TACCIMO Literature Report

Literature Report - Annotated Bibliography Format

Report Date: September 03, 2013

Content Selections

Vegetation
Management
Growth and Yield
R1: Northern
R2 & R4: Mountain West

How to cite the information containted within this report

Each source found within the TACICMO literature report should be cited individually. APA 6th edition formatted citations are given for each source. The use of TACCIMO may be recognized using the following acknowledgement:

"We acknowledge the Template for Assessing Climate Change Impacts and Management Options (TACCIMO) for its role in making available their database of climate change science. Support of this database is provided by the Eastern Forest Environmental Threat Assessment Center, USDA Forest Service."

Best available scientific information justification

Content in this Literature report is based on peer reviewed literature available and reviewed as of the date of this report. The inclusion of information in TACCIMO is performed following documented methods and criteria designed to ensure scientific credibility. This information reflects a comprehensive literature review process concentrating on focal resources within the geographic areas of interest.

Suggested next steps

TACCIMO provides information to support the initial phase of a more comprehensive and rigorous evaluation of climate change within a broader science assessment and decision support framework. Possible next steps include:

1. Highlighting key sources and excerpts
2. Reviewing primary sources where needed
3. Consulting with local experts
4. Summarizing excerpts within a broader context

More information can be found in the user guide. The section entitled Content Guidance provides a detailed explanation of the purpose, strengths, limitations, and intended applications of the provided information.

Where this document goes

The TACCIMO literature report may be appropriate as an appendix to the main document or may simply be included in the administrative record.

Brief content methods

Content in the Literature Reports is the product of a rigorous literature review process focused on cataloguing sources describing the effects of climate change on natural resources and adaptive management options to use in the face of climate change. Excerpts are selected from the body of the source papers to capture key points, focusing on the results and discussions sections and those results that are most pertinent to land managers and natural resource planners. Both primary effects (e.g., increasing temperatures and changing precipitation patterns) and secondary effects (e.g., impacts of high temperatures on biological communities) are considered. Guidelines and other background information are documented in the user guide. The section entitled Content Production System fully explains methods and criteria for the inclusion of content in TACCIMO.

Resource Area (Factor): Vegetation Management

Growth and Yield

R1: Northern

Biondi, F. (2000). Are climate-tree growth relationships changing in north-central Idaho, U.S.A.? Arctic, Antarctic, and Alpine Research, 32 (2), 111 – 116.

"The strongest, and temporally stable, climatic signal [for Douglas-fir (Pseudotsuga menziesii) from the Salmon River Valley, Idaho] is a negative response to July temperature [determined by using backward and forward response functions to analyze climate-tree growth relationships]. It is also possible to identify a weaker, positive April-June precipitation signal, which is more pronounced and temporally consistent for the month of May. The combination of negative response to summer temperature and positive response to late spring/early summer precipitation indicates that Douglas-fir growth at this arid site is mostly a proxy for moisture stress during the growing season, presumably because of lack of soil, 50 to 60% slope, and scarce precipitation (Biondi, 1997)."

"There is a tendency for the moisture stress signal [of Douglas-fir (Pseudotsuga menziesii)] to become earlier during the course of the 20th century (Fig. 3) [relating a tree-ring chronology from the Salmon River Valley, Idaho to monthly instrumental records of precipitation, temperature, and Palmer Drought Severity Index from 1895 to 1995]. Over time, significance shifts slightly from June to May to April precipitation, and a negative response to April temperature appears in the last decades. Those shifts may be associated with increased temperatures in early spring. "

"Of all monthly variables considered, only March temperature [in north-central Idaho] shows a significant linear trend from 1895 to 1995, estimated at 1.6°C/100 yr. Since March is the last cold-season month, with mean temperature of -0.24°C, a slight increase in temperature would influence snowmelt patterns, for instance by causing earlier release of water accumulated as snowpack, thereby reducing moisture availability for tree [Douglas-fir (Pseudotsuga menziesii)] growth at the beginning of the season. The variability of April mean temperature, which has never fallen below 0°C from 1895 to 1995, could then become more closely associated with the variability of tree growth by controlling soil water balance at the start of tree growth. The combination of stronger negative response to April temperature and stronger positive response to April precipitation [using backward and forward response functions to analyze climate-tree growth relationships] indicates higher dependence of tree growth on soil moisture in recent decades."

Gea-Izquierdo, G., Mäkelä, A., Margolis, H., Bergeron, Y., Black, T. A., Dunn, A. .,Berninger, F. (2010). Modeling acclimation of photosynthesis to temperature in evergreen conifer forests. New Phytologist, 188(1), 175-186.

"Photosynthesis in conifer forests from colder sites responded more slowly to temperature than in warmer forests situated further south."

R2 & R4: Mountain West

Hu, J., Moore, J. P., Burns, S. P. & Monson, R. K. (2009). Longer growing seasons lead to less carbon sequestration by a subalpine forest. Global Change Biology, doi: 10.1111/j.1365-2486.2009.01967.x

"We found a significant negative correlation between GSL [growing season length] and NEP [net ecosystem productivity] (P=0.04, R2=0.42, NEP=-2.66 xGSL+510.51) for 9 years of eddy flux data [at Niwot Ridge in the Rocky Mountains], indicating that years with the longest growing seasons were correlated with the lowest annual rates of forest CO_2 uptake (Fig. 2a). Using the SWE [snow water equivalent] data from the SNOTEL database, we also found a significant, negative correlation between SWE and GSL (P=0.01, R2=0.61, SWE=-1.08xGSL+223.87), suggesting that smaller winter snow pack occurred during years with a longer GSL (Fig. 2b). For example, in 1999, a large snow pack delayed the onset of spring and reduced GSL to only 146 days, but annual NEP was one of the highest during the 9-year period. Contrary to 1999, in 2002, the snow pack melted earlier and extended the growing season to 179 days, but resulted in the lowest NEP during the observation period. "

"During the 9-year period [1999-2007], we found the lengthening of the growing season [at Niwot Ridge in the Colorado Rocky Mountains] was more likely due to an earlier onset of spring than a later onset of winter. The end of the growing season date in the autumn varied by 2 weeks (October 9–October 24), but the beginning of the growing season date in the spring varied by nearly 4 weeks (April 25–May 21). We found there was no significant correlation between autumn temperature and NEP [net ecosystem productivity] either in terms of absolute rate or percentage of the annual cumulative NEP (Fig. 4b). We also found no relationship between mean winter temperature and cumulative winter NEP. However, we did find a significant relationship between average temperature and NEP during the first 2 weeks of the growing season (P=0.0048, R2=0.7) (Fig. 4a)."