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An ecological assessment of Oregon's CREP cumulative impact incentive program

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Background

Riparian buffer strips perform important ecological services. For example, they absorb floodwaters during high flows, filter sediment and nutrient runoff from upland areas, regulate river water temperatures, and provide allochthonous nutrient inputs to rivers. In agricultural areas, riparian buffers are often highly degraded, if not absent entirely, and incapable of providing these important ecological services. The result is degraded streams that are eutrophic, have high sediment loads with wide channels and have high water temperatures that are unsuitable for fish and macroinvertebrates. The Pacific Northwest struggles with riparian management and it is especially important here because of the many species of endemic anadromous fish that are listed as threatened or endangered.

Unbuffered riparian reaches have high sediment loads that change the substrate of the riverbed, making it unsuitable for salmonid fish to nest. In addition, in riparian areas without a vegetated buffer, stream temperatures are often too high for successful development of eggs and fry. Large woody debris (LWD) is also important in stream systems for creating small pools for fish to spawn in and to protect young fry. Several methods for riparian restoration have been proposed (e.g. adding LWD, nutrient addition) but fencing riparian areas from agricultural disturbance seems to have the highest success rate for restoration. Riparian fencing can be coupled with native vegetation plantings or the vegetation can be allowed to restore naturally. Results from riparian fencing projects include decreased sediment loads in the stream, water temperatures, channel width, and increased LWD. All these results are thought to increase habitat suitability for anadromous fish. One limitation for many studies on riparian fencing is that the area fenced is small in size which limits inference about the success of riparian fencing for stream vertebrates and macroinvertebrates.

The Conservation Reserve Enhancement Program (CREP) is a federal program that pays rental fees to farmers on land along riparian areas that the farmer removes from production. The resulting area is fenced for restoration and conservation purposes. Despite the fact that CREP is a federal program, it is the responsibility of the individual states to see that the program is implemented and the money distributed. Oregon's CREP program is unique due to its cumulative impact incentive payment. This is a program in which a landowner (or group of landowners) can fence >50% of a five mile stream segment and receive a one time payment of four times the annual rental rate. This cumulative impact incentive program has generated controversy because of the lack of data to support paying such a large monetary incentive for restoration of longer stream sections.

Despite the enormous efforts of private, state and federal agencies to encourage riparian restoration, very little data exists that illustrates the effectiveness of such measures. Many of the studies conducted to date are on small fenced areas that were fenced many years ago. Evidence suggests that these small riparian fencing projects are not large enough to effect any change on the stream reach in question. Parkyn et al. (2003) suggest that the width and length of riparian

buffers need to be created in proportion to the size of river segment that is to be restored. For example, wider rivers need wider and longer buffers to effect any change on the river ecosystem. Wooster and DeBano (2006) concluded that wooded buffer length has a greater impact on stream macroinvertebrates than width of wooded buffers. Kondolf (1993) concluded that riparian buffers along one section of the stream will have little effect on overall stream recovery if cattle are allowed access to the stream in other sections.

The purpose of this study is to determine the effectiveness of Oregon's CREP program on a variety of indicators of stream health; stream physical characteristics, macroinvertebrates and presence of invasive plants. Specifically we will select areas of cumulative impact buffers for an in depth assessment and determine their effectiveness compared to control (unbuffered) reaches and a series of shorter buffered areas whose total buffer area is equal to the total length of cumulative impact buffer. This comparison will allow us to assess whether cumulative impact buffered areas have a higher impact than shorter buffers.

Site Selection – To make sure that results from this study are comparable with other scientific studies of riparian it is important that site selection proceed in an unbiased manner. A random sampling of streams in several different age classes will allow us to make inferences to a larger part of the ecosystem and scientific literature. We are interested in CREP buffers on streams of similar size, geological substrate and surrounding land-use type. To make this initial cut at site selection, we thought it would be best to look at GIS layers of the data (e.g. CREP buffer locations, aerial photos, geology). We obtained aerial photos, land-use and land-cover maps, and geology maps from the internet. To obtain a map of the CREP locations, we made contact with Lois Loop and Kent Willett at the Oregon Farm Services Agency office in Tualatin. We requested from them electronic GIS data of landowners in Sherman and Wasco Counties that are participating in the CREP program. We selected Sherman and Wasco Counties because these two counties contain the majority of CREP buffers in Oregon and so we will be able to have similar sites to compare. From these two, we learned that privacy laws enacted as part of the last USDA Farm Bill prohibited them from providing this information. Instead, we received an electronic, Microsoft Excel file containing the streams or creeks on which there were CREP buffers. This file also included the area of the CREP buffer. After identifying the CREP buffers that were of the most interest to us, Anne Bartuszevige met with Ms. Loop and Mr. Willett at their office in Tualatin (Dec 2007). We agreed that the next step would be for OSU to request a GIS shape file of the buffers in Sherman and Wasco counties >4.04 ha and < 70.82 ha; these sizes corresponded to the range of CREP buffer sizes. We were provided this data and were able to identify properties with CREP buffers on streams that matched the data in the Excel file. Using a GIS data layer from the Wasco County Tax Assessor's Office, we were able to identify 100 landowners who appeared to have a CREP buffer on their property, according to the two separate data layers. We narrowed our search to Wasco County because matching apparent CREP buffers from the GIS shape file with the buffers described in the Excel file was feasible for this county. In Sherman County, the data from the Excel file could potentially be associated with >3 buffers and thus, many more non-participating landowners could be contacted which we wanted to avoid. If we determine there are insufficient numbers of sites in Wasco County, we will continue to pursue this investigation in Sherman County.

In January 2008, we sent letters to landowners asking permission to access their property and to access the hard and electronic data associated with their CREP buffer. Beginning in

February 2008, we will contact cooperating landowners and the appropriate staff at the county soil and water conservation office in order to make site visits to perform final site selection.

Macroinvertebrate sampling – We have made contact with two invertebrate ecologists from Oregon State University's Hermiston Agricultural Research Station. Sandy DeBano and David Wooster both have experience with stream macroinvertebrate sampling and have agreed to collaborate with us to collect macroinvertebrate data. They will also assist with final site selection.

Invasive plant sampling – During the summer 2007 (July – September), we performed experiments to determine the best method to capture seeds from the streams. These experiments were performed by an Eastern Oregon University undergraduate student supervised by Dr. Bartuszevige. In the first experiment, she identified multiple types of fabric that would potentially capture seeds. They were: cheesecloth, mosquito netting, burlap, and two types of synthetic material. Each material was made into a 31 X 15 cm "net". Then, 100 seeds from three species of plants were poured into a water trough (130 X 51 cm) filled with water. Each net was scooped through the water one time and the number of seeds collected counted. This was repeated 10 times for each net and seed combination. We discovered that cheesecloth and mosquito netting collected the most seeds of all three species (Figure 1). Next, 10 nets each of cheesecloth and mosquito netting were placed into a ditch in front of the Eastern Oregon Agricultural Research Station. Nets were randomly placed on either the right or left side of the ditch approximately 1.5 m apart. The nets were placed at the edge of the flowing water so that seeds floating in the water at the edge would be captured by the nets. Nets remained in place for one week, after the nets were dried, the seeds were counted. The cheesecloth captured a total of 405 seeds and the mosquito netting captured a total of 237 seeds. In addition, we were able to successfully germinate the seeds captured from the water. Species identified include: *Bromus* sp, *Cirsium* sp, *Poa* sp, *Stellaria media*, *Verbasum thapsus*. We have designed a successful method for capturing seeds from the water column. An additional benefit to our design is that they are flat and any vertebrate animal that contacts the nets will not be captured; they can move around the net. This will enhance our permit applications associated with stream sampling.

Products

The undergraduate who performed these experiments presented the results from this study at the Society for Range Management annual meeting in Louisville, Kentucky in January 2008. The title of her talk was: Assessment of Methods to Capture Seeds from Streams. Co-authored by Kristi Horn and Anne Bartuszevige.

Literature Cited

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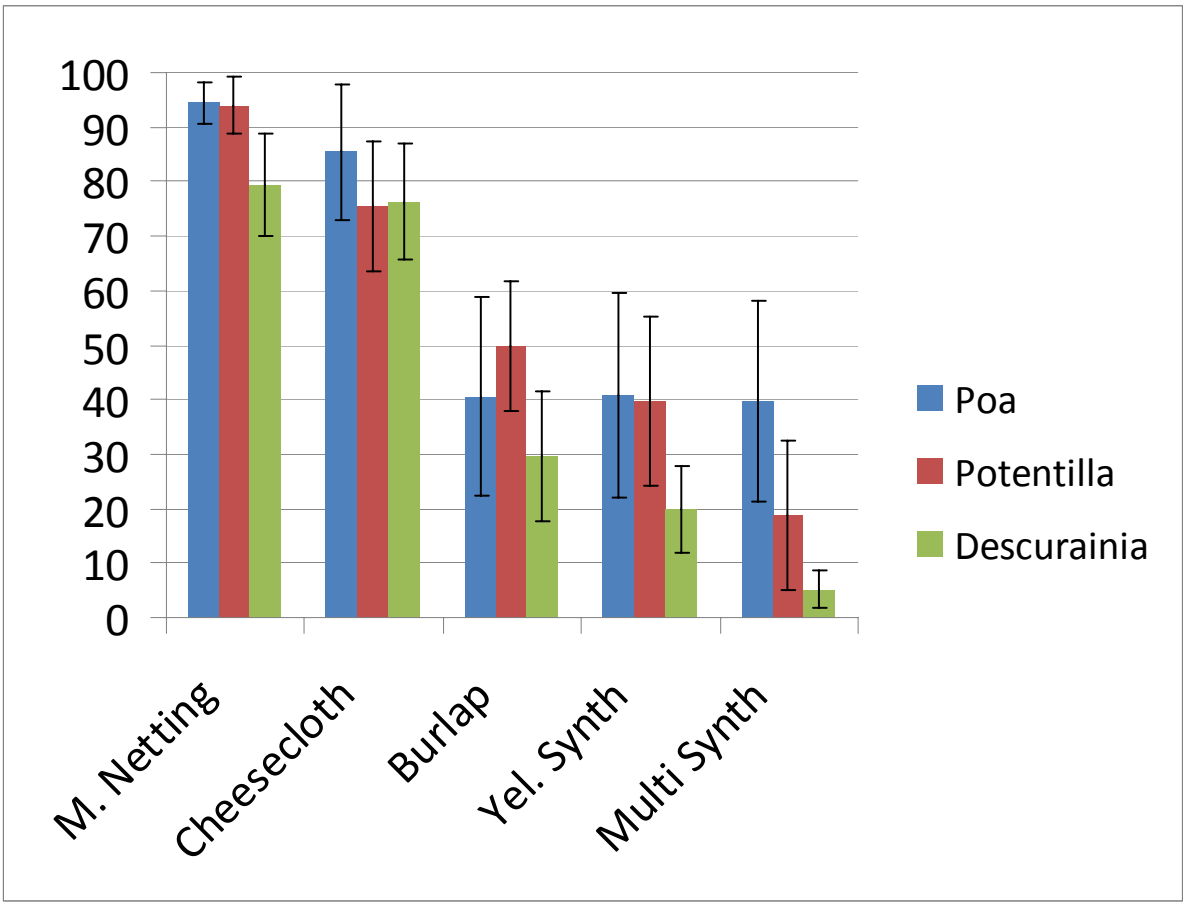

Figure 1: Average number (± 95% Confidence Interval) of seeds collected in nets made of a variety of materials (M. netting = Mosquito netting, Yel. Synthetic = yellow synthetic material). The mosquito netting and cheesecloth nets collected significantly more seeds of all species than the other three materials as evidenced by the non-overlapping confidence intervals.