

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

I. INTRODUCTION

The Deschutes River originates in the Bald Hills of Thurston County 3,500 feet above sea level. It travels fifty miles northwest through farmland and housing developments and ends at the base of Tumwater falls. The Deschutes River Riparian Habitat Plan addresses the northernmost part of the river, from the Henderson Blvd. bridge to the I-5 bridge over Capitol Lake.

A. Purpose of Plan

The City of Tumwater undertook the Deschutes River Riparian Habitat Plan (DRRHP) in compliance with a recommendation in the Deschutes River Special Area Management Plan (SAMP), which is part of the Shoreline Master Program for the Thurston Region. The Deschutes River SAMP defines the DRRHP as follows:

A Deschutes Riparian Habitat Plan shall be defined as a plan prepared by a public entity which recommends appropriate means of preserving, protecting, enhancing and restoring plant, fish and wildlife habitat associated with the Deschutes River.

The City received a Coastal Zone Management grant from the Washington State Department of Ecology to undertake this project.

B. Effect of Plan

Because the DRRHP is an amendment to the Shoreline Master Plan, a property owner must, as a condition of receiving a shoreline development permit, complete any required DRRHP site projects located on the tax lot on which the proposed development is located. The projects can be undertaken at any time (e.g. by community groups in conjunction with the property owners) even if no development is planned.

C. Organization of Plan

This plan has three parts. Part one is an introduction to riverine ecosystems which gives a background on hydrology, fisheries, wildlife issues, erosion, rivers as integrated units, and wetlands. It also addresses public and private access issues. Part two is a list and descriptions of the habitat rehabilitation site projects. It includes the purpose for each

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project, how each project will be implemented, a list of plants, any special challenges a site may present and maps of each site. Additional suggested habitat improvements are included for some sites. Part three discusses the logistics of undertaking these projects. This part describes several community groups concerned with local ecology and interested in performing riparian projects; suggests where to find native plants for the re-vegetation projects; discusses permits necessary before beginning the projects; and lists the current land owners.

II. THE RIVERINE ECOSYSTEM

A. The Riparian Zone As An Integrated Unit

A riparian zone consists of a band of vegetation bordering a body of water. In the case of this document, the body of water is the portion of the Deschutes River running from Henderson Boulevard to Interstate 5. A strong riparian zone plays several vital roles in the stabilization and health of a river ecosystem. A healthy riparian zone helps moderate high and low river flows by capturing rainfall and runoff with foliage and roots, then releasing it slowly. It provides aquatic habitat by supplying large woody debris and overhanging vegetation. It also provides a multi-story habitat for terrestrial wildlife which live in all levels of the riparian zone from rotting leaves to the forest crown. Finally, it protects the river from contaminants by filtering out contaminants from runoff water with soil and by taking them up into roots.

Human activities along the river can damage or destroy the riparian zone by covering it over with sod or concrete and through people carelessly trampling vegetation and fish spawning beds while fishing.

B. Hydrology

The majority of water flow in the Deschutes River comes from rainfall. In the summer months, the flow falls lower than 100 cubic feet per second while winter flows typically rise to around 1000 cubic feet per second. During the flood of January 9, 1990, the river rose to 9,600 cubic feet per second. If development continues to increase along the river, floods may exceed 10,000 cubic feet per second in the near future.¹

Hydrology and Fisheries:

Although flows vary from season to season, they must remain fairly constant to support a healthy riverine ecosystem. Very low water levels during salmon runs and spawning season make travel difficult or impossible for migratory fish. They also make life for non-migratory fish difficult. Many non-migratory fish live in shallow riffle areas and depend on these areas to provide them with nourishment. When the water level drops, these areas become uninhabitable.

¹ Development increases flood levels by eliminating vegetation and increasing impervious surfaces. The reasons why these actions increase flood levels will be discussed in the section on vegetation and public access.

Water levels which are too high damage or destroy habitat and kill fish in their rushing waters. Fish can escape these flood waters by swimming into side channels or wetlands connected to the river.

Hydrology and Vegetation:

Healthy riparian zones moderate the river flow by catching rainfall and runoff and releasing it slowly. The leaves catch the rainfall which evaporates or is released slowly through several stories of vegetation to the ground. Here some of the water is absorbed by decaying leaves, some by roots, and some by the soil. The remainder runs off into the river. Plant leaves transpire off the water absorbed by the roots, but the water absorbed by the soil and the decaying leaves enters the ground water table. The high ground water table helps keep the river levels up during dry seasons.

Trees, logs and stumps may fall into the river from the riparian zone, increasing the roughness of the channel and reducing the velocity of the flow.

Hydrology and Erosion:

During heavy rains, even a healthy riparian zone and river system will not prevent flood erosion. However, under natural river conditions flood erosion creates good in-stream habitat. Flood waters wash out gravel banks, creating spawning beds. They wash trees, logs, and stumps into the river, creating hiding, resting, and feeding places. Finally, they partially wash out banks, causing trees to lean out over the water, cooling it and creating feeding and hiding places.

Under natural conditions, a river may have any or all of the following: side channels, meanders, ox bows, associated wetlands, and flood plains. These features slow and temporarily store flood waters coming down the river and offer fish and other water dwellers a refuge from rushing flood waters. So, the river can flood and cause some erosion without destroying habitat and killing river dwellers. However, armoring the river banks with rip-rap, straightening the river channel, and eliminating riparian vegetation reduces or eliminates the river's natural flood control methods. Under these conditions, flood waters rush down the river with unnaturally high volume and force. The river transfers this energy to any part of the river which is not armored, causing severe bank erosion, washing out spawning beds and in-stream habitat (such as woody debris and even overhanging vegetation) and killing in-stream fauna. Flood waters may also wash armoring along the bank into the main channel. This decreases the channel capacity and creates greater erosion forces on the bank.

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C. Wetlands

Wetlands serve several major functions in a river ecosystem. They provide in-stream fauna a place out of the current during floods and they filter out harmful chemicals before such chemicals reach the river. During normal flow periods, they provide a habitat rich in nutrients for vegetarian and carnivorous fish. They are ideal rearing grounds for juvenile fish.

D. Vegetation

In addition to reducing channel instability, vegetation contributes very significantly to the food production, habitat and water quality of river ecosystems.

Vegetation and the Fisheries Nutrient Cycle:

In slow moving areas of the Deschutes, the aquatic ecosystem depends largely on the detrital food chain. Energy from decaying vegetation fuels this system. Micro-organisms break down this vegetation and release nutrients into the river. Insects and insect larva eat the broken-down plant material and plants take up the released nutrients. Larger animals then feed on these insects and plants.

The grazing cycle does not produce as much energy as the detrital cycle but it too adds energy to the river ecosystem. During the grazing cycle, algae in the river and leaves on the bank provide food for grazing invertebrates who then provide food to carnivores (other invertebrates or vertebrates).

Vegetation and Fish Habitat:

As well as providing food, vegetation provides essential habitat for aquatic animals. Large woody vegetation, such as trunks or root balls, which falls into the river provides three habitat advantages. First, it creates an object for fauna to hide under and around. Second, currents eddying around it create scour holes where trout and steelhead rest and feed. Third, it creates riffles where invertebrates feed and provide food for larger fauna.²

² Ninety percent of energy production takes place in riffle areas. Riffles in the river oxygenate the water allowing invertebrates to metabolize more efficiently. Thus, they grow and reproduce more rapidly, providing vertebrates and large invertebrates with food.

Overhanging vegetation also provides important habitat for aquatic organisms. Like woody debris, overhanging vegetation provides places for fish to hide and to feed.³ It also provides a corridor for fish to travel up or down stream. Fish do not like to cross sections of open water because they make easy targets for fish-eating birds.

Tall trees along the river bank, such as fir and cedar, shade the river and keep it cool so the water can hold more oxygen.⁴ When water has a high oxygen content, fish and other aquatic animals can breathe more easily.

Vegetation and the Wildlife Nutrient Cycle:

The terrestrial environment, like the aquatic environment, depends upon healthy vegetation to provide the base for its detrital and grazing cycles. The detrital cycle provides the majority of the energy in the terrestrial system. Insects and fungi break down fallen leaves and wood into nutrients which the plants take up. Larger organisms eat the insects and fungi and the energy continues up the food chain. The fungi also improve soil structure which is essential for nutrient uptake in plants.

The grazing cycle depends on the solar energy captured by plants. Insects and other invertebrates feed on plants and each other. Vertebrates then feed on these animals and each other, carrying the solar energy up the food chain.

These two cycles interconnect. For example, squirrels graze on the cones of trees and are eaten by hawks and owls; but they also eat fungi and occasionally live in decaying logs and trees.

Vegetation and Wildlife Habitat:

A healthy riparian zone provides multi-story habitat for terrestrial wildlife. Each of these stories provides habitat for a different community of animals and plants. The duff (leaf litter and fallen logs) provides habitat for insects and various arthropods,

³ Overhanging vegetation provides food to fish in the form of insects which fall from the branches into the river. In addition, leaves falling from overhanging vegetation provide energy and nutrients to the detritus cycle.

⁴ These very tall trees also provide the best in-stream debris because they are very large and won't move as easily during floods. They also do not rot as quickly as alders or willows.

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amphibians and small mammals. The detritus cycle arises from this story and helps support the rest of the stories. The understory consists of low shrubs and ferns. It provides berries and seeds for birds and small mammals, as well as hiding places and dens. The trunks and snags provide nesting and roosting sites and insects for birds and small rodents. The crown provides habitat for insects, spiders, birds and small mammals. This area captures energy from the sun and puts it into the ecosystem. Insects, birds and small mammals eating the leaves and cones take the stored energy and disperse it when they die or are eaten. This is the base of the grazing cycle.

Vegetation and Water Quality:

As well as providing habitat and food, a healthy riparian zone acts as a water filter. Many types of contaminants can enter the river and damage its ecosystem. An overabundance of silt can enter the river through excessive erosion and cover spawning beds.⁵ Fertilizers, pesticides, and herbicides enter the river from nearby lawns and poison and deoxygenate the water.⁶ Heavy metals and oils can enter the river from street and parking lot runoff and poison the ecosystem at the base of its food chain.⁷

A healthy riparian zone can filter out these contaminants and hold them in a benign state. Riparian zones resist excessive erosion by holding the soil in place with a root structure. This keeps silt from covering over spawning beds and wiping out salmon runs. Plants take up fertilizers, pesticides and herbicides into their systems and hold them there until

⁵Normally erosion is good for fish habitat, but when it occurs at too high a rate the river begins to fill with silt, which destroys spawning beds. Spawning beds must have gravel that is fine enough so that fish can make nests in it and the gravel will not crush the eggs buried beneath it, but coarse enough to allow water to flow freely through it so the eggs receive oxygen. When silt fills in a spawning bed it prevents the flow of water to eggs and so suffocates them.

⁶ Pesticides can poison aquatic fauna directly by interfering with their metabolism. Herbicides can kill fauna by interfering with their metabolism and by killing plants they feed on. Fertilizers can kill aquatic fauna by promoting explosive plant growth (algae blooms). The algae take up oxygen in the water and suffocate fauna.

⁷ Heavy metals and other pollutants from street and parking lot runoff settle into the detritus at the bottom of the river, stream or wetland. When animals eat this material they concentrate it within their bodies. When larger animals eat the smaller animals they concentrate the pollutants further. At the top of the food chain these pollutants become very concentrated and fish become inedible (and often die).

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they die. As the plants decay, they return these substances to the soil slowly and in less harmful forms. Riparian zones also filter out oils and heavy metals from street and parking lot runoff. These pollutants are held by the soil and, to a small degree, by plants so they do not travel into the river and poison the aquatic fauna and disrupt the detrital cycle.

E. Public Access

People use the river and its adjacent land for many activities. Each of these activities has a slightly different impact on the ecosystem. Some activities, such as walking, canoeing, and picnicking⁸, have very small impacts on the environment. These small impact activities result in disturbing some wildlife and trampling some vegetation; but, if the area is not overused, these activities should have little impact.

Some human activities taking place along the river have a greater impact on the riverine environment. For example, planting a well kept lawn up to or almost up to the river's edge eliminates most benefits of a riparian zone and can create runoff problems (especially if the lawn is fertilized or sprayed for pests). A parking lot near the river can create serious runoff problems and permanently eliminate any benefits of a riparian zone. Water running off the pavement can cause unnaturally high levels of erosion in areas downstream and carry pollutants into the river's aquatic ecosystem. Fishermen can do serious harm by wading through spawning beds and trampling sensitive shoreline areas. The cumulative effect of these high impact activities can destroy a river ecosystem if they are not carefully controlled.

⁸ Picnicking can be very high impact if a lawn is put in to accommodate it. Lawn may create all the problems associated with pesticides, herbicides, and fertilizers. It may also increase runoff and decrease wildlife habitat.

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III. SITE PROJECTS

This part of the plan consists of a series of re-vegetation plans for specific sites. Locations of sites are shown on map #1. Each site plan lists a Purpose, Implementation, Plant List, Special Comments, and has a site map. Sites with a site number ending with a 0 (zero) are required to be completed as a condition of receiving a shoreline permit for development of the property on which the site project is located. Several site plans also have a suggestion section. The activities described in the suggestion section are not mandatory but are highly recommended.

Sites with a site number ending with a 5 (ex. Site 5 or Site 145a) are suggested sites. All the activities described for these sites are recommended but not mandatory.

The Purpose lays out the goals which are intended to be accomplished by the re-vegetation project.

The Implementation is meant to serve as a guide for re-vegetation. This can be followed exactly or with minor modifications (such as plant substitutions). Any modifications must carry out the goals laid out in the Purpose.

The Plant Lists contain plants which should be used in re-vegetating each site. Native plants not on this list may be substituted as long as they accomplish the goals laid out in the Purpose.

Special Comments describes any complications or special circumstances that should be considered in re-vegetating a site.

The maps in this part are meant as graphic portrayals of the Implementation. They are not drawn to scale, but are intended to clarify and expand upon the Implementation. Like the Implementation section, they may be modified as long as any modifications carry out the goals laid out in the Purpose section.

Generally, the following rules of thumb should be applied when completing a site project:

- * Plant beginning near the water's edge and work back up the bank to avoid trampling new plantings during the project.
- * Where both taller trees and an understory are recommended, plant the taller trees first. Once they are established (several years), return and plant the understory.
- * Some loss of plantings can be expected due to floods, drought, trampling, etc. Provisions should be made prior to starting the project to return each year for three years and replace damaged or lost plants.

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A. Site 5 (Suggestion Site)

Purpose:

- * *To provide overhanging vegetation under which fish can hide.*
- * *To shade the river.*

Implementation:

- * *Plant a 10 foot wide strip of willows and Red-osier dogwood along the river's edge in the rip-rap.*

Plant List:

- * *Willows: Salix spp.*
- * *Red-osier dogwood: Cornus stolonifera*

Special Comments:

- * *Permission from the Washington State Department of Transportation will need to be obtained before undertaking any re-vegetation of this area.*

B. Site 10

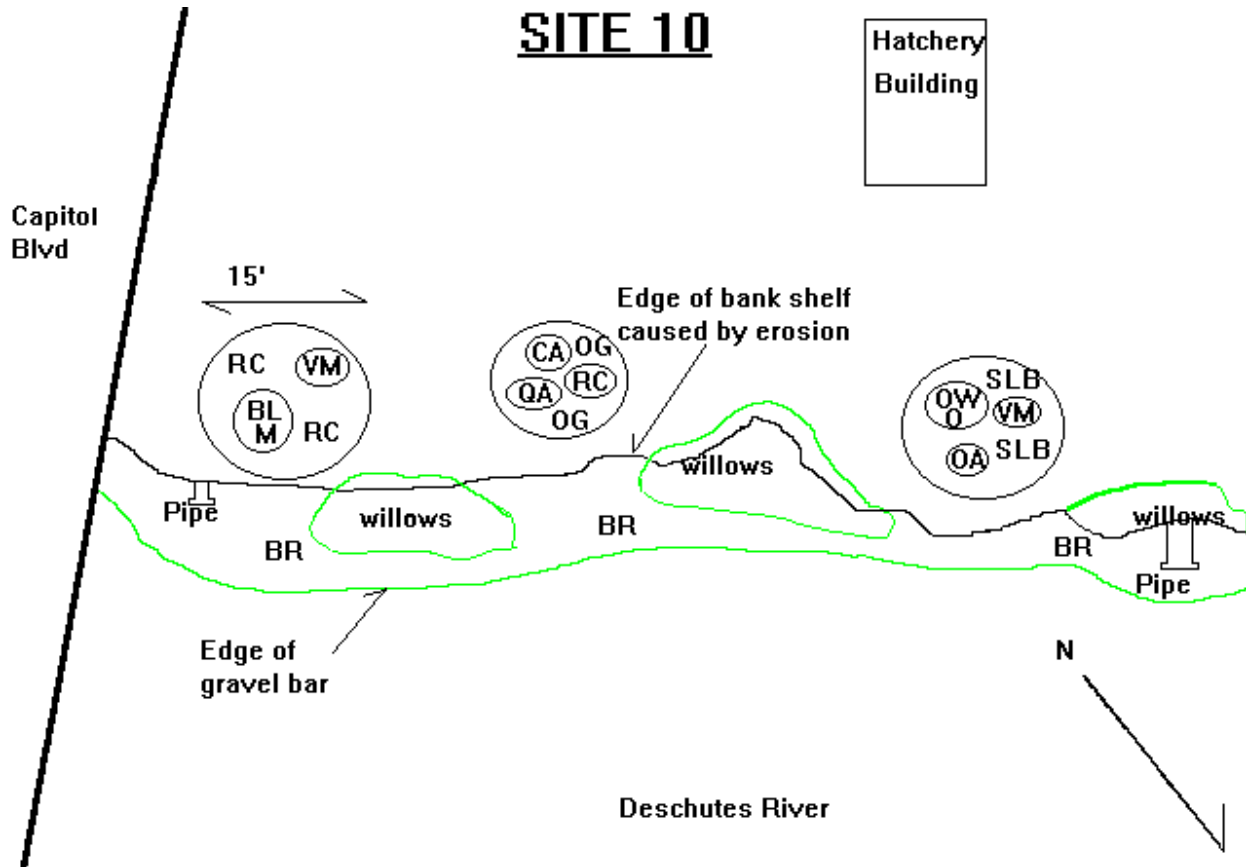
Purpose:

- * *To provide overhanging vegetation for fish cover.*
- * *To provide stability to the bank.*
- * *To provide shade to the river*
- * *To provide detritus to the river food cycle.*
- * *To allow people access to the river.*

Implementation:

- * *Plant islands of willows approximately 30 feet apart. Each island should stretch from 5 to 10 feet along the bank and 4 to 5 feet back from the bank.*
- * *The deciduous trees should be planted 5 to 10 feet back from the bank. The groups should be planted 30 to 35 feet apart.*
- * *Plant the low-growing shrubs in circles with 10 to 15 foot diameters.*
- * *Plant the aquatic plants along the waterline and on the sand and gravel bars. They should be interspersed among each other rather than planted in separate clumps.*

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Symbols

- | | |
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Plant List:

- * *Bigleaf maple: Acer macrophylla*
- * *Vine maple: Acer circinatum*
- * *Oregon ash: Fraxinus latifolia*
- * *Willows: Salix spp.*
- * *Red flowering current: Ribes sanguineum*
- * *Tall Oregon grape: Berberis aquifolium*
- * *Hardstem bulrush: Scirpus acutus*
- * *Small fruited bulrush: Scirpus microcarpus*
- * *Cattails: Typha spp.*
- * *Snowberry: Symphoricarpos albus*

Special Comments: *NONE*

C. Site 20

Purpose:

- * *To provide overhanging vegetation for fish cover.*
- * *To provide food and habitat for birds and small mammals.*
- * *To shade the river.*
- * *To provide detritus to the aquatic ecosystem.*
- * *To allow fishermen access to the river.*

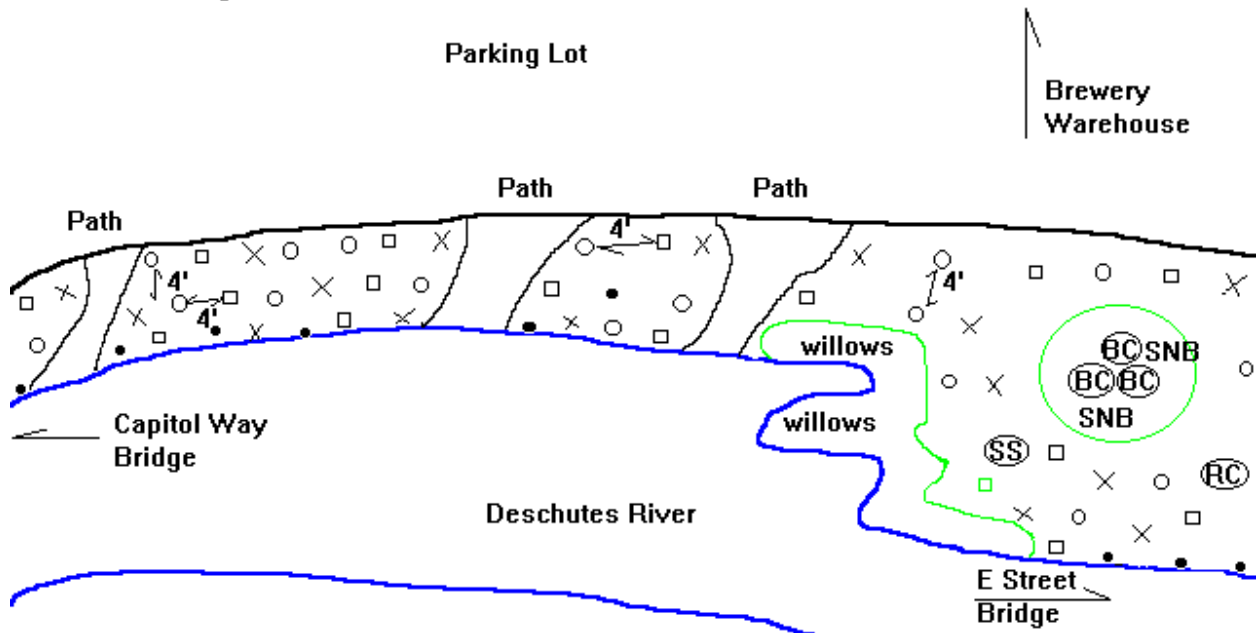
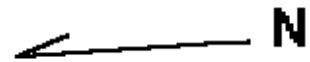
Implementation:

- * *Red-osier dogwood, Indian plum, Ninebark and willows should be planted throughout this site. They should be planted 4 feet apart and off center.*
- * *Leave three 4 foot wide paths through the shrubs. These paths can be graveled for fishing access.*
- * *On the north end of the bar plant a band of willows.*
- * *In the center of the bar plant 3 Bitter cherry trees. Snowberry should be planted around these trees in a 15' diameter circle.*
- * *Plant a Sitka spruce 10 feet from the shoreline on the bar.*
- * *Plant a Western red cedar 10 feet from the shoreline on the bar.*

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SITE 20

- Indian Plum
- × Ninebark
- Willows
- Red-osier dogwood



Symbols

- | | |
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| DF = Douglas Fir | SB = Scotch Broom |
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Plant List:

- * *Red-osier dogwood: Cornus stolonifera*
- * *Indian plum: Osmoronia cerasiformis*
- * *Willows: Salix spp.*
- * *Sitka spruce: Picea sitchensis*
- * *Western red cedar: Thuja plicata*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Ninebark: Physocarpus capitatus*
- * *Bitter cherry: Prunus emarginata*

Special Comments:

- * *After planting, it is suggested to install temporary barriers along the footpaths to protect the plantings from being trampled. It is also suggested that signs be placed on the barriers indicating that it is a plant restoration site.*
- * *If any large scale development takes place along the river, at least 10 feet of the parking lot must be taken up and two more rows of Western red cedar and Douglas fir, and Western hemlock (two rows total) must be planted. Snowberry and ferns should be planted under these trees.*

SITE 20 SUGGESTIONS:

Purpose:

- * *To create riffles and scour holes in which fish can rest and feed.*
- * *To educate the public about riparian zones.*
- * *To provide shade for the river.*
- * *To improve esthetics of the parking lot.*
- * *To provide habitat to birds.*

Implementation:

- * *Put large root balls or boulders in the river and anchor them to the bank.*
- * *Create a 3 foot wide trail through the vegetation all the way from the Capitol Boulevard bridge to the "E" Street bridge.*
- * *Place decks over the river at three points along the bank.*
- * *Put interpretive signs along the trail explaining river ecology and the purpose of the re-vegetation project.*

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- * *Take up 3 to 6 squares of pavement throughout the Pabst Brewing Co. (Olympia Brewery) parking lot. These squares should be between 5 by 5 feet and 10 by 10 feet in area. Plant a mixture of Oregon white oak, Vine maple, and Quaking aspen along with Pacific yew, Douglas fir and Western hemlock. Below the trees, plant Snowberry, Sword fern, Evergreen huckleberry, Salal, and Tall Oregon grape.*

Plant List:

- * *Oregon white oak: *Quercus garryana**
- * *Vine maple: *Acer circinatum**
- * *Quaking aspen: *Populus tremuloides**
- * *Pacific yew: *Taxus brevifolia**
- * *Douglas fir: *Pseudotsuga menziesii**
- * *Western hemlock: *Tsuga heterophylla**
- * *Snowberry: *Symphoricarpos albus**
- * *Sword fern: *Polystichum munitum**
- * *Evergreen huckleberry: *Vaccinium ovatum**
- * *Salal: *Gaultheria shallon**
- * *Tall Oregon grape: *Berberis (Mahonia) aquifolium**

Special Comments:

- * *Careful attention will need to be paid to how the placement of root balls or boulders will affect the flow of the river. Incorrect placement could cause severe erosion problems, especially along the park bank.*

D. Site 30

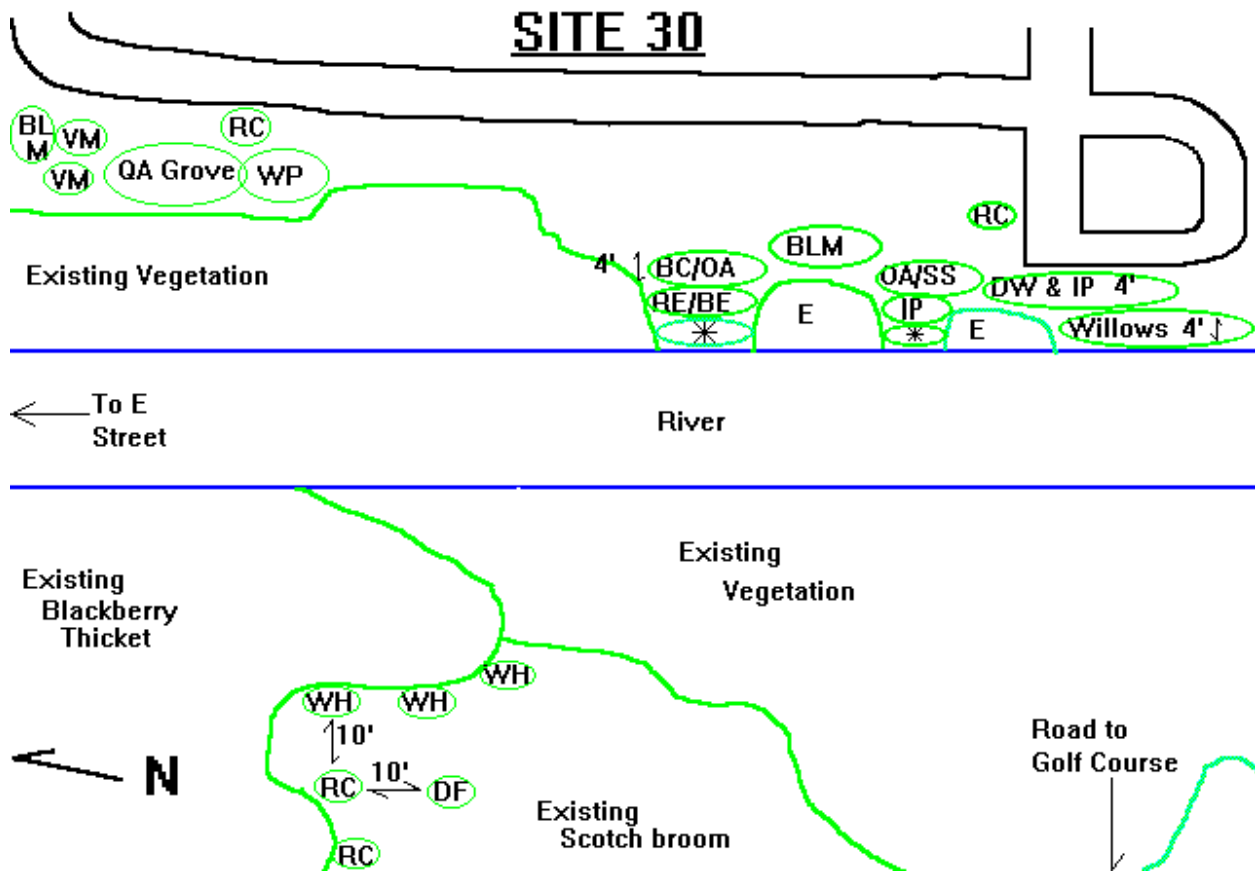
Purpose:

- * *To provide overhanging vegetation for fish cover.*
- * *To provide habitat and food for birds and small mammals.*
- * *To shade the river.*
- * *To provide detritus to the river.*

Implementation:

- * *Bigleaf maple and Vine maples should be planted 5 to 10 feet back from the north bend in the access road.*

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- * *A grove of Quaking aspen and another of Paperbirch should be planted just down from the maples. A Western red cedar should be planted between the aspen and birches.*
- * *Willows should be planted in 4 foot wide strips along the bank at any point where there is no native vegetation. Behind the willows, Indian plum, Red-osier dogwood, and Red and Blue elderberry should be planted in 4 foot wide strips.*
- * *Bitter cherry, Oregon ash and a very few Sitka spruce should be planted in 5 to 10 foot sections behind the above shrubs.*
- * *Near the end of the access road a Western red cedar should be planted.*
- * *Bigleaf maple should be planted 10 feet back from the access road wherever there is no existing native vegetation.*
- * *On the north bank, plant Western red cedar, Western hemlock and Douglas fir along the border of the existing berry patch, just upriver from the "E" Street bridge.*
- * *All Scotch broom should be removed from the site, particularly the patch just up river from the above-mentioned berry patch. As it is removed, it should be replaced with Snowberry and/or other native shrubs.*

Plant List:

- * *Bigleaf maple: Acer macrophylla*
- * *Vine maple: Acer circinatum*
- * *Quaking aspen: Populus tremuloides*
- * *Western red cedar: Thuja plicata*
- * *Western paperbirch: Betula papyrifera var. subcordata*
- * *Bitter cherry: Prunus emarginata*
- * *Oregon ash: Fraxinus latifolia*
- * *Red elderberry: Sambucus racemosa*
- * *Blue elderberry: Sambucus caerulea*
- * *Willows: Salix spp.*
- * *Sitka spruce: Picea sitchensis*
- * *Indian plum: Osmoronia cerasiformis*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Western hemlock: Tsuga heterophylla*
- * *Douglas fir: Pseudotsuga menziesii*

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Special Comments:

- * *The Scotch broom is very well-established and will take a great deal of time to eradicate, perhaps several years. Therefore, if small scale development takes place on this land, the development can begin before the Scotch broom is eradicated, as long as the developers eradicate it and replace it with Snowberry and/or other native shrubs within 5 years. The Washington State Department of Natural Resources, Division of Land and Water Resources, Natural Area Preserve Program has information on eradicating Scotch broom.*

SITE 30 SUGGESTIONS:

Purpose:

- * To create riffles and scour holes in which fish can rest and feed.

Implementation:

- * *Place 3 or 4 large logs, preferably cedar or Douglas fir, in the river at about 75 foot intervals.*

Special Comments: *NONE*

E. Site 40

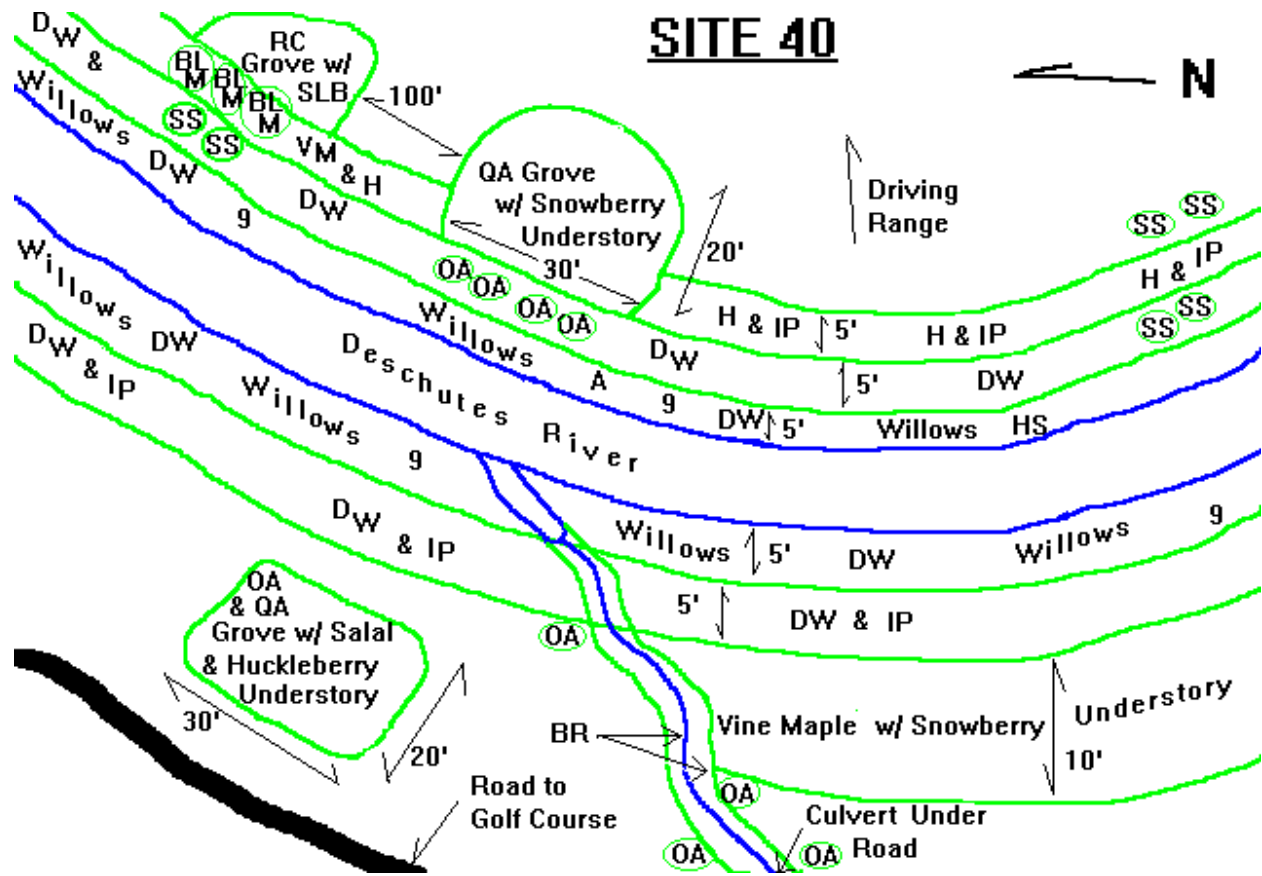
Purpose:

- * *To provide overhanging vegetation for fish cover.*
- * *To provide food and habitat to terrestrial wildlife.*
- * *To provide detritus to the river.*
- * *To shade the river.*
- * *To help purify creek water entering the river.*

Implementation:

- * *Willows, Red-osier Dogwood, Ninebark, and alders should be planted all along the edge of both river banks in a strip 4 feet wide.*
- * *On the east bank, Red-osier dogwood should be planted in a 4 foot wide strip immediately behind the above-mentioned strip. Sitka spruce and Oregon ash should be planted in this strip, but they should be planted in groups of two or three trees and these groups should be 100 feet apart.*

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



Symbols

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| HS = Hardhack Spireae | TB = Thimbleberry |
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| MO = Mock Orange | WH = Western Hemlock |
| 9 = Ninebark | WP = Western Paperbirch |
| * = Willows | WR = Wild and Wood Rose |

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *A strip of Vine maple, Hawthorn, Indian plum, and Snowberry 4 feet wide should be planted immediately behind the strip of Dogwood. Bigleaf maple and Quaking aspen can be planted in this strip, but they should be planted behind the Sitka spruce or Oregon ash mentioned in the previous paragraph.*
- * *A 30 foot by 20 foot grove of Western red cedar and another of Quaking aspen should be planted behind the taller trees mentioned in the two preceding paragraphs. These groves should have understories of Snowberries and fern. They should be 100 feet apart.*
- * *Directly across the river from the Quaking aspen grove, plant a grove of Oregon ash and Quaking aspen with a Salal and Huckleberry understory.*
- * *Hardstem and Softstem bulrushes and sedges should be planted along the edge of the small creek entering the river on the west bank. Oregon ash should be planted along the banks of this creek.*
- * *South of this small creek, behind the band of dogwood plant a band of Vine maple with an understory of Snowberry. This band should be a least 10 feet from the road.*

Plant List:

- * *Vine maple: *Acer circinatum**
- * *Black hawthorn: *Crataegus douglasii**
- * *Red-osier dogwood: *Cornus stolonifera**
- * *Western red cedar: *Thuja plicata**
- * *Bigleaf maple: *Acer macrophylla**
- * *Snowberry: *Symphoricarpos albus**
- * *Quaking aspen: *Populus tremuloides**
- * *Sitka spruce: *Picea sitchensis**
- * *Ninebark: *Physocarpus capitatus**
- * *Red flowering current: *Ribes sanguineum**
- * *Indian plum: *Oemleria cerasiformis**
- * *Oregon ash: *Fraxinus latifolia**
- * *Willows: *Salix spp.**
- * *Hardstem bulrush: *Scirpus acutus**
- * *Softstem bulrush: *Scirpus validus**
- * *Sedges: *Carex spp.**
- * *Salal: *Gaultheria shallon**
- * *Evergreen huckleberry: *Vaccinium ovatum**

Special Comments: *NONE*

SITE 40 SUGGESTIONS:

Purpose:

- * *To provide riffles in the river in which fish can feed and rest.*

Implementation:

- * *Place 3 to 5 very large boulders in the river at 10 to 60 foot intervals.*

Special Comments:

- * *Before placing the boulders, the river banks should be evaluated to see if they can withstand increased force in case the boulders direct water towards the banks.*

F. Site 50

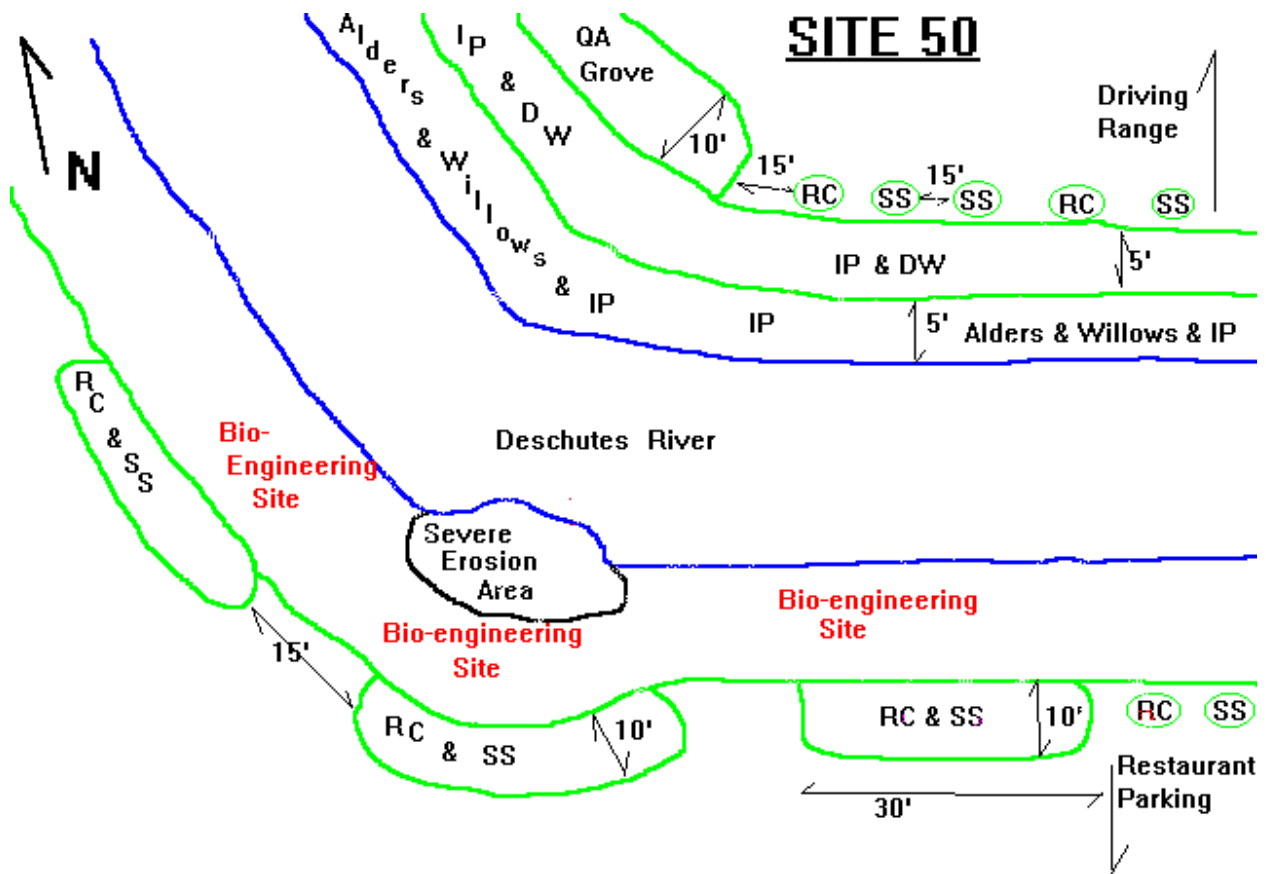
Objective:

- * *To provide overhanging vegetation for fish cover.*
- * *To provide food, habitat and detritus to aquatic and terrestrial fauna.*
- * *To shade the river.*
- * *To filter runoff water entering the river.*
- * *To inhibit erosion.*

Implementation:

- * *Plant a 5 foot wide band of willows, Indian plum and alders along the edge of the bank nearest the driving range.*
- * *Plant a 5 foot wide band of Red-osier dogwood and Indian plum behind the alder-willow band.*
- * *Behind the Red-osier dogwood, plant 10 by 30 foot strips of Western red cedar and Sitka spruce.*
- * *Just downstream of the Sitka spruce and cedar, plant a strip of Quaking aspen 10 feet wide and 30 feet long.*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



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SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *On the bank nearest the restaurant parking lot, plant 10 foot wide by 30 foot long strips of Western red cedar and Sitka spruce between the parking lot and the river. The strips should be 15 to 20 feet apart and 10 to 15 feet from the edge of the parking lot.*
- * *Just downriver from the pedestrian bridge, plant Western red cedar and Sitka spruce every 15 feet (this will be 2 to 3 trees on the restaurant side of the bridge and 5 to 7 trees on the driving range side of the river).*

Plant List:

- * *Bigleaf maple: Acer macrophylla*
- * *Sitka spruce: Picea sitchensis*
- * *Western red cedar: Thuja plicata*
- * *Indian plum: Osmoronia cerasiformis*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Red alder: Alnus rubra*
- * *Willows: Salix spp.*

Special Comments:

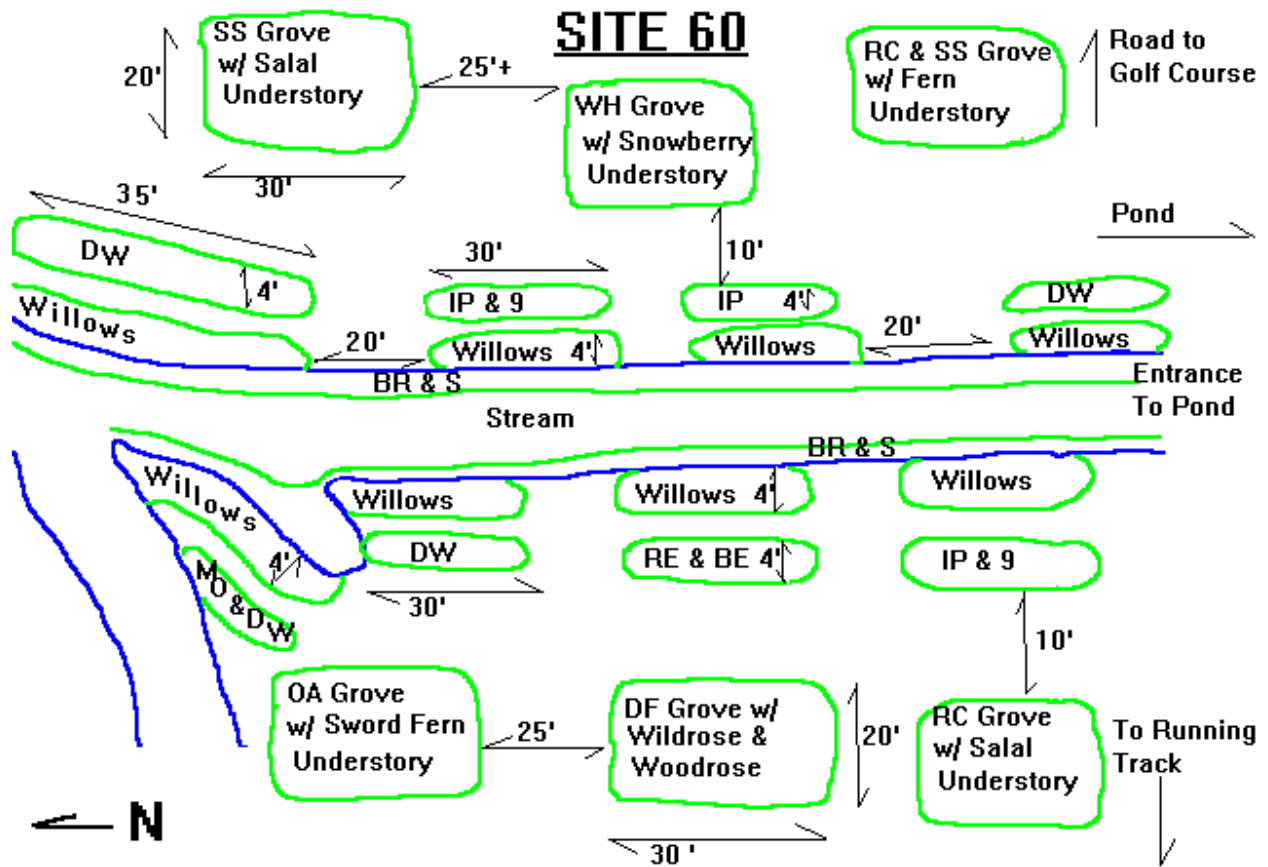
- * *The bank nearest the restaurant is eroding and will continue to erode rapidly unless it is protected. Bioengineering would be the best option for habitat and might be less expensive than a massive armoring project. The Thurston Conservation District should be consulted on plans for this bioengineering project.*
- * *For safety reasons, trees should be planted no closer than 10 feet from the restaurant parking lot.*

G. Site 60

Purpose:

- * *To provide overhanging vegetation for fish cover.*
- * *To filter runoff water.*
- * *To provide detritus.*
- * *To shade the creek.*
- * *To provide food and habitat for terrestrial fauna.*
- * *To maintain access to the creek.*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



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SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

Implementation:

- * *Plant Hardstem and Softstem bulrushes and sedges all along the stream bank.*
- * *Plant strips of willows 4 feet wide by 15 to 20 feet long along the bank. Leave 10 feet between strips.*
- * *Plant 4 foot by 15 to 20 foot strips of low growing shrubs directly behind the willow strips.*
- * *Plant the 20 by 30 foot islands of conifers 10 feet back from the strips of shrubs. These islands need to have understories of Salal, Snowberry, fern, Wild and Wood rose. These islands should be planted at least 20 feet apart.*

Plant List:

- * *Red-osier dogwood: Cornus stolonifera*
- * *Ninebark: Physocarpus capitatus*
- * *Snowberry: Symphoricarpos albus*
- * *Ferns: Athyrium filix-femina*
- * *Salal: Gaultheria shallon*
- * *Indian plum: Osmoronia (Oemleria) cerasiformis*
- * *Red elderberry: Sambucus racemosa*
- * *Blue elderberry: Sambucus caerulea*
- * *Mock orange: Philadelphus lewisii*
- * *Willow: Salix spp.*
- * *Sitka spruce: Picea sitchensis*
- * *Western hemlock: Tsuga heterophylla*
- * *Western red cedar: Thuja plicata*
- * *Douglas-fir: Pseudotsuga menziesii*
- * *Oregon ash: Fraxinus latifolia*

Special Comments:

- * *Reed canary grass in this area should be removed manually rather than with sprays. This will be a long term project. The best way to eliminate this grass is to shade it out. As the trees grow, they will accomplish this naturally. However, this will take decades. In the meantime, the grass should be manually eliminated and replaced. Mulching around plantings after removing grass can discourage the grass from returning.*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *No future spraying should be done within 30 feet of the creek or pond.*
- * *This site could be handed over to a land trust for restoration and care.*

H. Site 70

Purpose:

- * *To provide detritus.*
- * *To provide food and habitat for terrestrial wildlife.*
- * *To provide overhanging vegetation for fish and amphibian cover.*
- * *To filter pollution from runoff water.*
- * *To shade the pond.*
- * *To allow access and viewing of the pond.*

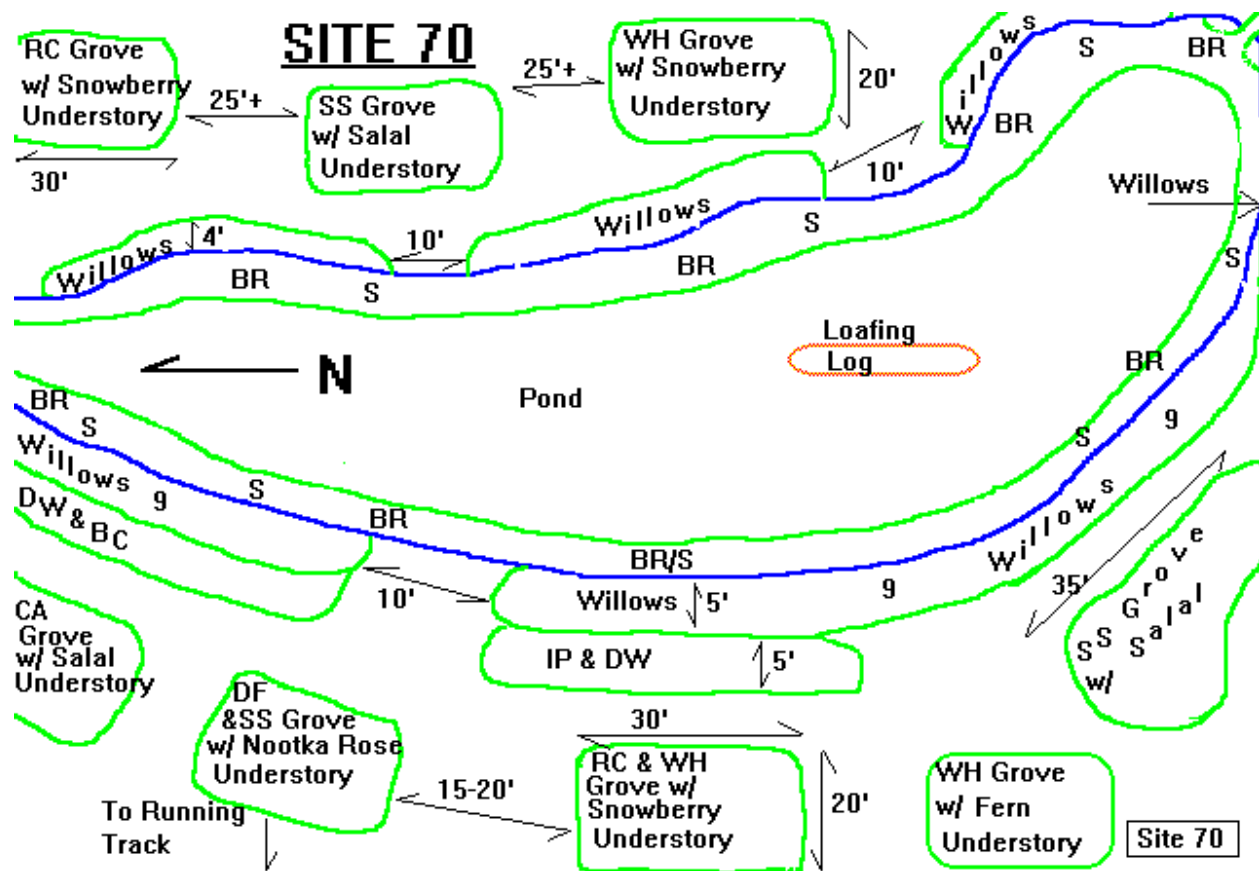
Implementation:

- * *Plant strips of willows and Ninebark 15 to 20 feet long and 4 feet wide along the whole shore. Space these islands 10 feet apart.*
- * *Behind the strips on the west shore, plant strips of Red-osier dogwood, Indian plum, and Bitter cherry which are equal in area to the willow strips.*
- * *Plant islands of coniferous trees 10 to 20 feet back from the rear edge of the shoreline vegetation. Occasional deciduous trees may be planted throughout the islands of conifers. These islands should have understories composed of native shrubs including Snowberry, Salal, and Nootka rose.*
- * *Bulrushes, cattails, and sedges should be planted all around the pond's shore.*

Plant List:

- * *Vine maple: *Acer circinatum**
- * *Snowberry: *Symphoricarpos albus**
- * *Willows: *Salix spp.**
- * *Salal: *Gaultheria shallon**
- * *Oregon ash: *Fraxinus latifolia**
- * *Oregon white oak: *Quercus garryana**
- * *Red-osier dogwood: *Cornus stolonifera**
- * *Bitter cherry: *Prunus emarginata**
- * *Western crabapple: *Malus (Pyrus) fusca**
- * *Quaking aspen: *Populus tremuloides**
- * *Nootka rose: *Rosa nutkana**

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



Symbols

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SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *Black hawthorn: Crataegus douglasii*
- * *Mock orange: Philadelphus lewisii*
- * *Hardstem bulrush: Scirpus acutus*
- * *Soft stem bulrush: Scirpus validus*
- * *Sitka spruce: Picea sitchensis*
- * *Western hemlock: Tsuga heterophylla*
- * *Western red cedar: Thuja plicata*
- * *Douglas fir: Pseudotsuga menziesii*
- * *Cattails: Typha latifolia*
- * *Sedges: Carex spp.*
- * *Ninebark: Physocarpus capitatus*

Special Comments:

- * *This pond is not currently inhabited by fish or amphibians. However, it has very high potential for fish and wildlife habitat.*
- * *There is a sewer line running through this area along the road. A map indicating exactly where the sewer line is located should be obtained before undertaking any re-vegetation on this site.*
- * *This site could be handed over to a land trust to be cared for and restored.*
- * *After planting, it is suggested to install temporary barriers along the footpaths to protect the plantings from being trampled. It is also suggested that signs be placed on the barriers indicating that it is a plant restoration site.*

SITE 70 SUGGESTIONS:

Purpose:

- * *To provide nesting sites for birds.*

Implementation:

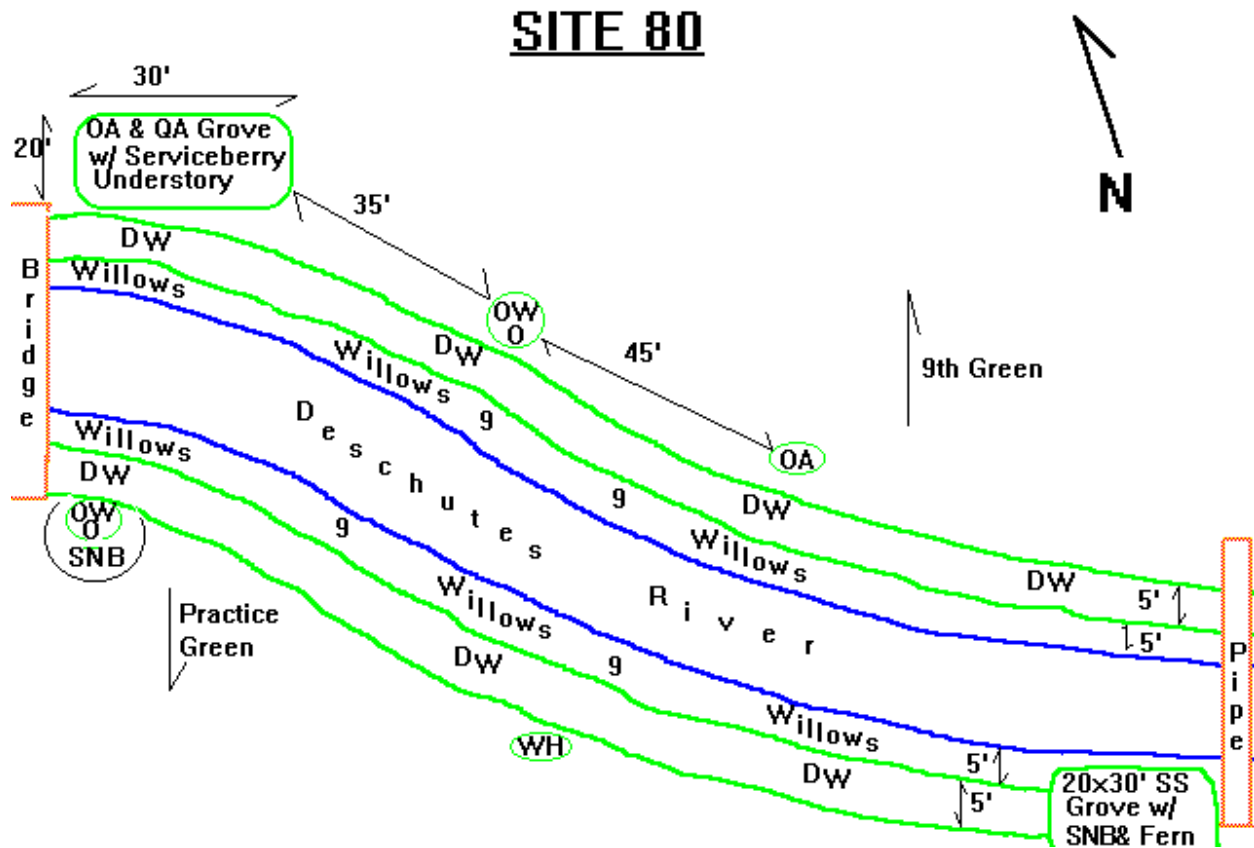
- * *Put up tall poles and place nesting boxes on them.*

I. Site 80

Objective:

- * *To provide overhanging vegetation for fish cover.*
- * *To provide food and habitat to wildlife.*

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



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SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *To provide detritus and food to aquatic fauna.*
- * *To stabilize the banks.*
- * *To shade the river where possible.*
- * *To maintain a view from the clubhouse to the 18th hole.*

Implementation:

- * *Plant a 4 foot wide band of willows and Ninebark along both sides of the river. Doughnut shaped pieces of biodegradable fabric may need to be placed around each plant to keep the grass down.*
- * *Plant a 4 foot wide band of Red-osier dogwood behind the band of willows.*
- * *Plant an Oregon white oak 10 feet upstream from the foot bridge. Plant Snowberry around the base of the tree.*
- * *Across the river from the above Oregon white oak, plant a 20 by 30 foot grove of Oregon ash and Quaking aspen with Serviceberry understory.*
- * *Plant a grove of Sitka spruce and Western red cedar with a fern and Snowberry understory 15 feet downstream of the pipe bridge on the west bank.*
- * *Plant 3 to 5 Quaking aspen 10 feet upstream from the pipe bridge.*
- * *Plant one Oregon white oak and one Oregon ash between the Quaking aspen/Oregon ash grove and the pipe bridge.*
- * *Plant a single Western hemlock between the Oregon white oak and the Sitka spruce/Western red cedar grove.*

Plant List:

- * *Red-osier dogwood: Cornus stolonifera*
- * *Willows: Salix spp.*
- * *Oregon ash: Fraxinus latifolia*
- * *Quaking aspen: Populus tremuloides*
- * *Serviceberry: Amelanchier alnifolia*
- * *Oregon white oak: Quercus garryana*
- * *Snowberry: Symphoricarpos albus*
- * *Western red cedar: Thuja plicata*
- * *Ferns: Athyrium filix-femina*
- * *Western hemlock: Tsuga heterophylla*
- * *Ninebark: Physocarpus capitatus*

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

Special Comments:

- * *The banks of this site are inundated with Reed canary grass. This grass currently keeps debris from washing onto the golf course. It should be removed and replaced in such a way that does not leave the bank vulnerable to flood damage.*

J. Site 90

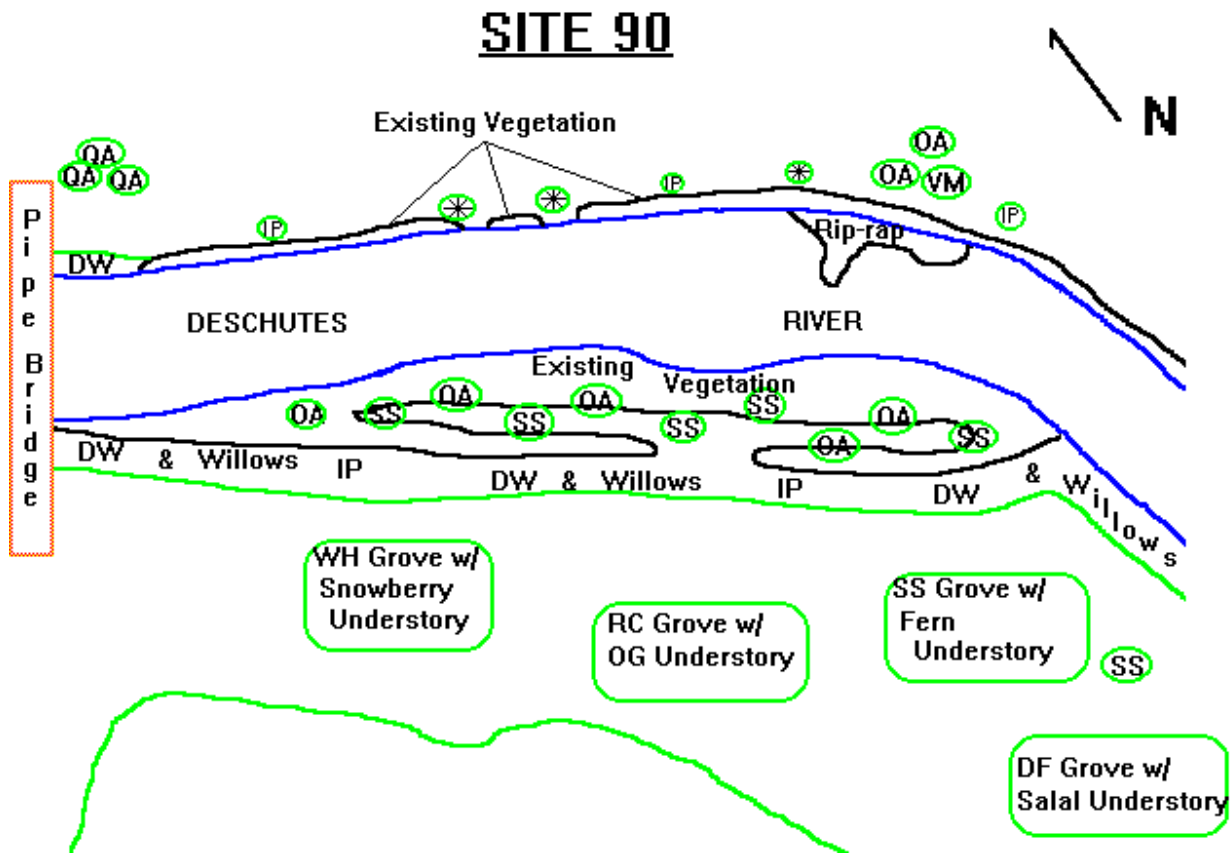
Purpose:

- * *To provide overhanging vegetation for fish cover.*
- * *To provide stability to the bank.*
- * *To provide food and habitat to terrestrial wildlife.*
- * *To shade the river.*
- * *To maintain air flow throughout the golf course.*

Implementation:

- * *Plant dogwoods and willows in a band 4 to 10 feet wide behind the existing willow, alder, dogwood thicket and along the west bank.*
- * *Plant Oregon ash and Sitka spruce throughout the middle of the willow and dogwood thicket on the west bank. They should be planted at least 10 feet apart.*
- * *Behind the willow and dogwood thicket, plant a 20 by 30 foot Western hemlock grove with a Snowberry understory.*
- * *Plant a 20 by 30 foot Douglas fir grove with Salal understory.*
- * *Near the Douglas fir grove plant a Sitka spruce grove with Sword fern understory.*
- * *Between the Western hemlock grove and the Sitka spruce grove, plant a Western red cedar grove with a Thimbleberry understory.*
- * *On the east side of the pipe bridge plant 3 Quaking aspen.*
- * *Along the east bank, between the pipe bridge and the existing vegetation, plant a 4 foot wide strip of dogwoods.*
- * *Plant willows on 20 foot centers just behind the existing foliage along the entire east bank. Between these, plant Red-osier dogwood, Ninebark, and Indian plum.*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



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SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *Plant 2 Oregon ash and a Vine maple in a group behind the area of rip rap which has fallen into the river.*

Plant List:

- * *Quaking aspen: Populus tremuloides*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Red alder: Alnus rubra*
- * *Willows: Salix spp.*
- * *Oregon ash: Fraxinus latifolia*
- * *Vine maple: Acer circinatum*
- * *Sitka spruce: Picea sitchensis*
- * *Western hemlock: Tsuga heterophylla*
- * *Snowberry: Symphoricarpos albus*
- * *Sword fern: Polystichum munitum*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Ninebark: Physocarpus capitatus*
- * *Thimbleberry: Rubus parviflorus*
- * *Tall Oregon grape: Berberis aquifolium*
- * *Indian plum: Osmoronia cerasiformis*

Special Comments: *NONE*

SITES 90-110 SUGGESTIONS:

Purpose:

- * *To allow wildlife free movement (so it can migrate to better food sources and different habitats).*
- * *To educate people on the importance of healthy riparian zones.*
- * *To provide scour holes and riffles in which fish can feed and rest.*

Implementation:

- * *Run 10 foot wide corridors of mixed deciduous and coniferous trees with low growing shrubs from the vegetation along the river to the large islands of trees.*
- * *Put interpretive signs at the trees nearest the riparian zone and beside the foot bridges. These signs should describe the importance and functions of healthy riparian zones.*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *Put root balls in the river at 60 to 100 foot intervals. These root balls should be anchored to the bank or into the river bed unless they are large enough that they will not move during floods. Do not place them near the bridges.*

Plant List:

- * *Vine maple: Acer circinatum*
- * *Oregon ash: Fraxinus latifolia*
- * *Oregon white oak: Quercus garryana*
- * *Quaking aspen: Populus tremuloides*
- * *Western hemlock: Tsuga heterophylla*
- * *Douglas fir: Pseudotsuga menziesii*
- * *Western redcedar: Thuja plicata*
- * *Snowberry: Symphoricarpos albus*
- * *Salal: Gaultheria shallon*
- * *Sword fern: Polystichum munitum*
- * *Evergreen huckleberry: Vaccinium ovatum*

Special Comments:

- * *The corridors of vegetation must not interfere with normal golf course activities.*

K. Site 100

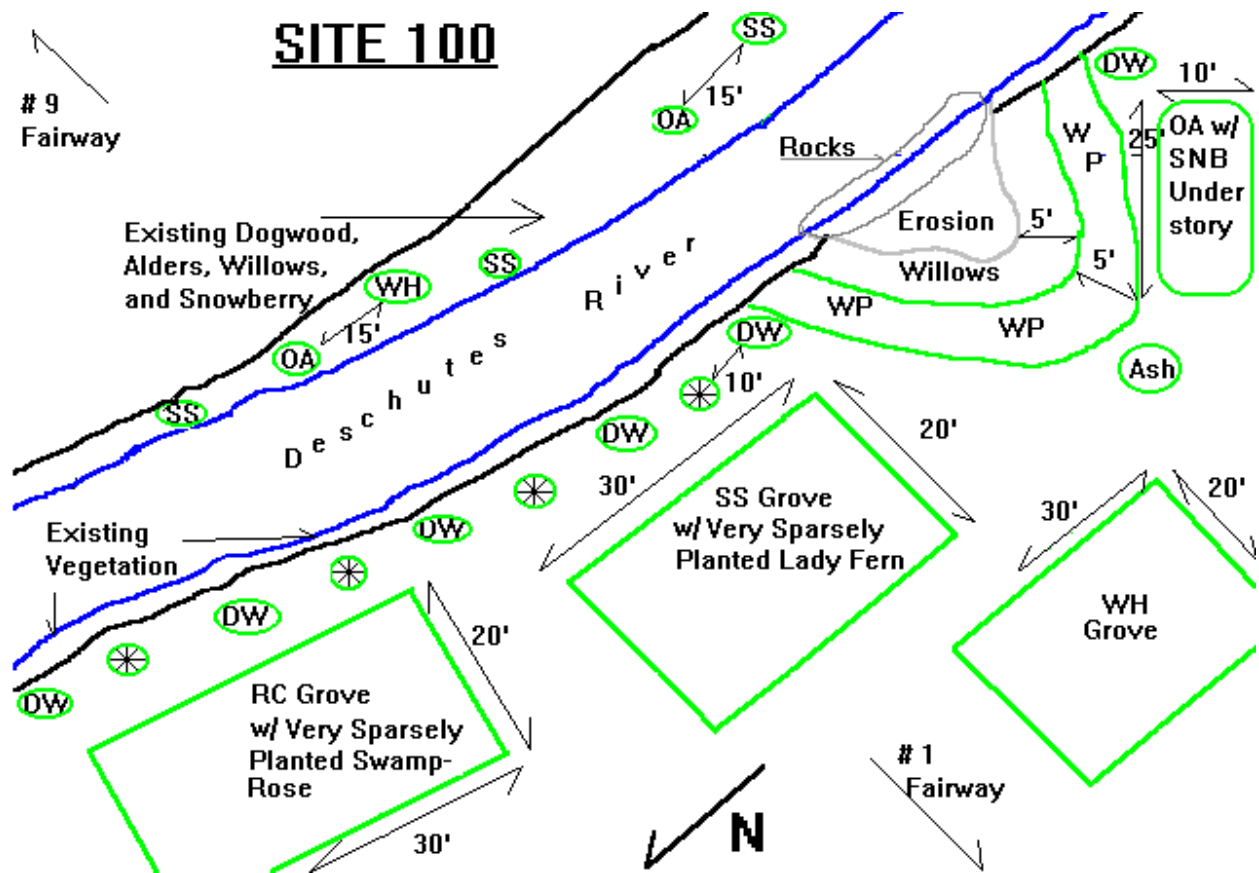
Purpose:

- * *To shade the river.*
- * *To provide overhanging vegetation for fish cover.*
- * *To inhibit erosion.*
- * *To provide food and habitat to terrestrial wildlife.*
- * *To maintain air flow through the golf course.*

Implementation:

- * *Plant willows and dogwoods on 10 foot centers along the west bank behind the existing vegetation.*
- * *Plant a 20 by 30 foot Sitka spruce grove with Lady fern sparsely planted below the trees behind the willow/dogwood strip along the bend of river.*
- * *Plant a 20 by 30 foot Western red cedar grove with no understory behind the Sitka spruce grove.*

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



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SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *Plant a 20 by 30 foot Western hemlock grove with Swamp rose sparsely planted below the trees just downriver from the Sitka spruce grove.*
- * *For the erosion site in this area, rock the toe using variously shaped and sized rocks. Lightly rock the eroding bank and plant it with willows. Along the top of the bank, plant a 4 to 6 foot strip of willows. Behind the willows, plant a 4 to 6 foot strip of Western paperbirch.*
- * *Behind the Western paperbirch, on the upstream side, plant a 10 by 25 foot Oregon ash grove with a Snowberry understory.*
- * *Plant willows or dogwoods in any gaps in the existing vegetation along the east bank.*
- * *Plant Sitka spruce, Oregon ash, and Western hemlock 10 to 15 feet apart throughout the wide band of existing vegetation on the east bank.*

Plant List:

- * *Willows: Salix spp.*
- * *Sitka spruce: Picea sitchensis*
- * *Oregon ash: Fraxinus latifolia*
- * *Western hemlock: Tsuga heterophylla*
- * *Western red cedar: Thuja plicata*
- * *Swamp rose: Rosa pisocarpa*
- * *Sword fern: Polystichum munitum*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Western paperbirch: Betula papyrifera var. subcordata*
- * *Western hemlock: Tsuga heterophylla*
- * *Snowberry: Symphoricarpos albus*

Special Comments:

- * ***A set of shallow wires runs back from and along the bank in this section. There is also an irrigation system in this area. The greenskeeper has a map of these wires and pipes. This map should be examined carefully before attempting to plant this site.***

SITE 100 SUGGESTIONS: SEE SUGGESTIONS FOR SITES 90-110 ON PAGE 290.

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

L. Site 110

Purpose:

- * *To shade the river.*
- * *To provide overhanging vegetation for fish cover.*
- * *To inhibit erosion.*
- * *To provide food and habitat to terrestrial wildlife.*
- * *To maintain airflow through the golf course.*

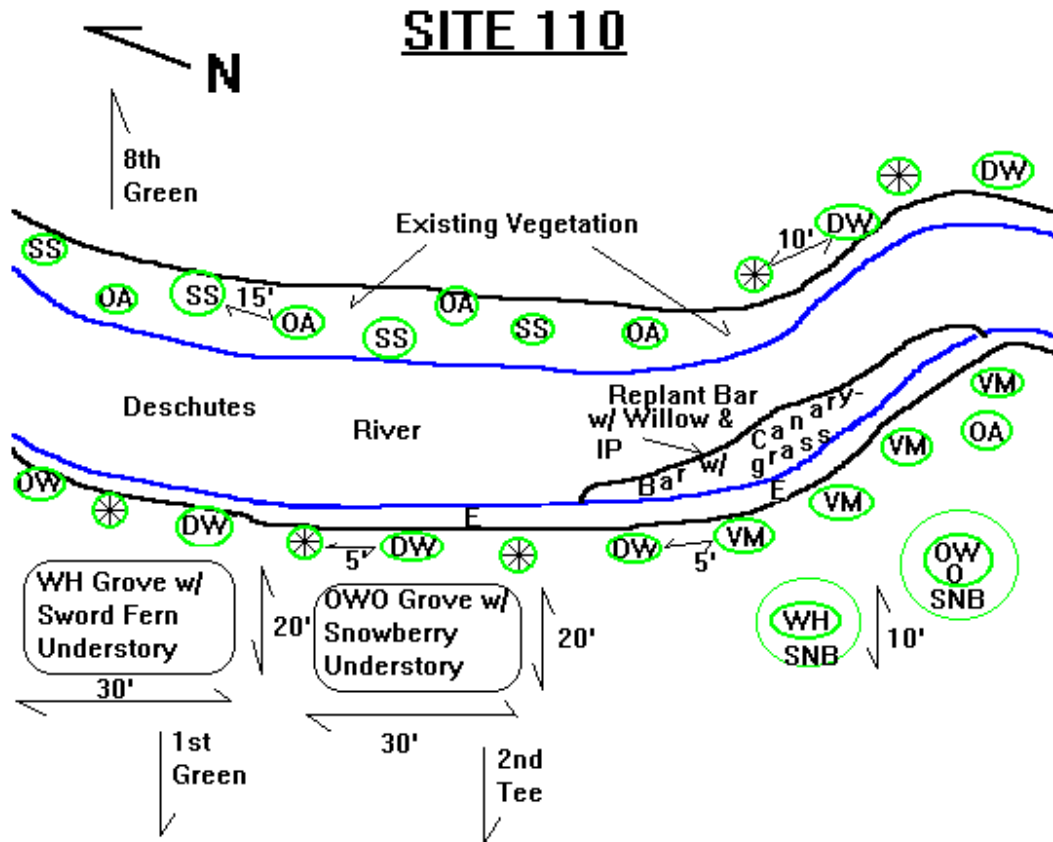
Implementation:

- * *Plant willows and dogwoods on 5 foot centers behind the existing vegetation on the west bank.*
- * *Replace the Reed canary grass growing on the bar along the west bank with Ninebark and willows.*
- * *Plant a long narrow grove of Western hemlock directly behind the dogwoods and willows. Plant ferns as an understory.*
- * *Plant a long narrow grove of Oregon white oak just upriver from the Western hemlock grove. Plant a Snowberry understory.*
- * *Plant Sitka spruce and Oregon ash throughout the wide area of existing vegetation on the east bank.*
- * *Plant dogwood and willows on 10 foot centers behind the narrow band of existing vegetation on the east bank.*
- * *Do not spray pesticides or fertilizers within 30 feet of the river.*
- * *Plant an Oregon white oak 50 to 100 feet upriver from the Oregon white oak grove. Plant a 10 foot diameter circle of Snowberry around the tree.*
- * *Plant an Oregon ash about 20 feet upriver from the Oregon white oak. Plant a 10 foot diameter circle of Snowberry around the tree.*

Plant List:

- * *Sitka spruce: Picea sitchensis*
- * *Oregon ash: Fraxinus latifolia*
- * *Willows: Salix spp.*
- * *Red-osier dogwood: Cornus stolonifera*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



Symbols

- | | |
|------------------------------------|-------------------------|
| A = Red alder | OA = Oregon Ash |
| BC = Bitter Cherry | OG = Oregon Grape |
| BE = Blue Elderberry | OS = Ocean Spray |
| BLM = Bigleaf Maple | OWO = Oregon White Oak |
| BR = Hardstem and Softstem Bulrush | QA = Quaking Aspen |
| CA = Western Crabapple | RC = Western Red Cedar |
| CS = Cascara | RE = Red Elderberry |
| CW = Black Cottonwood | S = Sedges |
| DF = Douglas Fir | SB = Scotch Broom |
| DW = Red-osier Dogwood | SLB = Salmonberry |
| E = Existing Vegetation | SNB = Snowberry |
| H = Black Hawthorn | SS = Sitka Spruce |
| HS = Hardhack Spireae | TB = Thimbleberry |
| IP = Indian Plum | VM = Vine Maple |
| MO = Mock Orange | WH = Western Hemlock |
| 9 = Ninebark | WP = Western Paperbirch |
| * = Willows | WR = Wild and Wood Rose |

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * Vine maple: *Acer circinatum*
- * Western hemlock: *Tsuga heterophylla*
- * Oregon white oak: *Quercus garryana*
- * Western red cedar: *Thuja plicata*
- * Snowberry: *Symphoricarpos albus*

Special Comments:

- * *A set of shallow wires runs along the bank in this section. There is also an irrigation system in this area. The greenskeeper has a map of these wires and pipes. This map should be examined carefully before attempting to plant this site.*

SITE 110 SUGGESTIONS: SEE SUGGESTIONS FOR SITES 90-110 ON PAGE 290.

M. Site 120

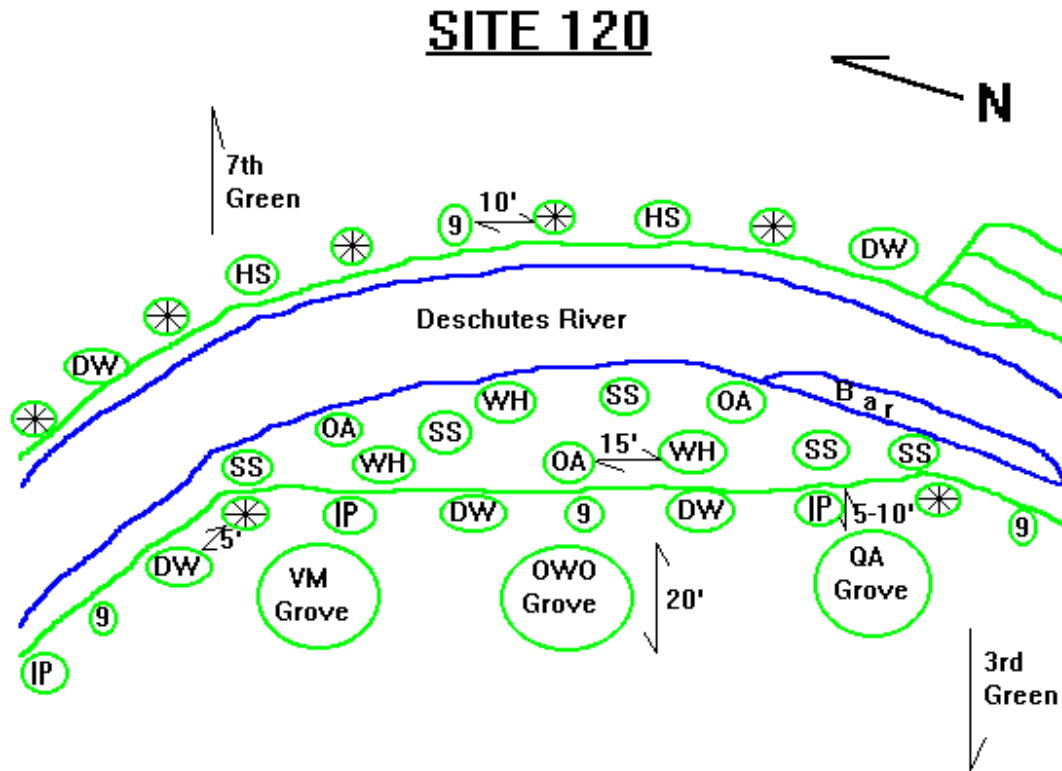
Purpose:

- * *To shade the river.*
- * *To provide overhanging vegetation for fish cover.*
- * *To inhibit erosion.*
- * *To provide food and habitat to terrestrial wildlife.*
- * *To maintain airflow through the golf course.*
- * *To maintain a view across the river.*

Implementation:

- * *Plant dogwood, Indian plum, Ninebark, and willows on 5 foot centers behind the band of existing vegetation on the west bank.*
- * *Plant Sitka spruce, Oregon oak, and Western hemlock on 10 foot centers throughout the wide band of vegetation on the west bank.*
- * *Plant a 20 foot diameter circle of Vine maples behind the existing vegetation on the west bank.*
- * *Plant a 20 foot diameter circle of Oregon white oak behind the existing vegetation on the west bank.*
- * *Plant a 20 foot diameter circle of Quaking aspen behind the existing vegetation on the west bank.*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



Symbols

- | | |
|------------------------------------|-------------------------|
| A = Red alder | OA = Oregon Ash |
| BC = Bitter Cherry | OG = Oregon Grape |
| BE = Blue Elderberry | OS = Ocean Spray |
| BLM = Bigleaf Maple | OWO = Oregon White Oak |
| BR = Hardstem and Softstem Bulrush | QA = Quaking Aspen |
| CA = Western Crabapple | RC = Western Red Cedar |
| CS = Cascara | RE = Red Elderberry |
| CW = Black Cottonwood | S = Sedges |
| DF = Douglas Fir | SB = Scotch Broom |
| DW = Red-osier Dogwood | SLB = Salmonberry |
| E = Existing Vegetation | SNB = Snowberry |
| H = Black Hawthorn | SS = Sitka Spruce |
| HS = Hardhack Spireaea | TB = Thimbleberry |
| IP = Indian Plum | VM = Vine Maple |
| MO = Mock Orange | WH = Western Hemlock |
| 9 = Ninebark | WP = Western Paperbirch |
| * = Willows | WR = Wild and Wood Rose |

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *Plant willows, Hardhack spiraea, and dogwoods on 10 foot centers behind the existing vegetation on the east bank.*
- * *Plant willows in any gaps in the existing vegetation along the east bank.*

Plant List:

- * *Willows: Salix spp.*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Hardhack spiraea: Spiraea douglasii*
- * *Red alder: Alnus rubra*
- * *Oregon ash: Fraxinus latifolia*
- * *Quaking aspen: Populus tremuloides*
- * *Sitka spruce: Picea sitchensis*
- * *Western red cedar: Thuja plicata*
- * *Western hemlock: Tsuga heterophylla*
- * *Vine maple: Acer circinatum*
- * *Indian plum: Osmoronia cerasiformis*
- * *Oregon white oak: Quercus garryana*

Special Comments:

- * ***A set of shallow wires runs along the bank in this section. There is also an irrigation system in this area. The greenskeeper has a map of these wires and pipes. This map should be examined carefully before attempting to plant this site.***
- * *Irrigation pipes run along the east bank on this site. When planting, a golf course employee should be present to help point out the location of the pipes so they are not damaged during the re-vegetation process.*

SITE 120 SUGGESTIONS:

Purpose:

- * *To stabilize the gravel bar below the #4 tee bridge.*
- * *To create feeding, resting and hiding places for fish.*

Implementation:

- * *Plant willows throughout the bar.*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

Plant List:

- * *Willows: Salix spp.*

Special Comments: *NONE*

N. Site 130

Purpose:

- * *To better shade the river.*
- * *To provide more overhanging vegetation for fish cover.*
- * *To provide better and more diversified terrestrial habitat.*
- * *To filter chemicals from runoff.*

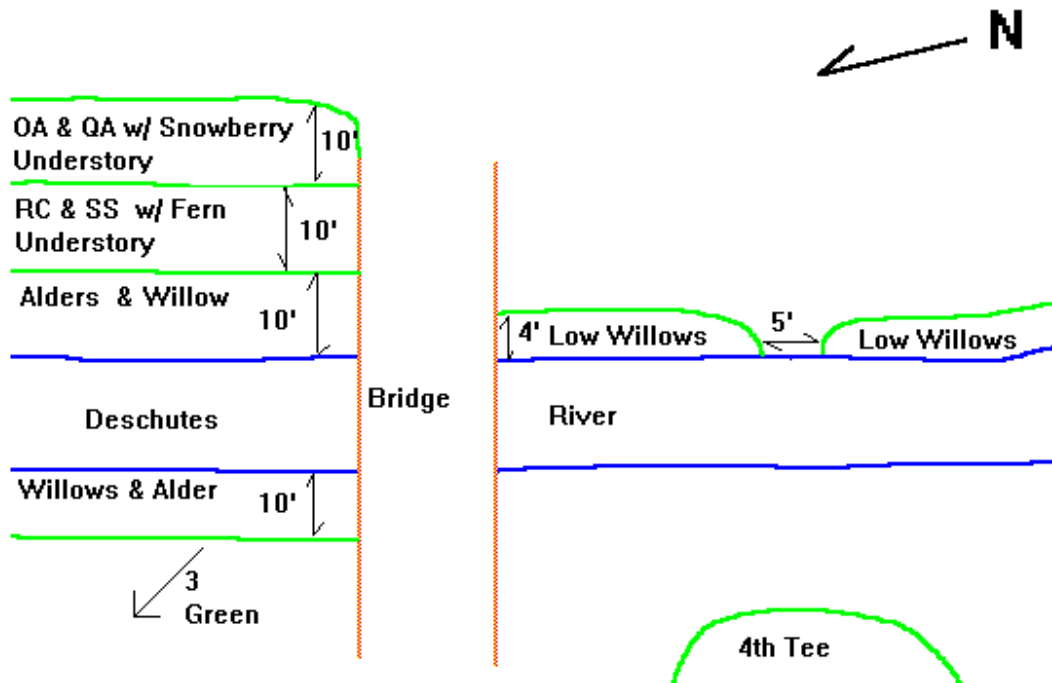
Implementation:

- * *Plant 2 strips of low growing willows across the river from the number 4 tee. The first strip should run from the foot bridge along the river bank for 15 to 25 feet. A 5 to 10 foot space should be left between this strip and the next strip which should run along the bank until it joins the existing willows up river.*
- * *Plant willows and alders along the east bank behind the existing band to fill out the existing band of willows and alders to 10 feet wide 60 feet long.*
- * *Plant a 10 foot by 60 foot long strip of Oregon ash and Quaking aspen behind the existing alders on the east bank.*
- * *Plant a 10 foot wide by approximately 60 foot long strip of Western red cedar and Sitka spruce behind the above-mentioned strip.*
- * *Plant willow and alder along the edge of the bank just downriver from the foot bridge on the west bank. This strip should be 10 feet wide and 60 feet long.*

Plant List:

- * *Sitka spruce: Picea sitchensis*
- * *Oregon ash: Fraxinus latifolia*
- * *Willow: Salix spp.*
- * *Red alder: Alnus rubra*
- * *Quaking aspen: Populus tremuloides*
- * *Western red cedar: Thuja plicata*

SITE 130



Symbols

- | | |
|------------------------------------|-------------------------|
| A = Red alder | OA = Oregon Ash |
| BC = Bitter Cherry | OG = Oregon Grape |
| BE = Blue Elderberry | OS = Ocean Spray |
| BLM = Bigleaf Maple | OWO = Oregon White Oak |
| BR = Hardstem and Softstem Bulrush | QA = Quaking Aspen |
| CA = Western Crabapple | RC = Western Red Cedar |
| CS = Cascara | RE = Red Elderberry |
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| DF = Douglas Fir | SB = Scotch Broom |
| DW = Red-osier Dogwood | SLB = Salmonberry |
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| * = Willows | WR = Wild and Wood Rose |

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

Special Comments:

- * *Snowberry, Salmonberry and/or ferns could be planted as an understory for the Oregon ash grove and strips of Red cedar and Sitka spruce.*
- * *Any work done on the golf course will need to be overseen by golf course staff.*
- * *Any vegetation on the bank opposite the number 4 tee must be lower than tee level.*

O. SITE 135 (suggestion site):

Purpose:

- * *To maintain fish habitat.*

Implementation:

- * *Do not remove any woody debris from this bend.*

Special Comments: *NONE*

P. Site 135a (suggestion site):

Purpose:

- * *To create and maintain fish habitat.*

Implementation:

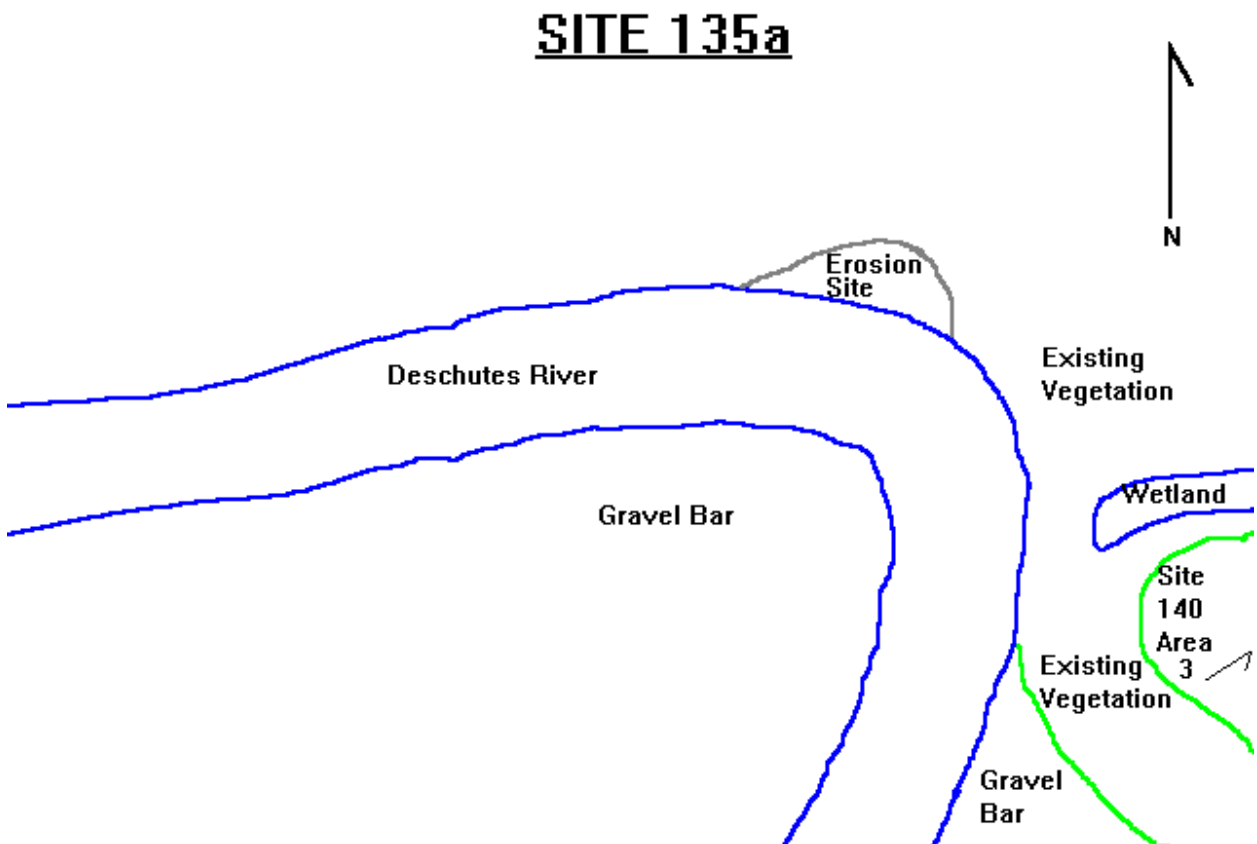
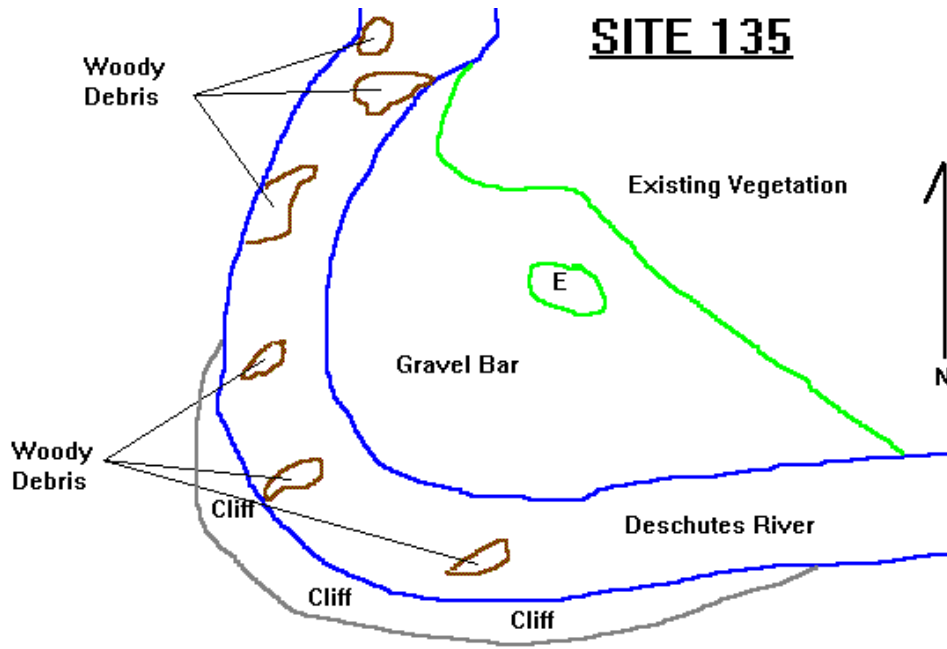
- * *Let the erosion site in this area continue to erode.*

Special Comments: *NONE*

Q Site 140

Purpose:

- * *To improve wildlife habitat.*
- * *To better shade the river.*



SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

Implementation:

Area 1:

- * *Remove all existing Scotch broom.*
- * *Plant a six foot wide strip of alders and willows all along the bank.*
- * *Behind the alders, plant a 10 foot strip of Western hemlock and Sitka spruce with an understory of Salmonberry and Thimbleberry.*
- * *Behind the above band, plant a band of Western red cedar and Western hemlock with a fern understory.*
- * *Behind the cedar/hemlock band, plant a 10 foot band of Douglas fir with Salmonberry, Thimbleberry and fern understory.*
- * *Behind the Douglas fir band, plant Snowberry and Black hawthorn.*

Area 2:

- * *Behind the existing willows, plant a 10 to 20 foot band of Black cottonwood and Sitka spruce with a Salmonberry understory.*
- * *Behind the cottonwood and spruce band, plant a Quaking aspen, Bitter cherry, and Cascara grove with Serviceberry understory.*

Area 3:

- * *Plant 2 wide bands of Western paperbirch and Black cottonwood all along the edges of this clearing bordering the existing willow and alder stands.*

Plant List:

- * *Snowberry: Symphoricarpos albus*
- * *Black hawthorn: Crataegus douglasii*
- * *Douglas fir: Pseudotsuga menziesii*
- * *Salmonberry: Rubus spectabilis*
- * *Thimbleberry: Rubus parviflorus*
- * *Ferns: Athyrium filix-femina*
- * *Western red cedar: Thuja plicata*
- * *Western hemlock: Tsuga heterophylla*
- * *Bigleaf maple: Acer macrophylla*

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *Sitka spruce: Picea sitchensis*
- * *Willows: Salix spp.*
- * *Red alder: Alnus rubra*
- * *Black cottonwood: Populus trichocarpa*
- * *Quaking aspen: Populus tremuloides*
- * *Bitter cherry: Prunus emarginata*
- * *Cascara: Rhamnus purshiana*
- * *Serviceberry: Amelanchier alnifolia*
- * *Western paperbirch: Betula papyrifera var. subcordata*

Special Comments:

- * *There is currently a band of willows and alders growing along the river bank throughout this area. This band is healthy and wide in some places. In a few places it is thin or nonexistent. These areas should be replanted.*
- * *The width of the band of alders and willows varies. Bands of trees planted behind it should follow the meandering of its edge.*

R. Site 145 (suggestion site):

Purpose:

- * *To create areas for fish to feed, hide and rest.*

Implementation:

- * *Place large organic debris in the river. Anchor debris which is small enough to wash away in high flows. Large root balls and boulders would work well here.*

Special Comments: *NONE*

S. Site 145a (suggestion site):

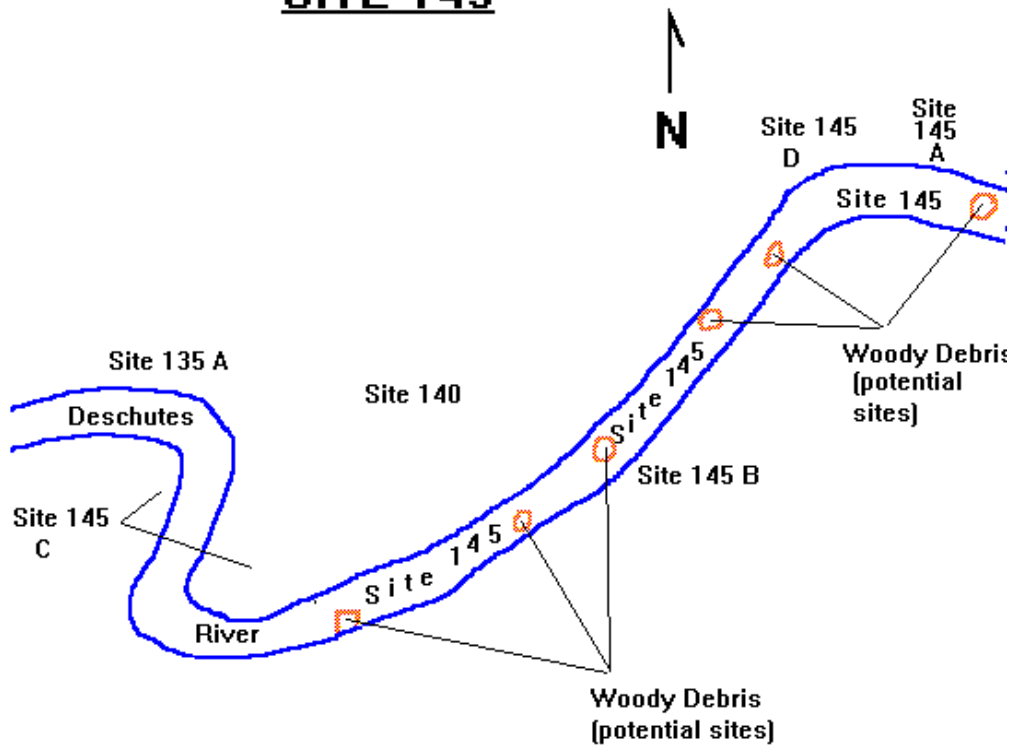
Purpose:

- * *To create a better environment for native vegetation.*
- * *To create overhanging vegetation to shade the river and under which fish can hide.*

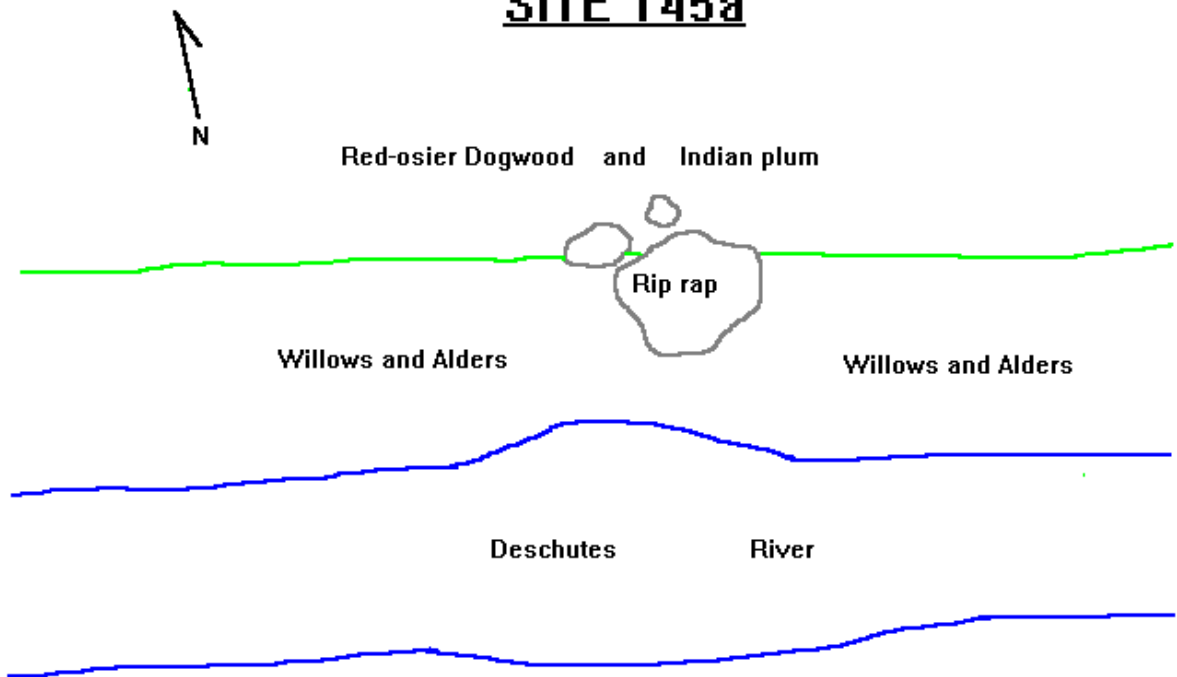
Implementation:

- * *Break up the large piece of concrete rip-rap and remove the pieces.*

SITE 145



SITE 145a



SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

- * *Plant the area with willows and alders along the bank.*
- * *Behind the willow/alder strip, plant a 5 to 10 foot wide strip of Red-osier dogwood and Indian plum.*
- * *Behind the dogwood/Indian plum strip, plant a 10 foot wide strip of Sitka spruce with a Thimbleberry understory.*

Plant List:

- * *Willows: Salix spp.*
- * *Red alder: Alnus rubra*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Sitka spruce: Picea sitchensis*
- * *Thimbleberry: Rubus parviflorus*

Special Comments:

- * *Thurston Conservation District is considering a revegetation project in this area. Any work on this site should be coordinated with the District. Contact: Jeff Swotek, 754-3588, 2407 Pacific Avenue S.E., Olympia, WA.*

T. Site 145b (suggestion site):

Purpose:

- * *To prevent erosion.*
- * *To provide overhanging vegetation under which fish can hide.*
- * *To shade the river.*

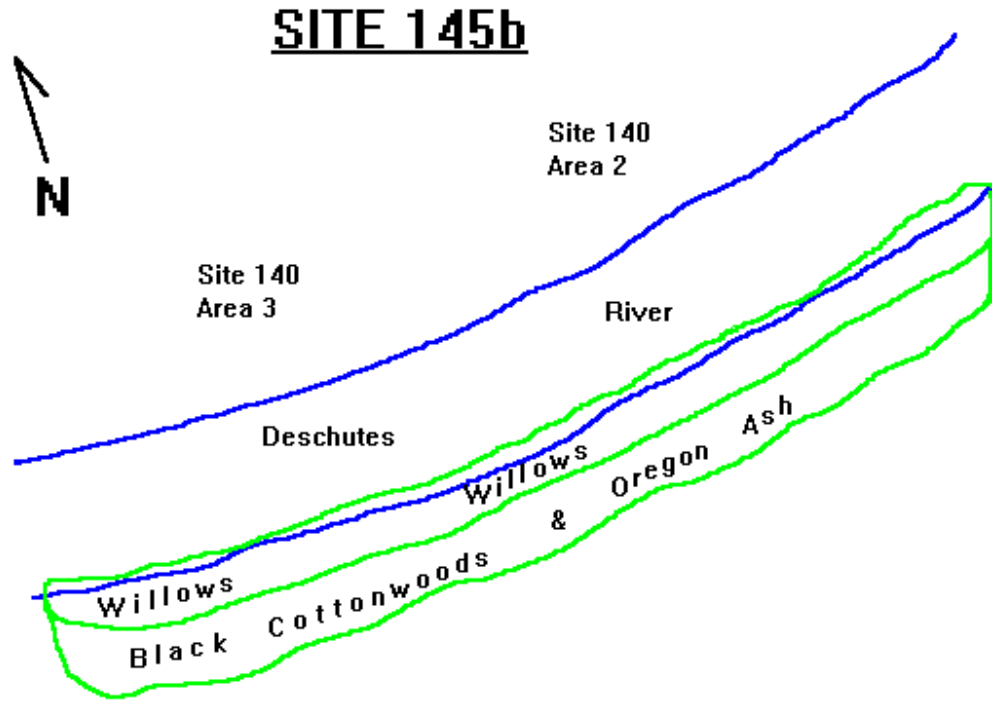
Implementation:

- * *Plant willows along the face of the bank on the County side of the river just south of the southern-most gravel bar.*
- * *Plant Oregon ash and Black cottonwood behind the willows.*

Plant List:

- * *Willows: Salix spp.*
- * *Sitka spruce: Picea sitchensis*
- * *Black cottonwood: Populus trichocarpa*

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN



SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

Special Comments: *NONE*

U. Site 145c (suggestion site):

Purpose:

- * *To provide nesting sites for birds.*
- * *To maintain fish habitat.*

Implementation:

- * *Place several nesting boxes throughout this area.*
- * *Do not remove any woody debris from this area.*

Special Comments: *NONE*

V. Site 145d (suggestion site):

Purpose:

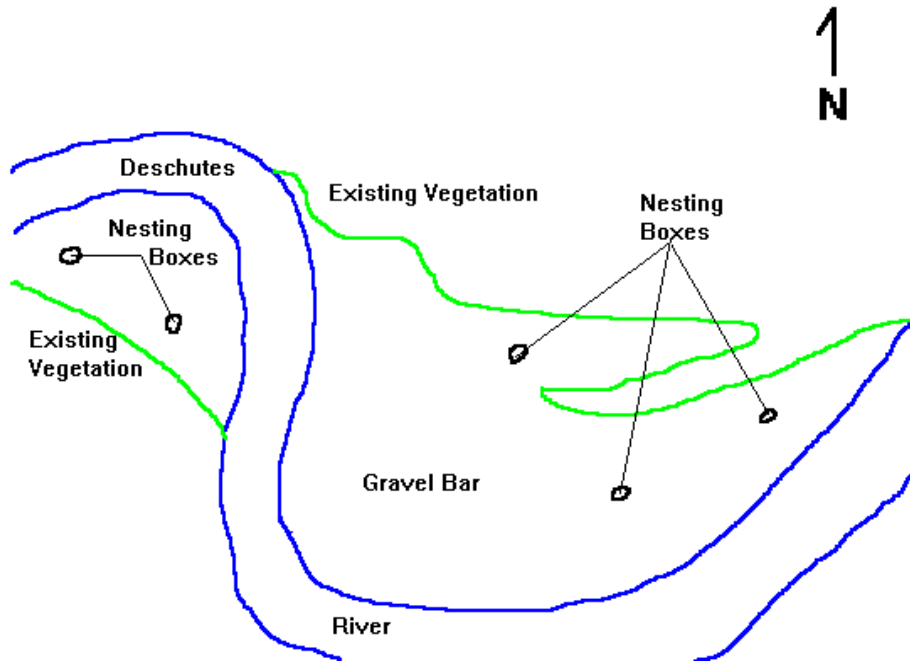
- * *To create areas for fish to feed, hide and rest.*
- * *To prevent erosion.*
- * *To provide detritus to the river.*

Implementation:

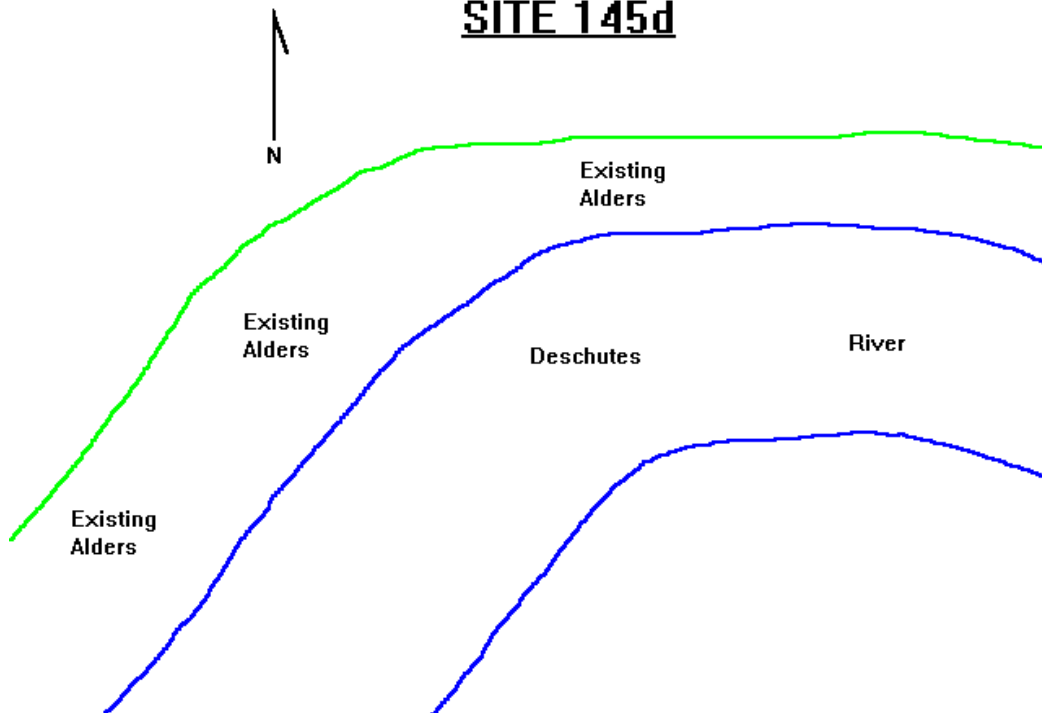
- * *Put large logs, root balls and/or boulders in the stream. Place them such that they do not direct the current toward either shore.*
- * *Monitor the alders throughout this strip regularly. If they appear to be falling into the river, cut them off at a height of 5 feet above ground. Cable the tops of the trees to the remaining 5 foot tall stump and let them fall into the river.*

Special Comments: *NONE*

SITE 145c



SITE 145d



SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

W. Site 150

Purpose:

- * *To provide overhanging vegetation for fish cover.*
- * *To stabilize the bank.*
- * *To provide food and habitat for wildlife.*

Implementation:

- * *Plant a 5 to 10 foot strip of willows along the bank. This strip should extend around the hole caused by currents flowing around the bridge support.*
- * *Plant a 5 to 10 foot strip of Red-osier dogwood and Indian plum behind the willow strip.*
- * *Remove the existing Reed canary grass.*
- * *Plant a 20 foot wide strip of Vine maple.*
- * *Beneath the Vine maples plant an understory of Snowberry, ferns and Salmonberry.*

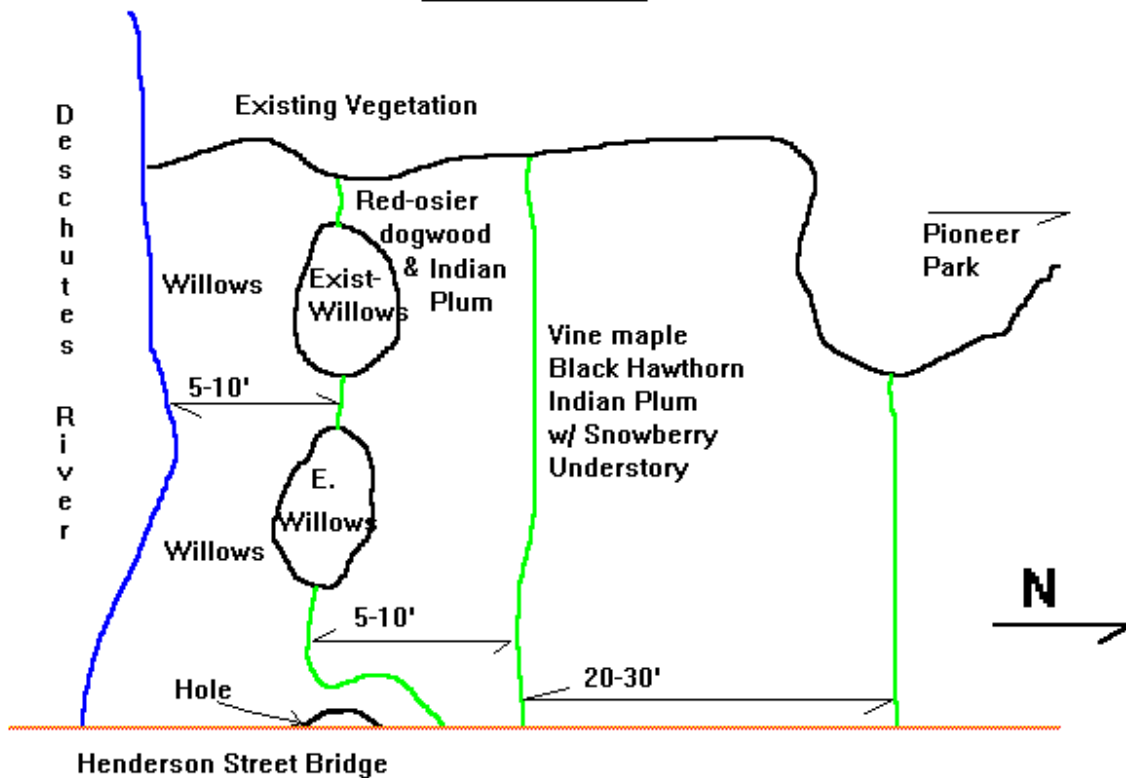
Plant List:

- * *Snowberry: Symphoricarpos albus*
- * *Ferns: Athyrium filix-femina*
- * *Salmonberry: Rubus spectabilis*
- * *Red-osier dogwood: Cornus stolonifera*
- * *Indian plum: Osmoronia cerasiformis*
- * *Willows: Salix spp.*
- * *Vine Maple: Acer circinatum*

Special Comments:

- * *Wires run over this site, so no tall trees can be planted here.*

SITE 150



Symbols

- | | |
|------------------------------------|-------------------------|
| A = Red alder | OA = Oregon Ash |
| BC = Bitter Cherry | OG = Oregon Grape |
| BE = Blue Elderberry | OS = Ocean Spray |
| BLM = Bigleaf Maple | OWO = Oregon White Oak |
| BR = Hardstem and Softstem Bulrush | QA = Quaking Aspen |
| CA = Western Crabapple | RC = Western Red Cedar |
| CS = Cascara | RE = Red Elderberry |
| CW = Black Cottonwood | S = Sedges |
| DF = Douglas Fir | SB = Scotch Broom |
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| IP = Indian Plum | VM = Vine Maple |
| MO = Mock Orange | WH = Western Hemlock |
| 9 = Ninebark | WP = Western Paperbirch |
| * = Willows | WR = Wild and Wood Rose |

IV. ADDITIONAL INFORMATION

This part of the plan provides additional information to assist groups in completing the site projects included in this plan. For additional assistance, contact the Policy and Planning Department, City of Tumwater, 555 Israel Road SW, Tumwater, WA, (206) 754-4160.

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

Technical assistance is also available by contacting the Thurston Conservation District, 2407 Pacific Avenue SE, Olympia, WA, (206) 754-3588.

This part of the plan is composed of four sections. Section 1 suggests places and ways of obtaining native plants. Section 2 lists and describes several community groups which might be interested in assisting in carrying out the site projects. Section 3 describes permits necessary for undertaking the site projects. Section 4 shows current land ownership along the Deschutes River in Tumwater.

A. Section 1. Where to Get Native Plants

Following is a list of places to obtain native plants. It is not an exhaustive list but offers some places to start looking.

Government Agencies:

1. Washington State Department of Natural Resources: Webster Nursery, 206-753-5305. The Webster Nursery sells only conifers. They do not keep a large variety of trees in stock at all times, so call ahead of time to make sure they have the desired trees.
2. Thurston Conservation District: 206-753-9448. The Conservation District takes orders for plants year round. Then, once a year they sell these plants.

Private Companies:

1. Weyerhaeuser Timber Company: Weyerhaeuser sells conifers and several varieties of deciduous trees. They need a 5 to 10 day lead time for orders.
2. Hortus Northwest: A Pacific Northwest Native Plant Directory and Journal, edited by Dale Shank. This annual journal contains a directory of nurseries which sell native plants. To receive a copy send \$ 9.00 to Hortus Northwest, PO Box 955, Canby, OR 97013
3. Briggs Nursery, Inc., 4407 Henderson Boulevard, Olympia, WA 98501, (206) 352-5405.

SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

4. Storm Lake Growers, Snohomish, WA (206) 794-4842 (wholesale only).
5. Pacific Wetland Nursery, 7035 Crawford Drive, Kingston, WA 98346, (206) 297-7575.
6. Watershed Garden Works, Gig Harbor, WA (206) 857-2785 or 2039 - 44th Ave., Longview, WA 98632, (206) 423-6456.
7. Sound Native Plants, PO Box 10155, Olympia, WA 98502, (206) 866-1046.
8. IFA Nursery, 135 Nisqually Cutoff Road, Olympia, WA (206) 456-5669.

Rescuing Plants:

1. When developers develop land, they often remove the plants on the development site. These plants can be used on re-vegetation sites if they are removed and handled properly.

B. Section 2. Volunteer Groups Concerned with Riparian Zones

Following is a list and brief description of several non-profit groups which work on rehabilitating and preserving ecologically sensitive areas. This list is not comprehensive but it offers a place to start looking for community participation in site restoration projects.

Olympia, Lacey and Thurston County Stream Teams:

Stream Team is a volunteer group made up of community members of all ages and walks of life. They do stream clean-up, re-vegetation projects, monitoring stream health, and species census among other activities. The goal of Stream Team is to involve the community in enhancing local water resources. For more information contact Wendy Burt at the City of Olympia: 206-753-8598, City of Olympia, Public Works, Water Resources, P.O. Box 1967, Olympia, WA 98506; Susie Vanderberg, Thurston County, Public Works Department, (206) 754-4681; or Jared Burbidge, City of Lacey, Public Works Department, (206) 491-5600.

Project GREEN:

Project GREEN is a volunteer group composed of students and their teachers. Project GREEN activities include water quality monitoring, studying watershed ecology, community service/action projects, and student congress among others. The main goal of GREEN is to educate and activate young people about water issues. For more

SECTION TEN -- DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

information contact Lisa Bryce Lewis at 206-943-3445, 1303 7th Ave. SW, Olympia, WA 98502-5316

Washington Senior Environmental Corp:

The Senior Environmental Corp is made up of volunteers over 55 years of age. They will undertake most environmentally oriented projects. They concentrate on public outreach and education, and monitoring projects rather than physical labor projects. For more information contact Pamela Jane Morgan at 206-438-7630.

Washington Ecology Youth Corp:

The State of Washington founded the Washington Youth Corp in 1983 to conserve natural resources and to provide job training for young people 18 to 25 years of age. The Corp developed Surface Water Action Teams (SWAT) to work on water quality projects including non-point pollution problems and bioengineering projects. Community groups or government entities must sponsor the projects; they may not be sponsored by private individuals. Before the Corp can undertake a project, the sponsor must provide specifications of the project, any materials needed, any large or specialized equipment and any specialized technical expertise. For information, contact Kirk Thomas at (206) 459-6139.

C. Section 3. Obtaining Permits for Projects

Following is a brief description of the permits that may be necessary for undertaking site restoration projects and where to apply for these permits. More detailed information may be obtained through the City of Tumwater's Development Services Department and the Washington State Department of Fisheries.

Shoreline Permits:

Some of the re-vegetation projects in this plan may require a shoreline permit. These permits are acquired through the City of Tumwater's Development Services Department. They may require several months to process, so paperwork should be filed early. To find out if a shoreline permit is required for a particular site project, contact Bob Boothe, 754-4180, City of Tumwater, Development Services, 555 Israel Rd. SW, Tumwater, WA, 98501.

State Environmental Policy Act:

Site projects that involve regrading or excavation of more than 100 cubic yards of soil may be subject to consideration under the State Environmental Policy Act (SEPA). Completion of a SEPA checklist may be required. Contact person: Bob Boothe, 754-4180, City of Tumwater, Development Services, 555 Israel Rd. SW, Tumwater, WA 98501.

Hydraulics Permits:

Any of the site projects which will divert, obstruct or change the natural flow of the river; involve regrading the river bank; or involve working below the river's ordinary high water mark may require a hydraulics permit from the Washington State Department of Fisheries or Wildlife. If required, a hydraulics permit application process will include submission of a written plan and a site visit. To determine if a hydraulics permit is required for a particular site project, contact Jim Frazier, 902-2571, Washington State Department of Fisheries, Olympia, WA.

D. Section 4. Contacting Landowners

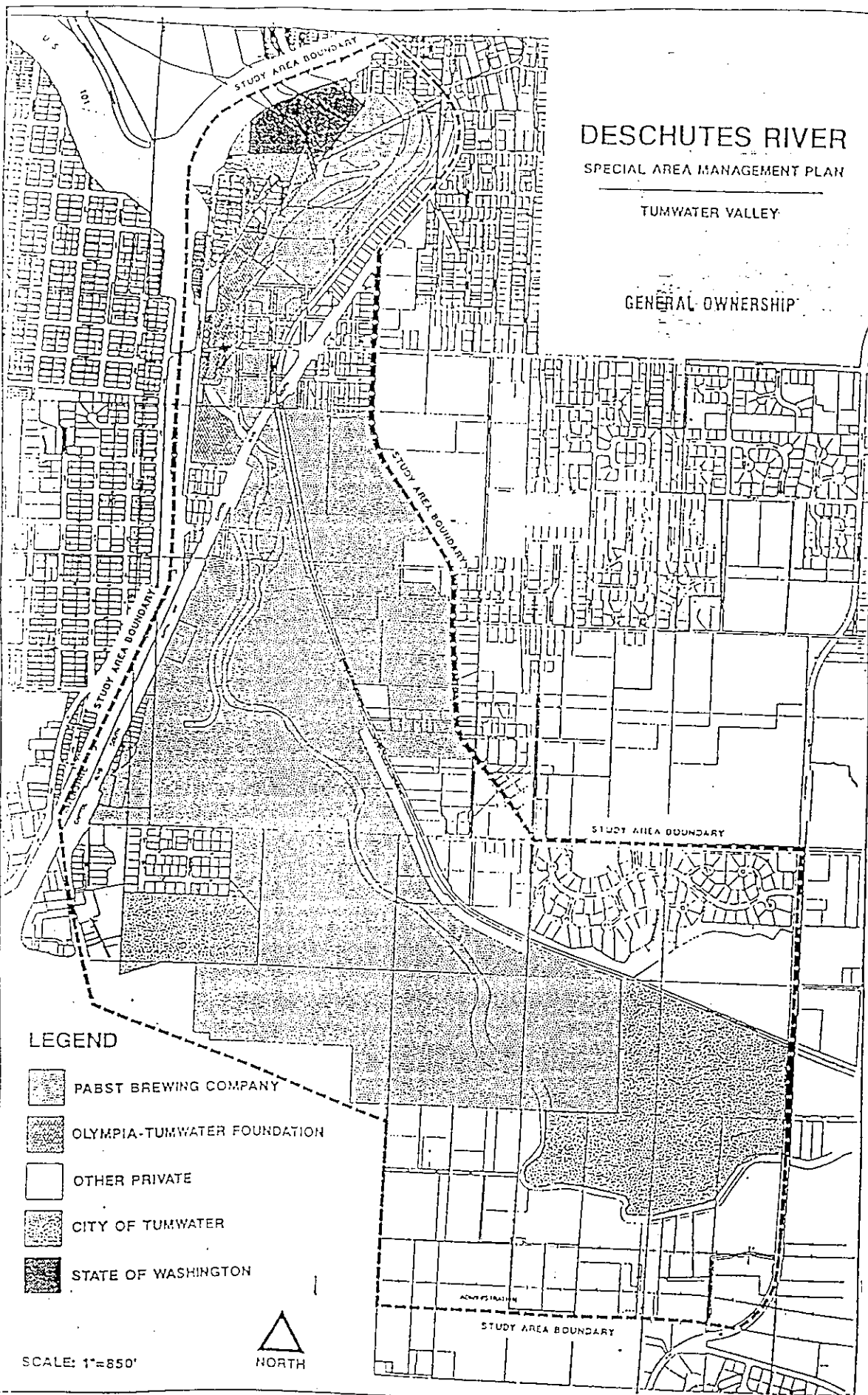
Community groups interested in carrying out one or more of these projects should work closely with the land holders. Current land ownership is shown on the Land Ownership Map. If a group needs assistance in contacting land owners, they may request assistance from Tumwater City Staff. (See Ownership map.)

DESCHUTES RIVER






SPECIAL AREA MANAGEMENT PLAN

TUMWATER VALLEY

GENERAL OWNERSHIP



LEGEND

-  PABST BREWING COMPANY
-  OLYMPIA-TUMWATER FOUNDATION
-  OTHER PRIVATE
-  CITY OF TUMWATER
-  STATE OF WASHINGTON

SCALE: 1"=850'



SECTION TEN --DESCHUTES RIPARIAN HABITAT REHABILITATION PLAN

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