Riparian Forest Buffers on Agricultural Lands in Western Oregon

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Gained increasing attention in PNW due to popular demand to protect salmon and steelhead,
The Governor’s Salmon and Watershed restoration initiative in early 1990’s,
Generated interest from landowners, watershed councils, and extension workers in the region,
Unique quality of PNW climate, geology and stream ecology requires caution in extrapolating results from other regions.
Riparian Vegetation Provides

* multiple benefits:
  - stream shade to ameliorate water temperature,
  * Stream bank protection and in-stream habitat to control erosion,
  * Remove nutrients from ground water runoff,
  * Decomposition of toxins
Beaver Creek Riparian Project, Western Oregon
Beaver Creek Riparian Project Site

- South of Newport, Oregon
- On private property,
- on north fork of Beaver Creek
- a meandering perennial stream
- Supports a productive Coho salmon
Riparian areas in PNW – Willamette Valley 50+ years
Trees were removed to expand crop farming.
Cattle grazing along stream – bank erosion
Project Objectives

- Control livestock access to stream to protect stream bank,
- Establish varying width of trees to provide stream shade,
- Test a variety of approaches to establish red alder as riparian buffer
- Determine the amount of shade on the stream.
• One thousand foot long treatment areas were identified, site prepared, and planted with red alder.

• 10 ft along the bank stream left unplanted and untreated with herbicide.
Research Design

Map showing the research design with different replications and treatments trials. The map includes symbols for individual tree protectors, unprotected trees, cottonweed/weed control fabric, alder/weed control fabric, and no-spray zones. The map also indicates the pasture areas and specific locations for the trials.
Damaged tree seedlings by cattle and Beavers
Tree Protectors
Table 1: Percent undamaged trees six and eight months after planting

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Trees/plot (average)</th>
<th>Six months</th>
<th>Eight months</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 rows alder</td>
<td>102</td>
<td>60</td>
<td>39</td>
</tr>
<tr>
<td>3 rows alder</td>
<td>51</td>
<td>26</td>
<td>12</td>
</tr>
<tr>
<td>1 row alder</td>
<td>17</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>1 row popular</td>
<td>65</td>
<td>29</td>
<td>0</td>
</tr>
</tbody>
</table>
Riparian buffer width Treatment

One row

Three rows

Six rows
Height and Diameter Measurements

Fig. 6. Mean HT (m) for Red Alder Trees at Beaver Creek Riparian Area

Fig. 7: Mean DBH (mm) for Red Alder Trees at Beaver Creek Riparian Area
Light Measurement & Control
Amount of Shade provided by:
A) 1-row, B) 3-rows and C) 6-rows
Effects of Tree Buffers on Protecting Stream
Maintenance - Chicken wires to protect trees from Beaver
Riparian Buffer provides shade to stream and livestock
Riparian Buffer Stream bank protection and shade
Table: Estimated Costs of three alternative strategies of establishing 1000’ Riparian Buffer

<table>
<thead>
<tr>
<th>Management</th>
<th>1 tree wide</th>
<th>6 trees wide</th>
<th>Cages</th>
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<tbody>
<tr>
<td>Fencing</td>
<td>$2,380.00</td>
<td>$2,380.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>$12.88</td>
<td>$77.28</td>
<td>$12.88</td>
</tr>
<tr>
<td>Follow-up Weed control</td>
<td>$27.98</td>
<td>$167.86</td>
<td>$16.98</td>
</tr>
<tr>
<td>Seedling and Planting</td>
<td>$64.40</td>
<td>$398.00</td>
<td>$198.00</td>
</tr>
<tr>
<td>Tree Protection</td>
<td>$263.00</td>
<td>$1,639.00</td>
<td>$1,213.00</td>
</tr>
<tr>
<td>Maintenance and Monitoring</td>
<td>$229.00</td>
<td>$714.00</td>
<td>$220.00</td>
</tr>
<tr>
<td>Total cost</td>
<td>$2979.00</td>
<td>$5,296.00</td>
<td>$1,673.00</td>
</tr>
<tr>
<td>Cost/Tree</td>
<td>$35.89</td>
<td>$10.63</td>
<td>$20.16</td>
</tr>
</tbody>
</table>
Conclusions

- Fencing important in establishing riparian buffers
- Herbicide application for weed control
- Planting good seedlings
- Tree protection (protex tubes & chicken wires)
- Continued maintenance protective devices
- Thinning and pruning
- Wider rows (3- and 6 rows) provide greater Shade
- to control bank erosion exclude livestock grazing at early stage
- maintain understory vegetation for erosion control
Sharing success story with land owners, stakeholders
Riparian Forest Buffers on Agricultural Lands in the Oregon Coast Range: Beaver Creek Riparian Project as a Case Study

by
Badege Bishaw
William Emmingham
William Rogers

July 2002

Forest Research Laboratory
Basic concepts:
WHY establish a tree buffer along the stream?
Willamette Valley Vegetation Changes

1850

2004

Legend:
- Yellow: Grasslands
- Dark Brown: Oak woodlands
- Green: Riparian
- Blue: Wetlands and wet prairie
Most riparian stands along the Willamette River, originally ranging from 1 to 7 miles wide, have shrunk to only a few hundred feet, depending on width of the floodplain (Benner and Sedell 1997). Many streams now have only a thin strip of vegetation one or two tree lengths in width, and others have had all of the riparian forest removed (Hulse 1998).
1958- Evergreen Creek before and after channelization

**BEFORE**

Portion of Evergreen Creek group drainage project before removal of beaver dam. Henry Clay, SCS Engineer (left) and Lee Allen, ACP office manager looking upstream across beaver pond.

**AFTER**

Evergreen Creek channel nearing completion. This channel will carry water from 4800 acres, and required about 1200 cubic yards of excavation.
Establishing and managing trees buffers on agricultural lands

* to provide multiple benefits:
  * Stream shade to ameliorate water temperature,
  * Stream bank protection and in-stream habitat,
  * Remove nutrients from ground water runoff,
  * Decomposition of toxins
Establishment of Tree Buffers

- Evaluation of stream factors
  - Where will be the exact location of buffer?
  - What is the behavior of the stream
    - Meander through deep soil
    - Constrained or channelized through rocks
    - Flooding annually and others rarely
    - Active streambank erosion
Evaluation of Site Characteristics

- Consider other site factors
  Site (slope, aspect, elevation and position)
  Soil (texture, depth, rock content, water holding)
  Stream incision
  Surrounding land use
Evaluation of site Characteristics

- What problems with weeds, tree predators or flood should be considered?
Evaluation of Site Characteristics

- How can I get the most benefit to the stream without using a lot of farmable land?
- What kind of tree buffer type will you chose?
Establishment of Tree Buffers

- **Management Factors**
  - **Equipment access**
    - Mechanical site preparation
      (if equipment available)
  
- **Vegetation control**
  - Early control of competing vegetation
  - Manual methods
  - Herbicides
Establishment of Tree Buffers

* Pest Management Factors
  * What kind of wildlife or livestock live in the area?
  * Elk and deer will cause serious problem
  * In Oregon streams beavers and nutria are common
    * adequate protection of young seedlings
    * Fencing or tree protectors are necessary
Tree Buffer Design

* Location

* a): Farming
  * Reduce the effects of farming on streams
  * Establishing trees on both sides of the stream is best

* b) Pasture
  * Keeping stream temperature cool
  * Place tree buffer on south to south west side
Tree Buffer Design

* **Species Selection**
  * The objectives you have set
  * The site characteristics (what are the limitations and challenges)
  * The type of tree buffer you wish to develop
  * All determine the type of plants and species
Species Selection

- What species of tree will do well on this site?
- Use a list of plants for the area
- Visit a reference site close by
- Know the plants’ tolerances to external factors (drought, shade, wet soil, frost and browse)
Tree Species Tolerance

Matching Species to Site

<table>
<thead>
<tr>
<th>Species</th>
<th>Wet Soil</th>
<th>Flooding</th>
<th>Drought</th>
<th>Shade</th>
<th>Frost</th>
<th>Browse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cottonwood</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Red alder</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>White alder</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Oregon ash</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Bigleaf maple</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Or. white oak</td>
<td>Low</td>
<td>Low-Med</td>
<td>High</td>
<td>High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ponderosa pine</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>Low</td>
<td>Very low</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>West. red-cedar</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
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</tbody>
</table>

* +Native shrubs have varying tolerances
Species Selection

- Hardwoods and conifers can provide the benefits of tree buffer
- Fast growing trees e.g. black cottonwood, hybrid cottonwood and red alder
- Conifers much slow to grow are capable of long life filtering, shading and woody debris
- Match site with species characteristics
Securing planting material

* Order high quality planting stock
* Order six months to year before planting date
* Bare root seedlings, container stock, unrooted cuttings (whips)

How many to order

* You need to know the area to be planted
* And the average spacing between plants
Planting and Vegetation Management

* **Site preparation**
  * Plowing and herbicides are effective methods
  * Both are effective in eliminating competing vegetation

* **Planting**
  * Chose the tool that fits the types of trees you plant
  * A shovel can be used to plant bare-rooted seedlings
  * Keep planting stock with care
Other Planting Issues

- Planting densities
- Arrangement
- Composition
- Order
- Passive v. active approaches to restoration
Planting Density

<table>
<thead>
<tr>
<th>Spacing</th>
<th>Seedlings per acre</th>
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<tbody>
<tr>
<td>2x2</td>
<td>10,890</td>
</tr>
<tr>
<td>4x4</td>
<td>2,723</td>
</tr>
<tr>
<td>8x8</td>
<td>681</td>
</tr>
<tr>
<td>10x10</td>
<td>436</td>
</tr>
<tr>
<td>12x12</td>
<td>302</td>
</tr>
<tr>
<td>14x14</td>
<td>222</td>
</tr>
<tr>
<td>16x16</td>
<td>170</td>
</tr>
<tr>
<td>20x20</td>
<td>109</td>
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</tbody>
</table>
Manipulate competing vegetation on the site

Fast growing hardwoods require 2-4 yrs.

Conifers needs several more years

Mechanical and herbicide methods can be effective

Remove over 90 percent of competing vegetation 3-6 ft of plants for 2-5 yrs
Types of Tree Buffers

A Irregular Clusters

B Single Row

C Narrow Band

D Commercial Plantation

E Complex Forest
Arrangement and Mixed Species Management

- How wide do you make your planting?
- Arrangement in rows or random?
- Composition—what type and how many?
- Density at planting and as stand develops?
- Thinning?
- Mixed species arrangement and sequence?
- Weed control?
Riparian restoration funding opportunities
CREP in Oregon

- Cooperative venture between the State of Oregon and the USDA - Farm Service Agency
- By the end of 2012, over 40,300 acres have been enrolled
- Since 1999, Oregon has invested more than $18.3 million
Conservation Reserve Enhancement Program (CREP)

- Protection and restoration of riparian areas
  - Fencing
  - Tree/shrub planting
  - Rental payment for buffer acreage enrolled in program
  - Stream crossings
Preventing livestock access to sensitive riparian areas
OWEB Restoration Grants

- Request up to $10,000 for OWEB small grant
- Grant funds >$10,000 can pay for technical assistance and large scale riparian restoration
- Must provide 25% matching funds/in-kind labor

Primarily used for improving water quality. Will fund riparian restoration, oak savannah, upland and wetland restoration.
Riparian tax credit

ODFW offers a property tax incentive to property owners for improving or maintaining qualifying riparian lands.

Under this program, property owners receive complete property tax exemption for their riparian property. This can include land up to 100 feet from a stream.
* Beaver Creek State Natural area video