Campus Stewardship Option
Wetland Creation
On McLane Forest

Presented to:

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The Evergreen State College
February 2001

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Introduction

The Wetland Option group began our Campus Stewardship Option on campus, with the plan in mind to do stream restoration. After walking a majority of the streams and wetland areas of the campus, we decided that there really wasn't much we could do to enhance them, they had either already been enhanced, or they didn't need any restoration. We went to Jim Stroh, a hydrology professor at the college, to see if he had any better information on a wetland project. He suggested that we help him on a project that he has already spent a few years working on and collecting data for. After discussing this option with our professor, Dr. Gabe Tucker, he advised us against using the site Stroh suggested because a portion of it was privately owned off campus. This progression has led us to the site on the McLane Forest.

The Wetland Campus Stewardship Option group is working on the McLane Forest, owned by the county and overseen by the McLane Forest Committee. We plan to design and create a wetland on the McLane Forest, which is adjacent to south end of The Evergreen State College campus. The location of the site for creating a wetland is on the north side of The Evergreen Parkway, between the Parkway and Delphi Road, within a half-mile east of Mud Bay Road (see Fig. 1, and map in appendix). The McLane Forest consists of 23 acres, about 5 acres of it is a Douglas-fir dominant forest, and the rest is an old field being converted into a forest. Currently the area is covered in about nine-year-old scotch broom, which is an invasive non-native, which is under-planted with hemlock, Douglas-fir, and red alder. Ralph Munro's vision is that the trees will eventually grow up and shade out the scotch broom, allowing the trees to fully take over. The McLane Forest

Committee has chosen to not use any herbicides in the area, which have commonly been used by other people to get rid of the invasive scotch broom.

Figure1: Open field on McLane land with Douglas-fir forest in the background. Representative of proposed wetland creation site.

We have met with Ralph Munro and David Pearsall, members of the McLane Forest Committee, and discussed the location and logistics of creating a wetland. Ralph and David, along with the rest of the McLane Forest Committee, support our effort fully and are willing to help with the permitting process and the equipment needed for creating a wetland. The McLane Forest Committee members are a great resource to our group and act as a model because they have already gone through the process of creating wetlands on the county property including going through the permitting and design processes. The McLane Forest currently has three man-made wetland areas (see Fig. 2).

Figure 2: Largest of three constructed ponds southeast of main trail.

Management Goals and Objectives

The goals of our wetland creation option are to provide adequate habitat for wetland obligate (wetland dependant species) and associate species, stabilize banks adjacent to wetland areas to prevent erosion and siltation, enhance wildlife habitats and biodiversity, and to protect wetland areas from non-native invasive species. In our option we would like to establish access to the wetland area with minimum impact for observations and monitoring. It is important to create a place that will foster an educational environment and also be open for the community to be a part of, observe, and learn.

Some of our specific objectives to help meet our goals of increasing wildlife habitat and diversity include: creating bird boxes to encourage local bird populations,

adding down woody debris for aquatic wildlife, including small mammals, amphibians, and invertebrates, along with providing nutrients and shelter for the local ecosystem. Additional objectives include: exotic species removal (i.e. scotch broom) and planting of appropriate native wetland species. We plan on providing access to the wetland site for observation and monitoring needs by creating a trail, boardwalk, wildlife blind, or other type of low-impact access.

Preliminary site monitoring of vegetation, fish, and birds will be conducted followed by continued biological monitoring during and after the completion of the project. Monitoring will take place on a yearly basis for up to ten years to track site changes

In order to give people a sense of ownership and pride in the wetland project, it is important that the community be involved. Some ways of involving the community are to have children from the local schools help out with the planting of native species, monitoring for signs of a healthy and productive wetland, and helping with the removal of non-native invasive species. The Evergreen State College students will have the opportunity to volunteer their time to help out with the planning or implementation of any of the work projects, participating directly with the school children, and helping with wetland and environmental education.

Protection of Wetland and Riparian Zones

A wetland is" an area seasonally or permanently covered by shallow water or where the water table is close to the surface, characterized by hydric soils and hydrophilic plants and animals"(Drengson and Taylor, 1997). Wetlands must be protected and restored to sustain habitat and ecosystem functions. Wetlands are important because they

trap sediment and other debris (Washington Smartwood Guidelines, 2000), along with moderating stream flow and storing floodwater. Wetlands are important for fish habitat, improving water quality, and recharging ground water. These functions must be monitored and sustained (Department of Natural Resources, 2000).

The government protects wetlands on both the state and federal level. In section 404 of the Federal Clean Water Act, project permits must be obtained for any project that alters or destroys a wetland. The wetlands that require protection only include those that are over an acre in area and are connected to navigable waters (1989). The local government under SEPA (State Environmental Policy Act in 1971) can require more studies to be performed to determine adverse impact. They can also require an Environmental Impact Statement, mitigation program, and project modifications. Wetlands can be impacted if mitigation occurs. Public notification and review is part of the process in most cases. After that SEPA can dispute the project further because of the likelihood of adverse effects on the environment (Ehlers, 1991).

Not enough mitigation has taking place. Many wetlands in the past have been altered or destroyed because the mitigation laws do not apply or were not in place at the time. When the college was first built a small swampy area between the dormitories and Hidden Spring Drive was mostly drained during the campus construction (Balatbat et. al, 1998). Mitigation laws were not in place at that time so no mitigation was required. By creating this wetland it will establish useful habitat for many species and can fulfill requirements for mitigation even though none has been required.

Forested wetlands management is feasible. Low impact thinning by cable systems are permitted but 30-70 % of the trees should be left for habitat. The trees left

must be in clusters so that small parts of the forest can be considered undisturbed (Department of Natural Resources, 2000).

Wetland management zones (WMZ) depend on what type and how many acres of wetland are present. Washington forest practices states that "Within the WMZ, leave a total of 75 trees per acre of WMZ greater than 6 inches in dbh in Western Washington." Of the trees left 25 of them must be 12 inches or greater and including 5 that are 20 inches or greater in dbh (only where possible). Management of wetland zones is possible with restrictions (Department of Natural Resources, 2000). The McLane forest adjacent to the Possible wetland creation site is potentially going to be thinned.

Wetland protection is important to habitat and wildlife. The removal of vegetation along banks can be devastating to the wetland structure and inhabitancies because vegetation provides shade, bank stability, and reduces erosion. Also, the presence of woody debris in and around the wetland area is very important to fish and other species. (Washington Smartwood Guidelines, 2000).

When roads and trails are put in "culverts need to be placed to allow fish passage and should be large enough to contain 100 year flood levels" (Washington Smartwood Guidelines, 2000). The Washington forest practices require that wetland and riparian areas have a buffer of trees and vegetation around them as well. The extents of the buffer zones are determined by the wetland type (Department of Natural Resources 2000).

A riparian zone is" the wet forest adjacent to creeks, rivers, lakes, and wetland" (Drengson and Taylor, 1997). These areas need to be protected and enhanced to provide and maintain habitat for species diversity. Riparian areas are a focus point because they

are sensitive. The reason they are so sensitive is because they are constantly saturated, which makes the soils very vulnerable to compaction and disturbance.

There are many protection measures and rules that are practiced to protect riparian areas. To protect these areas first the wetlands must be identified and classified. The Washington State Smartwood Guidelines explain that the management of the adjacent forest must not have adverse affects on riparian zones. The riparian zones must be restored and maintained from damage done during past management actions strategies for anadromous and non-anadromous fish. Adaptive management must be in place to take measures to stabilize and prevent erosion, soil movement, and landslides. Roads and ground disturbing equipment must not be permitted into riparian zones (Washington Smartwood Guidelines, 2000).

Plant Survey

In preparation for the McLane wetland project, a plant survey should be done before any action is taken on the site. We will implement the plant survey by marking off one square meter quadrants, and identifying the plants within these plots. We can then map the plant distribution within our quadrants. We will also take photos of the plants, which will be helpful for identifying, and mapping species distribution (See Simenstad and Thom, 1996). By analyzing the spatial distribution, and diversity of species, we can better analyze the condition of the soil, as well as water and nutrient availability (Vivian-Smith, 1997).

The invasive scotch broom (*Cytisus scoparius*) is an obvious problem in McLane Forest. From our initial observations of the site, we did not note an abundance of this species directly within our site; however it is expected that its status will quickly change

due to rapid spreading, and the abundant seed source nearby. A portion of our project should address the removal of some of the scotch broom. This could be a project within itself, requiring a substantial amount of time and labor. The removal will be done without the use of chemicals, in keeping with Ralph Munro's request, (personal communication) as well as within our own guidelines. Himalayan blackberry (*Rubus discolor*) has grown over several brush piles, and dominates many disturbed areas on the west side of the main trail. We will need to survey for other invasive, non-native plants on the premises for possible removal, such as poison hemlock (*Conium maculatum*). Some attempts to remove the invasive plants have been made. The main trail, and some areas of the open field are frequently mowed. Western hemlock (*Tsuga heterophylla*) has been planted among the scotch broom in an attempt to eventually shade it out once the hemlock has reached the overstory. Red alder (*Alnus rubra*) and western redcedar (*Thuja plicata*) have also been planted (see Figure 3). A species of Junco was planted by volunteers approximately two years ago, and has shown some success, although it is not yet established.

Figure 2: View of trees planted among scotch broom adjacent to main trail.

The results of our plant survey will provide important information to create our management plan for this wetland. Identifying the current native species, as well as observing the success of imported plant specimens can provide some knowledge of the present condition of this site. It should be noted that a plant survey is only one small tool in measuring the condition of a wetland (Zedler, 1996). However, combining this data with wildlife surveys, hydrology, and soil data, we can better assess appropriate areas within the site for replanting, and choose the appropriate plant species for this region (Mitsch and Wilson, 1996). Since this area is adjacent to a high-traffic road, and can be impacted by disturbance and run-off, we should use the survey to analyze the best methods for improving the current buffer zone (a line of trees and scotch broom). We will also need to choose plants that are tolerant to varying saturation levels, as there are seasonal changes to the amount of available water in this area.

The McLane forest is an ongoing ecological project involving numerous volunteers from the community, as well as professionals from varying fields of expertise. Due to the nature of this long-term project, a preliminary plant survey is important for both assessing current plant species diversity and success, and in comparing with future plant monitoring data. Photo-documentation of current plant distribution allows us to pass a visual history of the area on to those involved in future projects. There is very limited documentation regarding this site, and any data that can be made available for future research is important.

Wetlands Monitoring

There are many reasons to carry out biological monitoring on a site. The reasons we are choosing to monitor our restoration site are: to make sure our management

actions increase wildlife habitat potential, our added plants and habitat structures get used, and to document how our efforts change the environment. Monitoring will be done in three main stages over time. The first stage is preliminary monitoring of the site. Next, we will document the restoration process. After the project is complete we will have constructed a monitoring plan to be carried out every two years.

Preliminary monitoring of the site will be carried out before the restoration project begins. Several types of biological monitoring should be done to gather base line data on the site. This is important for later comparisons of site changes. The first step is to take photographs of each site to be worked on. Photos will be a good visual aid in site changes over time (Bob Thomas, June 30, 2000, personal communication).

The next preliminary surveys that should be done are bird surveys. Point count surveys would work best for obtaining an estimate of species richness and abundance. Point count stations should be about 100 to 200 meters apart so individuals will not be counted twice (Sutherland, 1996). The bird surveys should start around dawn and finish within four hours after sunrise (Nobuya Suzuki, October 17, 2000, personal communication). Monitoring each station for 10 minutes would be sufficient. Conducting the surveys at least twice at each station during the season, once in the first half and once in the second half will ensure that both early and late breeding birds are detected (Sutherland, 1996). At each station, information on temperature, wind, weather conditions, time, and date will need to be taken.

Another preliminary survey that should be done is an amphibian survey along transect lines. This will give us an estimate of species richness. The method involves lying out transect lines then walking along them looking for amphibians within one meter

on each side of the line. This involves picking up any object you come across and looking under it for amphibians. This method is effective, simple, and inexpensive (Sutherland, 1996).

During the restoration project it will be important to document the process through photographs. These pictures can be used in the future as teaching visual aids. Written documents of exactly how many of each plant species were planted along with the number of bird boxes put up and coarse woody debris pieces added would be helpful for future inventory comparisons.

Monitoring after the restoration project is complete should be done at intervals of two years. During each of these monitoring sessions several things should be done. We suggest taking photographs to track progress of site conditions, carrying out point count bird surveys, and conducting amphibian surveys along transect lines. It would be a good idea if this new data was compared to the preliminary data and analyzed. The final survey we would like to see conducted is a vegetation survey. A complete inventory (total count) of all shrubs and trees planted would be ideal. A total count of bird boxes still up and coarse woody debris pieces still in place might be done. These total counts will give us an idea of plant, bird box, and coarse woody debris survival.

In order to enhance wildlife habitat in the wetland, our plants must survive and wildlife structures must remain on the site. Some mortality of plants and loss of habitat structures is inevitable, but it is beneficial to set standards. We propose that four years after our project is complete 90% of all bird boxes and coarse woody debris pieces should be remaining. Shrubs and trees should see a 75% survival rate (Bob Thomas, June 30,

2000, personal communication). If the standards for survival are not met we propose that more plantings be done or habitat structures be replaced.

Community Involvement and Plant Resources

Community involvement and education play the most important role when striving to accomplish environmental excellence because it gives people a feeling of ownership and pride in their community resources. As part of the Wetland Campus Stewardship Option, we will try to incorporate our campus community as well as the surrounding community in all aspects of our mission in establishing a new wetland site at the McLane Community Forest. The manner in which we will be implementing this community involvement will be broken into two directions. The first route will be involvement within the Evergreen Campus community itself, which could aide us in generating labor and environmental expertise. An example could include recruiting from environmental conscious clubs and students to volunteer their time, work and knowledge in wetland enhancement. The second route would focus on the outside community, which would be vitally important in the continuance of the wetland project. Some examples may include; asking school children to come out for a day of shrub and tree planting, asking state or county officials for wetland establishment guidance, and solicit help from surrounding community members who use and enjoy the McLane Community Forest on a daily basis. By involving the help of the community, we can act as one "team" to insure that future generations may have the privilege of enjoying the wonder of wetlands forever.

Within The Evergreen State College campus, student participation can be one key

to establishing a successful project. Not only is Evergreen unique to the struggle of environmental modification, but also the learning structure is based on campus involvement and therefore is a perfect platform to begin our wetland creation proposal. One environmental orientated club, that we examined to aide us in this exciting project was AFISH. The spokesperson stated that the goal of this group is to contribute in anyway possible to further endangered fish populations in our area and includes any restoration or enhancement of streams or wetland sites. AFISH does volunteer work with the Olympia Stream Team on a monthly basis and has multiple contacts in all areas of wetland and stream restoration. Although they desire to initiate and fund new projects in wetland enhancement on and off campus, the club needs a specific time frame for scheduling purposes until they will totally commit to helping us with our project. AFISH looks forward to the opportunity of multiple groups working side by side on any project put forth and both representatives were quite excited (Dawn, January 2001, personal communication). Another way to involve The Evergreen State College campus community is to ask for independent volunteers, like those who expressed written interest on the campus wide program survey. These students could help construct interpretive trails around the wetlands or remove non-native plant species form the area. Another idea of campus involvement could be inviting guest speakers from the local chapter of Society of Wetland Scientists to provide a forum day of wetland education for whoever may be interested.

As an external link, the involvement of the surrounding community could be the determining factor for the Wetland Campus Stewardship Option. By instilling the foundations of environmental values and beliefs to as many people as possible; we as a

community may accomplish a definite balance between our wetland resources and encroaching human sprawl. The first, and obvious community contact we will be working with will be the McLane Elementary School children and staff. The McLane school children and many other community contacts have been in the process of restoring some 40 acres of previous farmland back into a viable and growing environment (Principal Terry Hodge, December 2000, personal communication). Some possible methods of involvement include; planting of wetland obligate species and or constructing additional wildlife habitat around the wetland site in the form of bird boxes and down logs.

Our next major source of community involvement will most likely come from Ralph Monroe, former Secretary of the State and Dave Pearsall, who are members of the McLane Forest Committee. Dave Pearsall has donated numerous hours of his time and bulldozer equipment to establish the existing wetland sites and reforest the McLane Community Forest (Dave Pearsall, January 2001, personal communication). Ralph Monroe has basically placed the McLane Forest in the palm of his hands and has done everything possible to see to its success. His efforts will ensure that the next generation of this community will have a natural wetland environment to enjoy. Ralph had also stated he wanted to help out in any way, even financially if possible, for permit and bulldozer fees (Ralph Monroe, January 2001, personal communication). Upon interview, both of these men expressed interests and are very excited at the opportunity to create a new wetland site.

Additional members of the community we will be working side by side with will be Thurston County itself. The processes by which we will be able to construct this proposed wetland site includes many steps in developmental planning and permit

acquisition. Some of these steps include: flood proofing the site, drawing up a grading plan for earth removal and hiring a county wetland biologist to aide us in our preparation. All of the above provisions are listed in the Thurston County Code number 14.38 for wetland construction.

A further source that would contribute to the Wetland Campus Stewardship Option will possibly be the Olympia Stream Team. One of the representatives, Kelly Keeley, expressed interest in the Wetland Campus Stewardship Option. Although the organization is in the process of donating trees and shrubs for the grass lakes project, she stated they possibility could generate some volunteers and resources for our intention. Kelly would like some additional information that we could not yet provide. As a group, we will keep in contact with this organization, as they can help us immensely (Kelly Keeley, January 2001, personal communication). Other members of the community that would be vitally important in continuance of the Wetland Stewardship Option could possibility include; The Department of Natural Resources, The Department of Ecology and surrounding community land owners.

The last aspect of the Wetland Campus Stewardship Option will be establishing native plant contacts for riparian restoration and non-native removal. Native vegetation and tree cover can be important to wetlands because it provides habitat diversity, maintains water quality and decreases both sedimentation contribution and soil bank erosion. Removal of non-native plant species plays a crucial role in riparian restoration because they can be invasive and take over entire areas. According to the Washington Natural Heritage Association website, "non native plant species can push out native species; therefore reducing biodiversity, productivity and can alter normal ecological

processes**."** The first and most important plant resource we will be depending on is the Department of Transportation. This state office donates allot of time and plant resources to various environmental groups and causes. Because this will be a low funded project, plant donations will be examined thoroughly and heavily relied on. Bob Barnes, a landscape project coordinator for the DOT stated, "We would like to help out in anyway possible." Bob also expressed that they have many wetland trees and shrubs like Red Alder, Twin Berry, Salmon Berry and Thimble Berry stored at their maintenance site off of Mottman Rd. and 21st. Therefore we would not have to be concerned about storage of the plants until the site was prepared (Bob Barnes, January 2001, personal communication). The second plant resource group that was contacted was Sound Native Plants. This is a for profit organization/business, ran by Josalyn Trivett. Sound Native Plants does donate some plants, including wetland species, but usually they are genetically poor plants and could hurt, rather than help the wetland area. It is logical to choose individual plants that are adapted to survive in extreme conditions and carry on those genes to future generations (Smith et al.1997). If we cannot accumulate viable plant donations, we as a group would have to purchase our wetland plant resources through Sound Native Plants. Prices for gallon trees and shrubs run from three dollars for a gallon container, to seventy five cents for emergents, sedges and grasses (Josalyn Trivett, December 2000, personal communication).

Bird Boxes

Goals

1) To enhance biodiversity and improve wildlife habitat

2) To improve community environmental awareness and education

Objectives

1) We will provide more habitat for birds in the form of nest boxes and platforms

2) We will provide information stops in close proximity to the nest box that will describe what the species is, how, and why it was put there

There are many reasons why nest boxes and platforms are beneficial additions to a forest. For instance, they provide habitat for endangered and sensitive species by providing more suitable habitat for cavity nesters. This may help reduce the mortality rate of secondary cavity nesters due to increased competition for preexisting cavities (Christman & Dhondt 1997). Studies have found higher reproductive success in species that nest in nest boxes (Purcell et al. 1997). This may be due to nest-site availability.

Nest boxes can also reduce predation and mortality rates. Christman and Dhondt (1997) found that nests built in boxes often exhibit lower predation rates then nests in natural cavities. Also, certain species have been found to lay larger clutches, hatch more eggs, and fledge more young in boxes than in cavities (Purcell et al. 1997).

In selecting artificial habitat there's no such thing as "one size fits all." Each species has an instinctive pattern of nesting, and with very few exceptions, will have only one kind of nesting behavior. Some birds will use a cavity for their nesting purposes while others prefer building a nest on the branches of shrubs and trees. Some birds like communal living, while others do not. Three examples of different types of artificial bird habitats that we will be looking at are 1) the single occupancy nest box, 2) the multi occupancy nest box and 3) the platform (this would be used for species that don't use cavities to nest). I haven't been able to find any significant information about nest

platform design. I do know that both the Bald Eagle and the Great Blue Heron do use them.

The best materials to use to create bird boxes are three-quarter-inch-thick wood that has not been treated with stains or preservatives because the fumes from the chemicals could harm the birds. It is best to use any wood that resists weathering, for example, bald cypress, Port Orford cedar, redwood, western redcedar, incence cedar, or pressure treated pine (Bryant & Payne 1994). Gluing all the joints before you nail them will extend the life of your birdhouse. Galvanized or brass shank nails, hinges, and screws resist rusting and better holds boxes/platforms together as they age. The building materials could be obtained from the wood that is collected from the thinning operations, through the purchasing of certified wood from a store, and/or through donations by the group.

"Knowing some of the habitat requirements of each of the species to be attracted is necessary before you can select a suitable location and design for nest construction" (Scott 1992). Some of the things that should be considered when building a bird box are texture, entrance hole size, ventilation, and drainage. The inside of the bird box should always remain untreated. A rough surface, both inside and out, makes it easier for the adults to get into the box and for the nestlings to climb out.

The entrance hole size is a very important characteristic because it determines what species of bird will utilize the bird box. "The entrance hole, as a general rule, should be directed away from prevailing winds--usually to the south" (Scott 1992). This will help keep wind, rain or snow out of the nest area.

All bird boxes need air vents, or they can turn into bird ovens if proper ventilation is not used. Two ways to provide sufficient ventilation are to leave gaps between the roof and sides of the box, or drill quarter-inch holes just below the roof and on both sides (Needham 1995). In very hot summers the entrance holes of the boxes should face north or east to avoid overheating.

Drainage is also important because water can become a problem when it sits at the bottom of a birdhouse, causing the growth of mold and insects, and can possibly drown the fledglings. A roof with sufficient slope with a 2" overhang offers some protection from rain (Needham 1995). Drilling the entrance hole on an upwards slant and cutting away the corners of the box floor and by drilling quarter inch holes in the box floor may also keep the water out.

Some of the things that should be considered when placing the bird boxes or platforms are: what are its behavioral characteristics, such as is it a territorial species? Do they not mind being in close proximity to other nesting birds or do they prefer isolation? Do they mind being close to humans or do they prefer to be away? Are they an interior species or do they prefer edges? Do they prefer nests in or out of trees? Do they like to be close to the ground, at he top of the canopy, or somewhere in between? Their habitat requirements will determine where and at what height the box/platforms should be placed.

At the very least the bird boxes and platforms should be inspected for any unwanted creatures, such as cat, squirrels, raccoons, opossums, mice, house sparrows, starlings, and insects, before and after every breeding season. Nesting birds are very vulnerable to cats, as are fledglings and birds roosting for the night. Some suggestions to

prevent cats from entering the nest area, are to nail a sheet metal guard or cone to a tree trunk, and also be sure to mount your boxes and platforms far enough away from trees or other structures, so cats cannot spring to the top of the structure in a single leap and disturb the nest (Kress 1995).

Squirrels can become a serious menace to birdhouses and the birds themselves. If you find your nest hole enlarged, changes are a squirrel is the culprit. Once inside the nest box squirrels make a meal of the eggs and young (Kress 1995). Adding a predator guard of sheet metal to the entrance hole is usually enough to keep squirrels out.

Raccoons and possums will stick their arms inside nest boxes and try to pull out the adult birds and nestlings, along with the eggs. Adding a predator guard to the birdhouse or to its pole support is simple solution. Lengthening the roof 1 1/4 inch so that it extends five inches beyond the front of the box will prevent theses animals from easily reaching into the entrance hole. Also a thick layer of grease could be applied to the mounting pole (Kress 1995).

Mice are usually problematic when they begin to build their nests for the winter because they often build them in vacant nest boxes. The nest boxes need to be cleaned out in the early spring or the birds will not use them.

Starlings and house sparrows are another threat to nesting birds because they compete for the use of the nesting boxes. If you don't discourage them, these two species will bully or kill cavity-nesting birds. Never put up a birdhouse with a perch below the entrance hole. Perches offer starlings, house sparrows, and other predators a convenient place to wait for lunch. Since house sparrows and starlings are not protected by law you

may destroy their nests (Needham, 1995 p.51), but if they already have eggs or fledglings leave them as they have already claimed the nest.

Many insects lay their eggs and pupate in bird boxes. You should inspect your birdhouses for signs of gypsy moths, blowflies, wasps, ants, gnats, fleas, flies, larvae, lice, wasps, and bees. You can keep bees and wasps from attaching their nests by coating the inside of the roof with bar soap. Other insects can be detoured by using insecticides that are safe for birds, but the ecological effects would have to be looked at first. If it is decided that insecticides are not going to be used then an old fashioned soap and water cleaning could work to evict the insects but it will not stop them from coming back.

Another way of helping to guard against predators and aid in nest building is to supply nesting material in close proximity to each of the nest boxes/platforms. This way they don't have to go very far to get enough material to build their nests, which may be in limited supply. Some of the materials we could provide include: moss, grass, ferns, milkweed, leaves, pine and conifer needles, steams, rootlets, bark, twigs, woodchips, sawdust, ground cork, lumps of earth, mud, fur, feathers, wool, and hair. The old nesting materials should be removed and the inside needs to be scrubbed out before every breeding season, which is late January to mid-February (Bryant & Payne 1994).

Monitoring the nest boxes is an important task for four reasons: 1) to know if the bird boxes/platforms are being used, 2) are they being used by the species of bird that was intended, 3) are there any mice, insects or any other pests that need to be evicted, and 4) do they need a general cleaning or repair. Through TESC or the McLane School, this can be accomplished through offering bird monitoring as a part of a class curriculum. Some of the information that could be collected are: 1) the species, 2) dates of start and

completion of nest building, 3) date of first egg laid (clutch initiation) and last egg laid (clutch completion), 4) total number of eggs laid, 5) number of chicks present in nest, 6) location of nest, 7) anything unusual about the nest, eggs, or chicks. This can offer valuable data about the nesting behaviors of many bird species.

Early spring before the birds have returned to their nesting areas is the ideal time to construct the nests. The nest boxes should be cleaned at least once a year, and for birds that raise more than one brood a year, they should be cleaned as soon after the young have left the nest as possible. Even if the original nesters don't reuse the same nest box, other birds that are looking for a new place for their second brood may move in and would benefit from a clean nesting box (Scott 1992).

Future conditions that can be expected to result from the proposed placement of bird boxes and platforms are, increased abundance of bird species and a rise in the overall quantity of them. If information centers are placed near the nest boxes/platforms, it would help educate the campus and the community on why the nest box/platform was put there, what type of species lives in it, and the importance of biodiversity, habitat, and preservation.

As far as the positive and negative impacts of the proposed management options, I feel that the native species project will encourage native bird populations by increasing native vegetation, thereby increasing the probability that the bird boxes and platforms will be inhabited. The wetlands will improve insect populations, which will provide a good food source for the birds. Overall they all support diversity in habitat which is good for bird populations and habitat increase.

Cost Analysis

In the McLane Forest, there are currently some natural and man-made wetlands already in place. The natural wetlands are currently in bad shape due to the lack of rainfall this year. The man-made wetlands are in better shape, having a plastic liner in which to keep the water stationary. We have decided to improve the natural wetland by excavation; and adding either a plastic liner or using clay. If the group were to use clay, it will have to be hauled from Elma, Washington, 40 miles away.

First, permits must be purchased. Second, complex machinery is needed in order to move land to improve the habitat. Third, the plan that is suggested must be compliant with all three agencies before anything is done to the land itself. Finally, the plan that is suggested should be cost effective. Permits would have to be attained to move any earth. After consulting with the Thurston County Permit Office, Army Corps. Of Engineers, and Dept. of Ecology we learned of several necessary permits that will have to be obtained. In order for any improvement of the wetlands to happen we must first acquire a grading permit from the Thurston County Permit Office, which is priced at $60. After this has been accomplished, there is an additional permit that must be obtained, a SEPA permit or a Critical Area permit must be purchased which are $450 and $225 respectively. While these permits are being acquired, another permit, the JARPA permit must be completed. The JARPA is to be obtained in order to be compliant with the Dept. of Ecology, Army Corp. of Engineers, and Thurston County (Rodger Giebelhouse, November 2000, personal communication).

The price of the earthmovers is from $45,000 upwards. That is a cost that could not possibly be achieved by the amount of resources that are available. There are other options that can be looked at, such as renting, or utilizing the TESC grounds keeper

equipment. The wetland options group must take into consideration that it will take a large sum of money in order for any improvements to take place. At least $510.00 to purchase the permits and perhaps some additional funds for the equipment that may be used during the creation of a wetland area.

After a brief talk with Ralph Munro and his associate, Dave Pearsall, the economic factors of this project have come to a close. They have ensured that the costs of the project would be negotiable on all fronts, from permit costs to manpower costs. The costs of the excavation will be supplied by Ralph Munro himself (P.C. Ralph Munro). There will be no costs to the students, and only a benefit to the ecosystem. The primary concern is to remove Scotch Broom, the invasive species from the land.

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Appendix: Aerial photo of McLane Forest (area outlined in top center).
Photo courtesy of TESC GIS files.