Resurrection Creek Stream Restoration Project
End of Construction Season Progress Report
2006

This summer the Forest Service completed the heavy equipment construction work for the Resurrection Creek Stream and Riparian Restoration Project initiated in 2005. Heavy equipment construction extended from May 16,2006 through June 29, 2006. Floodplain revegetation efforts began in earnest this year, and included planting and seeding floodplains on the lower half the project area. The Youth Restoration Corps in partnership with the Forest Service conducted all the hand labor intensive revegetation work. A comprehensive progress report for 2005 work is available on the web at:

http://www.fs.fed.us/r10/chugach/pdf/res_creek_pdf/res_prog_090705.pdf

A project monitoring report covering various aspects of the 2005 construction is online at:

http://www.fs.fed.us/r10/chugach/pdf/res_creek_pdf/monitor_rep05.pdf

Restoration construction work done in 2005 focused primarily on increasing the length, sinuosity, slow water habitat, and large wood component of the main channel of Resurrection Creek in the lower 0.6 miles of the project area. In contrast, 2006 construction focused more on construction of new side channels and side channel habitat adjacent to Resurrection Creek, and on rebuilding the lower 0.2 miles of Palmer Creek to provide enhanced spawning and rearing habitat.

The response of the Resurrection Creek fishery to newly created habitats has been very exciting. Last year (2005), we found all five Pacific salmon species spawning in newly created habitats. In July through August 2005, chinook, chum, and coho salmon were each counted in the range of 100 spawning adults, and pink salmon had over 2,000 spawners. Coho numbers were likely higher, but counts were not taken in September or October 2005 when many cohos are still arriving. Spawners in the project area chose the new habitats rather than continuing upstream to traditional spawning grounds. Occupation of the newly created habitats should increase salmon run sizes in Resurrection Creek. Counts in 2006 (as of July 27th) show continued increased use by chinook, pink, and chum salmon, particularly in main channel pool and glide habitats, with cohos starting to arrive.

Project construction accomplishments for 2006 include:

- ***Excavating, shaping, and "stepping" 1.2 miles of new side channels and associated ponds*** with natural "pool-rifle" sequences. Side channels varied in size and flow, from upwards of 25 percent of Resurrection Creek's flow, down to just a few percent. All side channels are designed to provide high quality rearing habitat for salmon, trout, and char, and most will provide spawning habitat as well. All side channels function as relief valves for high energy flood flows on Resurrection and/or Palmer Creek. In almost all cases, the channels are designed and constructed to provide perennial (year-round) flow.

- ***Redistributing approximately 40,000 cubic yards of mine tailings*** to develop a new stream channel and floodplain
- ***Shaping 20 acres of new floodplain*** adjacent to Resurrection Creek, Palmer Creek, and newly formed side channels. These floodplains are designed to accommodate overbank flows during flood events, and limit main channel erosion and scour.
- ***Placing approximately 600 pieces of large wood into engineered log jams*** along new side channels. We constructed 20 new log jams along the new side channels. These jams allow for moderation of side slough flows during flooding, provide cover and protection for spawning and rearing fish, provide a high quality nutrient supply for fish, and capture additional natural large wood during flooding. The logjams are constructed primarily of beetle-impacted spruce harvested from adjacent areas, helping to reduce local fuel loading hazards. Some cottonwood, birch, and alder were also incorporated in the jams.
- ***Hauling and spreading approximately 3000 cubic yards of soil and woody debris onto the newly created floodplains*** to enhance both natural revegetation and future hand planting. Soil was scavenged from terrace areas adjacent to the creek.

Figure 1 displays two aerial photos of the project area, one taken in 2002 before restoration construction, and the other taken in July 2006 following completion of construction. A rectangular inholding of private land is situated at the top (north end) of both photos. Restoration efforts extended about 300 feet onto this private parcel.

In the 2002 photo, tailings piles are readily apparent, as well as Resurrection Creek's straight, steep stream course, and its lack of side channels and in-channel large wood. The 2006 aerial photo shows all the new channel construction on both Resurrection and Palmer Creeks from 2005 and 2006. Apparent on the 2006 photo are the increased length and meander of Resurrection and Palmer Creeks, and the many fold increase in side channels. Also apparent on the 2006 photo is the large increase in slow water habitats within both the main and side channels, as well as the enormous increase of large wood incorporated into the channels.

Figure 2 shows three aerial photographs of the lower 0.7 mile of the Resurrection Creek Restoration Project. The first photo is from 2002, before project construction. The second photo is from July 2006, following construction. The third photo is the same as the first, but has the new channel construction from 2005 and 2006 mapped onto it to help clarify where the construction occurred. Much of the channel construction in this lower reach occurred in 2005, particularly the five new meanders on Resurrection Creek, the diversion of Palmer Creek, and several side channels on the meanders. Additional channel construction in this reach in 2006 includes two new side channels with high quality rearing habitat along Meanders 3 and 4 (total length 1,700 feet), and the relocation of the Palmer Creek channel. Palmer Creek features also appear in Figure 4.

Figure 1 – Resurrection Creek Restoration Project Area

Before (June 6, 2002) **After (July 10, 2006)**

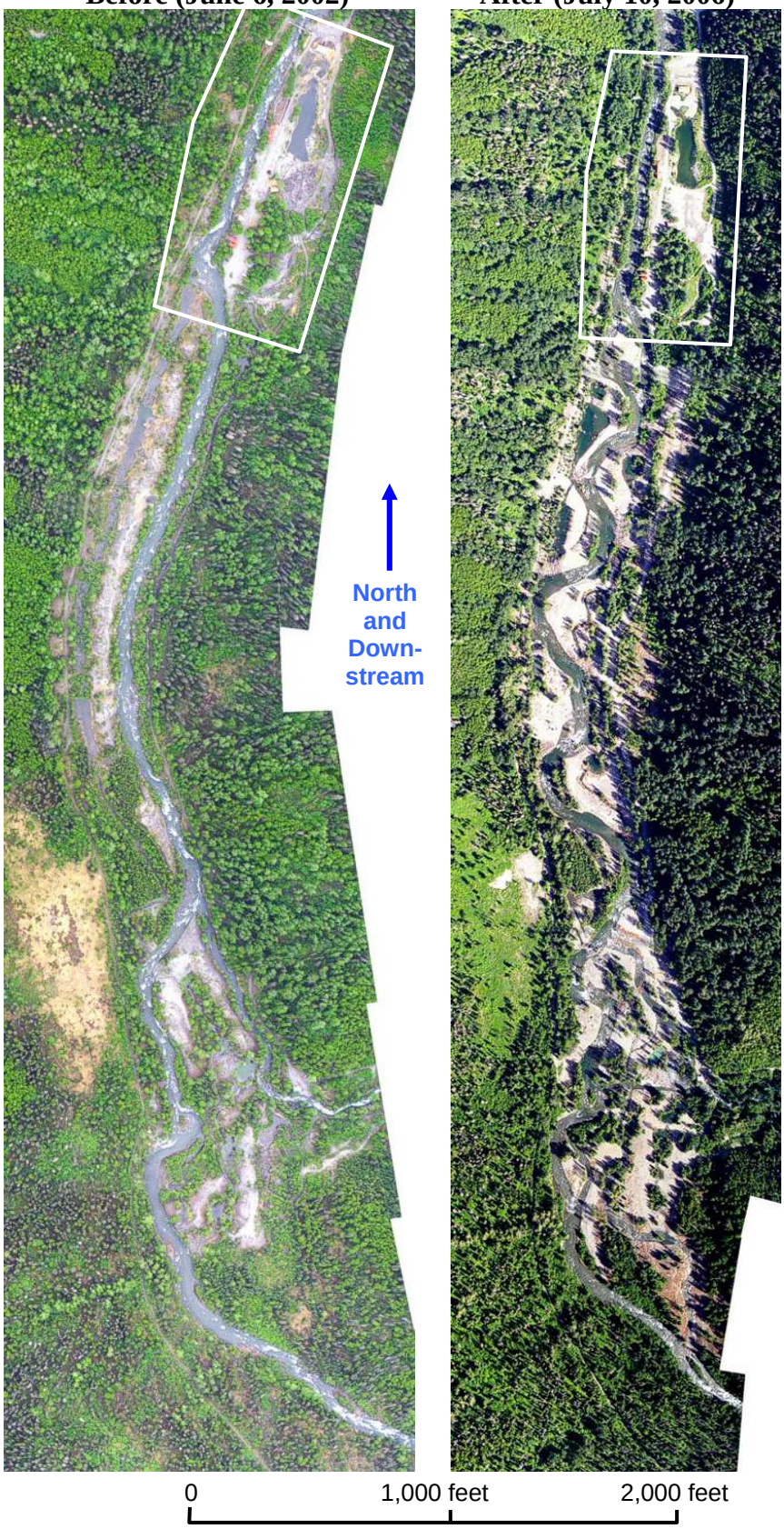
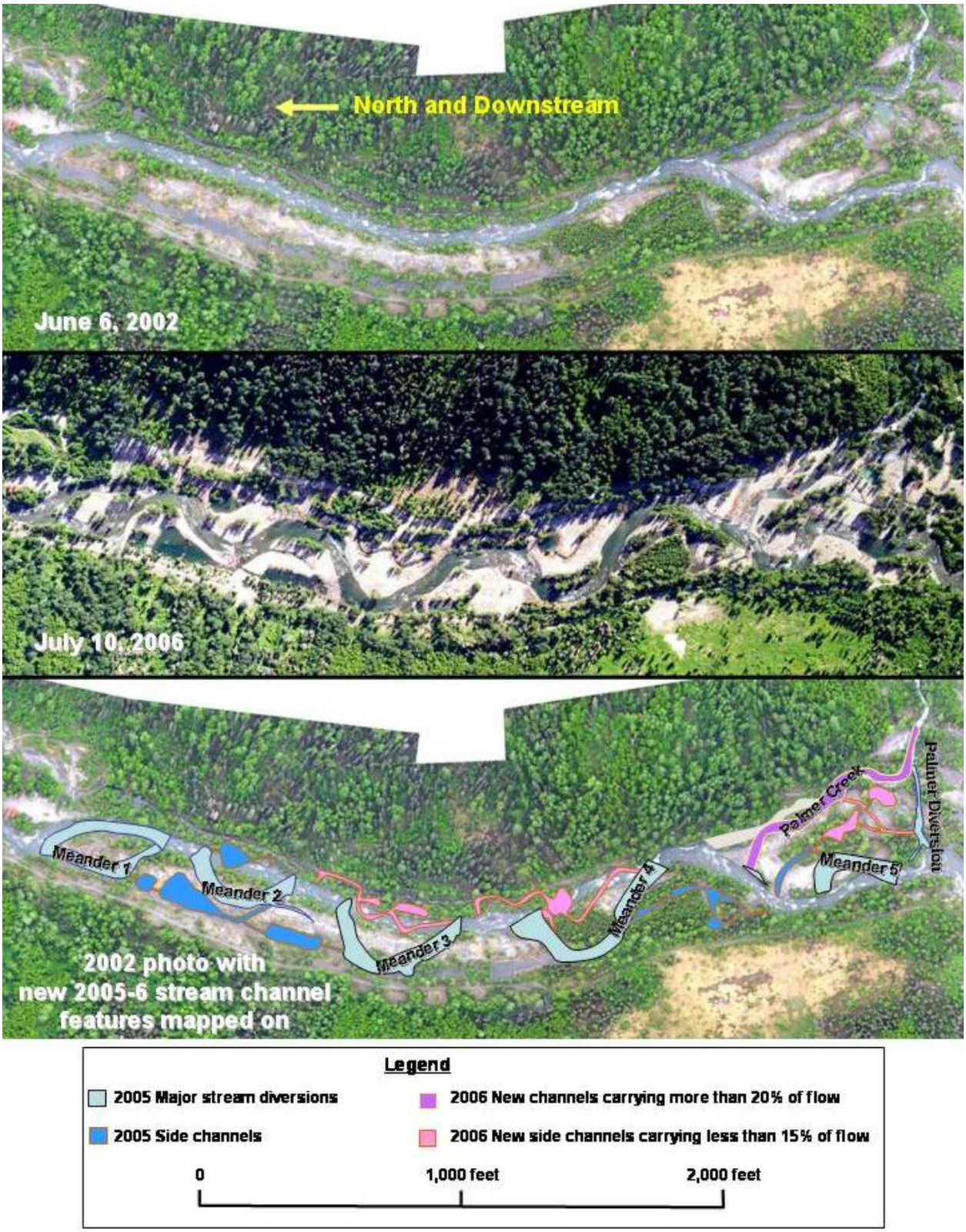


Figure 2 - Aerial Photos of the Lower Resurrection Creek Restoration Project Area Before and After Channel and Floodplain Reconstruction



Figures 3 shows YRC floodplain planting efforts on Resurrection Creek. YRC revegetated floodplains on the east and west sides of Meanders 1, 2, 3, and 4. Revegetation work included planting over 4,000 birch seedlings (Figure 3a & b) and saplings, 600 spruce seedlings on floodplains, and 4000 Feltleaf, Sitka, Under-green, and Barclay willow cuttings (Figure 3c) along the main and side channels. Considerable natural regeneration of grasses and shrubs is occurring on the soil spread over floodplain areas. Additional hand seeding of bluejoint grass and fireweed was undertaken to enhance the natural revegetation.

Figure 3 – Youth Restoration Corps planting efforts on Resurrection Creek Floodplains

Figure 3a. Youth Planting birch seedlings

Figure 3b. Planting a potted birch

Figure 3c. Youth planting willow cuttings

Figure 3d. Vegetation growth in late July

Figure 4 shows three aerial photographs of the upper 0.4 mile of the Resurrection Creek Restoration Project. The first photo is from 2002, before project construction. The second photo is from July 2006, following construction. The third photo is the same as the first, with the new channel construction from 2005 and 2006 mapped on. Some of the construction displayed in Figure 4 overlaps with that in Figure 2. Most of the channel construction displayed in Figure 4 took place in 2006. This construction includes:

1. ***The 1,960-foot long South Side Channel.*** This new channel diverts approximately 25 percent of Resurrection Creek's flow into this habitat-rich side channel (see also Figures 5 and 6) through a disturbed mining area. By reducing the flow in Resurrection Creek, this side channel also improves habitat and reduces erosion on the main stem of Resurrection Creek through this segment during high flow periods.
2. ***A 730-foot long side channel to the South Side Channel***. This channel incorporates a series of four small ponds, remnants of the past mining. It has relatively low flow, and provides high quality rearing and over-wintering habitat in its ponds.
3. ***The 650-foot long West Side Channel***. This channel diverts about 30 percent of the remaining flow in Resurrection Creek. The side channel is rich in new spawning and rearing habitat. Extensive new floodplain was constructed adjacent to this channel and Resurrection Creek to allow overbank flooding during high water events, thus reducing scour within the main stem and improving spawning habitat and substrate. (see Figure 7)
4. ***The 950-foot long reconstructed Palmer Creek Channel.*** In its new location Palmer Creek has increased length and reduced gradient, allowing for greatly expanded glide segments. Instream habitats with suitable spawning gravels have been expanded hugely from its former channel.
5. ***The Palmer Creek diversion channel.*** This channel was built during 2005 construction, and has been incorporated as a side channel to Palmer Creek. It carries about 10 percent of Palmer Creek's flow, and provides both flood relief and additional rearing habitat.
6. ***An 800-foot, low-volume side channel and pond complex***. This complex carries overflow from the Palmer Creek diversion/side channel and splits flow back into Palmer and Resurrection Creeks. It provides additional rearing and over-wintering habitat.

Figure 5 shows part of the construction sequence on the South Side Channel taken from a fixed point partway down the channel. In its upper portion this side channel followed the course of an old mining ditch, likely used as a water source for historic mining operations. Construction of this channel included

- Roughing in the channel (requiring end-hauling volumes of soil, gravels, and clay)
- Building an extensive series of "pool-riffle" sequences down the channel
- Building logjams adjacent to the channel, generally adjacent to pool segments
- Spreading soil and woody debris along the streambanks

Figure 4 - Aerial Photos of the Upper Resurrection Creek Restoration Project Area Before and After Channel and Floodplain Reconstruction

Figure 5 –Resurrection Creek South Side Channel Construction Sequence
(Photo point is 700 feet downstream from the upstream end of this 0.4 mile-long side channel)

June 19, 2006 – Channel is roughed in, construction of riffle/run/pool/glide sequences in the dry

June 23, 2006 – channel construction is complete, diversion of minor flow component on 6/22/06

June 23, 2006 – Fully diverted flows into channel (approx. 25% of Resurrection Creek)

June 30, 2006 – Construction complete, with soil and woody debris spread on banks

Figure 6 –Resurrection Creek South Side Channel
(Photos taken down the length of this 0.4 mile-long side channel)

6/30/2006 – Channel entrance on Resurrection Creek – looking upstream-left and downstream – right

6/30/2006 – Upper channel with channel entrance on Resurrection Creek visible on right. Riffle/run/pool/glide sequences extend down the channel. Ten log jams were built along the channel. Woody debris was spread along both stream banks.

6/30/2006 – Mid-channel, taken about 1,000 feet downstream from channel entrance.

6/30/2006 – Looking downstream on lower channel where it flows adjacent to a beaver dam. The low gradient stream channel provides high quality spawning and rearing habitat.

Figure 7 – Resurrection Creek West Side Channel

6/30/2005 –Resurrection Creek's West Side Channel at its upper end. Flow is from left to right. Here Resurrection Creek was previously constrained to a single channel by coarse tailings piles. During construction, the tailings were removed, and flow was split around a central island (main channel flows behind the island in the center of the photo.) Both the side channel and the main channel now have pool and glide habitat, even at higher flow. Newly created floodplain allows for overbank flow during large-scale flooding.

Figure 8 – Newly Constructed Palmer Creek Channel.
(Palmer is Resurrection Creek's largest tributary.
This lower 0.2 mile segment was previously tailings-constrained, and all riffle habitat.)

6/30/2005 – Completed Palmer Creek Channel at its middle section. Flow is from right to left. Note the extensive glide segment that provides high quality spawning and rearing habitat.

6/30/2005 – Completed Palmer Creek Channel in its lower reach. The stream flows from left to right, and joins Resurrection Creek at the right side of the photo. Several log jams were incorporated into the channel for improved habitat and bank protection.

Future Work on Resurrection Creek. Heavy construction work on this phase of the Resurrection Creek Stream and Riparian Restoration Project is complete. Some adjustment of side sloughs may continue with hand tools, however, our intent is to have the river adjust its own course naturally over time. Revegetation work by the Youth Restoration Corps will continue in the summer of 2007 and possibly into the summer of 2008. Revegetation work in 2007 will focus on revegetating floodplain areas built in 2006. Revegetation efforts will include planting willows and alders along the newly created side sloughs to provide cover for rearing fish, and on planting birch and spruce on the newly created floodplains. We expect abundant natural regeneration of cottonwoods from seed. Soil placed on floodplains in 2005 and 2006 is in some locations showing rapid regeneration for grasses, forbs, and shrubs.

The Forest Service is currently evaluating restoration potential on a two mile reach of Resurrection Creek located about a mile downstream from the existing project. This reach is also impacted by historic mining, with a steepened channel constrained by tailings, fast water, very little pool habitat, and poor spawning and rearing habitat. This stream reach is located on active mining claims. The Forest Service is working with the mining claimant in evaluating potential restoration alternatives. We plan to work on site analysis and NEPA environmental documentation in fiscal year 2007, with restoration efforts potentially starting in 2008 and ongoing for 2 to 4 years. Figure 9 displays a recent aerial photograph of this mining impacted stream reach.

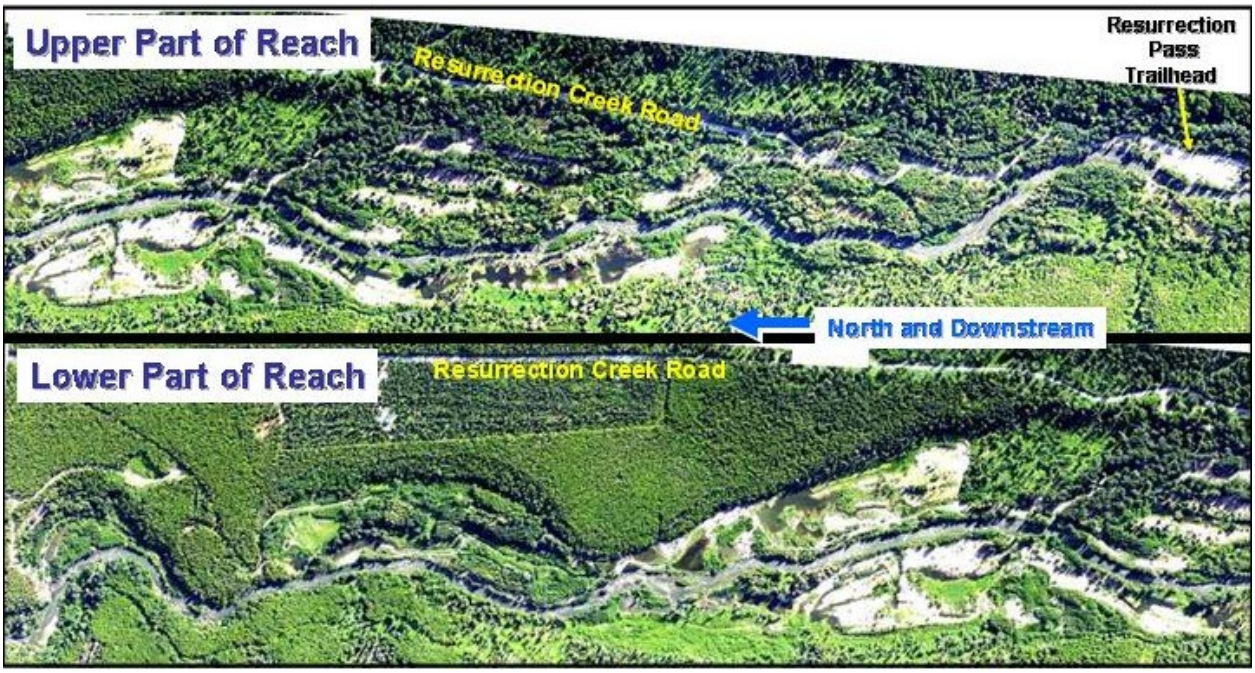



Figure 9 – Potential Future Restoration Area on Resurrection Creek
(Located Downstream from the Resurrection Pass Trailhead)