

# OUTCROP CORE COLLECTION

In the first varve studies in North America and Sweden varves were generally measured in the field. However, in some situations it can be difficult to get accurate measurements of summer and winter layer thicknesses at an outcrop. This is especially true if the varved sediment is very clayey and wet, varves are thin (<1 cm), or subtle deformation features or unconformities occur in the varves. Our studies of outcrop exposures of varves at Tufts now routinely start with the collection of overlapping cores of the outcrop that can be transported back to a lab and partially dried for detailed study. The cores can also be used for sampling for microfossils and other features and make excellent teaching specimens. Outcrop cores have the advantage of greater accuracy and they also provide the possibility of creating a digital image archive of varve measurements. The measurement archive can always be checked for potential errors or anomalous varve thicknesses as one tries to match the varve record with other sequences. Given that almost all varve sequences have different inter-annual couplet stratigraphy, mistakes are often made in a first attempt at measuring many varve sequences. Later attempts at measurement often come with a better understanding of the repeated character of summer and winter layers, leading to more accurate annual layer recognition and measurement.

The system described below is the one used at Tufts University. It has the advantage of being easy to assemble and inexpensive. The system involves driving outcrop core liners or pipes into the sediment using a drop-weight core driver. The core liners are usually 2-ft lengths of 3-in inside diameter (ID) schedule 40 PVC pipe, which is easily cut and machined, and yet is a very strong material, easily able to withstand being driven into the outcrop. The bottom end of each 2-ft pipe section is beveled with a belt sander on the outside to produce a cutting edge. Smaller PVC pipe (2 or 2.5-in ID) can be used with success, but may not always be able to show beds over a wide enough distance to escape core deformation or side-step bedding irregularities (dropstones, concretions, bioturbation). PVC pipe larger than 3-in ID can also work although these cores are very heavy and far more difficult to drive into a outcrop.

3-inch ID PVC (schedule 40) pipe cut to 2-ft lengths with ends beveled. The inside of the beveled end of the coring pipe is liberally smeared with Vaseline to help the sample slide into pipe during coring. Smaller pipe, down to 2" can be used with good results but 2.5-3" is recommended.



# Driving Cores with Drop-Weight Core Driver

(Instructions for making the driver are included in a separate document)

Shown is the core driver set up for driving 3"ID PVC pipe sections perpendicular to bedding planes.

(left to right) Jack Ridge, Jonathan Nichols, and Duane Braun at Starrucca Ck. in northeastern Pennsylvania.



# Drop-Weight Core Driver

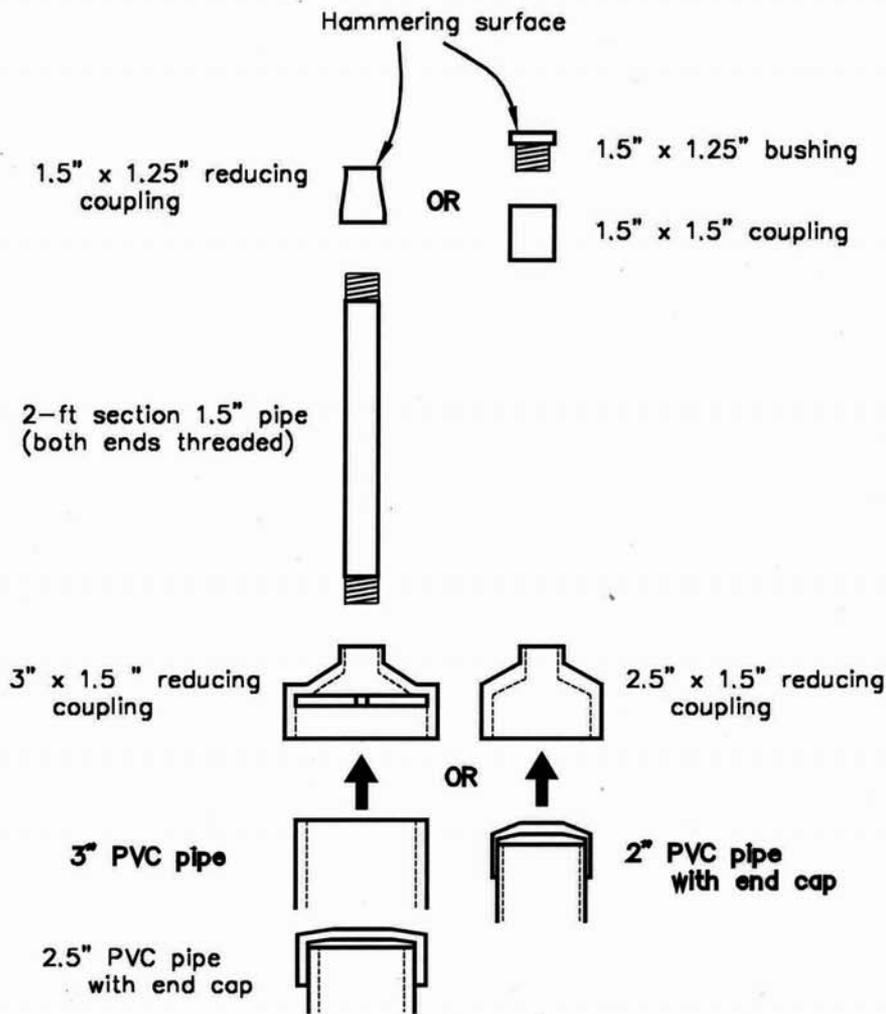
Upper (right) and lower (left) pieces of drop weight core driver. Two lower pieces are shown, one for 2.5-3"ID and one for 2"ID PVC pipe. Barbell weights are clamped and also duct-taped to the upper handle assembly with heavy card board spacers to prevent them from clanging.



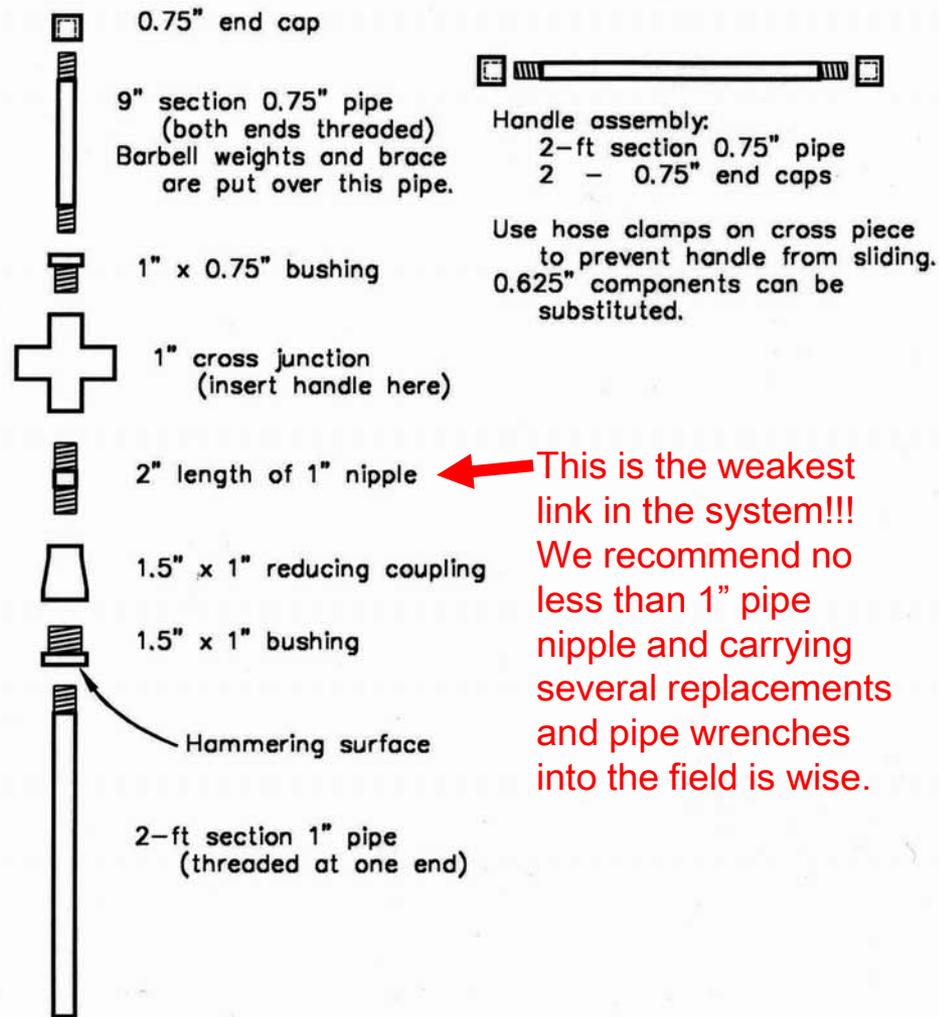
Close up view of bottom of lower half of core driver that fits over 3"ID PVC pipe or 2.5"ID PVC pipe with an end cap. The threads inside this coupling have been removed on a lathe to easily accept the PVC pipe. It should be snug but not tight. A flat platform with a hole to allow air escape has also been mounted with liquid steel epoxy inside the coupling cap as a sturdy, flat, pounding platform for the PVC pipe.

# Core Driver Assembly

## OUTER SHAFT/CORE HOLDER ASSEMBLY



## HANDLE AND WEIGHT DRIVING ASSEMBLY



The large 1.5" x 3" reducing coupling of the core holder that fits over a 3" PVC pipe is the hardest component to find and will likely require a visit to a well-stocked plumbing supply store. Buy more than one if possible.

Removing Cores – Just dig them out and cap them with duct tape!



Outcrop cores (B2) at Newbury, VT. The thin and very clayey character of these varves in the field made core collection and lab analysis of dried cores necessary.