

*Herrera Environmental Consultants, Inc.*

**Sustainable Seed Harvest Proposal Memorandum**

**Skagit Environmental Bank**

**To** Betsy Stevenson, Senior Planner, Skagit County Planning and Development Services

**cc** Jerome Ryan, Kevin Noon, James Hodge; Clear Valley Environmental Farm, LLC

**From** Len Ballek, Herrera Environmental Consultants, Inc.

**Date** July 19, 2007

**Subject** Sustainable Harvesting of Seed and Cuttings at Skagit Environmental Bank

**Summary**

Seeds, and cuttings from select species, will be collected by hand; no machinery of any kind will be used in this operation. Seeds and cuttings will be taken once each year for each selected species. No more than 30 percent of the entire mature seed crop (available at the time of collection) for any species will be harvested during any one growing season. No more than 30 percent of the current year's growth of new stems on the woody species will be harvested during any one growing season. Collection will be supervised by nursery staff experienced in hand collecting seeds and cuttings and best management practices will be employed including minimizing trampling, limiting the harvest to no more than 30 percent of the available seed or new growth cuttings, and refraining from harvesting when seed plant species aerial coverage within the bank site is less than 1,000 square feet.

**Introduction**

The development of an alternative agricultural enterprise involved in the sustainable harvesting of seed and cuttings in conjunction with the Skagit Environmental Bank has enormous ecological, economic, and cultural benefits. In addition, careful monitoring by the owners and the easement holders will prevent any activities that would adversely affect the projects ability to meet the performance standards of the mitigation bank. Sustainable harvest of seeds within the Skagit Environmental Bank is also consistent with the agricultural uses allowed under the Shoreline Management Act (SMA) in Skagit County.

Some of the historic natural processes that historically assured a sustainable and ecological healthy native ecosystem on the site have been eliminated through time. The lack of large herbivores has left a gap in the ecological processes that must be replaced in order to maintain a sustainable ecosystem. These animals browsed the woody plants in a random pattern, which resulted in periodic new healthy growth providing food and habitat for small game and passerine

birds. The presence of these animals also reduced biomass in the herbaceous vegetation and helped distribute seed and incorporate it into new sites. The result of this animal activity was a mosaic of mixed age stands of vegetation that provided the ecotone habitat required by many species and maintenance of healthy and reproducing plant communities. The ecological services provided by large herbivores will be replaced by the careful and controlled harvest of seed and cuttings on the site.

Products harvested will provide additional plant material for use in ongoing maintenance and repair of the Bank. The harvest of these products will also provide an additional source of income for the owners and job opportunities for agricultural workers in the community.

Many of the skills and equipment needed for the harvest and processing of seed and cuttings from the site exist within the Skagit agricultural community. The jobs provided by this alternative agricultural enterprise will help maintain the rural character of the area.

Proper management of the seed bank is critical to protect the sales of mitigation credits. It is in the best interest of the owners to prevent any activities that would be detrimental to the achievement of the performance standards set for the Bank. Careful monitoring by the owners with oversight by the easement holders will result in the temporary or permanent cancellation of any activities before they delay meeting of performance standards.

### **Background Information Obtained by Literature Review**

The method of choice for collecting seed from diverse native plant communities in which particular species are targeted is hand collection. This method is considered the least invasive and damaging to the native vegetation. Seed is collected on an opportunistic basis. Hand collection is time consuming and unprofitable unless a large amount of seed can be collected within a short period of time. Therefore, hand collectors do not try to get every bit of seed but instead look for opportunities to collect more seed within a shorter timeframe. As a result, collectors access a small percentage of the actual area, and a huge amount of the available seed is left behind. In most seed collection efforts, it is virtually impossible to collect more than 50 to 70 percent of the available seed (Ogden 2007).

Dumrose (2004) describes the use of simple tools such as racquets, hoppers, and felt boards for seed collection and unique low-cost tools such as rock tumblers in aqueous and dry modes for cleaning and conditioning seed. Hand and mechanical collection of the seed-bearing stalks can be effective for grass-like species (Darris 2005). However, mechanical stripping results in a loss of substantial quantities of seed.

Lochner (1997) suggests that hand collection is the best method for harvesting individual species. He emphasizes the importance of an ethic of seed collection that includes (1) always obtaining permission from the landowner, (2) limiting the harvest to no more than 10 to 75 percent of the available seed, (3) refraining from harvesting when seed crops are small, and (4) keeping in mind the goal of harvesting native seeds, which is to preserve native species.

In areas with substantially reduced populations of mammals (such as the Skagit Environmental Bank), harvesting seed and cuttings will mimic herbivory in the short term, maintaining the health and diversity of native plant communities. A study by Bowers (1993) showed that a large number of plants reached the highest abundance when herbivore pressure was intermediate. This “intermediate level” of herbivory can be difficult to achieve in an uncontrolled situation involving large herbivores but the proper level can be mimicked through the selective harvesting of cuttings. Similar responses to herbivory were noted in grassland management studies (Chase et al. 2000; Comis 1999). These studies support the belief that herbivore reduction of biomass at a moderate level increases the health and biodiversity of grasslands. Hand harvest of seed from grass-like species involves the cutting of plant material to harvest the seed heads. This material is then dried out and the seed is extracted. Seed harvest from grass-like plants is an excellent method of providing the moderate and selective biomass reduction that moderate grazing provides, but in a much more controlled manner. Darris (2005) notes that the removal of this biomass or dead material is widely known to improve the seed yields of most grass seed crops.

In a study of herbivory effects on wetlands, the results suggested that “herbivore activity prevented competitive exclusion despite increased biomass, probably by suppressing one of the dominant plant species and preventing dead biomass accumulation” (Gough and Grace 1998). The investigators found that inside the fences (controls) in both marshes, the significant increase in accumulation of dead biomass may have suppressed seedling establishment and germination. They showed that selective reduction of biomass in wetlands is an important management activity, especially in emergent wetlands. Rupp et al. (2001) investigated issues of both trampling and biomass reduction on the health of a wetland plant community. They concluded that *Carex* spp. did not appear to be adversely affected by grazing and trampling. The results of the study also suggested that moderate trampling may stimulate plant productivity.

### **Species-Specific Management Practices**

Management practices for the sustainable collection of seed and cuttings have been developed to serve as safeguards to ensure that the collection of seed and cuttings results in no damage to the environmental bank. Typical collection techniques and retrieval rates of harvestable seed and cuttings for the various types of plant material to be collected are described in the following text. The management practices include a commitment to retaining a specified percentage of the collections for potential repairs and enhancement of the mitigation site identified through the process of adaptive management.

### ***Cone-Bearing Trees***

Western red cedar (*Thuja plicata*) and Sitka spruce (*Picea sitchensis*) will not bear harvestable seed for at least 20 years. When seed is produced, it will be collected by climbing or using pole pruners to cut ripe cones. During the collection process, care will be taken to avoid damaging tree trunks and branches. Ladders and pole pruners will be used while the trees are small enough to reach seed and only the cone clusters will be removed. This is similar to the clipping of cones by tree squirrels in a native stand. When the trees are taller, professional tree climbers using

light impact climbing gear may be hired. These climbers will be supervised at all times by Bank representatives to prevent damage to the trees. During each season, no more than 30 percent of each cone crop will be collected. Ten percent of the clean seed in each collection will be reserved to grow plants for the repair or enhancement of the cedar and spruce populations at the environmental bank. This rate of seed retention will continue until enough seed is available to replace 50 percent of the trees on the site if necessary. Seed stored for this purpose can be held for up to 10 years (below freezing) but will be tested annually and replaced as it loses viability.

### ***Alders***

Red alder (*Alnus rubra*) and Sitka alder (*Alnus sinuata*) produce seed in small cone-like capsules that are persistent over the winter but shed seed over a period of several weeks. Because of this characteristic, it is virtually impossible to collect more than 30 percent of the available seed. The cones are collected by hand, resulting in little impact on the plants. Ten percent of the clean seed in each collection will be reserved to grow plants for the repair or enhancement of the alder populations at the environmental bank. This rate of seed retention will continue until enough seed is available to replace 50 percent of the alder on the site if necessary. Seed stored for this purpose can be held for up to 5 years under refrigeration but will be tested annually and replaced as it loses viability.

### ***Ninebark***

Pacific ninebark (*Physocarpus capitatus*) produces seeds in small capsules that are harvested by hand picking ripe seed capsules and extracting the seed. When the seed is ripe, a majority of seed is lost during harvesting, and ripening occurs over a period of several weeks. It would be impossible to harvest more than 30 percent of the seed crop. The seed has adapted to be carried by wind and would be transported to new germination sites during the harvesting process. Ten percent of each collection will be reserved to grow plants for the repair or enhancement of the ninebark populations at the environmental bank. This rate of seed retention will continue until enough seed is available to replace 50 percent of the ninebark on the site if necessary. Seed stored for this purpose can be held for up to 5 years under refrigeration but will be tested annually and replaced as it loses viability.

### ***Fruit-Bearing Shrubs***

Seed of the following species are harvested by hand picking ripe fruit.

- Salmonberry (*Rubus spectabilis*)
- Douglas hawthorn (*Crataegus douglasii*)
- Black twinberry (*Lonicera involucrata*)
- Cascara (*Rhamnus purshiana*)
- Pacific crabapple (*Malus fusca*)
- Sweet gale (*Myrica gale*).

Typically the fruit does not all ripen at same time; therefore, much is left behind during the harvest and subsequently drops to the ground, where it can be eaten by rodents and birds and transported to new sites (with the germination-inhibiting fruit removed). This dispersal will result in expanding populations of each species. Because of the uneven ripening, it is impossible to collect more than 30 percent of the crop during one picking.

Fruit of the following species persists through the winter.

- Swamp rose (*Rosa pisocarpus*)
- Nootka rose (*Rosa nutkana*).

At least 50 percent of each seed crop will be left on the shrubs to provide food for wildlife and winter dispersal of the seed by the consumers of the fruit.

Ten percent of each collection will be reserved to grow plants for the repair or enhancement of the populations at the environmental bank. This rate of retention will continue until enough seed is available to replace 50 percent of each species on the site if necessary. Seed stored for this purpose can be held for up to 5 years under refrigeration but will be tested annually and replaced as it loses viability.

### ***Willows and Dogwood***

For the following species, 2- to 3-foot-long cuttings will be harvested by cutting up to one-third of the yearly stems after the plants are well established. Inspections and approval by the conservation easement holder will be required before the collection of cuttings.

- Red-osier dogwood (*Cornus stolonifera*)
- Pacific willow (*Salix lucida*)
- Sitka willow (*Salix sitchensis*)
- Hookers willow (*Salix hookeriana*)
- Sandbar willow (*Salix exigua*).

Appropriate harvesting will encourage increased sprouting and production of vegetation. The collection activity will also prevent willows from becoming decadent and overgrown with woody material that is not usable habitat. This collection will mimic browsing by large herbivores or beavers. Cuttings will not be harvested from select populations of willows to allow them to reach maximum height and density in situations where heavy shade is beneficial for the suppression of reed canarygrass and a reduction in water temperatures. Up to 10 percent of each collection will be reserved for use by the mitigation bank. However, cuttings cannot be stored for more than a few months; therefore, the conservation easement holder will determine whether cuttings from the cutting collection will be needed for repair or enhancement during that season.

Mature willows and dogwoods excluded from the cutting collection will be a valuable source of seed. Many native plant nurseries grow red-osier dogwood from seed; therefore, mature dogwood would provide a source of seed for the market with some reserved for use in repairing

or enhancing the environmental bank. There is also considerable interest in and increasing use of willow seed instead of cuttings to grow willow plants. Bitterroot Restoration (a native plant nursery in Corvallis, Montana) grows all of its container willows from seed. Thousands of plants can be grown from seed collected from a small patch of willows in an hour or so with no visible impact on the plants. As this practice becomes more common, the seed bank will work to develop a viable market for willow and dogwood seed.

### ***Cottonwoods***

Cuttings of black cottonwood (*Populus balsamifera* spp. *trichocarpa*), 2- to 3-foot-long, will be harvested by cutting new growth from lower branches to encourage the development of a tree form. Cuttings will also be collected from sprouts at the bases of the trees. No cuttings will be made from the apical tips of the trees, and no more than one-third of the crown will be removed during any collection. Cuttings will be available for use by the mitigation bank as requested by the conservation easement holder.

As with willows, cottonwoods can be successfully grown from seed. The seed bank will attempt to develop a market for cottonwood seed that can be sold and retained in storage for use in the environmental bank.

### ***Emergent Wetland Vegetation: Grasses and Forbs***

Seeds or plant material will be collected from the following emergent species:

- Short awn foxtail (*Alopecurus aequalis*)
- Douglas aster (*Aster subspicatus*)
- Tufted hairgrass (*Deschampsia caespitosa*)
- Common spikerush (*Eleocharis palustris*)
- Slough sedge (*Carex obnupta*)
- Daggerleaf rush (*Juncus ensifolius*)
- Soft rush (*Juncus effuses*)
- Baltic rush (*Juncus balticus*)
- Three-square bulrush (*Scirpus americanus*)
- Small-fruited bulrush (*Scirpus microcarpus*).

Collection from emergent vegetation will be conducted by hand picking or cutting ripe seed heads and extracting the seed. This operation results in a maximum harvest of approximately 30 percent of the seed because the seed is released and scattered by the collection process. Seed collection may be a very useful management technique for scattering seed to bare spots and stepping it into the seed bed. Ten percent of each collection will be reserved to grow plants for the repair or enhancement of the emergent populations at the environmental bank. Seed stored for this purpose can be held for up to 5 years under refrigeration but will be tested annually and replaced as it loses viability.

The method for collecting grass-like species is cutting the seed-bearing stalks, drying the material, and then extracting the seed in a way that is similar to pre-combine methods of grain harvest. This results in not only usable seed but a great deal of “wetland straw” that could be used for erosion control in repairs at the environmental bank or other wetland restoration projects.

### ***Submerged or Floating Vegetation***

Plant material will be collected from the following submerged or floating species:

- Yellow pond lily (*Nuphar luteum*)
- Wapato (*Sagittaria latifolia*).

Collection of plant material from submerged or floating vegetation will be conducted by dividing well-established populations that cover more than 100 square feet and removing no more than 20 percent of the existing plants. The collection will not be concentrated in one area and will result in minimal unvegetated areas. Because plants harvested in this way cannot be stored for more than a few months, the conservation easement holder will determine how many plants from each collection will be needed for repair or enhancement at the mitigation bank.

### **Management Protocol and Safeguards**

Collection of seeds and cuttings from established native vegetation at the Skagit Environmental Bank will be managed according to a sustainable approach that is not detrimental to the survival of the plant communities. The collection will be performed according to the ethics described by Lochner (1997): there will be no collection when seed crops are small and the goal of harvesting native seeds (the preservation of native species) will be a focus. In many cases, this activity will be beneficial and can be used as a management technique to maintain the health of the system. Practices and restrictions for ensuring the success of the mitigation site and the seed and cutting business will include but not be limited to (1) limiting the percentage of available seed and cuttings to be collected each season, (2) reserving a portion of each collection for repair and enhancement at the environmental bank by the conservation easement holder, (3) coordinating the collection activities with site maintenance, and (4) using the seed and cutting collection as enhancement efforts to improve the health of the environmental bank.

Management protocols and safeguards to protect the mitigation site from potential impacts of seed and cutting collection will include (1) restricting the harvest of each species to an appropriate level by not conducting seed/cutting collection that would exceed the limit for that species as outlined in this document (2) monitoring the growth of plant groups to assess progress toward meeting the MBRT density, aerial cover and crown cover performance goals. (3) performing no seed or cutting collection if MBRT performance goals are not yet met or fall below the goals.(4) approval of any seed or cutting collection must be approved by the conservation easement holder prior to any collection activity. (5) a qualified wetland scientist must be on site during all collection activities.

The first commitment to maintaining the integrity and health of the environmental bank is to restrict the collection of seed and cuttings to a maximum of 30 percent of the annual production. This is emphasized in the section “Species-Specific Management Practices.” In a healthy plant community, this amount of harvesting will not result in any degradation of community health. This commitment will ensure that the plant community and that wildlife that depend on the seed crops for food and the riparian shrubs for cover will not be adversely affected.

Monitoring of the mitigation site will be the basis for determining whether or not the collection of seeds and cuttings will be allowed and will be conducted by the conservation easement holder. After the initial planting, it is expected that several years of growth will be required for the establishment of plant communities that can produce seed and cuttings at rates that can sustain the communities and provide materials for collection. Based on the establishment of vegetation and the goals for coverage at the environmental bank and the quantity and quality of the seed crops, the seed bank will make a yearly species-specific proposal for seed and cutting collection. The conservation easement holder will have the final authority for approving or disapproving the collection of seed or cuttings from any species. The seed bank will have the right to respond to any disapproval with a modified collection plan or further justifications for the collection; however, the final decision will be made by the conservation easement holder.

Sites to be excluded from the collection of cuttings to allow the development of mature shrubs for stream shading, habitat value, and inhibition of reed canarygrass will be determined by the conservation easement holder and may be reviewed yearly. These areas will be mapped by a global positioning system (GPS) and clearly delineated on a site map. Cuttings will not be collected from these sites unless the conservation easement holder specifically requests a collection to rejuvenate the shrubs as they become decadent over time. Any collection of cuttings from these areas will be supervised by representatives of the conservation easement holder.

The safeguards and protocols described in this memorandum will set appropriate levels of harvesting seed and cuttings and provide a mechanism for monitoring and restricting the harvest if the health of the environmental bank is adversely affected. Data collected during each year of harvest will be used for the modification of future collection plans. The required approval of collection activities by a third-party conservation easement holder (before collection) will ensure the protection of a sustainable vegetation community. The easement holder will have the authority to reduce or stop collection activities if they are preventing the site from meeting the established performance standards. The ethical and effective collection of seed and cuttings at the Skagit Environmental Bank will provide for an operation that is a good example of self-sustaining, low-impact agriculture.

### **Consistency with the Shoreline Management Act**

The proposed sustainable seed harvesting is consistent with SMA regulations presented in Section 14.26, Chapter 7.01 of the Skagit County Code. The site zoned Rural and is currently in agricultural use. The restoration of the site will improve water quality, wetland habitat, and fish



and wildlife habitat at the site and within Nookachamps Creek and the East Fork of Nookachamps Creek. The process of sustainable seed harvesting will not remove the parent plants, and will provide a buffer of sustainable, perennial vegetation for Nookachamps Creek and East Fork Nookachamps Creek. No pesticides or herbicides will be used at this site. Furthermore, no structures will be developed in conjunction with the proposed restoration site or the sustainable seed harvest. Based on the above information, the proposed sustainable seed harvest at the Skagit Environmental Bank is consistent with the policies and goals of the SMA in Skagit County. For further information on project compliance with the SMA, is presented in detail in the *Shoreline Compliance Narrative – Skagit Environmental Bank*, provided to Skagit County (Herrera 2007).

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