development of performance standards for the treatment of stormwater. Pollutant loadings and concentrations at certain levels can harm or injure fish. This has been an issue on most projects, and has been resolved at the statewide program level through an agreed to Interim Stormwater Guidance document. A third issue requiring considerable attention was the effect of pile-driving on the Chinook and Bull Trout. Sound pressure, at certain threshold levels, can harm and injure these species. Conservation measures such as the use of bubble curtains to attenuate sound pressure will be used.

Consultation is nearing completion and a limited number of outstanding issues remain. However, none of the outstanding issues are expected to cause changes to the preferred alternative. For example, an issue involving an underground arsenic plume from the nearby B&L Woodwaste site is still under discussion with the Services. This waste site is not within the project area, nor is the clean-up of the arsenic contamination WSDOT's responsibility. However, WSDOT is currently working with Ecology and the Services to develop a plan to avoid and/or minimize any impacts to T&E species within the project corridor that could be attributed to arsenic contamination from the B&L Woodwaste site.

The project includes performance standards and multiple measures that will minimize adverse effects to Chinook salmon, bull trout, and their critical habitats. However, adverse effects are still anticipated. Take, in the form of harm and harassment, may occur to individual Chinook salmon and bull trout. Therefore, the project "may affect and will likely adversely affect" Puget Sound Chinook salmon and Coastal/Puget Sound bull trout. The project impacts are expected to affect low numbers of individual Chinook salmon and bull trout, and will not impact the sub-populations as a whole. Therefore, the survival and recovery of the entire listed species in the wild will not be jeopardized by this project. Likewise, the project impacts will affect small portions, but multiple Primary Constituent Elements of designated Chinook salmon and bull trout critical habitat. Therefore, the project "may affect and will likely adversely affect" Puget Sound Chinook salmon and Coastal/Puget Sound bull trout critical habitat. However, it will not destroy the conservation value of the entire critical habitat units. Therefore, the project will not destroy or adversely modify Chinook salmon and bull trout critical habitat.

The formal and final determination of effects will be made with the issuance of the Biological Opinions. It is expected that the final Biological Opinion will be completed by the Services before the project Record of Decision is issued.

3.4.10 Mitigating Measures

Mitigation involves avoiding impacts, then minimizing impacts, and finally compensating for unavoidable impacts. The development of the Tier I EIS and the selection of the current corridor was the first step in the avoidance of impacts. The selected corridor has the least impacts. As the project within the corridor develops, individual design actions will be taken to further avoid and minimize impacts to various resources including habitats and species. It is not possible to avoid all impacts and still meet the purpose and needs of the project.

Some habitats, such as wetlands, are easily quantified with regard to direct impacts and are regulated at local, state, and federal levels. Most jurisdictions have defined compensation ratios for wetlands whereas other habitats are not regulated as such.

Section 7 consultation was initiated with the Services. The commitments to the necessary performance measures and terms and conditions of the Biological Opinion will be included in the Tier II Record of Decision. During design WSDOT and FHWA will continue to use all practicable means to minimize impacts to habitats. These efforts may include, but not be limited to using retaining walls (to prevent fill from entering aquatic habitats), using structures to avoid impacts, and refining the alignment by making additional minor shifts to avoid or minimize impact to wetlands or other important habitats.

As noted, wetlands are generally more strictly regulated than other wildlife habitat types. To mitigate unavoidable wetland impacts, creating wetlands is proposed on at least one of ten potential sites identified. There will be no net loss of wetland function or area from the proposed project. Through the project design, impacts to wetlands and streams was avoided or minimized to the greatest extent possible. The alignment was shifted away from Hylebos Creek north of I-5. The alignment necessitates the relocation of a reach of Hylebos Creek and Surprise Lake Drain. FHWA and WSDOT are proposing to mitigate for these impacts by designing a more natural, meandering channel for the relocated streams. The proposed relocations of Hylebos Creek and Surprise Lake Drain are described as part of the RRP in Section 3.4.

Based on the size and scope of the proposed project, there will be some unavoidable loss of plants and animals due to site preparation, roadway construction, and operation. Measures can be incorporated into the design of the proposal related to landscaping, soil retention, site rehabilitation and habitat restoration that will help minimize the impacts to wildlife and wildlife habitat.

The project will contribute to the existing fragmented nature of grassland/shrub and agricultural habitat and could continue to fragment riparian habitat. Due to the location of existing forested habitat fragments, the project would have little effect on forest habitat that is currently linked. The RRP would result in corridor linkage from upper to lower reaches of Hylebos and Wapato Creeks and Surprise Lake Drain. Potential wetland mitigation sites would provide additional linkage between the RRP areas. The addition of low-cost wildlife crossings and the use of oversized culverts, will be considered at appropriate locations.

Preservation of vegetation will decrease the impacts of project construction, and existing native plants and trees will be preserved provided roadway clear zone and sight distance requirements are met. Trees and shrubs, when present adjacent to the alignment, will be preserved wherever possible for esthetic value. Vegetation buffers will also offer wildlife physical protection from human disturbance. Landscaping with native species will mitigate habitat losses in the alignment right of way as vegetation matures.

Vegetated areas adjacent to streams (riparian corridors) are of relatively greater importance to wildlife than equivalent areas of vegetation not associated with water. Riparian sites in the project area are of particular importance to wildlife because surrounding lands are typically urban or agricultural parcels with little valuable wildlife habitat. Riparian areas should be protected from disturbance during project construction and operation through implementation with BMPs and compliance with buffer requirements established by the appropriate jurisdictions. Potential impacts to streams crossed by the corridor should be avoided by constructing bridges over the streams and adjacent riparian wetlands and placing bridge supports in upland areas wherever practicable. Replacement of existing undersized culverts with culverts or bridges sized to sustain ecological processes where feasible would have a positive benefit to both fish and wildlife.

Pollution to wetlands and stream courses associated with road runoff will be minimized through the use of vegetated biofiltration swales, wet ponds, constructed wetlands, and other BMPs. The emergent plant species typically used in vegetated swales aid in sediment and chemical pollutant retention. The project design will include drainage features that incorporate best available technology as a part of best management practices and implement appropriate stormwater treatment for water quality and quantity as established in the 2004 WSDOT *Highway Runoff Manual* (WSDOT 2004) to minimize impact to wildlife and fisheries.

The MBTA specifies that nesting migratory birds must not be directly impacted from project-related activities. Direct impacts could result if nesting migratory birds were present in the project area during construction. Construction activities will be reviewed to ensure compliance with Federal, State and local wildlife regulations, including MBTA.

In order to ensure the protection of T&E and MBTA species, a biologist knowledgeable in the species of plants and wildlife protected by ESA and the MBTA would survey proposed work areas prior to construction. If any protected species are found, WSDOT would consult with NOAA Fisheries, USFWS, and WDFW as to the best methods to protect and/or relocate them. Monitoring would continue throughout the construction phase to maintain compliance. Also, mitigation designed to offset wetland impacts would benefit migratory birds. Approximately 50 acres of new wetlands would be developed as a result of the proposed project.

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