


# TACCIMO

Template for Assessing Climate Change Impacts and Management Options

## SCIENCE AT YOUR FINGERTIPS




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# TACCIMO

Template for Assessing Climate Change Impacts and Management Options

## Webinar Goals & Objectives

- This webinar will:
  - Explore TACCIMO, a science tool that helps natural resource professionals understand and communicate about climate change
- This webinar will not:
  - Discuss whether climate change is “real” or not  
A recent study<sup>1</sup> showed 97-98% of climate scientists believe in anthropogenic climate change.
  - Discuss potential carbon markets or greenhouse gas mitigation techniques (other than general carbon management in forests)  
These topics are out of the scope of this talk, but there are other resources to address these areas.

<sup>1</sup> Anderegg, W. R. L., Prall, J. W., Harold, J., and Schneider, S. H. (2010). Expert credibility in climate change. *Proceedings of the National Academy of Sciences*, 107(27), 12107-12109.



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## Poll #1 – Multiple Choice

- **In your work, how important is reading scientific (peer-reviewed) papers to keep current on new and emerging issues?**
  - A. Extremely Important
  - B. Moderately Important
  - C. Slightly Important
  - D. Not Important
  - E. I do not read these papers as part of my work

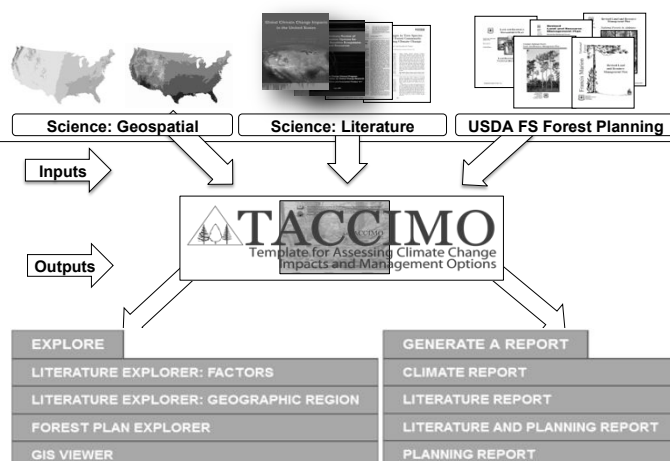
U.S. EPA NAWWETAC

## Poll #2 – Multiple Choice

- In the last 6 months, approximately how many scientific (peer-reviewed) articles about climate change and natural resource management have you read?
  - A. More than 20 (too many to count!)
  - B. 10-20
  - C. 5-10
  - D. 1-5
  - E. I do not read these papers as part of my work



**TACCIMO** is a web-based application integrating climate change science with management and planning options through search and reporting tools that connect land managers with peer-reviewed information they can trust.



## Why TACCIMO?

- Federal guidance requires FS managers and planners to consider climate change.
- There is an ever-increasing volume of useful scientific knowledge about climate change and forest ecosystems.
- TACCIMO highlights elements from this wealth of information with attention to what natural resource managers need.
- TACCIMO's team of content developers and flexible framework allows new information to be added routinely and existing information to be reorganized.



Chris Madden, Incline Press



## What's available on the website?

- **2,800+** quotations describing effects of climate change
- **700+** adaptive management options
- **700+** peer-reviewed source papers
  - With citations to almost **3,000** supporting literature documents
- Content is organized into **16** resource area "Factors"
  - In **16** Geographic Regions and **58** Categories
- Associated with **36** National Forest plans
  - Over **12,000** desired conditions, objectives and design criteria
- Supported by geospatial projections from **3** General Circulation Models (GCMs) and PRISM historic data
  - With **87** supporting resource layers





## What's available on the website?

### TACCIMO includes resources for training and assistance:

- Quick-link buttons at the top of each page provide access to:
  - step-by-step help files
  - how-to videos
  - feedback forms
  - general site disclaimer



Help



Video



Feedback



Disclaimer

- These resources allow users to come to TACCIMO without any prior knowledge of the tool and produce the results needed to quickly and effectively address impacts of a changing climate on forest resources.
- TACCIMO's website also offers a comprehensive user guide, example case studies, and direct user support (phone, emails, etc.)





## How is TACCIMO Used?

- **National Forest Land and Management Plan (LMP) Revisions in the Southern (R8) and Pacific Southwest (R5) regions**
  - TACCIMO was used in recent George Washington National Forest LMP revision in the Mid-Atlantic Highlands.
  - TACCIMO is currently being used in support of the El Yunque National Forest LMP revision in Puerto Rico.
  - TACCIMO content is being developed for use in the upcoming Southern Sierra National Forests LMP revision in California.



## How is TACCIMO Used?

- **NEPA analysis and responding to public comments**
  - NEPA coordinators in the Southern region are using TACCIMO to respond to public comments regarding climate change and carbon sequestration
- **State and Private-Level Forest Management**
  - The North Carolina Forest Service worked with TACCIMO to craft climate change materials for private landowner stewardship plans.
- **Everyday use**
  - TACCIMO is used for every day climate change needs by federal, state, and private natural resource planners, managers, and others



## A Dynamic Literature Review Tool

- A Natural Resource Professional needs to preform a literature review of climate change science....



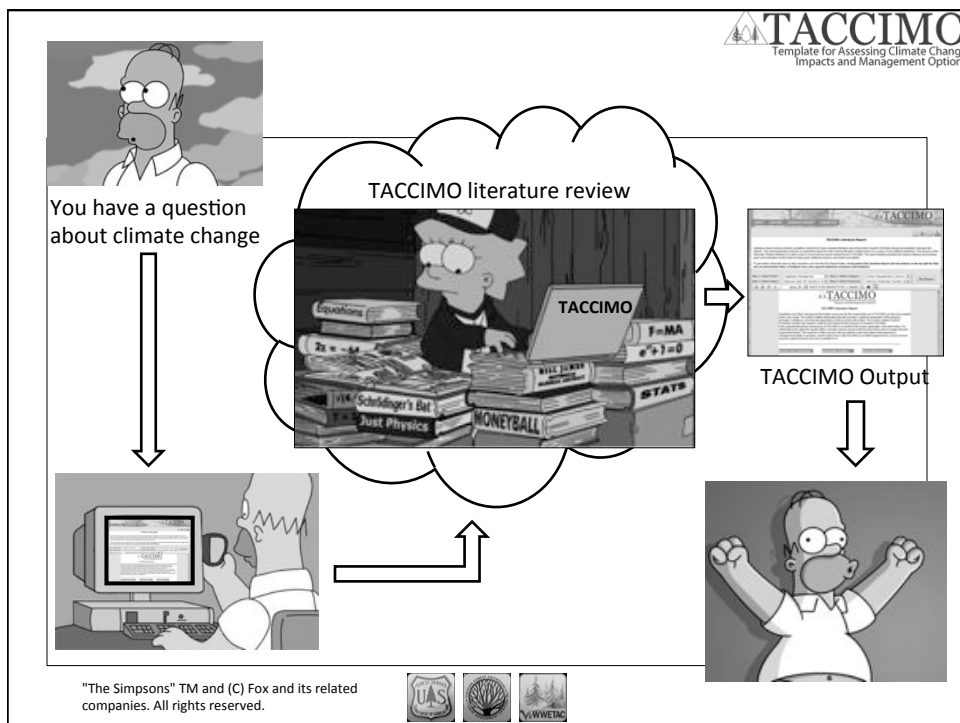
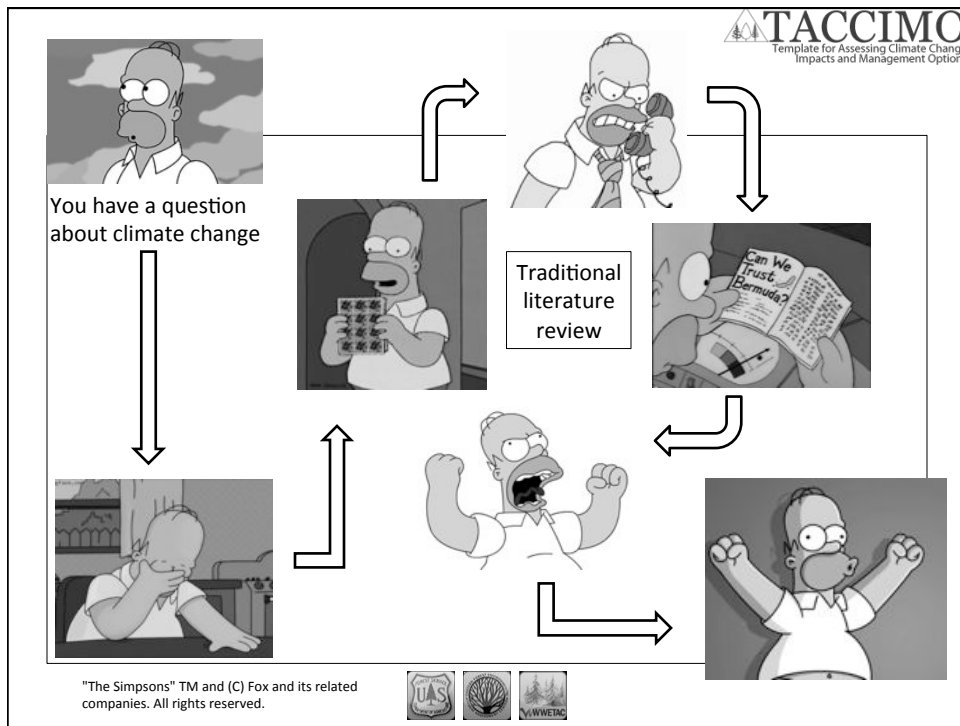
## A Dynamic Literature Review Tool

- A Natural Resource Professional needs to preform a literature review of climate change science....



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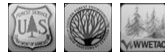
## Poll #3 – Multiple Choice

- **What is the “gold standard” of literature for inclusion in a scientific literature review?**

- A. Gray Literature
- B. Website/Blog Posts
- C. Peer-reviewed Literature
- D. White Literature
- E. Green Literature




- **Questions for clarification about the tool?**



An applied case study...


## **USING TACCIMO AS A LITERATURE REVIEW TOOL**





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## A Dynamic Literature Review Tool

- A Natural Resource Professional needs to preform a literature review of climate change science....
- The professional is interested in the impact of climate change on **plethodontid salamanders**, to include in a review of salamander ecology in **George Washington National Forest**.

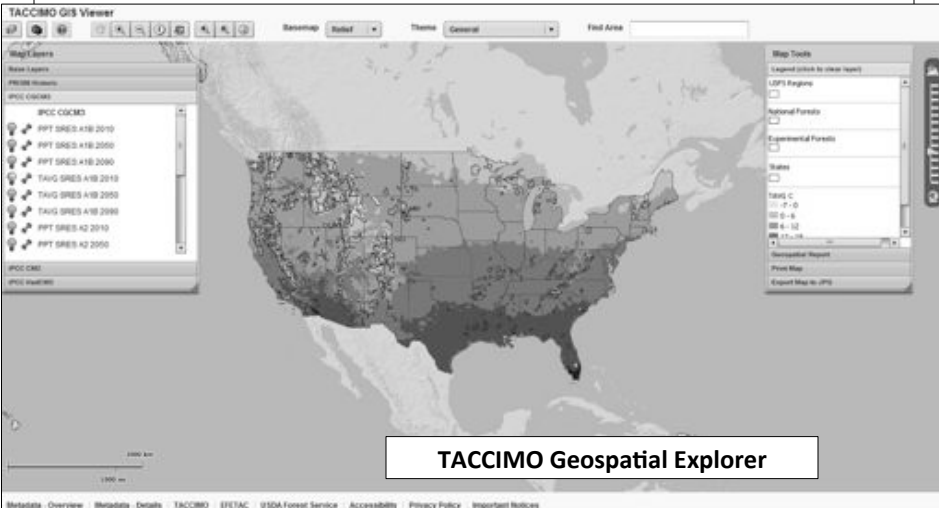







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## Describing the bounds of future climate



TACCIMO Geospatial Explorer





## Describing the bounds of future climate

Using TACCIMO results, summary statements can be crafted:

- “Based on data from TACCIMO, the predicted changes in precipitation and temperature are shown in the following tables:”

Table A3.2 Predicted Changes in Precipitation on the GWRF

Precipitation, annual average from 2009-2099 (in)

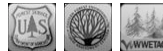
Emissions Path	Commerce Model	Canadian Model	Hadley Model
Middle Emissions	46.3	43.9	47.7
Higher Emissions	47.0	43.9	44.7
Lower Emissions	44.4	44.8	45.8
Average of all emission options	45.9	44.2	46.1
Historical Average (PRISM 1970-2000)	43.5	43.5	43.5

Table A3.3 Predicted Changes in Temperature on the GWRF

Average temperature (°F, Monthly Average spanning 2009 - 2099)

Emissions Path	Commerce Model	Canadian Model	Hadley Model
Middle Emissions	56.3	56.8	57.7
Higher Emissions	56.8	57.0	57.2
Lower Emissions	55.2	55.2	56.1
Average of all emission options	56.1	56.5	57.0
Historical Average (PRISM 1970-2000)	52.5	52.5	52.5


- “All of the models predict an increase in precipitation ranging from less than a half inch to more than four inches per year. All of the models also predict an increase in temperature ranging from 2.7°F to 5.2°F (Meehl et al. 2007).”




## Investigating Effects of Climate Change

The screenshot shows the TACCIMO Literature Explorer interface. At the top, there are navigation tabs: ABOUT, EXPLORE, GENERATE A REPORT, and CONTACT US. Below the navigation is a search bar and a 'TACCIMO Literature Explorer' title. The main content area displays search results for 'Amphibians' under the 'Animal Communities' factor. The results are organized into a table with columns for Effect, Region, and Category. Three results are visible, all for the 'Southern' region and 'Amphibians' category. The first result discusses plethodontid species richness in the southern Appalachian Highlands. The second result discusses projected mean change in salamander suitable climatic habitat size. The third result discusses percent of suitable climatic habitat loss for plethodontid salamander species.



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## Investigating Effects of Climate Change




**Effects**


Effects are quotations from scientific literature that describe the likely effects of climate change. Each effect is grouped by factor, category, and region and is linked to source literature, supporting literature, and interacting factors.

**“While projected mean change in salamander suitable climatic habitat size by 2020 varied depending on threshold, assumed CO2 level, and current range size and latitude, even the most ‘optimistic’ model (low threshold, low CO2, HADCM3) projected at least a 20% reduction in suitable climatic range for more southerly distributed plethodontid species (Fig. 1; Tables S2 and S3).”**


Source: Milanovich, J. R., et al. (2010). Projected Loss of a Salamander Diversity Hotspot as a Consequence of Projected Global Climate Change. PLoS ONE, 5(8), e12189. doi:10.1371/journal.pone.0012189

salamander species with small, southerly geographic ranges under models assuming high CO2, and strict lowest threshold (Fig. 1, Tables S1, S2 and S3)    NB: Southern    Amphibians    Source



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## Investigating Effects of Climate Change



**TACCIMO Literature Report**


Literature based science includes quotations derived from peer reviewed literature describing direct impacts of climate change and potential management options. This report generator produces an exportable report from the science literature content based on a series of user-defined selections. The purpose of the Generate A Report interface is to allow users to document and export content found in TACCIMO. The report interface parallels the explore interface and enables quick summarization of information to help guide additional analysis and expert consultation.


To get started, follow the step-by-step selections and click the Run Report button. At any point in the Literature Report click the buttons on the top right for help text, an instructional Video, a Feedback Form, and a general statement of purpose and limitations.

Step 1: Select Factor: Animal Communities    Step 2: Select Category: Amphibians  
Step 3: Select Region: National; East; Southern; Se    Step 4: Select Resolution: General; Moderately Specific; S

Please input data for all parameters.

**TACCIMO Literature Report**  
(Effects and Management Options are connected by common Factor, Category, Region, and Content Resolution)



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## Investigating Effects of Climate Change

**TACCIMO Literature Report**

**Management Options**

All such management that address climate change... (text continues)

**General**




Consistent with global objectives of sustainable development... (text continues)


**Management Options**

2007 (published) identified climate and... (text continues)

**Sources**

134 Chan, S., & Burnett, C. (2005). Design and management of bridge assets across... (text continues)

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## Investigating Effects of Climate Change

**TACCIMO Literature Report**

**Sources**

134 Chan, S., & Burnett, C. (2005). Design and management of bridge assets across... (text continues)

**Management Options**




All such management that address climate change... (text continues)

**General**

Consistent with global objectives of sustainable development... (text continues)

**Sources**

134 Chan, S., & Burnett, C. (2005). Design and management of bridge assets across... (text continues)

## Investigating Effects of Climate Change

### Using TACCIMO results, summary statements can be crafted:

- Quotations from Rodenhouse et al. (2009) identify negative impacts of temperature and decreasing soil moisture on plethodontid salamander species reproduction.
- Milanovich et al. (2010) predict significant declines in plethodontid salamander species habitat availability as soon as 2020 and almost total habitat loss by the end of the century, with significant losses in species with southerly, high elevation distributions.
- Identifying management options, quotations from Shoo et al. (2011) suggest supplementing naturally occurring shelters with logs and debris to provide temperature-maintaining refuges, restoring riparian vegetation to maintain soil moisture, and increasing connectivity between habitat patches.



## Looking at Management Plan Guidelines



**TACCIMO Forest Plan Explorer**

Start exploring land and resource management plan components for Region 8 and 9 of the USDA Forest Service by selecting a National Forest (date of latest plan version is indicated in parentheses). Results from the selected plan are organized by plan components (Desired Conditions, Objectives, and Design Criteria). Click on each tab to review the different components, which can be sorted by column heading. Use the filter button and a keyword to narrow plan component results.

National Forest: George Washington (2007)

National Forest

Desired Conditions | Plan Objectives | Design Criteria

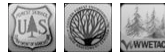
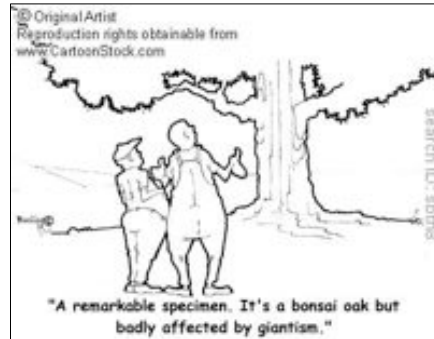
Design Criteria	Heading	Factor
Where soils in riparian areas are disturbed by management activities, revegetation measures should begin implementation within 14 days of the start of disturbance. When outside the fall and spring seeding seasons, initial treatments may be of a temporary nature, e.g. armoring the exposed area against the effects of raindrops and surface runoff.	Watersheds – Water, Soil, And Aquatic Species	Hydrology
Log landings should be located outside of riparian corridors.	Watersheds – Water, Soil, And Aquatic Species	Hydrology
All equipment used for harvesting and hauling operations should be serviced outside of riparian corridors.	Watersheds – Water, Soil, And Aquatic Species	Hydrology
Skid trails may cross riparian corridors at designated crossings. If crossing a perennial or intermittent stream is unavoidable, a temporary bridge or other approved method within the State Best Management Practices (SBMPs) should be used. All streams should be crossed at as close to a right angle as possible. Restoration of skid trails occurs as soon as possible after trail use is finished.	Watersheds – Water, Soil, And Aquatic Species	Hydrology



## Poll #4 – Yes/No

- **Good forest and natural resource stewardship is generally good climate change stewardship.**

- Yes (TRUE)
- No (FALSE)



An applied case study...

## USING TACCIMO TO INFORM FOREST MANAGEMENT



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## Emerging Forest Threats – NC:

### Management Options For Healthy Forests

- Pamphlet created in collaboration with the NC Forest Service Forest Management Division
- Targeted at private forest landowners engaged in stewardship plans
- Summarized from over 300 peer-reviewed sources in TACCIMO
- Does not explicitly mention Climate Change
- Available to public in late summer








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## Emerging Forest Threats Pamphlet

### Emerging Forest Threats for the Southeastern US

- Impacts to Forest Health, Wildfire, Timber, Water Quantity and Quality, Wetlands, Wildlife, Fish, Biological Diversity, Soils, & Recreation and Aesthetic Quality



### Top Emerging Threats by North Carolina Region



- Mountains: High Elevation Forests
- Piedmont: Water Quantity
- Coastal Plain: Sea Level Rise



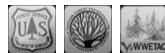
## Emerging Forest Threats Pamphlet

### Forest Management Strategies to Address Emerging Threats in the Southeastern US

- Timber management activities provide forest managers and landowners with an opportunity to adapt their forests to multiple threats.
- Including “adaptation” as a landowner’s management goal may provide multiple benefits and does not have to be costly.

### Simple alterations can be made to forest management activities in the face of climate change

- Site Preparation, Fertilization, Planting, Thinning, Prescribed Fire, & Harvest



## Visit our Case Studies Page

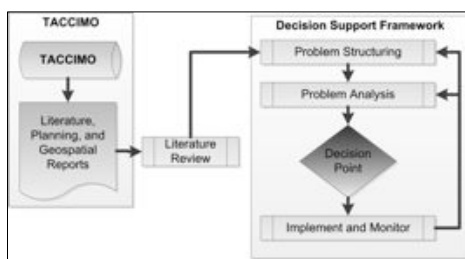
- For more examples of TACCIMO uses, visit our case studies page:

<http://www.taccimo.sgcp.ncsu.edu/casestudy>



## Remember:

- **TACCIMO IS:**
  - A literature review and decision support tool
  - A starting point in the decision making process
  - A large and growing repository of peer-reviewed climate change science for forest resources
- **TACCIMO is NOT:**
  - A decision making tool
  - A substitute for local and expert knowledge
  - An all-inclusive climate change resource for all regions



*Thank You!*

## Questions?

For further inquires contact :  
[emrys.treasure@fs.fed.us](mailto:emrys.treasure@fs.fed.us) or [Lisa\\_Jennings@ncsu.edu](mailto:Lisa_Jennings@ncsu.edu)

Visit the TACCIMO Website today:  
[www.forestthreats.org/taccimotool](http://www.forestthreats.org/taccimotool)



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