DOWN WOODY MATERIAL, SOIL AND TREE CORE COLLECTION AND ANALYSIS FROM THE 2014 TANANA PILOT PLOTS

Robert R. Pattison, Andrew N. Gray, Patrick F. Sullivan, and Kristen L. Manies[1]

Abstract—In the summer of 2014 the US Forest Service's Forest Inventory and Analysis (FIA) Program of the Pacific Northwest (PNW) Research Station in conjunction with NASA Goddard carried out a pilot inventory of the forests of interior Alaska. This inventory was conducted on the State of Alaska's Tanana Valley State Forest and on the Tetlin National Wildlife Refuge. As part of the field protocols that were implemented, field crews measured Down Woody Material (DWM), sampled soils and collected tree cores. The DWM protocols were based on standard FIA protocols. The soil sampling included a modified protocol based on the US Geological Survey's (USGS) protocols for the boreal forests of the region. The tree core measurements were made on cores collected from site and age trees of FIA plots. The results of these data collection efforts will provide insights into carbon content in these forests and into trends in tree growth rates. In addition, because it was a pilot inventory the goals were to improve field sampling methods prior to a full scale inventory of the interior forests of Alaska.

INTRODUCTION

Interior Alaska has experienced some of the greatest increases in temperature globally and this trend is predicted to continue. The results of this warming trend appear to manifest in large scale changes in the region, leading some to suggest that a "biome shift" is underway (Beck et al. 2010, Juday et al. 2015). Such a shift could have dramatic impacts on local communities, which are dependent on wildlife and forest resources. In addition, as boreal forests worldwide contain to up 30% of terrestrial carbon, warming trends may impact global carbon cycles (Tarnocia et al. 2009).

Interior Alaska contains an estimated 15% of the forested lands in the US but does not have an FIA or other large scale inventory. The 2014 inventory in the Tanana Valley State Forest and Tetlin National Wildlife Refuge in interior Alaska was the first large scale systematic inventory in the region since the early 1980s. This inventory sought to test new field protocols to provide critical insights into current conditions in the region. Of particular interest are the carbon stores in soils and in trends in tree growth for these forested plots.

Downed woody material and soils properties are poorly understood for much of interior Alaska. Knowledge of DWM and soil carbon can improve insights into carbon storage and fire dynamics of these ecosystems (Gould et al. 2008, Beck et al. 2011).

STUDY AREA

The Tanana Valley is located in Interior Alaska, north of the Alaska Range, following the Tanana River. A systematic sample of 98 plots was measured within the Tanana Valley State Forest and the Tetlin National Wildlife Refuge (NWR). These plots represent a ¼ sample of the standard FIA grid.

[1] Research Ecologist (RRP), Pacific Northwest Research Station USDA Forest Service, 161 East 1st Ave, Door 8, Anchorage, AK, 9950; and Research Ecologist (ANG), Pacific Northwest Research Station USDA Forest Service, 3200 SW Jefferson Way, Corvallis, OR, 97331. Research Scientist (PFS) University of Alaska Anchorage, 3151 Alumni Loop Road, Anchorage, AK, 99508; Ecologist (KLM), US Geological Survey, 345 Middlefield Road, Menlo Park, CA,94025. RRP is corresponding author: to contact, call (907) 743-9414 or e-mail at rrpattison@fs.fed.us

METHODS

The crews used a standard P2 DWM protocols for sampling the DWM and a modified soils protocol developed by the USGS that included the use of a soil corer (Nadler and Wein 1998) and tile probes. Tile probe measurements were made to sample the depth of the active thaw layer. Soils sampling was limited to a depth of 40" because of the logistical constraints of packing excesses materials. Tree cores were collected from the field and analyzed for growth trends in a tree core analysis lab.

RESULTS AND DISCUSSION

There were 95 field plots that were sampled for soils. Of these 51 (54 percent) had frozen soils present at depths < 40". The depths of the frozen layer ranged from < 1" to 37" (Fig. 1). There were 21 plots in which crews tallied gravel and did not hit frozen soils and 14 plots in which soil probes reached > 40". There were 7 plots where the substrate was classified as unknown (neither rock or nor frozen). In many boreal forest ecosystems (e.g., black spruce dominated forests) the maximum thaw of the soils occurs in the September or October (Hollingsworth et al. 2008) - well after the optimal time to inventory the above ground forested conditions (June- mid August). As a result the soil sampling efforts used in this study are likely to not be capturing the maximum thaw depth of the soils and therefore not sampling full available soil carbon pool in these forest soils. The FIA program is currently considering alternative methods to sample soil carbon pools more effectively. These methods include using more robust soil sampling methods that require the use of gas powered augers.

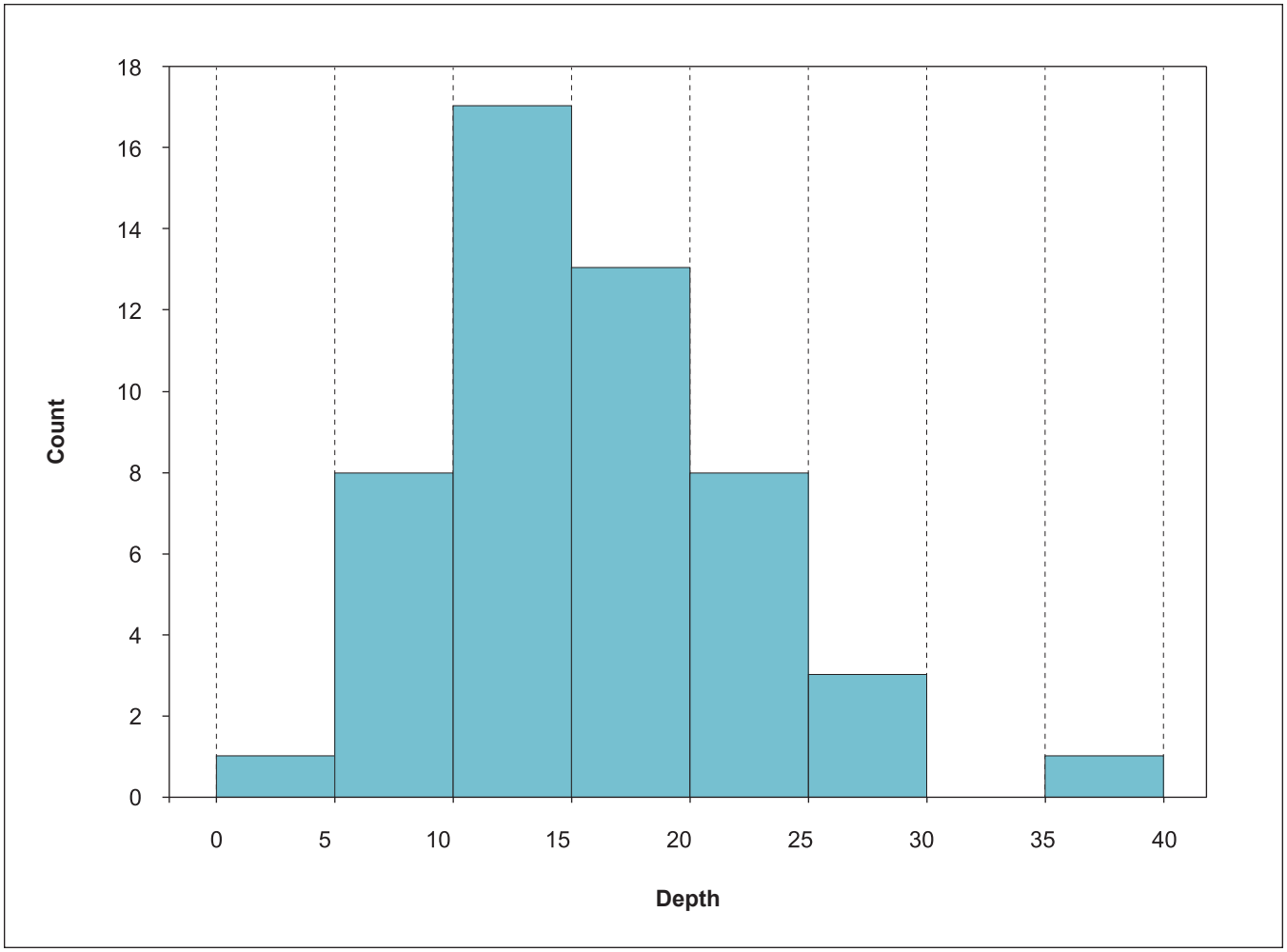

Figure 1—Distribution of depth to frozen layer on the 51 plots that had frozen soils.

Unlike the soils, the DWM protocols were generally not constrained by frozen soil conditions. One exception was the presence of frozen duff on several plots which prevented crews from obtaining accurate measurements of duff depth. Duff measurements can be useful in providing insights into fuel properties of forests.

Accurate aging of trees is important to determine stand age and site quality. In order to account for the time it takes for trees to reach breast height a set value is typically added to the counted rings on cores. However black spruce trees can take 50 + years to reach breast height. In order to account for this long period of time changes to core collection location such as collection cores at the base of trees are being considered. The preliminary results of the trends in tree growth rates across all of the field plots suggests that both black and white (Picea glauca) spruce have seen increases in tree growth. The greatest increases in growth occurred from 1920- 1950. From 1950 to the present tree growth rates showed stable to slight increases in growth. These trends are counter to recent studies suggesting that tree growth rates are declining in interior boreal forests (Juday et al. 2015).

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