



Seamless weather simulation tool for habitat impacts and management

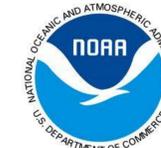
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Introduction

Motivation: Additional tools are needed to translate climate information into products that are useful for local environmental assessments.

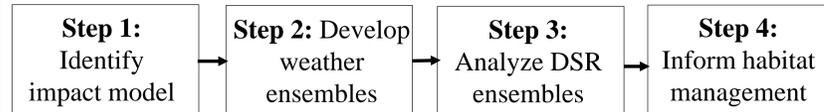
Tool: A weather generator was developed that resamples historic data conditional on a forecast; the tool works seamlessly with forecasts derived from seasonal forecasts and/or climate change projections.

Application: In an effort to inform management and adaptation strategies, daily survival rate (DSR) of nests for Lewis's woodpeckers in two different habitats are assessed under climate variability and change.

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Approach

The research approach has four main steps:



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Identify Impact Model

Daily survival rate (DSR) of nests for Lewis's woodpeckers has been modeled for different habitats:



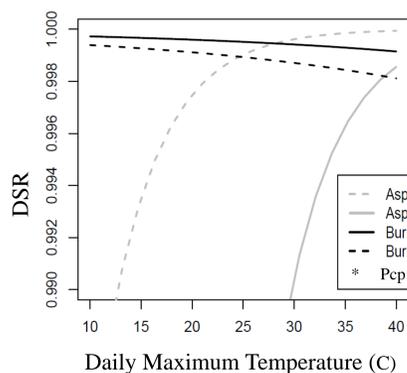
Study	Newlon and Saab (2011)	Saab et al. (2011)
Habitat	Aspen riparian woodlands	Burned conifer forests
Study Area/Weather Station	Craters of the Moon National Monument, ID	Idaho City, ID
Best-fit nest survival (i.e., impact) model	logit(DSR) = 3.4-0.18(InDt^a) + 0.19(MxT^b)	logit(DSR) = 8.8-0.80(Pfp^c) - 0.21(Pcp^d) - 0.038(MxT^b)

^a InDt = Nest initiation date; Early = 29 May and Late = 16 Jun

^b MxT = Daily Maximum Temperature, C

^c Pfp = Postfire Period; Early = 1-4 years after burn and Late = 5-12 years after burn

^d Pcp = Precipitation, mm

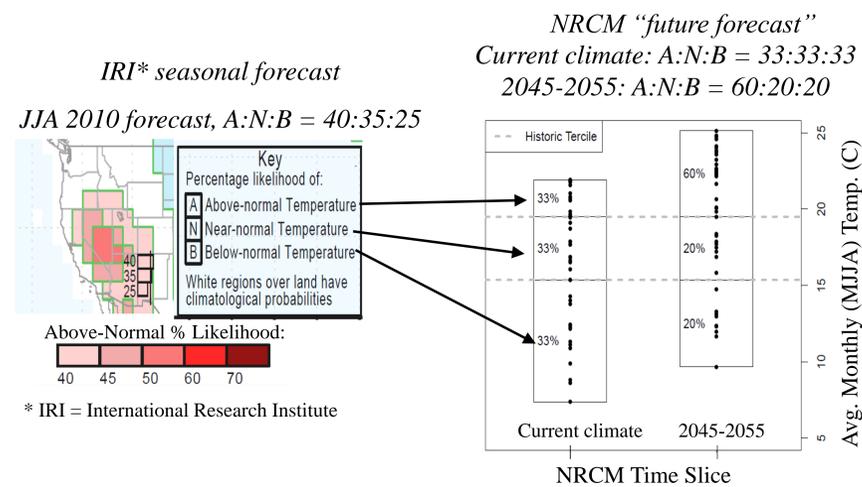


• **Increasing daily maximum temperatures have a positive effect on DSR in aspen habitat, but have a negative effect on DSR in burned conifer forests.**

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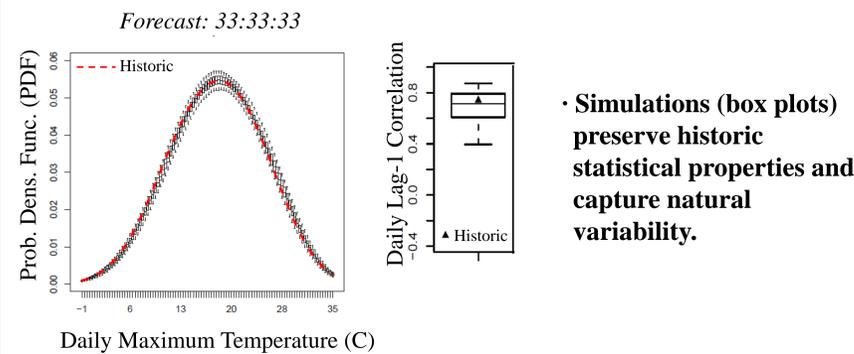
Develop Weather Ensembles

The A:N:B structure used in seasonal forecasts was adopted and extended to output from high resolution climate model data from NCAR's Nested Regional Climate Model (NRCM; Holland et al. 2010):

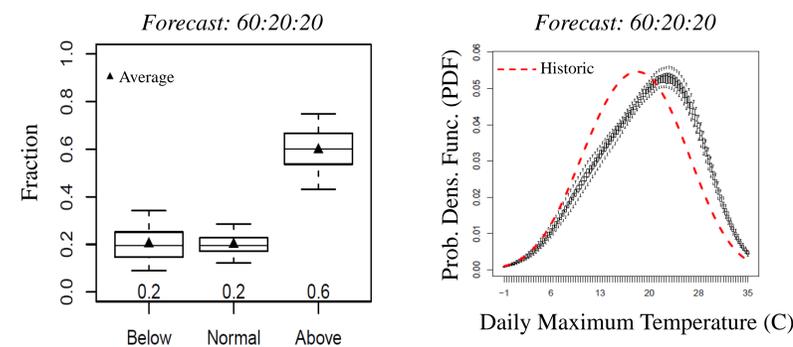


A weather generator developed by Yates et al. (2003) was modified to incorporate the A:N:B-type forecasts.

Method: Lag-1 nonparametric k-nearest neighbor resampling scheme



• **Simulations (box plots) preserve historic statistical properties and capture natural variability.**



• **Algorithm dynamically converges to desired forecast**

• **Conditional algorithm re-samples to reflect forecast**

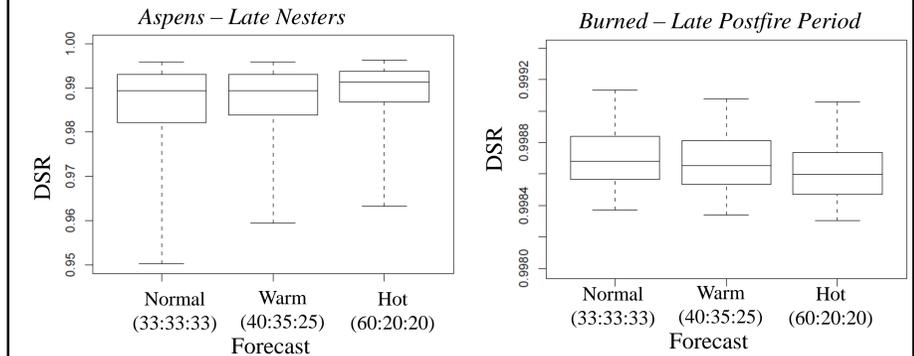
Next Step:

Extend weather generator to include multiple variables (e.g., precipitation)

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Analyze DSR Ensembles

Maximum temperature ensembles for each location are used in conjunction with the associated impact models to calculate daily survival rate (DSR).



• **Aspen habitat late nesters exhibited the greatest sensitivity to the warming scenarios as well as the largest DSR increase, especially the lower quantiles.**

• **Despite slight decreases, burned-habitat nesters were largely insensitive to warming scenarios.**

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Inform Habitat Management

From these results, it appears that aspen habitat can provide an increasing number of recruits to Lewis's woodpecker populations, while recruits will remain relatively constant in burned conifers.

Next steps:

- (1) Manager outreach
Engage with forest managers to see implications for habitat planning and management decisions.
- (2) Aspen forest vulnerability
Explore aspen forest vulnerability to climate variability and change.



References

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