A Ground Penetrating Radar Investigation of an 1805 Lewis and Clark Site, Oregon, USA

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Abstract—Lewis and Clark, legendary explorers of the western USA, spent the winter of 1805 along the Oregon State coastline. During their stay, they mapped many locations, including a native village along the former Clatsop River. Several wooden structures south of the river's outlet to the Pacific Ocean were noted in their journals. As part of a larger collaborative project, we collected ground penetrating radar (GPR) profiles to aid in locating the historic Clatsop River's outlet and previously mapped native structures. After reviewing Lewis and Clark's journals and maps, we constrained the study area to the west shore of Slusher Lake, near Warrenton, OR. Multiple GPR lines were collected with depths of up to 16 m. GPR profiles along the ridge west of Slusher Lake show parallel to sub-parallel, continuous to semi-continuous reflection patterns, which are interpreted as vertically accreting sand dunes. A channel-form pattern was noted northwest of Slusher Lake and is interpreted as the old, relict Clatsop River outlet originally mapped by Lewis and Clark. These results have helped delineate the physical location of the historic native village mapped by Lewis and Clark and provide a foundation from which to base future archaeological investigations.

Keywords - Meriwether Lewis, William Clark, Clatsop Native Americans, Slusher Lake, Oregon, GPR, archaeology

I. INTRODUCTION

Between 1803 and 1806, Meriwether Lewis and William Clark led a 33-person team of explorers on an overland journey between the Missouri and Columbia River systems. This historical expedition provided the first detailed maps and descriptions of the western United States [1]. During the team's stay along the Oregon coastline over the winter of 1805, they visited, mapped and described a native village belonging to the Clatsop Nation along the former Clatsop River. Four wooden structures south of the river's outlet to the Pacific Ocean were noted on their maps and described in their journals (Fig. 1). Investigations by previous researchers have failed to locate the native village [2]. According to [3], this may be due to post-rebound beach accretion and/or increased coastal sedimentation following the construction of jetties to the north along the mouth of the Columbia River (Fig. 2).

The research coincides with the 200-year anniversary of the Lewis and Clark expedition and seeks to constrain the physical location of the former Clatsop River outlet and previously mapped native village. Upon reviewing Lewis and Clark's journals and maps, and speaking with military personnel, local residents, historians, and geologists, a study area was selected along the west side of Slusher Lake, within the Camp Rilea Armed Forces Training Facility, near Warrenton, Oregon (Fig. 3). This area, we believe, corresponds with the geographic
No cultural remnants (Clatsop village) or buried soils were found during the collaborative research. However, a distinct channel-form pattern was imaged using GPR along the northwest corner of Slusher Lake (Figs. 3 and 7). This reflection pattern is interpreted as an infilled channel and most likely represents the historic Clatsop River outlet previously mapped by Lewis and Clark.

According to Lewis and Clark’s journals, the Clatsop village should be located just southwest of the discovered outlet. Future research will include a detailed subsurface investigation of the historic Clatsop River outlet area and will incorporate the use of hydraulic coring equipment to collect subsurface materials below the present water table.

IV. SUMMARY

1) Initial tests have shown that GPR can image to the depths of up to 16 m, with many GPR profiles showing parallel to sub-parallel, continuous to semi-continuous reflection patterns. These patterns are interpreted as vertically accreting sand dunes.

2) An erosional remnant of the last major Cascadia earthquake was imaged with GPR and marks the 300-yr BP shoreline position just prior to Lewis and Clark’s arrival.

3) A distinct channel-form pattern was noted northwest of Slusher Lake. The pattern most likely represents the historic Clatsop River outlet.

4) The analysis and interpretation of these initial data sets will be used to plan a detailed archaeological investigation that will involve the use of hydraulic coring equipment to attempt to collect subsurface materials that correlate with the time of Lewis and Clark's arrival and to hopefully locate the previously mapped native structures.

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REFERENCES

Figure 3. A color aerial photo of the Slusher Lake study area within Camp Rilea, near Warrenton, Oregon (see inset). Locations and direction of GPR lines (yellow for 100 MHz, red for 225 MHz) and GPR profiles are shown. Photo courtesy of Camp Rilea Armed Forces Training Facility.

Figure 4. A 225 MHz GPR profile collected parallel to the west side of Slusher Lake exhibits parallel to sub-parallel, continuous reflection patterns (see Fig. 3 for location). These patterns are interpreted as vertically accreting coastal foredunes. Diffraction patterns likely represent shallow modern objects.
Figure 5. A 225 MHz GPR profile showing parallel to sub-parallel, semi-continuous reflection patterns that dip westward toward the Pacific Ocean. These reflections are interpreted as aggrading and seaward-prograding coastal foredune surfaces (See Fig. 3 for location).

Figure 6. A reflection pattern similar to those described by [5] as representing erosional remnants of the last major Cascadia earthquake event (300 yr BP) was imaged perpendicular to the ridge west of Slusher Lake (see Fig. 3 for location). The pattern is interpreted as a buried scarp that records the 300 yr BP shoreline position just prior to Lewis and Clark’s arrival.

Figure 7. The highlighted channel-form pattern was found between positions 40 and 230 m (south) along the 100 MHz north-to-south GPR line (see Fig. 3 for location). The reflection pattern is interpreted as an infilled channel and may represent the historic Clatsop River outlet to the Pacific Ocean originally mapped by Lewis and Clark.