

# *Crystal River Ranch Upland Erosion Control Project*

## November 2013 CRR Restoration Status Report

### Reference:

PALS Permit No. 695650, Development Eng. File No. 56-15

WDFW Hydraulic Permit No. 112720-2

Pierce County parcels: 3360090210, 3360041404, 3360050800

### Project Overview:

- December 2010 fourteen buried rock vanes installed.
- April 2011 plantings 767 individually wire cage to discourage elk damage and submittal of baseline report (RestorCRR\_BaselineRpt\_20110428) as required to Pierce County Planning & Land Services (PALS).
  - Sitka willow (*Salix sitchensis*), Birch (*Betula papyrifera*) planted in low terrace vane cluster sites V1, V2-4, V10-12 & V13-14.
  - Douglas fir (*Pseudotsuga menziesii*), Sitka spruce (*Picea sitchensis*), Western hemlock (*Tsuga heterophylla*) planted in high terrace vane sites V5-9.
- July 2011 PALS approved “as-built” construction.
- March - April 2012 Wire cages removed from Douglas fir, Hemlock and Spruce.
  - Cages, stakes and debris clean-up accomplished at high terrace vane site locations.
- August - October 2012 Majority of scotch broom pulled at all sites with irrigation in operation at vanes V1, V5-7.
- June - October 2013 Additional irrigation installed at more vane sites with consistent operation through summer months. Resident elk herd consuming Birch and Sitka willow branch growth. Majority of dead plants removed and replaced with Douglas fir.

### Definitions:



Vigor: 1) “good” means the plant exhibits lots of new growth, flowers, vegetative growth  
2) “fair” means the plant is green, erect without exhibiting new growth, little if any infestations  
3) “poor” means no evidence of new growth such as shoots, sprouting branches, flowers  
4) “dead” means there is no evidence of green cambium (Use thumb nail to scratch the base and upper portion of the main stem; if no green layer is observed, the plant is dead.

Volunteer plants included in live quantities.

Survival % calculation: Divide “live plants” quantity by “planted Apr 2011” quantity = survival % for each vane site.

## Survival Plant Status Each Vane Site:

**Vane 1 length 107 feet located inland shoreline CRR picnic area off Willow Tree Way.**

| Plant Type  | Height | Vigor | Qty | Plant status as of Nov 2013              |   |
|---|--------|-------|-----|--|---|
| Sitka willow  | 2 ft   | Fair  | 1   | Planted Apr 2011 = 40                    |   |
| Birch   | 6-7 ft | Fair  | 13  | <b>Vane 1 plant survival exceeds 80%</b> |   |
| Birch   | 4-5 ft | Fair  | 5   |  |   |
| Doug fir  | 1-3 ft | Good  | 20  |  |   |
| Live plants:  |        |       | 39  |  | #1539   |
| N 47° 06.654', W 121° 36.305' at shoreline vane stake (toe end).<br><br>3 Foot approximate OHW (ordinary high water) bank height. |        |       |     |  |  |
|   |        |       |     |  | Downstream #1538  |



#1539

Downstream #1538

Vane 1 live plants quantity 39 divided by planted April 2011 quantity 40 = 80%+ survival



Vane 2 length 123 feet located inland downstream of old bridge abutment off Meadow Way.



| Plant Type  | Height | Vigor | Qty | Plant Status as of Nov 2013              |   |
|---|--------|-------|-----|--|---|
| Doug fir  | 2-3 ft | Good  | 5   | Planted Apr 2011 = 49                    |   |
| Sitka willow  | 4 ft   | Fair  | 1   | <b>Vane 2 plant survival exceeds 80%</b> |   |
| Birch   | 6-7 ft | Good  | 6   |  |   |
| Alder   | 7 ft   | Good  | 1   |  |   |
| Alder   | 3-4 ft | Good  | 17  |  |   |
| Alder   | 1-2 ft | Good  | 13  |  |   |
| Live Plants:  |        |       | 43  |  |   |
| N 47° 06.518', W 121° 36.153' at shoreline vane stake.<br><br>3 Foot approximate OHW bank height. |        |       |     |  |  |
|   |        |       |     |  |   |

#1544

Upstream #1543

Vane 2 live plants quantity 43 divided by planted April 2011 quantity 49 = 80%+ survival

Vane 3 length 107 feet located inland downstream of old bridge abutment off Meadow Way.

| Plant Type  | Height | Vigor | Qty | Plant status as of Nov 2013              |   |
|---|--------|-------|-----|--|---|
| Sitka willow  | 3-4 ft | Fair  | 3   | Planted Apr 2011 = 43                    |   |
| Birch   | 6-7 ft | Fair  | 11  | <b>Vane 3 plant survival exceeds 80%</b> |   |
| Birch   | 4-5 ft | Fair  | 3   |  |   |
| Doug fir  | 2 ft   | Good  | 2   |  |   |
| Alder   | 4-5 ft | Good  | 12  |  |   |
| Alder   | 2-3 ft | Good  | 46  |  |   |
| Live Plants:  |        |       | 77  |  |   |
| <p>N 47° 06.560', W 121° 36.106' at shoreline stake (toe) of vane.</p> <p>3 Foot approximate OHW (ordinary high water) bank height.</p> |        |       |     |  |  |
|   |        |       |     |  |   |



#1545

Upstream #1542

Vane 3 live plants quantity 77 divided by planted April 2011 quantity 43 = 80%+ survival



Vane 4 length 111 feet located inland downstream of old bridge abutment off Meadow Way.

| Plant Type   | Height | Vigor | Qty | Plant status as of Nov 2013              |   |
|--|--------|-------|-----|--|---|
| Sitka willow   | 4 ft   | Fair  | 9   | Planted Apr 2011 = 38                    |   |
| Birch  | 8-9 ft | Good  | 8   | <b>Vane 4 plant survival exceeds 80%</b> |   |
| Birch  | 6-7 ft | Fair  | 23  |  |   |
| Alder  | 2-3 ft | Good  | 20  |  |   |
| Doug Fir   | 2 ft   | Good  | 1   |  |   |
| Live Plants:   |        |       | 61  |  |   |
| N 47° 06.531', W 121° 36.072' at shoreline stake (toe) of vane.<br><br>3 Foot approximate OHW (ordinary high water) bank height. |        |       |     |  |  |
|  |        |       |     |  |   |

#1546


Downstream #1540

#1546

Downstream #1540

Vane 4 live plants quantity 61 divided by planted April 2011 quantity 38 = 80%+ survival

**Access route to vanes 2-4 next to bridge abutment end of Meadow Way.**



| Access Route | Plant Type | Height | Vigor | Qty |  | Plant status as of July 2012            |  |
|--------------|------------|--------|-------|-----|--|---|--|
| V2 - 4       | Birch      | 8-9 ft | Good  | 2   |  | Planted Apr 2011 = 6                    |  |
| V2 - 4       | Birch      | 6-7 ft | Good  | 3   |  | Access route plant survival exceeds 80% |  |
| Live Plants: |            |        |       | 5   |  |   |  |

#1547

#1547

Access route live plants quantity 5 divided by planted April 2011 quantity 6 = 80%+ survival

**Vane 5 length 74 feet located inland shoreline SE of pump house off Meadow Way. The following table data combines access V5-V7 route and Vane 5 status.**

| Plant Type   | Height | Vigor | Qty | Plant status as of Nov 2013       |   |
|--|--------|-------|-----|-----------------------------------|--|
| Doug fir, Sitka spruce, Hemlock  | 4-5 ft | Good  | 55  | Planted Apr 2011 = 112            |  |
| Doug fir, Sitka spruce, Hemlock  | 2-3 ft | Good  | 37  | Vane 5 plant survival exceeds 80% |  |
| Alder  | 2-3 ft | Good  | 17  |                                   |  |
| Live Plants:   |        |       | 109 |                                   | #1548  |
| N 47° 06.487', W 121° 36.052' at shoreline vane stake.<br><br>> 16 Foot OHW bank height. |        |       |     |                                   |  |
|  |        |       |     |                                   | Upstream #1549   |



#1548

Upstream #1549

Vane 5 live plants quantity 109 divided by planted April 2011 quantity 112 = 80%+ survival





Vane 6 length 70 feet located inland shoreline upstream of Vane 5 off Meadow Way.

| Plant Type   | Height | Vigor | Qty | Plant status as of Nov 2013   |  |
|--|--------|-------|-----|---|--|
| Doug fir, Sitka spruce, Hemlock  | 4-5 ft | Good  | 27  | Planted Apr 2011 = 106  |  |
| Doug fir, Sitka spruce, Hemlock  | 2-3 ft | Good  | 59  | <b>Vane 6 plant survival exceeds 80%</b>  |  |
| Alder  | 4 ft   | Good  | 1   |   |  |
| Alder  | 2-3 ft | Good  | 4   |   |  |
| Live Plants:   |        |       | 91  |   | #1550  |
| N 47° 06.459', W 121° 36.048' at shoreline vane stake.<br><br>> 16 Foot OHW bank height. |        |       |     |  |  |
|  |        |       |     | Upstream #1551  |  |

Vane 6 live plants quantity 91 divided by planted April 2011 quantity 106 = 80%+ survival


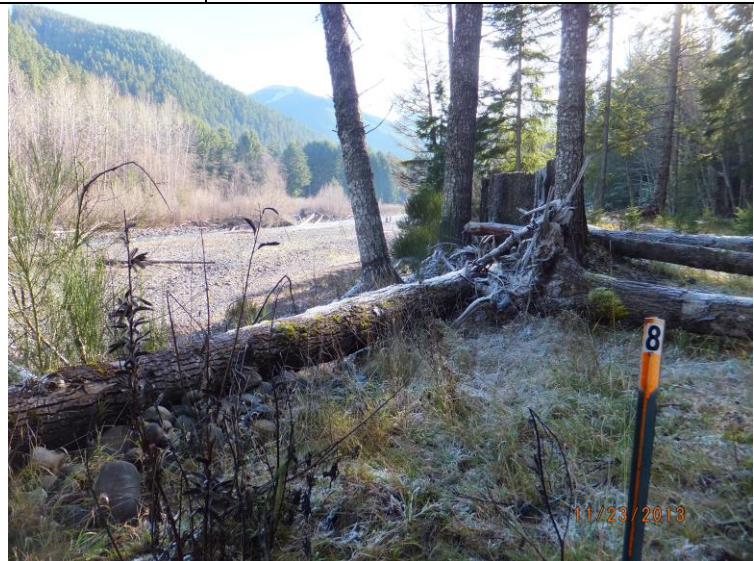
Vane 7 length 66 feet located inland shoreline upstream of Vane 6 off Meadow Way.

| Plant Type   | Height | Vigor | Qty | Plant status as of Nov 2013              |   |
|--|--------|-------|-----|--|---|
| Doug fir, Sitka willow, Hemlock  | 4-5 ft | Good  | 24  | Planted Apr 2011<br>= 100                |   |
| Doug fir, Sitka willow, Hemlock  | 2-3 ft | Good  | 51  | <b>Vane 7 plant survival exceeds 80%</b> |   |
| Alder  | 3-4 ft | Good  | 5   |  |   |
| Alder  | 1-2 ft | Good  | 3   |  |   |
| Live Plants:   |        |       | 83  |  |   |
| N 47° 06.435', W 121° 36.037' at shoreline vane stake.<br><br>> 16 Foot OHW bank height. |        |       |     |  |  |
|  |        |       |     |  | Upstream #1553  |

Vane 7 live plants quantity 83 divided by planted April 2011 quantity 100 = 80%+ survival





Vane 8 length 53 feet located inland shoreline downstream off Piney Way.

| Plant Type   | Height | Vigor | Qty       | Plant status as of Sept 2012  |  |
|--|--------|-------|-----------|---|--|
| Doug fir, Sitka spruce, Hemlock  | 6-7 ft | Good  | 6         | Planted Apr 2011 = 66   |  |
| Doug fir, Sitka spruce, Hemlock  | 4-5 ft | Good  | 38        | <b>Vane 8 plant survival exceeds 80%</b>  |  |
| Doug fir, Sitka spruce, Hemlock  | 2-3 ft | Good  | 26        |   |  |
| <b>Live Plants:</b>  |        |       | <b>70</b> |   | #1570  |
| N 47° 06.381', W 121° 35.000' at shoreline vane stake.<br><br>> 10 Foot OHW bank height. |        |       |           |  |  |
|  |        |       |           | Upstream #1571  |  |

Vane 8 live plants quantity 70 divided by planted April 2011 quantity 66 = 80%+ survival



Vane 9 length 43 feet located inland shoreline upstream of vane 8 off Piney Way.

| Plant Type   | Height | Vigor | Qty | Plant status as of Nov 2013       | <br>#1574             |
|--|--------|-------|-----|-----------------------------------|---|
| Doug fir, Sitka spruce, Hemlock  | 6-7 ft | Good  | 12  | Planted Apr 2011 = 66             |   |
| Doug fir, Sitka spruce, Hemlock  | 4-5 ft | Good  | 37  | Vane 9 plant survival exceeds 80% |   |
| Doug fir, Sitka spruce, Hemlock  | 2-3 ft | Good  | 16  |                                   |   |
| Live Plants:   |        |       | 65  |                                   |   |
| N 47° 06.369', W 121° 35.982' at shoreline vane stake.<br><br>> 10 Foot OHW bank height. |        |       |     |                                   | <br>Downstream #1575 |

Vane 9 live plants quantity 65 divided by planted April 2011 quantity 66 = 80%+ survival





Vane 10 length 50 feet located inland shoreline upstream of vane 9 off Piney Way.  
Following data combines access V8-V14 route and Vane 10 status.

| Plant Type  | Height | Vigor | Qty | Plant status as of Nov 2013               |   |
|---|--------|-------|-----|---|---|
| Sitka willow  | 5 ft   | Fair  | 1   | Planted Apr 2011 = 22                     |   |
| Birch   | 6-7 ft | Fair  | 3   | <b>Vane 10 plant survival exceeds 80%</b> |   |
| Doug fir, Sitka spruce, Hemlock   | 4-5 ft | Good  | 13  |   |   |
| Doug fir, Sitka spruce, Hemlock   | 2-3 ft | Good  | 8   |   |   |
| Alder   | 2 ft   | Fair  | 4   |   |   |
| Live Plants:  |        |       | 29  |   | #1576   |
| N 47° 06.346', W 121° 35.971' at shoreline vane stake.<br><br>3 Foot OHW bank height. |        |       |     |   |  |
|   |        |       |     |   | Upstream #1577  |

Vane 10 live plants quantity 29 divided by planted April 2011 quantity 22 = 80%+ survival



Vane 11 length 137 feet located inland shoreline upstream of vane 10 off Piney Way.

| Plant Type   | Height | Vigor | Qty       | Plant status as of Nov 2013   |  |
|--|--------|-------|-----------|---|--|
| Sitka willow   | 3 ft   | Fair  | 2         | Planted Apr 2011 = 55   |  |
| Birch  | 6-7 ft | Fair  | 12        | <b>Vane 11<br/>plant<br/>survival<br/>exceeds<br/>80%</b>                           |  |
| Birch  | 4-5 ft | Fair  | 5         |   |  |
| Doug fir,<br>Sitka willow,<br>Hemlock  | 3-4 ft | Good  | 18        |   |  |
| Doug fir,<br>Sitka willow,<br>Hemlock  | 2 ft   | Good  | 4         |   |  |
| Alder  | 4-5 ft | Good  | 3         |   |  |
| Alder  | 1-2 ft | Fair  | 2         |   |  |
| <b>Live Plants:</b>  |        |       | <b>46</b> |   | #1580  |
| N 47° 06.332', W 121° 35.935' at shoreline vane stake.<br><br>1 to 2 Foot OHW bank height. |        |       |           |  | Upstream #1581   |

Vane 11 live plants quantity 46 divided by planted April 2011 quantity 55 = 80%+ survival



Vane 12 length 62 feet located inland shoreline upstream of vane 11 off Piney Way.



| Plant Type   | Height | Vigor | Qty | Plant status as of Sept 2012              |   |
|--|--------|-------|-----|---|---|
| Doug fir   | 3-4 ft | Good  | 6   |   |   |
| Doug fir   | 2 ft   | Good  | 4   | Planted Apr 2011 = 25                     |   |
| Birch  | 7 ft   | Good  | 2   | <b>Vane 12 plant survival exceeds 80%</b> |   |
| Birch  | 5-6 ft | Good  | 8   |   |   |
| Sitka willow   | 4 ft   | Fair  | 2   |   |   |
| Sitka willow   | 2 ft   | Fair  | 2   |   |   |
| Live Plants:   |        |       | 24  |   |   |
| N 47° 06.305', W 121° 35.918' at shoreline vane stake.<br><br>2 to 3 Foot OHW bank height. |        |       |     |   |  |
|  |        |       |     |   |   |

#1579

Upstream #1578

Vane 12 live plants quantity 24 divided by planted April 2011 quantity 25 = 80%+ survival



Vane 13 length 40 feet inland shoreline downstream next to vane 14 from Piney Way.

| Plant Type  | Height | Vigor | Qty | Plant status as of Oct 2012               |   |
|---|--------|-------|-----|---|---|
| Birch   | 8 ft   | Good  | 5   | Planted Apr 2011 = 15                     |   |
| Birch   | 6-7 ft | Good  | 8   | <b>Vane 13 plant survival exceeds 80%</b> |   |
| Doug fir  | 3 ft   | Good  | 1   |   |   |
| Live Plants:  |        |       | 14  |   | #1582   |
| N 47° 06.319', W 121° 35.923' at shoreline vane stake.<br><br>3 Foot OHW bank height. |        |       |     |   |  |
|   |        |       |     |   | Downstream #1583  |

Vane 13 live plants quantity 14 divided by planted April 2011 quantity 15 = 80%+ survival



Vane 14 length 90 feet inland shoreline with vane 13 furthest upstream from Piney Way.

| Plant Type   | Height   | Vigor | Qty       | Plant status as of Nov 2013   |  |
|--|----------|-------|-----------|---|--|
| Sitka willow   | 3-4 ft   | Fair  | 4         | Planted Apr 2011 = 24   |  |
| Birch  | 10-12 ft | Good  | 6         | <b>Vane 14 plant survival exceeds 80%</b>   |  |
| Birch  | 6-7 ft   | Good  | 6         |   |  |
| Doug fir   | 3-4 ft   | Good  | 3         |   |  |
| Alder  | 2-3 ft   | Good  | 2         |   |  |
| <b>Live Plants:</b>  |          |       | <b>21</b> |   |  |
| N 47° 06.148', W 121° 35.395' at shoreline vane stake. Furthest upstream inland rock vane. At site main channel bends West to East.<br><br>3 Foot OHW bank height. |          |       |           |  |  |
|  |          |       |           |   | <b>#1584</b>   |
|  |          |       |           |   | <b>Downstream #1585</b>  |

Vane 14 live plants quantity 21 divided by planted April 2011 quantity 24 = 80%+ survival

**Vane sites and access routes totals:**

|                          |   |
|--------------------------|---|
| April 2011 planted = 767 | November 2013 live plants = 777, survival exceeds 80% |
|--------------------------|---|