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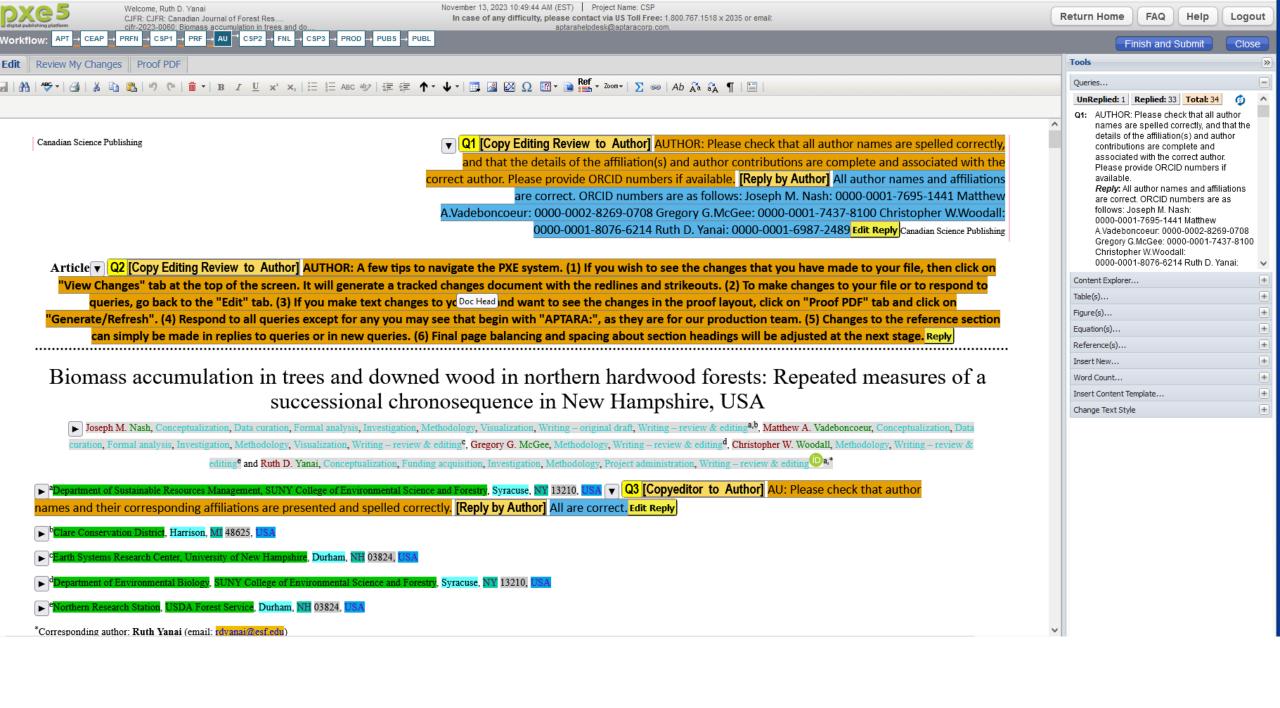
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Forest biomass is an important carbon stock, and forest growth currently offsets more than 10% of annual US greenhouse gas emissions (Domke et al. 2022). Predicting carbon accumulation in aging forests is important in eastern North America where much of the landscape consists of maturing second-growth forests that established following large-scale clearing of primary forests in the 18th and 19th centuries (Considine 1984; Nyland et al. 1986; Irland 1999; Bellemere et al. 2002). Thus, the development of successional forests in the northern hardwoods type of eastern North America (Dyer 2006) Q4 [Copyeditor to Author] The reference 'Dyer 2006' is cited in the text but is not listed in the references list. Please either delete the in-text citation or provide full reference details following journal style. [Reply by Author] Dyer, J. M. 2006. Revisiting the deciduous forests of eastern North America. BioScience, 56(4), 341-352. Edit Reply is of concern for both forest management and carbon accounting (Birdsey et al. 2023), especially as climate change may exacerbate future disturbances including mortality from insects and disease. Management decisions may need to consider carbon sequestration goals and maintenance of a variety of ecosystem services including critical structural habitat features, biodiversity, nutrient retention, and recreational opportunities that develop in older forests (Michel and Winter 2009) Publick et al. 2020; Larrieu et al. 2022).

Forest biomass accumulation is driven by tree growth and mortality while exhibiting a high degree of spatial and temporal variation. Standing and downed trees are two major carbon stocks in forests. Standing tree biomass accumulates as a function of tree growth and mortality, while downed woody debris (DWD) accumulation is driven by inputs from overstory trees and outputs via decomposition and combustion during stand development. In theory, as forests age, biomass pools should reach a dynamic steady-state where inputs and outputs are roughly balanced (Bormann and Likens 1979; Oliver and Larson 1996) of Edit Reply, but in northern hardwoods, the accumulation of tree biomass following stand-replacing disturbances such as clearcutting or blowdowns is difficult to predict. A variety of simulation models have been used to characterize forest biomass dynamics, but empirical data are critical for evaluating them. One such model, developed at Hubbard Brook, NH, USA, described live aboveground biomass in northern hardwood forests increasing for about 100 years following disturbance and then decreasing slightly as even-aged stands transition to uneven-aged structures characterized by regeneration within small canopy gaps formed by the death of single or multiple trees (Bormann and Likens 1979). Observational studies have reported a wide range of biomass accumulation trajectories at different sites. Aboveground live biomass at the Hubbard Brook Experimental Forest peaked and declined earlier than expected, at about 80 years (Battles et al. 2014). In a meta-analysis of data from sites across the northeastern United States, aboveground live biomass was observed to accumulate for over 200 years before reaching an asymptote (Keeton et al. 2011).

[Reply by Author] Changed to "northeastern United States". Edit Reply Importantly, observations are sparse for forests within the transition period (100–200 years after harvest) proposed by Bormann and Likens (1979). Since this is the developmental stage that many successional northe

With time and development, successional forests may eventually resemble old growth in structure and function. One of the defining features of old-growth forests is the presence of large standing and downed trees. Old-growth stands differed from maturing (~100 years old, post-fire) stands in the Adirondacks by having six times more live trees >50 cm diameter at breast height (dbh), with ~85% of large-diameter trees in the maturing stands being residual stems that survived the stand-replacing fires (McGee et al. 1999). Old-growth stands may also have about twice as much DWD exhibiting signs of advanced decomposition and 10 times more in logs ≥50 cm compared to maturing stands (McGee et al. 1999). While there are general time frames proposed for aging forests to resemble old growth, additional data from a range of site ages would allow for a more accurate estimate of how many years are needed for the diameter distribution of stems, and therefore the structural complexity of maturing forests, to resemble old growth. Q8 [Copy Editor Aptara to Author] Please check the text "and therefore the structural complexity of maturing forests to resemble old growth" for its intended meaning in the sentence and amend if necessary. [Reply by Author] Comma added after "maturing forests" Edit Reply

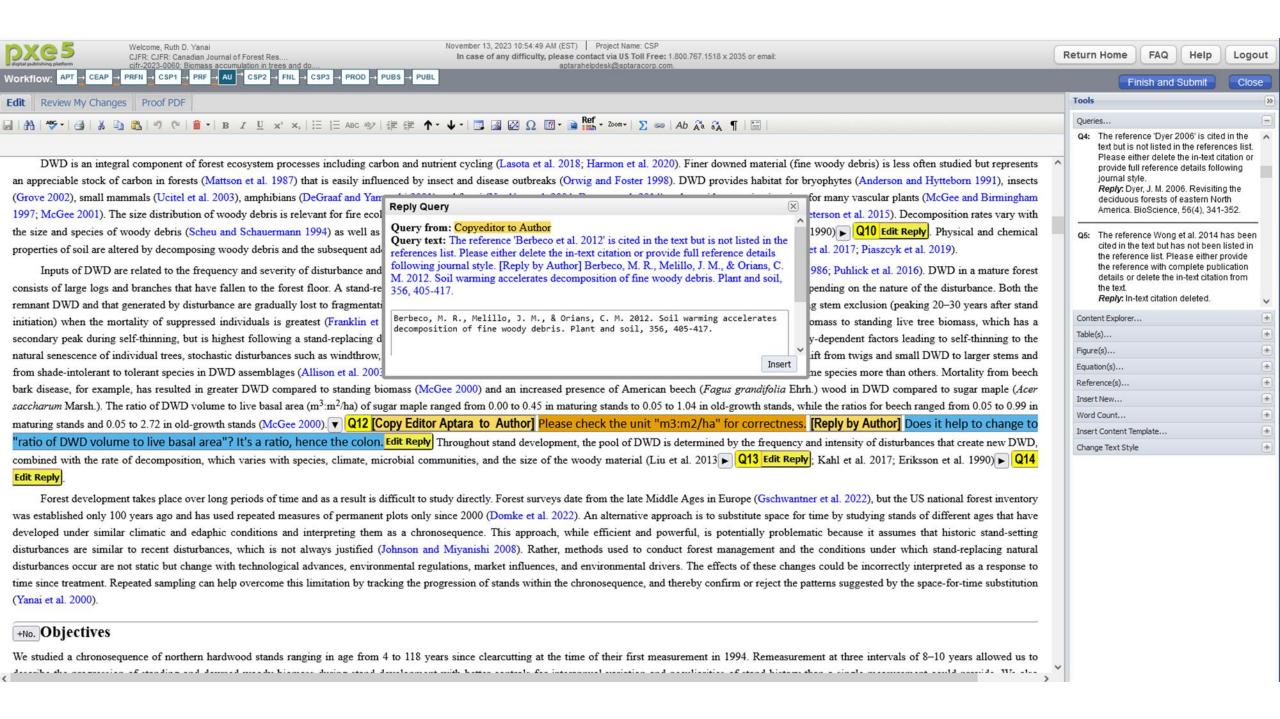
DWD is an integral component of forest ecosystem processes including carbon and nutrient cycling (Lasota et al. 2018; Harmon et al. 2020). Finer downed material (fine woody debris) is less often studied but represents an appreciable stock of carbon in forests (Mattson et al. 1987) that is easily influenced by insect and disease outbreaks (Orwig and Foster 1998). DWD provides habitat for bryophytes (Anderson and Hytteborn 1991), insects (Grove 2002), small mammals (Ucitel et al. 2003), amphibians (DeGraaf and Yamasaki 2001) and fungi (Nordén et al. 2004; Brazee et al. 2014) and provides germination sites for many vascular plants (McGee and Birmingham 1997; McGee 2001). The size distribution of woody debris is relevant for fire ecology as it determines fuel loads, fuel drying rates, and the severity of fires (Shang et al. 2004; Peterson et al. 2015). Decomposition rates vary with

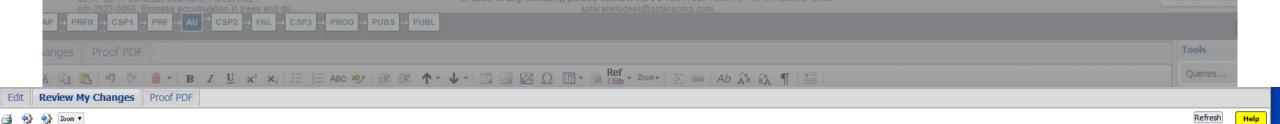
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Introduction

Forest biomass is an important carbon stock, and forest growth currently offsets more than 10% of annual US greenhouse gas emissions (Domke et al. 2022). Predicting carbon accumulation in aging forests is important in eastern North America where much of the landscape is consisted consists of maturing second-growth forests that established following large-scale clearing of primary forests in the 18th and 19th centuries (Considine 1984; Nyland et al. 1986; Irland 1999; Bellemere et al. 2002). Thus, the development of successional forests in the northern hardwoods type of eastern North America (Dyer 2006) Q4 [Copyeditor to Author] The reference 'Dyer 2006' is cited in the text but is not listed in the references list. Please either delete the in-text citation or provide full reference details following journal style. [Reply by Author] Dyer, J. M. 2006. Revisiting the deciduous forests of eastern North America. BioScience, 56(4), 341-352. is of concern for both forest management and carbon accounting (Birdsey et al. 2023), especially as climate change may exacerbate future disturbances including critical structural habitat features, biodiversity, nutrient retention, and recreational opportunities that develop in older forests (Michel and Winter 2009; Wong et al. 2014) Q5 [Copy Editor Aptara to Author] The reference Wong et al. 2014 has been cited in the text but has not been listed in the reference list. Please either provide the reference with complete publication details or delete the in-text citation from the text. [Reply by Author] In-text citation deleted.] Publick et al. 2020; Larrieu et al. 2020.

Forest biomass accumulation is driven by tree growth and mortality, while exhibiting a high degree of spatial and temporal variation. Standing and downed trees are two major carbon stocks in forests. Standing tree biomass accumulates as a function of tree growth and mortality, while downed woody debris (DWD) accumulation is driven by inputs from overstory trees and outputs via decomposition and combustion decomposition and combustion development. In theory, as forests age, biomass pools should reach a dynamic steady-state where inputs and outputs are roughly balanced (Bormann and Likens 1979; Oliver and Larson 1996) [Copyeditor to Author] The reference 'Oliver and Larson 1996' is cited in the text but is not listed in the references list. Please either delete the in-text citation or provide full reference details following journal styles. [Reply by Author] Oliver, C. D., Larson, B. C. 1996. Forest stand dynamics. Wiley Publishing, New York.] but in northern hardwoods, the accumulation of tree biomass following stand-replacing disturbances such as clearcutting or blowdowns is difficult to predict. A variety of simulation models have been used to characterize forest biomass dynamics, but empirical data are critical for evaluating them. One such model, developed at Hubbard Brook, NH, USA, described live aboveground biomass in northern hardwood forests increasing for about 100 years following disturbance and then decreasing slightly as even-aged structures characterized by regeneration within small canopy gaps formed by the death of single or multiple trees (Bormann and Likens 1979). Observational studies have reported a wide range of biomass accumulation trajectories at different sites. Aboveground live biomass are submitted to over 200 years before reaching an asymptote (Keeton et al. 2011). Q7 [Copy Editor Aptara to Author] Please check the term "Northeastern United States", Importantly, observations are sparse for forests management strategies.

With time and development, successional forests may eventually resemble old growth in structure and function. One of the defining features of old-growth forests is the presence of large standing and downed trees. Old-growth stands differed from maturing (~100 years old, post-fire) stands in the Adirondacks by having six times more live trees >50 cm diameter at breast height (dbh), with ~85% of large-diameter trees in the maturing stands being residual stems that survived the stand-replacing fires (McGee et al. 1999). Old-growth stands may also have about twice as much DWD exhibiting signs of advanced decomposition and 10 times more in logs ≥50 cm compared to maturing stands (McGee et al. 1999). While there are general time frames proposed for aging forests to resemble old growth, additional data from a range of site ages would allow for a more accurate estimate of how many years are needed for the diameter distribution of stems, and therefore the structural complexity of maturing forests, to resemble old growth. Q8 [Copy Editor Aptara to Author] Please check the text "and therefore the structural complexity of maturing forests to resemble old growth" for its intended meaning in the sentence and amend if necessary. [Reply by Author] Comma added after "maturing forests"]

DWD is an integral component of forest ecosystem processes including carbon and nutrient cycling (Lasota et al. 2018; Harmon et al. 2020). Finer downed material (fine woody debris) is less often studied but represents an appreciable stock of carbon in forests (Mattson et al. 1987) that is easily influenced by insect and disease outbreaks (Orwig and Foster 1998). DWD provides habitat for bryophytes (Anderson and Hytteborn 1991), insects (Grove 2002), small mammals (Ucitel et al. 2003), amphibians (DeGraaf and Yamasaki 2001) and fungi (Nordén et al. 2014) and provides germination sites for many vascular plants (McGee and Birmingham 1997; McGee 2001). The size distribution of woody debris is relevant for fire ecology as it determines fuel loads, fuel drying rates, and the severity of fires (Shang et al. 2015). Decomposition rates vary with the size and species of woody debris (Scheu and Schauermann 1994) as well as climate (Berbeco et al. 2012) Q9 [Copyeditor to Author] The reference 'Berbeco et al. 2012' is cited in the text but is not listed in the references list. Please either delete the in-text citation or provide full reference details following journal type [Reply by Author] Reply by Author]

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e that they have no competing interests.