A Simple, Low Cost Soil Probe Extractor that Minimizes Core Disturbance

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The Problem

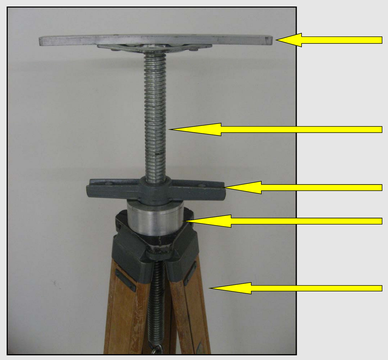
- Soil cores are commonly required for physical or biological testing on undisturbed samples
- Probes are often driven into the ground with the soil captured within the hollow interior
- Removal of soil coring devices is difficult as the soil around the exterior of the probe is compressed, thus exerting considerable friction against the walls, increasing proportionally with the length of probe in the ground
- This friction must be overcome to extract the core, but this must be done while minimizing disturbance to the soil sample via shattering, compaction or distortion which may occur through the application of concussive upward blows with a slide hammer
- It is paramount that a method be used which prevents excessive fatigue and physical injury through manual upward pulling
- Hydraulic or electric lifting devices are effective although neither are portable considering ancillary equipment including pumps and generators
- Previous manual extraction methods include the use of winches (Prior and Rogers, 1992), jacks (Prior and Rogers, 1994) and leverage devices (Wendt, 2006)
- These typically suffer from a lack of stability as an upward lifting force is applied to pull the core from the ground

The Solution

- A system to slowly and smoothly extract the sampler from the ground was devised utilizing a screw jack used for leveling construction scaffolding
- Advantages:
  - low cost
  - readily available at hardware stores and building supply outlets
  - coarse thread ensures adequate strength
  - sturdy handle facilitates turning

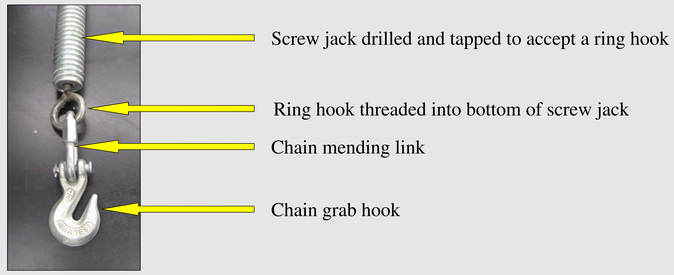
- A wooden surveying tripod was re-purposed to serve as the base
  - readily available and inexpensive
  - easily transportable
  - very sturdy
  - very stable
  - wide range of height adjustment
  - can be handled by one person (watch the video to see in action)

Tripod with Screw Jack



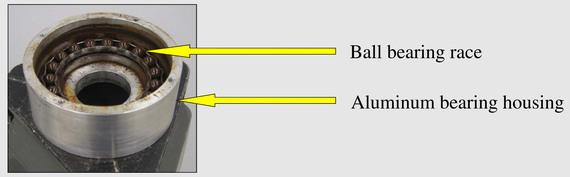
Screw Jack with Hook

- The bottom of the screw jack is drilled and tapped to accept a ring hook
- A chain grab hook is attached via a mending link



Detail of Ball Bearing Housing

- Although a ball bearing is used here, any other type of sliding surface (e.g., ultra high molecular weight plastic - UHMW) can be substituted

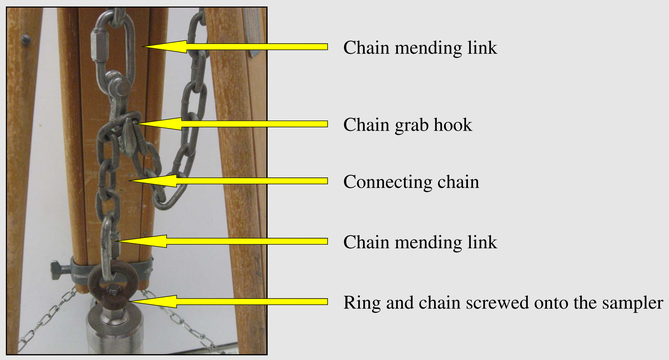


Ring and Chain on Soil Sampler

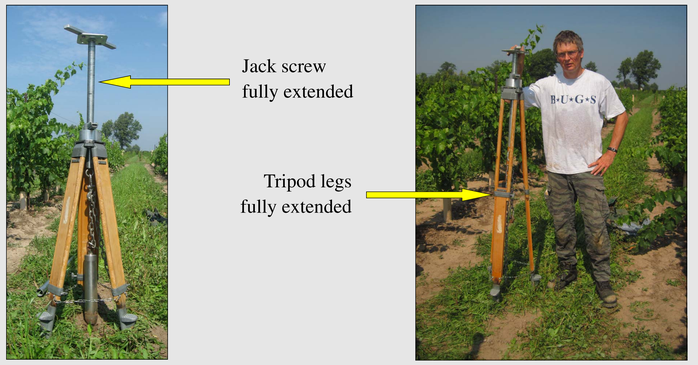
- The ring and chain are threaded onto the soil sampler

Chain Between Sampler and Hook

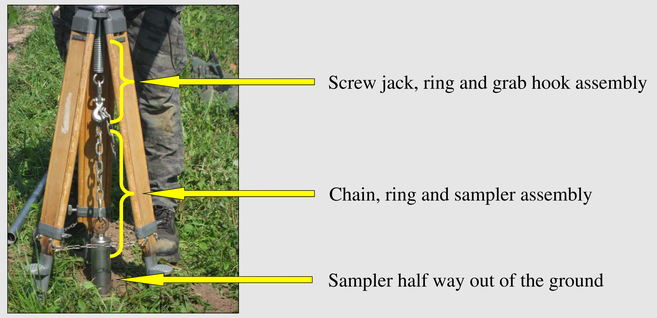
- Sampler and chain connected to the chain grab hook and screw jack



Range of Vertical Adjustment



Sampler being pulled from the soil



Watch the YouTube Video

http://www.youtube.com/watch?v=XUpLMsGR8-A&feature=youtu.be

References

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Prior, S.A. and H.H. Rogers. 1994. A manual soil coring system for soil-root studies. Commun. Soil Sci. Plant Anal.25:517-522.

Wendt, J.W. 2006. A soil probe pulling device facilitates soil sampling. Soil Sci. Soc. Amer. J. 70: 2161-2163.

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