USFWS. Brent Lawrence. "Diablo Lake in the Northern Cascades" Flickr, 3 November 2023, https://www.flickr.com/photos/52133016@N08/53450162751/

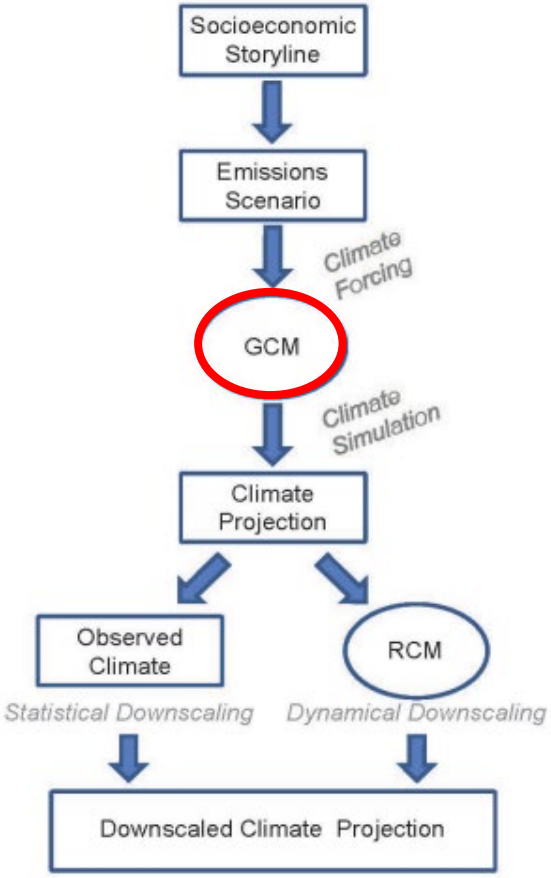
An Overview of Climate-FVS

Don Robinson, with contributions from Nick Crookston and Erin Smith-Mateja

Wednesday, March 13, 2024

ESSA

Setting the Stage



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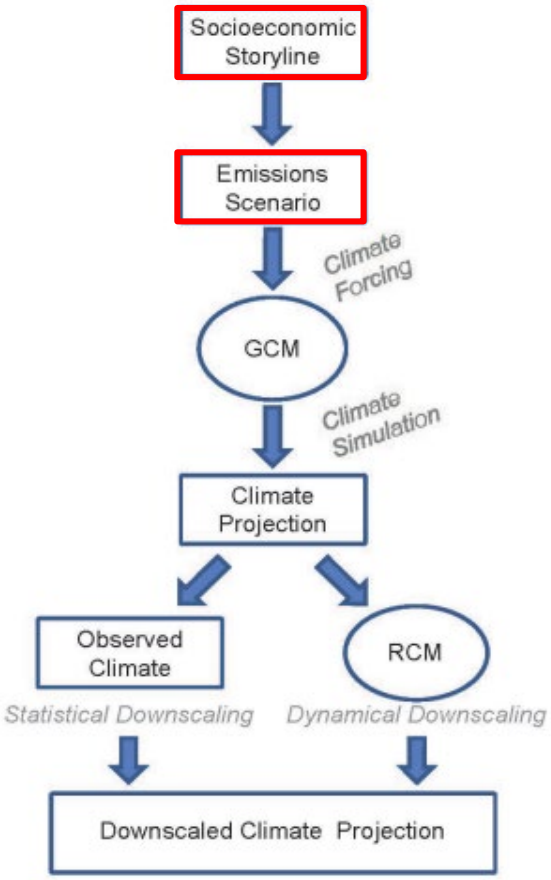

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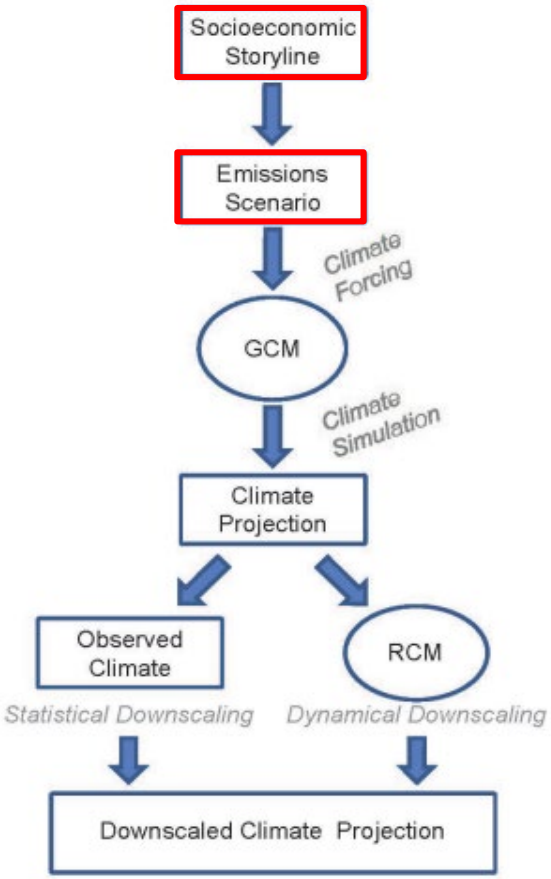

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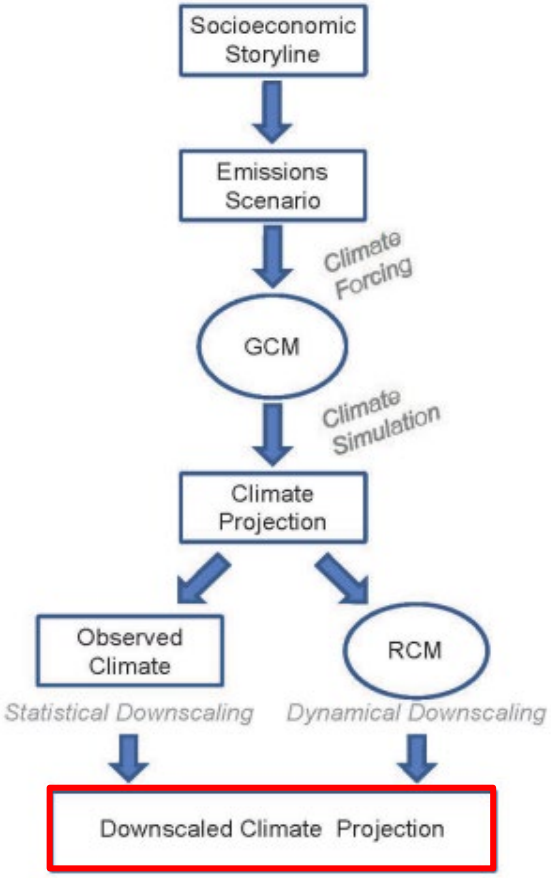

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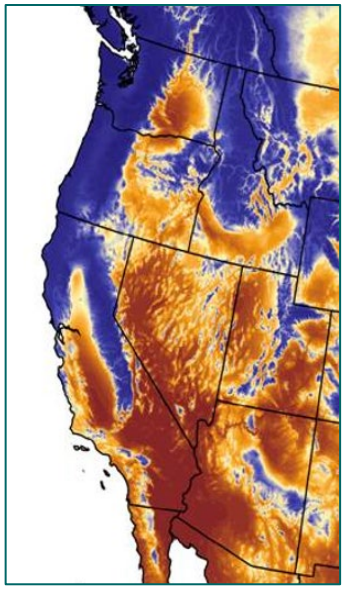
- GCMs predict climate at large scales. These are downscaled to specific locations

Future Climate Prediction

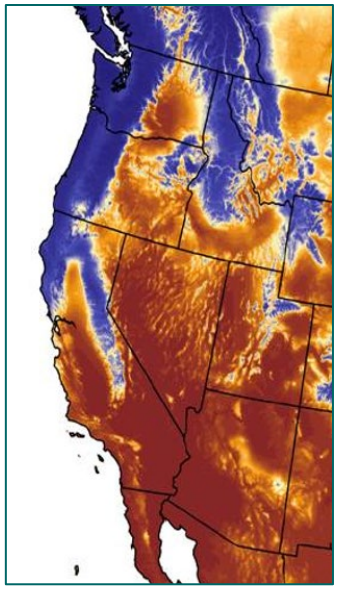
Climate-FVS is an extension to the Forest Vegetation Simulator (FVS), a computer model that projects growth and yield

Adding climate sensitivity and using GCMs and RCPs it tries to answer the question: Will a species that is currently found in stands be viable under **future** climate?

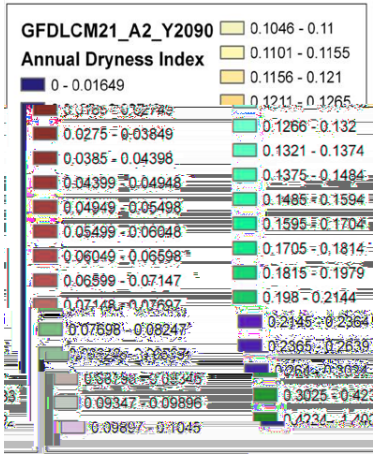
Current



2090



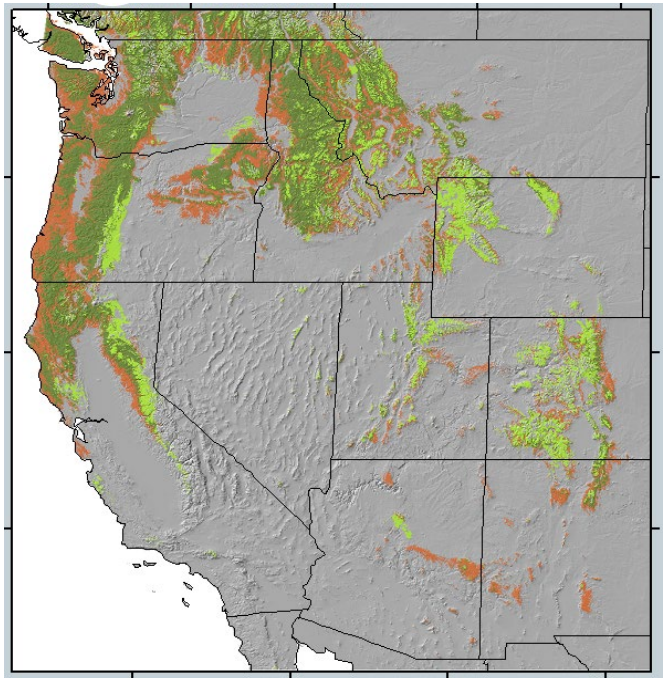
Predictions of one GCM with one RCP



Species Presence

Step 1: Analyze current climate and current species distribution and find the climatic variables that predict that distribution

Step 2: Use a GCM+RCP to predict where the species will/will-not be present in the future



Douglas-fir current vs 2060

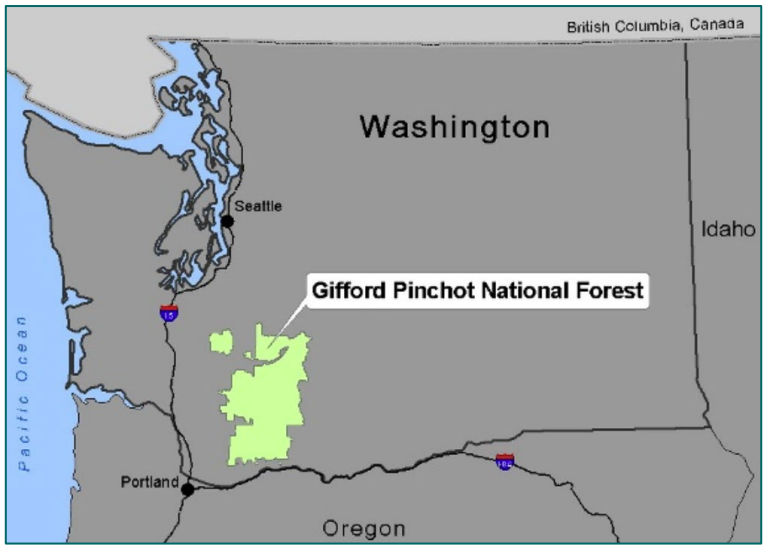
new
recede
stays

Source: Crookston, Nicholas L.; Rehfeldt, Gerald E. Climate Estimates and Plant-Climate Relationships. Web Site http://charcoal.cnre.vt.edu/climate/ accessed on March 12, 2024. Moscow ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station

Species Viability

Presence or absence is measured with a **Viability score**

Climate-FVS has species viabilities for 75 western species, using the 12 future climates predicted by **3 RCPs** and **4 GCMs**



Viability Scores

	DF	WH	PP
1990	0.973	0.960	0.376
2030	0.960	0.656	0.290
2060	0.857	0.236	0.546
2090	0.877	0.131	0.596

Recommended: the **Ensemble** GCM based on blending of 17 GCMs

What Does Climate-FVS Change?

Using the **Viability Score**, these will all change on a species or tree basis:

- Stand carrying capacity
- Tree mortality
- Tree growth
- Species regeneration

FVS settings can change most default assumptions

Carrying Capacity

Carrying capacity is the maximum volume that a stand can support and is a metric of the stand's potential production

If carrying capacity changes, tree mortality also changes due to changes in crowding tolerance ("density dependent mortality")

Each species contributes to the stand's carrying capacity in its own way

Climate-FVS uses the species viability score to change the way species contribute to stand carrying capacity under different climates

This affects carbon sequestration, harvest volume and species mixes

Mortality

Additional mortality is applied if the viability score is less than 0.50

Growth

Growth rate will change if stand site quality changes

Growth can decline based on changes to the viability score.

Regeneration

500 seedings/acre are planted when stand density falls below a stocking threshold defined by the user

The four highest viability species are planted with the amounts depending on their relative viability scores.

If no species are viable there is no regeneration

What Is Left Out?

Climate-FVS does not currently simulate changes to these processes

- **Fire dynamics**, which depend on fuel moisture, temperature and wind speed.
- **Decay** rate of down wood
- **Snag** dynamics

Questions?