ET-AL FACTSHEET

BRAT
Beaver Restoration Assessment Tool

UtahStateUniversity
ECOGEOMORPHOLOGY & TOPOGRAPHIC ANALYSIS LABORATORY

THE ISSUE

With increasing price tags for stream and river restoration and anticipated impacts from climate change looming, managers and practitioners are increasingly turning to beaver (Castor canadensis) for help. Through their dam-building activity, beaver can improve habitat quality and complexity and maintain dynamic, healthy ecosystems. Plus, they do it for free.

KEY QUESTIONS

• Where in the riverscape are beaver an appropriate restoration agent?
• What is the capacity of the landscape to support dam building activity?

BACKGROUND

The ecogeomorphic benefits and impacts of beaver dam building activity are reasonably well understood, but predicting where beaver will build dams is critical to using beaver in a restoration context. Traditional habitat suitability modeling approaches attempt to predict where beaver may consistently fail, because beaver are such generalists that can survive in a very large range of conditions. From a restoration perspective, we primarily care about where beaver are able to build dams that persist. In this context, we can focus on the conditions beaver need to build dams (note if water depths are deep enough beaver do not need to build dams).

Figure 1. A schematic of the three primary inputs to the fuzzy capacity model.

APPROACH

Three primary lines of evidence were used to consider whether beaver could build dams:
• Availability of woody building materials (from LANDFIRE)
• Ability of beaver to build dams at baseflow (from baseflow stream power estimates)
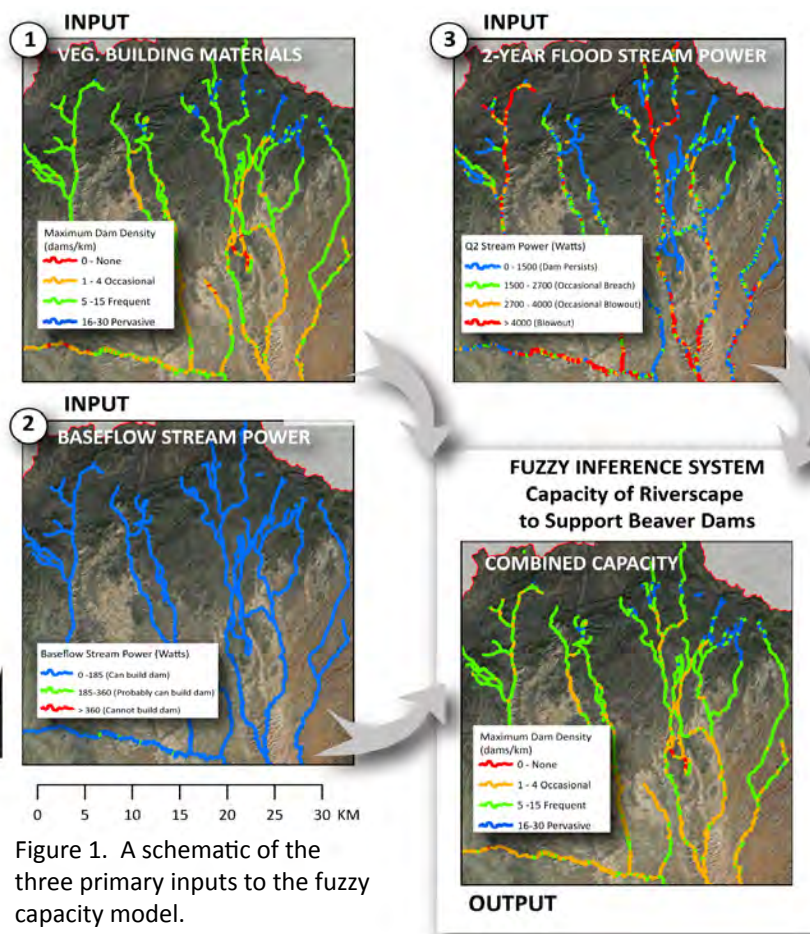• Likelihood of dams to withstand high flows (from flood stream power)

All three inputs can be readily derived from nationally available DEMs, vegetation cover data (e.g. LANDFIRE) and hydrologic data. These factors were combined in a fuzzy inference system to predict an upper limit of dam density (in terms of dams per km) that the riverscape could support.

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EXAMPLE APPLICATION & VERIFICATION

In Figure 2, an example is shown within the Temple Fork watershed in northern Utah comparing actual dam densities to the BRAT capacity model. The model is able to discriminate areas that have no history of beaver dams from those with occasional dams and from those that support major dam complexes and colonies. Interestingly, the model picked up a high capacity not only for a long-term dam complex that has persisted for at least the past 50 years, but also a brand new dam complex. The new dam complex was constructed by beaver thought to be displaced by a 2011 flood. The beavers built 12 dams in a one month period in precisely the 250 meter segment predicted as being able to support 'pervasive' dam densities.

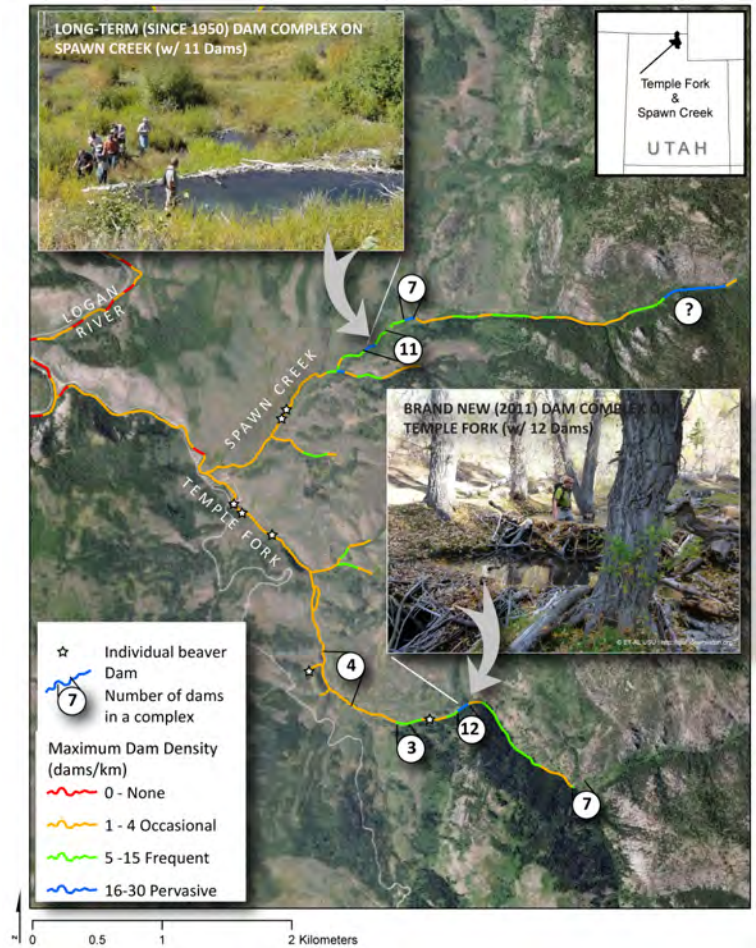A beaver dam located in the Temple Fork Watershed, Logan Canyon, Utah.

Figure 2: An example of how well actual beaver dam building activity and dam density compare with the BRAT capacity model predictions.

TAKE AWAY

•A simple capacity model driven by widely available input data sets does a good job of discriminating where beavers build dams at different densities
•The model compares well with actual patterns of dam building
•The model could be run for large areas (e.g. entire Western US) to aid in restoration and conservation planning.

FOR MORE INFORMATION:

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The mission of the ET-AL lab is to illuminate and understand ecogeomorphic feedbacks and dynamics in rivers and streams through state-of-the-art monitoring and modeling analyses. To learn more about us, visit etal.joewheaton.org