

# CLIMATE CHANGE ADAPTATION: Let's Make it Real

**Climate change projections and risks have been widely discussed** in broad terms for many years, but climate adaptation principles have generally been weakly integrated into operational forest management decision-making. Real world examples of systematic climate change adaptation efforts in the forestry sector are sparse. There has been progress in the field of reforestation silviculture, but beyond such initiatives as climate-based seed transfer, management actions have been limited.

Why is there lots of theory but not much action? I think there are several reasons, including the firehose of climate information that often seems to increase our sense of uncertainty rather than provide clear direction or helpful tools. I have spent over a decade trying to figure out how to integrate climate change adaptation and mitigation into my work as a forest manager, and after much deliberation and consultation with my peers, I am convinced that there are practical ways to move forward. It is time for operational forestry professionals to engage and inform the high-level discussions and theories about climate change adaptation.

## Project History

In 2010 and 2011, I attended a series of workshops delivered by the West Kootenay Climate Vulnerability and Resilience Project.<sup>1</sup> The workshops were designed for forest managers. We received a compelling overview of climate projections for the West Kootenays, and discussed adaptation principles, opportunities, and barriers. During the final workshop, participants were asked to step forward to try to operationalize the project's findings in our local areas. I put my hand up. As the manager of a community forest that was already commit-

ted to ecosystem-based management and innovative practices, I was fortunate to have a mandate to engage in this work.

In 2016, Harrop-Procter Community Co-operative (HPCC) and Columbia Basin Trust (CBT) provided funding for a multi-year project to develop a detailed case study to demonstrate how climate science and risk assessment could be integrated into tangible forest management decision-making on the ground. The project would have an applied focus and be oriented to the needs of forest managers.

The West Kootenay Climate Adaptation in Action project is based on the premises we have enough science to act and we have enough high-level direction to proceed.<sup>2</sup> By focusing on a specific 11,300 hectare landbase, and a decision-making time horizon of 20 to 40 years, the level of uncertainty is reduced significantly. The uncertainty associated with climate adaptation is often related to complexities inherent in trying to simultaneously understand and manage large diverse landscapes. Also, extended time frames of 60 to 80 years are important to consider but can confound management actions. Shorter-term management imperatives are evident in a small landscape which is already experiencing warmer and wetter winters and hotter and drier summers.

To ensure the project was strongly linked to regional climate expertise and offered practical value, I assembled a project advisory committee. The advisory committee included regional experts and consulting ecologists; Ministry of Forests' district and regional staff; and representatives from small, medium, and large forest industry. I developed and implemented the project myself to ensure a direct connection with real world management decisions. Invaluable GIS support was provided by Tom Bradley, RFT, to undertake the analysis for Phase 1 and Phase 3 of the project.

## Phase 1: Risk Assessment

In phase one of the project, we used a systematic risk assessment approach to prioritize areas for adaptation actions. The current probability (relative likelihood) of wildfire and drought was assessed for each stand in the community forest based on terrain, ecosystem classification, vegetation resource inventory, and LiDAR

*Erik Leslie, RPF, is a forestry consultant and manager of the Harrop-Procter Community Forest near Nelson. He has worked for 25 years with the forest industry, Indigenous Peoples, community organizations, and governments on projects from Haida Gwaii to Labrador. Erik has extensive experience in forestry planning and operations, community engagement, and wildfire risk reduction.*



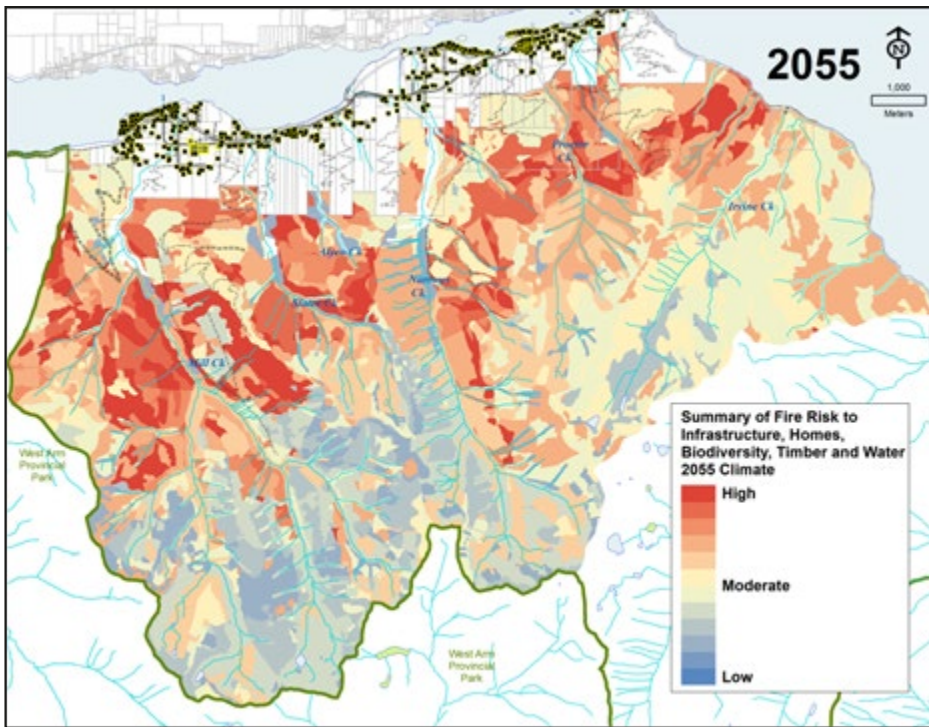


FIGURE 1. *Risk assessment summary map—2055 climate.*

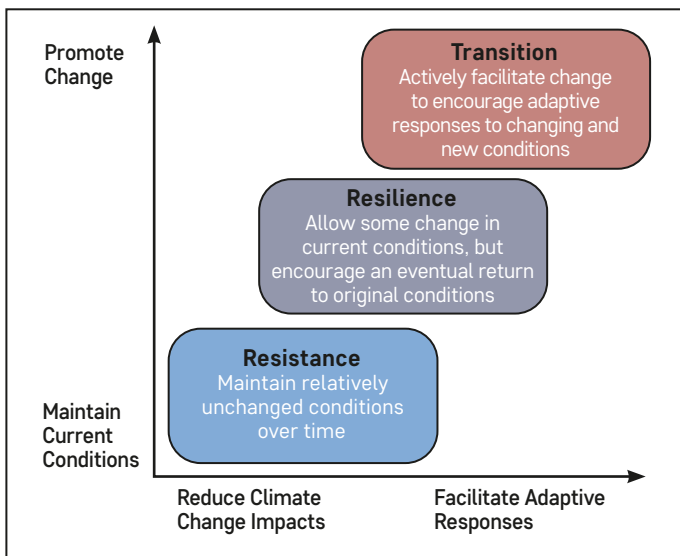


FIGURE 2. *Adaptation options, from Nagel et al 2017.*

interpretations. Fire and drought probabilities were reassessed for 2055 and 2085 climates using provincial climate data and modelled changes to actual soil moisture regimes<sup>3</sup> for each biogeoclimatic subzone variant and site series.

The *consequences* of fire and drought to homes, water, biodiversity and timber were also independently mapped. By combining probabilities and consequences, relative risk ratings were assigned and highest priority areas for adaptation action were identified (Figure 1).

## Phase 2: Operations Strategy

The risk assessment identified top priority areas for adaptation actions. The next step was to identify specific adaptation strategies

### OPERATIONS STRATEGIES

Resistance (protect)	Realignment (transition)
• Construct fuel breaks	• Convert forest composition and structure
• Protect old forests and rare sites	• Novel stocking standards
• Connectivity – reserves	• Connectivity – treatments

FIGURE 3. *Examples of resistance and realignment strategies.*

to address the risks. To organize our strategies and techniques, we considered a gradient of adaptation strategies, ranging from *resistance* to *resilience* to realignment/transition.<sup>4</sup> We can choose to act defensively to maintain current conditions and resist undesirable change; we can accommodate some change and promote resilience; or we can proactively facilitate change through a *realignment/transition* strategy (Figure 2).

We chose site specific adaptation strategies for each forest type based on priority values, landscape context, current site conditions, and an assessment of desired future conditions. If the current forest conditions are similar to desired (and feasible) future conditions then a resistance or resilience strategy is likely to be chosen. However, if current conditions represent a high risk and are incompatible with desired future conditions, then a realignment/transition strategy is likely to be chosen. For example, developing fuel breaks around high risk values is a resistance strategy, whereas tree species conversion to drought-tolerant species is a realignment/transition strategy (Figure 3). In practice, these strategies can overlap and be complementary or sequential.

Once a resistance/resilience/realignment decision is made, an operational technique is chosen. HPCC's operations techniques include identifying priority reserve areas (resist), locating strate-





FIGURE 4.  
*Low elevation  
submesic forest  
before and after  
resilience strategy  
implementation.*

Photo credits:  
Erik Leslie, RPF.



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gic landscape-level fuel breaks (resist), thinning to lower stand densities (resilience) (*Figure 4*), and removal of fire- and drought-intolerant species to promote Douglas-fir, Ponderosa pine, and deciduous (realignment).

### Phase 3: Management Plan and Allowable Annual Cut (AAC) Scenarios

The risk assessment addressed the question of *where to adapt*. The operations strategy addressed the question of *how to adapt*. The third phase of the project addresses, in part, the question of *how fast to adapt*.

As forest managers, our ability to address climate change is limited by the scope of our operations. There are many issues and risks we cannot easily address (e.g. drought risks outside of the timber harvesting landbase). Since many adaptation strategies require active management, the potential rate of harvest is a key adaptation consideration. Prioritizing the protection, management, or conversion of stands with high probability of drought and/or wildfire can potentially help reduce risks to timber values while also addressing risks to homes, water, and biodiversity values.


Ultimately, AAC determinations are social decisions based on values and priorities, and should include assessments of the relative risks associated with a range of scenarios. Thus, in the final part of the project, timber supply modeling is being used to assess the potential impacts of a suite of adaptation-based harvest scenarios. The scenarios will be used to inform discussions during our next AAC determination.



*Transition of drought-prone site to more open conditions, Harrop Creek.* Photo credit: Erik Leslie, RPF.

### Conclusion

This project is a case study. Our goal is to pilot tangible adaptation strategies and actions, and to stimulate discussion. Our community forest now has an action plan with clear management priorities and site specific adaptation targets. Over the next two to three years, I would like to collaborate with other BC community forests and land managers to scale up and refine the methods piloted in our project. Let's get to work on the ground and make it real.

*More information about this project can be found on the Harrop-Procter Community Forest community updates page of the website<sup>5</sup> and the BCCFA 2021 Conference - Session 7: Climate change adaptation on YouTube<sup>6</sup>.* 

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