

Monitoring stream erosion at Fairfield Osborn Preserve

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Abstract

In the Fall of 2016 students in Geography 360, Geomorphology, took part in a project to re-visit previously established creek monitoring locations at the Fairfield Osborn Preserve. Since 2013, two locations, one on Copeland Creek and the other an unnamed ephemeral creek, have been monitored. Students used autolevels to develop topographic profiles of the channels and their thalweg profiles. Students also measured previously placed erosion pins and added new ones along the creek banks for future comparisons. Copeland Creek has experienced erosion and significant bank undercutting. Additionally, the ephemeral creek exhibited dynamic changes to its lower channel since the inception of the study. Most recently, winter storms have resulted in abandonment of the monitored lower channel.

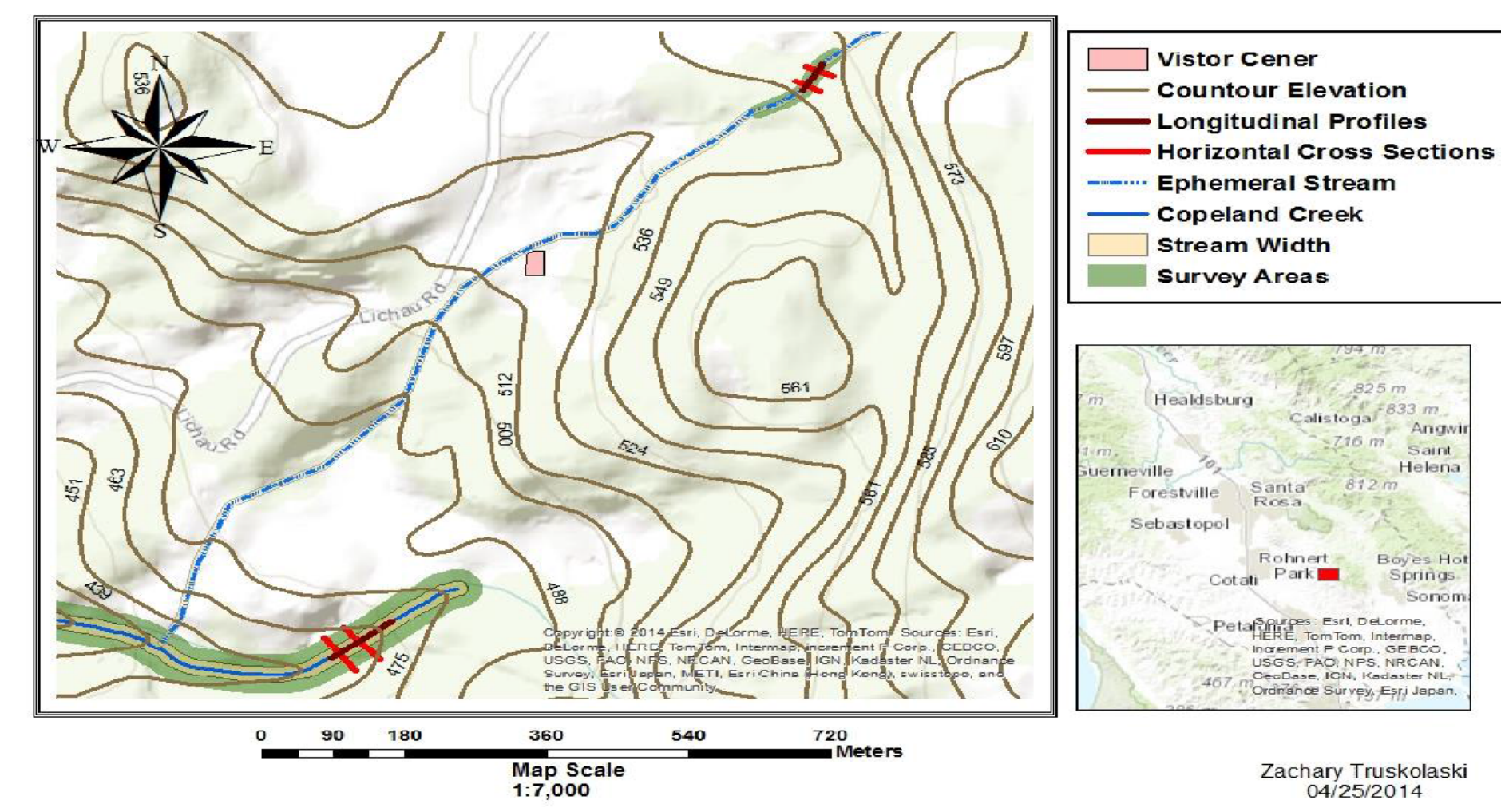


Figure 1: Location Map

Methods

Using auto levels we constructed two cross sectional profiles of each creek. Elevation along the cross sections was measured approximately every 0.5 m and related to a temporary benchmark. The cross sections are designated upper and lower for each site (Figure 1).

Similarly, longitudinal profile were measured to show the stream's gradient from its source area to it's mouth.

Bank erosion was surveyed through placement of erosion pins (rebar spray-painted in orange) hammered into the creek banks near the cross section locations. The exposed portions of the rebar were measured in centimeters with a ruler. Greater exposure from one year to the next indicates erosion, less exposure indicates deposition.



Figure 2: Longitudinal profile survey at the Ephemeral Creek.

Copeland Creek

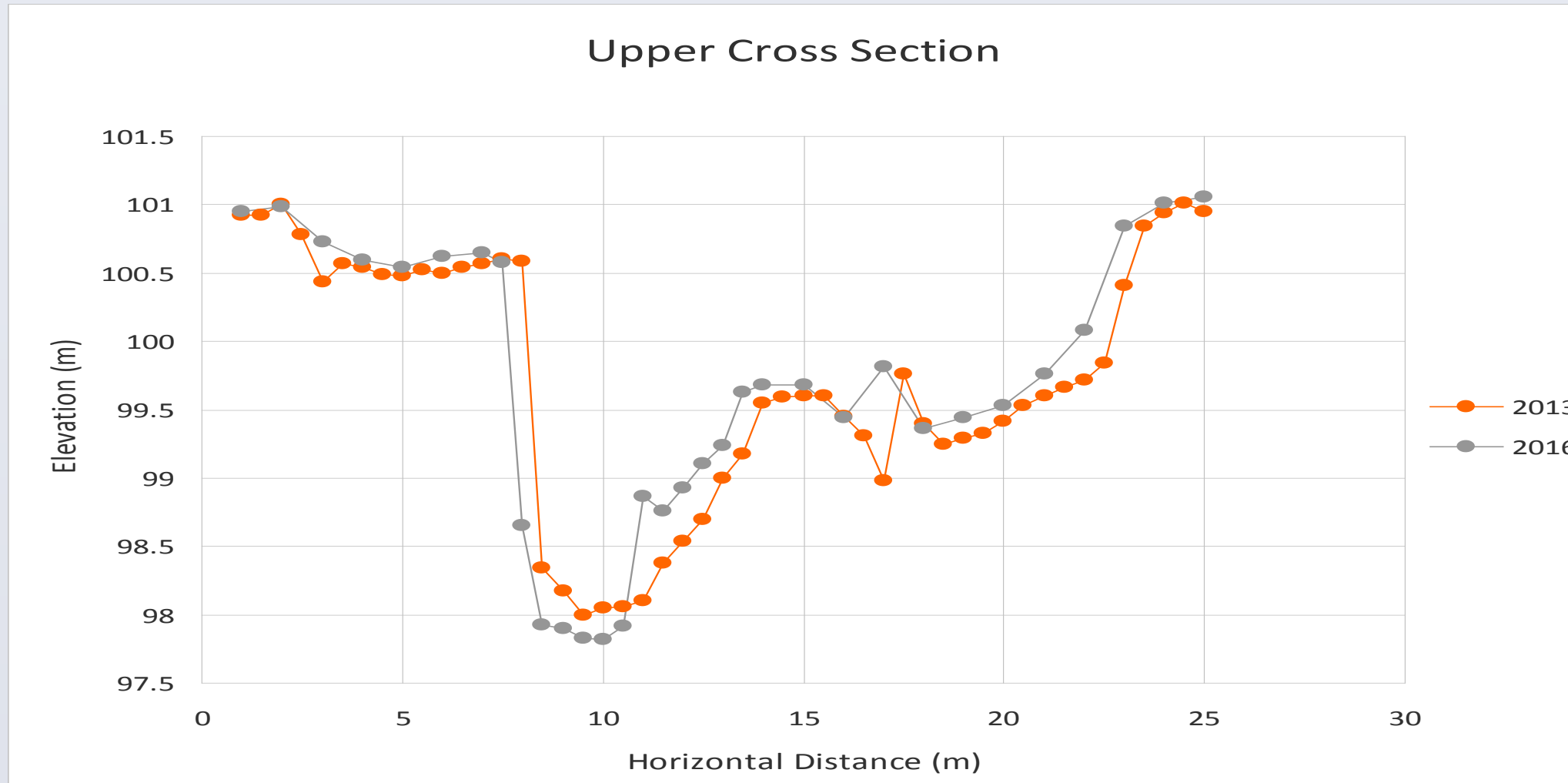


Figure 3

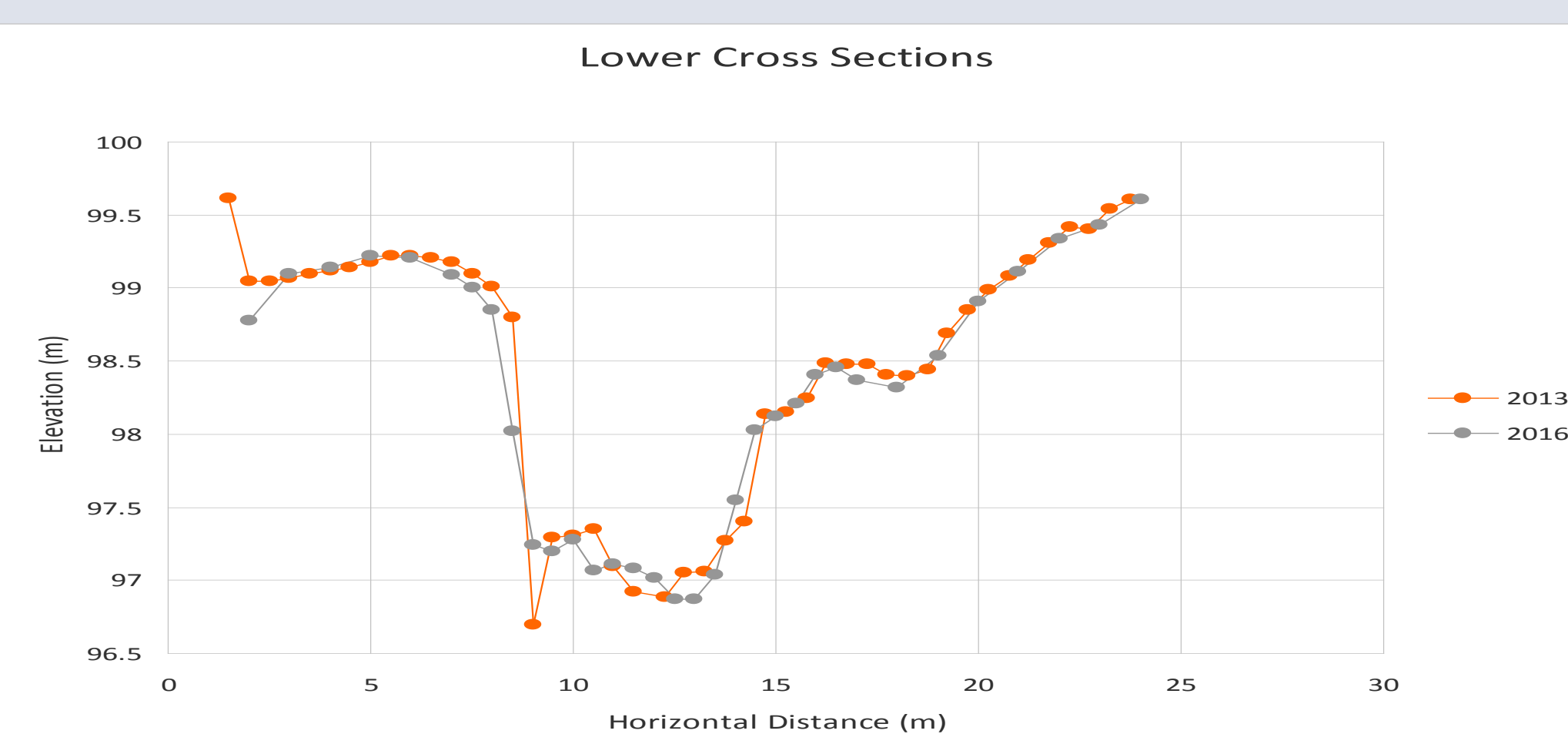


Figure 4

Figure 3&4 show slight erosion on both the lower and upper sections within the past three years. Figure 5 indicates the longitudinal profile of the creek, showing minor changes between years.

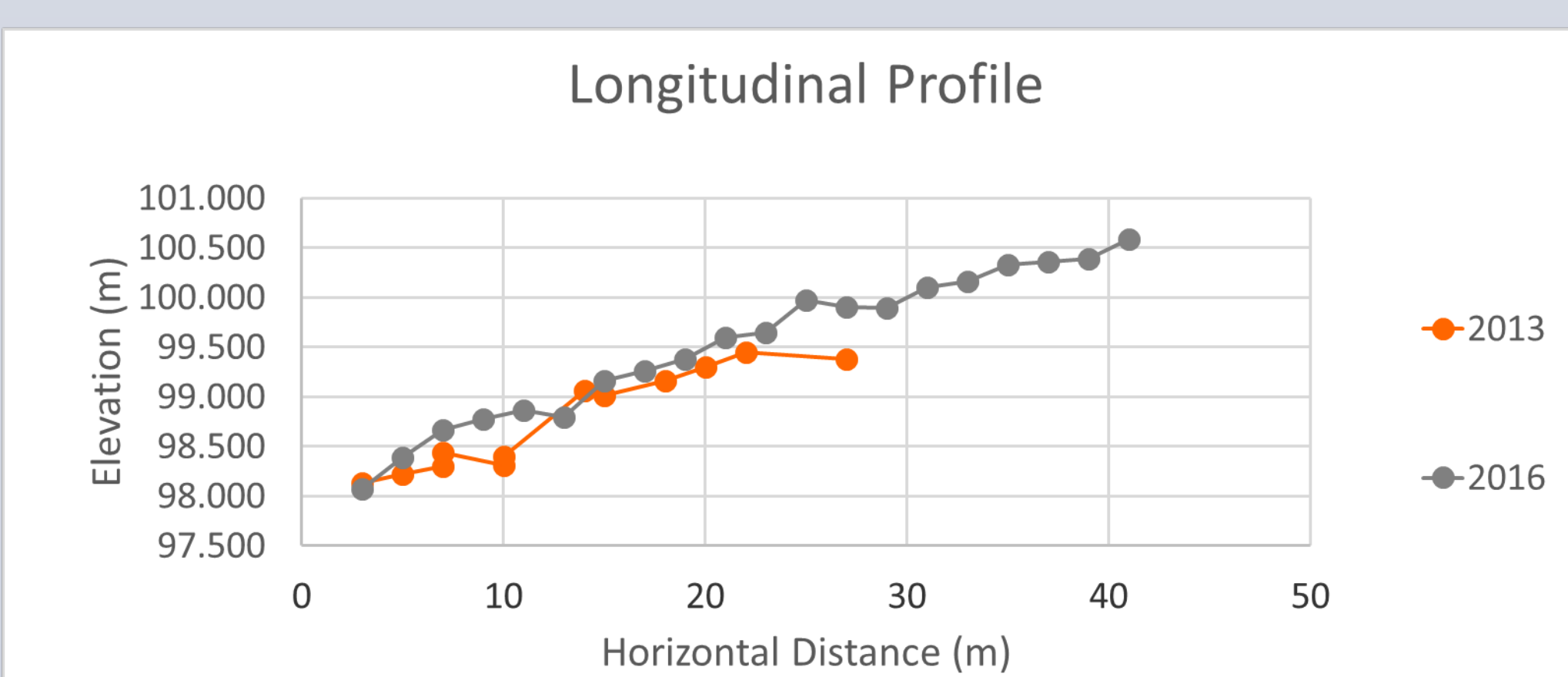


Figure 5

Ephemeral Creek

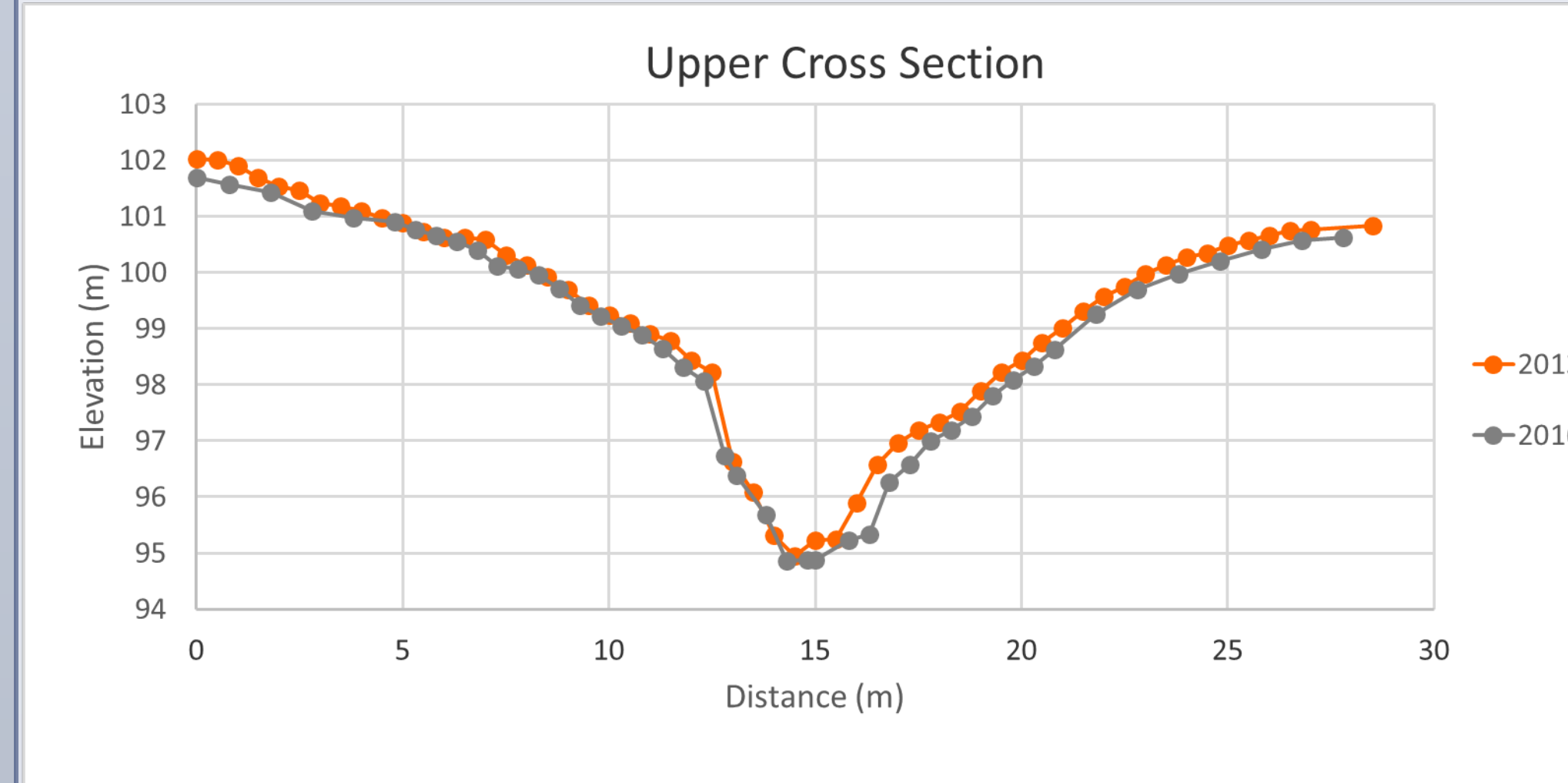


Figure 6

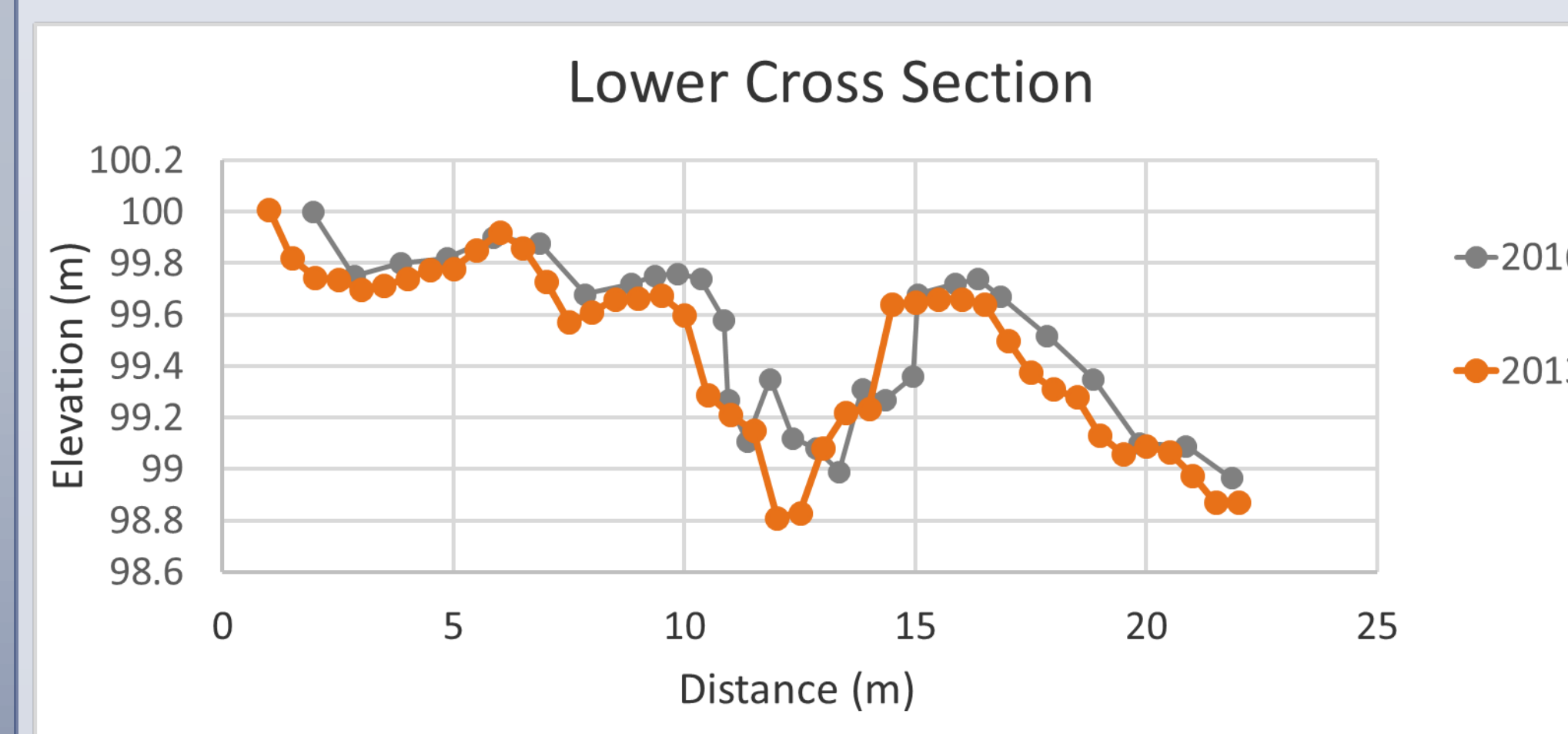


Figure 7

In the upper section, the Ephemeral Creek experienced slight erosion and bank cutting towards the North (0 m direction; Figure 6). In contrast, the lower section shows variable erosion and deposition occurred in this much shallower stream channel (Figure 7). Figure 8 shows the longitudinal profile for the creek, notice the downstream migration of a "plunge pool".

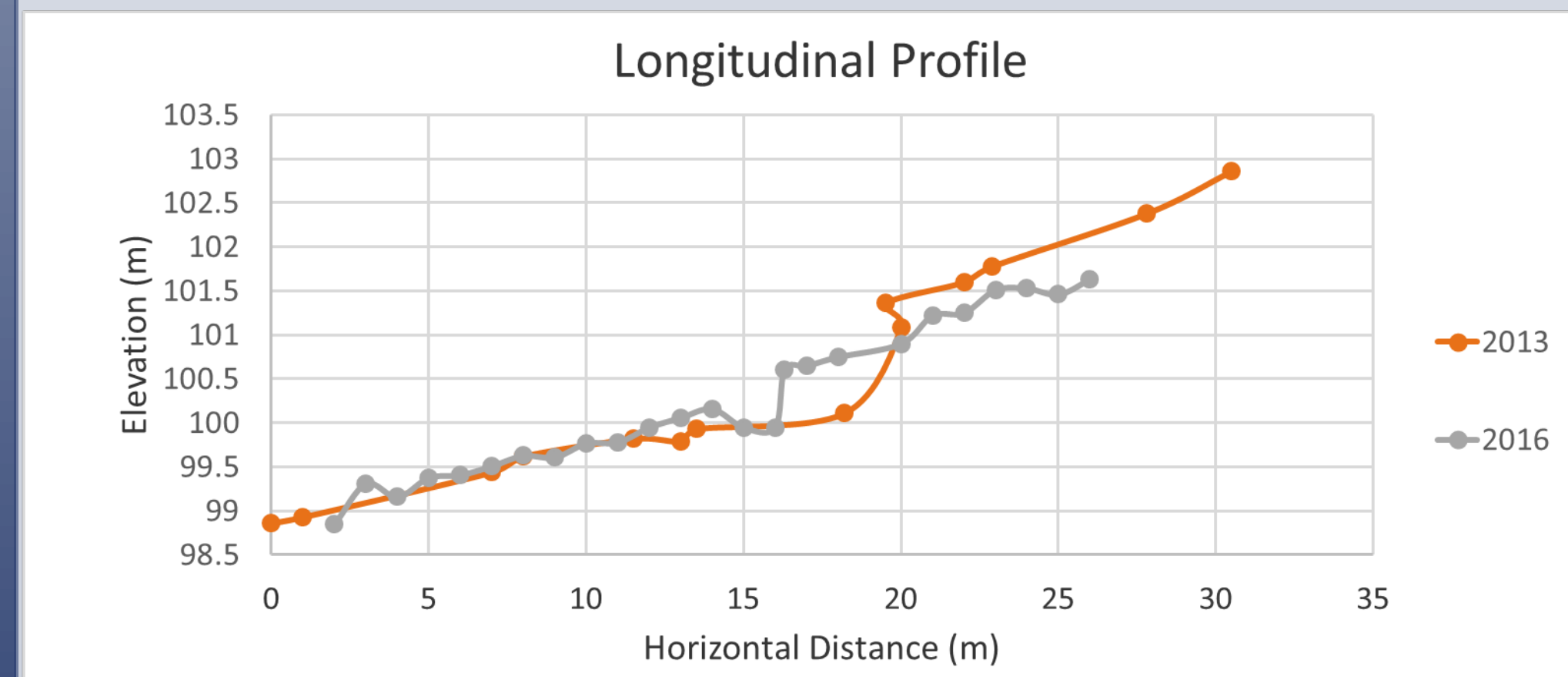


Figure 8

Creek Erosion

Copeland Creek

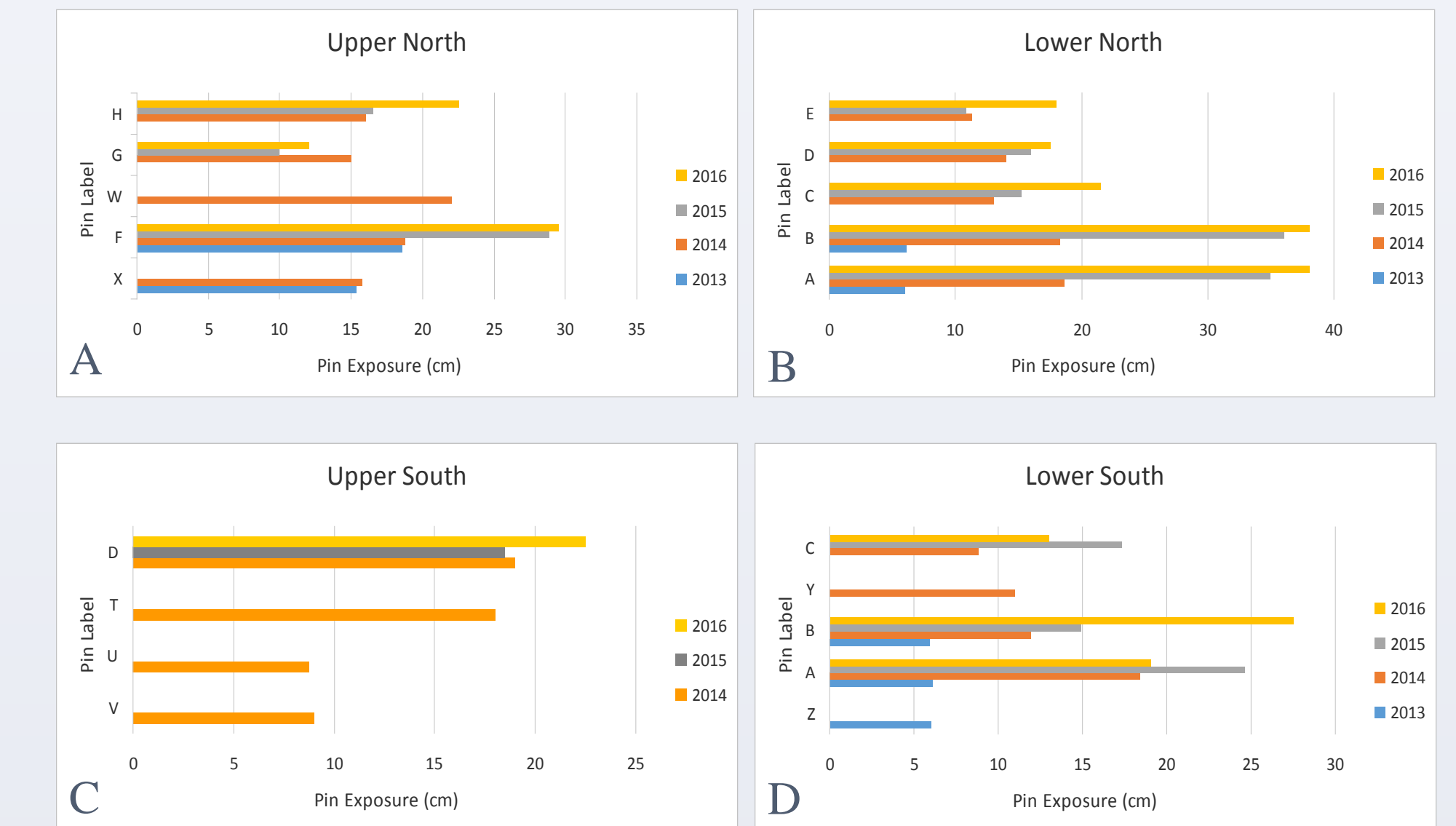


Figure 9

The monitored erosion pin data for the North bank shows significant increases in pin exposure, signifying major erosion on both sections, more so on the lower North of the creek (Figure 9A,B). All erosion pins, except D, for the upper South bank were not relocated, likely due to erosional removal. Pin D, however, shows slight erosion (Figure 9C). The lower section of the

Ephemeral Creek



Figure 10

As of 2017, the Ephemeral creek has abandoned its old lower channel (Figure 7 and 10A) and is in the process of creating a new channel (Figure 10B). Previous erosion pin data indicate deposition on both banks as a result of discharge during extreme weather conditions. These pins are now buried or eroded away.

Conclusions

- Copeland Creek erosion data shows Northward migration
 - Rate of erosion approximately 6 cm/yr
- Trails and pathways near the migrated Ephemeral Creek have already been rerouted.
- These creeks are actively migrating under natural stream processes and weather surges.

Acknowledgments

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