

CULTURAL AND ETHICAL CONSIDERATIONS IN ENVIRONMENTAL RESTORATION ACTIVITIES: NATIVE REVEGETATION AT HANFORD NUCLEAR SITE

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ABSTRACT

Affected Tribes have been involved in environmental activities of the US Department of Energy (USDOE) at the Hanford Nuclear Reservation after the Nuclear Waste Policy Act was declared in 1982. The Hanford site has a large tract of culturally significant native shrub-steppe habitat. Such habitat has been destroyed and degraded at a rapid rate due to construction. As an example, human remains of Native Americans who lived along the Columbia River were discovered during ground-breaking activities at a future USDOE research facility in April 1994. After consultation with representatives from the affected tribal nations, construction was halted for 30 days in accordance with the Native American Graves Protection and Repatriation Act (NAGPRA). The consultation with tribal representatives resulted to leave the remains in place, re-inter the scattered bones, revegetate the place, and relocate the research facility. Hence, the Tribes developed a restoration plan for the disturbed site and an Inter-Tribal Restoration Team was formed from members of the affected Tribes. Tribal restoration activities from 1994-96 consisted of re-contouring disturbed area; preventive measures against noxious weeds invasion and wind-caused soil erosion; revegetation with native species; and gathering/salvaging native seeds and plants for seeding/transplanting, revegetation and hand weeding on the old EMSL site, and at a 10-acre fire-disturbed section of Hanford's North Slope. In Fall 1997, the Nez Perce Tribe entered into a subcontract with Fluor Daniel Hanford (FDH) to revegetate and construct a native interpretive trail at the HAMMER Training facility. In 1998, The Nez Perce Tribe was sub-contracted by Bechtel Hanford, Inc. (BHI) for native plant identification and production project.

INTRODUCTION

The Hanford Site, which has a larger tract of culturally significant shrub-steppe, has been continually imposed with serious threats to the sustenance and survival of unique habitat and traditional plant species due to various remediation activities, new facilities construction and changes. For successful restoration activities, there are some ethical and cultural issues and concerns to be considered. A classic example is the construction of the Environmental Molecular Sciences Laboratory (EMSL) site which started in April, 1994. The affected Tribes strongly opposed to the location near the river mainly because traditions indicate that the site is sacred. In addition three earlier independent studies also indicate that the site may be a burial site. However, DOE decided to build EMSL with the justification that EMSL is a world-class research facility, so it should at least deserve a view of the beautiful Columbia River. During ground-breaking and leveling activities,

human remains of Native Americans were discovered. Construction was halted for 30 days in compliance with the Native Americans Graves Protection and Repatriation Act (NAGPRA). Elders from the four affected tribes were consulted and the consultation resulted to relocate EMSL, re-inter the bones, re-contour the severely disturbed area, and revegetate the area with native plant species. Thus, an inter-tribal restoration team was formed, which consist of members from the Nez Perce Tribe (NPT), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Wanapum Indian Band (WIB) and the Yakama Indian Nation (YIN). Native revegetation continues, and as a result one of the affected Tribe went into a native nursery enterprise and the Nez Perce engaged in sub-contracting activities, from revegetation, to plant identification, and production.

ACTIVITIES

During May and June of 1994 the Inter-tribal Restoration Team (Team), composed of members from each tribe, moved the soils and sands to locations approximating the contours of the original landform. The entire twelve acres, (that were severely disturbed and almost completely stripped of vegetation), were covered with two types of tarping/landscape cover. The purpose of the tarp was to permit the entry of rainwater, to prevent the growth of most weeds, to retard soil moisture evaporation, and to prevent wind-caused erosion. Except for two experimental areas, the tarps were removed from the old EMSL site in the fall of 1994.

In June, 1994 the Team constructed a makeshift native plant nursery on the campus of Washington State University, Tri-Cities. Plants were grown from seed, cuttings and salvaged transplants and kept in pots or trenches at the nursery. All nursery stock was transplanted at the restoration area in late fall of 1994. The nursery was closed and dismantled in early 1995. After the nursery closed, planting materials were either grown from seed scattered directly on to the EMSL site or salvaged from construction areas and transplanted to the restoration project within 24 hours. The restoration work at EMSL was conducted within an experimental framework so that Tribes could gain a more thorough understanding of the requirements of the plants that make up and shrub-steppe vegetation and discover the most economical ways to restore them. In keeping with the wishes of the elders of cooperating tribes, no herbicides or other pesticides were used during any phase of the EMSL restoration. Weeds were controlled by hand removal in the fall of 1995 and 1996. There is evidence to suggest that the application of pesticides simply adds to the disruption of any ecosystem, simplifying and facilitating the continued invasion of exotics. In addition, there was an effort to be flexible and match salvaging, planting and seed collecting schedules to optimal seasonal conditions for each task. The impressive early successes of the EMSL restoration project suggest that the natural way strategy is highly cost effective in that no irrigation or pesticides are needed and survival rates are good for most species.

Another major goal of the EMSL restoration was to resurrect the diversity of native species to the disturbed site as possible. Numerous native plants still inhabit areas adjacent to the EMSL site and the restoration crew attempted to match that diversity as closely as

possible. Many of the species cultivated or salvaged for the project have rarely been included in restorations, although some are exceptionally beautiful and have potential value as ornamentals. Other native species are also capable of competing with exotic weeds and may contribute to the re-establishment of natural plant communities, which aid in sequential stages of the vegetation to develop naturally. There was also the opportunity to experiment with numerous under-utilized native species which resulted to recommendations that many of these species be included in future restoration efforts.

Planting Materials

Plants grown in the temporary nursery at WSU Tri-Cities were salvaged from roadsides and various small construction sites. Seeds were collected from a wide variety of native species adjacent to EMSL. Some of the natives from cuttings were tried to be grown, but conditions in the nursery were unsuitable for this purpose.

A major contributor of salvage plants for the EMSL restoration has been the HAMMER project, a disaster training complex located about two miles west of EMSL site. Before construction of the HAMMER facilities, the restoration crew acquired thousands of transplants from lands scheduled for ground leveling and disturbance. Another source of large numbers of transplants was a site near the 200 West area of Hanford. A construction project had been planned for this location and the restoration crew was able to salvage many more plants prior to destruction of the vegetation. All plants taken from the 200-West Area were checked for radiation contamination prior to being transported. None were found to be contaminated.

Sagebrush tubelings grown in nursery from one of the Hanford contractor were transplanted at the North Slope. Other native species that were salvaged from roadsides and small construction sites were also transplanted at the North Slope. For the Interpretive Trail at the HAMMER Training Complex, the plant sources came from road sides, small construction sites, and at the EMSL site vicinity.

Propagation/Salvage Methods & Timing

The two primary methods for acquiring plants for EMSL were propagation by seed and the transplanting of native species salvaged from construction sites. Transplants salvaged from small construction sites during the summer of 1994 were either planted into pots or into trenches at the temporary nursery and kept watered. Some of the trenched bunchgrasses were first divided into smaller individuals as a means of propagation. Survival and growth rates were tracked in the nursery and all plants were replanted at the EMSL site during the late fall of 1994.

Plants salvaged from the HAMMER site were moved during late winter of 1995. Native plants were taken from the 200-West site during the late fall of 1995. All plants removed from construction sites were dug as bareroot plants, stored briefly in buckets during

transport and replanted directly onto the EMSL site, usually on the same day. The salvaged plants that were replanted within 24 hours were not watered nor fertilized.

Studies of seed germination have so far been small and informal conducted either at the nursery or at the Prosser Agricultural Station, (part of Washington State University Tri-Cities)). Seed germination at Prosser was in conjunction with studies of herbicide drift and its impact on the natural vegetation of native species.

Many native shrub species are quite easy to grow from seed while others are more difficult, often requiring stratification (chilling treatment) or scarification (mechanical or chemical abrasion of the seed coat) before germination. The makeshift nursery had no facilities for artificially providing such conditions, so the test relied on nature to freeze and thaw the seeds in several small experiments were incomplete due to time constraints. The studies were not replicated, and it is recommended that it should be repeated especially for important wildlife species such as antelope bitterbrush (*Purshia tridentata*). In addition, the 1994 season was too dry for some of the important steppe bunchgrasses to set seed, including Sandberg's bluegrass (*Poa sandbergii*) and bluebunch wheatgrass (*Agropyron spicatum*). Seed for these and other species should be collected in 1997, a season that shows good promise to produce excellent quantities of seed.

The EMSL restoration project assesses the survival of native species cared for in the nursery by comparing numbers of plants potted during the summer of 1994 with the numbers of survivors planted out in the fall. The EMSL restoration site was partitioned into easily located map units in the fall of 1994. Running totals of numbers of individuals of each species planted to each map unit were kept during all planting activities. The raw data were originally organized by salvage and planting dates, but here we have summarized the data by total numbers of individuals of each species from each source (nursery, HAMMER, etc.) planted to each map unit. Total numbers of plants salvaged and transplanted to each map unit are compared with numbers remaining after two years of sporadic restoration work on EMSL, giving us an estimate of vigor and survival for each species.

An additional treatment has been to leave the tarp in three of the EMSL areas. Holes were cut in the fabric for the plants and, after planting, the edges of the holes were secured from the wind with soil and rocks. Tarping is more labor-intensive, but has reduced weed competition and water stress, producing unusually large plants.

Other experiments conducted in the 1994 nursery included the use of a shade house and transpiration blocker to discover if these treatments might reduce shock and water stress, and so increase survival rates. Data collected in the nursery consisted of the following four variables: height of plant (or of the longest green blade for the grasses), width at the widest point, number of green leaves 1 cm. or more in length and condition of the plant (1=good, 2=fair, 3=poor, 4=dead). Data were gathered every few weeks so that growth rates, mortality and the effects of different treatments upon the various species in the nursery could be tracked.

Transects were set up on different parts of the EMSL site in order to monitor changes in the vegetation through time. The Russian thistle has been heaviest at the south and north ends, becoming fairly sparse in the bottleneck. The restoration crew has all had the opportunity to run transects and read percent cover for the different variables (species present, percent sod or sand, etc.) within randomly selected one meter quadrats. This practice is a standard method for assessment of vegetation and given sufficient sample sizes, the results can be analyzed in various ways. Only a small subset of the existing EMSL transect data were examined, and frequencies for eight of the native species and four of the most noxious weeds were determined as a percentage of occurrence in 30 quadrats. Native shrubs include big sagebrush (*Artemisia tridentata*), gray rabbitbrush (*Chrysothamnus nauseosus*) and snow buckwheat (*Erigonum niveum*). Indian wheat (*Plantago patagonica*), yarrow (*Achillea millefolium*), pale desert evening primrose (*Oenothera pallida*) and scorpion-weed (*Phacelia hastata*) were the herbaceous dicots present along the transect. The bunchgrass needle-and-thread (*Stipa comata*) was also encountered. Weeds included Russian thistle (*Salsola kali*), cheatgrass (*Bromus tectorum*), tumble mustard (*Sisymbrium altissimum*) and diffuse knapweed (*Centaurea diffusa*).

The main source of planting materials for the North Slope revegetation activities conducted in Summer 1996 were leftover tubelings from research conducted by a contractor in revegetating a portion of the Arid Lands Ecology (ALE) area. Some grasses and dominant dicots were also transplanted alongside with the sagebrush tubelings. Since the tubelings were raised in the nursery, the transplants were watered. No follow-up activities like hand weeding and watering was done because the project and its funding ended few weeks after the revegetation.

The Native Interpretive Trail at the HAMMER Training Complex was revegetated during the Fall of 1997. A temporary makeshift nursery was built at the EMSL site. The transplanting/salvage procedure at HAMMER was similar to that of the EMSL revegetation effort. Experience learned from previous activities were applied at HAMMER. Easy to grow or dominant native species were revegetated at the site, and tarping was also applied. Most of the tarps were removed by late Fall.

RESULTS

A total of 37 species were revegetated at EMSL (refer to appendix Table 1). Of the 37 native species, 7 were shrubs, 23 were forbs or dicots and 7 were grasses. Survival of native plants has been very promising at the EMSL site. An average of 80% survival rate was observed. Tarping served its purpose of eliminating the aggressive alien species. Survival ranged from 60% to 100%. All of Indian ricegrass and Sandberg's bluegrass survived, while big sagebrush and gray rabbitbrush were at 60%. The latter's low survival was due to heat stress and bareroot damage during salvaging operation. Transplanting sagebrush and rabbitbrush during hot months is not recommended.

There were aggressive alien species (Russian thistle, cheatgrass and tumbled mustard). At the makeshift nursery and at EMSL, species that were easy to grow or propagate were sagebrush, rabbitbrush, buckwheat, yarrow, bluebunch wheatgrass and prairie junegrass. At the transects, dominant species were buckwheat (37%), Indian wheat (33%) and rabbitbrush (33%). These dominant species were as competitive as the aggressive alien species.

At the North Slope, since no follow up activities (i.e., hand weeding, watering, and site visit/evaluation), plant survival rate is still unknown. Unconfirmed report indicated that most of the sagebrush tubelings died due to drought and invasion of crickets during spring and summer months.

At the HAMMER Training Complex, a total of 14 native species were transplanted, (3 shrubs, 5 forbs and 6 grasses). For some species, seeds were also strewn at the site. There are no data yet on survival rate of transplanted materials. Broadcasted seeds are expected to germinate this spring.

Nez Perce: Native Plant Identification and Production Project 1998 – Dec. 99

Current revegetation efforts by Bechtel Hanford, Inc. (BHI) are directed primarily towards establishing ground cover, not plants traditionally used by area tribes. Revegetation is incomplete without these understory plants. The goals of this Project are to: identify plants with significant traditional use by the Columbia Basin Tribes; identify and protect areas from which they are gathered; and incorporate these plants into BHI's revegetation efforts.

The Nez Perce: Native Plant Identification and Production Project is committed to identifying culturally significant plants and gathering locations through oral interviews with Columbia Basin Tribes; consisting of the Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, Yakama Indian Reservation, and Wamapum Band. Identified native transplants and seeds at Hanford are then to be gathered from the area and healed into three individual test plots by intertribal restoration team members.

In order to attain successful restoration through revegetation at the Hanford Site, appropriate measures should be done. Steps to identify the necessary traditional plant species and proper propagation techniques that will enable BHI to efficiently fulfill its restoration capabilities. Strategies for gathering, salvaging, propagating, growing, storing, seeding, transplanting, monitoring and maintaining native shrub-steppe plants are to be continued to be pursued and identified. Restoration attempts at disturbed sites need to be revegetated with culturally significant native species; to ensure the longevity of such plants in maintaining a diverse habitat. As well as ensuring these native plant species as a cultural resource for affected Columbia Basin Tribes.

With success in growing traditional plant species that should be protected during clean-up operations; using locally derived native seed in revegetation efforts; and incorporating Tribal consultation in the project-specific revegetation plans.

The Nez Perce: Native Plant Identification and Production Project was initialized in July of 1998 in response to identify traditionally used plant species, and growing capabilities of seed and transplants in various soil types under natural conditions. Traditional plants were identified through oral interviews with Tribal elder participation from the Columbia Basin Tribes. Transplants and seed were collected from the local area and then propagated into three separate test sites to monitor their growing capabilities. With success, such traditional plants may be incorporated into future revegetation efforts in the Hanford region, and test plots may potentially be harvested for such restoration activities or utilized for Tribal benefit.

Three temporary Cultural Technicians with the Project Leader perform the fieldwork within spring and fall windows at the Hanford Site. The three positions are filled by tribal members: one representing the CTUIR, a Wanapum representative and the other the Yakama Nation. Fieldwork consists of seed collection, transplant collection, tagging, weeding, watering, and plant identification. Three plots of contrasting soil types in the Hanford area, each have been planted with seed and transplants under natural conditions. In addition to noxious weed control and inceptive watering by team members.

BHI is committed to the use of locally-derived native seed in our revegetation efforts, and incorporating Tribal consultation in the preparation of project specific revegetation plans. BHI's efforts have been primarily towards establishing ground cover and not directed at traditionally important plants used by the Tribes. The goal of this Task Order is to continue to identify plants with significant traditional use by the Tribes and recommend their incorporation into BHI's revegetation efforts. Revegetation has long been an issue of concern to the Nez Perce Tribe as well as to all Colombia Basin Tribes. Continued Native American involvement is needed to identify and develop those areas for which existing on-the-ground information is incomplete.

BHI has identified this Project, with Intertribal participation, as an essential component of its revegetation efforts. Locally derived native seeds and planting materials have the best survival/sustainable rate, that is more beneficial to wildlife, and need less maintenance. There is a need for sufficient gathering areas that are indigenous to the Hanford Site. Such a capacity for native transplants and seed collection can evolve from this Project with Inter-Tribal participation.