Riparian Forest Buffers on Agricultural Lands in Western Oregon

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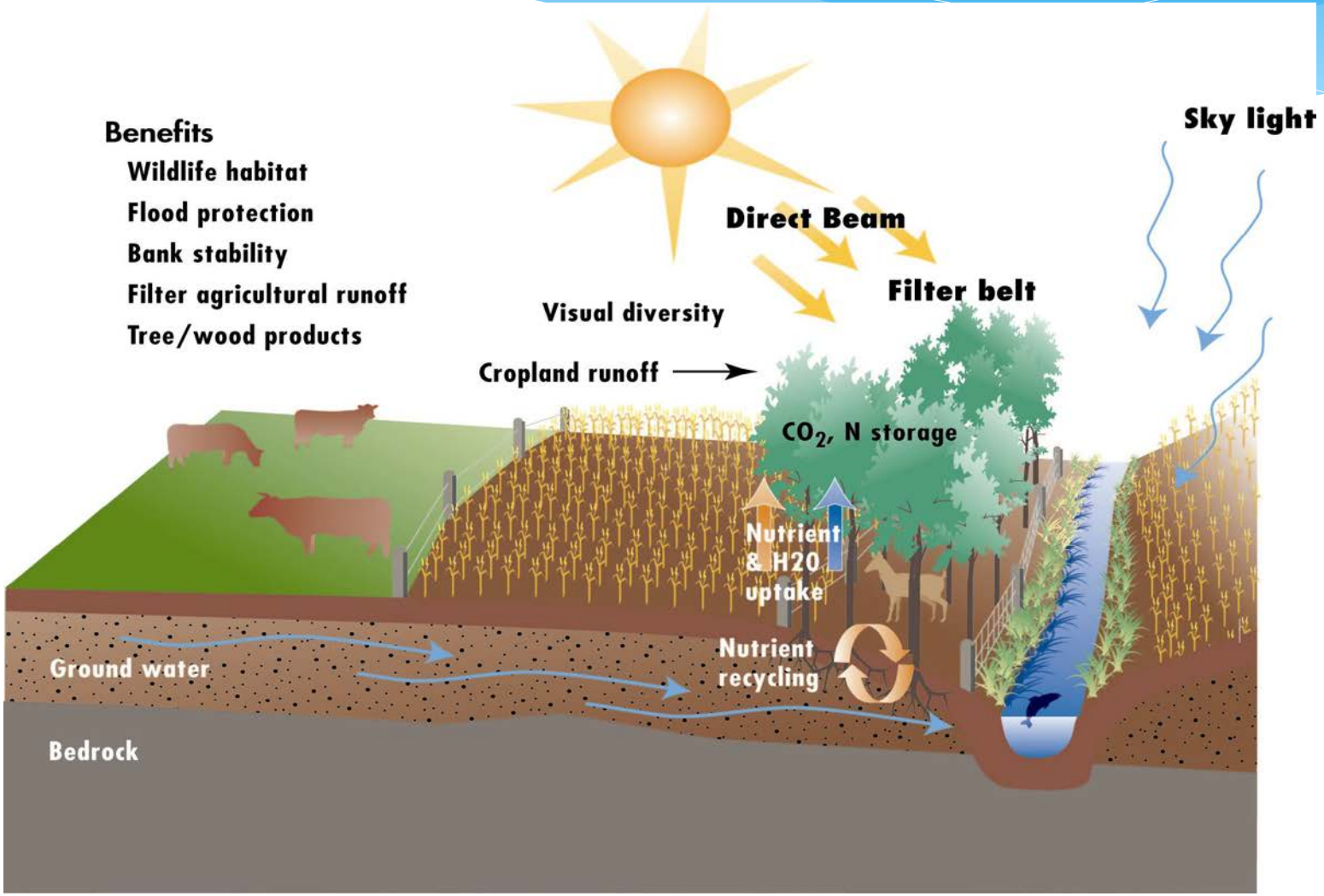
Riparian Buffers in Crop and Grazing lands PNW

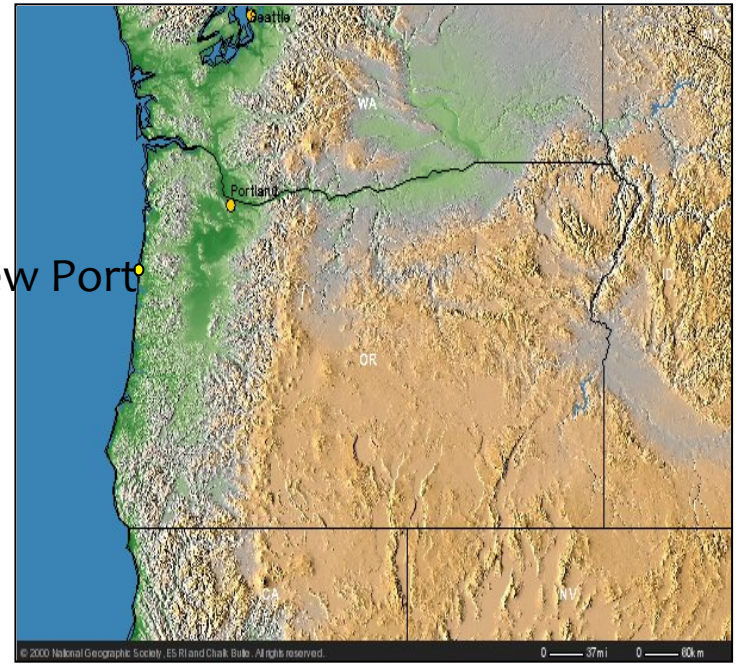
* Gained increasing attention in PNW due to popular demand to protect salmon and steelhead,
* The Governor's Salmon and Watershed restoration initiative in early 1990's,
* Generated interest from landowners, watershed councils, and extension workers in the region,
* Unique quality of PNW climate, geology 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**


Benefits
Wildlife habitat
Flood protection
Bank stability
Filter agricultural runoff
Tree/wood products
Sky light
Direct Beam
Filter belt
Visual diversity
Cropland runoff
CO_2, N storage
Nutrient & H20 uptake
Nutrient recycling
Ground water
Bedrock

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

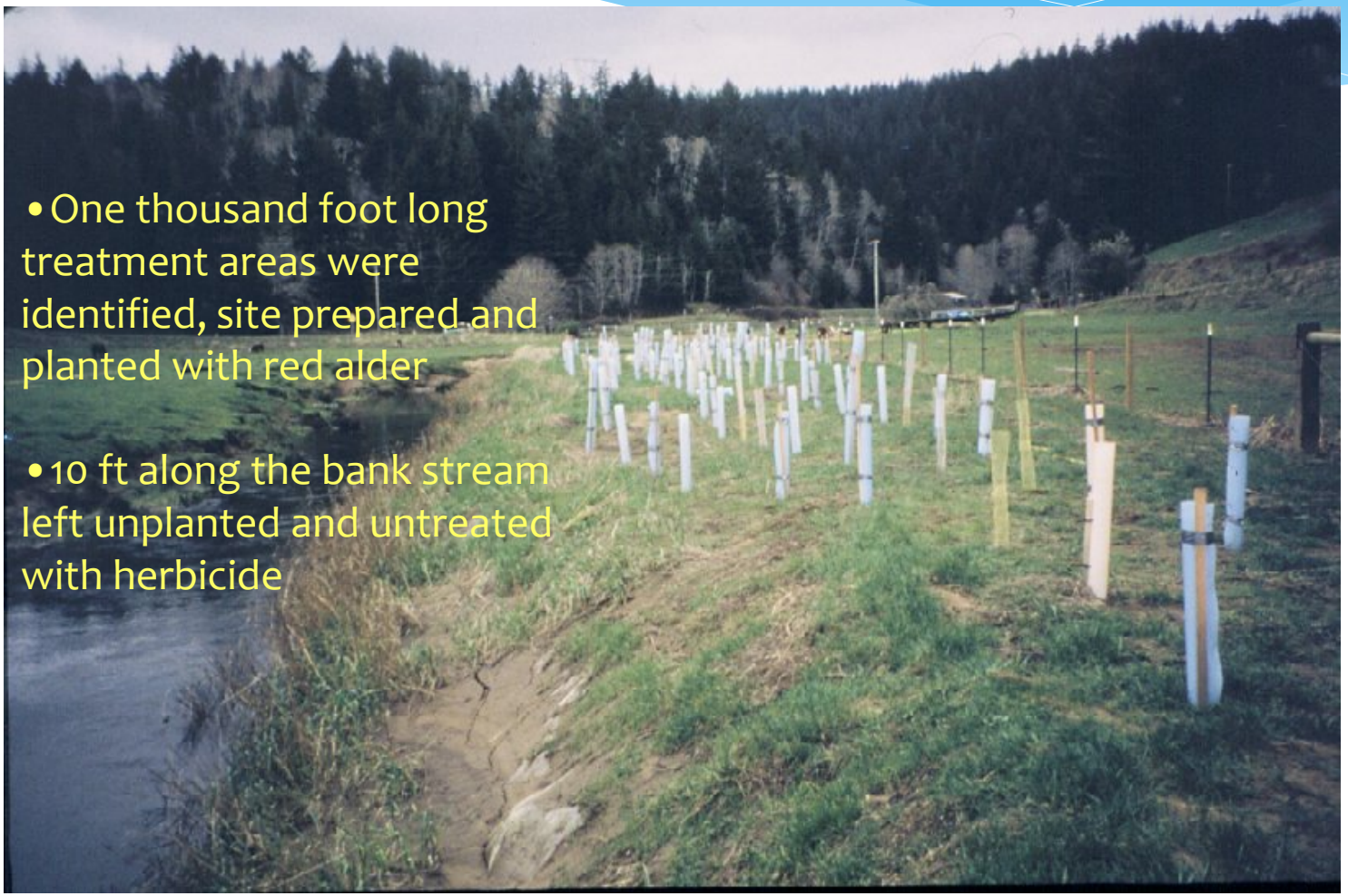
4 13'94

Project Objectives

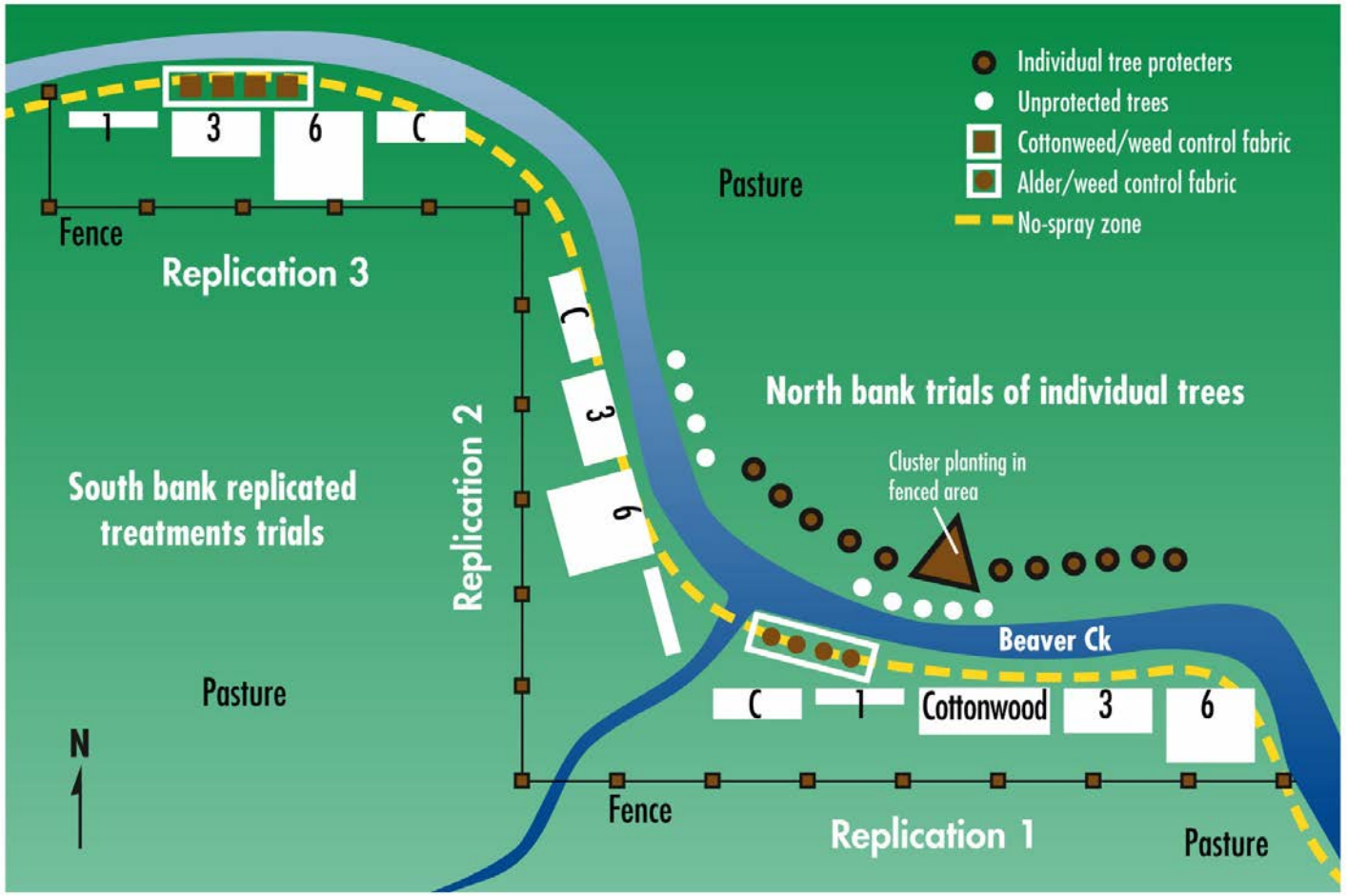
* Control livestock access to stream to protect stream bank,
* Establish varying width of trees to provide stream shade,
* Test a variety of approaches to establish red alder as riparian buffer
* Determine the amount of shade on the stream.

Project Site – Private Property

Riparian buffers installation 1995



Research Design

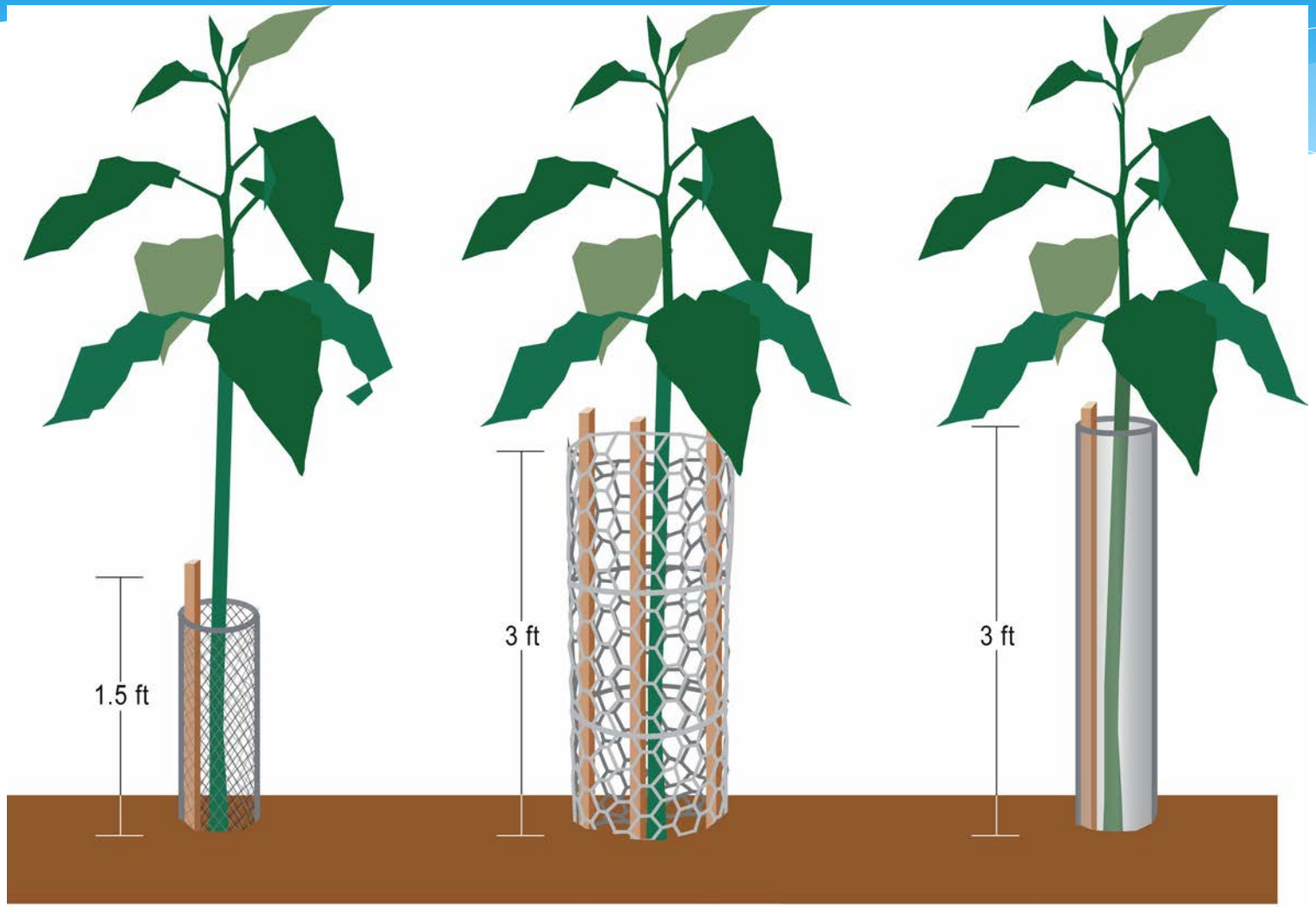


Damaged tree seedlings by cattle and Beavers

Tree Protectors

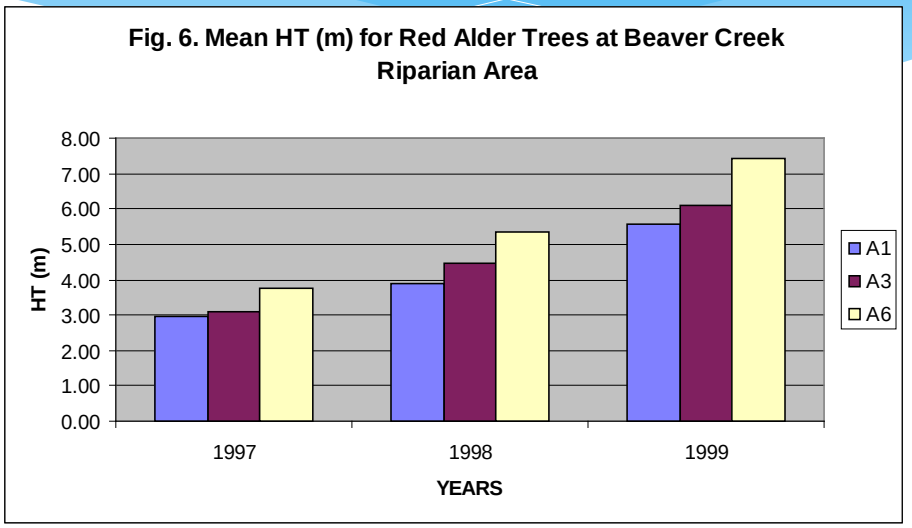
Table1: Percent undamaged trees six and eight months after planting

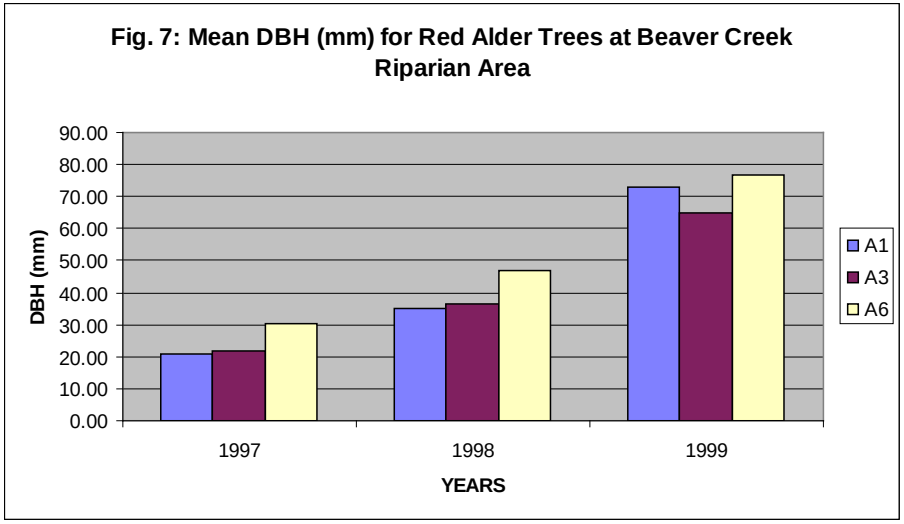
Treatments	Trees/plot (average)	Six months	Eight months
6 rows alder	102	60	39
3 rows alder	51	26	12
1 row alder	17	5	4
1 row popular	65	29	0


1.5 ft
3 ft
3 ft
Vexar
Beaver Fence
Tree Shelter

Riparian buffer width Treatment

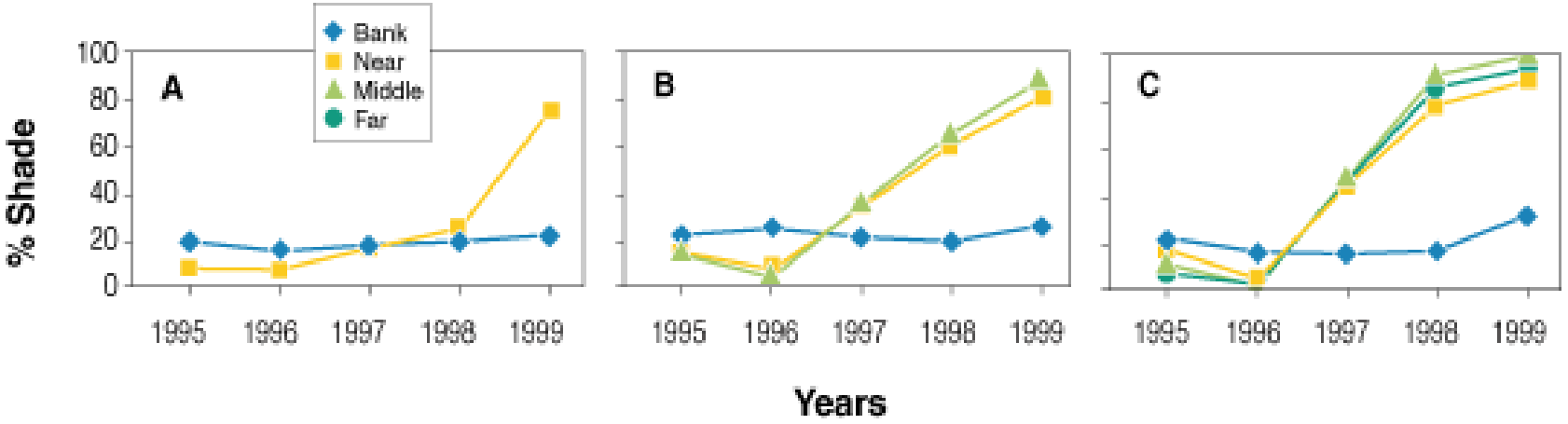
Height and Diameter Measurements



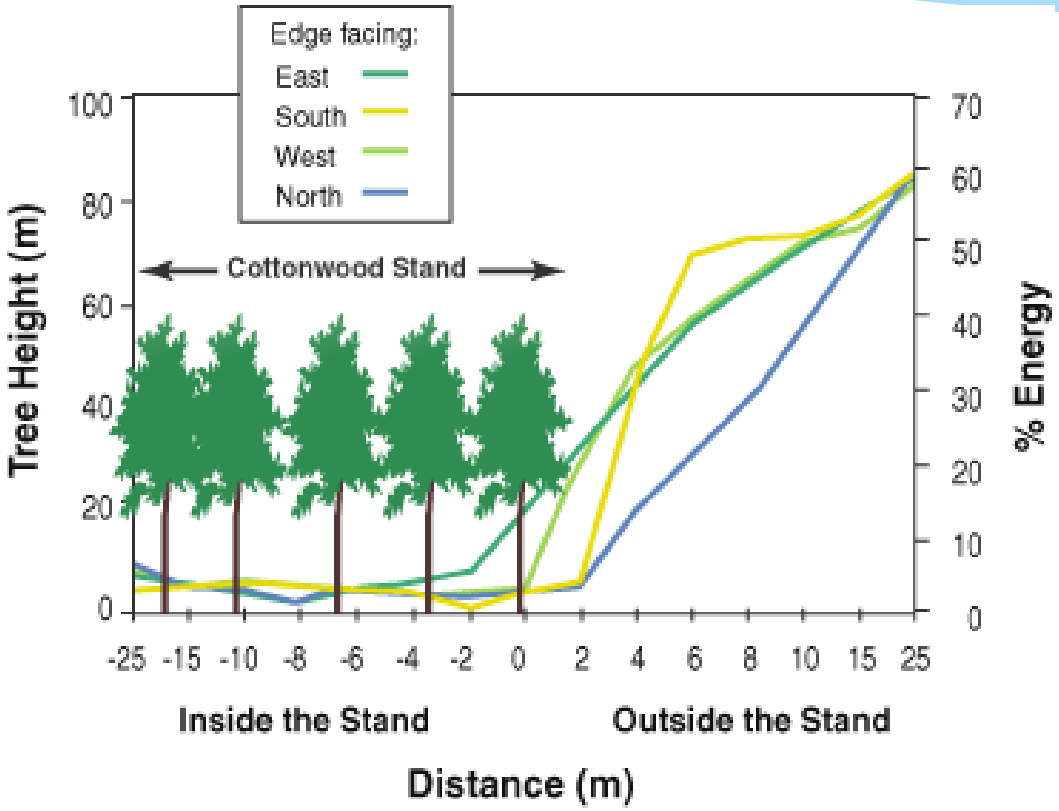


Light Measurement & Control

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

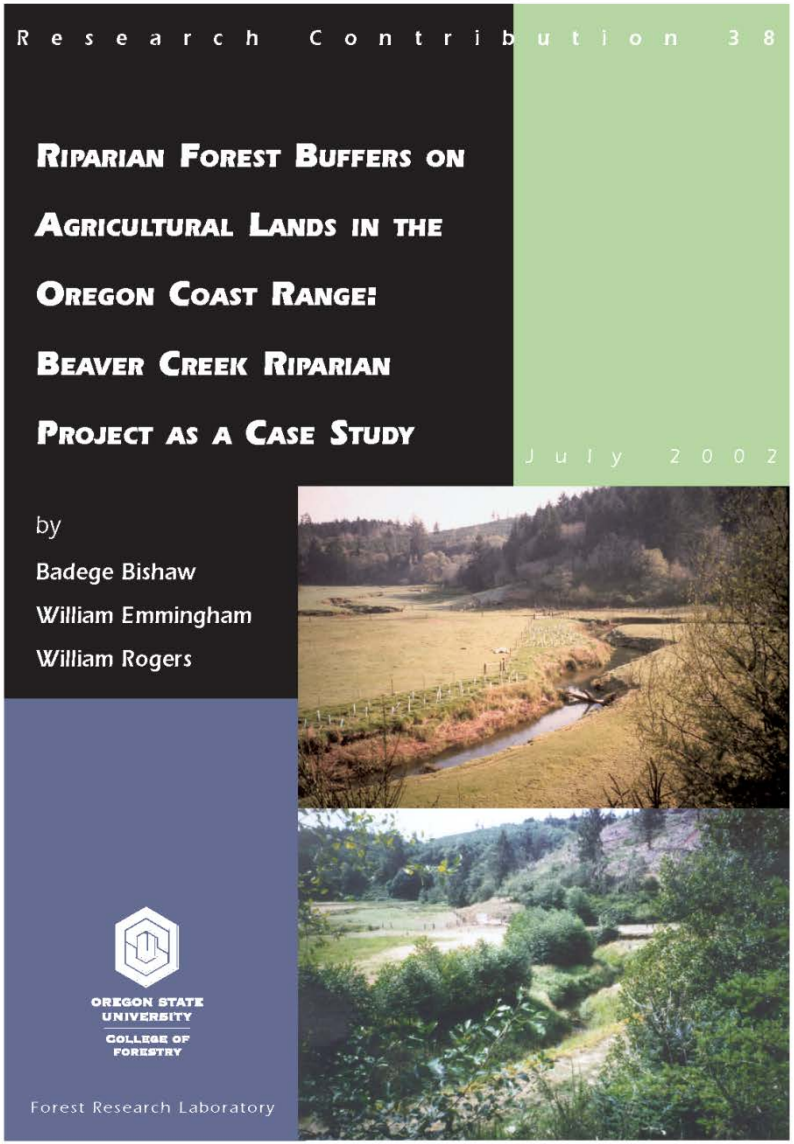
Table: Estimated Costs of three alternative strategies of establishing 1000' Riparian Buffer

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

Conclusions

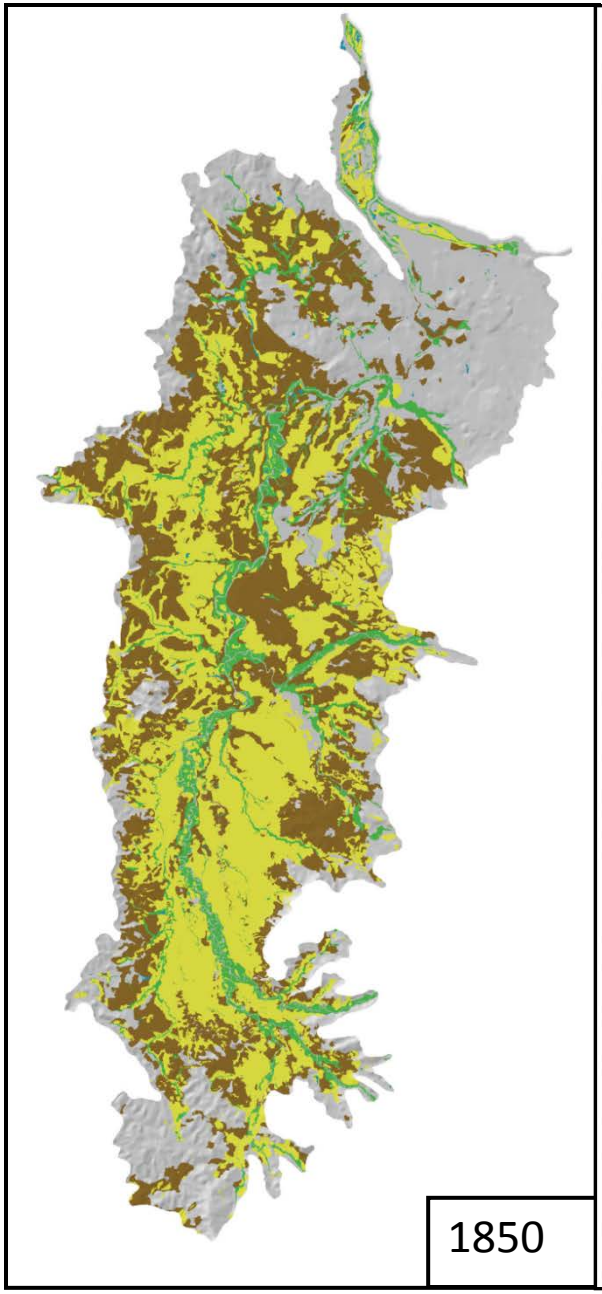
* Fencing important in establishing riparian buffers
* Herbicide application for weed control
* Planting good seedlings
* Tree protection (protex tubes & chicken wires)
* Continued maintenance protective devices
* Thinning and pruning
* Wider rows (3- and 6 rows) provide greater Shade
* to control bank erosion exclude livestock grazing at early stage
* maintain understory vegetation for erosion control

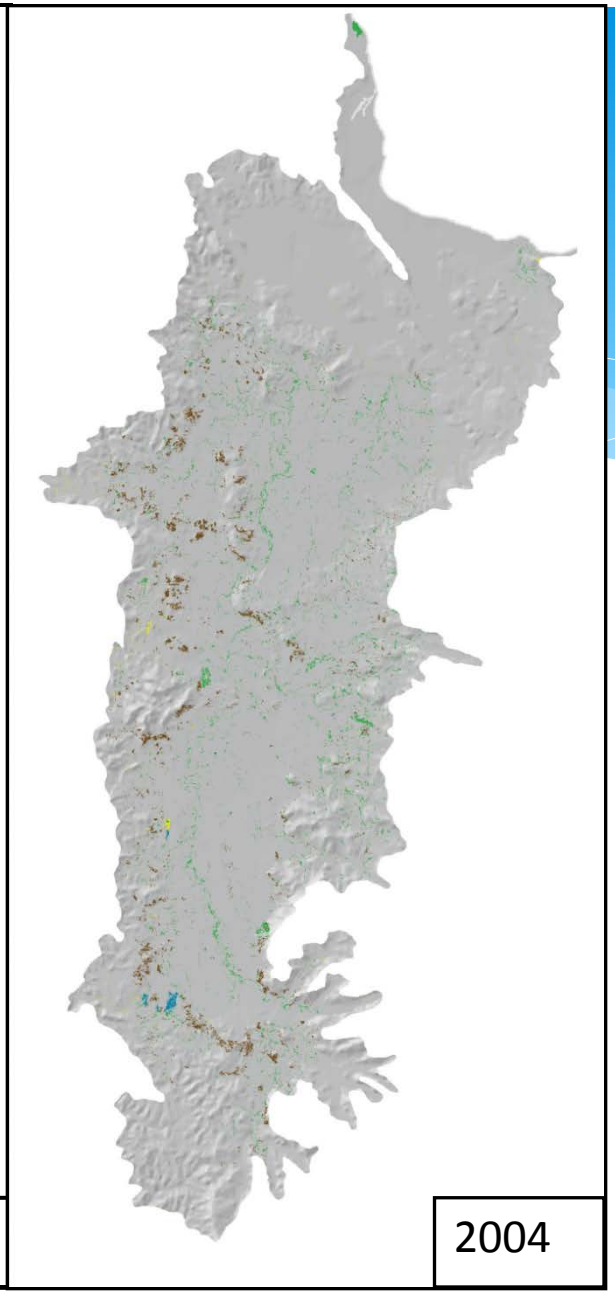
Sharing success story with land owners, stakeholders


Research Contribution 38
Riparian Forest Buffers on Agricultural Lands in the Oregon Coast Range: Beaver Creek Riparian Project as a Case Study
July 2002
by
Badege Bishaw
William Emmingham
William Rogers
Oregon State University
College of Forestry
Forest Research Laboratory

Basic concepts:
WHY establish a tree buffer along the stream?

Willamette Valley Vegetation Changes





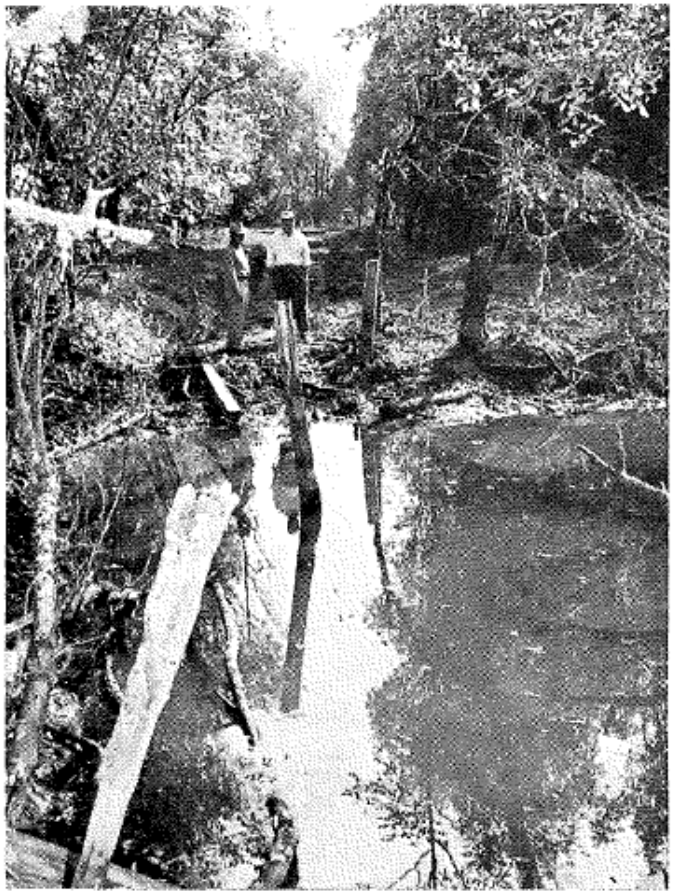
- Grasslands
- Oak woodlands
- Riparian
- Wetlands and wet prairie

Pre-EuroAmerican Scenario (PESVEG) ca. 1851

Land Use / Land Cover (LULC) ca. 1990

* 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



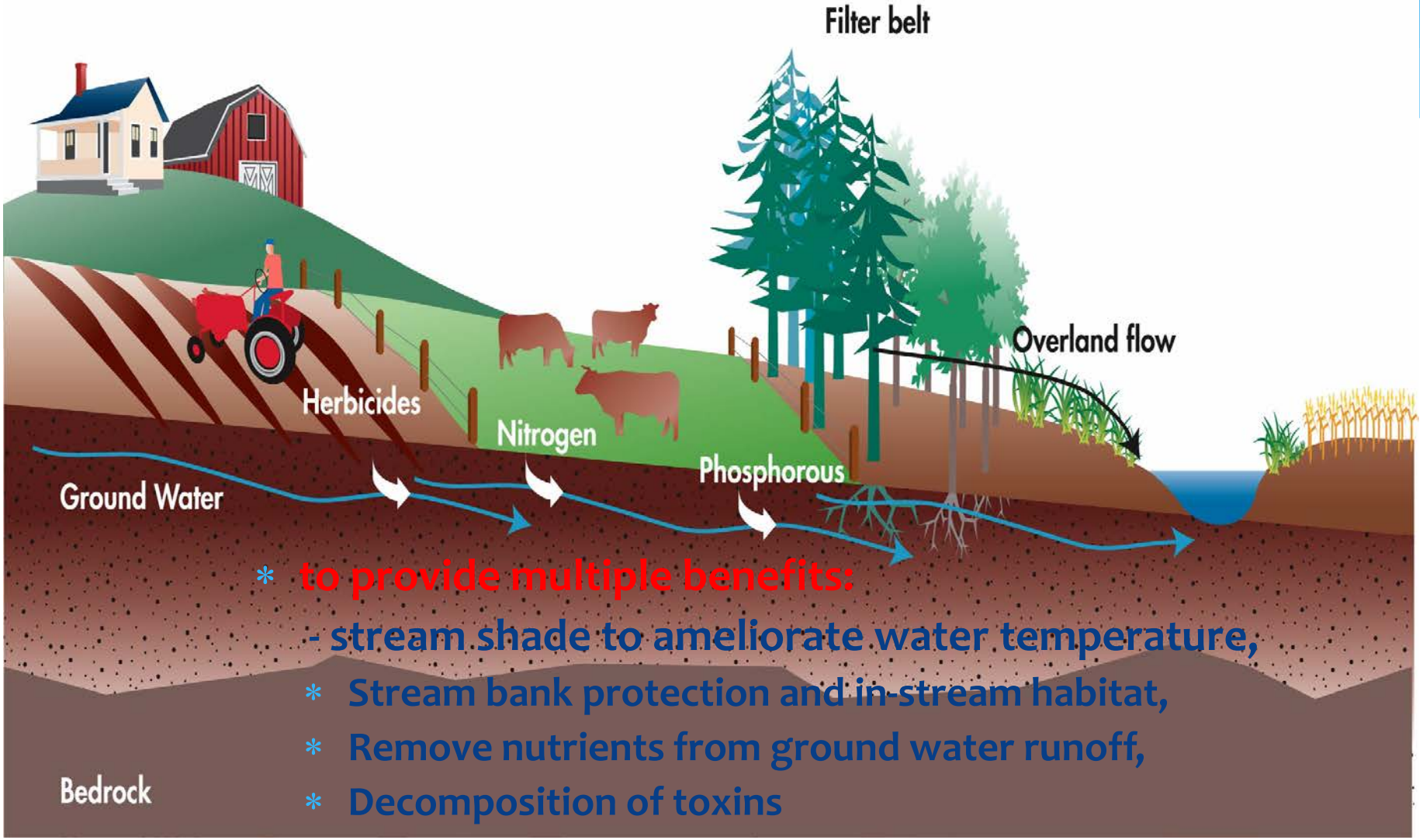
BEFORE

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

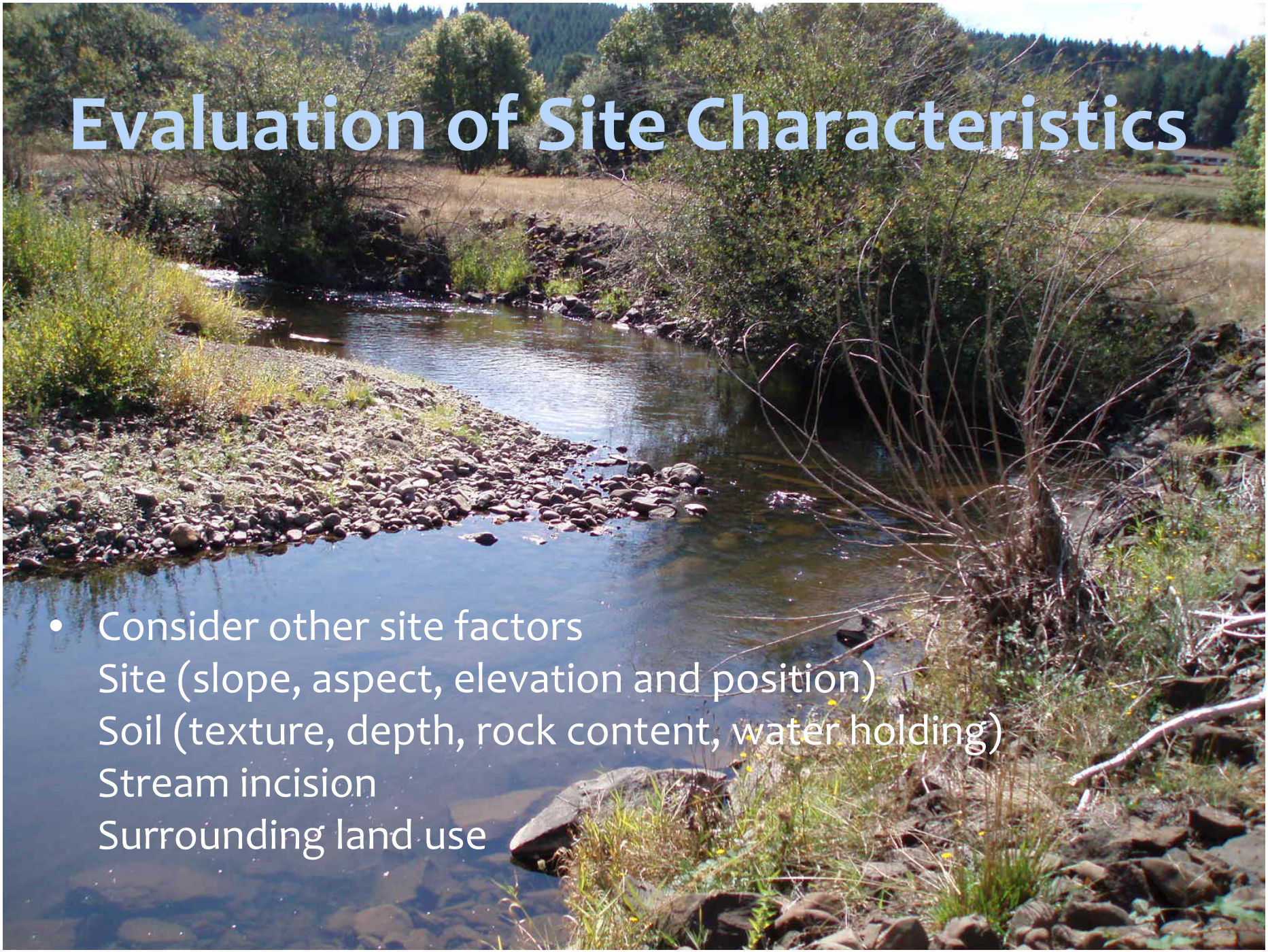


* to provide multiple benefits:
  - stream shade to ameliorate water temperature,
* Stream bank protection and in-stream habitat,
* Remove nutrients from ground water runoff,
* Decomposition of toxins

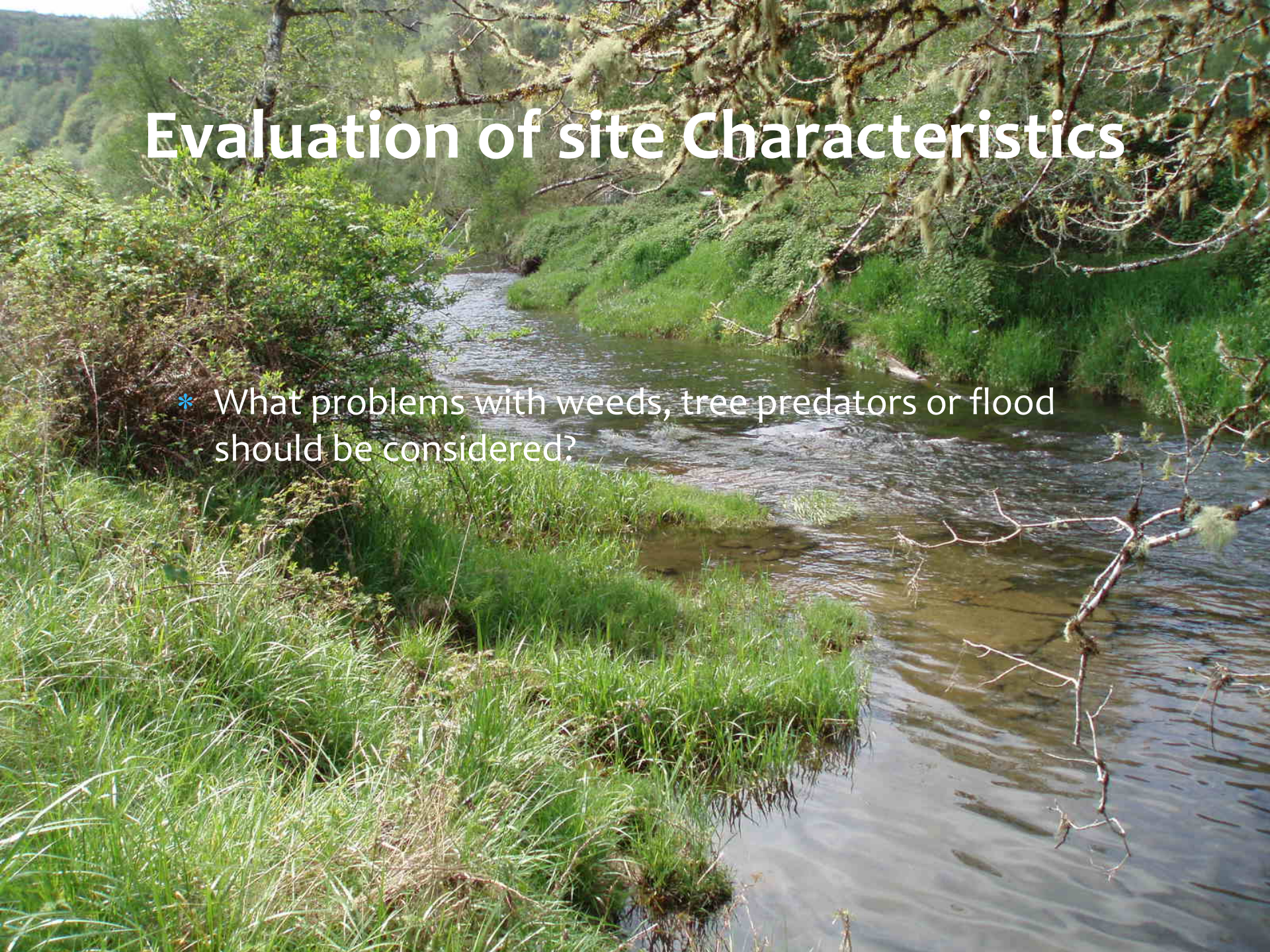
Establishment of Tree Buffers

- 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



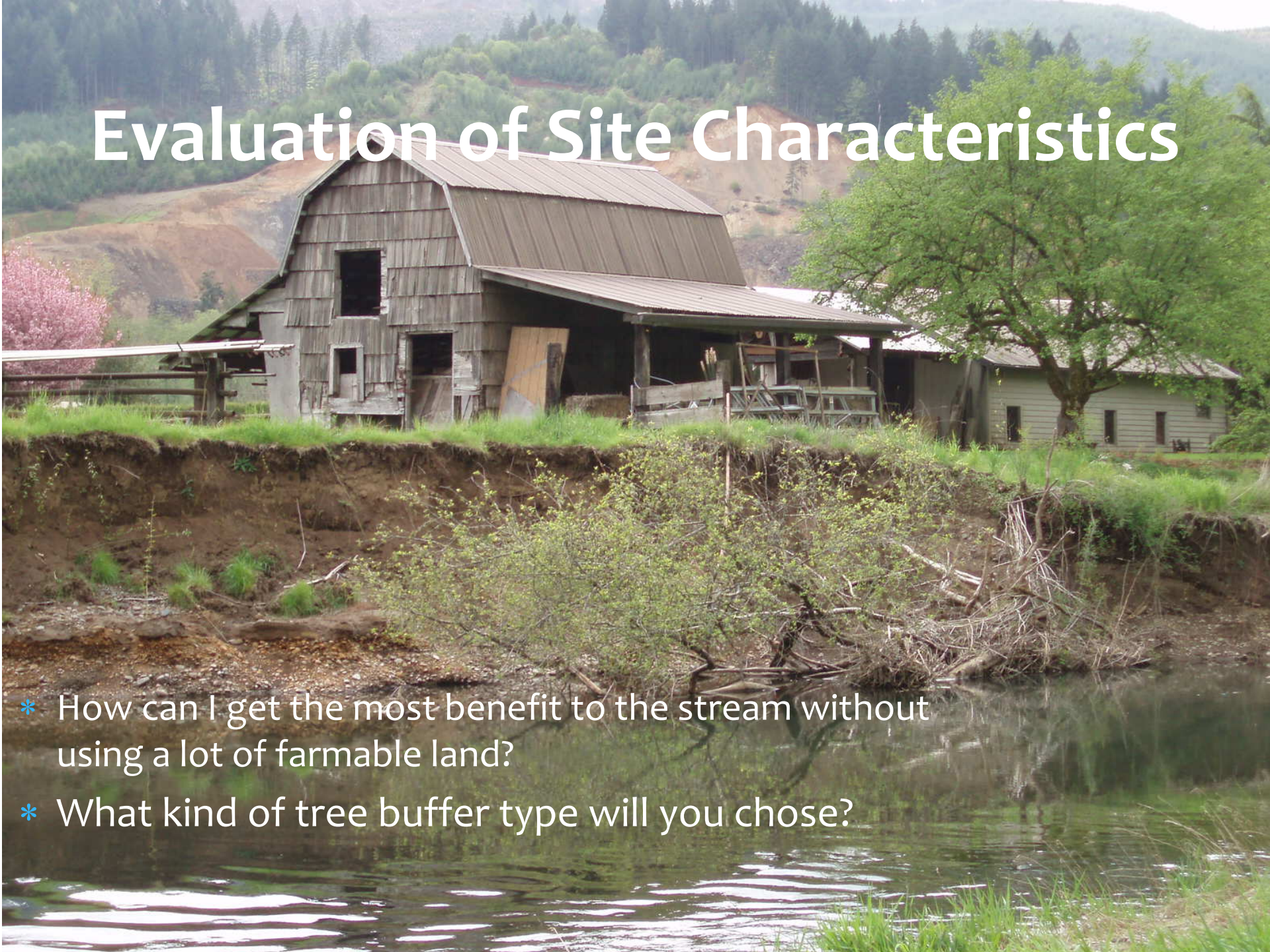
- Consider other site factors
  Site (slope, aspect, elevation and position)
  Soil (texture, depth, rock content, water holding)
  Stream incision
  Surrounding land use



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

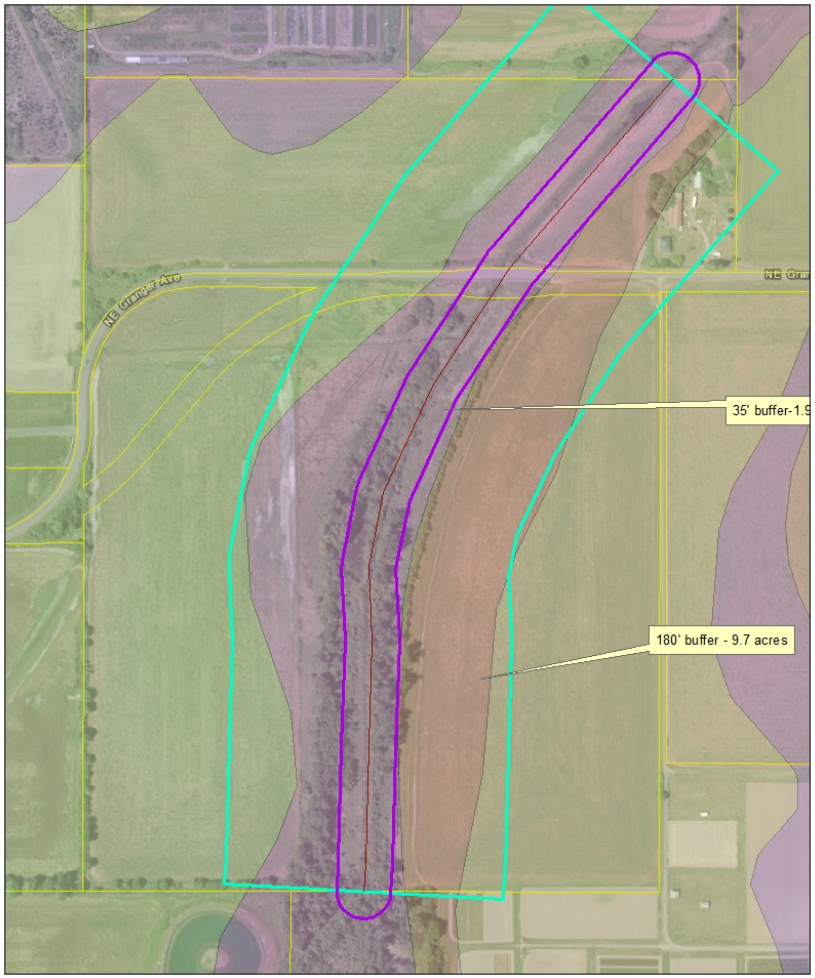
Establishment of Tree Buffers

* **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

Species	Wet Soil	Flooding	Drought	Shade	Frost	Browse
Cottonwood	Medium	High	Low	Low		
Red alder	Medium	High	Low	Low	Low	Low
White alder	Medium	High	Low	Low	Medium	Low
Oregon ash	High	High	High	Medium	Medium	High
Bigleaf maple	Low	Medium	High	High		
Or. white oak	low	Low-Med	High	Low		
Ponderosa pine	Medium	Medium	High	Low	High	Medium
Douglas-fir	Low	Very low	Medium	Medium	Medium	Low
West. red-cedar	Medium	High	Low	High	Low	Low

* +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

Planting Material

- **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

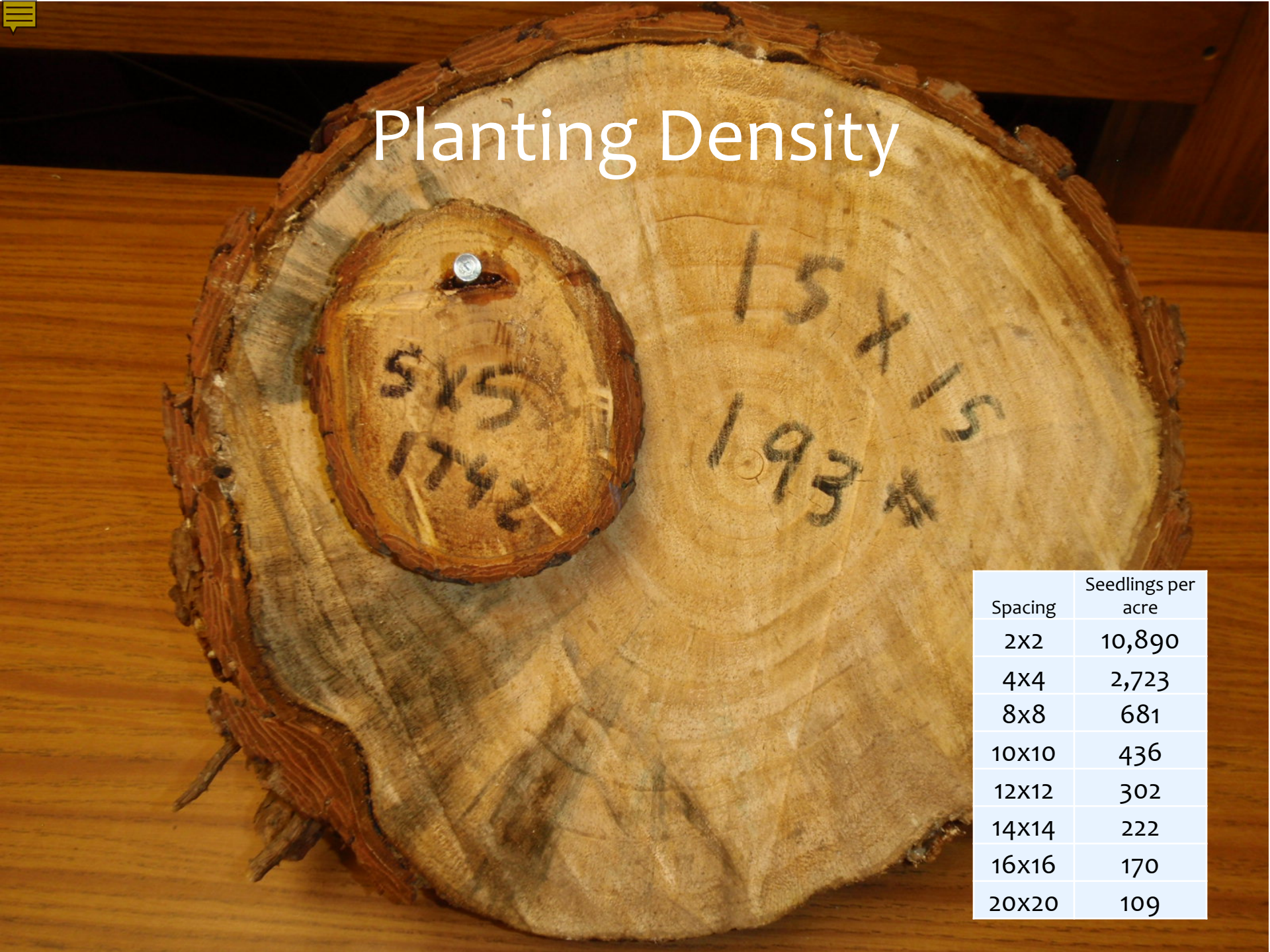
Planting and Vegetation Management

* 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



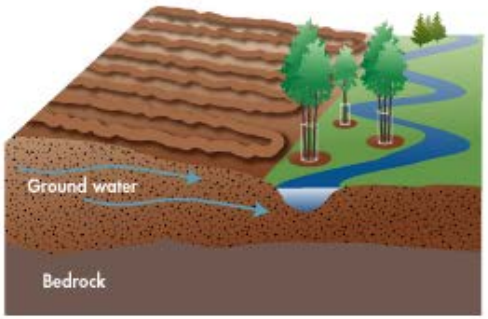
Spacing	Seedlings per acre
2x2	10,890
4x4	2,723
8x8	681
10x10	436
12x12	302
14x14	222
16x16	170
20x20	109

Planting and Vegetation Management

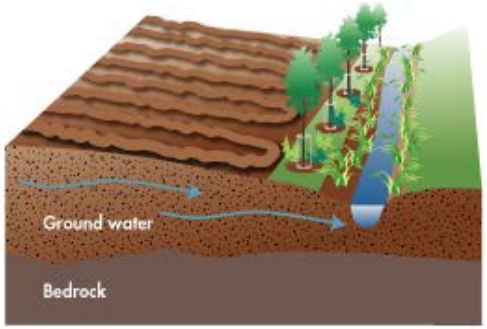
* Manipulate competing vegetation on the site
* Fast growing hardwoods require 2-4 yrs.
* Conifers needs several more years
* Mechanical and herbicide methods can be effective
* Remove over 90 percent of competing vegetation 3-6 ft of plants for 2-5 yrs

Types of Tree Buffers

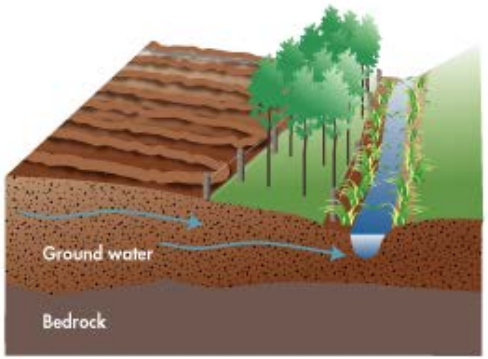
A Irregular Clusters



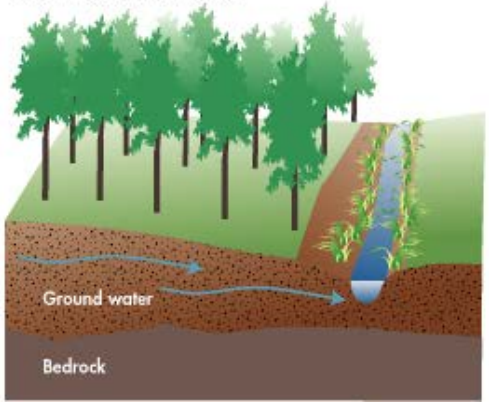
B Single Row



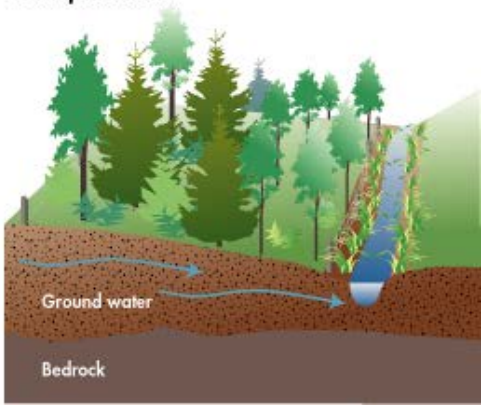
C Narrow Band



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

2001

2013

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 incentiv
property owners for improving or
maintaining qualifying riparian lands

Under this program, property owner
receive complete property tax exem
for their riparian property. This can i
land up to 100 feet from a stream.

Beaver Creek State Natural area video

* Beaver Creek State Natural area