Data from: Assessing the Effects of Management Activities on Biodiversity and Carbon Storage on Public and Private Lands and Waters in the United States

Natural and working lands (NWLs) provide many benefits to people, including storing greenhouse gases (GHGs), supporting biodiversity, and other ecosystem services. Management of NWLs can influence their condition and function and therefore the benefits they provide. This project surveys the synthesis literature to assess how different management actions on various types of NWLs affect biodiversity and GHG outcomes. This information can help to determine how to best manage these lands to contribute to both biodiversity and climate solutions in the United States.

The first step in this process was to develop a framework to organize the work by land or water system and management activity, allowing us to define searches based on combinations of these attributes. USDA identified an initial set of management activities and a list of priority land and water systems (Box 1) with input from other federal agency partners. The activities are commonly used by federal agencies and have potential effects on either carbon or biodiversity.

Box 1. Land and water systems

Working forests

Grasslands/rangelands*

Croplands

Coastal habitats

Marine habitats

Freshwater habitats

*The term "grasslands" can include both planted croplands and grazed pastures as well as perennial grasslands. We focus on perennial grasslands that may or may not be grazed by livestock. Croplands are considered as a separate land system.

We performed a rapid literature review for each relationship, following a standardized process—search, screen, code, and summarize (Figure 1)—using the approach outlined by the Collaboration for Environmental Evidence (2022). We completed 92 rapid literature reviews for the effects of various management activities on carbon and 114 rapid literature reviews for biodiversity across multiple land and water systems. Because of the broad scope and short timeframe of this project, we focused on reviewing synthesis, meta-analysis, and review papers and limited the number of sources searched for relevant evidence (Lagisz et al. 2022).

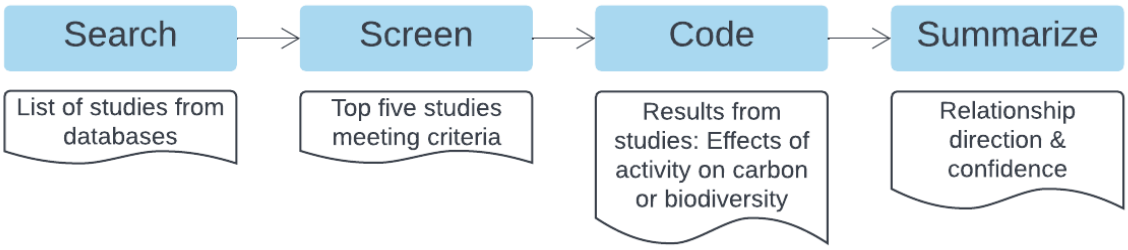

Figure 1: The four main steps in our rapid literature review process. Each step in a teal box generated the output listed below it in a white box, which fed into the following step.

Search: We conducted a separate search for each unique combination of land system, management activity, and outcome. We searched for literature synthesizing primary research in two academic databases (Web of Science and CAB Abstracts) using a search string developed for each relationship and saved the first 50 studies—ranked by relevance to search term—from each database for screening. We used a standard structure for each search string but modified and tested it iteratively until the search results were relevant to the relationships. The standard structure included search terms for activity, outcome, land or water system, and synthesis and meta-analysis studies. The output was a maximum of 100 scientific studies returned by our search strings.

Screen: We screened the studies' titles and abstracts to determine if they were meta-analyses or syntheses of primary research reporting the effect of the relevant management activity on either carbon or biodiversity. Studies also needed to be conducted in the focal land or water system, compare the effect of the activity to a control site where the activity did not occur, and include data from the United States or relevant to the US context. If more than five papers met these initial criteria, we selected the five most relevant papers for the relationship based on the specific variables reported, the geographic scope, and the recency of the paper. If fewer than five papers met the initial criteria, then we occasionally included results from a non-US relevant context, from a study with no control, or from a primary literature study. The narrative summaries of the results describe where these exceptions were made. The output of this step was five or fewer relevant papers for coding.

Code: We extracted relevant information about the effect of the management activity on carbon or biodiversity and recorded it in a database. Information about the number of primary research papers synthesized in the meta-analysis or review, other variables influencing the relationship, and additional details about the paper were also recorded. We categorized each recorded result as representing a positive (e.g., increase in carbon sequestration or decrease in carbon emissions; increased biodiversity), negative (e.g., decrease in carbon sequestration or increase in carbon emissions; decreased biodiversity), neutral, or mixed effect on carbon or biodiversity. The outputs were a database for carbon with a total of 356 rows and a database for biodiversity with a total of 434 rows, where each row represents a *relationship*, or the effect of a management activity on a particular carbon pool or biodiversity taxa in a land or water system.