Appendix E: Action Tables and Maps

Habitat Action Tables

Descriptive tables of habitat actions are presented here. The tables are divided by landscape unit (LU).

Habitat Action Maps

Maps of habitat actions are presented here. The maps include the outlines of each valley-bottom LU, but in many cases the LUs span multiple pages. The action maps are shown from upstream to downstream, with the Cowlitz River first and the Cispus River second. References for the datasets used in the maps are as follows:

- Action Areas (developed by Inter-Fluve);
- Landscape Unit Boundaries (developed by Inter-Fluve);
- Levee and/or Armoring (various sources, including Lewis County data);
- Parcel Boundaries (GIS dataset from Lewis County data);
- Roads (GIS dataset adapted from County data and other sources);
- River Miles (USGS, 2007[1]); and,
- NHD Streams (USGS, 2004[2]).

[1] *U.S. Geological Survey.2007.USGS WDFW River Miles. [Reston, Va.]: U.S. Dept. of the Interior, U.S. Geological Survey. Digitized by Ecology from 7.5 minute 24k topographic quadrangle maps.*
[2] *U.S. Geological Survey.2004.National Hydrography Dataset. [Reston, Va.]: U.S. Dept. of the Interior, U.S. Geological Survey,*

Table 1. Specific actions identified for the Upper Cowlitz River Valley – Muddy Fork LU. See maps for action locations.

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
1	UCMF	Strategic	Enhance floodplain inundation, channel migration, and sediment transport processes by modifying (e.g. removing / setting back) levees and armoring, development, and roadways located within hazard areas caused by debris flow related erosion and avulsions off of Mount Rainier. Would require relocation of infrastructure and features out of flood hazard zone. Would provide secondary benefits of flood hazard reduction to communities.	RL	129.0	131.2	1. Removing impediments to channel migration (e.g., bank armoring, infrastructure and assets) to provide the river with adequate width as it adjusts to the 2006 avulsion; 3. Protecting riparian areas that are functioning well; and, 4. Enhancing tributary habitats (e.g., wood jam installation).	Restoring CMZ would help to restore components of Island Braided channel type that would support highly complex main channel and side-channel spawning and rearing habitat for steelhead, chinook, and coho.	Medium-to-long	Low. Established communities and vacation cabins with significant (though likely inadequate over the long-term) flood protection infrastructure in place.	$$$
2	UCMF	Strategic	Enhance floodplain inundation, channel migration, and sediment transport processes by modifying (e.g. removing / setting back) levees and armoring, development, and roadways located within hazard areas caused by debris flow related erosion and avulsions off of Mount Rainier. Would require relocation of infrastructure and features out of flood hazard zone. Would provide secondary benefits of flood hazard reduction to communities.	RR	125.3	131.0	1. Removing impediments to channel migration (e.g., bank armoring, infrastructure and assets) to provide the river with adequate width as it adjusts to the 2006 avulsion; 3. Protecting riparian areas that are functioning well; and, 4. Enhancing tributary habitats (e.g., wood jam installation).	Restoring CMZ would help to restore components of Island Braided channel type that would support highly complex main channel and side-channel spawning and rearing habitat for steelhead, chinook, and coho.	Medium-to-long	Low. Established communities and vacation cabins with significant (though likely inadequate over the long-term) flood protection infrastructure in place.	$$$
3	UCMF	Enhance and Create	Enhance habitat cover, complexity, and structure in lower Coal Creek where channelization and simplification have impaired instream habitat.	RL	131.2	131.2	4. Enhancing tributary habitats (e.g., wood jam installation).	Restoring habitat structure, cover, and complexity would primarily benefit spawning and rearing for steelhead and coho.	Short	Moderate-to-high. Private downstream of highway and USFS above.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
4	UCMF	Protect	Protect undeveloped and forested parcel within flood hazard zone. Protect via willing landowner agreement, easement, or acquisition.	RL	129.0	129.8	3. Protecting riparian areas that are functioning well.	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate. Mainly one owner, but may be a developer.	$
5	UCMF	Protect	Protect undeveloped and forested parcel within flood hazard zone. Protect via willing landowner agreement, easement, or acquisition.	RR	129.0	129.7	3. Protecting riparian areas that are functioning well; and,	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate. Multiple private parcels and a homeowners association.	$$
6	UCMF	Enhance and Create	Enhance habitat cover, complexity, and structure in lower Lake Creek where channelization, simplification, and timber harvest have impaired instream habitat.	RL	129.0	129.0	4. Enhancing tributary habitats (e.g., wood jam installation).	Restoring habitat structure, cover, and complexity would primarily benefit spawning and rearing for steelhead and coho.	Short	Moderate. Two private parcels.	$

Table 2. Specific actions identified for the Upper Cowlitz River Valley – Packwood LU. See maps for action locations.

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
7	UCP	Strategic	Enhance floodplain inundation and channel migration by modifying (e.g. relocating) development and roadways located within the flood hazard zone. Would provide secondary benefits of flood hazard reduction to communities.	RL	126.4	129.2	1. Removing impediments to channel migration (e.g., bank armoring, infrastructure and assets) and reconnecting the channel to its floodplain (e.g., selective grading to lower and revegetate floodplain surfaces); 3. Managing riparian forests for the production of trees that are large enough to produce wood that can self-stabilize in the channel;	Restoring CMZ would help to restore components of Island Braided channel type that would support highly complex main channel and side-channel spawning and rearing habitat for steelhead, chinook, and coho.	Medium-to-long	Low. Established communities and vacation cabins with significant (though likely inadequate over the long-term) flood protection infrastructure in place.	$$$
8	UCP	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels. Achieve this by using large apex jams to stimulate sediment aggradation and island formation; and also, via reconnection of side-channels.	Chan	126.4	129.1	1. Removing impediments to channel migration (e.g., bank armoring, infrastructure and assets) and reconnecting the channel to its floodplain (e.g., selective grading to lower and revegetate floodplain surfaces); 2. Kick starting the re-establishment of an island braided channel pattern with the construction of mainstem large wood jams;	Installing large apex jams and creating an island braided system would create pools, enhance margin complexity, help to stabilize spawning gravels, and provide side-channel refugia. These improvements would benefit spawning for Chinook and steelhead; juvenile rearing for Chinook, steelhead, and coho; and adult holding and migration habitat for all salmonids.	Short - Long	Moderate-to-low. Periodic adjacent infrastructure at risk.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
9	UCP	Strategic	Enhance floodplain inundation and channel migration along lower Butter Creek by modifying (e.g. removing / setting back) levees and armoring, development, and roadways located within historical floodplain/CMZ and flood hazard zone. Address incision caused by extensive levee system. Would provide secondary benefits of flood hazard reduction to communities.	RR	128.3	128.3	1. Removing impediments to channel migration (e.g., bank armoring, infrastructure and assets) and reconnecting the channel to its floodplain (e.g., selective grading to lower and revegetate floodplain surfaces); 2. Kick starting the re-establishment of an island braided channel pattern with the construction of mainstem large wood jams; 5. Enhancing tributary habitats (e.g., riparian revegetation).	Addressing levee confinement would help to change straightened and confined high energy and low complexity reach into a meandering stream with pool-riffle and step-pool habitats that would support spawning and rearing of steelhead and coho and possibly chinook.	Short	Low. Heavily developed area protected by existing levees, though may be inadequate during large debris flow events in Butter Creek.	$$$
10	UCP	Strategic	Enhance floodplain inundation and channel migration by modifying (e.g. removing / setting back) levees and armoring, development, and roadways located within flood hazard zones. Would provide secondary benefits of flood hazard reduction to communities.	RR	127.3	128.0	1. Removing impediments to channel migration (e.g., bank armoring, infrastructure and assets) and reconnecting the channel to its floodplain (e.g., selective grading to lower and revegetate floodplain surfaces); 3. Managing riparian forests for the production of trees that are large enough to produce wood that can self-stabilize in the channel; 4. Protecting riparian areas that are functioning well; and, 5. Enhancing tributary habitats (e.g., riparian revegetation).	Restoring CMZ would help to restore components of Island Braided channel type that would support highly complex main channel and side-channel spawning and rearing habitat for steelhead, chinook, and coho.	Medium-to-long	Low. Established communities and vacation cabins with significant (though likely inadequate over the long-term) flood protection infrastructure in place.	$$$
11	UCP	Enhance and Create	Enhance connection to the mainstem and habitat complexity within the abandoned oxbow. If reconnection of UCP-4 occurs, it could be grouped with this area for larger-scale reconnect and restore opportunities.	RR	127.0	127.6	5. Enhancing tributary habitats (e.g., riparian revegetation).	Enhancing connectivity to the mainstem and habitat within the oxbow would enhance fish access to high quality off-channel rearing habitat. Primarily would benefit juvenile rearing and flood refuge for steelhead, coho, and chinook.	Short	High. Forest Service land.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
12	UCP	Protect	Protect undeveloped and forested parcel within low floodplain surface and flood hazard zone. Protect via willing landowner agreement, easement, or acquisition.	RR	126.4	127.0	3. Managing riparian forests for the production of trees that are large enough to produce wood that can self-stabilize in the channel; 4. Protecting riparian areas that are functioning well; and,	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate. Multiple private parcels.	$$
13	UCP	Strategic	Enhance floodplain inundation and channel migration zone connectivity impaired by Packwood Bridge crossing and nearby development and associated floodplain fill, levees, and armoring.	Chan	126.2	126.4	1. Removing impediments to channel migration (e.g., bank armoring, infrastructure and assets) and reconnecting the channel to its floodplain (e.g., selective grading to lower and revegetate floodplain surfaces); 2. Kick starting the re-establishment of an island braided channel pattern with the construction of mainstem large wood jams;	Restoring lateral connectivity would improve habitats including pools, riffles, wood cover, spawning gravels, margin complexity, and off-channel refugia. These improvements would benefit spawning for Chinook and steelhead; juvenile rearing for Chinook, steelhead, and coho; and adult holding and migration habitat for all salmonids.	Medium	Low. Large infrastructure, high cost, multiple landowner and community interests	$$$
14	UCP	Protect	Protect undeveloped and forested parcel within low floodplain surface and flood hazard zone. Protect via willing landowner agreement, easement, or acquisition.	RR	126.4	127.0	3. Managing riparian forests for the production of trees that are large enough to produce wood that can self-stabilize in the channel; 4. Protecting riparian areas that are functioning well;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate. Multiple private parcels.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
15	UCP	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels extending along the Skate Creek alluvial fan. Achieve this by using large apex jams to stimulate sediment aggradation and island formation; and also via reconnection of side-channels.	RR	125.5	126.3	1. Removing impediments to channel migration (e.g., bank armoring, infrastructure and assets) and reconnecting the channel to its floodplain (e.g., selective grading to lower and revegetate floodplain surfaces); 2. Kick starting the re-establishment of an island braided channel pattern with the construction of mainstem large wood jams; 5. Enhancing tributary habitats (e.g., riparian revegetation).	Installing large apex jams and creating an island braided system would create pools, enhance margin complexity, help to stabilize spawning gravels, and provide side-channel refugia. These improvements would benefit spawning for Chinook and steelhead; juvenile rearing for Chinook, steelhead, and coho; and adult holding and migration habitat for all salmonids.	Short - Long	High. WA State Park property.	$
16	UCP	Enhance and Create	Enhance habitat cover, complexity, and structure in Hall Creek where it enters the valley floor and where simplification and past timber harvest have impaired instream habitat.	RL	~127		5. Enhancing tributary habitats (e.g., riparian revegetation).	Restoring habitat structure, cover, and complexity would primarily benefit spawning and rearing for steelhead and coho.	Short	Moderate. Multiple private parcels.	$
17	UCP	Reconnect and Restore	Enhance Hall Creek where it is incised through pasture and open ground via channel reconstruction and reconnection of floodplain inundation processes. Address incision from Park Ditch crossing.	RL	~126		5. Enhancing tributary habitats (e.g., riparian revegetation).	Restoring channel planform and floodplain connectivity would benefit spawning and rearing of steelhead and coho.	Short	Moderate. Low in area of ditch crossing. High in areas up- and downstream.	$$

Table 3. Specific actions identified for the Upper Cowlitz River Valley – Mid Valley LU. See maps for action locations.

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
18	UCMV	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels. Achieve this by using large apex jams to stimulate sediment aggradation and island formation; and also, via reconnection of side-channels.	Chan	122.5	126.2	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 4. Initiating the formation of stable islands; and, 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Installing large apex jams and creating an island braided system would create pools, enhance margin complexity, help to stabilize spawning gravels, and provide side-channel refugia. These improvements would benefit spawning for Chinook and steelhead; juvenile rearing for Chinook, steelhead, and coho; and adult holding and migration habitat for all salmonids.	Short - Long	High. Minimal adjacent infrastructure at risk.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
19	UCMV	Strategic	Enhance floodplain inundation and channel migration by modifying (e.g. removing / setting back) levees and armoring, airstrip, rural development, old gravel pond, and roadways. Would require relocation of infrastructure and features out of flood hazard zone.	RL	123.1	125.9	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 4. Initiating the formation of stable islands; and, 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes and side-channel connectivity would improve habitats including channel types, wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Medium - Long	Low as a whole, but moderate in upstream section where it is unclear what the levee is protecting. Multiple private parcels and residences. Addressing airstrip and highway would be challenging. Set-back levees likely required in various areas.	$$$
20	UCMV	Strategic	Enhance floodplain inundation and channel migration via select relocation of structures out of flood hazard zone and through removal / setting-back of bank armoring.	RR	124.8	125.5	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 4. Initiating the formation of stable islands; and, 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Medium - Long	Low. High cost for relatively low benefit due to houses and minimal area reconnected.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
21	UCMV	Protect	Protect undeveloped timber land parcel within flood hazard zone. Protect via willing landowner agreement, easement, or acquisition.	RR	124.6	125.0	1. Protect existing, high-functioning areas	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Two timberland owners.	$
22	UCMV	Protect	Protect and enhance this minimally developed floodplain and CMZ that is within the flood hazard zone and has abundant channel scars, including an old oxbow that has good reconnection potential. Protect via willing landowner agreement, easement, or acquisition.	RL	122.7	124.2	1. Protect existing, high-functioning areas	Existing processes and habitat in this area, which includes existing side-channel habitat and potential future mainstem habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Multiple private parcels but some large. Mostly undeveloped.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
23	UCMV	Protect	Protect floodplain and CMZ area. May be at low risk of development as a result of limited access. Protect via willing landowner agreement, easement, or acquisition.	RR	123.0	123.7	1. Protect existing, high-functioning areas	Existing processes and habitat in this area, which includes existing side-channel habitat and potential future mainstem habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Single timberland owner.	$
24	UCMV	Protect	Protect and enhance buffered section of Hall Creek through private timber land. Protect via willing landowner agreement, easement, or acquisition.	RL	124.0	125.4	1. Protect existing, high-functioning areas	Existing processes and habitat in this area are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Currently undeveloped timberland. Only a few private parcels.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
25	UCMV	Enhance and Create	Enhance habitat complexity and riparian conditions in Hall Creek through a rural residential zone.	RL	123.3	124.0	5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing complexity and riparian conditions will create immediate cover and complexity habitat and long-term riparian functions including wood recruitment, shade, and natural bank stability. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho. Possible benefits to steelhead and coho spawning.	Short	High. Multiple private owners but some large ones and would only require landowner agreements.	$
26	UCMV	Reconnect and Restore	Reduce artificial confinement and increase habitat complexity in lower Hall Creek.	RL	123.0	123.3	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Restoring lateral connectivity and habitat in lower Hall Creek would improve channel type and instream complexity with benefits to coho, Chinook, and steelhead spawning and juvenile rearing.	Short	Moderate. Addressing confinement from Hwy 12 is challenging. Enhancement downstream is highly feasible.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
27	UCMV	Strategic	Enhance floodplain inundation and channel migration via select relocation of structures out of flood hazard zone. Important to address if restoration of old oxbow occurs (UCMV-5).	RL	122.7	123.2	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 4. Initiating the formation of stable islands; and, 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing CMZ/floodplain processes and [future potential] margin habitat would improve wood cover, margin complexity, and riparian processes. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho.	Medium	Low. Multiple private parcels and houses.	$$$
28	UCMV	Enhance and Create	Reduce levee confinement where feasible & cost effective. Enhance complexity and off-channel habitat. Highly impacted by levees and Hwy 12 crossing. Assume full fan processes not restored.	RL	122.6	122.7	5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing processes and habitat in lower Johnson Creek are expected to support spawning, juvenile rearing, migration, and adult holding habitat primarily for steelhead, with some potential benefits for Chinook and coho.	Short	High. Mostly within stream corridor.	$
29	UCMV	Enhance and Create	Enhance instream cover and complexity, particularly channel margin habitat.	Main channel	121.2	122.5	5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing cover and complexity is expected to support juvenile rearing, migration, and adult holding habitat for steelhead, chinook, and coho.	Short	Moderate. Completely within stream corridor but high energy zone.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
30	UCMV	Protect	Protect lower alluvial section of Willame Creek. Protect via willing landowner agreement, easement, or acquisition.	RR	121.2	121.6	1. Protect existing, high-functioning areas	Existing processes and habitat in lower Willame Creek are expected to support spawning, juvenile rearing, migration, and adult holding habitat primarily for steelhead and coho.	Short	Mod-High. Mostly one timberland owner but already a vacation cabin or two.	$
31	UCMV	Strategic	Enhance floodplain inundation and channel migration in this moderately developed area within CMZ hazard zone. Achieve this via select relocation of structures out of flood hazard zone, removal of fill, and reconnection of former side-channels. Action considered strategic because the structures/development need to be addressed prior to further action.	RL	119.8	122.0	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes and side-channel connectivity would improve habitats including channel types, wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat for all species over the long-term.	Medium	Low-to-moderate. Multiple private parcels with some rural residential development.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
32	UCMV	Protect	Protect and restore this partially developed floodplain and CMZ that is within the flood hazard zone and has numerous channel scars. Protect via willing landowner agreement, easement, or acquisition.	RL	120.0	121.6	1. Protect existing, high-functioning areas	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Several private parcels but a few large timber parcels. Relatively undeveloped.	$$
33	UCMV	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels. Achieve this by using large apex jams to stimulate sediment aggradation and island formation; and also, via reconnection of side-channels.	Chan	116.7	121.2	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 4. Initiating the formation of stable islands; and, 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Installing large apex jams and creating an island braided system would create pools, enhance margin complexity, help to stabilize spawning gravels, and provide side-channel refugia. These improvements would benefit spawning for Chinook and steelhead; juvenile rearing for Chinook, steelhead, and coho; and adult holding and migration habitat for all salmonids.	Short - Long	High. Minimal adjacent infrastructure at risk.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
34	UCMV	Reconnect and Restore	Reduce limitations to channel migration through removal of a section of no-longer-needed levee/armoring and enhance activation of side channel.	RL	119.5	120.2	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 4. Initiating the formation of stable islands; and, 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing CMZ processes and side-channel connectivity would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho.	Short - Medium	High. Levee and riprap appear to be no longer protecting anything. Undeveloped timber land	$
35	UCMV	Strategic	Enhance floodplain inundation and channel migration in this moderately developed area within CMZ hazard zone. Achieve this via select relocation of structures and other features (e.g. roadways) out of flood hazard zone, removal of fill, and reconnection of former side-channels. Great opportunity for re-connection of long side channel from RM 117.7 to 119.6. Action considered strategic because the structures/development need to be addressed prior to further action.	RL	116.7	120.0	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 4. Initiating the formation of stable islands; and, 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes and side-channel connectivity would improve habitats including channel types, wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat for all species over the long-term.	Medium	Low. Multiple private parcels and rural residential development.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
36	UCMV	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RR	118.3	118.8	1. Protect existing, high-functioning areas	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Mod-High. Undeveloped. Mainly one owner.	$$
37	UCMV	Strategic	Reduce floodplain and CMZ disconnection created by Cora Bridge and approach fills, and from the upstream and downstream levees and armoring. Increase bridge span and/or create perforations through the approach fills to convey greater flood flows. Action considered strategic because the bridge needs to be addressed prior to further action.	RL and RR	115.8	116.7	2. Restoring connectivity to the floodplain; 3. Removing impediments to channel migration zone processes; 4. Initiating the formation of stable islands; and, 5. Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Restoring lateral connectivity would improve habitats including pools, riffles, wood cover, spawning gravels, margin complexity, and off-channel refugia. These improvements would benefit spawning for Chinook and steelhead; juvenile rearing for Chinook, steelhead, and coho; and adult holding and migration habitat for all salmonids.	Medium	Low. Large infrastructure, high cost, multiple landowners.	$$$

Table 4. Specific actions identified for the Upper Cowlitz River Valley – Randle LU. See maps for action locations.

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
38	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	115.4	116.0	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate. Undeveloped. A few owners.	$
39	UCR	Strategic	Enhance floodplain forest conditions, floodplain inundation, and side-channel connectivity to the mainstem in this heavily agriculturally developed area with many private parcels within the CMZ hazard zone (much of it within the high hazard zone). Achieve this via select relocation of structures and other features (e.g. roadways) out of flood hazard zone, removal of fill, reforestation, and reconnection of former side-channels. Potential opportunity for re-connection of long side channel(s) that reconnect to mainstem near RM 113. Action considered strategic because the structures/development/ag use need to be addressed prior to further action.	RR	114.0	115.7	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing floodplain and CMZ processes and side-channel connectivity would improve habitats including channel types, wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat for all species over the long-term.	Medium	Low. Multiple private parcels, active agriculture, and rural residential development.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
40	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$
41	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	114.8	115.3	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate-to-high. Undeveloped. Two owners. Timberland.	$
42	UCR	Enhance and Create	Enhance instream cover and complexity, particularly channel margin habitat.	Main channel	114.5	115.3	Enhancing mainstem and tributary habitats.	Enhancing cover and complexity is expected to support juvenile rearing, migration, and adult holding habitat for steelhead, chinook, and coho.	Short	Moderate-to-high. Completely within stream corridor but access may be challenging.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
43	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RR	113.0	114.8	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Low. Many individual owners. Some sparse development, structures, and dirt roads.	$$$
44	UCR	Reconnect and Restore	Enhance connectivity of mainstem with large side channel (former mainstem channel) and floodplain wetland complex. May require large jams in mainstem to raise water elevations and divert flows, as well as select excavation in side channel. Likely would require excavation of channel to connect mainstem or side channel to large wetland complex to the southeast. Re-establish native riparian and floodplain woody vegetation communities throughout.	RL	111.0	114.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing activation of the side channel would benefit spawning and rearing for steelhead and coho, and possibly chinook, depending on the flow in the side channel. Providing fish access to the wetland complex would primarily benefit coho juvenile rearing but would also provide flood refuge habitat for juveniles of steelhead and chinook.	Short	Moderate-to-High. Side channel alignment is public land. Adjacent lands mainly a few large owners. May require aggressive large wood jams and extensive excavation to make connections.	$$$
45	UCR	Strategic	Enhance mainstem habitat as well as floodplain inundation and channel migration by modifying (e.g. removing / setting back) levees and armoring, rural development, and possibly modification of Highway 20. Would likely require relocation of infrastructure and features out of flood hazard zone. Action considered strategic because the structures/ development need to be addressed prior to further action.	RR	122.6	113.0	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing main channel, floodplain, and CMZ processes would improve habitats including channel types (e.g. quality pools and riffles), wood cover, and margin complexity. These improvements would benefit juvenile (i.e. rearing, migration) and adult (holding, spawning) life stages for Chinook, steelhead, and coho.	Short-to-Medium	Low. Existing house adjacent to channel and numerous small parcels. Highway 12 also at risk and would require relocation and/or protection.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
46	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	111.5	113.4	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Undeveloped. Mainly one large owner. Somewhat isolated parcel on island created by flood channel.	$
47	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$
48	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RR	110.4	112.6	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate-to-low. Undeveloped, but many small parcels.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
49	UCR	Reconnect and Restore	Reconnect mainstem side channels through placement of large wood jams and select excavation. Reforest cleared areas of riparian and floodplain forest.	Chan	111.0	112.6	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing activation of side channels would benefit spawning and rearing for steelhead and coho, and possibly chinook, depending on the flow in the side channels.	Short for side channel activation, Long for riparian growth	Moderate-to-high. Most of the site is one large owner. May require aggressive large wood jams and extensive excavation to make connections.	$$$
50	UCR	Strategic	Enhance floodplain inundation, channel migration, and side-channel connectivity in this moderately developed area within CMZ hazard zone. Achieve this via select relocation of structures and other features (e.g. roadways) out of flood hazard zone, removal of fill, and reconnection of former side-channels. Great opportunity for re-connection of long side channels (former mainstem channel scars) at the upstream and downstream ends. Action considered strategic because the structures/ development need to be addressed prior to further action.	RL	107.2	111.0	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing floodplain and CMZ processes and side-channel connectivity would improve habitats including channel types (e.g. quality pools and riffles), wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat for all species over the long-term.	Short-to-Medium	Low. Multiple private parcels and rural residential development.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
51	UCR	Strategic	Re-establish forested floodplain and enhance channel margin habitat, floodplain inundation, and channel migration processes. Action considered strategic because the structures/ development need to be addressed prior to further action.	RR	109.3	110.7	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing main channel, floodplain, and CMZ processes would improve habitats including channel types (e.g. quality pools and riffles), wood cover, and margin complexity. These improvements would benefit juvenile (i.e. rearing, migration) and adult (holding, spawning) life stages for Chinook, steelhead, and coho.	Short	Moderate-to-high. Multiple private parcels but at severe risk of continued erosion. Erosion has already reached the "moderate" hazard zone from the 2008 CMZ study.	$$
52	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RR	109.0	112.0	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate-to-low. Undeveloped, but many small parcels.	$$
53	UCR	Strategic	Enhance mainstem habitat as well as floodplain inundation and channel migration by modifying (e.g. removing / setting back) armoring (barbs), agricultural development, and possibly modification of Highway 20. Would likely require relocation of infrastructure and features out of flood hazard zone. Action considered strategic because the structures/ roadway need to be addressed prior to further action.	RR	108.2	108.9	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing main channel, floodplain, and CMZ processes would improve habitats including channel types (e.g. quality pools and riffles), wood cover, and margin complexity. These improvements would benefit juvenile (i.e. rearing, migration) and adult (holding, spawning) life stages for Chinook, steelhead, and coho.	Short	Low. Highway 12 and agricultural land would need to be modified. Multiple land owners.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
54	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	107.8	108.9	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate-to-high. Undeveloped. Two owners.	$
55	UCR	Enhance and Create	Enhance instream cover and complexity, particularly channel margin habitat.	Main channel	103.4	108.2	Enhancing mainstem and tributary habitats.	Enhancing cover and complexity is expected to support juvenile rearing, migration, and adult holding habitat for steelhead, chinook, and coho.	Short	Moderate-to-high. Completely within stream corridor but access may be challenging in some areas.	$$
56	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
57	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$
58	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	114.8	115.3	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate-to-high. Undeveloped. One owner.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
59	UCR	Strategic	Enhance mainstem habitat as well as floodplain inundation and channel migration by modifying (e.g. removing / setting back) levees and armoring and industrial development. Would likely require relocation of infrastructure and features out of flood hazard zone. Action considered strategic because the structures/ development need to be addressed prior to further action.	RR	105.5	106.0	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing main channel, floodplain, and CMZ processes would improve habitats including channel types (e.g. quality pools and riffles), wood cover, and margin complexity. These improvements would benefit juvenile (i.e. rearing, migration) and adult (holding, spawning) life stages for Chinook, steelhead, and coho. Tributary fan dynamics in lower Silver Creek would also be improved, improving long-term habitat primarily for coho and steelhead using lower Silver Creek.	Short	Low. Levee and armoring protect log yard at mill.	$$$
60	UCR	Enhance and Create	Enhance instream complexity, off-channel availability, and riparian conditions in lower Surrey Creek.	RR	106	106	Enhancing mainstem and tributary habitats.	Instream and off-channel habitat enhancements would be expected to primarily benefit coho spawning and rearing (possibly steelhead).	Short	High. One owner.	$
61	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	104.3	105.6	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate. Some rural residential development. Several owners.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
62	UCR	Strategic	Enhance floodplain inundation, channel migration, and instream habitat along lower Silver Creek and its alluvial fan by modifying (e.g. removing / setting back) levees and armoring, development, and roadways located within historical floodplain/CMZ and flood hazard zone. Address incision caused by extensive levee system. May provide secondary benefits of flood hazard reduction to communities. Action considered strategic because the structures/ development need to be addressed prior to further action.	RR	104.9	105.6	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Addressing levee confinement would help to change straightened and confined high energy and low complexity reach into a meandering stream with pool-riffle and step-pool habitats that would support spawning and rearing of steelhead and coho and possibly chinook.	Short	Low. Heavily developed area protected by existing levees. Highway 12 crosses in this area and the lumber mill lies adjacent to the stream.	$$$
63	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	104.8	104.9	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. One owner. Currently in ag/rural residential use.	$
64	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
65	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RR	103.3	104.7	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	Moderate. Undeveloped. Mainly one large owner, with a couple smaller ones. Surrounded by active ag land.	$$
66	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	103.2	104.2	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Undeveloped. Mainly one large owner plus smaller bits of multiple owners; plus some State land. Some may be isolated due to old channel scar.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
67	UCR	Strategic	Improve floodplain forest conditions, enhance in-channel habitat conditions, and reduce floodplain, CMZ, and side channel disconnection created by Randle Bridge, southern bridge approach fill, upstream levees and armoring, residential development, agriculture, Highway 12, and Highway 131. Action considered strategic because numerous infrastructure modifications or relocations would need to be addressed prior to further action.	RL and RR	101.5	103.4	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Improving floodplain forests, instream habitat, and restoring floodplain, CMZ, and side-channel connectivity would improve habitats including pools, riffles, wood cover, spawning gravels, margin complexity, and off-channel refugia. These improvements would benefit spawning for Chinook and steelhead; juvenile rearing for Chinook, steelhead, and coho; and adult holding and migration habitat for all salmonids.	Short	Low. Large and widespread infrastructure challenges, high cost, multiple landowner and community interests.	$$$
68	UCR	Enhance and Create	Enhance instream cover and complexity, particularly channel margin habitat.	Main channel	100.4	102.5	Enhancing mainstem and tributary habitats.	Enhancing cover and complexity is expected to support juvenile rearing, migration, and adult holding habitat for steelhead, chinook, and coho.	Short	High. Completely within stream corridor. Good access.	$
69	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions. Reconnect abandoned oxbows. Re-align and enhance ditched section of lower Peters Creek.	RR	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
70	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions. Reconnect channel scars. Re-align Peters Creek.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$
71	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	101.3	100.7	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Undeveloped. One large owner. Somewhat isolated parcel on inside of sharp bend subject to cut-off.	$
72	UCR	Reconnect and Restore	Re-align/re-meander ditched section of Kiona Creek to reconnect to its floodplain. Enhance instream habitat complexity. Restore riparian and floodplain forests.	RR	~100.5	~100.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Restoring channel planform and floodplain connectivity would benefit spawning and rearing of steelhead and coho.	Short	High. Tacoma Power and one other agriculture owner. Undeveloped.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
73	UCR	Protect	Protect large, undeveloped wetland area adjacent to Kiona Creek.	RR	NA	NA	Protecting and/or restoring riparian forests and vegetation;	Potential benefit to off-channel juvenile salmonid rearing, primarily for coho, but also for limited use by steelhead.	Short	High. Possibly challenging to develop due to wetlands. Needs review to see if there are existing protections that would conserve this area already. Partially owned by Tacoma Power.	$
74	UCR	Enhance and Create	Enhance instream complexity, off-channel availability, and riparian conditions in lower Kiona Creek.	RR	~100.4	~100.4	Enhancing mainstem and tributary habitats.	Instream and off-channel habitat enhancements would be expected to primarily benefit coho and steelhead spawning and rearing.	Short	High. PUD and one other ag owner.	$
75	UCR	Reconnect and Restore	Reconnect mainstem side channels and alcove/backwater habitat through placement of large wood jams and select excavation.	Chan	99.3	100.3	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Enhancing activation of side channels and alcoves would benefit spawning and rearing for steelhead and coho, and possibly chinook, depending on the flow in the side channels.	Short	Moderate-to-high. Most is PUD land, other portion is made up of two owners.	$$$
76	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
77	UCR	Reconnect and Restore	Restore instream habitat complexity and ditched channel segments in lower Siler Creek and the north tributary to Gibbs Pond. Restore former mill ponds to wetlands connected to Siler Creek. Re-establish native riparian and floodplain woody vegetation communities throughout.	RL	~100	~100	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Restoring channel planform and floodplain/wetland connectivity would benefit spawning and rearing of steelhead and coho.	Short	High. Mostly Tacoma Power property.	$$
78	UCR	Enhance and Create	Enhance instream complexity, off-channel availability, and riparian conditions in lower Siler Creek.	RL	~99.8	~99.8	Enhancing mainstem and tributary habitats.	Instream and off-channel habitat enhancements would be expected to primarily benefit coho and steelhead spawning and rearing.	Short	High. One owner.	$
79	UCR	Enhance and Create	Enhance instream cover and complexity, particularly channel margin habitat.	Main channel	97.8	99.3	Enhancing mainstem and tributary habitats.	Enhancing cover and complexity is expected to support juvenile rearing, migration, and adult holding habitat for steelhead, chinook, and coho.	Short	High. Completely within stream corridor. Good access.	$
80	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
81	UCR	Protect	Protect undeveloped parcels within flood hazard zone via willing agreement, easement, or acquisition.	RL	98.5	99.1	Protecting and/or restoring riparian forests and vegetation;	Existing processes and habitat in this area, which includes future potential mainstem and side-channel habitat, are expected to support spawning, juvenile rearing, migration, and adult holding habitat for Chinook, steelhead and coho.	Short	High. Undeveloped. One large owner.	$
82	UCR	Reconnect and Restore	Re-establish native riparian and floodplain woody vegetation communities to support long-term riparian and floodplain functions.	RL	115.3	115.5	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Mainly one large owner. Currently in agricultural use.	$
83	UCR	Reconnect and Restore	Reconnect lower Schooley Creek into its historical meandering alignment and out of the current ditched channel to enhance instream habitat and floodplain connectivity. Address upstream ditched section via channel realignment/re-meandering. Restore riparian and floodplain forests in the area of lower Schooley Creek.	RL	97.3	97.9	Removing barriers to channel migration processes and reconnecting the channel to floodplains and side channels where possible; and, Enhancing mainstem and tributary habitats.	Restoring channel planform and floodplain connectivity would benefit spawning and rearing of steelhead and coho.	Short	High. A few owners but one primary owner for most of the area. Undeveloped but in ag use.	$

Table 5. Specific actions identified for the Upper Cowlitz River Valley – Scanewa LU. See maps for action locations.

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
84	UCS	Enhance and Create	Enhance instream cover and complexity, particularly channel margin habitat.	Main channel	90.7	97.8	Creating margin habitat.	Enhancing cover and complexity is expected to support juvenile rearing, migration, and adult holding habitat for steelhead, chinook, and coho. Benefits affected by impoundment.	Short	Moderate-to-high. Completely within stream corridor but access limited in many places.	$$
85	UCS	Reconnect and Restore	Re-establish native riparian woody vegetation communities to support long-term riparian functions.	RR	96.4	97.8	Protecting and/or restoring riparian forests and vegetation; and, Creating margin habitat.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	High. Two owners, but some forested buffer already exists.	$
86	UCS	Reconnect and Restore	Re-establish native riparian woody vegetation communities to support long-term riparian functions.	RL	97.4	97.8	Protecting and/or restoring riparian forests and vegetation; and, Creating margin habitat.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	High. PUD and one other owner. Good access.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
87	UCS	Reconnect and Restore	Re-establish native riparian woody vegetation communities to support long-term riparian functions.	RR	95.5	95.8	Protecting and/or restoring riparian forests and vegetation; and, Creating margin habitat.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	Moderate. Multiple owners.	$$
88	UCS	Reconnect and Restore	Re-establish native riparian woody vegetation communities to support long-term riparian functions.	RL	94.8	95.2	Protecting and/or restoring riparian forests and vegetation; and, Creating margin habitat.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	High. PUD land and one other owner.	$
89	UCS	Reconnect and Restore	Re-establish native riparian woody vegetation communities to support long-term riparian functions.	RL	94.0	94.3	Protecting and/or restoring riparian forests and vegetation; and, Creating margin habitat.	Re-establishing vegetation conditions will have long-term benefits to all species and life-stages of native aquatic biota via direct and indirect benefits including stream shading/temperature, large wood recruitment, hydraulic roughness, and nutrient exchange.	Long	High. PUD land and one other owner.	$

Table 6. Specific actions identified for the Cispus River Valley – Upper LU. See maps for action locations.

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
90	CRU	Enhance and Create	Enhance habitat complexity and local sediment storage by placing large key pieces of wood to form large log jams.	Both	29.2	30.7	Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead.	Enhancing complexity and riparian conditions will create immediate cover and complexity habitat and long-term riparian functions including wood recruitment, shade, and natural bank stability. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho. Possible benefits to steelhead and coho spawning.	Short-to-Medium	Moderate to High. US Forest Service land but access is challenging. Helicopter work and/or felling large riparian trees.	$
91	CRU	Strategic Actions	Reduce lateral confinement and floodplain disconnection associated with FS 23 Road crossing and approach fills. Action is considered strategic because the road requires action prior to implementing restoration measures.	Both	29.0	29.2	Increasing connectivity to the floodplain; Initiating the formation of stable islands; and, Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead.	Reducing anthropogenic lateral confinement would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Medium	Low. Would require bridge removal or relocation.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
92	CRU	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels.	Both	27.4	29.0	Increasing connectivity to the floodplain; Initiating the formation of stable islands; and, Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead.	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Long	High. No infrastructure at risk. Access can be obtained from 23 Road. Can be accomplished via creation of large log jams to promote sediment deposition and forested island creation.	$$
93	CRU	Enhance and Create	Enhance habitat complexity and local sediment storage by placing large key pieces of wood to form large log jams.	Both	24.6	27.4	Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead.	Enhancing complexity and riparian conditions will create immediate cover and complexity habitat and long-term riparian functions including wood recruitment, shade, and natural bank stability. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho. Possible benefits to steelhead and coho spawning.	Short-to-Medium	Moderate to High. US Forest Service land but access is challenging. Helicopter work and/or felling large riparian trees.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
94	CRU	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels.	Both	21.2	24.6	Increasing connectivity to the floodplain; Initiating the formation of stable islands; and, Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead.	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Long	Moderate. No infrastructure at risk. But access is likely challenging. Could be accomplished via creation of large log jams to promote sediment deposition and forested island creation.	$$

Table 7. Specific actions identified for the Cispus River Valley – Mid-Valley LU. See maps for action locations.

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
95	CRMV	Reconnect and Restore	Address effects of recently-constructed push-up levee on keeping channel along riprap highway embankment and effects on lateral channel dynamics. Address impaired margin habitat from riprap embankment. Potentially use large wood jams to move channel away from highway.	RL	21.0	21.2	Remove barriers to channel migration processes and floodplain connectivity	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short	Moderate-to-High. Removal of push-up berm is straightforward. Addressing channel location and margin habitat is more challenging due to proximity of highway. Forest Service land.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
96	CRMV	Reconnect and Restore	Address channelization of lower NF Cispus on its fan where push-up berms confine and straighten the channel. Channel modification and relocation may be necessary to restore active channel processes and sediment storage to larger portion of historical fan.	RL. Both sides of NF Cispus	19.7	20.6	Remove barriers to channel migration processes and floodplain connectivity	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Medium	High. Push up berms appear to be no longer protecting anything. Forest Service land.	$$
97	CRMV	Strategic Actions	Reduce floodplain and CMZ disconnection caused by abandoned and failing riprap bank, spur road, and the FS 23 Road. Consider set-back of 23 Road to hillslope toe to facilitate CMZ restoration. Action is considered strategic because the road requires action prior to implementing restoration measures.	RL	18.6	19.7	Remove barriers to channel migration processes and floodplain connectivity	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Medium	Moderate-to-High. Removal of riprap at channel margin is highly feasible. It is currently failing in places already. Relocation of 23 Road is more challenging. Forest Service land.	$$
98	CRMV	Strategic Actions	Reduce floodplain and CMZ disconnection, and channel incision caused by Cispus Road fill and bridge over Cispus River. Consider perforations through road fill or larger-scale bridge removal and removal/relocation of Cispus Road and FS 2801 Road where they cross the floodplain. Could be combined with large-scale modifications to Yellowjacket Creek Bridge. Action is considered strategic because the road requires action prior to implementing restoration measures.	Both	17.3	18.0	Remove barriers to channel migration processes and floodplain connectivity	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Long	Low. Large-scale efforts here have low feasibility due to requirements to address access issues. Will require road program planning and modification over many years with stakeholders. Forest Service land.	$$$

Table 8. Specific actions identified for the Cispus River – Tower Rock LU. See maps for action locations.

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
99	CRTR	Strategic Actions	Address floodplain and CMZ disconnection and related incision in Yellowjacket Creek due to Cispus Road approach fills and bridge crossing over Yellowjacket Creek. Restore island braided system. Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels on upper portion of Yellowjacket Creek fan.	Both sides of Yellowjacket Creek	Yellowjacket Cr RM 0.5	Yellowjacket Cr RM 1.0	Restoring connectivity to the floodplain throughout the LU Removing impediments to channel migration zone processes Initiating the formation of stable islands Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Medium-to-long	Low. Would require removing or relocating the bridge crossing. Forest Service land.	$$$
100	CRTR	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels on Yellowjacket Creek fan.	Both sides of Yellowjacket Creek	Yellowjacket Cr RM 0	Yellowjacket Cr RM 0.5	Restoring connectivity to the floodplain throughout the LU Removing impediments to channel migration zone processes Initiating the formation of stable islands Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Long	High. Can be accomplished via creation of large log jams to promote sediment deposition and forested island creation.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
101	CRTR	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels.	Both	14.9	17.3	Restoring connectivity to the floodplain throughout the LU Removing impediments to channel migration zone processes Initiating the formation of stable islands Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Long	High-to-Moderate. Mostly private property but not much nearby infrastructure.	$$
102	CRTR	Strategic Actions	Address floodplain and CMZ disconnection from road, levee, campground, floodplain fill. Address flood hazard to campground and private property.	RL	15.3	15.6	Restoring connectivity to the floodplain throughout the LU Removing impediments to channel migration zone processes Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Medium	Low. Private and public infrastructure would need to be removed/relocated.	$$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
103	CRTR	Strategic Actions	Address floodplain and CMZ disconnection from levees, development, and floodplain fill. Address flood hazard.	RL	13.5	15.3	Restoring connectivity to the floodplain throughout the LU Removing impediments to channel migration zone processes Initiating the formation of stable islands Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing floodplain and CMZ processes would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Medium	Low. Primarily a privately developed neighborhood in historical floodplain.	$$$
104	CRTR	Reconnect and Restore	Enhance connectivity of abandoned side-channel. Levee and riprap removal associated with CRTR-5 could facilitate the reconnection of a flow-through side-channel.	RL	13.5	15.1	Restoring connectivity to the floodplain Enhancing spawning and rearing habitats for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing side-channel connectivity and habitat would improve juvenile rearing habitat for steelhead and coho and possibly spawning habitat for coho.	Short	Moderate-to-High. Lower portion is Forest Service land. No infrastructure within channel alignment. Reconnection of upper portion is more challenging and there are multiple private residences.	$

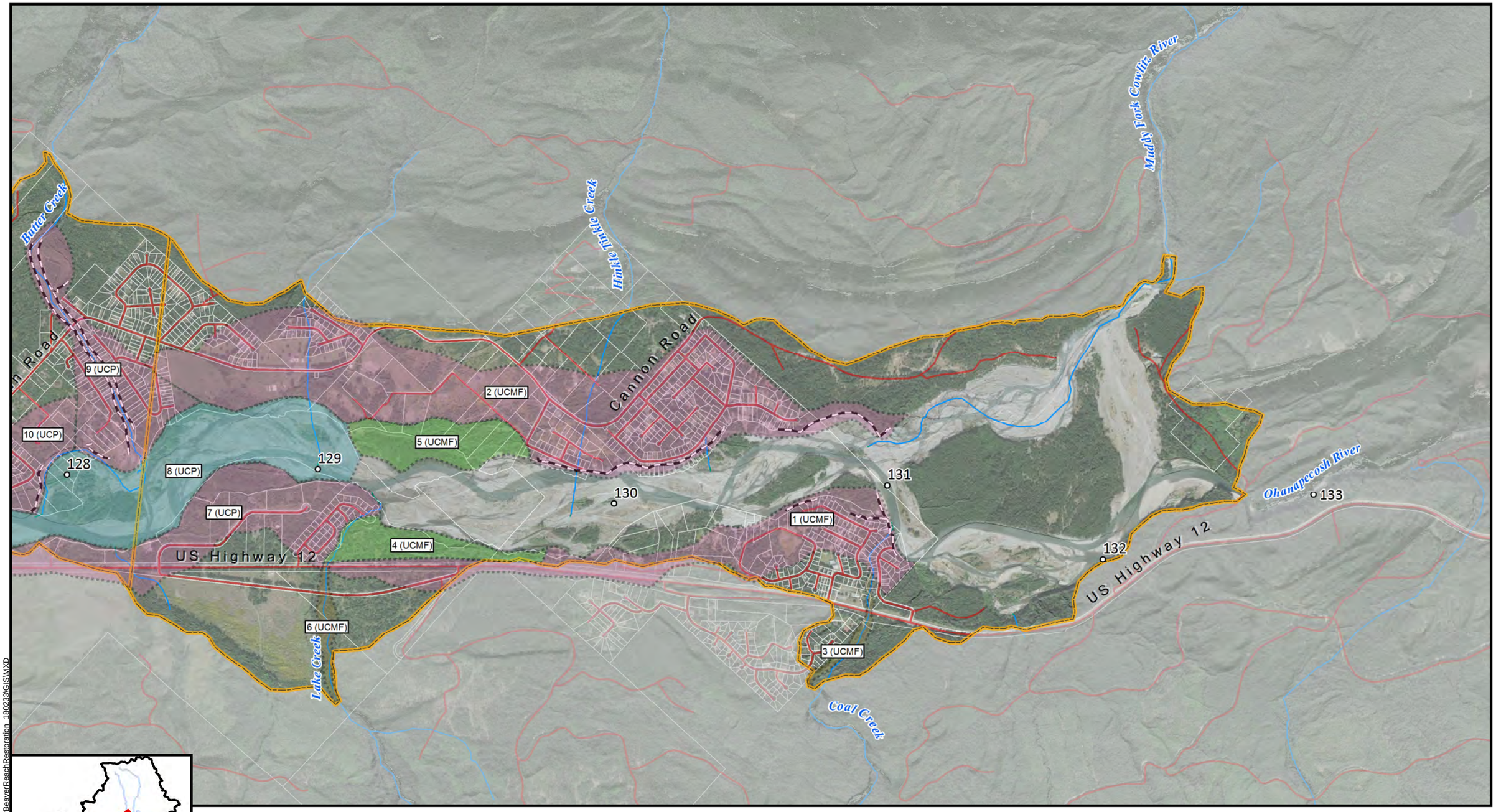
Table 9. Specific actions identified for the Cispus River – Lower LU. See maps for action locations.

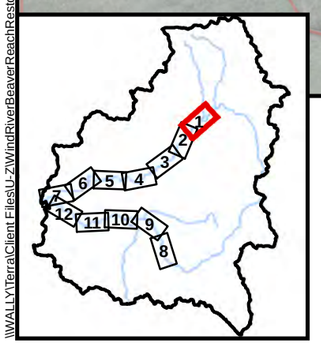
Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
105	CRL	Enhance and Create	Enhance habitat complexity and local sediment storage by placing large key pieces of wood to form large log jams.	Both	8.0	13.5	Enhancing rearing and holding habitats in the mainstem and tributaries for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing complexity and riparian conditions will create immediate cover and complexity habitat and long-term riparian functions including wood recruitment, shade, and natural bank stability. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho. Possible benefits to steelhead and coho spawning.	Short-to-Medium	Moderate to High. US Forest Service land but access is challenging. Helicopter work and/or felling large riparian trees.	$
106	CRL	Reconnect and Restore	Address entrenchment, push-up levees, and Forest Road 76 and bridge on lower Iron Creek. Restore sediment storage and lateral channel migration processes to fan. Restore riparian vegetation.	RL. Both sides of lower Iron Cr.	Iron Cr RM 0	Iron Cr RM 0.7	Enhance sediment storage and lateral connectivity Enhancing rearing and holding habitats in the mainstem and tributaries for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing sediment storage and lateral connectivity where possible would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Medium	Moderate-to-High. Work downstream of bridge is highly feasible (no infrastructure, good access). Addressing road and bridge effects is more challenging. All Forest Service land.	$$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
107	CRL	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels.	Both	7.5	8.0	Enhance sediment storage and lateral connectivity Enhancing rearing and holding habitats in the mainstem and tributaries for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing sediment storage and lateral connectivity where possible would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Long	High. No nearby infrastructure. Forest Service land.	$$
108	CRL	Enhance and Create	Enhance habitat complexity and local sediment storage by placing large key pieces of wood to form large log jams.	Both	6.3	7.5	Enhancing rearing and holding habitats in the mainstem and tributaries for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing complexity and riparian conditions will create immediate cover and complexity habitat and long-term riparian functions including wood recruitment, shade, and natural bank stability. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho. Possible benefits to steelhead and coho spawning.	Short-to-Medium	High. Private timber land.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
109	CRL	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels.	Both	5.6	6.3	Enhance sediment storage and lateral connectivity Enhancing rearing and holding habitats in the mainstem and tributaries for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing sediment storage and lateral connectivity where possible would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Long	High. Single private timber land owner.	$$
110	CRL	Enhance and Create	Enhance habitat complexity and local sediment storage by placing large key pieces of wood to form large log jams.	RR. Both sides of Lower Woods Creek	Woods Cr RM 0	Woods Cr RM 1.0	Enhancing rearing and holding habitats in the mainstem and tributaries for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing complexity and riparian conditions will create immediate cover and complexity habitat and long-term riparian functions including wood recruitment, shade, and natural bank stability. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho. Possible benefits to steelhead and coho spawning.	Short-to-Medium	High. Good access. Single private timber land owner.	$

Action No.	LU Code	Primary Action Type	Approach	Side	Start (RM)	End (RM)	Strategy Objectives Affected	Primary Fish Effects	Time to Benefit Accrual	Feasibility Considerations	Cost Estimate
111	CRL	Enhance and Create	Enhance habitat complexity and local sediment storage by placing large key pieces of wood to form large log jams.	Both	2.4	5.6	Enhancing rearing and holding habitats in the mainstem and tributaries for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing complexity and riparian conditions will create immediate cover and complexity habitat and long-term riparian functions including wood recruitment, shade, and natural bank stability. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho. Possible benefits to steelhead and coho spawning.	Short-to-Medium	High. Private timber land.	$
112	CRL	Reconnect and Restore	Restore sediment storage and lateral connectivity to re-create anastomosing channel pattern including forested island complexes & multiple thread channels.	Both	1.1	2.4	Enhance sediment storage and lateral connectivity Enhancing rearing and holding habitats in the mainstem and tributaries for all targeted species: spring Chinook, Coho, and Winter Steelhead	Enhancing sediment storage and lateral connectivity where possible would improve habitats including wood cover, margin complexity, and off-channel refugia. These improvements would primarily benefit juvenile rearing for Chinook, steelhead, and coho; and could also enhance spawning habitat over the long-term.	Short-to-Long	High. Single private timber land owner and PUD land, including PUD regulations on large wood removal.	$$





*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

0 1,000 2,000 4,000 Feet

Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Upper Cowlitz - Packwood
Upper Cowlitz - Muddy Fork

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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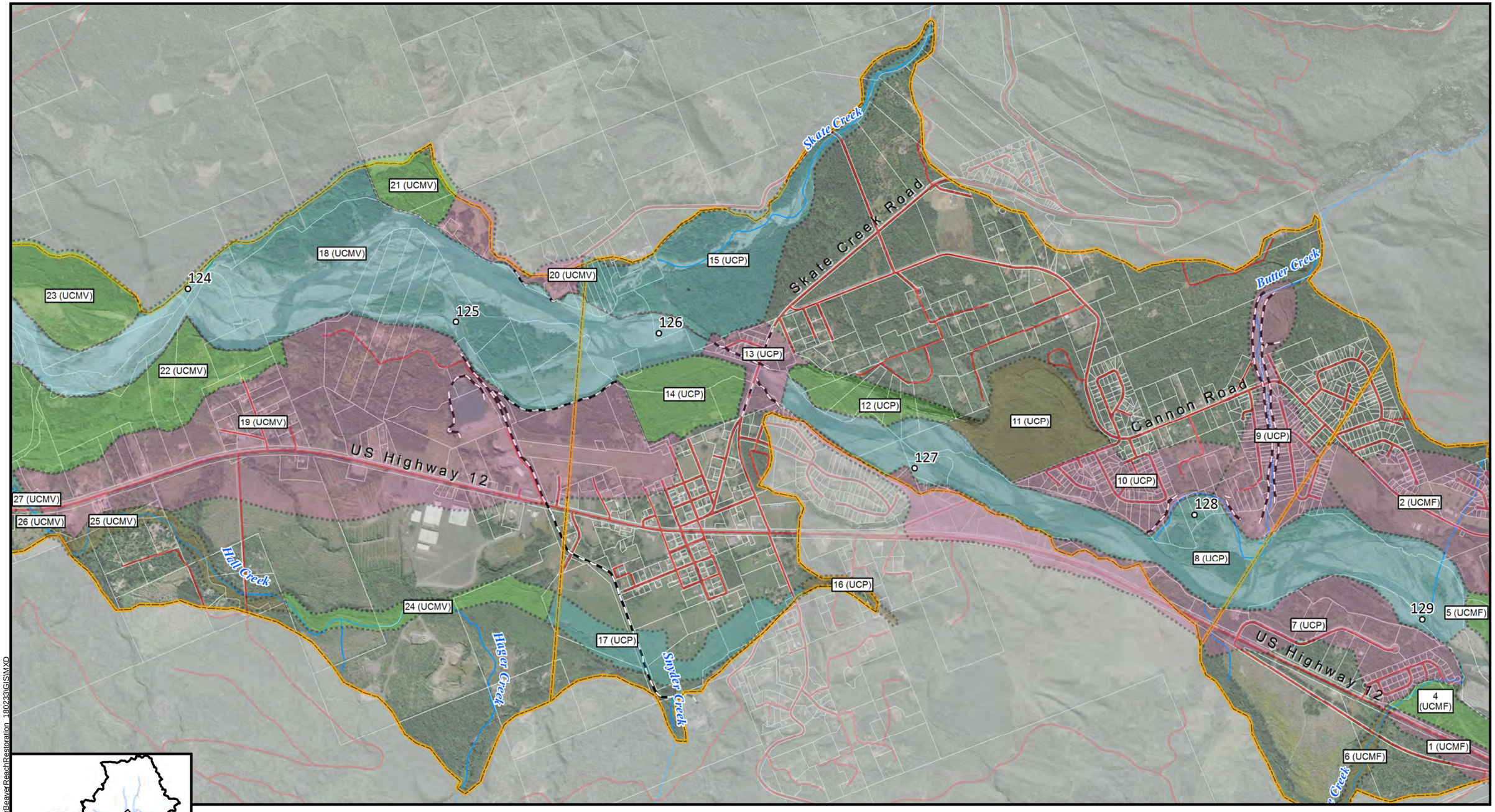

*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

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0 1,000 2,000 4,000 Feet

Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Upper Cowlitz - Mid-Valley
Upper Cowlitz - Packwood
Upper Cowlitz - Muddy Fork

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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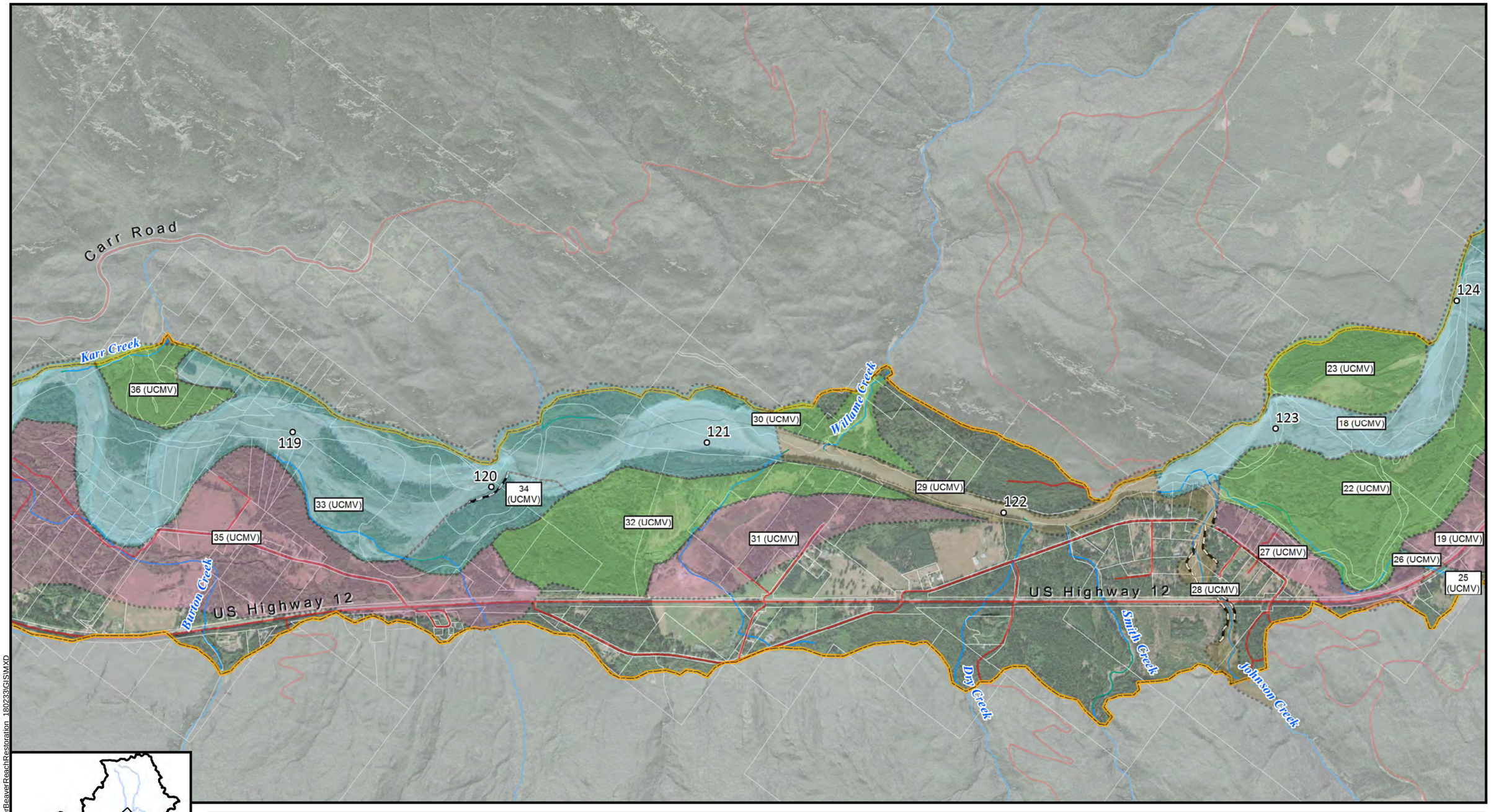

*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

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Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Upper Cowlitz - Mid-Valley

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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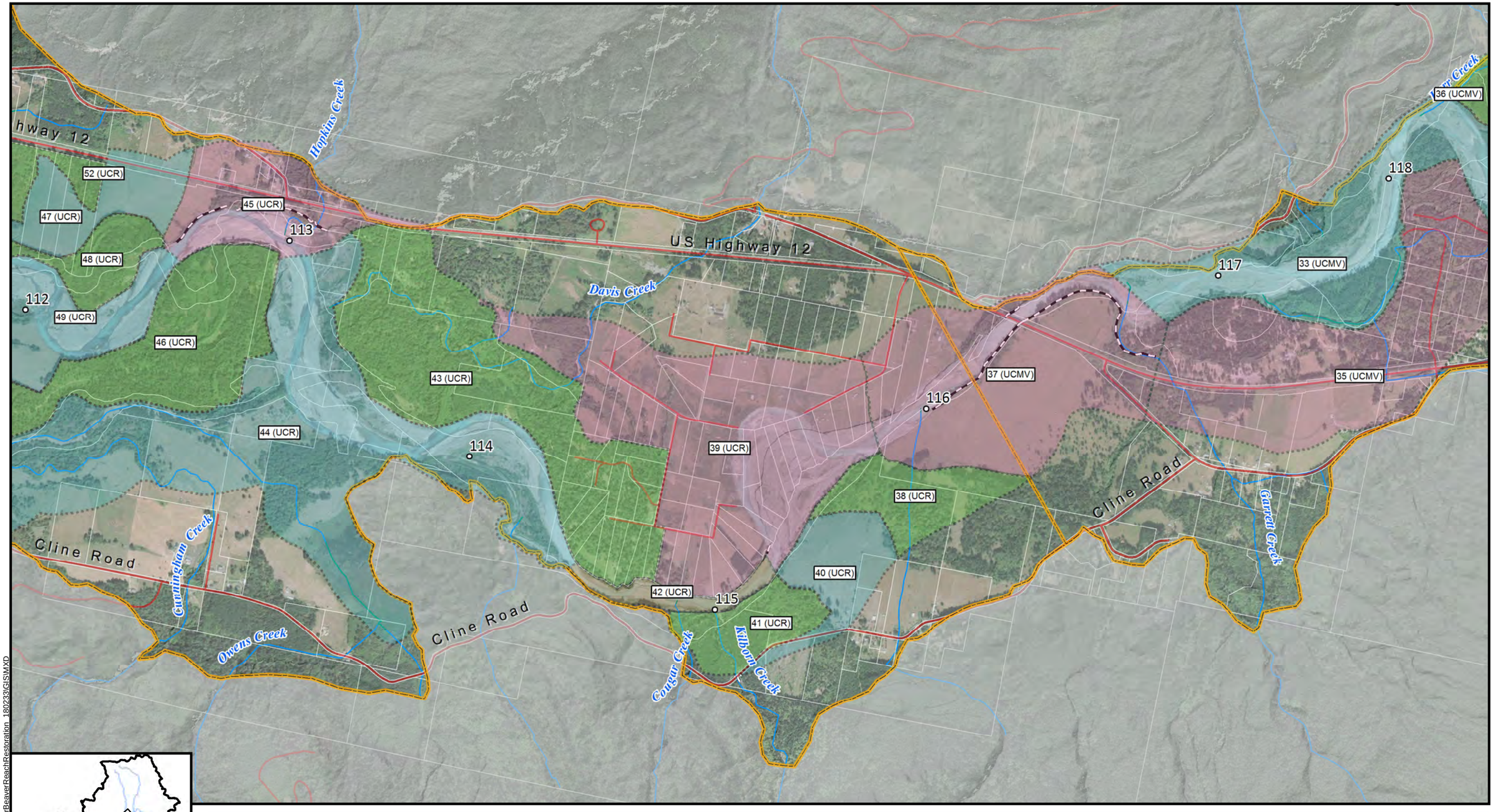

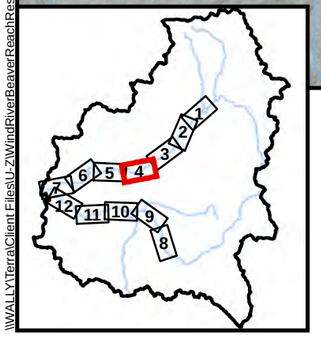

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*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

0 1,000 2,000 4,000 Feet

Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Upper Cowlitz - Randle
Upper Cowlitz - Mid-Valley

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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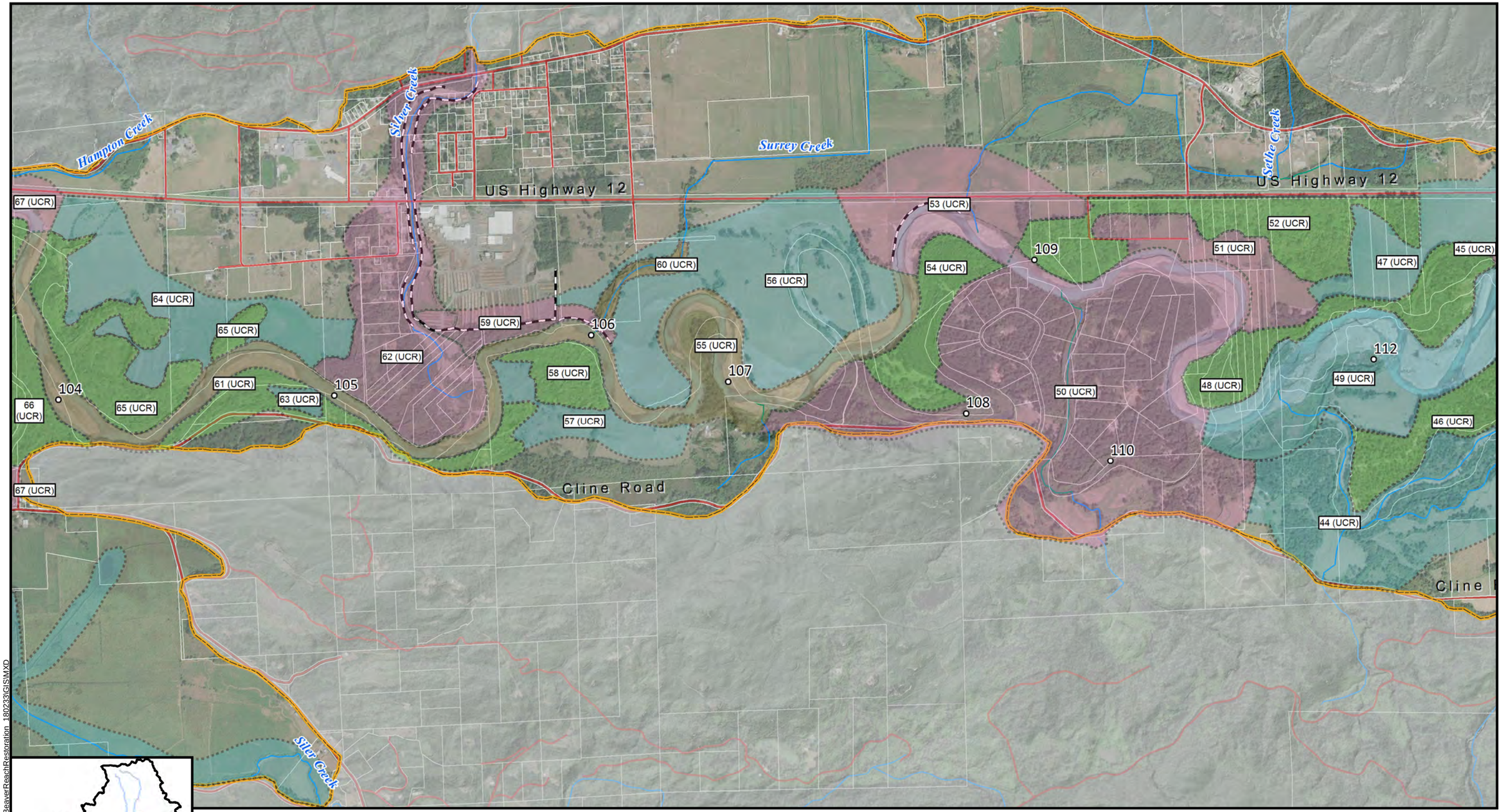

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*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

0 1,000 2,000 4,000 Feet

Action Type

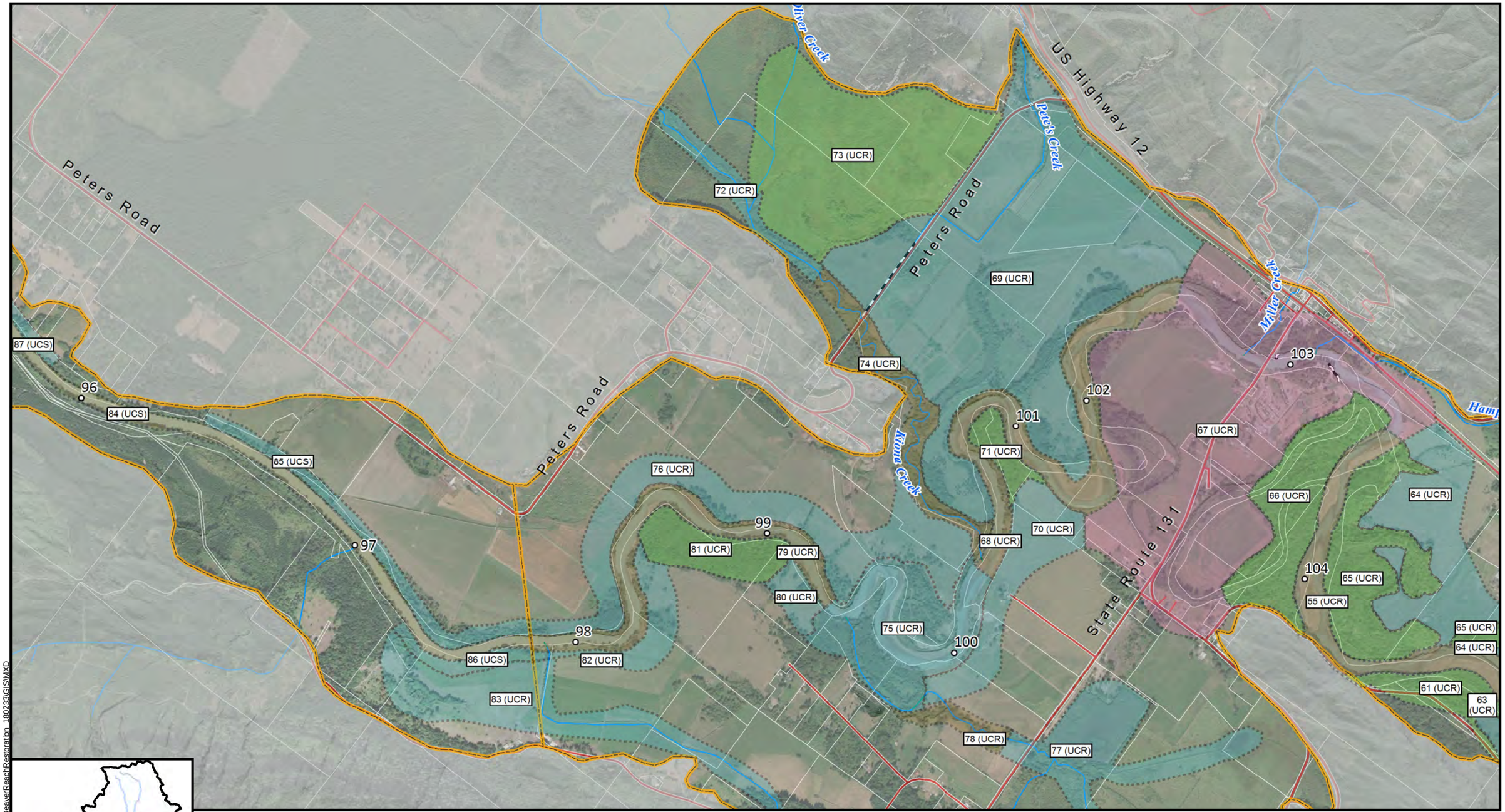
- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Upper Cowlitz - Randle

Upper Cowlitz-Cispus Community-based Habitat Strategy Development



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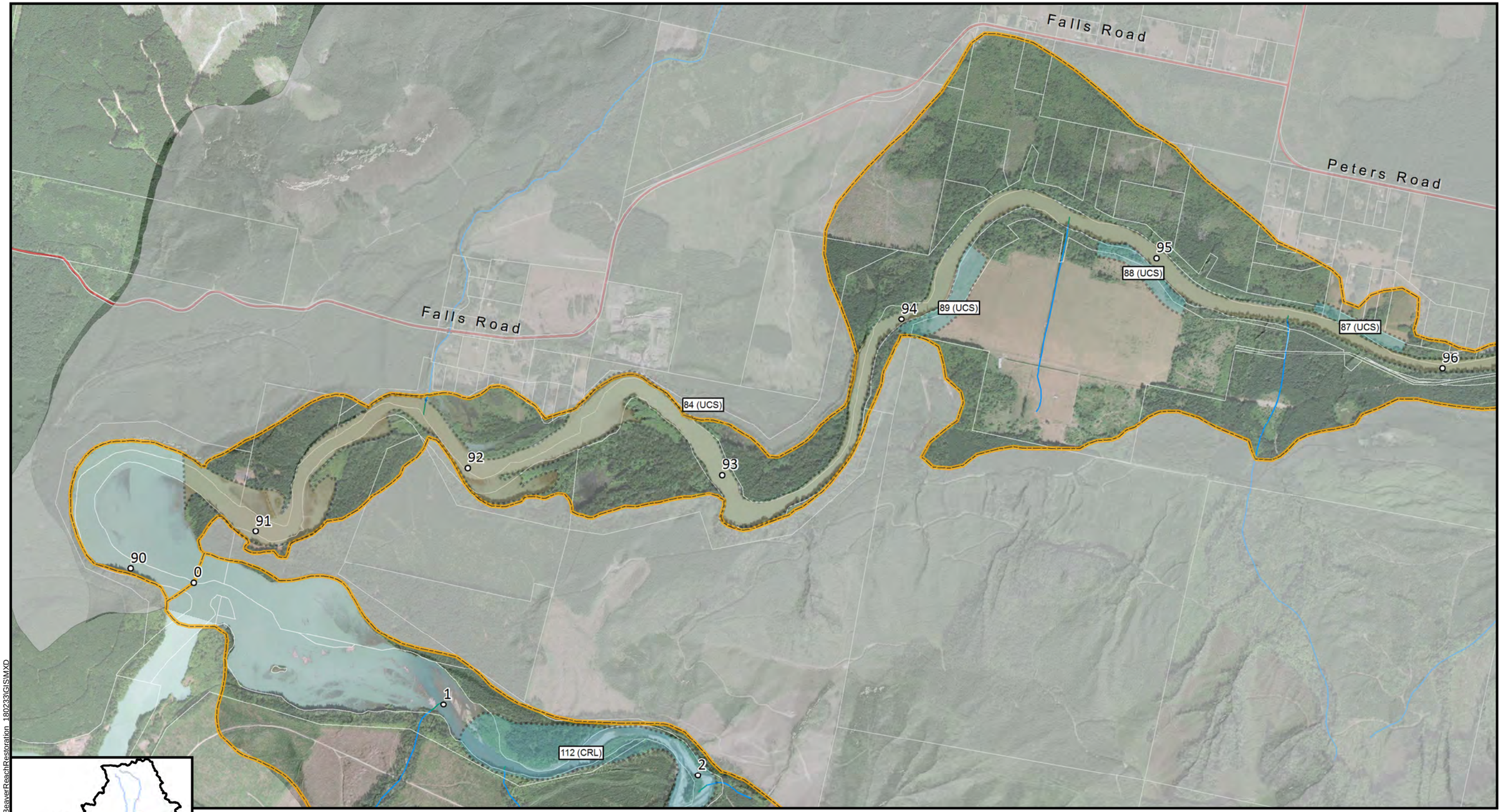
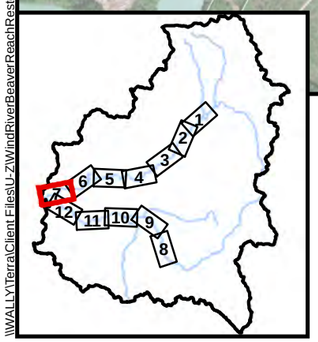
Habitat Action Areas

Landscape Unit(s):

Upper Cowlitz - Scanewa
Upper Cowlitz - Randle

Upper Cowlitz-Cispus Community-based Habitat Strategy Development





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*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

0 1,000 2,000 4,000 Feet

Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Upper Cowlitz - Scanewa

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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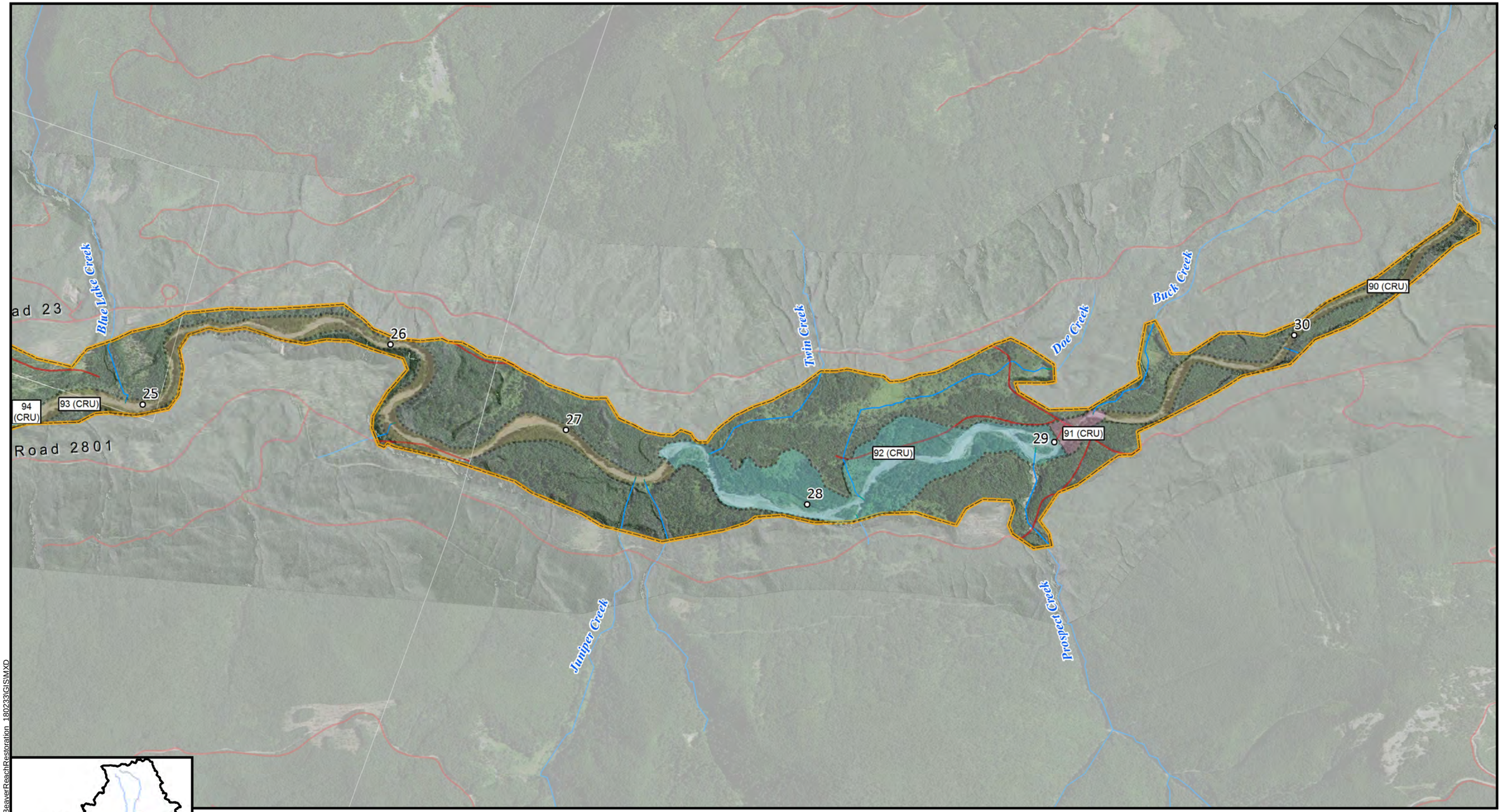

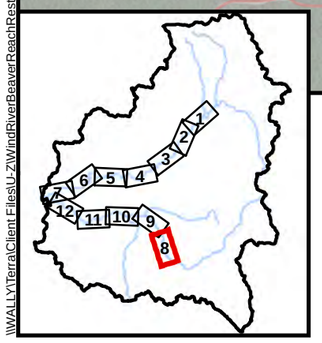

*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

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0 1,000 2,000 4,000 Feet

Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Cispus - Upper

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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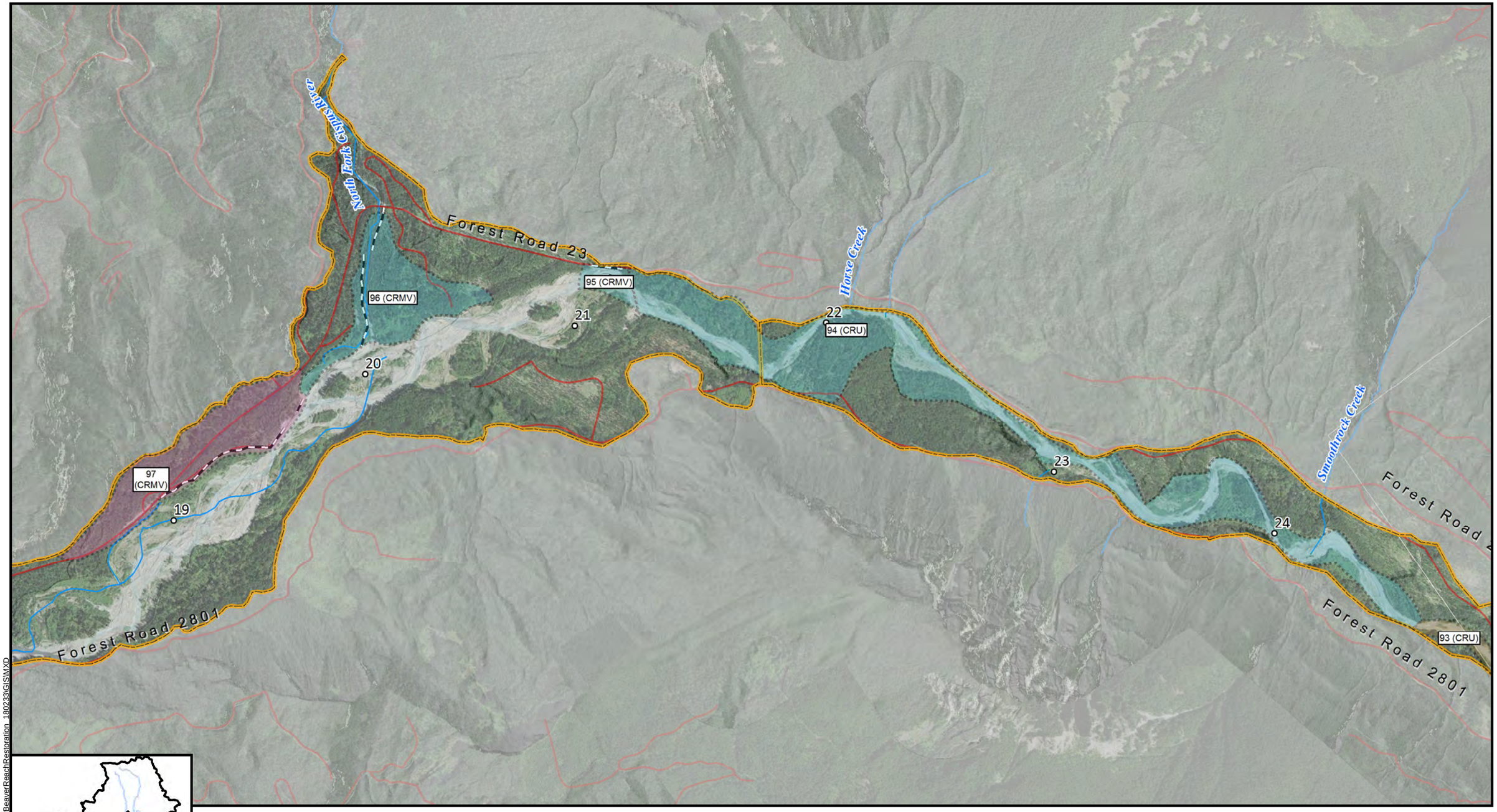

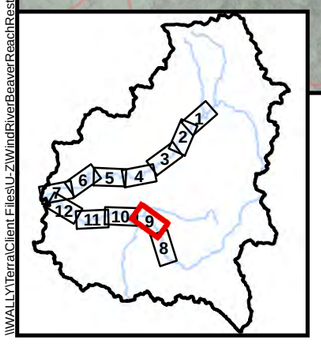

*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

0 1,000 2,000 4,000 Feet

Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Cispus - Mid-Valley
Cispus - Upper

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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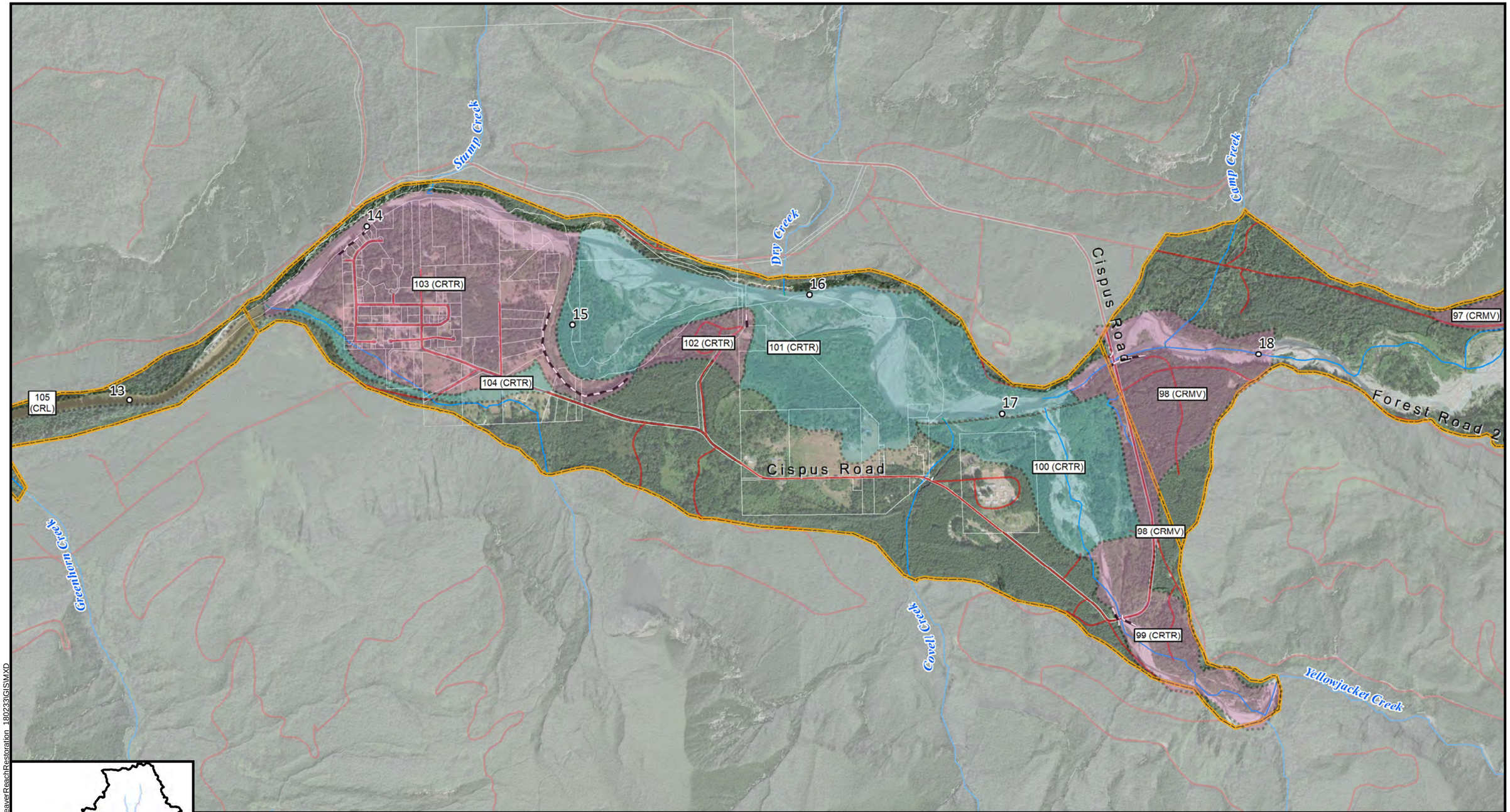

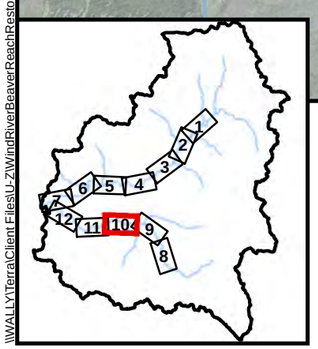

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*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

0 1,000 2,000 4,000 Feet

Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Cispus - Lower
Cispus - Tower Rock
Cispus - Mid-Valley

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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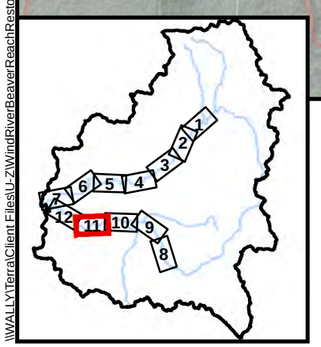

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*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

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Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Cispus - Lower

Upper Cowlitz-Cispus Community-based Habitat Strategy Development

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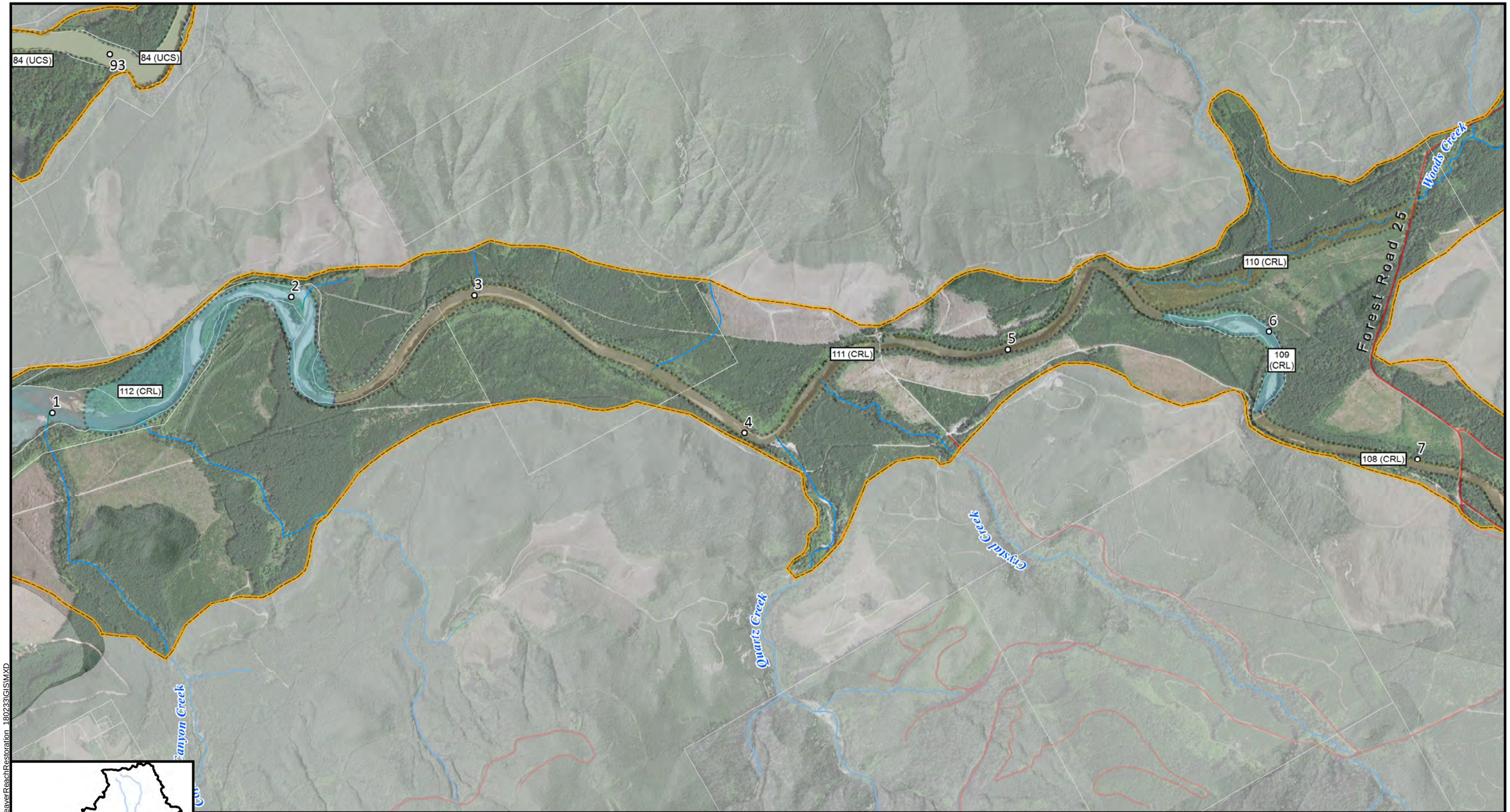

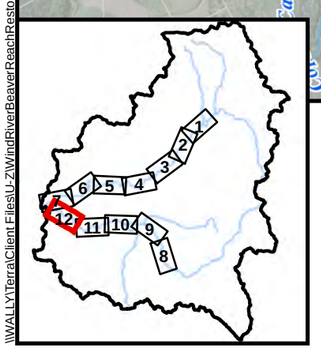

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*Underlying hillshade calclulated from multiple LiDAR datasets

*Imagery from Bing Maps

0 1,000 2,000 4,000 Feet

Action Type

- Protect
- Strategic Actions
- Reconnect and Restore
- Enhance and Create
- Landscape Unit Boundary
- Levee and/or Armoring
- Parcel Boundaries
- Roads
- River Miles
- NHD Streams

Habitat Action Areas

Landscape Unit(s):

Cispus - Lower

Upper Cowlitz-Cispus Community-based Habitat Strategy Development