

Restoration Project  
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# WESTERN RESTORING BLUEBIRDS TO SALT SPRING ISLAND

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## 1.0 Introduction

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Fifty years ago, Carson (1962) warned of the imminent danger the environment faced with the advances of human technology and development.

“There was a strange stillness. The birds, for example—where have they gone? Many people spoke of them, puzzled and disturbed. The feeding stations in the backyards were deserted. The few birds seen anywhere were moribund; they trembled violently and could not fly. It was spring without voices. On the mornings that had once throbbed with the dawn chorus of robins, catbirds, dove’s, jay’s, wren’s, and scores of other bird voices there was now no sound; only silence lay over the fields and woods and marsh.” (Carson, p. 2, 1962)

Carson fabricated the above scene as an imaginary reality of a world without birds. Her predictions were not far from the truth. Today, many species are threatened or have become extinct. The Western Bluebird (*Sialia mexicana*) is an example of a species that has been locally extirpated from Canada’s west coast.

Critics might argue that communities such as Salt Spring Island have plenty of other birds, and cannot be compared to the morbid depiction of the birdless environment presented in Carson’s predictions. It cannot be argued that Mount Tuam isn’t home to many nesting birds and raptors (BC Parks, 2012). However, the Western Bluebird—an integral species to the ecological integrity of the region—has been extirpated from the island due to human activity. The Western Bluebird’s beauty and song is absent from a place where it belongs, we are confident that our strategy will succeed in reintroducing the bluebird back to it’s home.

People love bluebirds; the beautiful colour and songs of the bluebird have sparked the imaginations and inspired the affections of societies throughout the ages (Krautwurst, 2010). Henry David Thoreau wrote “the bluebird carries the sky on his back.” (cited in Krautwurst, p. 44, 2010). Because of the special place the bluebird has in the hearts of so many, restoration projects across America have succeeded in their efforts to reintroduced the bluebird into communities it disappeared from while educating people about how they can help (Krautwurst, 2010). Our project aims to employ this same strategy by emphasizing the lyrical beauty the Western Bluebird will bring to Mount Tuam and the island.

The Western Bluebird has been subject to recent extirpation on the West Coast of British Columbia. The reason for the decline is largely a result of human activity, causing direct and indirect effects on local ecosystems. The influence of invasive species, namely the European Starling and the House Sparrow (*Passer domesticus*), should be noted as an important consideration. A number of restoration efforts are currently underway by conservation groups such as the Garry Oak Ecosystem Recovery Team (GOERT), in hopes of bringing the beautiful bluebird back.

This project’s vision is to establish a restoration link between efforts in the San Juan Islands and Cowichan through effective implementation of bird boxes and translocation of breeding pairs on Salt Spring Island, and to return the western bluebird to an ecologically self-sustaining state.

## 2.0 Species Profile: Western Bluebird

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### 2.1 Physical Description

Western Bluebirds can be distinguished from other bluebirds by their colour patterns. The males have deep blue heads and wings, and bold rofous colouring on their breasts and between their shoulders (Seattle Audubon Society, 2012). The female has more faded colouring than the male (see figure 1.). She has a white eye ring that the male lacks. Western Bluebirds are small, generally between 16-19cm long and weigh approximately 24-31 grams (Seattle Audubon Society, 2012).



Figure 1. Female bluebird (left) and male bluebird (right)

## 2.2 Behaviours

The Western Bluebird is the least migratory of all bluebirds; when they do migrate, it is more in terms of altitude rather than latitude (Seattle Audubon Society, 2012). They are cavity-nesters, meaning they will use a natural hollow in a tree, an old woodpecker hole, a hole in a building, or even a man-made nest box. Reproduction occurs typically between January and April with nest building/egg-laying occurring afterward. The timelines may vary based on local ecological principles (Guinan *et. al*, 2000). Preferred nesting habitat is relatively low, approximately 50 feet from the ground (Seattle Audubon Society, 2012). When nesting, the male arrives on the breeding grounds and defends their territory through song. He may help the female build the nest, but it is primarily her responsibility. The nest resembles a loose cup of twigs and weeds, and is lined with fine plant materials. Brooding and incubation is performed by the female, although the male may deliver food items during this time.

## 2.3 Distribution

Western Bluebirds were historically abundant and resided in southern British Columbia, central Montana, to northern Baja California, and the central mainland of Mexico (Garry Oak Ecosystems Recovery Team, 2003). For reasons that will be discussed below, and addressed in the restoration project design, the current distribution is significantly different from the historical distribution. Extirpation of the species within the Georgia Depression ecoregion occurred in 1995 (Garry Oak Ecosystems Recovery Team, 2003).

## 2.4 Reasons for Decline

1. Urban development causing habitat fragmentation, (Garry Oak Ecosystems Recovery Team, 2003)
2. Direct habitat loss (Beauchesne *et. al*, 2012)
3. Increased number of competitors, House Sparrows and European Starling (Beauchesne *et. al*, 2012)
4. Fire suppression in combination with proliferation of invasive Scotch Broom, leading to the loss of understories (Garry Oak Ecosystems Recovery Team, 2003)
5. Reductions in insect prey caused by increased pesticide use (Beauchesne *et. al*, 2012)
6. Modern land management practices that involve the removal of dead standing trees that provide nesting cavities (Garry Oak Ecosystems Recovery Team, 2003)

It can be surmised that human activity is the overarching reason for the declines in Western Bluebird populations.

## 2.5 Ecological Role

The Western Bluebird plays a significant role in Garry Oak Ecosystems. The Western Bluebird normally preys on insects in the summer. During the winter they generally alter their diet, and eat berries from mistletoe, juniper and elderberry trees. In fact, mistletoe actually depends on the birds for seed dispersal (Boucher, 2009). Invasive species have been problematic for the Western Bluebird. Abundant European Starling and House Sparrow populations have out competed the birds (Beauchesne *et al.*, 2012). Predators of Western Bluebird adults are primarily domestic cats and large avian species such as hawks (Beauchesne *et. al*, 2012 ). However the eggs are additionally subject to predation, specifically by rodents, weasels, snakes, and raccoons (Beauchesne *et. al*, 2012). The extirpation of the

species has implications on all players of the ecosystem, due to the complex nature of ecosystems.

### 3.0 Site Analysis

The site that was chosen for the restoration project to bring back the Western Bluebird is located in Mount Tuam Ecological Reserve. Mount Tuam is located at 48°44'N latitude and 123°28'W longitude (BC Parks, 2012). Established in 1971, this 362ha park is located on the Southeast side of Salt Spring Island, 4km south of Fulford Harbour (BC Parks, 2012). The ecological reserve is suitable to the project because it provides the highest level of protection of physical and biological diversity allowing for research and educational opportunity (BC Parks, 2012). Refer to Figure 2. for a map of the site location.

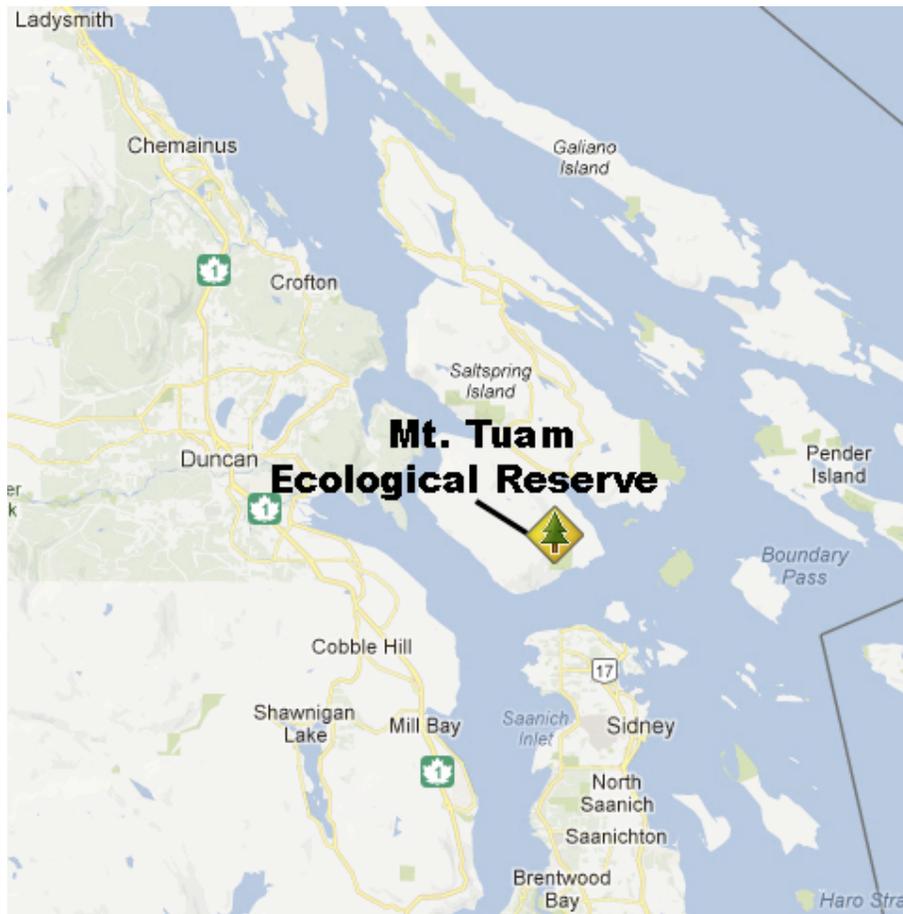


Figure 2. Mt. Tuam Ecological Reserve Location

### 3.1 Ecology

Mount Tuam Ecological Reserve is comprised of the Coastal Douglas fir, moist maritime, and the Coastal Western Hemlock biogeoclimatic zones, creating a unique ecological environment (BC Parks, 2012). The mild climate and long growing season enables the region to support many rare ecological communities that are at risk as a result of growing human pressures.

The region supports 11 red-listed ecosystems and one blue-listed ecosystem including a mosaic of areas that comprise the Garry Oak Meadow (BC Parks, 2012).

The south and west sides of the upper slopes contain herbaceous meadows and scattered medium to large Garry Oak trees. The lower slopes and the southern part of the ecological reserve support young to mature second-growth stands of Douglas-fir, Western redcedar and Arbutus (BC Parks, 2012). For a more detailed representation refer to Appendix 10.0 (Ecosystem Map of Mount Tuam Ecological Reserve).

The site consists of very thick, well-drained till deposits, intersected with riparian channels and corridors containing abundant Red alder and Stinging nettle. There are few invasive species influencing the ecology of the site, though some of the herbaceous meadows contained up to 25% exotic grasses such as Hedgehog dogtail. Additionally, some Scotch broom is present by the roadside.

The level of human disturbance is kept to a minimum, however still plays an important role in the ecology of the reserve. Particularly, homestead use of the land resulted in foraging animals (such as feral sheep). This in turn caused overgrazing of native vegetation and the dispersal of invasive grasses (BC Parks, 2012). Moreover, fire historically was used to influence the establishment, persistence and overall health of Garry Oak ecosystems. Fire

suppression is speculated to have led to changes in species composition, though there is little data to support the claim (BC Parks, 2012). Logging and soil alterations have also been speculated to cause the changes in ecology (BC Parks, 2012).

In essence, Mount Tuam Ecological Reserve contains the ecological characteristics to support a diverse range of protected habitats for a variety of species, and was therefore deemed suitable for the project design.

### **3.2 Culture and History**

Mount Tuam Ecological Reserve has a precious history for indigenous peoples, who have valued the land since time immemorial. Mount Tuam is within the traditional territory of members of the Hul'qumi'num Treaty Group (Chemainus First Nation, Cowichan First Nation, Halat First Nation, Lake Cowichan First Nation, Lyakson First Nation and Penlakut First Nation), in addition to the Malahat Indian Band and the Tsawassen First Nation (BC Parks, 2012). Unfortunately, when the mining industry made its way to the region, many of the archaeological records were destroyed (BC Parks, 2012). Stratified shell deposits collected in 1998 reveal evidence of repetitive settlement of the site over a long period of time (BC Parks, 2012). Two Carbon-14 dates estimate the inland shell midden site to be dated to 2 millennia ago (BC Parks, 2012).

Mount Tuam was first mentioned by European settler James Douglas in 1853 through a written letter detailing his experiences (BC Parks, 2012). A year after his exploration of Vancouver Island by canoe, he believed that the discovery of salt springs would bring great wealth to the country.

The Cowichan First Nations coined the original name for Mount Tuam. Chuam, as it

was originally called, was translated to mean, “facing the sea” (BC Parks, 2012). Over time the name changed from Chuan, to Tuan, to today’s Tuam (BC Parks, 2012).

### **3.3 Problem Identification**

Given the ecological importance of the Western Bluebird, restoration must be valued and made a priority for all entities, specifically government agencies, restoration groups, and the general public. Responsibility for human activity that has directly and indirectly altered ecosystems must be actively recognized and accounted for. The following sections of the project design aim to provide a multi-faceted approach to restoration of the Western Bluebird.

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## 4.0 Policy, Goals, and Objectives and Legalities

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### 4.1 Policy

The Western Bluebird is an important ecological species and a highly popular species with bird enthusiasts. As the species is very popular among bird watchers and the general public alike, the loss of the bird on Salt Spring Island was never well received. The Western Bluebird was extirpated from the island by a combination of inter species competition, land use changes, and development of Salt Spring Island. In order to re-colonize the island with the Western Bluebird, restoration must occur to transfer Western Bluebirds back to Salt Spring Island to create a sustainable population. Through community involvement from the citizens of Salt Spring Island and the required governmental organizations of the Mount Tuam area, the project aims to re-establish the Western Bluebird.

### 4.2 Goals

The goals are to re-establish a Western Bluebird population on Salt Spring Island by reintroducing birds to the Mt. Tuam Ecological Reserve. In addition, we aim to monitor and support the reproductive success of the Western Bluebird to create a self-sustaining Western Bluebird population.

### 4.3 Objectives

Successfully translocate and reintroduce the Western Bluebird

- Successfully translocate and reintroduce 5-6 breeding pairs in first year
- Successfully translocate and reintroduce 9-11 pairs each year following first year
- Introduce a minimum of 45 breeding pairs over five years
- Place bands on all Western Bluebirds introduced and naturally born on Salt Spring Island

Create a monitoring program through community involvement

- Educate the community on the Western Bluebird and the restoration program
- Gain support and volunteers from the Salt Spring Island Community
- Checking bird nests during mating periods for eggs and fledglings
- Counting and tracking the size of the Western Bluebird population in Mt. Tuam Ecological Reserve and across Salt Spring Island

Establish a naturally reproducing population

- The reintroduced population grows with each successive year during both short-term and long-term monitoring
- Long-term monitoring of the reintroduced population shows similar estimates for reproduction and survival when compared with a high quality reference population
- Western Bluebird population expansion to all of Salt Spring Island
- Promote Salt Spring Island as a part of a Western Bluebird link between the San Juan Island and Cowichan Valley Western Bluebird populations

### 4.4 Legalities

This restoration project will transport Western Bluebirds from the United States of

America (U.S.A) to Canada. Therefore, a certain amount of paperwork and pre-planning must occur in order for the Western Bluebirds to cross the international border. To import wildlife into Canada from the U.S.A, the animals must be inspected by an official veterinarian of the U.S.A within 30 days preceding the date of importation and the veterinarian must also find the animal to be free of communicable diseases (Canadian Food Inspection Agency, 2007). A permit must also be obtained from the Canadian government indicating the final use of the imported birds. If the proper paperwork is not completed, this may result in the quarantine of the birds upon importation to Canada (Canadian Food Inspection Agency, 2012). Finally, all imported animals must cross through a land crossing in order to be clearly identified and inspected (Canadian Food Inspection Agency, 2012). The breeding pairs will need to be collected and inspected by veterinarians 30 days prior to export from the U.S.A to Canada and then contained until the day of export.

In order to band the Western Bluebirds for this restoration project, an application will need to be made to the Canadian bird banding office to gain a permit that will allow for the banding of the birds (Environment Canada, 2012). A master permit will need to be held by the leader of the project and this person will be responsible for all aspects of the banding project. As well, each of the remaining participants in the banding project will need to apply for a sub-permit that allows them to band birds under the watch of a person in possession of a master permit for bird banding (Environment Canada, 2012)

## 5.0 Design

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### 5.1 Overview

Since 2009 the Salt Spring Island Conservancy (2011) has implemented the Bring Back the Bluebird Project. This has included setting up a network of bluebird boxes in suitable habitat in hopes of attracting the Western Bluebirds back to the island. Our plan proposes a more active role in bringing back the Western Bluebird to Salt Spring Island. Over the course of five years we will reintroduce a minimum of 45 breeding pairs to the island with the initial release site at Mount Tuam. This number of translocated individuals has been found to correlate with reintroduction success in previous studies (Griffith *et al.*, 1989 and Slater and Altman, 2011). In the first year 5 to 6 pairs will be reintroduced and, in each following year, 9 to 11 pairs will be reintroduced. We will also establish a monitoring program during bluebird season from February through to September for each of the five years and continuing for at least three years thereafter. The design of our project is modeled after the successful reintroduction plan for Western Bluebirds in the San Juan Islands done by Slater and Altman (2004).

### 5.2 Site Preparation: Bird Boxes

The Salt Spring Island Conservancy bluebird project has set up 155 bluebird boxes throughout the Mount Maxwell, Andreas Vogt Nature Reserve, Reginald Hill, Beaver Point Road area, Burgoyne Bay Provincial Park, Fulford Valley and Mt. Tuam, our initial project site (Salt Spring Island Conservancy, 2011). While these spots were chosen because of their suitable habitat, once reintroduced the birds may try to make territories in other parts of the

island. For this reason boxes should be available to put up in areas that the birds show preference to during our project. Information on habitat suitability for western bluebirds as well as building and placement instructions for bird boxes will be made available for anyone on the island. Sustaining a Western Bluebird population depends on bird boxes taking the place of natural nest cavities and, assuming that the reintroduced population grows during and after the program, there will be an increasing need for bird boxes.

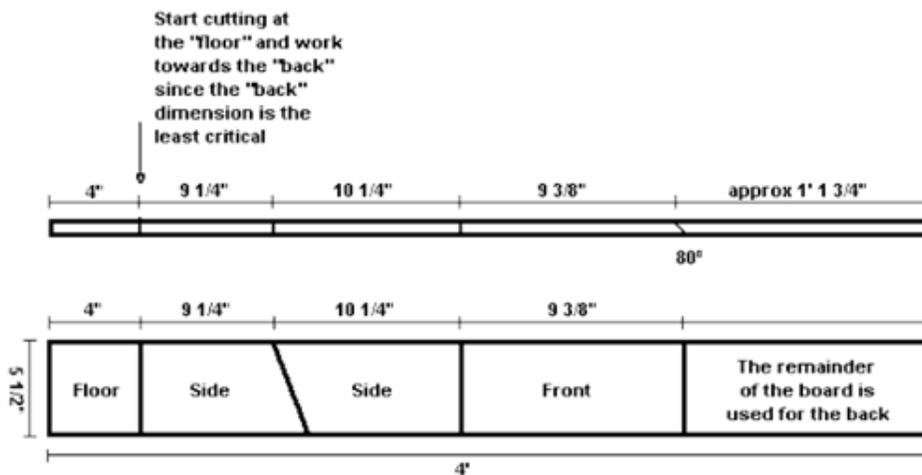


Figure 3. The top and side view of 1''x10''x10.5'' wooden board used for making a bird box suitable for the western bluebird.

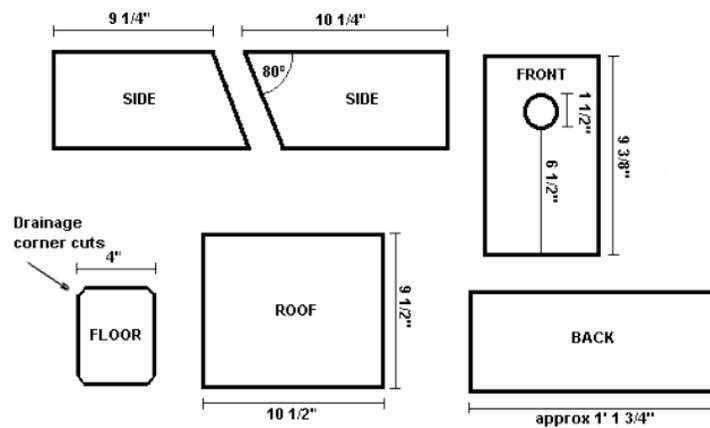


Figure 4. A top view of the individual dimensions of each piece necessary to make a bird box suitable for the western bluebird.

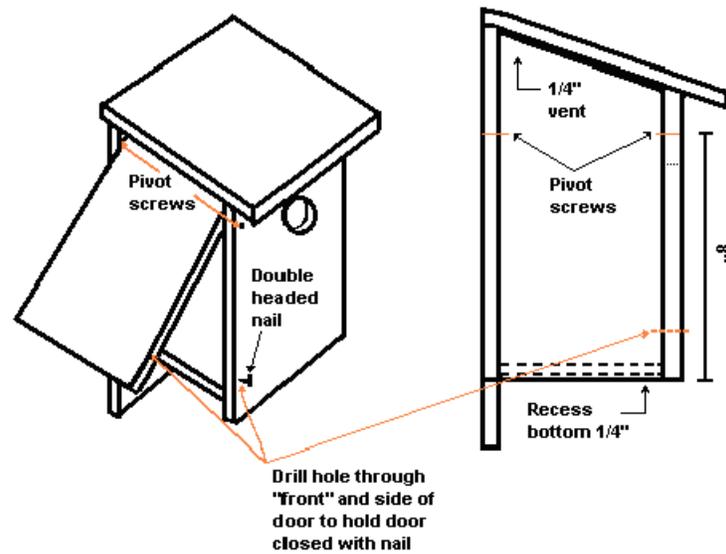


Figure 5. Diagrams of a completed bird box from a diagonal and side view. (North American Bluebird Society, 2012)

The dimensions of a nestbox that is suitable for western bluebirds (seen in figures 3, 4 and 5) have become fairly standard. The materials needed to make one include a wooden board 1"x10"x10.5" long, twenty 1.75" galvanized screws, two 1.75" galvanized nails for the pivot joint and a double headed nail for holding the door closed (North American Bluebird Society, 2012). The diagonal view of the completed box in figure 5 shows how the box can be accessed from a side door so that the birds can be checked and the box cleaned at the end of the season. The 1.5" hole is important in excluding European Starlings from using the box. In addition to regular nestboxes, five special boxes fitted with cameras will also be utilized. These camera boxes will be used for observation as well as an educational opportunity and motivation for the community. Every box will be given a numbered label to help monitor and keep track of occupied territories.

Boxes should be put up sometime in late winter before they migrate back North (Garry Oak Ecosystems Recovery Team, 2012). Bird boxes can be mounted on trees, freestanding poles (avoid utility poles) and fencing. Tree damage can be avoided by using rope to secure the bird box instead of screws. However, the thick bark of Garry Oak and Douglas-fir trees allow you to screw the box onto the tree (up to 5 centimeters) without risk to the tree's health (Garry Oak Ecosystems Recovery Team, 2012). When mounting a box onto a fence it is best to use a PVC or metal extension pole so the box is at the right height and out of reach to predators such as squirrels, raccoons and cats (Garry Oak Ecosystems Recovery Team, 2012). Entrance holes should be placed 1.5 to 2 meters from the ground. Both the birds and the monitors should have clear and easy access to the box. Monitors need easy access so they can check for problems with wasps, ants, squirrels, and other birds as well as gather the necessary demographic data. When possible we will have the box face a tree or bush within approximately 50 yards so that when young birds are learning to fly they have a refuge. Boxes near roadways will be oriented parallel to the road so that birds don't run the risk of dying while flying in the path of traffic.

Threats from predators and other birds, both invasive and native, make placement of the box critical. Besides taking over bluebird boxes, some birds of concern such as House Wrens (*Troglodytes aedon*) will destroy the nest and eggs of bluebirds as well as kill the nestlings (Davis and Roca, 1995). If House Wrens are a problem in the area, the box will need to be mounted 60m from any densely wooded area (Garry Oak Ecosystems Recovery Team, 2012). Mounting boxes on barns, building or near animal feeding areas should be avoided so that House Sparrows will not compete for the bird box (Garry Oak Ecosystems Recovery Team, 2012). If they are still a problem, then add a piece of wood to the floor of the box to

make it shallower. The shallower the box the less attractive it is to sparrows, however bluebirds will use a box that is even 4" deep (Davis and Roca, 1995). Ordinarily, because Western Bluebirds are territorial, only one box will be put up in an area. When competition with other birds is unavoidable it is best to place bird boxes in pairs about 4m apart and 100m from the next box or pair of bird boxes (Davis and Roca, 1995 and Garry Oak Ecosystems Recovery Team, 2012). This will hopefully reduce competition between species for bird boxes and allow the species to nest peacefully in the shared area.

Every year between November and January the nest boxes should be cleaned. Western Bluebirds return to the Salish Sea area as early as February and they will not nest in a box that is already occupied with a previous nest or the nest of another bird species (Davis and Roca, 1995 and Garry Oak Ecosystems Recovery Team, 2012).

### **5.3 Translocation Procedure**

Each of the five years of our plan we will use two main translocation strategies. In the first, bluebird pairs will be captured as breeding territories are being established in February. Later in the breeding season bluebird pairs and their nestlings can also be translocated. The combination of these two strategies has proven to be successful in the San Juan western bluebird reintroduction (Slater and Altman, 2011).

In the returning years there was a higher ratio of males to females observed in the San Juan population (Slater and Altman, 2011). For this reason after the first breeding season single females will be translocated on a case-by-case basis dependent on the number of single territorial males present. These translocations will be done in February, during the early breeding season, at the same time as the translocation of paired bluebirds without nestlings.

Our source population of bluebirds will come from Ft. Lewis, Washington. In the last two years of the project Western Bluebirds will be taken from a second source population in Oregon. This will increase the genetic diversity of the reintroduced population. We will also switch to the second source population if there are signs of disease reported in the original source population. Before any translocation occurs we will ensure that the number of birds we intend to be translocated are available. To accomplish this, more than the intended number of pairs and individuals will have to be observed in case a pair or individual cannot be captured or they need to be released.

To capture the birds, vocal playbacks of Western Bluebird calls and mist nets will be used. The mist nets will be placed near boxes where a pair or single female have been observed. Once removed from the nets, each individual will be placed in a cotton bird bag and taken to a central station away from other netting activity. At this central station, pairs or single females will be placed in a 0.5m x 0.5m x 0.5 m holding cage. The cages will be made of plywood and 0.6-cm-mesh polyester netting with the bottom lined with paper. Each shall also contain several cut branches to provide perches as well as live mealworms and water. Initial evaluation of whether the birds will be appropriate for temporary captivity will occur after 20 minutes of being put in the holding cage. If an individual is lethargic, crouched, or fluffed it will be released. If one or both individuals in a breeding pair display this kind of behaviour then both will be released. After an hour has passed the birds shall be evaluated again. In addition to behaviour and physical appearance of the bird, the feces of the birds will be used as an indicator for their condition. If the feces are a greenish liquid (as opposed to white liquid with or without solid matter) this indicates that the birds have not consumed the provided food or water and are stressed (Griffith *et al.*, 1989). If this is the case, then the bird

will be released. If it is part of a pair then the pair will also be released. The first 6 hours of captivity are crucial in determining if a bird will accept a captive environment and a bird is considered to be accepting of captivity after it has survived 24 hours (Griffith *et al.*, 1989).

The Ft. Lewis population is a banded population so the identification of the birds should be checked and recorded once it accepts captivity before continuing with the translocation. The holding cages will then be transferred to a vehicle, stacked and covered with dark cloth that allows for good ventilation. The cages will be transported in quiet vehicles with the interior unheated and a window slightly open to provide air circulation. During transport the birds will need to be fed mealworms every 45 to 60 minutes. Nestlings that are being transported are kept in their nest, but not put in cages. This makes it easier for them to be fed every 30 minutes.

Due to certain legalities the birds will have to go through inspection by a veterinarian for possible communicable diseases before going through customs at the Peace Arch border crossing for identification and further inspection. Afterwards the birds will be driven to the coast of British Columbia where they will be transported to Salt Spring Island by the ferry.

#### **5.4 Release Procedure**

Once at Mount Tuam, each pair of birds will be transferred into large outdoor aviaries (see figure 6). The same goes for pairs with nestlings, but single females will use smaller aviaries because they will only occupy them for a relatively short amount of time. Smaller aviaries with shorter holding times for paired birds have been used before, but only 13% established a breeding territory compared with larger aviaries that had an outcome of 49% (Slater and Altman, 2011). Large aviaries will be 2x2x2m and small aviaries will be 1m x1m x

2m. Both are constructed of plywood and metal mesh. The holding cages each aviary will have cut branches to provide several different perches for the birds. To ward off predators a 1m high barrier of hardware cloth will encircle the aviary and be staked into the ground.



Figure 6. A Western Bluebird aviary with a nestbox (left) occupied by a bluebird pair and the other nestbox (right) occupied by a pair of swallows.

The aviaries will each be placed at separate release sites within sight of a nest box. Because our primary release area is within parkland and not private land, our release sites will not depend on the willingness of landowners to host aviaries, but on the quality of the habitat to determine the different release sites. The release site for a single female will have the aviary within the established territory of a single male.

A pair of birds without nestlings will be kept within their aviary until breeding behaviour or nest building activity has been observed. If, by the end of three weeks, this has not been observed the pair will be released.

If a pair was translocated with nestlings, the nestlings will be placed in an artificial nest in a nest box within the aviary (see figure 6). To stimulate feeding the top of the nest box will be removed so the parents can observe begging behaviour from the nestlings. Birds will be given free (ad libitum) access to water and food (mealworms and crickets). Only when the young have fledged and are capable of flight will all the birds be released.

If there is a need to translocate single females they will only be held within the small aviary for a period of three days before being released. To increase the probability for interaction the female will be released in the morning when the male would likely be feeding and a recording of bluebird calls will be played.

### **5.5 Post Release**

After their release, the birds could potentially leave the initial release site. If this happens, a thorough search of the surrounding area will be needed daily for at least one week. After one week has passed, the birds will be searched for during the regular systematic vocal playback surveys at both the release sites and throughout areas where bluebirds have established territories or are reported being seen. These surveys will begin in mid March when the birds begin establishing territories, and will continue through the monitoring period. Short-term monitoring during each year of the five-year reintroduction is important for determining demographic trends and identifying problems. Any unforeseen problems will mean that our project strategy may have to evolve through the years to address these issues. At the end of the five-year period, long-term monitoring will be undertaken to address the success of our project.

## 6.0 Social Monitoring and Management

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### 6.1 Management Overview

One full-time administrator will be responsible for all aspects of the design, monitoring, communication, collaborations and management of this proposal. This position will be responsible for organizing public meetings, and connecting with community organizations on Salt Spring Island. The administrator will also facilitate training volunteers and other staff members for specific monitoring tasks. Lastly, the administrator will be involved with website development and maintenance such as blog posts and social media. In addition, two seasonal, part-time bluebird technicians will be hired. The primary role of the technicians is the reintroduction process, handling the birds, and training volunteers and students on the monitoring team. We propose to hire the administrator and technicians locally, perhaps through a local non-profit such as the Salt Spring Conservancy.

### 6.2 Social Monitoring Objectives

The success of this proposal is dependent on short term and long term monitoring strategies to assess the ecological integrity over an 8-year period. Ecological integrity, as defined by the Canadian National Park Act (2001) is:

“A condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and composition and abundance of native species and biological communities, rates of change, and supporting processes.”

(Canada National Parks Act, 2001)

The success of any restoration project requires a dedicated group of individuals to diligently carry out the monitoring requirements to assess, and when needed, adapt to changing environmental conditions. Both the needs of the species and the influence of human activity must be carefully and consistently observed (Parks Canada, 2001). The Western Bluebird was extirpated due to human activity. Therefore, we feel it is essential that community members on Salt Spring Island play an integral role in monitoring the project. In essence, we believe the success of our restoration proposal is dependent on the involvement of community members on Salt Spring Island.

### **6.3 At the Core of Restoration – Community and Education**

Human dimensions are essential to the success of any ecological restoration project (Egan, Hjerpe and Abrams, 2011). Essentially, people are to blame for the environmental degradation and have a responsibility to mend it (Egan, Hjerpe and Abrams, 2011). Egan, Hjerpe and Abrams (2011) describe ecological restoration efforts as experiential and therefore create ideal conditions for “educational possibilities” (p. 2). Much emphasis of the design of this project is placed on community education and involvement in the monitoring portion of this proposal in an effort to ensure long-term commitment and engagement with volunteers and community members.

The first task of the administrator will be to consult with the Salt Spring Island Conservatory, a well-established organization on the island, and work closely with them utilizing the work they’ve already established in the community (Salt Spring Island Conservancy, 2011). Schools, community organizations, visitor centers, bird watching clubs,

and farmer's markets will be targeted as possible groups to present to. In addition, the Garry Oak Ecosystems Recovery Team (GOERT) has conducted substantial educational programs concerning the Western Bluebird and will be another close collaborator in the educational initiatives regarding this project on the island. We feel confident that our proposal will evolve with these foundational organizations in the community.

#### **6.4 Volunteer Recruitment**

The restoration process is largely shaped by how humans engage in the structure and direction of the ecosystem development (Burke and Mitchell, 2007). As mentioned in an earlier section, education will be fundamental in gaining community awareness, involvement and cooperation. The first step will be to develop promotional materials and give educational presentations promoting the campaign, "Bring Back the Bluebirds" (see Appendix 10.1) to various groups on the island. Public meetings will be conducted on Salt Spring Island to recruit volunteers for the project. Emphasis will be on educating the public about the reintroduction project and how they can get involved.

The campaign will aim to inspire an emotional connection from community members to the Western Bluebird. Research indicates that threatened species recover in communities where an emotional attachment has been established (Toussaint, 2005). An example of this is the bald eagle in the United States, which has a successful recovery story due largely to the emotional connection Americans have to species as an iconic symbol for their nation (Boswell, 2012).

Presentations will be conducted throughout the island to educate the community about our project and find volunteers and staff. Three levels of volunteer involvement will be clearly

presented to community members in the recruiting sessions and on the website:

1. Part of the volunteer committee at various levels:
  - Educational and volunteer leaders
  - Bluebird technician assistants (monitoring bluebird activity)
  - Nestbox stewards (clean nest boxes, assess dangers and site cleanup)
2. Information about how to report a sighting:
  - Downloading instructions for our app
  - Website link to report sightings or upload pictures
3. Instruction on how to make and put up a bird box.

GOERT has created materials such as a nest identification key, a nest box monitoring protocol and tips for identifying Western bluebirds which can be handed out at presentations and found on our website (Garry Oak Ecosystems Recovery Team, 2003).

Building off of the GOERT materials, we have created a DVD with more pictures and songs of the Western Bluebird (see Appendix 10.2). This will be a tool for identifying sounds and sightings. In addition, the directions for building a bird box will be made available. These items will also be represented on the website which will be used as a tool for monitoring and education. Schools, families and community members can observe the inside of a nest box and watch the eggs hatch and the nestlings grow. The monitoring cameras will also improve the monitoring needs of five nest boxes on a 24-hour basis.

## 6.5 Volunteer Stewardship

Restoration efforts have the capacity to restore both ecosystems and to restore the relationship of participants to nature (Lee and Hancock, 2011). It is a reciprocal relationship where people can play various roles to receive the physical, spiritual and psychological benefits from their engagement with restoration activities (Lee and Hancock, 2011). This proposal acknowledges the important role people play in the successful reintegration of the Western Bluebird on Salt Spring Island. Lee and Hancock (2011) refer to organized volunteers working on restoration projects as volunteer stewardship groups, where stewardship is “the careful and responsible management of our natural resources” (Merriam-Webster, 1998 as cited in Lee and Hancock, 2011). The desire to preserve the natural environment is a common motivation for people who get involved with restoration activities (Lee and Hancock, 2011).

Miles, Sullivan, and Kuo (1998) suggest additional motivators that steer volunteer stewards to restoration projects: 1) the opportunity to be away [from regular routines]; 2) meaningful action; 3) general participation; 4) personal growth; 5) physical fitness; 6) and a fascination with nature. In addition, it was found that overall satisfaction increases with responsibility (Miles, Sullivan, and Kuo, 1998). Understanding the many reasons why people will volunteer their time and what contributes to their satisfaction is crucial to keeping people interested and on board for long-term monitoring restoration projects such as ours. We believe that our efforts in ensuring satisfaction of our volunteers will contribute to the success of our project.

Volunteer stewards who show an interest and are committed to the long-term will be given a substantial amount of training and responsibility for various parts of the monitoring project. Volunteers will be trained by the part-time bluebird technicians to handle the birds,

clean boxes, identify and collect data on the species and evaluate threats such as invaders and human activity. As volunteers develop their skills, more training will be offered. Our design team is confident that keeping volunteers and staff who are committed to our objective is essential to the extensive monitoring needed over an 8-year period.

## 7.0 Biological Monitoring

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### 7.1 Biological Monitoring Overview

The aim of this project is for the reintroduced population to grow annually. Successful reintroduction is dependent on the capacity for translocated individuals to reproduce and also for their offspring to reproduce successfully. Throughout each breeding season, from February to September, monitoring will be conducted to ensure the population of bluebirds grows annually. Data will be collected on the number of individuals that establish a territory, reproduction rates and population size.

### 7.2 Monitoring Procedures

Weekly surveys will begin in mid March and initially will help to locate bluebird territories. The bluebird technicians and volunteers will conduct these surveys. The surveys will also allow us to capture and band unbanded birds that may immigrate to the area and set up territories. To capture them we will use a Potter live-trap that will use live mealworms as a lure. This method has been found to take less time, only 30 minutes to capture a pair, than other methods (Keyser *et al.*, 2004). The bluebird technicians will give these unbanded birds both metal service bands as well as coloured bands to make identification easier. After the first year these surveys will also be used to identify returning birds. The goal of these surveys is to determine the minimum estimated size of the adult population (including territorial and non-territorial adults) in addition to finding established bluebird territories.

After locating individuals who have established a territory we will identify them by their bands and check for signs of breeding behaviour such as nest building and mate

feeding. These checks will be repeated every 3 to 5 days from February to September. After evidence of nesting has been observed, nests will be monitored every 1 to 3 days. This will continue until the nest has either failed or the young have fledged. The part-time technicians or volunteer coordinators will organize a system for monitoring based on the availability of the volunteer stewards. The data monitoring table will be a standard form used to record the nest box ID number, the bird band ID number and any activity or observations made by data collectors (see Appendix 10.3).

More specifically, the data recorded with respect to reproduction during these checks will include the recorded dates of nest initiation, hatching and fledging as well as the number of eggs laid, hatched and nestlings fledged. Dates for nest initiation, hatching and fledging will have to be estimated due to the length between checks. Determining nest initiation could be difficult because eggs may be laid over several monitoring checks. This is why recording the number of eggs is important at each check. When the number of eggs in a clutch stops increasing and is confirmed complete it is simply a matter of counting back the days assuming that one egg was laid per day and that there was no reduction in the number of eggs between checks. Knowing the approximate date when the last egg was laid we can estimate the hatch date by assuming it will take 14 days of incubation. Despite being laid days apart, eggs hatch at roughly the same time (Davis and Roca, 1995). Because there will be multiple data collectors and there are many dates to keep track of there will be a calendar for each month for the bluebird technicians to make accurate estimations of egg hatching date (Appendix 10.4).

Nestlings will be banded with service and colour bands when they are between 10 to 14 days old (figure 7). To prevent premature fledging we will no longer open the nest boxes once

the nestlings are over 14 days old and have been banded. Premature fledging accelerates the growth of the young above the average growth rate. The effects can be detrimental to the overall fitness of the bird and often the development of secondary sex traits are impaired as well as bone size and body mass (Searcy *et al.*, 2004). To prevent this, the status of the nest will be based on the presence of adult birds and the sound of nestlings inside the box.



Figure 7. A nestling with both service and colour (red and blue) bands on it's legs

### 7.3 Monitoring Assessments and Interventions

There are several factors to consider when determining a nest's success or failure. A nest that fledged one or more nestlings will be considered successful. Usually, 20 to 21 days is the expected time for nestlings to remain in the nest before fledging (Keyser *et al.*, 2004). If the nest becomes empty of eggs or nestlings before the expected time of fledging (less than 18 days) the nest will be considered as failed and will be listed as a predation event. If nestlings were found within the territory of the nest, it will be considered a success. If the nest failed the cause of the failure will be determined by the state of the nest and observations of the surrounding area. It is important to determine the causes of nest failure so that we can develop strategies to prevent them in other areas as well as take them into account in future

years of the project. To check for re-nesting, breeding pairs will be monitored despite whether the initial nest was successful or not.

In hopes of accelerating population growth by improving fecundity and survival, supplemental food will be given during poor weather conditions that can often lead to nest failure. These include rainy or windy weather as well as cool periods of less than 16°C (Slater and Altman, 2011). Supplemental feeding regardless of weather will also occur from the hatching date of the clutch until 1 to 3 weeks after fledging. This is to increase the survival of the young as well as give the parents more energy for possible re-nesting.

Due to the limitations on the parents' ability to deliver food, and later the young's own inexperience as foragers, the few weeks after hatching and fledging are considered a nutritional stress period. Supplemental feeding provides more energy to be put towards development and often results in birds of greater body size and fitness (Searcy *et al.*, 2004). The feedings will be carried out by the technicians who will put mealworms on a jar lid that they cannot get out of and then placing the lid on top of the roof of the occupied nest box. The coordinator will be responsible for monitoring the weather condition forecast on the consistent basis and ensure proper feeding is employed.

#### **7.4 Monitoring for Invaders**

Monitoring will also be done to ensure that no invaders, such as the House Sparrow, takes over a nestbox intended to be used by the bluebirds. House Sparrows will be removed from the box, however other native species protected under federal law will be left alone (Garry Oak Ecosystems Recovery Team, 2003). These birds include: House Wren, Violet-green Swallow (*Tachycineta thalassina*), Tree Swallow (*Tachycineta bicolor*), and Chestnut-

backed Chickadee (*Poecile rufescens*) (see Appendix 10.5). In addition, nest boxes will be cleaned between the months of September and November (Garry Oak Ecosystems Recovery Team, 2003). All data will be collected regarding the dates of the nestbox cleanups, information about other species that might have nested or been present in the nestboxes. If it happens that a dead Western Bluebird is located the data regarding location, ID number and cause of death (if it can be determined) will be recorded.

### **7.5 Post Reintroduction Monitoring**

Following the 5-year reintroduction we suggest 3 years of additional monitoring to determine the success of the program. There are two criteria we will use to evaluate the success of the program. The first criterion for success is that the reintroduced population grows between successive years. The second criterion is that our reintroduced population has similar estimates for reproduction and survival when compared with a high quality reference population. Similar to monitoring during the reintroduction, community tip-offs and island wide surveys will be used to determine established territories, identify individuals and estimate population size. Population estimates will include the number of adults, juveniles (regardless of whether or not a breeding territory is established) and free floaters. When possible, nestlings will be colour banded as well as adults if they have not already been done. The procedure for nest monitoring will be exactly the same as previously described for during the reintroduction period and the same demographic data recorded for comparison with the reference population. Evaluation is important not only in determining if the reintroduction was a success or failure, but also their associated factors to help in future conservation efforts. We want to know if our reintroduction procedures increase the

probability of success. Regardless of whether or not the criteria are met during each year of the post reintroduction monitoring, if the population remains small and vulnerable to stochastic processes, then additional years of monitoring will be undertaken.

Throughout the entire reintroduction period the coordinator will be continuously assessing the data and the bluebird populations. In addition, research will be conducted throughout the 5-year reintroduction to ensure all literature and research is up-to-date regarding technologies and assessments. Human activity will also be monitored in region surrounding Mount Tuam. Lastly, the coordinator will maintain ongoing communications with other Western Bluebird restoration projects in the surrounding areas. Salt Spring Island acts as a link between important projects such as the San Juan Islands and Cowichan restoration sites.

## 8.0 Budget Analysis

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### 8.1 Overview

This budget reflects the resources needed for the reintroduction procedures and five years of active monitoring and completion of a final report. Funding is allocated for 1 full time administrator and two seasonal bluebird technicians to assist with capture and reintroduction during the first five years of the project. We believe students working through the co-op program at nearby universities, such as the University of Victoria, may be used as assistants in most or all cases. Travel and lodging will be provided as project staff capture and determine viability of Western Bluebirds, and relocate them to Salt Spring Island. As is shown in Table 1.1 (budget), labour costs will make up the bulk of the expenses associated with this effort, though the project will rely heavily on local volunteers once reintroduction has taken place and as populations of Western Bluebirds become established on Salt Spring Island.

**Table 1.1 Estimated Project Costs**

Budget Items	Cost Per Unit	Per year	5 years
Bird Boxes (regular)	\$75	\$1350	\$6750
Bird Boxes w/cameras	\$100	\$500*	\$500
Mist nets/ Aviaries	\$110	\$550*	\$550
Food, leg bands, and Veterinarian exam for birds		\$6000	\$30,000
Bird identification App	\$1000	\$1000*	\$1000
Website development	\$1000	\$1000*	\$1000
Website maintenance		\$250.00	\$1250
Vehicle rental	\$250 per vehicle week	\$1500.00	\$7500
Gasoline	\$75 per tank	\$600	\$3000
Lodging	\$60 per night per room	\$3780	\$18,900
Public outreach (public meetings, printing, etc.)	\$500 per meeting	\$2000*	\$6000
Educational materials	\$1000**	\$1000	\$8000
Labour (One administrator & two full-time assistants)	\$15 hour for 2 part-time seasonal assistants & \$30 hour for full-time project administrator	\$71,400***	\$571,200****
Fundraising (Grantwriter, mailings)	10% commission per grant plus printing and mass mailings as needed.	\$30,000	\$150,000
Legal (Customs, environmental compliance, etc.)		\$5,000	\$25,000
Total		\$196,630	\$822,650

\*One time cost spent only during the first year of project. It is anticipated as many as four meeting will be needed during the initial year. Future meetings held after the first year will be annual one-time events or on an as needed basis.

\*\* Educational materials may include, but are not limited to: Bird identification kits, CDs, films on Western Bluebird or other native bird species, etc. These would be developed in cooperation with local educators as part of the environmental education component of the project.

\*\*\*Average labour cost over eight years. Last three years does not include seasonal assistants

## 8.2 Funding

It is necessary to secure funding that guarantees it will be possible to follow through with the 5-year reintroduction effort and sufficiently monitor the population during each year of reintroduction and for a minimum of 3 years following reintroduction. Funding should also be sufficient to ensure completion of a peer reviewed analysis of the reintroduction methods, monitoring techniques, and results of the Salt Spring Western Bluebird reintroduction. Toward this end, among our initial goals will be identifying a grant writer/professional fundraiser willing to work on commission or for a small salary to facilitate funding needed for successful completion of this project. It is our hope that by running funding through an existing non-profit organization we will be able to leverage fundraising resources and contacts already in place to accomplish this goal.

Because we will rely heavily on volunteers from the local community from the moment the first Western Bluebirds are released on the island, it will be essential volunteers have access to tools to maximize the monitoring they do. These tools will need to be in place at the beginning of the eight-year reintroduction and monitoring effort in order to be most effective, and therefore represent upfront expenses at the beginning of the reintroduction program. We desire these tools to be available long-term, and to provide a blueprint for other efforts, whether directly related to Western Bluebird restoration or to the conservation and recovery of other species.

Initial fundraising efforts will focus on enabling the restoration team to hold meetings with local stakeholders on Salt Spring Island to make certain the tools we propose will meet the needs of the local volunteers we plan to incorporate into our efforts. These meetings will enable us to better tailor additional grant requests to the appropriate foundations as

fundraising efforts proceed.

Among the tools we initially propose are cameras in selected nest boxes providing live feeds to a website that can be accessed by members of the community and also incorporated into environmental education programs at local schools. Additionally, it is our intent to develop an application (or app) for use on cell phones that will allow volunteers, interested members of the public who simply may witness a Western Bluebird in passing, or visitors to Salt Spring Island aware of the reintroduction efforts to quickly upload photographs along with accurate information regarding the location of the bird(s) in question. This app will have practical application well beyond the Western Bluebird that could be valuable to birders, environmental activists, and interested citizens in collecting useful data regarding birds in general over time providing valuable assistance in recording population trends.

Once funding is secured for both the initial meetings and the ongoing monitoring tools cited above, the restoration funding effort will become the focus of all future fundraising in an effort to secure the resources needed for the reintroduction itself. Our primary targets will be, in order of priority: 1) foundations; 2) major donors; and, 3) smaller donors. Priority will be given in all three categories to those willing to commit to contributing to the effort over a multi-year period to ensure continuity of funding throughout the entire project. Foundations involved in the nearby San Juan Island reintroduction effort will be the focus of initial grant requests to the extent possible depending upon their funding guidelines. It is also hoped many major and small donors within the local community, as well as potential foundation contacts, will be identified during the initial public meeting and planning phase of the project.

## 9.0 Conclusion

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### 9.1 Conclusion

The optimistic end result of this project is to bring a self-sustaining population of the Western Bluebird to Mount Tuam Ecological Reserve. The hope is through introducing the birds to the reserve, they will spread throughout the island facilitating an overall regional recovery in Western British Columbia. As noted throughout the project, the extirpation of the species will have ramifications for bird enthusiasts, but more importantly the ecology of the region. Though the battle with human influence on the landscape will be uphill, we are hopeful that through effective implementation and long-term monitoring, the Bluebird will return.

*“We stand now where two roads diverge. But unlike the roads in Robert Frost’s familiar poem, they are not equally fair. The road we have long been travelling is deceptively easy, a smooth superhighway on which we progress with great speed, but at its end lies disaster. The other fork of the road – the one “less traveled by” – offers our last, our only chance to reach a destination that assures the preservation of the earth. (Rachel Carson, 1907 - 1962)*

## 9.2 References

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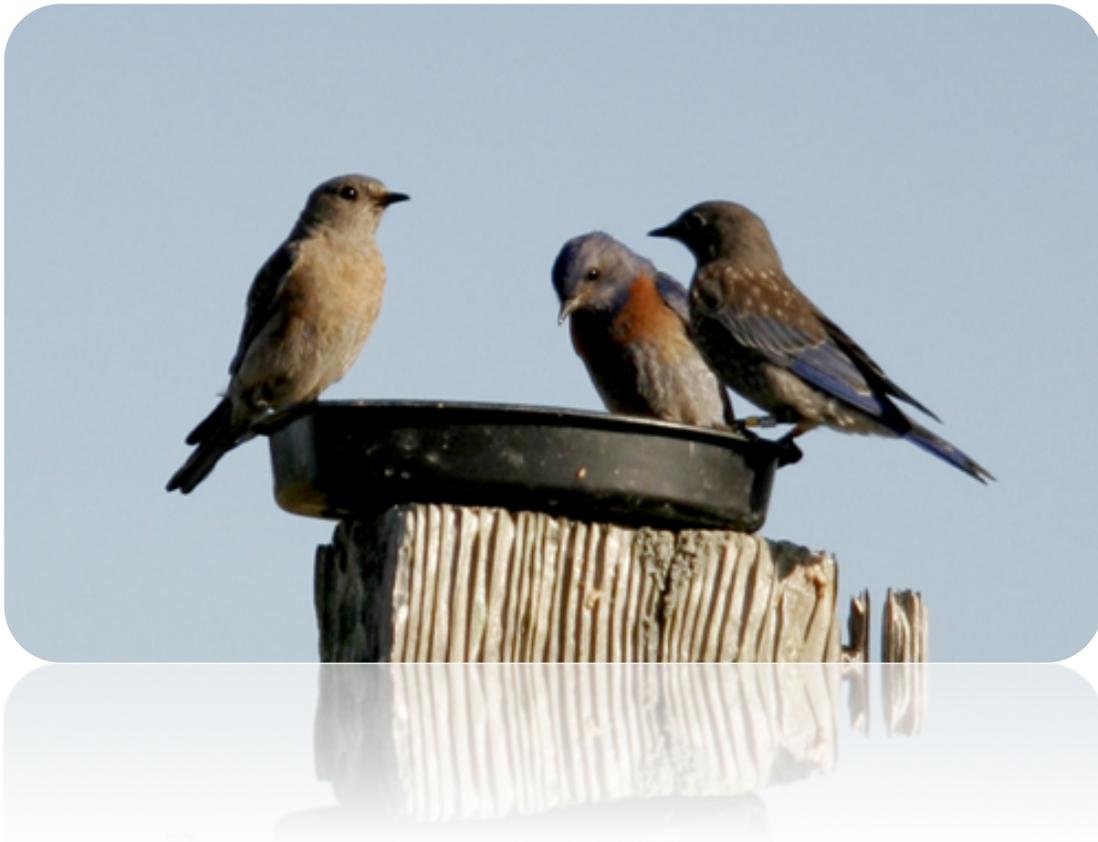
## Appendices

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Appendix 10.0 Detailed Ecological Map of Mount Tuam Ecological Reserve

## Appendix 10.1 Bring Back the Bluebirds Presentation Demo DVD

This DVD will be used in presentations to community members.



## Appendix 10.2 Song and Species Identification DVD





## Appendix 10.4 Standard Calendar for Estimating Nest Activity

### Calendar to monitor fledging success

Each nest has its own calendar based on its GPS coordinates. A calendar will be made for each month between February-September for every nest initiation to monitor activity.



**BOX \_\_\_\_\_ Location - \_\_\_\_\_**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Record dates of:

- nest initiation date
- band ID numbers of bluebird pair
- how many eggs are laid
- when the eggs hatch
- when fledging occurs
- how many successfully fledge

Some dates will have to be estimated due to inability to check daily. It can be assumed that one egg is laid per day. It takes about 14 days for incubation to be complete and the eggs hatch roughly at the same time. Nestlings must be banded between 10-14 days

## Appendix 10.5 ID Sheet for Nestbox Invaders

### Identification Key – Birds That Use Nestboxes

**These native species are protected under federal law.**

They should not be interfered with if they have become tenants of your nestbox.

#### Western Bluebird *Sialia mexicana*



**Nest:** 2-10 cm (1-4 in) deep.  
Fine grasses or pine needles, fairly deep nest cup.

**Eggs:** 4-6, powder blue, occasionally white.

#### House Wren *Troglodytes aedon*



**Nest:** Tall.  
Twigs & grasses.  
Cup is lined with fine grass.

**Eggs:** 6-8, white with brown markings.

#### Violet-green Swallow *Tachycineta thalassina*



**Nest:** Deep.  
Grasses and straw.  
Lined with many mixed feathers.

**Eggs:** 4-5, white.

According to the Cornell Lab of Ornithology, Violet-green Swallows have been observed feeding and defending nests of Western Bluebirds:

[www.allaboutbirds.org/guide/western\\_bluebird/lifehistory](http://www.allaboutbirds.org/guide/western_bluebird/lifehistory).

## Tree Swallow *Tachycineta bicolor*



**Nest:** Grasses lined with feathers.

**Eggs:** 3-8, white.

## Chestnut-backed Chickadee *Poecile rufescens*



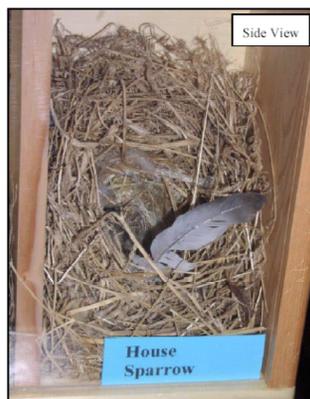
**Nest:** Soft mosses and fine grasses lined with feathers.

**Eggs:** 4-8, white.

## **Invasive species: Not protected under federal law**

We encourage the removal of any nesting attempts by House Sparrows. It is important that any signs of nesting attempts by these birds be noted so that boxes can be moved from these sites.

## House Sparrow *Passer domesticus*



**Nest:** Tall.  
Coarse grasses, scrap paper, cellophane, or other refuse.

**Eggs:** 5-7, cream with brown markings.

Appendix 10.6 Photo and Appendix Sources

Figure 1. Female bluebird (left) and male bluebird (right). Retrieved from: <http://sialia-bluebird.blogspot.ca/2011/04/article-about-psbrp-and-western-and.html>

Figure 2. Mt. Tuam Ecological Reserve Map. Retrieved from: [http://www.env.gov.bc.ca/bcparks/eco\\_reserve/mttuam\\_er/mount\\_tuam\\_map.pdf](http://www.env.gov.bc.ca/bcparks/eco_reserve/mttuam_er/mount_tuam_map.pdf)

Figure 3. The top and side view of 1"x10"x10.5" wooden board used for making a bird box suitable for the western bluebird. Retrieved from: <http://www.nabluebirdsociety.org/eastwestbox.htm>

Figure 4. A top view of the individual dimensions of each piece necessary to make a bird box suitable for the western bluebird. Retrieved from: <http://www.nabluebirdsociety.org/eastwestbox.htm>

Figure 5. Diagrams of a completed bird box from a diagonal and side view. Retrieved from: <http://www.nabluebirdsociety.org/eastwestbox.htm>

Figure 6. A Western Bluebird aviary with a nestbox (left) occupied by a bluebird pair and the other nestbox (right) occupied by a pair of swallows. Retrieved from: <http://www.goert.ca/news/2012/07/a-bluebird-summer/>

Figure 7. A nestling with both service and colour (red and blue) bands on it's legs. Retrieved from: <http://www.goert.ca/news/2012/07/a-bluebird-summer/>

Appendix 10.0 Map. Retrieved from:

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Appendix 10.1 Figure. Retrieved from: Source:<http://www.goert.ca/news/2010/08/bring-back-the-bluebirds/#matedpair>

Appendix 10.2 Figure. Retrieved from:

[http://www.goert.ca/publications\\_resources/bluebird.php](http://www.goert.ca/publications_resources/bluebird.php)

Appendix 10.3 Figures. Retrieved from:

[http://www.goert.ca/publications\\_resources/bluebird.php](http://www.goert.ca/publications_resources/bluebird.php)