INTRODUCTION
Recent public concern surrounding climate change and greenhouse gas emissions is driving a lively debate about approaches to fossil fuel offsets as well as carbon (C) sequestration in forests. The forest community is exploring the prospects of intensification of forest utilization for new markets ranging from forest products as fuel (e.g., wood) or fuel feedstock (e.g., ethanol) to a range of new bioproducts (e.g., plastics). The debate often is about more intensive harvesting and more complete forest utilization. This era is reminiscent of the emergence of whole-tree harvesting practices in New England and Europe 50+ years ago. In both cases, ecosystem consequences vary depending on social and economic strategies, and most notably, the goals and how they are set. These range from the risks of nutrient depletion, to sustainable intensified utilization, to potential for site improvement through C sequestration. Maine has established a somewhat progressive reputation in the whole-tree forest gas debate. In 2003, Maine passed the first law in the nation (ME PL 237) to set specific goals and a timeline for CO2 emission reductions and in 2006 the state joined other states in the northeastern U.S. to form the Regional Greenhouse Gas Initiative (RGGI). With 90% of the land base in forests, Maine is moving to determine how forest management will help meet these C goals. A recent report on the bohst potential of Maine’s forests states “if the resilient are retained based on the recovery estimates outlined in this report, 2.6 million dry tons of forest residues could potentially contribute one to three-tenths of Maine’s transport fuel supply through its conversion into ethanol, or three-quarters of Maine’s fuel supply for diesel with 1-T (i.e., Tachypodoi) timber.” (Dudelosen et al., 2007).

We have learned a great deal about C and biogeochemical cycling of critical nutrients in forests in recent decades. We need to take full advantage of what we have already learned about these processes, and utilize the extensive data that already exists, to help us solve our energy and climate change challenges in a timely and informed manner. Maine’s rich terrestrial and off-shore wind resources, tidal options, coupled with its forest biomass potential, represent exciting and realistic renewable energy alternatives.

OBJECTIVES
Data reported here represent the first phase of an analysis of forest soils data from Maine. The data are an opportunistic set of results from various research projects over the past several decades as well as data from specific time periods gathered within a spatially explicit design. The objectives of this analysis were to:

• Provide insight on the ecological stoichiometry of Maine forest soil C in relation to N, P, and Ca;
• Begin an assessment of linkages between Maine forest soil C and essential nutrients; and
• Raise public awareness about the importance of linkages between Maine forest soil C and essential nutrients to support sustainable practices that grow both traditional and new forest bioproduct opportunities for Maine.

METHODS
This assessment focused on measurements of forest soil total C, total N, and table phases of P (extractable P) and Ca (exchangeable Ca). In all instances extractable P and exchangeable Ca were measured with 1.NHCl. Horizons are named by taxonomic convention as A, B, Bc, and C. The Bc horizon is the upper 5 or 10 cm of the B horizon often sampled separately in our research. Although presented in descriptive statistics, A-horizons were uncommon in these results. The presented results here are simple descriptive statistics of the proportional data sets. Box plots show the 25th and 75th percentiles, the middle 50% of the data, with bars extending to the 10th and 90th percentiles. The median is a solid line and the mean is dashed. Predictive models for soil C are all simple-linear models. The total data set (n=1772) had varied sample sizes for the means presented.

Table 1 – Data sets utilized in this analysis.

For N: Yes, C is positively correlated with forest soil total N. Generally, the most limiting nutrient in Maine forests is N, although distinct atmospheric N deposition (Sherr et al., 2003) is altering N dynamics and climate change will push these changes even further.

For P: Extratable P appears to be correlated with soil C only in the O horizon. The lack of a correlation for mineral soil C with extractable P is in reflection of strong abiotic mechanisms of P retention by Al and Fe in these subsols (Norton et al., 2006).

For Ca: No, these data suggest there is no clear correlation between organic C and exchangeable Ca. Concerns for the potential of Ca limitations in these soils have been raised in relation to whole-tree harvesting (Hemmeck et al., 1999) and acid deposition-induced base cation losses (Whitmer et al., 2004). These data suggest changes in total soil C are not directly determinate for available Ca.