Supplement S2. Intervention Type and Cost Estimate Descriptions

| **Biological variable and metric** | **Description**  | **Actions** | **Cost metric** | **Cost estimate and source** | **Transformation** |
| --- | --- | --- | --- | --- | --- |
| Riparian forest cover (% of HUC6 riparian zone) | Forested area in 230 meter corridor around stream | RFR - Riparian forest restoration Riparian restoration project, including riparian planting, invasive species management, riparian fencing, and so forth. Assumptions: Project cost is one-time expense; project effects are immediate and last forever. | $/km2 (based on $/acre) | $8,366,699 per km2 ($33,859 per acre)Source: Based on average unit cost for 8 projects conducted in Wenatchee River subbasin by the Chelan County Natural Resource Department. Documented in Unit Costs\_Data\_Final/RFC - Restoration worksheet. Projects years ranged from 2006 to 2011. Project costs were transformed into 2011 dollars using the Producer Price Index.Riparian restoration projects (N=8)CCNRD\_Cummings Restoration ProjectCCNRD\_Icicle Revegetation Fromm 7CCNRD\_Lower Wenatchee Agricultural Riparian EnhancementCCNRD\_Wenatchee River Riparian Enhancement RM 1.4CCNRD\_Wenatchee River Riparian Enhancement RM 11CCNRD\_Wenatchee River Riparian Enhancement RM 13.6CCNRD\_Wenatchee River Riparian Enhancement RM 15.1CCNRD\_Old Peshastin Mill Riparian Enhancement | For each watershed, the $/km2 cost estimate is transformed into a $/(%km2) cost estimate by first calculating the number of km2 that is equivalent to 1% of the watershed’s riparian zone. The $/km2 cost estimate is then multiplied by this number to get the $/(%km2) cost estimate, expressed in terms of a 1% unit (instead of 1.0 = 100%). For example, if the cost per km2 is $1M, and the number of km2 that equals 1% of a watershed’s riparian area is 0.25, the cost per 1% of that watershed’s riparian area would be $250,000. Note that a unit cost that is uniform across watersheds in terms of the original cost metric (area) will vary after it is transformed into the biological metric (% of area) because the total riparian zone varies across watersheds. |
| Total forest cover (% of HUC6) | Using a USFS GIS layer of stand compositions and clearings with known sources, we filled clearings from logging activities and anthropogenic impervious surface additions with the same forest cover types as adjacent forested areas. We filled fire clearings in the dry forest types, with the assumption that under historical conditions fires in dry forests were generally more frequent and less intense, and not likely to create open-canopied clearings that happen now with the more intense fire regimes. We chose this method because it was in alignment with forest planning efforts for this area which are trying to move it so that it looks more like historical conditions are estimated to be.% of HUC6 | UFR - Upland forest restoration Forest fuel reduction project, including combinations of mechanical treatments (*i.e.*, removal of standing timber and other biomass) and prescribed fire.Assumption: Project cost is one-time initial expense (mechanical treatments + prescribed burning) + annual costs (prescribed burning); annual "maintenance" produces effects forever. | $/km2 of treatment | $308,881/km2 of treatment In lieu of in-basin estimates we assume an initial expense of $250/acre and an annual expense of $50/ acre ($2011USD). Converted to net present value assuming a 5% discount rate.  | The focus is on the effects of wildfire on TFC. Current conditions promote fires that are more severe than those experienced historically, resulting in lower levels of TFC compared to historic periods. One set of treatments for these conditions involves combinations of mechanical treatments (*i.e.*, removal of standing timber and other biomass) and prescribed fire. These treatments, referred to as fuel reduction treatments, can be characterized as an action that affects TFC.Two sources of uncertainty confound any attempt to estimate the cost of changing TFC in this way, however. First, fuel reduction treatments can generate economic benefits separate from the effects on TFC. This action can include the sale of timber as part of the treatment action, depending on the size of logs generated. The location of the treatment and the relevant market conditions determine the extent to which such sales can offset the cost of the treatment action, but estimating such an offset is beyond the scope of this project. Successful treatments actions can also reduce fire suppression costs, which again can be viewed as offsetting treatment costs but for which estimates are not possible.Second, connecting fuel reduction treatments to a change in TFC requires information on how the area treated is transformed into a change in the area of TFC. This transformation depends on how treatments affect the probability of wildfires on the treated area as well as adjacent areas. Without information specific to the Wenatchee, then, no estimates of how fuel reduction treatments change TFC are possible.Sources: Hartsough, B.R., S. Abrams, R.J. Barbour, E.S. Drews, J.D. McIver, J.J. Moghaddas, D.W. Schwilk, and S.L. Stephens. 2008. The economics of alternative fuel reduction treatments in western United States dry forests: financial and policy implications from the National Fire and Fire Surrogate Study. Forest Economics and Policy. 10:344-354Stephens, S.L., J.J. Moghaddas, C. Ediminster, C.E. Fiedler, S. Hasse, M.Harrington, J.E. Keeley, J.D. McIver, K. Metlen, C.N. Skinner, and A.Youngblood. 2009. Fire treatment effects on vegetation structure, fuels, and potential fire severity in western U.S. forests. Ecological Applications 19: 305-320.Rummer, B. 2008. Assessing the Cost of Fuel Reduction Treatments: A Critical Review. Forest Policy and Economics 10(6):355-362. |
| Road density | km·km-2 in HUC6 | RDD - Road decommissioning“Road decommissioning involves hydrologically restoring by out sloping, restoring natural drainage features, blocking, and removing from the classified road system. Decommissioning treatments would be site-specific and would involve using a variety of techniques including removal of culverts and fill at stream crossings, construction of new waterbars and dips, outsloping of road surfaces, pullback of sidecast material, recontouring or blocking of the road entrance, scarification of the roadway and ditches, placement of cleared vegetative material on disturbed areas, revegetation of select sites, and seed and/or mulching of disturbed areas. Given the topography of the area, most of the roads would receive the following treatments unless identified otherwise. Active decommissioning entails intensive, mechanical treatment (e.g. culvert removal, outsloping, scarification/decompaction of road surface, revegetation) in order to achieve restoration objectives. Passive decommissioning does not entail major mechanical treatment because the road or road segment is already revegetated and it does not pose a hydrologic risk due to the slope or condition. For roads that are passively decommissioned the treatment would merely entail permanent blockage of the entrance to motor vehicles in order to allow the road to return to a more natural condition. The level of decommissioning has been classified for each road or road segment proposed in this project based on the most current information on its condition, slope, existing stream crossings, and unstable areas. Level a decommissioning entails intensive active treatment (e.g. culvert removal, outsloping, decompaction of the road surface, revegetation) across most or all of the road or road segment in order to achieve restoration objectives. Level b decommissioning is for road or road segments that need only minor prescriptions (e.g. waterbars, small culvert removal, entrance blockage). Level c decommissioning is for passive decommissioning (no action or entrance blockage).”Source: USDA, USFS, Draft Environmental Assessment, Peshastin and Chumstick Road Decommissioning Project, 2012, p. 25 (Defns of levels), p. 90 (Table 11, Estimated costs for road decommissioning under Alternative 2 based on recent decommissioning project costs in the project area) | $/km of road | $9321/kmAssumes project cost is one-time expense; project effects last forever with no annual maintenance costs.Estimate is for “level a” decommissioning.Source: Environmental Assessment, Peshastin and Chumstick Road Decommissioning Project Wenatchee River Ranger District, Okanogan‑Wenatchee National Forest Chelan County, Washington, 2012 | $/km transformed into $/(km/km2), based on km2 of watershed |
| Spawner capacity  | # of spawner capacity | CLV - Culvert removal | $/culvert removed | $150,000/culvertSource: Upper Columbia Salmon Recovery Board, Upper Columbia Implementation Schedule database, Wenatchee subbasin projects (http://uc.ekosystem.us/)Culvert projects used for estimate (N=30)Alder Creek Culvert #1Alder Creek Culvert #3CCNRD Mill Creek Culvert Replacement Mountain Home Ranch RdCCNRD\_Nason Creek Coulter Creek Barrier ReplacementChumstick Culvert Project #1 ‑ Lemons 1Chumstick Culvert Project #10 ‑ WatkinsChumstick Culvert Project #11 ‑ HinthorneChumstick Culvert Project #12 ‑ SunitschChumstick Culvert Project #13 ‑ BeardsleyChumstick Culvert Project #14 ‑ JesterChumstick Culvert Project #15 ‑ WolgamuthChumstick Culvert Project #16 ‑ Himes‑MazurChumstick Culvert Project #17 ‑ ZirjackChumstick Culvert Project #2 ‑ EllsChumstick Culvert Project #3 ‑ DeRosierChumstick Culvert Project #4 ‑ DolozyckiChumstick Culvert Project #5 ‑ OwnbyChumstick Culvert Project #6 ‑ SchielChumstick Culvert Project #7 ‑ LairdChumstick Culvert Project #8 ‑ Lemons 2Chumstick Culvert Project #9 ‑ Lemons 3Clear Creek Passage Program ‑ Culvert #1Clear Creek Passage Program ‑ Culvert #2Clear Creek Passage Program ‑ Culvert #3Mill Creek Culvert Replacement ProjectUpper Skinney Creek Culvert Replacement ProjBeaver Creek Passage Program #1Beaver Creek Passage Program #2Beaver Creek Passage Program #3 | Assumes removal of each culvert increases habitat area by 1,000 m2 and raises the carrying capacity in optimal habitat conditions by five additional potential spawning adultsSource for new habitat from culverts:Chelan County Natural Resources Department, 2006 (7th Round) SRFB Cycle – Grant Application, Alder Creek Culvert #1, Project Report, Table 3. Relative priority, biological benefit, feasibility and costs for replacing selected culverts in Chelan County, n.d. |
| Fry capacity | a) m2 of fry capacity | SCH - Side channel construction | $/m2 of side channels | $86.56/m2 of side channels Source: Upper Columbia Salmon Recovery Board, Upper Columbia Implementation Schedule database, Wenatchee subbasin projects (http://uc.ekosystem.us/)Side Channel projects (N=15)Boat launch off channel reconnection projectCashmere Pond Off Channel HabitatCCNRD\_CMZ 6 Side ChannelEntiat National Fish Hatchery Floodplain ConnectioEntiat River Foreman Floodplain ConnectionFender Mill Floodplain Restor Phase 1Gagnon CMZ Off Channel Habitat ProjectGoodfellow Chotzen Floodplain ReconnectionHarrison Side ChannelLower Wenatchee River Complexity Site 12/13Lower White Pine B+ ReconnectionNason Creek Oxbow Reconnection ProjectPeshastin Creek Levee Removal RM 6.2PUD\_Dryden Fish Enhancement CMZ ProjectReecer Creek Floodplain Restoration | Side channels directly expand fry capacity (1:1) |