



Cascadia Resilience Center

Executive Summary – Cascadia Resilience Center
Visualizing scientific knowledge
for industry, governmental and citizen communities
to build a resilient Cascadia.

Definition of terms

Cascadia is a geographical and biological region that encompasses the states of Washington, Oregon, parts of Idaho, southern Alaska and northern California, as well as British Columbia, Canada. Its unique topography, geology, cultural, economic and environmental aspects distinguish it from surrounding regions.

Currently, Cascadia faces a broad range of natural hazards and risks from periodic large-scale earthquakes, tsunamis, and volcanic eruptions, and could readily experience massive infrastructure failures and loss of life resulting from these potentialities. Even the long-distance impact of a Fukushima nuclear meltdown needs to be considered, as well as the consequences of dramatically reduced fresh water supplies due to accelerated melting of nearby glaciers. And yet, there is no comprehensive program from existing academic, governmental and non-profit organizations to integrate all these risk factors – nor can one find an organized effort to make comprehensive sense of them.

Resilience is the ability to recover quickly from change or misfortune and can only be achieved when the nature of change is thoroughly understood and anticipated. Resilience requires a readiness for any contingency - even the ‘unknown unknowns.’

Scientific progress and systems thinking are beginning to make clear that significant natural events can often be highly connected and share deep and complex interdependent relationships, and that they can also tie into broader socio-economic dynamics. To the contrary, many of our university departments and government agencies are currently siloed in their particular fields of understanding, causing much of our citizenry to lack a broad understanding of this connectedness. Indeed, all units of society are in desperate need of clear visual communications to help explain the coupling and complexity that is inherently involved.

The Cascadia Resilience Center (CRC) will partner with local organizations to provide a means of systematically studying, modeling, assessing and visually communicating these risks to citizens and leaders. We will provide easy to use methods to visually and intuitively understand complex events, processes and natural cycles, along with their multiple underlying feedback mechanisms.



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Potential partnering organizations all report that while they do great science they feel they are not effective at visualization, communication and public engagement with their work. CRC will collaborate with and offer fee-for-service and licensing possibilities to partner organizations to better display, understand and manage their data.

The basis of our work entails five essential elements...

- the ability to recognize cross-connections and feedback loops between all systems, both natural (biogeophysical) and socioeconomic (health, economy, community)
- coherent and compelling visual narratives that impart literacy and simplify complex thinking - story boards that inform and catalyze social movements toward change by conveying emergent dangers
- collaborative efforts to collect, integrate and harmonize disparate sets of data and local knowledge
- interactive, online, near-real-time maps on which information can be presented and displayed
- advanced yet easy-to-use communication technologies

How We'll Achieve Our Vision

Our plan involves four separate steps:

Step 1: We'll produce a ten-minute video history of Cascadia, portraying the fundamentals of formation and geology while answering questions such as:

- What is Cascadia?
- How did it get here?
- What forces of nature shape and affect us?
- What will CRC be and do – giving a taste of the future.

The video will be based entirely on systems thinking and integrative, trans-disciplinary science. It will help illuminate the workings and interconnections of all bio-geophysical systems that have shaped Cascadia – making our history immediately and delightfully obvious

In this step we will make the case for why a CRC is needed - and create a dynamic flowing visual history that orients our Cascadia home in time and place. It's the foundation for a means to systematically study, model, assess, categorize and communicate multiple future risks to citizens and leaders.



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Step 2: We'll create a software and visualization tool-kit so that we can intelligently provide compelling narratives/stories around big data sets. This tool-kit will include:

- Data layering,
- Times series animations
- Modeling & simulation of cause and effect
- Predictive analytics and probabilities of future events
- Bayesian methods to generate hypotheses and explanatory theories

In all cases we will ask what tools can be purchased, licensed & outsourced versus what items need to be self-developed?

Using such tools, we can ultimately create a dynamically flowing, visually interactive narrative that intuitively imparts fundamental ecological and Earth System literacy. This, we believe, will be essential for citizens, institutions and organizations to navigate toward a sustainable future in the Pacific Northwest.

Also during Step 2 we will host a series of gatherings that bring together regional private, public and academic institutions to discuss how best to mold our approach so as to ensure it is useful to a broad constituency and to the general public.

We believe that visualizing de-siloed information will have a profound impact on the Cascadia's thought leaders. We will co-create an interactive map to model, simulate and illustrate predictive scenarios that address future regional risks.

Step 3: In this step we plan to hire a team of expert programmers and system thinkers who are able to consult with partners and clients throughout Cascadia. This team will include big data experts, systems designers, visualization specialists, communication/story masters, gamification specialists, and several domain experts in various scientific fields. Such a team will enable the CRC to extend its breadth and depth of cooperation across Cascadia.

Step 4: Here we plan to build and operate an advanced virtual reality auditorium facility to provide a permanent setting for story telling and decision support - possibly on a fee-for-use basis. The facility would deploy advanced 4D interactive immersive visualization methods along with multi-science, holistic integration, and gamification techniques.



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In Summary

Through improved modeling, simulation, visualizations and cogent narratives, the following outcomes will be realized:

- Strategic and tactical scenarios that contribute to a safer and more resilient society, helping prepare for and avoid future threats and disasters;
- Public education on extreme weather, climate and environmental change, energy, transportation, etc., and their related impacts on societal health and public safety;
- Reduced loss of life and economic losses through a more comprehensive understanding of risk, vulnerability, and prevention.

This CRC enterprise will promote focused discussion, collaboration and integration of scientific information across research and education centers throughout the Pacific Northwest. We will become a pre-eminent collaborative research hub to engage the general public, private industry, universities and government and create several flowing 3D visual maps that integrate environmental changes and sociological processes, thus enhancing systemic thinking and holistic insightfulness.