Scuba Diving to Core Subfossil Trees in Lake Kapowsin, WA using an Increment Borer

**Challenges and Successes**

Dannielle Z’berg, George Potts, Bert Brezicha, Patrick Pringle

The boat we used was a 2012 16-foot Hewescraft Sport Fishing boat with a deep, v-shaped hull. Each diver used their own personal gear, allowing for a variety. Steel tanks were used by everyone. George Potts, a safety diver, dived on a single tank and used standard weights. Bert Brezicha and Dannielle used doubles. George Potts, a safety diver, dived on a single tank, and Danielle used a single tank. Each diver wore 32 pounds of weight. Each was using a back plate style harness. Each diver also carried extra safety gear—several lights, and two cutting devices. The divers used nitrox for optimal bottom time. A benthic survey was not available for the lake, so the team used a fish-finder, Lowes with GPS. The increment borer (tree coring device) was a 20-in, 5 mm inside diameter, Hagloff three-thread increment borer.

We first began by surveying the lake from the boat. The team used the fish-finder to look for large trees that were vertical, not tilted. The lake was a logging operation and therefore avoidance of new trees deposited was mandatory. By visually surveying the lake, they located large sized trees. We were in search of old, large Douglas fir trees. Unfortunately, the bark of the trees had fallen off, thus it was difficult to identify individual trees species without coring or sample the wood. After seeing each tree that would potentially yield a useful sample, we made a note on the GPS to return to later.

After gear up on shore, and doing safety checks, the team climbed onto the boat. Pat Pringle and Jordan Conner paddled alongside in a kayak, while the dive team and their support man motored in the boat. Once arriving at the chosen tree, a Busy buoy was deployed. The two safety divers went down first to note the visibility, location of the tree, water depth, and to find out any possible entanglement. The lake was too dark and murky for any video to be done. The divers were marked as safe and for safety, Bert attached a line to the SMB pouch on the back plate that held the tree coring device in place. The increment borer was taken down already prepared for drilling (the drill bit was attached), and the extractor within the sample tube. Danielle then submerged. The boat docked approximately 15 feet from the tree, and once the divers spotted the target tree, they descended. The water was extremely dark and filled with tannins. Visibility without lights was near zero, with lights approximately 10 inches in the path of your light only. The safety divers descended alongside in a V-shaped formation next to the tree. Once at a good depth, Danielle hovered in a horizontal position. Lights were directed at the tree and at Danielle (for safety reasons). It was quite dark, but nothing was visible because of the murkiness of the lake. Danielle kicked as she drilled to approximately 6 feet below the surface. The person in charge of coring would have to wear very small gloves or in the case of our expedition) no gloves. Coring the tree itself is very strenuous and tiring. The diver must constantly kick so that they don’t push themselves away from the tree. With the large core sample, you could not hold on to the tree. By kicking, the diver silted up the bottom and made visibility worse.

**Discussion**

Several of the issues listed above could potentially be fixed by using a slightly different method. For example, adding two screw-eyes of a large diameter placed on either side of the tree for the diver to hold on to. Also, use of a mallet to gently tap in the drill or starting it with a nail would allow for easier access. All gear should be attached to the diver in some form to prevent loss. Having the entire dive team use bright-colored safety lights on their gear as well as wearing headlamps would be extremely useful. Other scientists could use this procedure in a variety of lakes and bodies of water to obtain tree core samples from well-preserved subfossil trees. I plan to go back to Lake Kapowsin and several other lakes in Washington to further test the procedure and obtain more samples.

**Materials and Methods**

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**Future Research**

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**Abstract**

Using standard cold-water scuba gear, we dove to core subfossil trees in Lake Kapowsin in order to assist in efforts to obtain a sample for radiocarbon dating and tree-ring analysis by CU student Jordan Conner and instructor, Patrick Pringle. The lake is interpreted to have been formed when a lahars from Mount Rainier, the Electron Mudflow, dammed Kapowsin Creek about 1500 CE killing the forest situated in the area, it inundated the newly-formed lake. We looked to previous efforts for details on techniques, specifically video work by Dan Pontbriand and William Walker of the US National Park Service at Lake Crescent using increment borer and strap harness for stability in 2002. Very little instruction of this technique was found online, but we were able to retrieve good cores from 2.5 m depth. In our field trial, three divers were used, one to core, one to video, and one for safety and light, but the visibility in the lake was extremely low. During several points in the dive, there was just enough visibility to see the drill of the core from the handle (approximately 50 centimeters). We successfully sampled two trees, each a different size, but both near the east center of the lake in water 5 m deep using a 20-in, 5 mm inside diameter, three-thread increment borer. This process could easily be replicated in the future for further samples here or at other lakes.

**Introduction**

Core sampling is a common technique used for a variety of functions. The rings of a tree can record various aspects of climate and environmental change. When a tree becomes submerged, it stops growing and dies. However, water, especially stagnant lake water, preserves the trees very well. The goal of the expedition was to retrieve core samples from the original forest within the lake for use in radiocarbon dating and dendrochronology. Kapowsin Lake was assumed to be dammed by the Electron Mudflow (Crandell, 1963), but the trees sampled previously were buried near the town of Electron, 1 mile north of the lake. (See Fig. 1). The trees submerged in the lake were never carbon dated. Our team consisted of surface staff, boat support, and divers. We used a team of three divers, one to core and two for optimal safety. The safety divers were trained by GLE and had experience in lake conditions. Without a large team, the expedition could not have been completed safely.