

## 7.0 ACTION PLAN

The recovery actions selected for implementation are presented in this chapter. The actions are designed to increase productivity, abundance, diversity, and spatial structure (distribution) of salmonids by eliminating the threats identified in Chapter 4.0. The discussion focuses on actions pertaining to habitat and, to a lesser extent, hatcheries. The discussions for the hydroelectric system and harvest are limited, because actions in these “Hs” are generally outside the control of subbasin managers. Chapter 7.0 also includes information on legal and public involvement actions that may be needed to implement the plan or to make the plan more successful. The chapter concludes with a discussion of the expected change in wild fish performance with plan implementation. It is important to note that the ICTRT has confirmed that hatchery fish will not count toward meeting the delisting criteria identified in Chapter 6.0.

### 7.1 HABITAT ACTIONS

Habitat actions proposed by the SRSRB are aimed at Major Spawning Aggregations and are grouped under “Approach Categories.” These categories define the approach to be taken to implementing strategies (restoration or protection) discussed in Section 6.0 in order to achieve the desired future condition and recovery goals (Chapter 5.0). These approaches are designed to improve upland habitat, riparian conditions, floodplain functions, instream habitat, water quantity, and water quality. The selected approaches were prioritized using the following criteria:

- **Effectiveness:** What is the probability that implementing this strategy will achieve the objective?
- **Technical Feasibility:** How feasible is the strategy from a technical perspective?
- **Cost/benefit:** Are the benefits to fish habitat large relative to the cost of the strategy?

The approach categories were given priority values on a scale of 1 (highest) to 5 (lowest). Habitat factors (attribute) are correlated with sets of approaches, each of which is prioritized. On Table 7-1, it can be seen that the approach to improving embeddedness will rely on actions involving improvement of riparian areas (highest priority) to improving water quantity (lowest priority). Actions to achieve these improvements will be defined for each MSA and each habitat factor.

**Table 7-1 Prioritization of Approaches to Habitat Restoration**

| Habitat Factor         | Approach Categories                     | Priority |
|------------------------|---|----------|
| Substrate Embeddedness | Improve riparian areas                  | 1        |
|                        | Improve uplands                         | 2        |
|                        | Improve channel and floodplain function | 3        |
|                        | Improve instream habitat                | 4        |
|                        | Improve water quantity                  | 5        |
| Large Woody Debris     | Improve channel and floodplains         | 1        |
|                        | Improve riparian areas                  | 2        |
|                        | Improve instream habitat                | 3        |
| Pools                  | Improve channel and floodplain          | 1        |
|                        | Improve riparian areas                  | 2        |
|                        | Improve instream habitat                | 3        |
|                        | Improve water quantity                  | 4        |

(continued)

**Table 7-1 Prioritization of Approaches to Habitat Restoration (continued)**

| Habitat Factor      | Approach Categories                     | Priority |
|---------------------|---|----------|
| Riparian Function   | Improve riparian areas                  | 1        |
|                     | Improve channel and floodplain function | 2        |
|                     | Improve water quantity                  | 3        |
| Confinement         | Improve channel and floodplain          | 1        |
|                     | Improve riparian areas                  | 2        |
| Maximum Temperature | Improve riparian areas                  | 1        |
|                     | Improve water quantity                  | 2        |
|                     | Improve channel and floodplain          | 3        |
|                     | Improve instream habitat                | 4        |
| Bedscour            | Improve channel and floodplain          | 1        |
|                     | Improve riparian areas                  | 2        |
|                     | Improve instream habitat                | 3        |
|                     | Improve uplands                         | 4        |
|                     | Improve water quantity                  | 5        |
| Summer Flow         | Improve water quantity                  | 1        |
|                     | Improve uplands                         | 2        |
|                     | Improve riparian areas                  | 3        |
|                     | Improve channel and floodplain          | 4        |

The habitat factors were then arranged in order, from the most important to least important for each MSA (Table 7-2). In most cases, attributes were combined to obtain a single value for a habitat factor. For example, the value for the habitat factor “embeddedness” is the total of the related attributes turbidity, percent fines, and embeddedness. Table 7-2 also contains restoration and protection objectives for habitat factors. For example, the restoration objective for temperature is to achieve a stream condition where the water temperature does not rise above 72°F for more than four days per month. Protection objectives for each habitat factor are maintenance of existing conditions.

The actions proposed to improve stream conditions in each MSA and mSA are presented in Table 7-3. The table includes information on action type, the number of units (acres, miles of stream etc.) affected by the action, annual costs, and the expected costs over the 15-year planning period. The tables in Appendix M detail the habitat factors and proposed actions for each population and MSA. Table M-1 contains the habitat factors and general proposed actions for each population. Table M-2 contains the habitat factors and detailed action strategy for each MSA.

The SRSRB recognizes the need to establish fair and equitable water sharing agreements to address flow in interstate streams between the states of Washington and Oregon to restore flow. The West Little Walla Walla River is a case in point. This perennial stream has been dried up in Washington three out of the last four years by actions taken in Oregon with the loss of fish and wildlife habitat and water rights. An example of such agreement is the stipulation entered into between Oregon and Washington October 21, 1933 providing that the waters of Mud Creek, Schwartz Spring Branch, and Dry Creek and their tributaries “shall be administered, and the water distributed to such rights, in accordance with the decrees of the courts of the two states and the permits for the appropriation of water issued by authority of the two states, in the same manner as if the State line did not exist.” These are interstate streams in the Walla Walla Basin.

**Table 7-2 Summary Table of Habitat Factors and Objectives for Each MSA**

| <b>Priority</b>  | <b>Habitat Factor and Objective</b>                        |
|--|--|
| <b>Mainstem Walla Walla River MSA</b>  |  |
| <b>Imminent Threats: Fish Screens, Passage Barriers, Low/Dewatered Streams</b>                               |  |
| I.   | Temperature: not more than 4 days above 72°F               |
| II.  | Large Woody Debris: 0.5 to 1 pieces per channel width      |
| III.   | Embeddedness: less than 10% embeddedness                   |
| III.   | Riparian Function: 40 to 90% of maximum                    |
| IV.  | Channel Confinement: reduce to 40% to 60% of stream length |
| <b>Mill Creek MSA</b>  |  |
| <b>Imminent Threats: Fish Passage Barriers (including gravel berms), Fish Screens, Low/Dewatered Streams</b> |  |
| I.   | Turbidity: Protect existing condition                      |
| II.  | Temperature: Protect existing condition                    |
| III.   | Large Woody Debris: Protect existing condition             |
| IV.  | Riparian: Protect existing condition                       |
| <b>Middle Touchet River MSA (mainstem from Coppei Creek to Patit Creek)</b>                                  |  |
| <b>Imminent Threats: Fish Screens, Fords, Low Stream Flows, Gravel Berms</b>                                 |  |
| I.   | Embeddedness: Less than 10%                                |
| II.  | Temperature: No more than 4 days above 72°F                |
| III.   | Large Woody Debris: 1 piece per channel width              |
| IV.  | Confinement: 15 to 40% of streambank length                |
| <b>Upper Touchet River MSA (Patit Creek Upstream to Touchet Headwaters)</b>                                  |  |
| <b>Imminent Threats: Fish Screens, Fords, Low Stream Flows, Gravel Berms</b>                                 |  |
| I.   | Temperature: No more than 4 days above 72°F                |
| II.  | Riparian: 62 to 82% of maximum                             |
| III.   | Large Woody Debris: 1 to 2 pieces per channel width        |
| IV.  | Confinement: 10 to 40% of streambank length                |
| <b>Upper Tucannon River MSA (from Pataha Creek Upstream to Tucannon Headwaters)</b>                          |  |
| <b>Imminent Threats: Fish Screens, Low Stream Flows</b>  |  |
| I.   | Riparian: 40 to 75% of maximum                             |
| II.  | Large Woody Debris: 1 or more pieces per channel width     |
| III.   | Confinement: 25 to 50% of streambank length                |
| IV.  | Temperature: No more than 4 days above 72°F                |
| <b>Alpowa Creek MSA</b>  |  |
| <b>Imminent Threats: Fish screens, Low Stream Flows, Remove Obstructions</b>                                 |  |
| I.   | Riparian: > 80% of Historic                                |
| II.  | Turbidity: Reduce  |
| III.   | Temperature: All Days < 77°F                               |
| IV.  | Large Woody Debris: >0.33 or more pieces per channel width |

(continued)

**Table 7-2 Summary Table of Habitat Factors and Objectives for Each MSA (continued)**

| Priority  | Habitat Factor and Objective  |
|---|---|
| <b>Joseph Creek MSA</b>   |   |
|   | Joseph Creek lies primarily in Oregon. Therefore, priority actions for the portion of Joseph Creek within Washington are to address imminent threats.                       |
| <b>Lower Grande Ronde MSA</b>   |   |
|   | Objectives for the Lower Grande Ronde are currently being developed in consultation with ODFW.  |
| <b>Wenaha River MSA</b>   |   |
|   | The vast majority of the Wenaha River lies entirely within a wilderness area administered by the USFS. The proposed action for this river is to continue protective status. |
| <b>Asotin Creek MSA (mouth to headwaters including all tributaries except George Creek)</b> |   |
| <b>Imminent Threat: Passage Barriers, Fish Screens, Dewatered Streams</b>                   |   |
| I.  | Large Woody Debris: 1 to 2 pieces per channel width   |
| II.   | Embeddedness: Less than 20%   |
| III.  | Bed Scour: Reduce to less than 10 cm  |
| IV.   | Riparian: 75% to 90% of maximum   |
| <b>George Creek MSA (Tributary of Asotin Creek)</b>   |   |
| I.  | Embeddedness: Less than 10%   |
| II.   | Large Woody Debris: 1 piece per channel width   |
| III.  | Riparian: >75%  |
| IV.   | Temperature: No more than 1 day above 72°C  |

### 7.1.1 Costs

Costs associated with the proposed actions for MSAs are contained in Table 7-3. This table summarizes the cost of proposed actions over the 15-year planning period. The data indicate that, exclusive of monitoring and evaluation, implementation planned actions in MSAs will cost approximately \$6.9 million per year or \$103.5 million over the 15-year plan period. Monitoring costs will be developed once the plan is accepted by NMFS. Funding sources are discussed in Section 8.1.

Protection and passive restoration will be used to restore mSAs. While there are no direct investments associated with protection, there would be costs associated with passive restoration. Cost estimates for completing passive restoration actions in each mSA will be developed over time as the plan is implemented.

Table 7-3 Annual Costs for Actions in MSAs

Annual costs<sup>1</sup> for actions in each of the Priority Restoration MSA's

| 20-May-05 | ACTIONS                                    | Mainstem Walla Walla |            |               |             | Mill Creek MSA      |                     |            |               |             |                     |
|-----------|--|----------------------|------------|---------------|-------------|---------------------|---------------------|------------|---------------|-------------|---------------------|
|           |  | # of Units per year  | Unit Type  | Cost per unit | Annual Cost | Total Units (15 yr) | # of Units per year | Unit Type  | Cost per unit | Annual Cost | Total Units (15 yr) |
|           | CRP <sup>2</sup>                           |                      |            |               |             |                     |                     |            |               |             |                     |
|           | Maintain roads/ditches                     |                      |            |               |             |                     |                     |            |               |             |                     |
|           | CRP-like program <sup>3</sup>              |                      |            |               |             |                     |                     |            |               |             |                     |
|           | direct seed                                | 1000                 | acres      | \$65          | \$65,000    | 15,000              | 500                 | acres      | \$65          | \$32,500    | 7,500               |
|           | Reforest Timberland                        | 1000                 | acres      | \$27          | \$27,000    | 15,000              | 200                 | acres      | \$27          | \$5,400     | 3,000               |
|           | Convert annual to perennial crops          | 50                   | acres      | \$1,000       | \$50,000    | 750                 | 100                 | acres      | \$1,000       | \$100,000   | 1,500               |
|           | Install grass waterways                    | 1000                 | acres      | \$30          | \$30,000    | 15,000              | 200                 | acres      | \$30          | \$6,000     | 3,000               |
|           | Install water control structures           | 100                  | acres      | \$70          | \$7,000     | 1,500               | 30                  | acres      | \$70          | \$2,100     | 450                 |
|           | Install sediment basins <sup>4</sup>       | 15                   | structures | \$4,000       | \$60,000    | 225                 | 10                  | structures | \$4,000       | \$40,000    | 150                 |
|           | Control upland noxious weeds               | 1                    | basin      | \$40,000      | \$40,000    | 15                  | 1                   | basin      | \$40,000      | \$40,000    | 15                  |
|           | Protect/restore road right of ways         | 100                  | acres      | \$50          | \$5,000     | 1,500               | 100                 | acres      | \$50          | \$5,000     | 1,500               |
|           | relocate roads <sup>10</sup>               | 10                   | acres      | \$1,000       | \$10,000    | 150                 | 5                   | acres      | \$1,000       | \$5,000     | 75                  |
|           | pave roads                                 | 0.4                  | miles      | \$100,000     | \$40,000    | 6                   | 0.1                 | miles      | \$100,000     | \$10,000    | 2                   |
|           |  | 0                    | miles      | \$100,000     | \$0         | 0                   | 0                   | miles      | \$100,000     | \$0         | 0                   |
|           | CRP <sup>5</sup>                           | 300                  | acres      | \$291         | \$87,300    | 4,500               | 50                  | acres      | \$291         | \$14,550    | 750                 |
|           | CRP-like program <sup>6</sup>              | 55                   | acres      | \$291         | \$16,005    | 825                 | 20                  | acres      | \$291         | \$5,820     | 300                 |
|           | Riparian easements in perpetuity           | 20                   | acres      | \$2,500       | \$50,000    | 300                 | 20                  | acres      | \$2,500       | \$50,000    | 300                 |
|           | Fence livestock&develop water <sup>7</sup> | 2                    | site       | \$50,000      | \$100,000   | 30                  | 2                   | site       | \$50,000      | \$100,000   | 30                  |
|           | Control riparian noxious weeds             | 20                   | acres      | \$500         | \$10,000    | 300                 | 20                  | acres      | \$500         | \$10,000    | 300                 |
|           | Soft bank stabilization                    | 500                  | feet       | \$50          | \$25,000    | 7,500               | 500                 | feet       | \$50          | \$25,000    | 7,500               |
|           | Modify channel geometry                    | 0.5                  | miles      | \$400,000     | \$200,000   | 8                   | 0.5                 | miles      | \$400,000     | \$200,000   | 8                   |
|           | Install instream habitat                   | 10                   | units      | \$3,000       | \$30,000    | 150                 | 10                  | units      | \$3,000       | \$30,000    | 150                 |
|           | Set dikes back                             | 1000                 | feet       | \$100         | \$100,000   | 15,000              | 1000                | feet       | \$100         | \$100,000   | 15,000              |
|           | Remove dikes                               | 0                    |            |               | \$0         | 0                   | 0                   |            |               | \$0         | 0                   |
|           | Add large wood                             | 500                  | feet       | \$50          | \$25,000    | 7,500               | 500                 | feet       | \$50          | \$25,000    | 7,500               |
|           | Protect wetlands                           | 1                    | acres      | \$500         | \$500       | 15                  | 1                   | acres      | \$500         | \$500       | 15                  |
|           | Develop wetlands                           | 0.2                  | acres      | \$10,000      | \$2,000     | 3                   | 0.2                 | acres      | \$10,000      | \$2,000     | 3                   |
|           | Implement water storage <sup>8</sup>       | 50                   | acre-feet  | \$2,000       | \$100,000   | 750                 | 0                   | acre-feet  | \$2,000       | \$0         | 0                   |
|           | Shallow aquifer recharge <sup>9</sup>      | 1                    | site       | \$20,000      | \$20,000    | 15                  | 1                   | site       | \$20,000      | \$20,000    | 15                  |
|           | Irrigation&conveyance efficiencies         | 150                  | acres      | \$2,000       | \$300,000   | 2,250               | 10                  | acres      | \$2,000       | \$20,000    | 150                 |
|           | lease water rights                         | 10                   | cfs        | \$50,000      | \$500,000   | 150                 | 1                   | cfs        | \$50,000      | \$50,000    | 15                  |
|           | Purchase water rights                      | 0.1                  | cfs        | \$100,000     | \$10,000    | 2                   | 0.1                 | cfs        | \$100,000     | \$10,000    | 2                   |
|           | Urban stormwater BMP                       |                      |            |               | \$0         | 0                   |                     |            |               | \$0         | 0                   |
|           | Rural stormwater BMP                       | 1                    | site       | \$30,000      | \$30,000    | 15                  | 1                   | site       | \$30,000      | \$30,000    | 15                  |
|           | Imminent Threats                           |                      |            |               | \$200,000   |                     |                     |            |               | \$200,000   |                     |
|           | TOTAL ANNUAL IMPLEMENTATION COST           |                      |            |               | \$2,139,805 |                     |                     |            |               | \$1,138,870 |                     |

<sup>1</sup>Many of the identified actions are funded by other programs. This table illustrates the combined, total cost of all projects for each MSA and does not suggest that these costs will be covered by the SRFB or BPA. Costs reported are estimates based on typical experience rates.

<sup>2</sup>CRP is currently funded by the USDA and the Recovery Plan "assumes" that funding will continue. The Cost is based on a vegetation establishment cost of \$100 per acre and then \$55 per year rental payment = avg of \$65 for the 10-year program. While the program is currently filled, it is expected that re-enrollment will occur but that costs will be provided through the Farm bill.

<sup>3</sup>This is for areas/owners where CRP cap has been met. This is not for CRP contract extension.

<sup>4</sup>Sediment basins cost \$50,000 per acre for a 10' deep basin.

<sup>5</sup>CRP is currently funded by the USDA and Conservation commission. The Recovery Plan presumes that funding levels will continue and that existing contracts will be covered after they expire. This is for areas/owners where CRP cap has been met and is based on \$2,500 tree planting cost and \$125/year rental fee. This is not for CRP contract extension.

<sup>6</sup>The intent is to implement CRP-like projects in areas with intermittent or perennial flow that are not CRP-eligible, or in areas where landholding is too small for CRP to be viable. Cost is based on \$2,500 per acre to establish vegetation then \$125 acre rental payment for 15 yr avg = \$291 per year.

<sup>7</sup>Project cost is based on average of 5,000 feet of fence per project @\$3.20/ft, one well and associated troughs and pipe.

<sup>8</sup>This is an anticipated estimate, but costs can vary considerably and final cost will be estimated at the time when actual projects are identified.

<sup>9</sup>The typical project is to divert winter flows into basins or onto fields for infiltration and slow release in the spring early summer and the cost estimate is largely unknown.

<sup>10</sup>This is an average cost, but the cost can vary from \$1,000 per mile for a "farm field" to over \$1,000,000 per mile for highways.

This is a 15-year schedule so we report the average annual implementation schedule and the reported costs are best estimates at today's dollar value.

**Table 7-3 Annual Costs for Actions in MSAs**

| 20-May-05                        |  | Mid-Touchet MSA           |            |               |             |                    | Upper Touchet MSA         |            |               |             |                     |
|----------------------------------|--|---------------------------|------------|---------------|-------------|--------------------|---------------------------|------------|---------------|-------------|---------------------|
|                                  |  | # of Units per year       | Unit Type  | Cost per unit | Annual Cost | Total Units(15 yr) | # of Units per year       | Unit Type  | Cost per unit | Annual Cost | Total Units (15 yr) |
| Upland Actions                   | ACTIONS                                    |                           |            |               |             |                    |                           |            |               |             |                     |
|                                  | CRP <sup>2</sup>                           | 100                       | acres      | \$65          | \$6,500     | 1,500              | 100                       | acres      | \$65          | \$6,500     | 1500                |
|                                  | Maintain roads/ditches                     | UNKNOWN SCHEDULE AND COST |            |               |             |                    | UNKNOWN SCHEDULE AND COST |            |               |             |                     |
|                                  | CRP-like program <sup>3</sup>              | 500                       | acres      | \$65          | \$32,500    | 7,500              | 500                       | acres      | \$65          | \$32,500    | 7500                |
|                                  | direct seed                                | 200                       | acres      | \$27          | \$5,400     | 3,000              | 200                       | acres      | \$27          | \$5,400     | 3000                |
|                                  | Reforest Timberland                        | 0                         | acres      |               | \$0         | 0                  | 100                       | acres      | \$1,000       | \$100,000   | 1500                |
|                                  | Convert annual to perennial crops          | 200                       | acres      | \$30          | \$6,000     | 3,000              | 100                       | acres      | \$30          | \$3,000     | 1500                |
|                                  | Install grass waterways                    | 30                        | acres      | \$70          | \$2,100     | 450                | 30                        | acres      | \$70          | \$2,100     | 450                 |
|                                  | Install water control structures           | 10                        | structures | \$4,000       | \$40,000    | 150                | 10                        | structures | \$4,000       | \$40,000    | 150                 |
|                                  | Install sediment basins <sup>4</sup>       | 1                         | basin      | \$40,000      | \$40,000    | 15                 | 1                         | basin      | \$40,000      | \$40,000    | 15                  |
|                                  | Control upland noxious weeds               | 1000                      | acres      | \$50          | \$50,000    | 15,000             | 1000                      | acres      | \$50          | \$50,000    | 15000               |
|                                  | Protect/restore road right of ways         | 5                         | acres      | \$1,000       | \$5,000     | 75                 | 10                        | acres      | \$1,000       | \$10,000    | 150                 |
|                                  | relocate roads <sup>10</sup>               | 0.1                       | miles      | \$100,000     | \$10,000    | 2                  | 0.1                       | miles      | \$100,000     | \$10,000    | 2                   |
|                                  | pave roads                                 | 0                         | miles      | \$100,000     | \$0         | 0                  | 0                         | miles      | \$100,000     | \$0         | 0                   |
| Riparian Actions                 | CREP <sup>5</sup>                          | 20                        | acres      | \$291         | \$5,820     | 300                | 20                        | acres      | \$291         | \$5,820     | 300                 |
|                                  | CREP-like program <sup>6</sup>             | 50                        | acres      | \$291         | \$14,550    | 750                | 50                        | acres      | \$291         | \$14,550    | 750                 |
|                                  | Riparian easements in perpetuity           | 20                        | acres      | \$2,500       | \$50,000    | 300                | 20                        | acres      | \$2,500       | \$50,000    | 300                 |
|                                  | Fence livestock&develop water <sup>7</sup> | 1                         | site       | \$50,000      | \$50,000    | 15                 | 2                         | site       | \$50,000      | \$100,000   | 30                  |
|                                  | Control riparian noxious weeds             | 20                        | acres      | \$500         | \$10,000    | 300                | 560                       | acres      | \$500         | \$280,000   | 8400                |
|                                  | Soft bank stabilization                    | 300                       | feet       | \$50          | \$15,000    | 4,500              | 500                       | feet       | \$50          | \$25,000    | 7500                |
| Channel and Floodplain Actions   | Modify channel geometry                    | 0.3                       | miles      | \$300,000     | \$90,000    | 5                  | 0.5                       | miles      | \$200,000     | \$100,000   | 8                   |
|                                  | Install instream habitat                   | 3                         | units      | \$3,000       | \$9,000     | 45                 | 10                        | units      | \$3,000       | \$30,000    | 150                 |
|                                  | Set dikes back                             | 300                       | feet       | \$100         | \$30,000    | 4,500              | 200                       | feet       | \$100         | \$20,000    | 3000                |
|                                  | Remove dikes                               | 0                         |            |               | \$0         | 0                  | 0                         |            |               | \$0         | 0                   |
|                                  | Add large wood                             | 200                       | feet       | \$50          | \$10,000    | 3,000              | 400                       | feet       | \$50          | \$20,000    | 6000                |
| Water Quantity Actions           | Protect wetlands                           | 0.3                       | acres      | \$500         | \$150       | 5                  | 0.5                       | acres      | \$500         | \$250       | 8                   |
|                                  | Develop wetlands                           | 0.1                       | acres      | \$10,000      | \$1,000     | 2                  | 0.33                      | acres      | \$10,000      | \$3,300     | 5                   |
|                                  | Implement water storage <sup>8</sup>       | 0                         | acre-feet  | \$2,000       | \$0         | 0                  | 0                         | acre-feet  | \$2,000       | \$0         | 0                   |
|                                  | Shallow aquifer recharge <sup>9</sup>      | 0.33                      | site       | \$20,000      | \$6,600     | 5                  | 1                         | site       | \$20,000      | \$20,000    | 15                  |
|                                  | Irrigation&conveyance efficiencies         | 10                        | acres      | \$2,000       | \$20,000    | 150                | 5                         | acres      | \$2,000       | \$10,000    | 75                  |
|                                  | lease water rights                         | 0.5                       | cfs        | \$50,000      | \$25,000    | 8                  | 0.5                       | cfs        | \$50,000      | \$25,000    | 8                   |
|                                  | Purchase water rights                      | 0.1                       | cfs        | \$100,000     | \$10,000    | 2                  | 0.1                       | cfs        | \$100,000     | \$10,000    | 2                   |
| Water Quality Actions            | Urban stormwater BMP                       |                           |            |               | \$0         | 0                  |                           |            |               | \$0         | 0                   |
|                                  | Rural stormwater BMP                       | 1                         | site       | \$30,000      | \$30,000    | 15                 | 1                         | site       | \$30,000      | \$30,000    | 15                  |
| Imminent Threats                 |  |                           |            | \$100,000     |             |                    |                           |            | \$100,000     |             |                     |
| TOTAL ANNUAL IMPLEMENTATION COST |  |                           |            |               | \$674,620   |                    |                           |            | \$1,136,920   |             |                     |

<sup>1</sup>Many of the identified actions are funded by other programs. This table illustrates the combined, total cost of all projects for each MSA and does not suggest that these costs will be covered by the SRFB or BPA. Costs reported are estimates based on typical experience rates.

<sup>2</sup>CRP is currently funded by the USDA and the Recovery Plan "assumes" that funding will continue. The Cost is based on a vegetation establishment cost of \$100 per acre and then \$55 per year rental payment = avg of \$65 for the 10-year program. While the program is currently filled, it is expected that re-enrollment will occur but that costs will be provided through the Farm bill.

<sup>3</sup>This is for areas/owners where CRP cap has been met. This is not for CRP contract extension.

<sup>4</sup>Sediment basins cost \$50,000 per acre for a 10' deep basin.

<sup>5</sup>CREP is currently funded by the USDA and Conservation commission. The Recovery Plan presumes that funding levels will continue and that existing contracts will be covered after they expire. This is for areas/owners where CREP cap has been met and is based on \$2,500 tree planting cost and \$125/year rental fee. This is not for CREP contract extension.

<sup>6</sup>The intent is to implement CREP-like projects in areas with intermittent or perennial flow that are not CREP-eligible, or in areas where landholding is too small for CREP to be viable. Cost is based on \$2,500 per acre to establish vegetation then \$125 acre rental payment for 15 yr avg = \$291 per year.

<sup>7</sup>Project cost is based on average of 5,000 feet of fence per project @\$3.20/ft, one well and associated troughs and pipe.

<sup>8</sup>This is an anticipated estimate, but costs can vary considerably and final cost will be estimated at the time when actual projects are identified.

<sup>9</sup>The typical project is to divert winter flows into basins or onto fields for infiltration and slow release in the spring early summer and the cost estimate is largely unknown.

<sup>10</sup>This is an average cost, but the cost can vary from \$1,000 per mile for a "farm field" to over \$1,000,000 per mile for highways.

This is a 15-year schedule so we report the average annual implementation schedule and the reported costs are best estimates at today's dollar value.

**Table 7-3 Annual Costs for Actions in MSAs**

| 20-May-05                        |  | Tucannon MSA        |            |               |             |                     | Asotin Creek MSA    |            |               |             |                     |
|----------------------------------|--|---------------------|------------|---------------|-------------|---------------------|---------------------|------------|---------------|-------------|---------------------|
|                                  |  | # of Units per year | Unit Type  | Cost per unit | Annual Cost | Total Units (15 yr) | # of Units per year | Unit Type  | Cost per unit | Annual Cost | Total Units (15 yr) |
| Upland Actions                   | ACTIONS                                    |                     |            |               |             |                     |                     |            |               |             |                     |
|                                  | CRP <sup>2</sup>                           | 100                 | acres      | \$65          | \$6,500     | 1,500               |                     |            |               |             |                     |
|                                  | Maintain roads/ditches                     |                     |            |               |             |                     |                     |            |               |             |                     |
|                                  | CRP-like program <sup>3</sup>              |                     |            |               |             |                     |                     |            |               |             |                     |
|                                  | direct seed                                | 500                 | acres      | \$65          | \$32,500    | 7,500               | 200                 | acres      | \$65          | \$13,000    | 3,000               |
|                                  | Reforest Timberland                        | 200                 | acres      | \$27          | \$5,400     | 3,000               | 500                 | acres      | \$27          | \$13,500    | 7,500               |
|                                  | Convert annual to perennial crops          | 100                 | acres      | \$1,000       | \$100,000   | 1,500               | 50                  | acres      | \$1,000       | \$50,000    | 750                 |
|                                  | Install grass waterways                    | 20                  | acres      | \$30          | \$600       | 300                 | 1000                | acres      | \$30          | \$30,000    | 15,000              |
|                                  | Install water control structures           | 30                  | acres      | \$70          | \$2,100     | 450                 | 30                  | acres      | \$70          | \$2,100     | 450                 |
|                                  | Install sediment basins <sup>4</sup>       | 10                  | structures | \$4,000       | \$40,000    | 150                 | 5                   | structures | \$1,500       | \$7,500     | 75                  |
|                                  | Control upland noxious weeds               | 1                   | basin      | \$40,000      | \$40,000    | 15                  | 5                   | structures | \$4,000       | \$20,000    | 75                  |
|                                  | Protect/restore road right of ways         | 1000                | acres      | \$50          | \$50,000    | 15,000              | 100                 | acres      | \$50          | \$5,000     | 1,500               |
|                                  | relocate roads <sup>10</sup>               | 5                   | acres      | \$1,000       | \$5,000     | 75                  | 10                  | acres      | \$1,000       | \$10,000    | 150                 |
|                                  | pave roads                                 | 0.1                 | miles      | \$10,000      | \$1,000     | 2                   | 0.4                 | miles      | \$10,000      | \$4,000     | 6                   |
|                                  |  | 0                   | miles      | \$100,000     | \$0         | 0                   | 0                   | miles      | \$100,000     | \$0         | 0                   |
| Riparian Actions                 | CREP <sup>5</sup>                          |                     | acres      |               | \$0         | 0                   | 100                 | acres      | \$291         | \$29,100    | 1,500               |
|                                  | CREP-like program <sup>6</sup>             | 20                  | acres      | \$291         | \$5,820     | 300                 | 100                 | acres      | \$291         | \$29,100    | 1,500               |
|                                  | Riparian easements in perpetuity           | 20                  | acres      | \$2,500       | \$50,000    | 300                 | 20                  | acres      | \$2,500       | \$50,000    | 300                 |
|                                  | Fence livestock&develop water <sup>7</sup> | 1                   | site       | \$50,000      | \$50,000    | 15                  | 1                   | site       | \$20,000      | \$20,000    | 15                  |
|                                  | Control riparian noxious weeds             | 20                  | acres      | \$500         | \$10,000    | 300                 | 20                  | acres      | \$500         | \$10,000    | 300                 |
|                                  | Soft bank stabilization                    | 300                 | feet       | \$50          | \$15,000    | 4,500               | 300                 | feet       | \$50          | \$15,000    | 4,500               |
| Channel and Floodplain Actions   | Modify channel geometry                    | 0.33                | miles      | \$300,000     | \$99,000    | 5                   | 0.5                 | miles      | \$185,000     | \$92,500    | 8                   |
|                                  | Install instream habitat                   | 3                   | units      | \$3,000       | \$9,000     | 45                  | 3                   | units      | \$3,000       | \$9,000     | 45                  |
|                                  | Set dikes back                             | 300                 | feet       | \$100         | \$30,000    | 4,500               | 300                 | feet       | \$100         | \$30,000    | 4,500               |
|                                  | Remove dikes                               | 0                   |            |               | \$0         | 0                   | 0                   |            |               | \$0         | 0                   |
|                                  | Add large wood                             | 200                 | feet       | \$50          | \$10,000    | 3,000               | 200                 | feet       | \$50          | \$10,000    | 3,000               |
| Water Quantity Actions           | Protect wetlands                           | 0.3                 | acres      | \$500         | \$150       | 5                   | 0.3                 | acres      | \$500         | \$150       | 5                   |
|                                  | Develop wetlands                           | 0.1                 | acres      | \$10,000      | \$1,000     | 2                   | 0.1                 | acres      | \$10,000      | \$1,000     | 2                   |
|                                  | Implement water storage <sup>8</sup>       | 10                  | acre-feet  | \$2,000       | \$20,000    | 150                 | 10                  | acre-feet  | \$2,000       | \$20,000    | 150                 |
|                                  | Shallow aquifer recharge <sup>9</sup>      | 0.33                | site       | \$20,000      | \$6,600     | 5                   | 0.33                | site       | \$20,000      | \$6,600     | 5                   |
|                                  | Irrigation&conveyance efficiencies         | 10                  | acres      | \$2,000       | \$20,000    | 150                 | 10                  | acres      | \$2,000       | \$20,000    | 150                 |
|                                  | lease water rights                         | 0.5                 | cfs        | \$50,000      | \$25,000    | 8                   | 0.5                 | cfs        | \$50,000      | \$25,000    | 8                   |
|                                  | Purchase water rights                      | 0.1                 | cfs        | \$100,000     | \$10,000    | 2                   | 0.1                 | cfs        | \$100,000     | \$10,000    | 2                   |
| Water Quality Actions            | Urban stormwater BMP                       |                     |            |               | \$0         | 0                   |                     |            |               | \$0         | 0                   |
|                                  | Rural stormwater BMP                       | 1                   | site       | \$30,000      | \$30,000    | 15                  | 1                   | site       | \$30,000      | \$30,000    | 15                  |
| Imminent Threats                 |  |                     |            | \$50,000      |             |                     |                     |            | \$50,000      |             |                     |
| TOTAL ANNUAL IMPLEMENTATION COST |  |                     |            |               | \$724,670   |                     |                     |            | \$612,550     |             |                     |

<sup>1</sup>Many of the identified actions are funded by other programs. This table illustrates the combined, total cost of all projects for each MSA and does not suggest that these costs will be covered by the SRFB or BPA. Costs reported are estimates based on typical experience rates.

<sup>2</sup>CRP is currently funded by the USDA and the Recovery Plan "assumes" that funding will continue. The Cost is based on a vegetation establishment cost of \$100 per acre and then \$55 per year rental payment = avg of \$65 for the 10-year program. While the program is currently filled, it is expected that re-enrollment will occur but that costs will be provided through the Farm bill.

<sup>3</sup>This is for areas/owners where CRP cap has been met. This is not for CRP contract extension.

<sup>4</sup>Sediment basins cost \$50,000 per acre for a 10' deep basin.

<sup>5</sup>CREP is currently funded by the USDA and Conservation commission. The Recovery Plan presumes that funding levels will continue and that existing contracts will be covered after they expire. This is for areas/owners where CREP cap has been met and is based on \$2,500 tree planting cost and \$125/year rental fee. This is not for CREP contract extension.

<sup>6</sup>The intent is to implement CREP-like projects in areas with intermittent or perennial flow that are not CREP-eligible, or in areas where landholding is too small for CREP to be viable. Cost is based on \$2,500 per acre to establish vegetation then \$125 acre rental payment for 15 yr avg = \$291 per year.

<sup>7</sup>Project cost is based on average of 5,000 feet of fence per project @ \$3.20/ft, one well and associated troughs and pipe.

<sup>8</sup>This is an anticipated estimate, but costs can vary considerably and final cost will be estimated at the time when actual projects are identified.

<sup>9</sup>The typical project is to divert winter flows into basins or onto fields for infiltration and slow release in the spring early summer and the cost estimate is largely unknown.

<sup>10</sup>This is an average cost, but the cost can vary from \$1,000 per mile for a "farm field" to over \$1,000,000 per mile for highways.

This is a 15-year schedule so we report the average annual implementation schedule and the reported costs are best estimates at today's dollar value.

**Table 7-3 Annual Costs for Actions in MSAs**

| 20-May-05                               |  | George Creek MSA          |            |               |             | Asotin Creek MSA          |                     |            |               |             |                     |
|---|--|---------------------------|------------|---------------|-------------|---------------------------|---------------------|------------|---------------|-------------|---------------------|
|   |  | # of Units per year       | Unit Type  | Cost per unit | Annual Cost | Total Units (15 yr)       | # of Units per year | Unit Type  | Cost per unit | Annual Cost | Total Units (15 yr) |
| <b>ACTIONS</b>                          |  | PROGRAM IS FILLED         |            |               |             | PROGRAM IS FILLED         |                     |            |               |             |                     |
| CRP <sup>2</sup>                        |  | UNKNOWN SCHEDULE AND COST |            |               |             | UNKNOWN SCHEDULE AND COST |                     |            |               |             |                     |
| Upland Actions                          | Maintain roads/ditches                     |                           |            |               |             |                           |                     |            |               |             |                     |
|   | CRP-like program <sup>3</sup>              | 200                       | acres      | \$65          | \$13,000    | 3000                      | 200                 | acres      | \$65          | \$13,000    | 3,000               |
|   | direct seed                                | 1000                      | acres      | \$27          | \$27,000    | 15000                     | 500                 | acres      | \$27          | \$13,500    | 7,500               |
|   | Reforest Timberland                        | 50                        | acres      | \$1,000       | \$50,000    | 750                       | 50                  | acres      | \$1,000       | \$50,000    | 750                 |
|   | Convert annual to perennial crops          | 200                       | acres      | \$30          | \$6,000     | 3000                      | 1000                | acres      | \$30          | \$30,000    | 15,000              |
|   | Install grass waterways                    | 30                        | acres      | \$70          | \$2,100     | 450                       | 30                  | acres      | \$70          | \$2,100     | 450                 |
|   | Install water control structures           | 5                         | structures | \$1,500       | \$7,500     | 75                        | 5                   | structures | \$1,500       | \$7,500     | 75                  |
|   | Install sediment basins <sup>4</sup>       | 5                         | structures | \$4,000       | \$20,000    | 75                        | 5                   | structures | \$4,000       | \$20,000    | 75                  |
|   | Control upland noxious weeds               | 100                       | acres      | \$50          | \$5,000     | 1500                      | 100                 | acres      | \$50          | \$5,000     | 1,500               |
|   | Protect/restore road right of ways         | 10                        | acres      | \$1,000       | \$10,000    | 150                       | 10                  | acres      | \$1,000       | \$10,000    | 150                 |
| relocate roads <sup>10</sup>            | 0.1  | mile                      | \$100,000  | \$10,000      | 1.5         | 0.4                       | miles               | \$10,000   | \$4,000       | 6           |                     |
| pave roads                              | 0  | mile                      | \$100,000  | \$0           | 0           | 0                         | miles               | \$100,000  | \$0           | 0           |                     |
| Riparian Actions                        | CREP <sup>5</sup>                          | 100                       | acres      | \$291         | \$29,100    | 1500                      | 100                 | acres      | \$291         | \$29,100    | 1,500               |
|   | CREP-like program <sup>6</sup>             | 100                       | acres      | \$291         | \$29,100    | 1500                      | 100                 | acres      | \$291         | \$29,100    | 1,500               |
|   | Riparian easements in perpetuity           | 10                        | acres      | \$2,500       | \$25,000    | 150                       | 20                  | acres      | \$2,500       | \$50,000    | 300                 |
|   | Fence livestock&develop water <sup>7</sup> | 1                         | site       | \$20,000      | \$20,000    | 15                        | 1                   | site       | \$20,000      | \$20,000    | 15                  |
|   | Control riparian noxious weeds             | 10                        | acres      | \$500         | \$5,000     | 150                       | 20                  | acres      | \$500         | \$10,000    | 300                 |
| Soft bank stabilization                 | 300  | feet                      | \$50       | \$15,000      | 4500        | 300                       | feet                | \$50       | \$15,000      | 4,500       |                     |
| Channel and Floodplain Actions          | Modify channel geometry                    | 0.5                       | miles      | \$185,000     | \$92,500    | 7.5                       | 0.5                 | miles      | \$185,000     | \$92,500    | 8                   |
|   | Install instream habitat                   | 3                         | units      | \$3,000       | \$9,000     | 45                        | 3                   | units      | \$3,000       | \$9,000     | 45                  |
|   | Set dikes back                             | 300                       | feet       | \$100         | \$30,000    | 4500                      | 300                 | feet       | \$100         | \$30,000    | 4,500               |
|   | Remove dikes                               | 0                         |            |               | \$0         | 0                         | 0                   |            |               | \$0         | 0                   |
| Water Quantity Actions                  | Add large wood                             | 200                       | feet       | \$50          | \$10,000    | 3000                      | 200                 | feet       | \$50          | \$10,000    | 3,000               |
|   | Protect wetlands                           | 0.3                       | acres      | \$500         | \$150       | 4.5                       | 0.3                 | acres      | \$500         | \$150       | 5                   |
|   | Develop wetlands                           | 0.1                       | acres      | \$10,000      | \$1,000     | 1.5                       | 0.1                 | acres      | \$10,000      | \$1,000     | 2                   |
|   | Implement water storage <sup>8</sup>       | 10                        | acre-feet  | \$2,000       | \$20,000    | 150                       | 10                  | acre-feet  | \$2,000       | \$20,000    | 150                 |
|   | Shallow aquifer recharge <sup>9</sup>      | 0.33                      | site       | \$20,000      | \$6,600     | 4.95                      | 0.33                | site       | \$20,000      | \$6,600     | 5                   |
|   | Irrigation&conveyance efficiencies         | 0                         |            |               | \$0         | 0                         | 10                  | acres      | \$2,000       | \$20,000    | 150                 |
|   | lease water rights                         | 0                         |            |               | \$0         | 0                         | 0.5                 | cfs        | \$50,000      | \$25,000    | 8                   |
| Purchase water rights                   | 0.1  | cfs                       | \$100,000  | \$10,000      | 1.5         | 0.1                       | cfs                 | \$100,000  | \$10,000      | 2           |                     |
| Water Quality Actions                   | Urban stormwater BMP                       |                           |            |               | \$0         | 0                         |                     |            |               | \$0         | 0                   |
|   | Rural stormwater BMP                       | 1                         | site       | \$30,000      | \$30,000    | 15                        | 1                   | site       | \$30,000      | \$30,000    | 15                  |
| Imminent Threats                        |  |                           |            | \$0           |             |                           |                     |            | \$50,000      |             |                     |
| <b>TOTAL ANNUAL IMPLEMENTATION COST</b> |  |                           |            |               | \$470,050   |                           |                     |            | \$612,550     |             |                     |

<sup>1</sup>Many of the identified actions are funded by other programs. This table illustrates the combined, total cost of all projects for each MSA and does not suggest that these costs will be covered by the SRFB or BPA. Costs reported are estimates based on typical experience rates.

<sup>2</sup>CRP is currently funded by the USDA and the Recovery Plan "assumes" that funding will continue. The Cost is based on a vegetation establishment cost of \$100 per acre and then \$55 per year rental payment = avg of \$65 for the 10-year program. While the program is currently filled, it is expected that re-enrollment will occur but that costs will be provided through the Farm bill.

<sup>3</sup>This is for areas/owners where CRP cap has been met. This is not for CRP contract extension.

<sup>4</sup>Sediment basins cost \$50,000 per acre for a 10' deep basin.

<sup>5</sup>CREP is currently funded by the USDA and Conservation commission. The Recovery Plan presumes that funding levels will continue and that existing contracts will be covered after they expire. This is for areas/owners where CREP cap has been met and is based on \$2,500 tree planting cost and \$125/year rental fee. This is not for CREP contract extension.

<sup>6</sup>The intent is to implement CREP-like projects in areas with intermittent or perennial flow that are not CREP-eligible, or in areas where landholding is too small for CREP to be viable. Cost is based on \$2,500 per acre to establish vegetation then \$125 acre rental payment for 15 yr avg = \$291 per year.

<sup>7</sup>Project cost is based on average of 5,000 feet of fence per project @\$3.20/ft, one well and associated troughs and pipe.

<sup>8</sup>This is an anticipated estimate, but costs can vary considerably and final cost will be estimated at the time when actual projects are identified.

<sup>9</sup>The typical project is to divert winter flows into basins or onto fields for infiltration and slow release in the spring early summer and the cost estimate is largely unknown.

<sup>10</sup>This is an average cost, but the cost can vary from \$1,000 per mile for a "farm field" to over \$1,000,000 per mile for highways.

This is a 15-year schedule so we report the average annual implementation schedule and the reported costs are best estimates at today's dollar value.

## **7.2 HYDRO STRATEGY**

Actions to improve juvenile or adult survival through the hydrosystem are not proposed as part of this recovery plan. Instead, the plan relies on the strategies and actions put forward by NMFS in the 2004 BiOp for the FCRPS (NOAA 2004). The 2004 BiOp allows for the continued operation of the FCRPS, while making some changes to operations that are expected to slightly decrease the survival of listed Snake River fish species. The strategy and actions proposed to improve salmon performance in the Columbia River basin rely heavily on habitat actions targeted in each of the subbasins and in the Columbia River estuary. In addition, the 2004 BiOp expects that actions to reduce bird predation in the lower Columbia River will also increase the survival and abundance of listed species.

The lack of significant salmon survival improvement in the hydrosystem limits what can be achieved to recover listed fish populations in southeast Washington. The data presented in Chapter 4.0 show that fish losses through the hydrosystem can be more than 50 percent for some species in some years.

### **7.2.1 Costs**

Costs associated with hydro actions are being covered by the Bonneville Power Administration and USACE and are not included in this plan.

### **7.2.2 Schedule**

Hydro actions are being implemented on a yearly basis by the USACE.

## **7.3 HATCHERY ACTIONS**

The SRSRB does not propose any hatchery actions under this recovery plan because hatchery actions are being handled by entities and programs outside the SRSRB. But hatchery Strategies supported by the SRSRB for hatcheries were presented in Section 6.5. The information contained in this section addresses actions called for by entities and programs other than the SRSRB.

The SRSRB recognizes that although the continued release of hatchery fish in the recovery area can pose risks to listed stocks, they also provide significant benefits including harvest and mitigation opportunity and the broodstock needed to reintroduce fish to streams where they have been extirpated (e.g., spring Chinook in Asotin Creek). In addition, the maintenance of small populations using hatchery supplementation can assist in recovery efforts. The monitoring program included in the SRSRP will be used to manage hatchery risks, and make changes to these programs as needed.

The role of hatcheries in recovery planning is to provide fish to meet harvest and conservation objectives for each subbasin. As noted in Chapter 6.0, hatcheries will be run as either integrated or segregated programs depending on the goals they are meant to achieve. In general, the primary short-term goal of integrated programs is to assist in the recovery of listed stocks. In contrast, segregated programs are primarily used to meet mitigation harvest objectives. Segregated programs provide conservation benefits by focusing harvest on unlisted stocks. Their major objective is to provide adults for meeting mitigation goals for tribal, sport and commercial fisheries.

Because hatchery fish and production facilities can negatively affect listed species, the recovery plan notes areas set aside where hatchery fish will not be released, or where actions will be taken to keep their numbers as low as possible. The hatchery programs to be implemented in the recovery area are presented for each subbasin and species in Tables 7-4 through 7-7). The majority of the information presented for each program came directly from the HGMPs produced by hatchery operators and managers. Where

available, information on the number of fish released, size at release, release locations, and expected survival rates are presented for each program. All hatcheries will be operated using best management practices (BMPs) as defined in the individual HGMPs.

Proposed actions needed to address NMFS concerns regarding hatchery program risks to wild fish are presented by hatchery program type (integrated/segregated) in the next section. It must be noted that NMFS has not completed their review of the HGMPs for compliance with ESA. The results of this review, as well as agreed upon changes, will be incorporated into the recovery plan when they are available.

**Table 7-4 Hatchery Programs in the Asotin and Tucannon Subbasins**

| Subbasin     | Species or Stock                        | Hatchery Program  | Type of Program | Release Numbers              | Release Size | Release Site (subbasin)   | Hatchery Adult return Goal                                  | Smolt-to-Adult Survival Goal | Comments  |
|--------------|---|---|-----------------|------------------------------|--------------|---|---|------------------------------|---|
| Asotin Creek | Summer Steelhead                        | None. This watershed is reserved for natural production only.   |                 |                              |              |   |   |                              |   |
|              | Spring Summer Chinook                   | New program proposed  | Integrated      | 100,000 to 200,000 yearlings | 15 fpp       | Asotin  | 500   | 0.3 – 0.5%                   | SAR based on Tucannon data  |
|              | Fall Chinook                            | None. This watershed is reserved for natural production only.   |                 |                              |              |   |   |                              |   |
|              | Resident Rainbow Trout                  | Resident rainbow are not released into streams  |                 |                              |              |   |   |                              |   |
| Tucannon     | Summer Steelhead – Lyons Ferry Hatchery | Tucannon River Summer Steelhead – Lyons Ferry Hatchery Stock: Lyons Ferry Complex   | Segregated      | 100,000                      | 4.5 fpp      | Tucannon River (Below Hwy 12 at RM 12)  | Total return = 625; Broodstock is from Lyons Ferry Hatchery | 0.50%                        | Harvest Mitigation  |
|              | Summer Steelhead – Endemic              | Tucannon River Endemic Summer Steelhead Stock Program: Lyons Ferry Complex – Lyons Ferry Hatchery   | Integrated      | 50,000                       | 4-5 fpp      | Tucannon River (currently near Curl Lake direct release at RM 40; proposed to be RM 40 to 60) | In river spawners = 200-220 Broodstock = 30-35              | 0.5%                         | Manage Tucannon River above Marengo for wild/endemic steelhead. This experimental program may replace segregated program. |
|              | Resident Rainbow                        | Resident rainbow are not released into streams  |                 |                              |              |   |   |                              |   |
|              | Spring Summer Chinook                   | Tucannon Spring/ Summer Chinook Tucannon River Spring Chinook Supplementation: Lyons Ferry Complex  | Integrated      | 132,000 (225,000 by 2006)    | 15 fpp       | Tucannon River (Curl Lake Acclimation Pond at RM 40)  | Total hatchery return = 1,152 Broodstock = 100              | 0.87%                        |   |
|              | Spring Summer Chinook                   | Tucannon Spring/ Summer Chinook Tucannon River Spring Chinook Captive Brood Program; Lyons Ferry Complex  | Integrated      | 150,000 (phased out by 2006) | 15 fpp       | Tucannon River (Curl Lake Acclimation Pond at RM 40)  | In-river spawners = 1,305 Broodstock = none                 | 0.87%                        |   |
|              | Fall Chinook                            | None. This watershed will be reserved for natural production only & natural production resulting from Lyons Ferry & other hatchery stock strays |                 |                              |              |   |   |                              |   |

**Table 7-5 Hatchery Programs in the Walla Walla Subbasin**

| Subbasin    | Species or Stock                                   | Hatchery Program   | Type of Program | Release Numbers                        | Release Size                 | Release Site (subbasin)                          | Adult Goal   | Smolt-to-Adult Survival Goal | Comments   |  |
|-------------|--|--|-----------------|--|------------------------------|--|--|------------------------------|--|--|
| Walla Walla | Summer Steelhead                                   | Walla Walla Basin Summer Steelhead – Lyons Ferry Hatchery Stock: Lyons Ferry Complex | Segregated      | 100,000                                | 4.5 fpp                      | Walla Walla River at RM 35 (below Mill Creek)    | Total hatchery return = 900<br>Broodstock is from Lyons Ferry Hatchery           | 0.50%                        | Walla Walla above Mill Creek is managed for wild steelhead         |  |
|             | Spring Summer Chinook                              | Walla Walla Spring/Summer Chinook proposed by CTUIR                                  | Integrated      | 250,000 now, 500,000 proposed by CTUIR | 10 fpp                       | SF Walla Walla                                   | In-river spawners = 3,850 (natural = 1,100 hatchery = 2,750)<br>Broodstock = 350 | 0.55%                        | Reintroduction program, not ESA listed                             |  |
|             | Spring Summer Chinook                              | Current Walla Walla Spring/Summer Chinook Adult Outplanting                          | Integrated      | 200                                    | Adults                       | Mill Creek in Walla Walla Basin                  | In-river spawners = 200 hatchery fish  | 0.55%                        | Experimental   |  |
|             | Resident Rainbow                                   | Resident rainbow are not released into streams                                       |                 |  |                              |  |  |                              |  |  |
|             | Fall Chinook                                       | None. This watershed will be reserved for natural production only.                   |                 |  |                              |  |  |                              |  |  |
| Touchet     | Summer Steelhead                                   | Touchet River Summer Steelhead – Lyons Ferry Hatchery Stock: Lyons Ferry Complex     | Segregated      | 85,000                                 | 4-5 fpp                      | Touchet River (Dayton Acclimation Pond at RM 53) | Total hatchery return = 600<br>Broodstock is from Lyons Ferry Hatchery           | 0.50%                        | Touchet River above Dayton reserved for wild and endemic steelhead |  |
|             | Spring/Summer Chinook Adult Outplanting (Proposed) | Integrated   | 300 (proposed)  | Adults                                 | Upper Touchet (above Dayton) | In-river spawners = 300 hatchery                 | 0.55%  | Experimental                 |  |  |
|             | Summer Steelhead (Endemic)                         | Touchet River Endemic Stock Summer Steelhead – Touchet River Release                 | Integrated      | 50,000                                 | 4-5 fpp                      | NF Touchet River (direct RM 53-58)               | In-river spawners = 200-220<br>Broodstock = 30-35                                | 0.50%                        | Experimental   |  |
|             | Resident Rainbow                                   | Resident rainbow are not released into streams                                       |                 |  |                              |  |  |                              |  |  |
|             |  | Fall Chinook   | None expected.  |  |                              |  |  |                              |  |  |

**Table 7-6 Hatchery Programs in the Lower Snake River Subbasin**

| Subbasin and Species/Stock | Hatchery Program  | Type of Program | Release Numbers                             | Release Size      | Release Site (subbasin)                       | Adult Goal  | Smolt-to-Adult Survival Goal | Comments  |
|----------------------------|---|-----------------|---|-------------------|---|---|------------------------------|---|
| Summer Steelhead           | Snake River Summer Steelhead – Lyons Ferry Hatchery Stock: Lyons Ferry Complex                          | Segregated      | 60,000                                      | 4.5 fpp           | Snake River (Lyons Ferry Hatchery at RM 36)   | Adult hatchery return = 300-400<br>Broodstock = 320-350 | 0.50%                        | Fish are for segregated programs with releases in lower Tucannon, Walla Walla, Touchet & Lyons Ferry. |
| Spring/Summer Chinook      | None expected.  |                 |   |                   |   |   |                              |   |
| Fall Chinook               | Snake River Fall Chinook Salmon – Snake River Stock Program: Lyons Ferry Complex – Lyons Ferry Hatchery | Integrated      | 450,000 yearlings, and 200,000 subyearlings | 10 fpp and 50 fpp | Snake River (Lyons Ferry Hatchery at RM 59)   | In-river spawners = 18,300                              | 0.20%                        | Adult goal is for <b>all</b> LSRCP fall Chinook releases  |
| Fall Chinook               | Snake River Fall Chinook Salmon – Snake River Stock Program: Lyons Ferry Complex – Lyons Ferry Hatchery | Integrated      | 450,000 yearlings, 2.4 million subyearlings | 10 fpp and 50 fpp | Above Lower Granite Dam in Idaho & Washington | Broodstock = 3,500                                      | 0.20%                        |   |

**Table 7-7 Hatchery Programs in the Grande Ronde Subbasin**

| Subbasin and Species/Stock | Hatchery Program  | Type of Program | Release Numbers                 | Release Size | Release Site (subbasin)                                   | Adult Goal  | Smolt-to-Adult Survival Goal | Comments                     |
|----------------------------|---|-----------------|---------------------------------|--------------|---|---|------------------------------|------------------------------|
| Summer Steelhead           | Grand Ronde River Summer Steelhead – Wallowa Stock Program: Lyons Ferry Complex – Lyons Ferry Hatchery                    | Segregated      | 160,000                         | 4.5 fpp      | Grande Ronde River (Cottonwood Acclimation Pond at RM 29) | Total hatchery returns = 1,501<br>Broodstock = 90-100 | 0.50%                        |                              |
| Spring/Summer Chinook      | None within Washington. Integrated spring Chinook hatchery programs would continue in Upper Grande Ronde River in Oregon. |                 |                                 |              |   |   |                              |                              |
| Fall Chinook               | New program utilizing Lyons Ferry production  | Integrated      | 200,000 to 400,000 subyearlings | 50 fpp       | Lower Grande Ronde Near WA border                         | Being developed                                       | Being developed              | Begin implementation in 2005 |
| Wenaha Summer Steelhead    | None. This watershed will be reserved for natural production only in both Oregon & Washington.                            |                 |                                 |              |   |   |                              |                              |
| Wenaha spring Chinook      | None. This watershed will be reserved for natural production only in both Oregon & Washington.                            |                 |                                 |              |   |   |                              |                              |
| Joseph Creek Steelhead     | None. This watershed will be reserved for natural production only in both Oregon & Washington.                            |                 |                                 |              |   |   |                              |                              |

## **Actions for Integrated Hatchery Programs**

An integrated supplementation program is usually designed and operated to protect and promote fish population viability. Only natural-origin or hatchery-origin fish derived from the same population are used for broodstock. The goal of integrated program is to allow local adaptation to be driven by the natural environment, not the hatchery.

The ICTRT has concluded that it is important to maintain natural patterns of gene flow for each fish population. Because hatchery fish are reared under different environmental conditions than wild fish, i.e., raceways versus streams, the hatchery environment may select for genetic traits that are successful in a hatchery but not in the wild. If such selection does take place, the greater the proportion of hatchery fish in a natural spawning population, the greater the chance for genetic alteration. Genetic alternation could reduce population variation and, ultimately, population fitness.

Based on preliminary spawner composition criteria developed by the ICTRT, integrated programs are often managed so that hatchery fish make up less than 50 percent of the natural spawning population. ICTRT considers that the 50 percent value will result in moderate risk to native fish populations as long as hatchery broodstock collection is non-selective (ICTRT 2004). The Hatchery Scientific Review Group (HSRG) recommends that for the natural environment to drive local adaptation, the proportion of natural origin fish used as broodstock must equal or exceed the proportion of hatchery fish on the spawning grounds (HSRG 2004). Over the long term (15 years or more), all integrated programs will likely be managed to achieve this balance. In the short term, it is recognized that to restore populations such as Asotin Creek and Tucannon spring/summer Chinook, the number of hatchery fish on the spawning grounds is likely to exceed the criteria. As the wild portion of the population increases in abundance, steps will be taken to reduce the number of hatchery fish spawning naturally in the basin so long as this can be accomplished without violating other legal mandates such as those developed in US V Oregon.

In addition to the spawning composition targets for both the hatchery and natural components, both the HSRG and ICTRT recommend that hatchery broodstock collection be done randomly over the course of the spawning run. In this way, the full range of population variation is maintained. This broodstock protocol will be implemented for all integrated programs in the recovery area.

## **Actions for Segregated Programs**

In contrast to integrated programs, segregated programs generally do not follow practices designed to promote population viability as determined by the VSP parameters. Local adaptation is driven by the hatchery environment rather than the natural environment. Segregated programs are managed to produce a fish with the characteristics that best achieve the objectives of the program. This may mean rearing and releasing fish only in locations and sizes that maximize their contribution to fisheries, increase culture success, or meet other management objectives. However, in southeast Washington the segregated programs are managed to minimize their effects on listed and unlisted naturally produced salmonids.

Fish from segregated programs may possess traits not suited for survival in the wild. Therefore, the HSRG and ICTRT have both recognized that segregated programs pose more risk to native populations if fish produced by them are allowed to spawn in the natural environment. The HSRG has recommended that fisheries managers implement actions that prevent gene flow from these less well-adapted hatchery fish to the native population. It was concluded that fish from segregated programs should not make up more than approximately 5 percent of the natural spawning population. The ICTRT has reached a similar conclusion, but has set preliminary criteria at approximately 10 percent. Based on these recommendations, segregated programs will be managed such that adults from segregated programs make up no more than 10 percent of the natural spawning population. The more tolerant ICTRT criterion was

selected because it represents the opinion of NMFS. This level may be reduced to 5 percent after further review.

NMFS is also concerned about non-local hatchery fish from one subbasin straying and successfully spawning in another subbasin. Straying by hatchery fish may change gene flow rates between populations, thereby affecting patterns of genetic variation and population productivity. To prevent straying, hatchery programs will be operated in a manner that maximizes homing fidelity, i.e., all fish return to the hatchery or release site. Because hatchery managers are unable to determine stray rate from the fish returning solely to their facility, adult trapping or spawning ground surveys will be undertaken in all recovery area subbasins to quantify the number and origin of hatchery fish present on the spawning grounds. An adequate hatchery mark rate will need to be employed for all releases inside and outside the basin in order to facilitate this work.

### **7.3.1 Costs**

Costs associated with proposed changes to hatchery programs are not included in this recovery plan because they are being addressed in other forums. However, funding for hatchery programs is being reduced by BPA and LSRCP so additional funding will be needed for marking and evaluation efforts.

### **7.3.2 Schedule**

Hatchery actions will be implemented following NMFS approval of the HGMPs and/or US v OR agreements. It is expected that all HGMP plans will be approved by 2007.

## **7.4 HARVEST ACTIONS**

Any new harvest strategies and actions will evolve from the current harvest management processes. This recovery plan does not prescribe new harvest actions. However, a local desire is to expand and increase spring and fall Chinook salmon fisheries in southeast Washington. The rationale for this approach is that periodic ESA consultations and biological assessments for fisheries in the ocean, Columbia River, and in the recovery area are ensuring that fisheries do not adversely affect recovery of listed species and provide a process that continues to seek improvements in minimizing impacts to listed species. The SRSRB may provide input or guidance on harvest actions within or outside the recovery area to maintain harvest opportunities and economic benefits.

Significant harvest reductions have been implemented in fisheries which impact species addressed by this recovery plan. The current harvest management processes and strategies are detailed in Chapters 4.0 and 6.0 and Appendix B. Current fisheries that might have an impact on stocks listed under the Endangered Species Act must be assessed for their biological impacts by the respective management entities and be approved by NMFS. Fisheries are monitored during the season to keep harvests within authorized limits.

In essence, harvest management today involves allowing some amount of target fishing on healthy stocks while minimizing impacts to weak stocks and listed species. Under the current management processes during the recovery period, it is expected that management authorities will continue to set harvest rates on listed stocks at the lowest practicable levels in order to provide for recovery. It is also expected that the management agencies will continue to develop improved methods of minimizing incidental harvest impacts to listed species. Such methods would include time and area restrictions including terminal area fisheries, improvements in selective gear, and improved handling techniques to minimize release mortality. Agencies are expected to continue to improve estimates of hook-and-release mortality. The harvest strategy relies heavily on the ability of selective fisheries to minimize incidental mortality on listed stocks. Thus, the rate of encounter of wild fish and the mortality of released wild fish needs to be reasonably accurate as well as spatially and temporally comprehensive for all fisheries.

Current harvest management processes include:

- **Pacific Salmon Commission:** The U.S. and Canada have agreed to a Chinook fishing framework that reduces Chinook fisheries off Southeast Alaska, British Columbia, and the U.S. for the years 1999 through 2008.
- **Pacific Fishery Management Council/NMFS:** Management measures for U.S. ocean fisheries in the 3 to 200 mile area off Washington, Oregon, and California are set by the PFMC and approved and implemented by NMFS. These measures are guided by a multi-year fishery management plan with annual fishing regimes, which are constrained by the ESA.
- **Columbia River Compact:** Under the Compact, the States of Washington and Oregon set restrictions each year for spring and fall commercial fisheries in the mainstem Columbia River, which are constrained by the ESA and consistent with U.S. vs. Oregon harvest management agreements. US v OR court mandated process for harvest management and hatchery production in the Columbia Basin.
- **Washington Department of Fish and Wildlife/Fish and Wildlife Commission:** The State of Washington establishes restrictions on recreational fishing by its citizens for the Columbia River, Snake River, and tributaries, which are constrained by the ESA. The State also sets ocean fishery regulations in the 0- to 3-mile area off the Washington Coast, which must be consistent with the federal regulations outside 3 miles.

#### **7.4.1 Costs**

No new harvest actions are proposed, except possibly expanded Chinook fisheries; therefore, only small additional costs from harvest management activities are expected. Existing monitoring funding is being reduced under the LSRCP. Monitoring costs associated with existing or expanded harvest activities will need to increase by approximately \$50,000.

#### **7.4.2 Schedule**

Harvest management is on-going and will be continually reviewed on a yearly basis throughout the expected lifetime of this plan.

### **7.5 RECOVERY PLAN EFFECTS ON LISTED SPECIES**

#### **7.5.1 Spring/Summer Chinook, Summer Steelhead, and Sockeye**

Based on EDT analysis, the actions proposed in this recovery plan are expected to substantially increase the abundance, productivity and diversity of listed species in the recovery area. Until the actions are implemented and their effectiveness are determined empirically, actual benefits to fish must be considered a working hypothesis to be tested and monitored over time (Chapter 8.0).

Because salmonid recovery is dependent on meeting the VSP criteria presented in Chapter 3.0, it was necessary to convert EDT estimates of adult abundance and productivity to points that could be placed on the viability curves developed by the ICTRT. The method used to make this conversion is presented in Appendix E and the actual EDT results are presented in Appendix H. The results are presented by subbasin and species below. Empirical data available on the number of adults returning to the basin were included on the viability curves to provide comparisons with EDT adult estimates. The empirical data are presented as averages for the period of record. Due to changing ocean and freshwater environmental conditions, the number of adults returning each year might vary by an order of magnitude. For example, natural adult spring/summer Chinook adult returns to the Tucannon River have ranged from 11 to 611 fish from 1985 to 1999. The origin of the restoration goals presented for each population can be found in Chapter 3. The goals were taken from various tribal and state management plans.

An EDT analysis was conducted for each MSA identified by the ICTRT in the recovery area by species in order to demonstrate how the spatial structure and diversity of the populations would change with the implementation of the recovery plan. This analysis was designed to demonstrate that proposed recovery plan actions are designed to improve fish performance in all major fish-producing areas in an effort to meet the spatial structure and diversity criteria established by the ICTRT. The numbers presented for each MSA should be considered indicators of the expected change in fish performance. The actual change in VSP parameters will be determined empirically through the monitoring program (Chapter 8.0).

It should also be noted that the EDT analysis and results use the following assumptions:

- Results reflect the number of adults that would return to the basin if ocean and freshwater fisheries were eliminated. In general, harvest rates on the listed spring/summer Chinook and steelhead species are less than 10 percent. If harvest were to continue at this rate, then the EDT run size to the basin would be reduced by 10 percent.
- The model does not account for any competition that may occur due to the presence of hatchery fish, or hatchery fish spawning with wild fish as these impacts have not been quantified. If hatchery/wild fish interactions reduce the fitness of the wild population, then adult returns to the basin would be lower than the EDT estimate.
- When comparing EDT model estimates of adult abundance in a stream to empirical data, it must be remembered that the EDT estimate does not account for hatchery fish. Empirical estimates may include both wild and hatchery production as it is not always possible to distinguish between the two.
- No improvements are expected in estuarine survival of juvenile fish. If estuary conditions improve from actions taken by entities in the Lower Columbia River, then juvenile and possibly adult survival would also improve. Improved survival would result in an increase in the number of adults returning to the recovery region.
- Hydrosystem survival is assumed to remain unchanged for the 15-year planning period. A change in hydrosystem survival would result in more or fewer adults returning to the spawning grounds, dependent on the direction (higher or lower) of the change.
- Habitat improvements occur in Oregon portions of the basin, where applicable. The EDT analysis relies on the subbasin plans which assumed that stream habitat conditions improve in Oregon controlled portions of the basins. If Oregon stream habitat does not improve over time, then EDT estimated benefits from the recovery plan would be optimistic.
- The effects of low flow (and thus the need for remediation) may not have been adequately described in the habitat inputs used in modeling. Flow issues will be addressed through the watershed planning processes. Because of this, new flow related actions will likely be proposed which should increase the effectiveness of the SRSRP.
- All migration barriers have been removed in the recovery plan.
- The expected level of improvement as estimated by EDT assumes that the habitat objectives in Section 4 have been fully achieved. Although biologists know what type of actions would best meet the objectives, they do not know what level of improvement will actually be achieved. Therefore, the numbers presented for the recovery plan assume that all habitat objectives are achieved within 15-years.

Actions associated with this plan are not expected to improve the performance of sockeye salmon because this species does not spawn or rear in the recovery region (Chapter 3.0). In general, adult and juvenile sockeye use the mainstem Snake River as a corridor to migrate to and from their spawning grounds

located in Idaho. Therefore, the biggest source of mortality on this species in Washington waters is due to passage through the FCRPS. Actions to improve FCRPS operations are detailed in NOAA 2004.

### **7.5.2 Bull Trout**

Determining the effect recovery plan implementation will have on bull trout populations is not possible because there are currently no models available to forecast the change in bull trout abundance, productivity, or diversity resulting from habitat actions in any of the subbasins. Therefore, the recovery plan focuses on implementing actions that reduce known threats to bull trout. This approach is consistent with the bull trout biological opinion developed by the USFWS for recovery area populations (USFWS 2002a). USFWS (2002a) states that:

*“...recovery for bull trout will entail reducing threats to the long-term persistence of populations and their habitats, ensuring the security of multiple interacting groups of bull trout, and providing habitat conditions and access to them that allow for the expression of various life-history forms.”*

USFWS hypothesizes that bull trout will recover to healthy sustainable levels if all known threats to the population are reduced or eliminated. To address the threats, USFWS identified actions that need to be taken in each subbasin of the recovery area that currently support (or historically supported) bull trout. Those actions proposed by the USFWS for Washington waters have been incorporated into this recovery plan. The effect the actions have on bull trout abundance will be determined as part of the monitoring program discussed in Chapter 8.0.

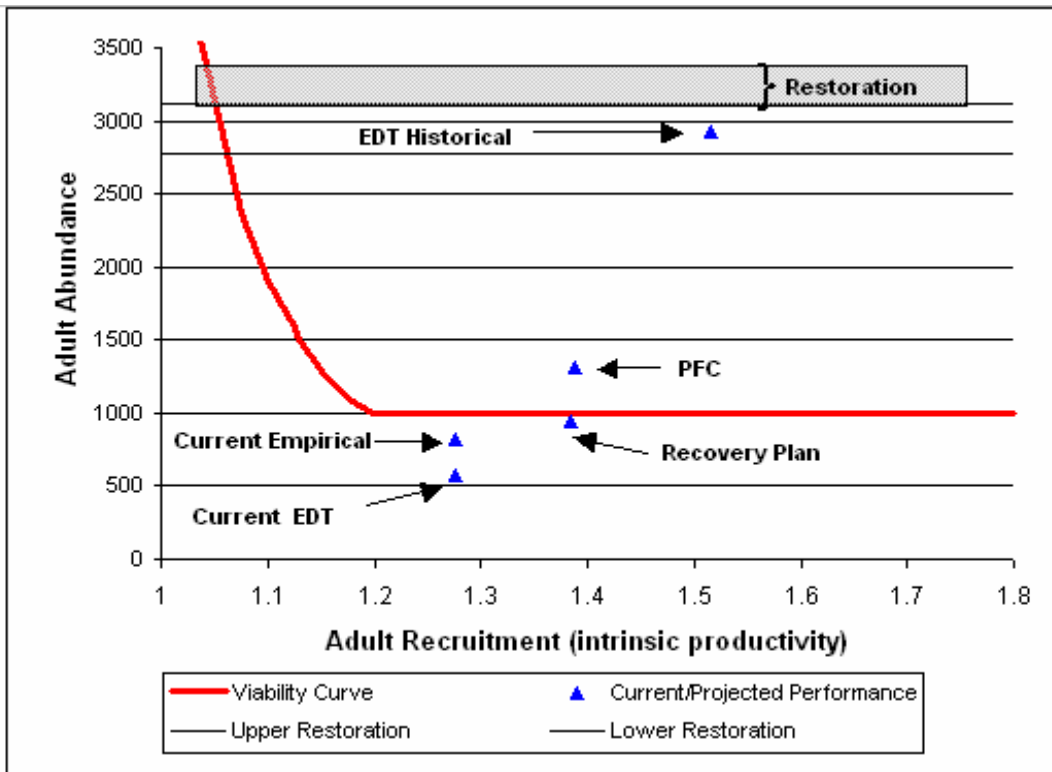
### **7.5.3 Asotin Creek**

The expected benefits of the recovery plan to listed fish species in Asotin Creek are discussed below. The discussion focuses on the change in VSP parameters as they affect population viability, abundance, intrinsic productivity, and life history diversity.

#### **Summer Steelhead**

##### Population Viability

Figure 7-1 shows the viability analysis for steelhead in the Asotin Creek subbasin. EDT simulations indicate that the abundance of the Asotin steelhead metapopulation under the recovery plan will increase from 577 to 947, while intrinsic productivity increases from 1.28 to 1.38. Therefore, as shown in Figure 7-1, habitat restoration actions (labeled “Recovery Plan” in the figure) proposed for the recovery plan do not quite move the population above the viability curve and into the region of low extinction risk defined by the ICTRT viability criteria. Although the recovery plan increases adult abundance and intrinsic potential by 64 percent and 8.4 percent respectively, the plot of these two points still falls just below the viability line that the ICTRT considers the boundary of high and low risk.



**Figure 7-1 EDT Viability Analysis for Asotin Summer Steelhead**

However, because of the uncertainty associated with model inputs and assumptions, predictions of future fish performance should not be taken as an absolute. The analysis simply points out that there is substantial risk that the viability criteria may not be achieved with the actions proposed as part of the recovery plan.

A number of additional points must be made about Figure 7-1. First, the plot includes both empirical and EDT-based estimates of current abundance and productivity. However, because data were not available to develop empirical estimates of intrinsic productivity, the value was plotted based on the EDT model result. The assumptions behind the EDT results were described previously. For comparison purposes with EDT generated estimates only the average number of adults returning to the basin is shown in the figure for the empirical data. In reality, adult returns to each of the basins has varied by an order of magnitude. In addition, the empirical data were generated using various methodologies each of which has different levels of error associated with it. Finally, because hatchery fish are not all marked, the number of adult fish returning to some basins consists of a mixture of wild and hatchery fish. Thus, wild production may be overestimated in some years.

Figure 7-1 also includes EDT-generated abundance and productivity estimates under Properly Functioning Conditions (PFC) and historical conditions (with FCRPS in place), as well as a range of rebuilding goals expressed solely in terms of abundance. The latter is displayed as a grayed band labeled “Restoration”. The point labeled “PFC” denotes “Properly Functioning Conditions” for all habitat variables and represents for each habitat variable a condition that maintains the long-term viability of the population.

PFC represents an environmental scenario under which, for each habitat variable, conditions are of sufficient quality to maintain the long-term viability of the population (this is strictly habitat based). The PFC analysis does not consider improved habitat conditions to exceed those which existed historically.

For example, if stream maximum temperatures were high historically in August, PFC does not assume that these conditions have been eliminated. The PFC values for each subbasin and population are presented because they represent likely WDFW and tribal long term (more than 30 years) habitat goals. PFCs are discussed further in Appendix D.

The lower restoration goal of 2,776 is based on a WDFW potential parr production estimate of MSY seeding in the Asotin subbasin, plus estimated restoration goals for the smaller Snake River tributaries included with this population, which were a mixture of PFC estimates and the professional opinion of the Asotin subbasin assessment team. The upper restoration goal of 3,114 is based on a Nez Perce Tribal goal of 2,000 fish in Asotin Creek plus the restoration goals for the smaller tributaries.

Finally, the intrinsic productivity values associated with EDT simulations were not produced by the EDT model directly; rather, they represent a mathematical transformation of the Beverton-Holt productivity parameter produced by the EDT model. Details of the mathematical transformation can be found in Appendix E.

It is also important to note that Asotin Creek was the first subbasin to be assessed by the planning team and that many environmental attributes incorporated into the EDT model were either derived values or was based on professional judgment. The RTT is of the opinion that this combination of factors led to the habitat being rated too harshly in the subbasin—particularly for attributes which such as bed scour and fine sediment that affect egg incubation. It would not be surprising to find that, over time, habitat quality in the Asotin subbasin as a whole was underestimated to some degree and that the population comes closer to meeting viability criteria than is indicated by Figure 7-1. The RTT plans on re-evaluating the Asotin Creek analysis in summer 2006.

#### VSP Parameters for Major and Minor Spawning Aggregations

VSP index values for Asotin summer steelhead major and minor spawning aggregations are presented in Figure 7-2, which shows that the recovery plan improves all VSP parameters in all spawning areas. Therefore, to the degree that the viability of all major and minor spawning aggregations is improved, the habitat restoration actions proposed by the recovery plan increase the viability of the metapopulation as a whole in terms of its spatial structure.

Rather than defining diversity, the ICTRT describes the mechanisms that determine it. Specifically, the ICTRT describes diversity as the result of the interaction of four basic mechanisms: **preservation of endemic genotypes and phenotypes** (preservation of distinctive life histories, age distributions, heterozygosity indices, and allele frequencies, etc.), **preservation of natural patterns of gene flow** (proportion of non-local spawners and the frequency of interbreeding among spawning aggregates), **preservation of local adaptations** (indexed to the diversity of habitat conditions occupied), and **preservation of the integrity of natural systems** (indexed by a lack of selection for a subset of genotypes or phenotypes because of anthropogenic habitat modifications). The net result of these four aspects of diversity is a self-sustaining population with multiple spawning locations, ages of spawners, juvenile migration patterns, local adaptations, times of river entry and spawning, and so on. To the degree that the determinants of diversity under current conditions match the determinants under historical conditions, the population is considered capable of adapting to environmental fluctuations and local catastrophes and is, therefore, at lower risk of extinction.

In the EDT model, diversity is also indexed in terms of the number of self-sustaining life history patterns. Fish habitat is conceived of as a space/time matrix in which rows represent successive portions of habitat in subbasin, the mainstem Snake/Columbia, the estuary, and the ocean while the columns represent time and successive life stages. A unique life history pattern consists of the trajectory through this matrix that

starts and ends at the same spawning reach and time: with parents spawning in reach X at time Y and progeny moving through all subsequent places and times of freshwater rearing, outmigration, marine rearing, adult migration, and holding and finally spawning in reach X at time Y. Every distinct trajectory represents a unique life history pattern and the proportion of self-sustaining trajectories is a reasonable measure of the functional life history diversity of the population.

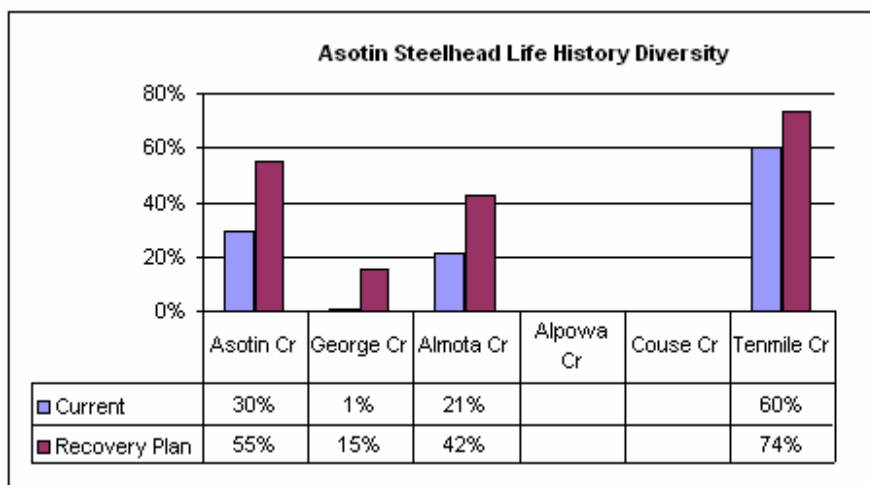
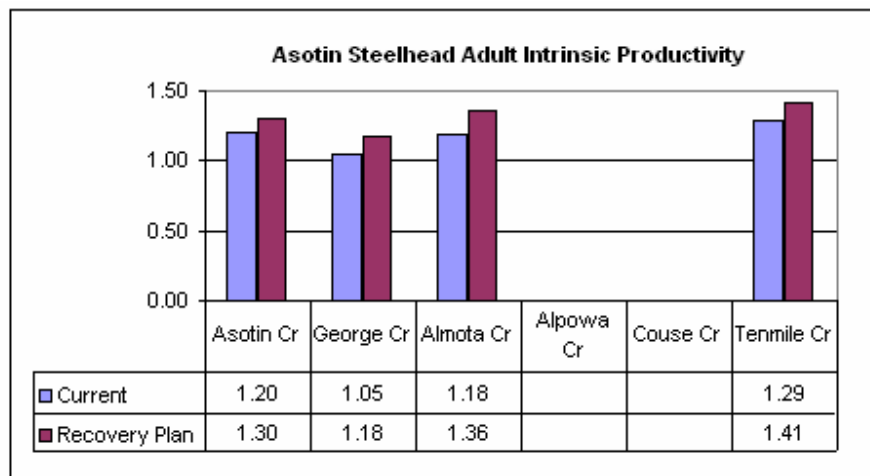
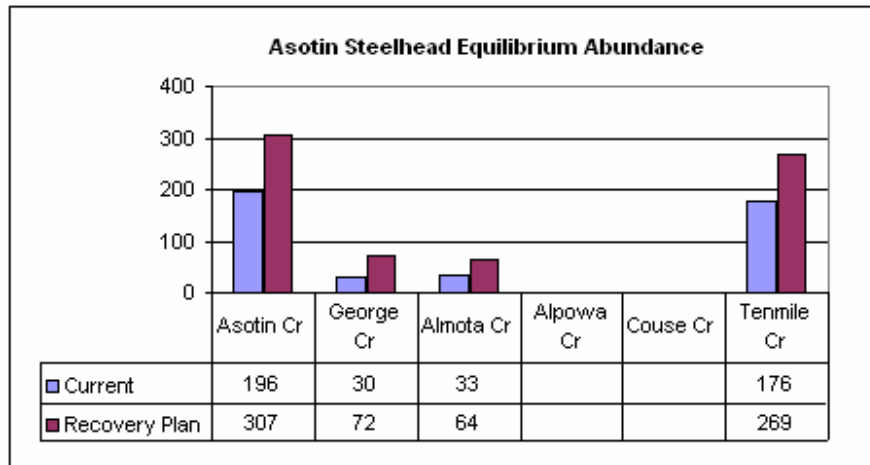
Thus, the proportion of EDT life history patterns that are viable, i.e., that produce at least one returning adult per spawner, can be seen as the net result of the operation of four mechanisms that promote or diminish life history diversity. In other words, the ICTRT assesses diversity in terms of the robustness of the underlying mechanisms, while EDT assesses diversity directly, in terms of self-sustaining unique life history patterns. To the degree that input data for EDT simulations are accurate, it can be expected that diversity as conceived by EDT and by the ICTRT will vary in parallel. That is, both EDT and the ICTRT's approach will predict improvement in diversity at the same time even though their underlying approaches are different.

It should be noted that in order to produce the data for Figure 7-2, and all similar figures that follow, the EDT Model had to be run multiple times under varying assumptions about spawning distribution. Therefore, the abundance values presented for the viability analysis may be different than the sum of the spawning areas. This is just one of the reasons that the numbers presented should be considered index values.

An additional caveat concerning quantitative EDT results should be noted. Some of the values reported differ to some degree from the values reported in the subbasin plans. These differences reflect slightly different assumptions made in the two planning efforts. One of the major differences concerns the "fitness" of the populations modeled. In subbasin planning, many of the populations were not assumed to be as fit as wild fish. Fitness was assumed to be 100 percent only for Asotin Creek steelhead and spring/summer Chinook, Wenaha spring/summer Chinook, Lower Grande Ronde steelhead, and Joseph Creek steelhead. All other populations were assumed to have a fitness of 90 percent, meaning that 10 percent fewer offspring are produced per spawner because of assumed hybridization with hatchery fish. Fitness in the recovery plan was assumed to be 100 percent in all cases.

Conditions in the mainstem Snake and Columbia were also modeled differently in subbasin planning and the recovery plan. In subbasin planning, estimated historical conditions were assumed for the mainstem Snake and Columbia for "historical" simulations for most subbasins (Asotin, Tucannon, Walla Walla). In the recovery plan, current mainstem conditions were assumed even for historical simulations in order to emphasize the role of the subbasin. There are other minor differences between the simulations performed during subbasin plan and the recovery plan including the changes in spawning distributions mentioned in the previous paragraph.

Figure 7-2 shows that the majority of the summer steelhead production both currently and in the recovery plan is being produced in Asotin Creek (mainstem and forks) and Tenmile Creek. George Creek, Alpowa, Almota, and Couse are able to support a limited run of summer steelhead, albeit at relatively high productivity with plan implementation. Thus, during periods of poor ocean or freshwater survival, or low stream flows that block passage, there may still be years when no adults return to some of these streams.



**Figure 7-2 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity and Life History Diversity for Asotin Summer Steelhead Under Current and SRSRP Conditions**

### Summary of Conclusions

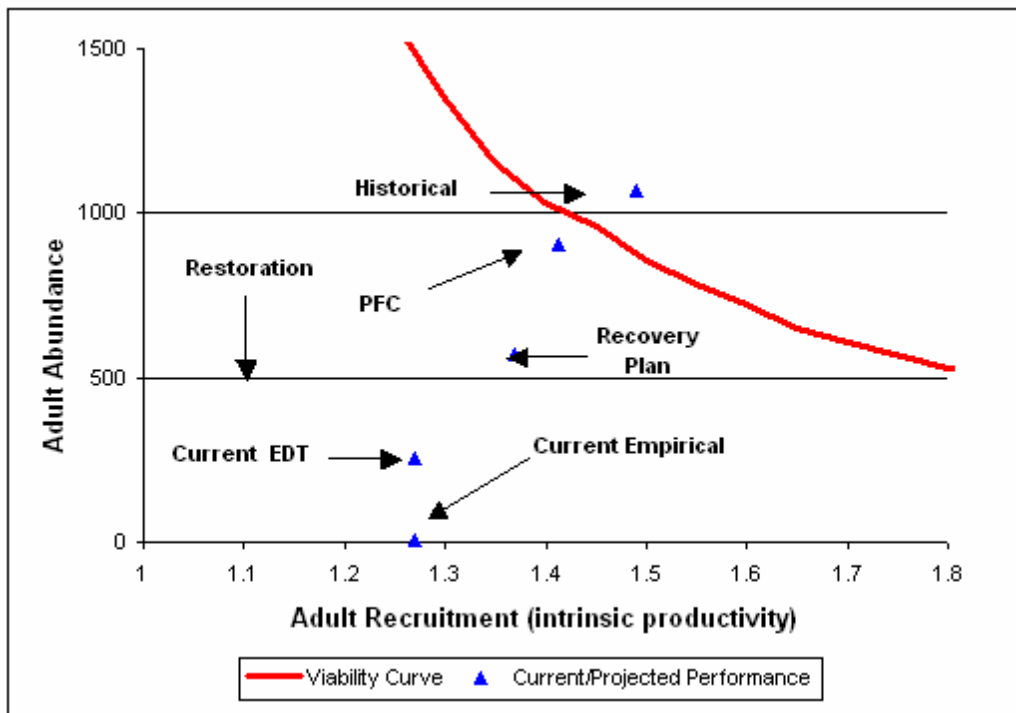
The data presented in Figure 7-1 show that, currently, Asotin Creek steelhead abundance and productivity values are likely well below the viability curve defined by the ICTRT. This conclusion is supported by the most recent NOAA status review (NOAA 2005) that estimated Asotin Creek steelhead abundance at less than 543 fish. Although the NOAA estimate did not include spawners in associated small tributaries, the empirical data presented in Figure 1 includes these fish and the abundance value still falls below the viability curve line.

The actions proposed in the SRSRP (recovery plan on graph) are forecast by EDT to increase overall Asotin Creek adult steelhead abundance by 64 percent. The resulting adult production falls just below the viability curve indicating that more actions are likely needed to achieve the recovery objective. However, as pointed out repeatedly in this document, the conclusion is based on modeling results that have a high degree of uncertainty associated with them.

### **Spring/Summer Chinook**

#### Population Viability

EDT simulations indicate that the recovery plan will improve spring/summer Chinook performance in Asotin Creek substantially. Relative to the EDT estimate of current production potential, improved habitat conditions are predicted to increase adult abundance and intrinsic productivity by 124 percent and 8 percent, respectively (Figure 7-3). Improvement of this magnitude would move the population just above the viability curve into the region of low extinction risk.



**Figure 7-3 EDT Viability Analysis for Asotin Spring/Summer Chinook**

The figure shows a large discrepancy between observed spring/summer Chinook production and production potential as estimated by EDT is in order. EDT reaches may be biased to the high side by including spawning in several streams (South Fork Asotin, Charley Creek, and portions of George Creek) which may be too small to support spawning or rearing. However, both of the values displayed in the figure can be “correct.” There is little doubt that the number of spring/summer Chinook spawning in Asotin Creek in recent years is very low, but this fact does not mean that the subbasin does not possess the potential to support a considerably larger number of spawners. The native run of spring/summer Chinook may have been extirpated years ago, so that the subbasin now receives only strays from other basins and perhaps from hatchery programs. If this is the case, the recolonization of Asotin Creek by spring/summer Chinook would be a very slow process, especially given the low productivity expected under current degraded habitat conditions. ICTRT believes that populations with less than 500 adults are at high risk of extinction. The Asotin Creek EDT analysis is consistent with this assumption.

It appears that, because of the uncertainty of many EDT performance estimate determinants, as well as the marginal viability estimate itself, achieving viability may require additional improvements to habitat conditions inside and outside the subbasin. Moreover, because of the virtual absence of spawning adults in recent years, it is appropriate to consider implementing an integrated hatchery re-introduction/supplementation program, perhaps utilizing Tucannon River donor stock. Combining additional habitat improvements with supplementation by hatchery fish could allow spring/summer Chinook to become self-sustaining in Asotin Creek, if out of basin limiting factors are not overly suppressing the population, and production in Asotin could contribute to the health of the Snake River Spring/Summer Chinook ESU.

It should be noted however that the data presented in Chapter 5 indicate that 72 percent of the loss in Asotin Creek spring/summer Chinook production was due to factors outside of the recovery area. This points out the need for fisheries managers to implement actions that increase fish survival through the hydrosystem and the estuary.

Figure 7-3 also includes EDT-generated abundance and productivity estimates under Properly Functioning Conditions (PFC) and historical habitat conditions (with FCRPS in place), as well as a range of restoration goals expressed solely in terms of abundance. The latter is displayed as a single line in the figure.

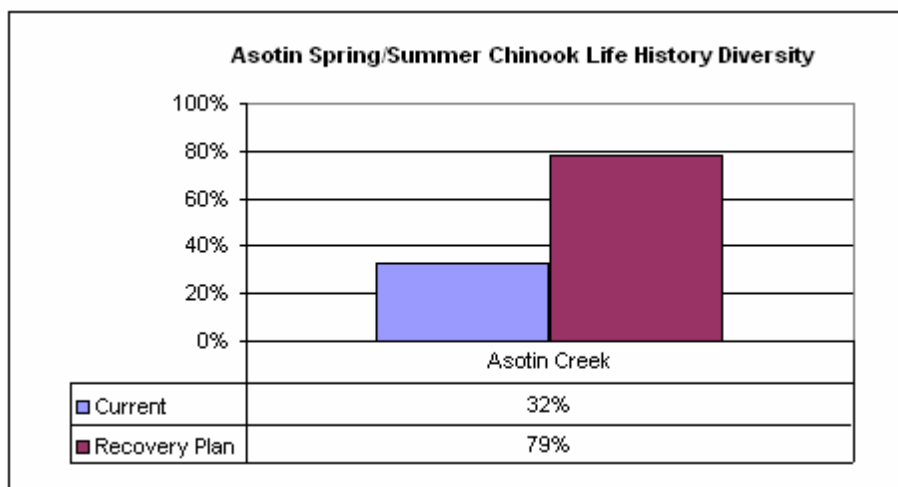
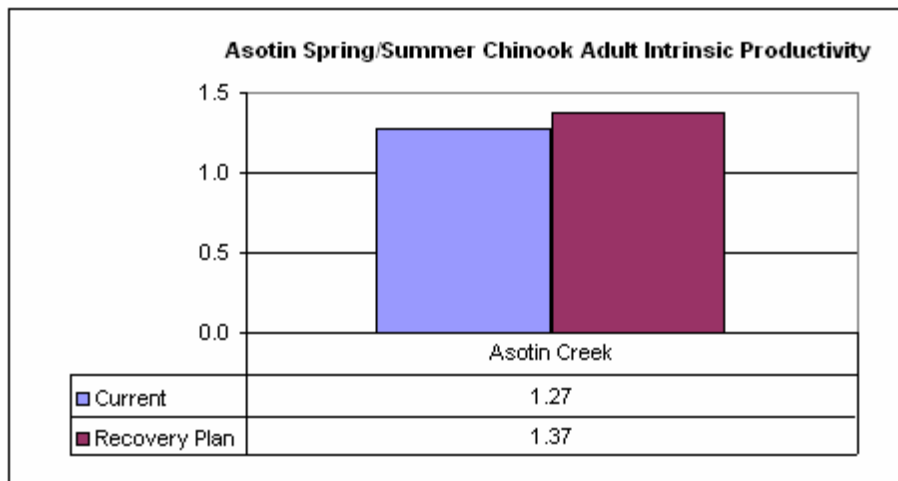
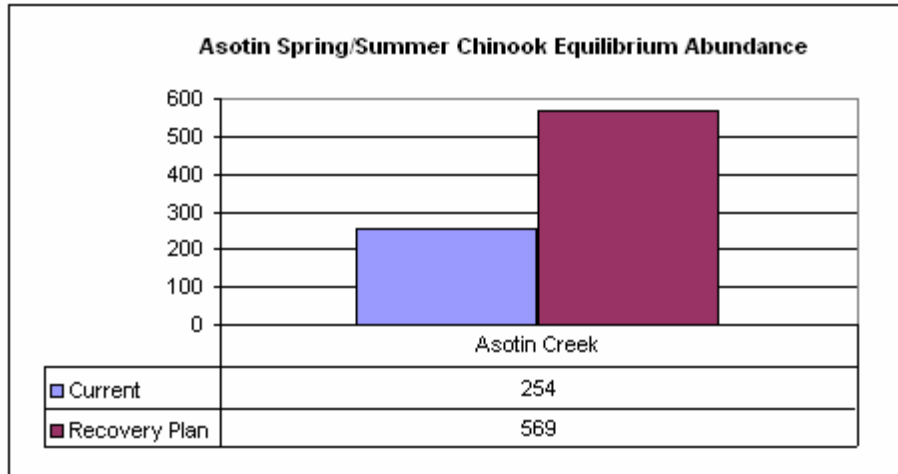
#### VSP Parameters for Major and Minor Spawning Aggregations

The recovery plan shows that the abundance index increases from 254 to 569 (a 124 percent increase), while intrinsic productivity increases from 1.27 to 1.37 (8 percent increase). The life history diversity value more than doubles, as it moves from 32 percent to 79 percent (Figure 7-4).

#### Summary of Conclusions

Both EDT generated results and empirical data collected in Asotin Creek show low abundance of spring/summer Chinook. EDT estimates that habitat conditions are of sufficient quality to support ~250 adults, but as noted by the ICTRT and confirmed by empirical data, the population is at serious risk of extinction. In fact, the empirical data already indicate that the population is likely functionally extinct.

With the implementation of the recovery plan, EDT forecasts that habitat conditions could be improved to support 500 adults. However, to recover this population would require that any remaining spawners be supplemented with hatchery fish. Because the success of such a supplementation program is not known, there is considerable uncertainty as to whether or not the population could ever achieve self-sustaining levels. Thus, the analysis concludes that the population may be recovered so long as the proposed hatchery supplementation program can be successful.



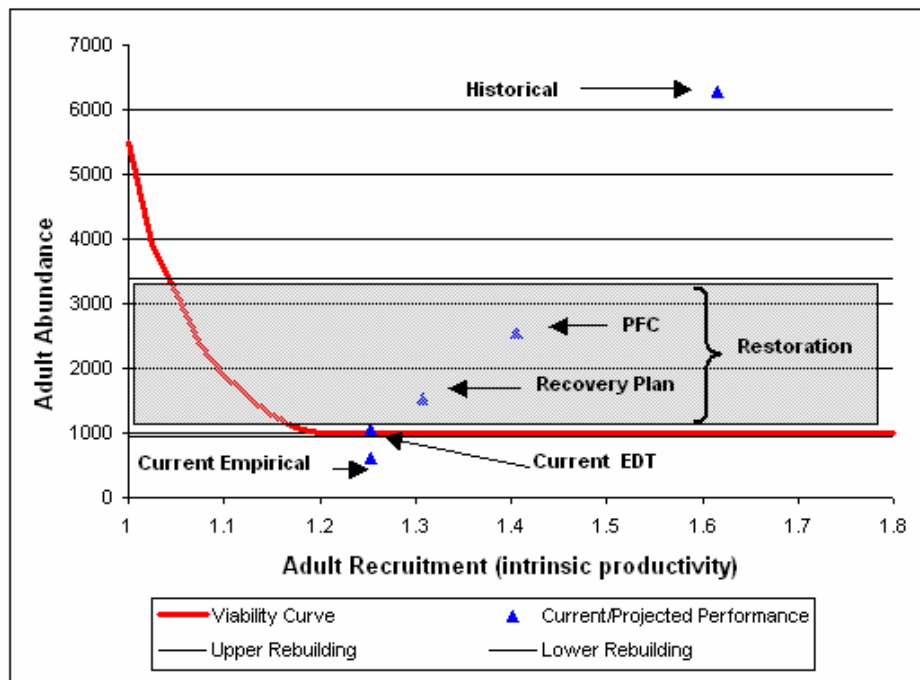
**Figure 7-4 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity and Life History Diversity for Asotin Spring/Summer Chinook Under Current and Recovery Plan Conditions**

## 7.5.4 Tucannon River

### Summer Steelhead

#### Population Viability

The ICTRT classified the Tucannon River as an intermediate-sized basin for summer steelhead production. Therefore, the basin must support a minimum of 1,000 adults at an intrinsic productivity of 1.25 to achieve the recovery objective for the basin. According to modeling forecasts, the recovery plan is expected to improve adult abundance and productivity by 43 percent and 4 percent, respectively. As shown in Figure 7-5, such changes (labeled “Recovery Plan” in the figure) would likely move the population above the viability curve into a region of relatively low risk.

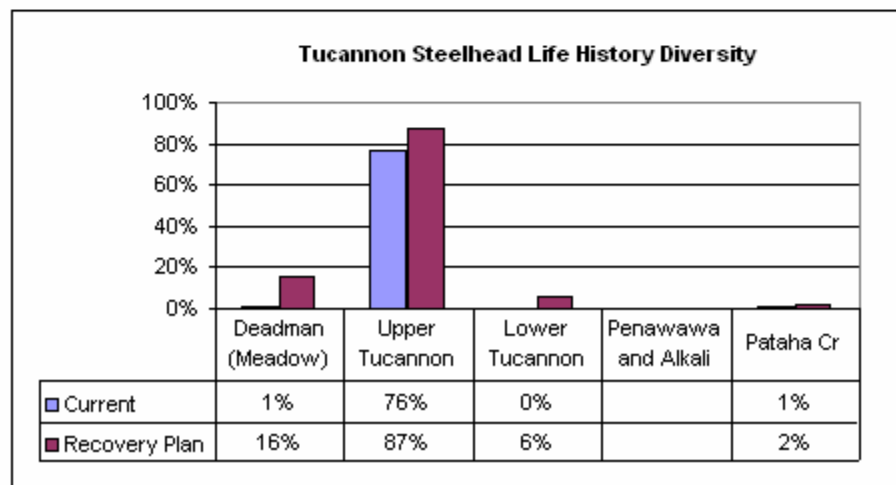
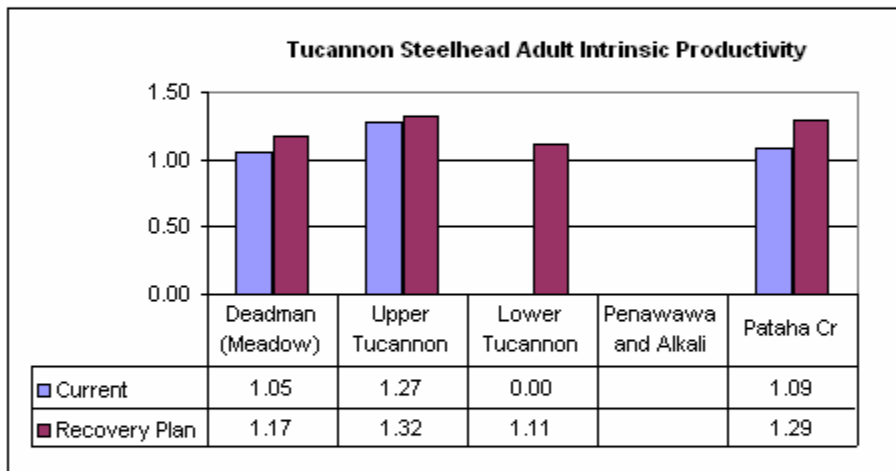
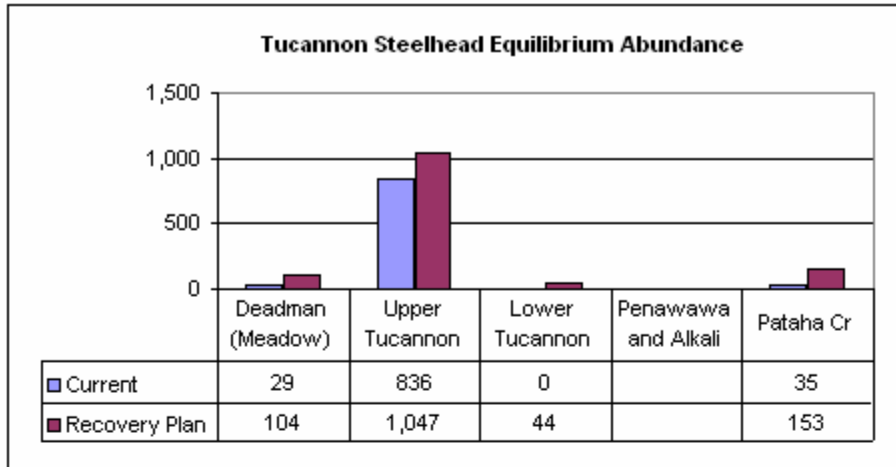


**Figure 7-5 EDT Viability Analysis for Tucannon Summer Steelhead Metapopulation.**

The analysis contained in Hyun and Talbot (2004), however, tempers this positive result. Their population viability analysis indicates that Tucannon steelhead are rapidly declining and at high risk of extinction. The low abundance value for Tucannon summer steelhead is also supported by the results of the recent status review which estimated steelhead abundance ranging from 257-628. If Hyun and Talbot’s and NOAA’s analyses are more accurate than the current EDT-Viability Curve analysis, the population is considerably further below the viability line and estimated population abundance under the recovery plan scenario might actually fall below the viability curve.

#### VSP Parameters for Major and Minor Spawning Aggregations

The resulting change in abundance, productivity, and life history diversity for major and minor spawning aggregations is shown in Figure 7-6. The recovery plan increases adult equilibrium or average abundance, intrinsic productivity, and life history diversity in each spawning area. These results show that recovery plan actions are not focused on a single area of the subbasin, but are widely spread. The improvement expected in each VSP parameter should result in increased population viability and a reduction in extinction risk.



**Figure 7-6 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity and Life History Diversity for Tucannon Summer Steelhead Under Current and Recovery Plan Conditions**

The majority of the production is centered on the Upper Tucannon River mainstem, with secondary production from Pataha and Deadman creeks. This same trend holds true for the intrinsic productivity parameter, and to a lesser extent, life history diversity.

Summary of Conclusions

EDT forecasts that the actions proposed in the SRSRP should be sufficient to recover this population. However, based on empirical estimates of current adult abundance, the opposite conclusion is reached. Thus, it will be important to monitor this population closely over the next 15 years to track not only the effectiveness of implemented actions, but also to estimate resulting adult abundance and productivity.

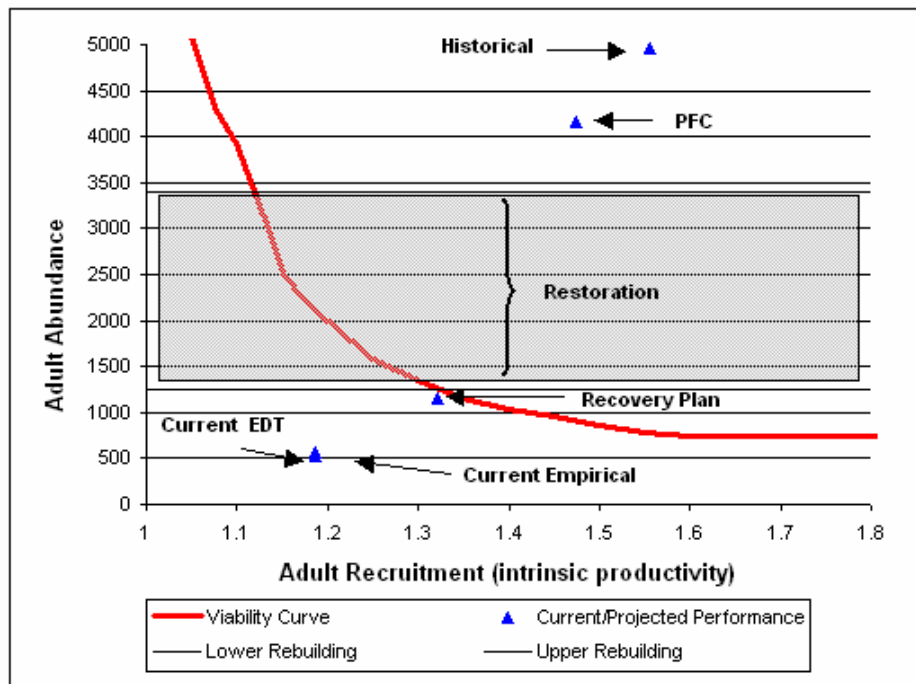
Regardless if the recovery goal is achieved, the habitat actions proposed are expected to increase steelhead abundance and productivity by 43 percent and 4 percent respectively. This level of improvement would reduce extinction risk significantly.

**Spring/Summer Chinook**

Population Viability

Spring/summer Chinook production in the Tucannon River is not forecast to achieve the viability criteria with the implementation of the recovery plan (Figure 7-7). Although the abundance criterion is achieved, intrinsic productivity falls just below the curve.

Modeling indicates that adult abundance is likely to double if implemented actions achieve full effectiveness. The intrinsic productivity of the population is also expected to increase by 11 percent.



**Figure 7-7 EDT Viability Analysis for Tucannon Spring/Summer Chinook**

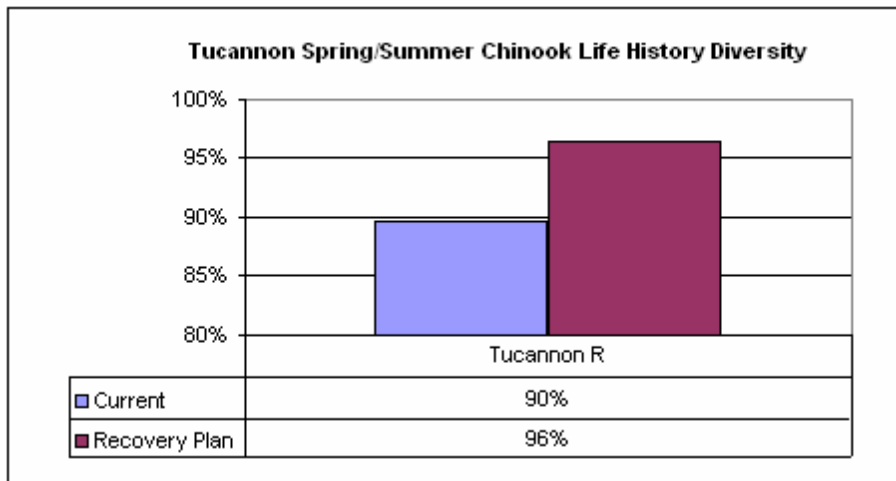
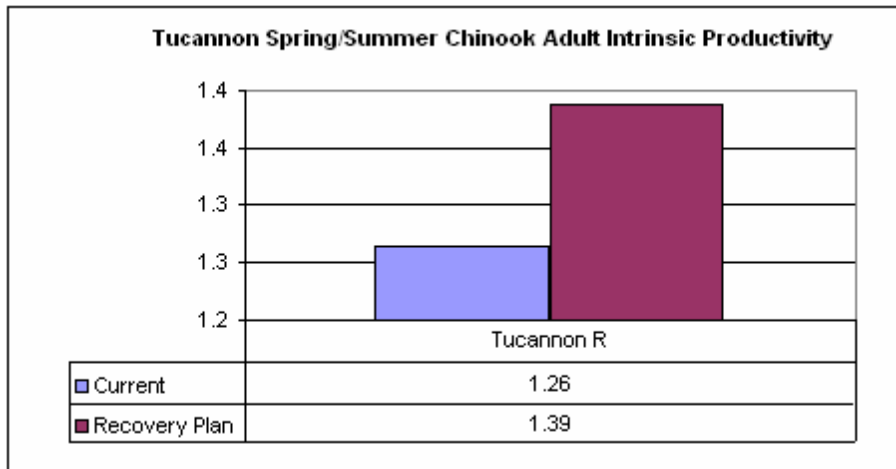
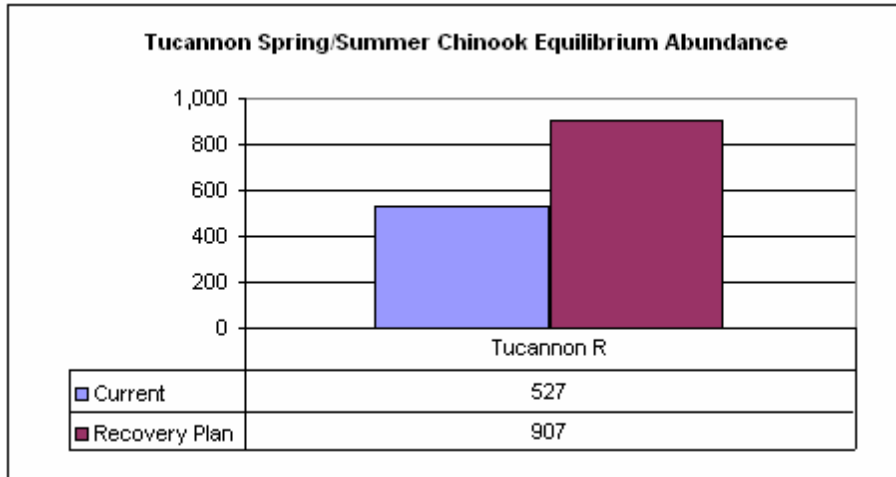
This result must also be tempered by the Hyun and Talbot (2004) findings. The marginal “success” of the habitat restoration scenario should be weighed against their conclusion that Tucannon spring/summer

Chinook are in rapid decline and at serious risk of extinction. Hyun and Talbot results are supported by WDFW empirical data and analyses for adult productivity which show that the productivity of this population is ~0.59. The NOAA 2005 status review indicates that fish abundance has ranged from 128 to 1,012, with the majority of these fish being of hatchery origin. Field measurements of spawner abundance in each minor and major spawning aggregations over the course of the recovery plan will determine if the viability criteria are met.

#### *VSP Parameters for Major and Minor Spawning Aggregations*

All of the significant improvement in the VSP parameters occurs in the Upper Tucannon MSA. Habitat changes from the implementation of the recovery plan would have little effect on the Lower Tucannon River or Pataha Creek spawning areas (Figure 7-8).

The intrinsic productivity portion of the figure shows that productivity does increase, but values are slightly less than 1.0. Intrinsic productivity values below 1.0 mean that the population cannot be sustained over time. The result is that, in some years of high survival, fish production may occur in these areas; but in average or low survival years, adult production will likely be low to non-existent. Thus, even after full implementation of the recovery plan, Tucannon spring/summer Chinook production will be highly dependent on a single MSA, leaving the population more vulnerable to catastrophic events that could decimate production.



**Figure 7-8 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity and Life History Diversity for Tucannon River Spring/Summer Chinook Under Current and Recovery Plan Conditions**

Summary of Conclusions

The EDT analysis indicates that the recovery plan, although making significant improvements to adult abundance and productivity, would still fall short of achieving recovery the intrinsic productivity objective for this population. However, given the uncertain effect hatchery fish are having on fish production in this stream, this conclusion should be considered speculative at this point.

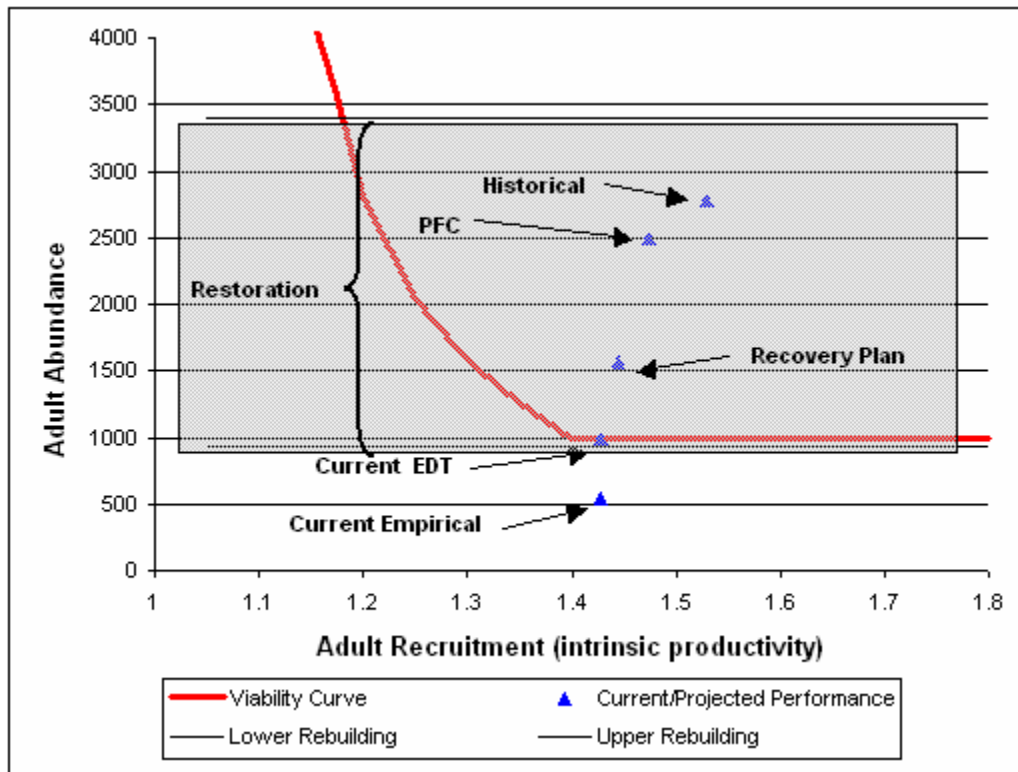
**7.5.5 Walla Walla River**

The change in the VSP parameters expected for Walla Walla summer steelhead is discussed in this section of the report. Because Walla Walla spring/summer Chinook are not listed under ESA, no VSP analysis is presented for this species.

**Summer Steelhead**

Population Viability

Based on modeling results, the recovery plan appears likely to achieve the viability criteria identified by the ICTRT for Walla Walla summer steelhead (Figure 7-9). Adult abundance and intrinsic productivity is forecast to increase by 59 percent and 1 percent, respectively. This level of performance improvement is likely to move the population into the Low Risk area of the curve.



**Figure 7-9 EDT Viability Analysis for Walla Walla Summer Steelhead**

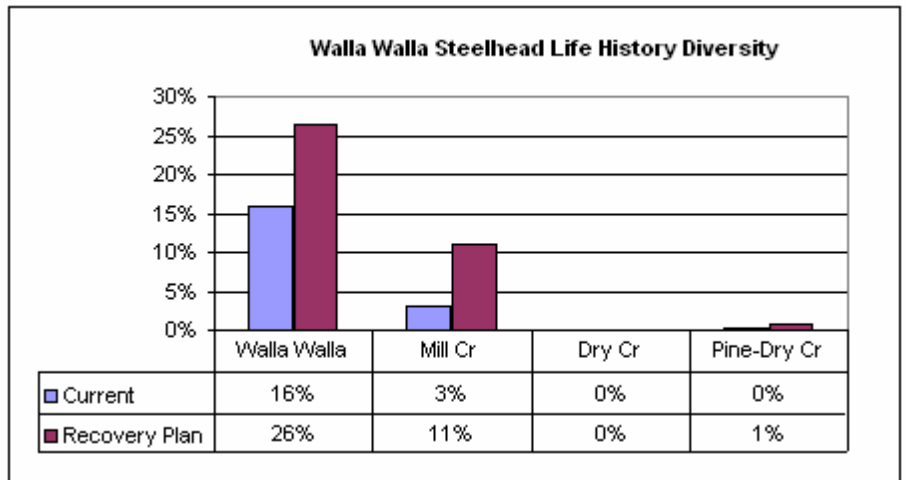
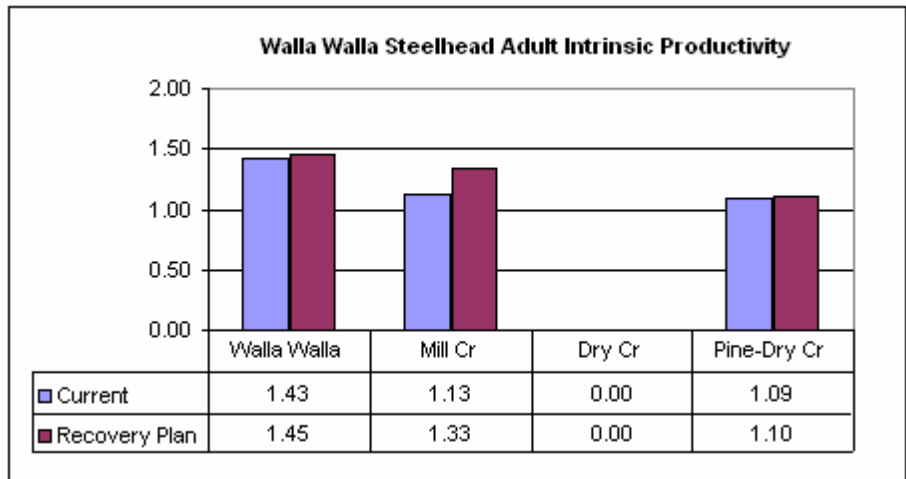
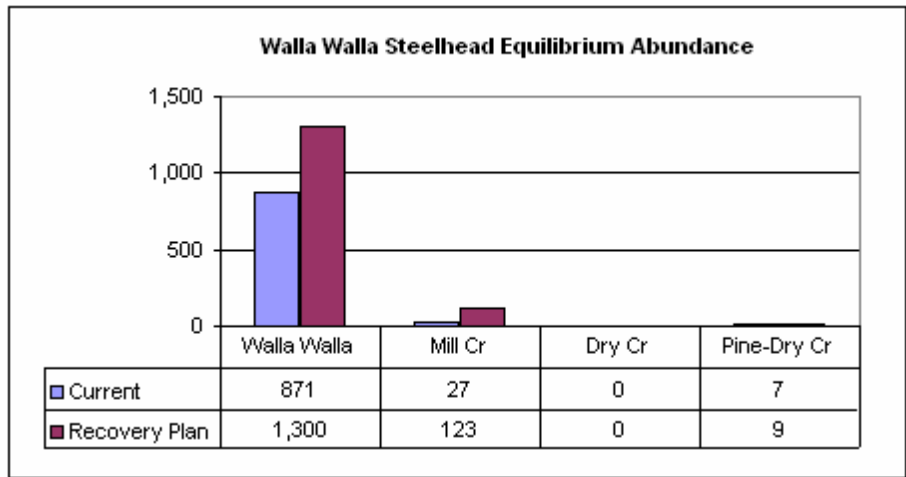
These results must be interpreted cautiously. There is considerable difference between current population performances estimated by EDT and by empirical observations.<sup>26</sup> Aside from the issue of accuracy of empirical estimates, the implications of a current population that is considerably less abundant than the EDT simulation must be considered. If EDT significantly overestimates production under current conditions, it might also overestimate production under the restored scenario.

*VSP Parameters for Major and Minor Spawning Aggregations*

With the exception of Dry Creek, the recovery plan increases index values for all VSP parameters in all spawning areas (Figure 7-10). No recovery actions were defined for Dry Creek; therefore, the result is to be expected. Instead, the recovery plan calls for protecting this reach by not allowing any further degradation of the current habitat conditions.

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<sup>26</sup> The 2005 NOAA Status Review did not provide updated information for Walla Walla summer steelhead.



**Figure 7-10 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity and Life History Diversity for Walla Walla Summer Steelhead Under Current and Recovery Plan Conditions**

The majority of the production is expected to occur in the mainstem and forks of the Walla Walla River. The removal of obstruction problems in Mill Creek would result in increased production in this spawning aggregation. Intrinsic productivity would increase the most in Mill Creek, the Walla Walla mainstem, and Pine-Dry Creek. This same trend is evident between areas for life history diversity.

Summary of Conclusions

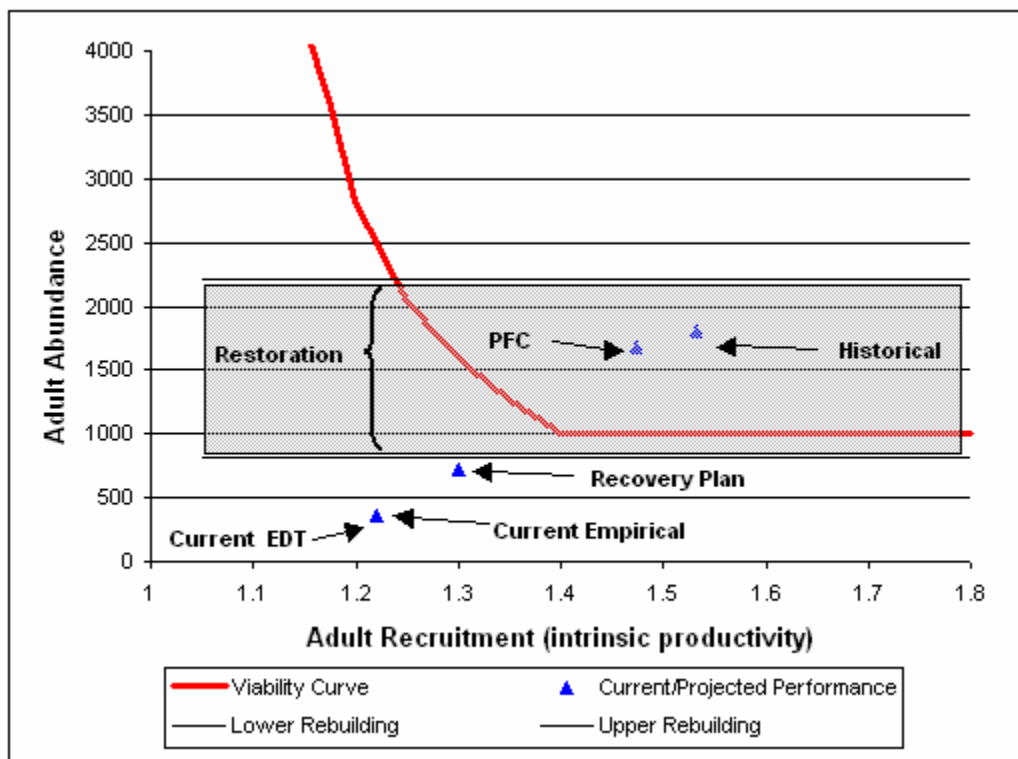
EDT forecasts that the recovery plan would likely meet recovery objectives defined by the ICTRT for this population. Although empirical data suggest that current steelhead abundance levels are lower than what EDT estimates for this population, the 59 percent improvement in abundance forecast by EDT, when added to empirical estimate, would still move the population very close to the low risk portion of the viability curve.

**7.5.6 Touchet River**

The ICTRT defined the Touchet River as an intermediate-sized basin with a target goal of 1,000 summer steelhead, although it is a tributary of the Walla Walla River.

Population Viability

The recovery plan improves summer steelhead population abundance and intrinsic productivity by 97 percent and 6 percent, respectively. However, even with this level of improvement, resulting fish production falls short of meeting the ICTRT defined viability criteria (Figure 7-11). At this level, the ICTRT would still consider the population to have a high risk of extinction, although the risk is substantially less than before plan implementation.



**Figure 7-11 EDT Viability Analysis for Touchet Summer Steelhead**

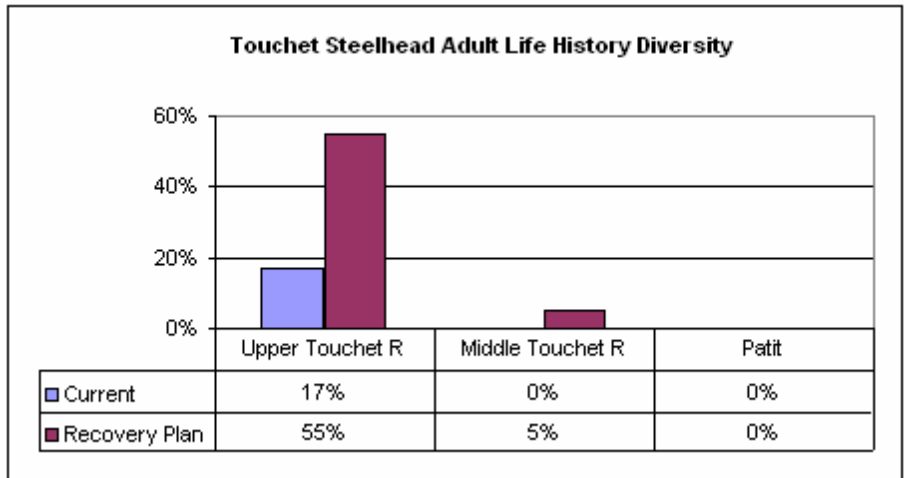
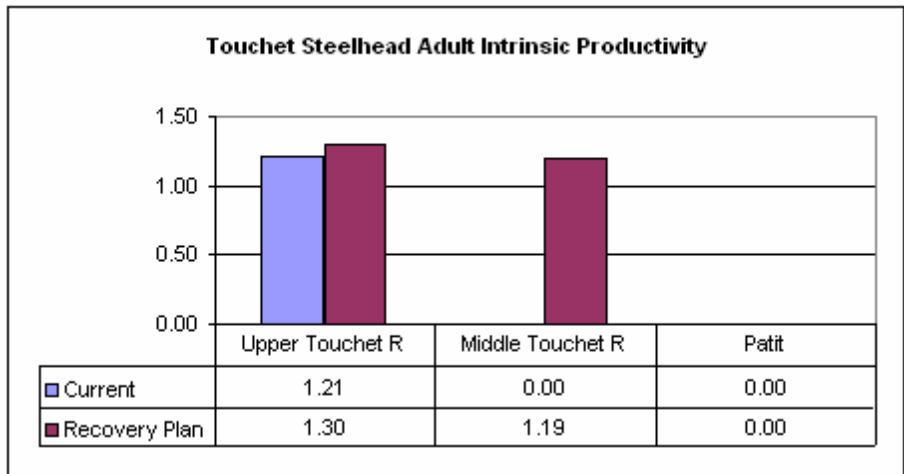
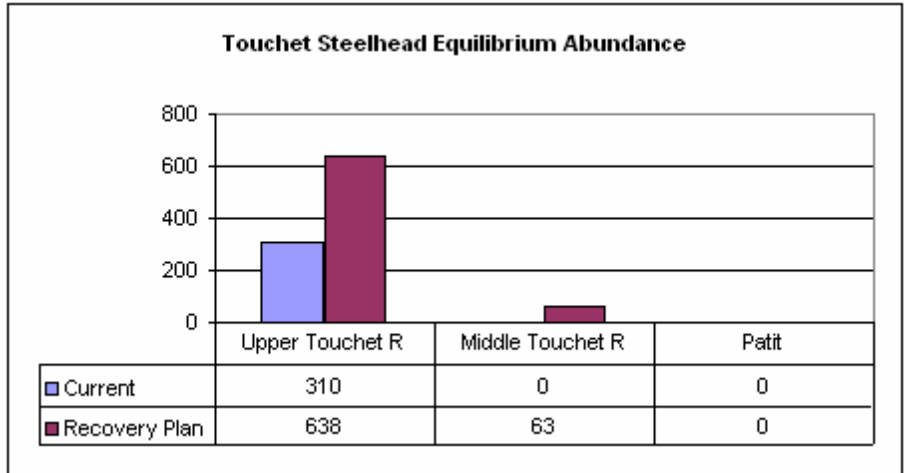
To achieve the viability criteria, adult summer steelhead abundance would need to be increased by an additional 40 percent. This increase in fish abundance could be achieved with more habitat actions, improvements in one of the other “Hs” (harvest, hydro, or hatcheries), or a combination of such actions.

The EDT results indicate that the viability benefits of habitat restoration in the Touchet drainage would be much lower than those in the Walla Walla. This would likely be due to the fact that the restoration agenda for the Walla Walla is more ambitious than that for the Touchet, and the lower Touchet River below Waitsburg would generally not contribute to production. The relative difference in restoration effort plus the assumed full use of the large production potential of the North and South forks of the Walla Walla are the most reasonable explanations for the discrepancy.

As is the case with most populations in the recovery area, there is considerable uncertainty regarding current population levels and their intrinsic productivity. As more data are collected as part of the monitoring plan described in Chapter 8, the conclusions reached in this report would be updated and refined.

#### *VSP Parameters for Major and Minor Spawning Aggregations*

Resulting VSP index values for Touchet River summer steelhead major and minor spawning aggregations are presented in Figure 7-12. Most of the improvement in summer steelhead performance occurs in the Upper Touchet MSA. Under the recovery plan, Upper Touchet summer steelhead abundance, intrinsic productivity, and life history diversity increases by 106 percent, 7 percent, and 224 percent, respectively.



**Figure 7-12 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity and Life History Diversity for Touchet Summer Steelhead Under Current and Recovery Plan Conditions**

The recovery plan also increases productivity in the Lower Touchet River to a level that can sustain limited summer steelhead production (63 adults). The recovery plan thereby increases the spatial structure (distribution) of the population, which should reduce extinction risk.

No improvement is seen in the Patit Creek population because actions were not targeted to this area. Patit Creek will, however, be protected from further degradation through the enforcement of existing laws and regulations.

Summary of Conclusions

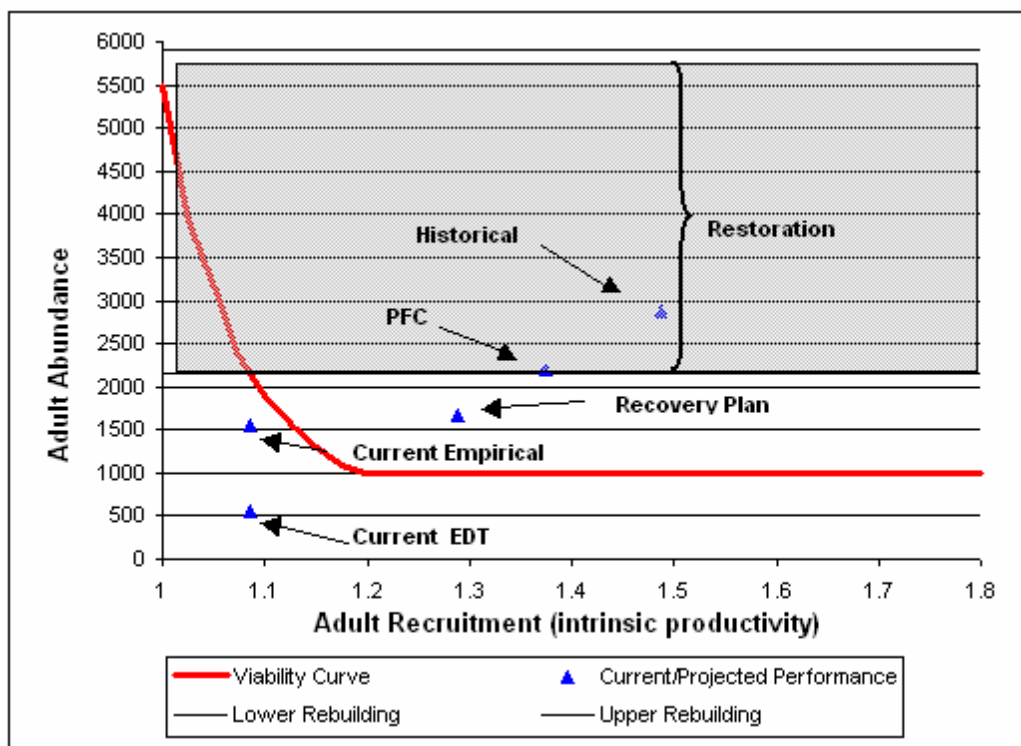
Based on EDT forecasts, the actions proposed in the recovery plan do not appear sufficient to achieve the recovery objectives developed by the ICRT. However, because of the high level of uncertainty associated with estimates of current abundance and productivity, and the effectiveness of proposed actions, the conclusion must be deemed speculative at this point in time.

**7.5.7 Joseph Creek (Grande Ronde)**

**Summer Steelhead**

Population Viability

The majority of Joseph Creek is located in Oregon; the remainder in Washington. Improvement in summer steelhead production in this stream will require habitat actions in both Washington and Oregon. Based on actions proposed for both states, summer steelhead production is expected to meet ICRT viability criteria. Summer steelhead adult abundance and intrinsic productivity is forecasted to increase by 197 percent and 19 percent, respectively (Figure 7-13). This level of improvement in fish production is ambitious, but represents subbasin planners’ best judgment of what can be achieved in Joseph Creek.



**Figure 7-13 EDT Viability Analysis for Joseph Creek (Grande Ronde) Summer Steelhead**

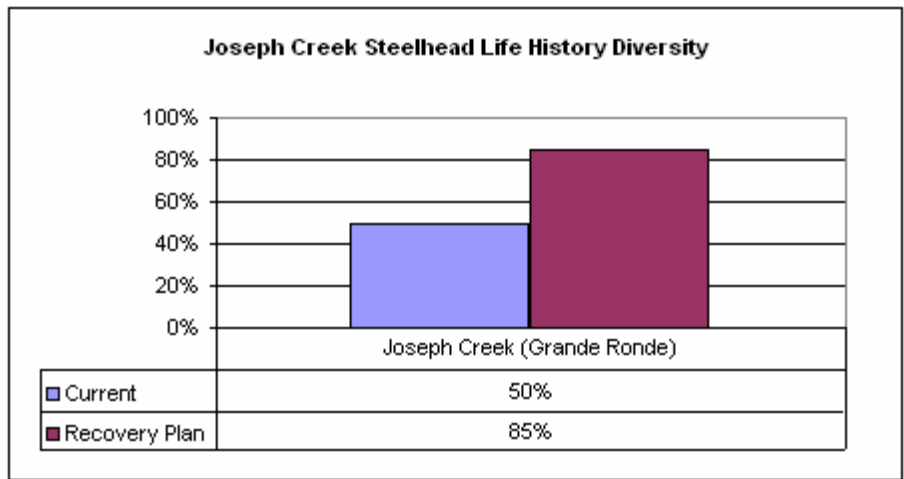
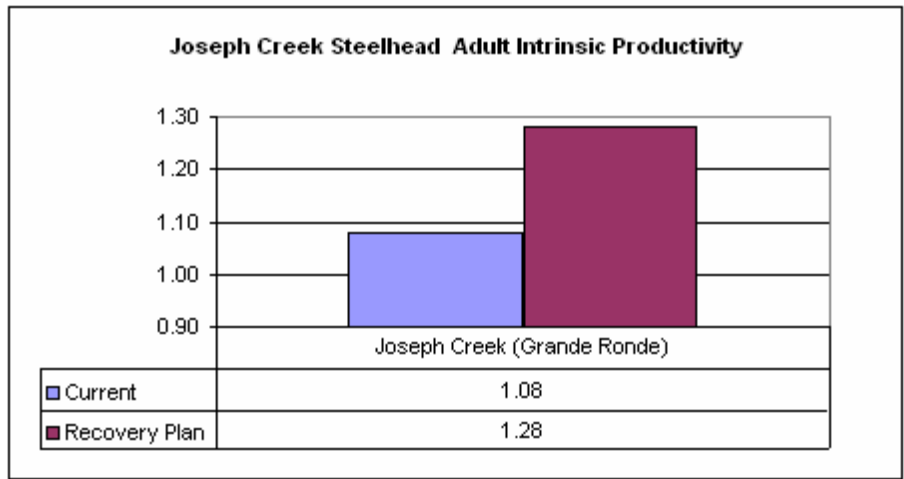
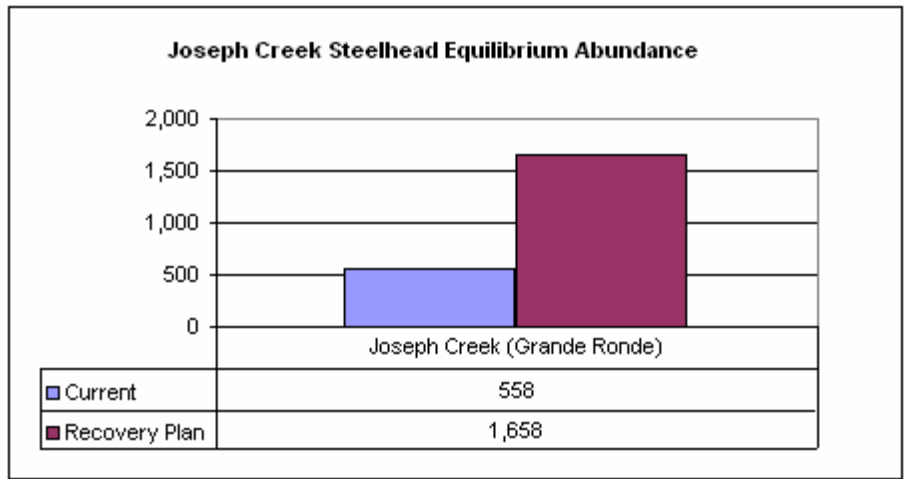
The EDT results shown in Figure 7-13 could be considered conservative. Chilcote's (2001) analysis suggests that Joseph Creek steelhead were already well above the viable level (based the author's definition) and are at or above optimal seeding levels. This is supported by the empirical data showing steelhead abundance at ~1600 adults.<sup>27</sup> In addition, the recent 2005 NOAA Status Review noted that this population likely already achieves the recovery criteria defined by the ICTRT. These results and those of EDT suggest that the proposed habitat restoration measures are likely to considerably increase the viability of the population.

*VSP Parameters for Major and Minor Spawning Aggregations*

Joseph Creek contains a single MSA. EDT forecasted change in abundance, intrinsic productivity, and life history diversity is shown in Figure 7-14. The plan results in an increase in abundance, intrinsic productivity and life history diversity of 197 percent, 19 percent, and 69 percent (or 35 percentage points), respectively. If achieved, improvement in the VSP parameters will significantly reduce extinction risk for this population.

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<sup>27</sup> Note that the intrinsic productivity value on the Joseph Creek graph for empirical estimates is based on EDT and not collected data.



**Figure 7-14 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity and Life History Diversity for Joseph Creek Summer Steelhead Under Current and Recovery Plan Conditions**

### Summary of Conclusions

Existing empirical data (Chilcote 2001 and NOAA 2005) show that this population is already at or very near recovery objectives; therefore, it is expected that the actions in this plan would further move this population into the low risk portion of the curve.

Of concern however, is the difference in EDT estimates of abundance versus empirically based estimates of current fish production. This points out the need to review all habitat ratings for both the Washington and Oregon portions of the basin.

#### **7.5.8 Lower Grande Ronde River**

The Lower Grande Ronde River population includes the Wenaha River and several small tributaries in the lower portion of the subbasin. This grouping of streams applies only to the summer steelhead population. The Wenaha River was designated as a separate population for spring/summer Chinook under the assumption that few, if any, spring/summer Chinook use the smaller tributaries.

#### **Summer Steelhead**

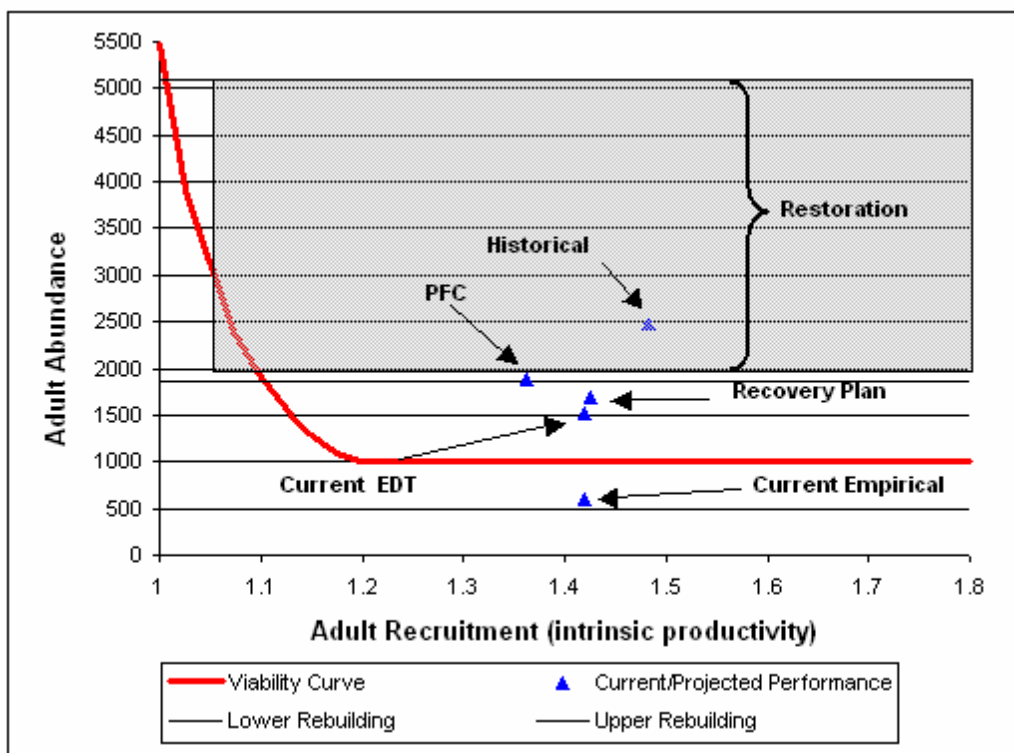
##### Population Viability

The Lower Grande Ronde summer steelhead population appears to meet the population viability criteria in terms of EDT projections (Figure 7-15), with or without recovery plan actions. The empirical production estimates, however, suggest the existing population is at risk, a conclusion not supported by Chilcote (2001). Chilcote (2001) concluded that Lower Grande Ronde steelhead abundance not only surpasses viability criteria, but equals maximum sustained yield (MSY) seeding. More empirical data will be needed to confirm population status before reaching any definitive conclusions regarding population viability.<sup>28</sup>

The results of the viability analysis are not surprising given that the Wenaha River is in relatively pristine condition. Because it is undisturbed, the recovery plan has targeted this stream for protection rather than restoration.

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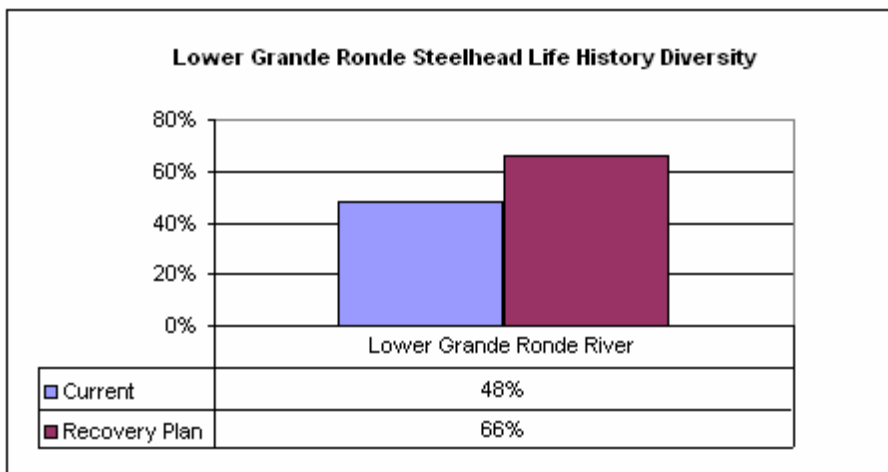
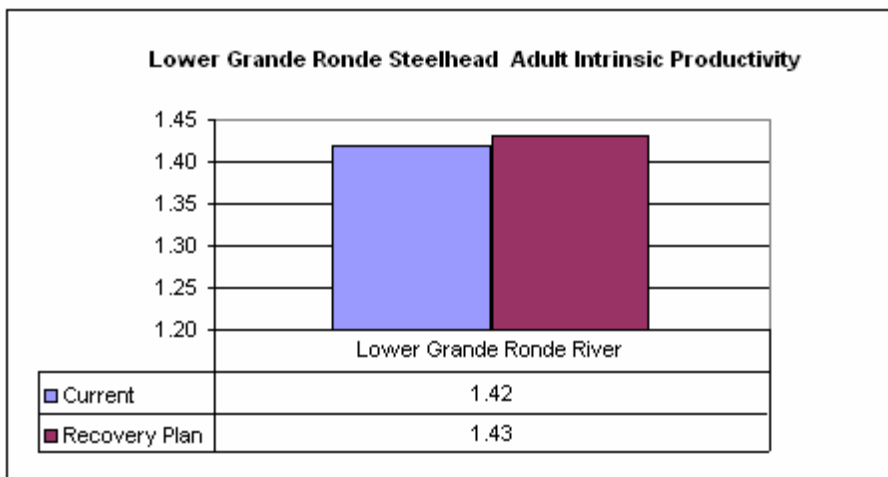
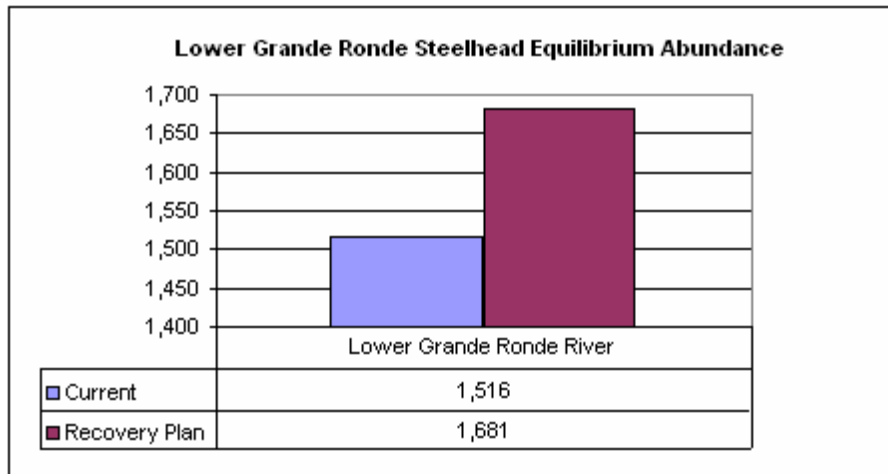
<sup>28</sup> The 2005 NOAA Status Review did not provide an update for this populations status.



**Figure 7-15 EDT Viability Analysis for Lower Grande Ronde Summer Steelhead.**

*VSP Parameters for Major and Minor Spawning Aggregations*

If recovery actions are as effective as the model indicates, adult abundance, intrinsic productivity, and life history diversity in the Lower Grande Ronde should increase by 11 percent, 1 percent and 40 percent (or 18 percentage points), respectively (Figure 7-16). Increases in all three VSP parameters should reduce extinction risk, while at the same time increasing the ability of the population to recover more quickly from periods of poor ocean or freshwater survival.



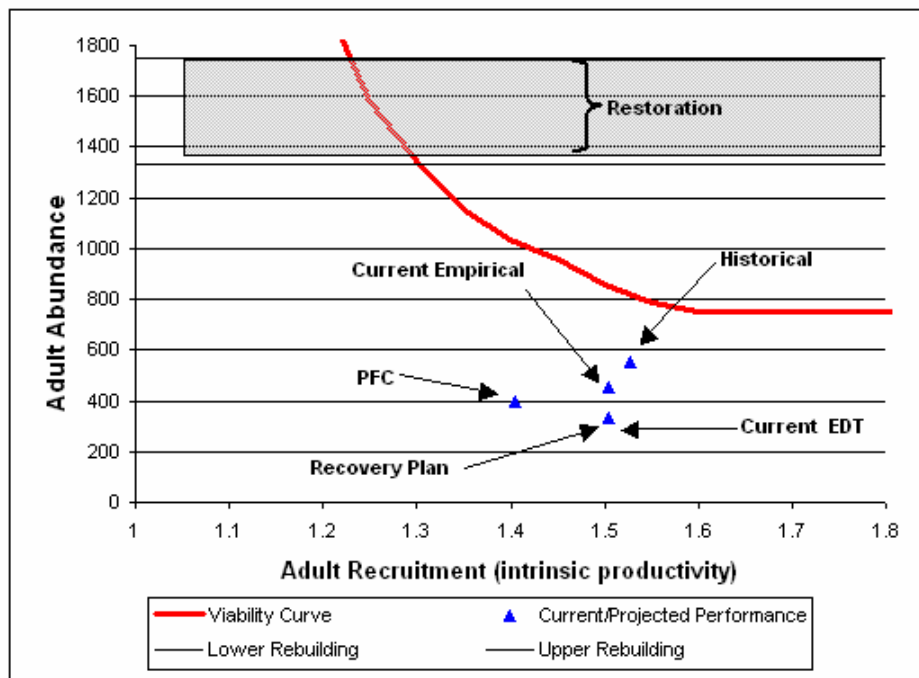
**Figure 7-16 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity, and Life History Diversity for Lower Grande Ronde Summer Steelhead Under Current and Recovery Plan Conditions**

### Summary of Conclusions

The EDT analysis concluded that current population abundance and productivity achieves the recovery criteria set forth by the ICTRT. This conclusion is supported by Chilcote's analysis (2001), that showed this population was at full seeding levels and had a low risk of extinction. However, given the current empirical estimate of adult abundance (~500), it is not clear that the ICTRT abundance target would be achieved.

### **Spring/Summer Chinook**

No recovery actions are proposed for the Wenaha River. Therefore, population viability is expected to be the same for current conditions and for the Recovery Plan (Figure 7-17). Neither will achieve the viability criteria identified by the ICTRT. If modeling results are accurate, given the pristine condition of the Wenaha River, only actions outside of the subbasin could increase survival sufficiently to achieve the viability criteria.



**Figure 7-17 EDT Viability Analysis for Wenaha River Spring/Summer Chinook**

The 2005 NOAA Status Review (NOAA 2005) estimated spring/summer Chinook abundance in this basin at 67-586 adults, with a large portion consisting of hatchery fish. The Hyun and Talbot analysis concluded that Wenaha River spring/summer Chinook were stable and at a low risk of extinction. Regardless, all three analyses estimates of adult abundance were below the recovery level defined by the ICTRT.

### VSP Parameters for Major and Minor Spawning Aggregations

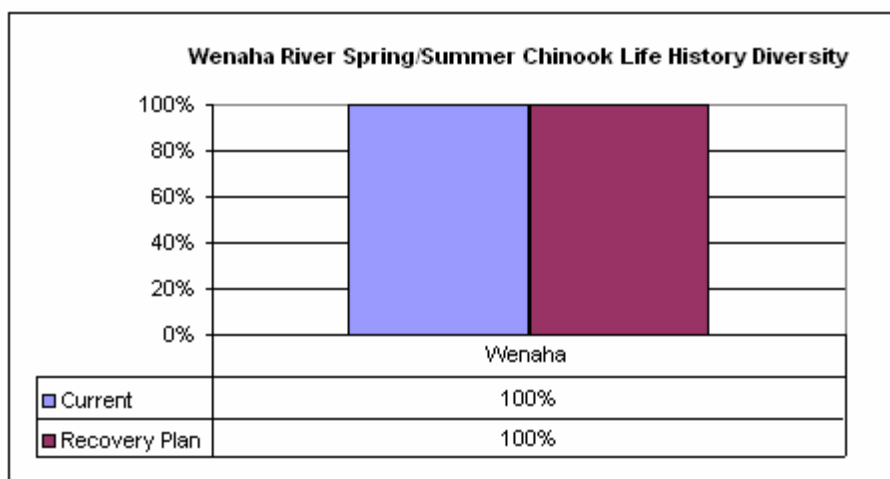
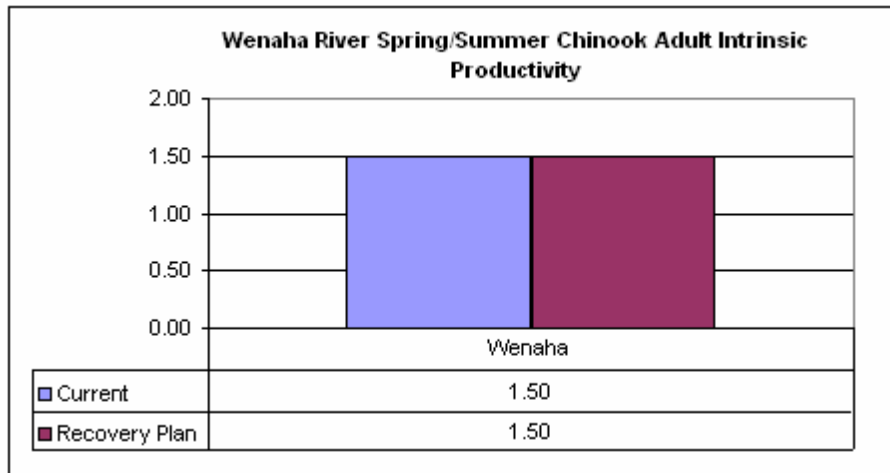
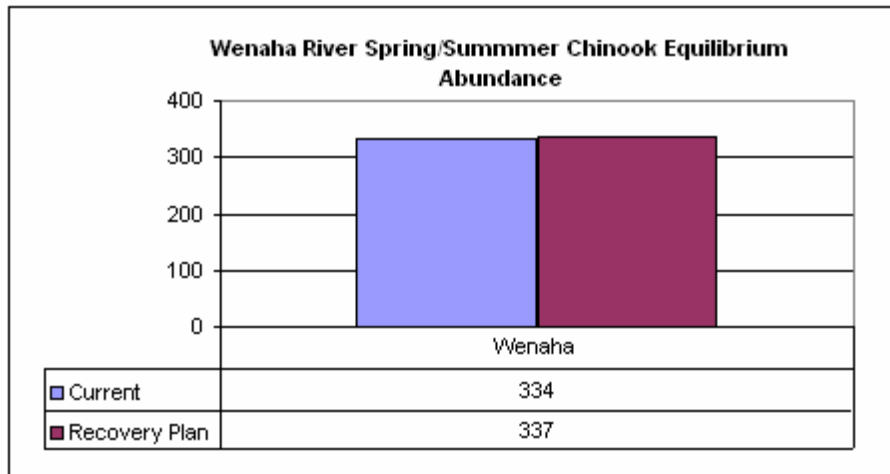
The Wenaha River was defined as a single MSA by the ICTRT. As can be seen in Figure 7-18, the change in the VSP parameters is expected to be quite low.

### Summary of Conclusions

Because no actions are proposed to improve habitat in the Wenaha River basin as part of this plan, no improvement in fish performance is expected with plan implementation. The existing empirical, as well as analyses completed by others, show that current spring/summer abundance in the Wenaha River is less than the abundance level established by the ICTRT. Because of this, it is assumed that the recovery plan would not achieve the recovery objectives. However, because there is little data on Wenaha River spring/summer Chinook distribution and abundance, results of stream surveys conducted as part of the monitoring program (Chapter 8) would be used to update this conclusion as they become available.

### **Fall Chinook**

The ICTRT has not yet developed criteria for fall Chinook. The analysis will be completed when the criteria are available, although fall Chinook are not likely to use much if any of the Wenaha River basin. The lower Grande Ronde is expected to be a significant spawning aggregation.



**Figure 7-18 Viability Curve Modified EDT Index Values of Abundance, Intrinsic Productivity, and Life History Diversity for Wenaha River Spring/Summer Under Current and Recovery Plan Conditions**

## 7.6 GAP ANALYSIS

The percent change expected in population abundance, productivity, and diversity from the implementation of the habitat objectives of the recovery plan is shown in Table 7-8. As can be seen, fish performance is expected to increase in virtually all subbasins. The exception is Wenaha River spring/summer Chinook, where population status remains unchanged because this area is proposed for protection only.

The data presented in Table 7-8 are based on several key assumptions. These are:

1. Implemented actions achieve the habitat objectives defined for each subbasin.
2. All obstruction/blockages have been removed or fixed to allow fish passage at high survival rates.
3. For those basins where the assumption applies, habitat actions are implemented in both the Oregon and Washington portions of the subbasins.
4. No improvements are expected in fish survival through the hydrosystem or estuary.
5. No change in harvest impacts.
6. No effects of hatchery fish releases on wild fish performance.

**Table 7-8 Projected Increases in Abundance, Productivity, and Life History Diversity Resulting from Recovery Actions**

| Stream                    | Species               | Abundance | Productivity | Diversity |
|---------------------------|-----------------------|-----------|--------------|-----------|
| Asotin Creek              | Steelhead             | 64%       | 8%           | 59%       |
| Asotin Creek              | Spring/Summer Chinook | 124%      | 8%           | 142%      |
| Tucannon River            | Steelhead             | 43%       | 4%           | 18%       |
| Tucannon River            | Spring/Summer Chinook | 103%      | 11%          | 23%       |
| Walla Walla River         | Steelhead             | 59%       | 1%           | 80%       |
| Touchet River             | Steelhead             | 97%       | 6%           | 283%      |
| Joseph Creek              | Steelhead             | 197%      | 19%          | 69%       |
| Lower Grande Ronde R.     | Steelhead             | 11%       | 1%           | 40%       |
| Wenaha <sup>1</sup> River | Spring/Summer Chinook | 0%        | 0%           | 0%        |

<sup>1</sup> Proposed for protection only; therefore, no change is expected.

Based on this level of improvement shown in Table 7-8, EDT modeling indicates that the actions proposed in the recovery plan are expected to achieve NMFS viability curve criteria for four of the nine listed populations in the recovery area (Table 7-9). Those populations deemed by EDT modeling to be less likely to meet the recovery curve criteria include:

- Asotin Creek summer steelhead
- Asotin Creek spring/summer Chinook
- Tucannon River spring/summer Chinook
- Touchet River summer steelhead
- Wenaha River spring/summer Chinook

**Table 7-9 EDT Conclusions Regarding Ability of Recovery Plan to Achieve NMFS Viability Curve Criteria by Subbasin and Species**

| Stream            | Species               | Viability Curve Criteria Achieved (EDT)? | Studies/Analyses<br>Supporting or Challenging EDT Conclusions   |
|-------------------|-----------------------|--|---|
| Asotin Creek      | Steelhead             | No                                       | 2005 Status Review shows 0-543 fish consistent with EDT assumptions   |
| Asotin Creek      | Spring/Summer Chinook | No                                       | Empirical data shows this population may be functionally extinct  |
| Tucannon River    | Steelhead             | Yes                                      | EDT overestimates current production based on empirical data, risk that EDT over estimates probable success of plan   |
| Tucannon River    | Spring/Summer Chinook | No                                       | EDT and empirical estimate for current abundance close, EDT estimates ~100% increase in abundance                     |
| Walla Walla River | Steelhead             | Yes                                      | EDT and empirical abundance estimates off, need thorough review of EDT assumptions and confirmation of empirical data |
| Touchet River     | Steelhead             | No                                       | 2005 Status Review shows population still in decline, supports EDT estimates of current productivity                  |

(continued)

**Table 7-9 EDT Conclusions Regarding Ability of Recovery Plan to Achieve NMFS Viability Curve Criteria by Subbasin and Species (continued)**

| Stream                   | Species               | Viability Curve Criteria Achieved (EDT)? | Studies/Analyses<br>Supporting or Challenging EDT Conclusions  |
|--------------------------|-----------------------|--|--|
| Joseph Creek             | Steelhead             | Yes                                      | <p>Chilcote (2001) concluded that this population was already at ICTRT abundance levels and had a low extinction risk</p> <p>Empirical data supports abundance criterion being achieved</p> <p>NOAA Status Review (2005) shows current levels likely to meet abundance and productivity criteria</p> |
| Lower Grande Ronde River | Steelhead             | Yes                                      | <p>Chilcote (2001) concluded that this population was already at ICTRT abundance levels and had a low extinction risk</p>  |
| Wenaha River             | Spring/Summer Chinook | No                                       | <p>Hyun and Talbot considered this population to be stable and at low extinction risk. However, adult abundance levels may not meet ICTRT criterion.</p>   |

However, it must be made clear that predictions of future fish performance are based on modeling results, which by their vary nature include significant uncertainty. Incorrect model inputs and assumptions may have led to false conclusions as to the probable success of the recovery plan in each of the basins. This is why the success of the recovery plan will be based not on modeling results, but instead on the development of empirical estimates of fish production obtained from a well-designed monitoring program.

The production “gap” between the levels of adult abundance needed to meet the NMFS viability criteria and future production as forecasted through modeling range from 6 percent for Asotin Creek summer steelhead to 49 percent for Wenaha spring/summer Chinook (Table 7-10).

**Table 7-10 Predicted Production Gap: Expressed in Terms of Mean Adult Abundance, Between NMFS Viability Curve Criteria and EDT Modeling Forecasts of Future Fish Production by Subbasin and Species**

| Stream         | Species               | Gap (mean abundance or productivity increase needed)           |
|----------------|-----------------------|--|
| Asotin Creek   | Steelhead             | ~6% (Abundance)  |
| Asotin Creek   | Spring/Summer Chinook | ~77% Increase in Abundance, or ~30% for intrinsic productivity |
| Tucannon River | Spring/Summer Chinook | ~2% (Increase in productivity, achieves abundance criterion)   |
| Touchet River  | Steelhead             | ~40% (Abundance)   |
| Wenaha River   | Spring/Summer Chinook | 123%% (Abundance)  |

To close this production gap may require that additional actions both within and outside of the recovery area be added to the recovery plan over time.

The success of the SRSRP can be affected, both positively and negatively, by actions taken by other entities on behalf of hatcheries, hydroelectric installations, and harvest. If harvest rates are reduced, it is likely that more adult fish will return to successfully spawn in the recovery region. The same could occur if adult survival through the hydrosystem is increased. Because factors beyond the control of the SRSRB can impact the number of adults returning to the recovery region, the emphasis of the SRSRP is on monitoring the number of juvenile fish produced per adult spawner in each subbasin. The SRSRB's opinion is that tracking juvenile abundance and productivity is a better indication of program success than tracking adult returns which may be controlled by other entities or circumstances.