RIVERSCAPES CONSORTIUM BRAT

BEAVER RESTORATION ASSESSMENT TOOL

THE ISSUE

Alteration to riverscapes is pervasive. It is estimated that **79%** of riverscapes in the contiguous US have been altered by human activity. Even with more than **$10 billion** spent annually, traditional stream restoration efforts are barely scratching the surface of what could be restored. Through their dam building activity, beaver can improve habitat quality and complexity and maintain dynamic, healthy riverscapes. Plus, **they do it for free.**

KEY QUESTIONS

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

BACKGROUND

The ecogeomorphic benefits and impacts of beaver dam building activity are well understood, but predicting where beaver will likely build dams is critical to using beaver in a restoration context.

Beaver are broadly appreciated for their utility as an ecosystem engineer capable of restoring streams, rivers, and wetlands to the benefit of numerous flora and fauna, including salmon and steelhead (Bouwes et al. 2016). 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.

APPROACH

Five lines of evidence are used to consider whether beaver could build dams:

- **Availability of water to support beaver ponds**
- **Availability/extent of woody building materials**
- **Ability of beaver to build dams at baseflow**
- **Likelihood of dams to withstand high flows**
- **Likelihood that a stream is small enough to dam**

The inputs to the capacity model (Figure 1) can be readily derived from nationally available DEMs, vegetation and hydrological data. These factors are combined in a fuzzy inference system to predict an upper limit of dam density (in terms of dams per mile/km) that the riverscape could support.

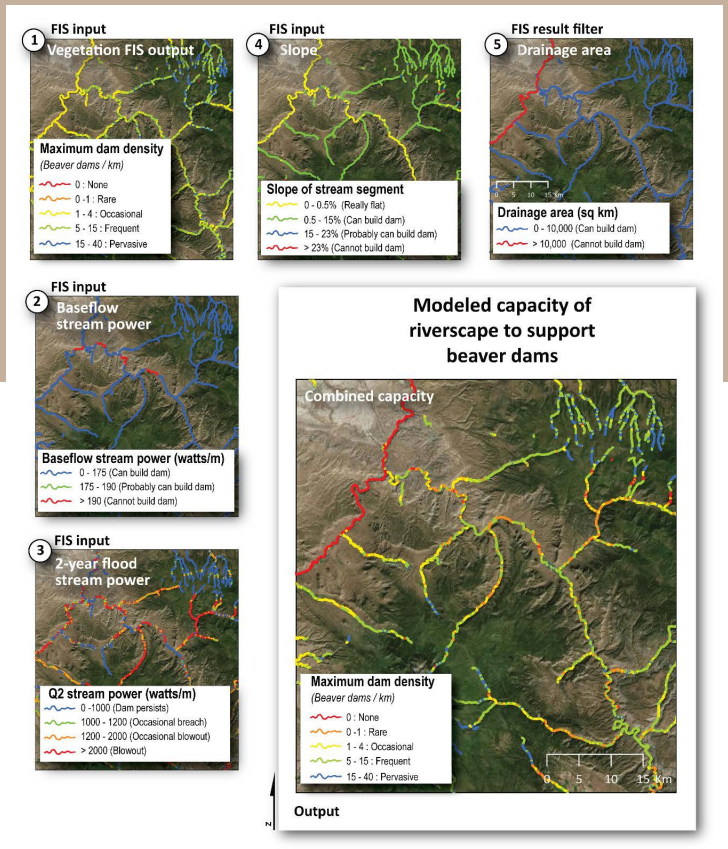

Figure 2. A schematic of the five inputs to the beaver dam capacity model.

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EXAMPLE OUTPUTS

Figure 2 shows some of the primary outputs of the BRAT model in Little Wood watershed, Idaho. These outputs help stakeholders understand patterns of beaver dam capacity, potential risks to human infrastructure, and constraints and opportunities for using beaver in restoration and conservation. This information helps with broad-scale planning efforts, as well as design and implementation of conservation and restoration activities.

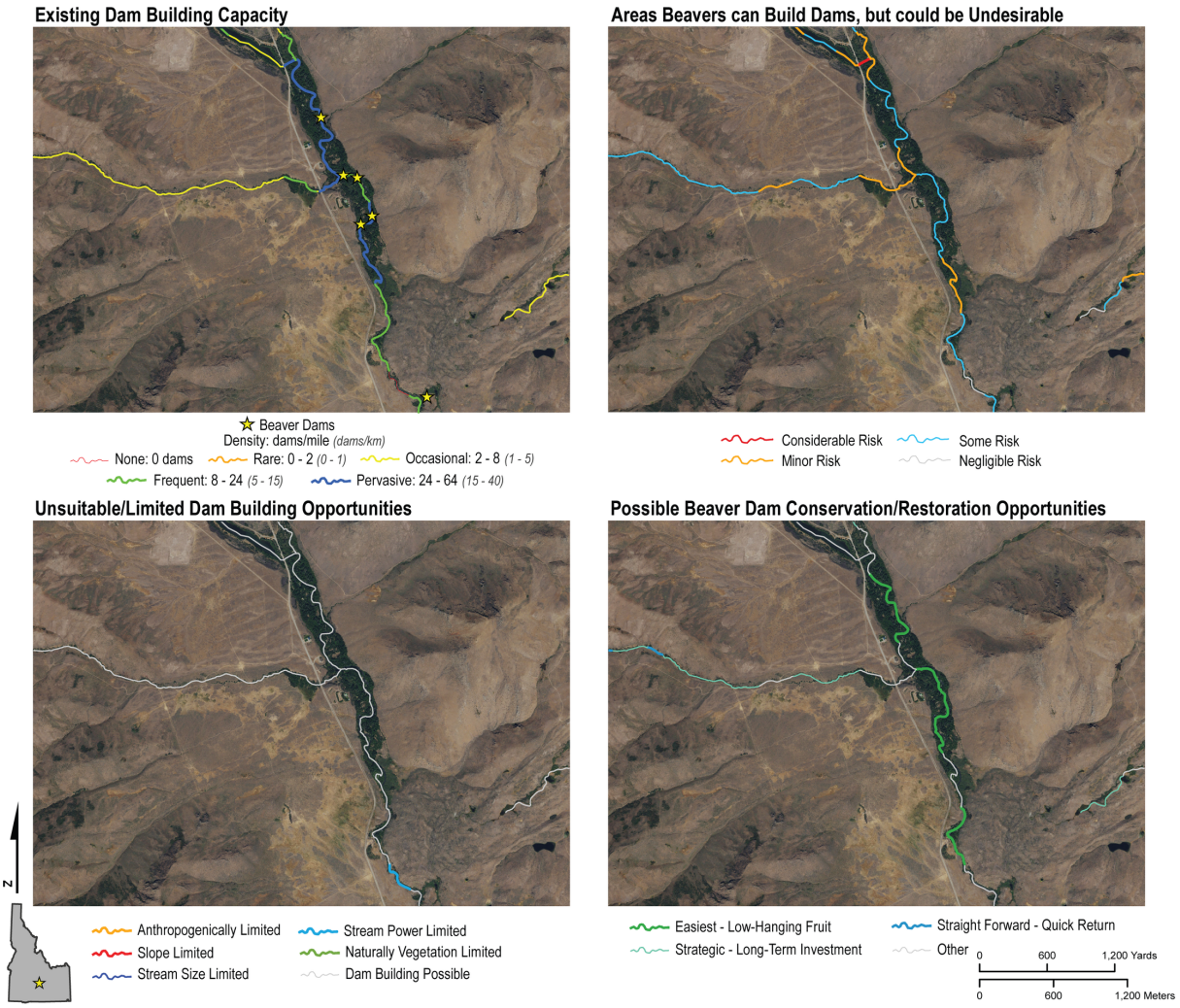

Figure 2. An example of BRAT outputs: **A)** existing beaver dam capacity, **B)** potential risk to infrastructure, **C)** unsuitable or limited dam building opportunities, and **D)** conservation and restoration opportunities.

THE TAKEAWAY

- BRAT's beaver dam capacity model compares favorably to actual dam distributions, even across a large, climatically and physiographically diverse landscapes where water and/or wood may be locally limiting.
- BRAT helps assess where beaver may be a viable restoration tool or where they may be seen as a nuisance requiring mitigation or relocation.

CITATIONS

Bouwes, N., N. Weber, C. E. Jordan, W. C. Saunders, C. Volk, J. M. Wheaton, and M. M. Pollock. 2016. Ecosystem experiment reveals benefits of natural and simulated beaver dams to a threatened population of steelhead (Oncorhynchus mykiss). Scientific Reports 6:28581.

Macfarlane, W. W., J. M. Wheaton, N. Bouwes, M. L. Jensen, J. T. Gilbert, N. Hough-Snee, and J. A. Shivik. 2017. Modeling the capacity ofriverscapes to support beaver dams. Geomorphology 277:72-99.

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