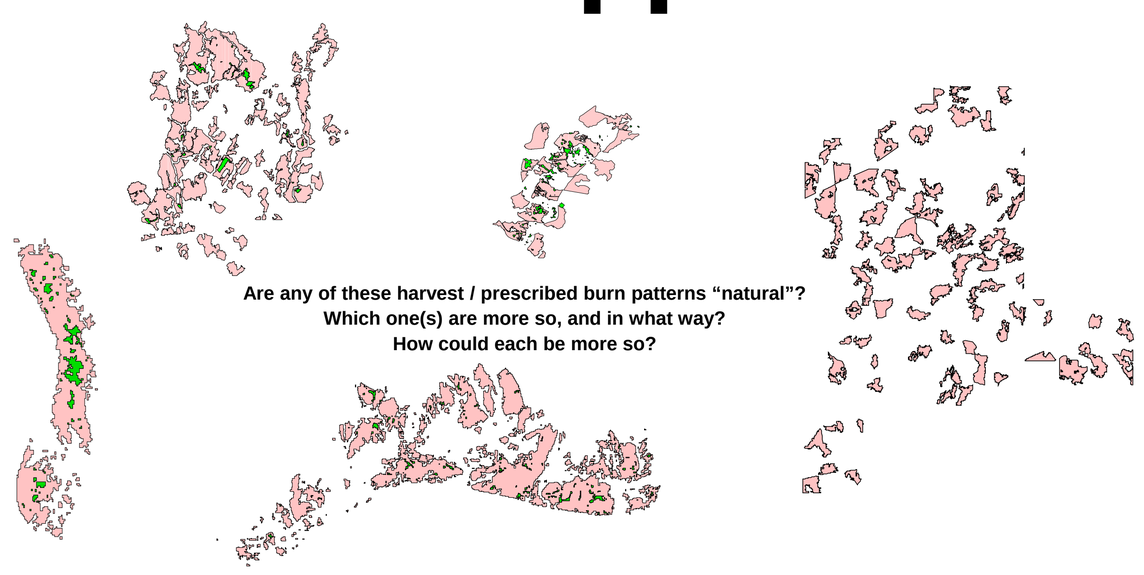
NEPTUNE

Natural Pattern Decision Support Tool



The Challenge:

The concept of using of natural disturbance patterns as guides for forest land management activities is well accepted In Canada, and research is expanding. However, integration efforts are still evolving.

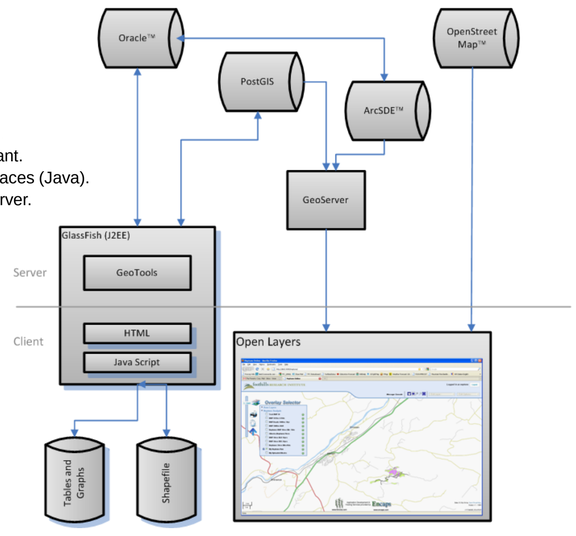
Part of the learning curve involves understanding which, and how, natural disturbance patterns differ from current practices. To further complicate matters, there is no single best answer, but rather an infinite number of (equally natural) possibilities. Moreover, it is precisely this variability that we are trying to capture.

This is not just a knowledge gap. This is a management integration issue: More specifically,

- How does the scientific knowledge of natural disturbance patterns manifest itself as definitive spatial entities that are “natural”
- How do we capture and track the variability in the appropriate disturbance pattern metrics over appropriate time and space scales?

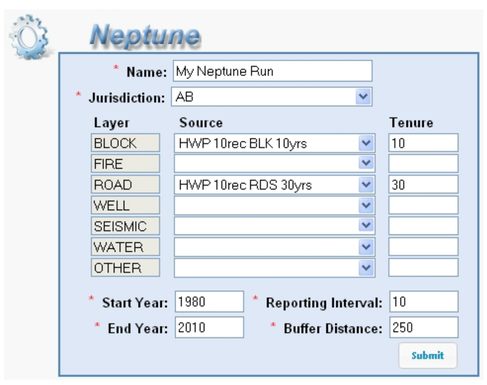
Model Architecture

- GeoTools for implementing spatial and data processing.
- JavaScript for the interface and process control on the client.
- Oracle for storing tabular NEPTUNE output.
- PostGIS geospatial database for storing client data.
- ArcSDE client spatial database of base features for mapping.
- OpenStreetMaps open service of base maps beyond client scope.
- GeoServer publishes data using GeoAPI to OGC and ISO compliant.
- OpenLayers web interface for data from GeoServer and tool interfaces (Java).
- GlassFish J2EE to manage communication between client and server.



Translation:

- On-line access from any computer, anytime.
- Secure on-line data storage.
- No software or distribution fees.
- Low maintenance fees.
- No software or hardware conflicts.
- Version consistency between users.



Natural Vs. *Cultural*

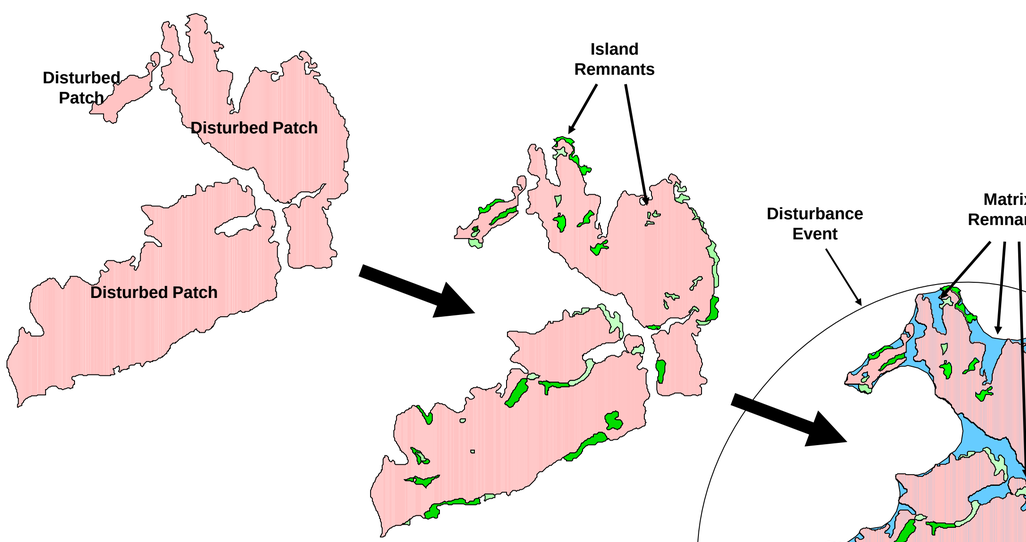
Translating between natural (wildfire) and cultural disturbance patterns requires more than a spatial language. There are several complicating factors. For example;

- How many years of adjacent harvesting qualify as a single “event”?
- How do we reconcile the fact that fires re-vegetate in weeks, harvest blocks in months, gravel-pits in years, and mines and roads in decades?
- Roads potentially connect all cultural disturbance activities into a single, massive event.
- Traditional mapping of harvested areas is a legal requirement that does not align with the net disturbed area.

NEPTUNE considers each of these issues.

The Solution:

NEPTUNE a web-based decision-support tool that calculates ten key disturbance pattern metrics from spatial input data. It then compares the pattern results to those of pre-industrial, natural disturbance patterns from empirical research.



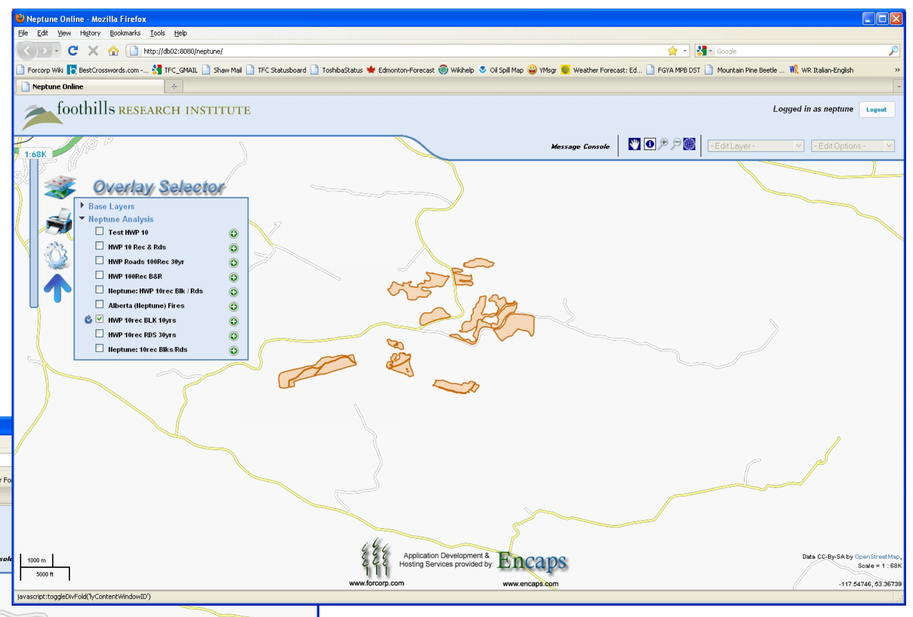
A Robust Spatial Language

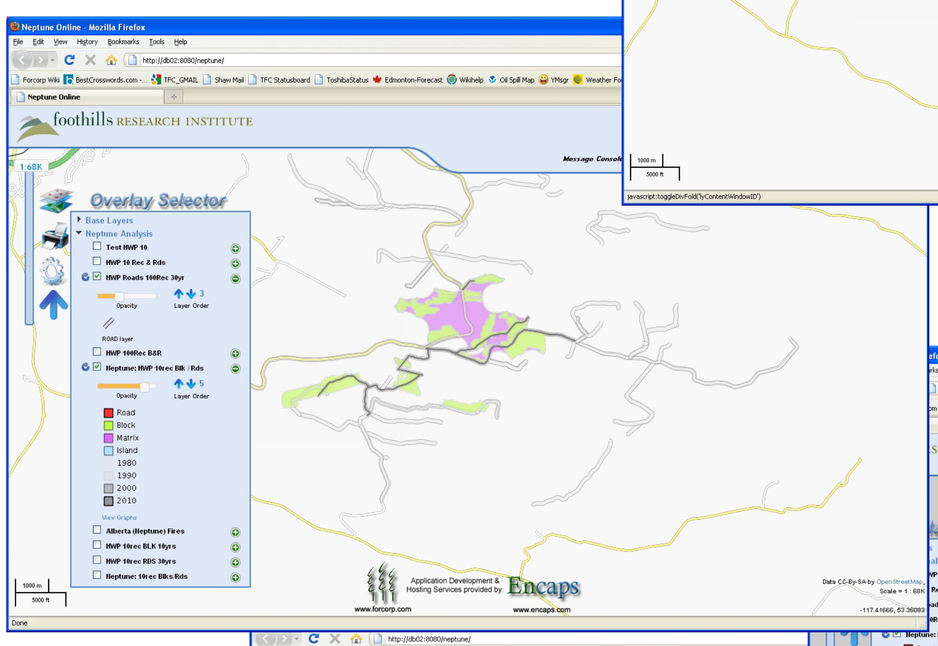
There exist many definitions of “disturbances”, “residuals” and “patches”. When dealing with patterns, it is less important to be right than it is to be simple and consistent. We want to compare apples to apples, every time.

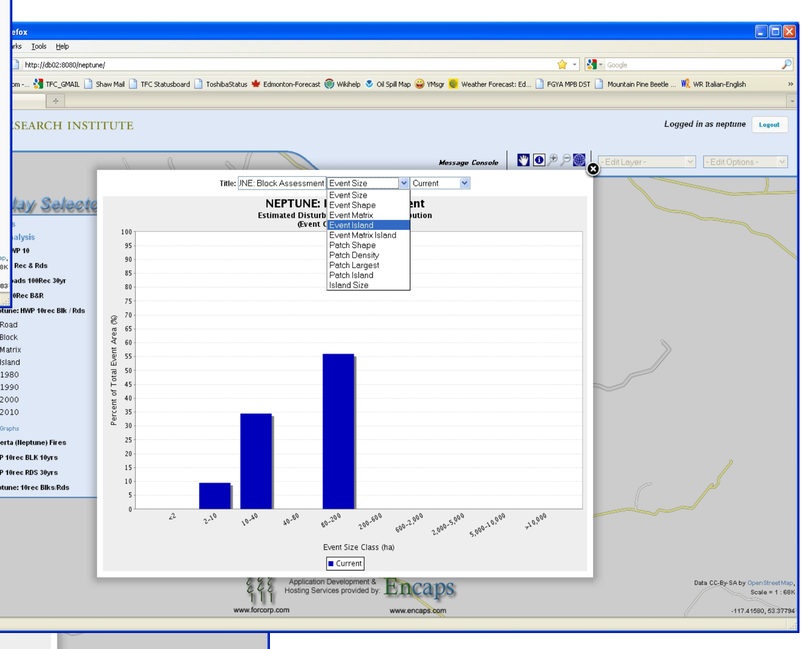
Our research suggests that a significant proportion of wildfires in the boreal forest “spot”, creating multiple burned patches. So within NEPTUNE, we adopted a simple buffering algorithm that gathers disturbed patches based on their distance from each other in space and time.

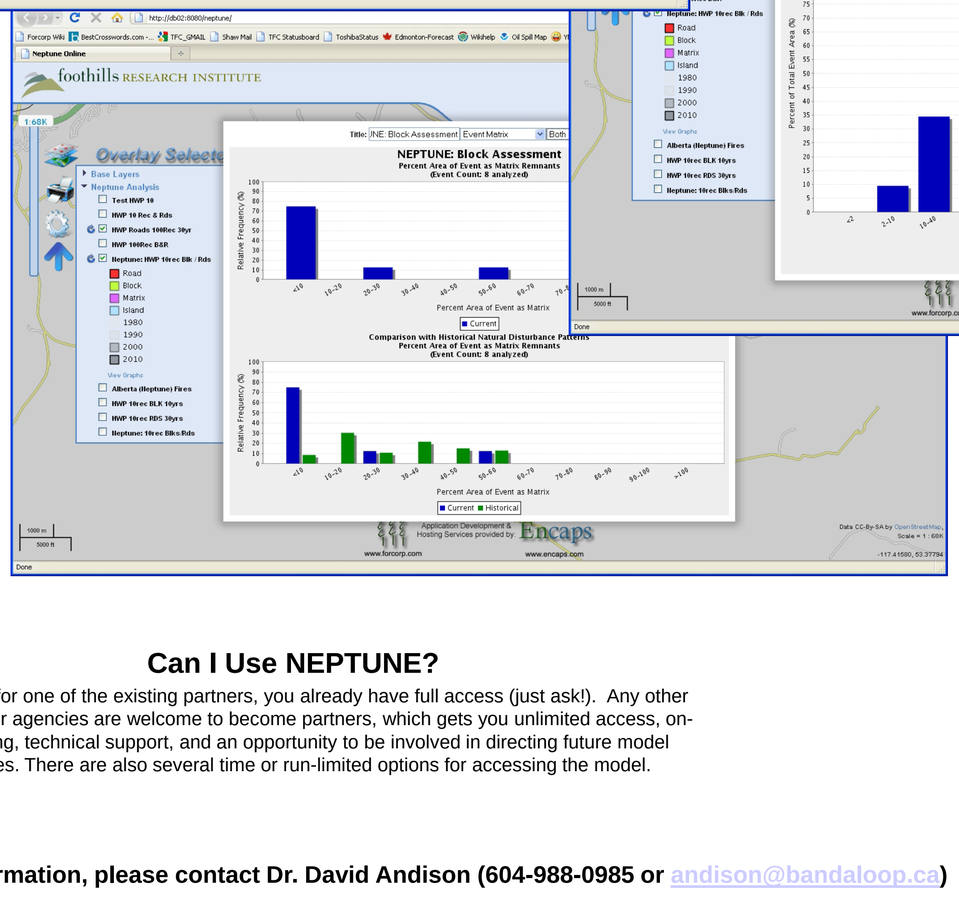
NEPTUNE is Being Used by:

- Forest management companies that have regulatory and/or certification commitments to create more natural harvesting patterns.
- National Parks and provincial fire agencies that are trying to re-introduce natural landscape features through prescribed burn or FireSmart programs.
- Provincial regulators who wish to align with a standard language of natural pattern emulation with forest management agencies.



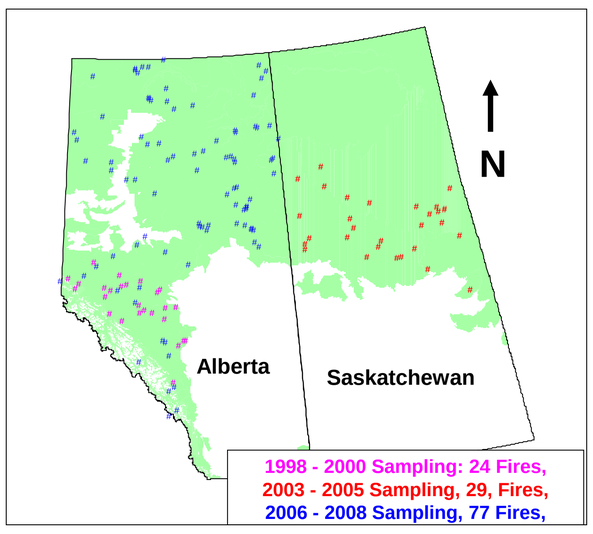






Where Do the Historical Comparisons Come From?

The raw data used to generate the historical, natural frequency distributions for NEPTUNE metrics originates from research on 129 natural wildfires across Alberta and Saskatchewan. The model can easily be calibrated to other areas with the appropriate research.



What Output Does the Model Generate?

The model creates a shapefile of the original input data plus the disturbance events that are created. It also produces graphical and tabular summaries for the following:

- Disturbance event sizes
- Event shapes
- Numbers of disturbed patches
- Shapes of disturbed patches
- Proportional area of the largest disturbed patch
- Percentage of disturbed patch area in island remnants
- Percentage of event area in island remnants
- Percentage of event area is matrix remnants
- Percentage of event area in total remnants
- Island remnant sizes

The frequency distribution of each metric is available from a drop-down menu, with the option of comparing this to the historical, natural range for each one, or a single summary table for all 10.

Can I Use NEPTUNE?

If you work for one of the existing partners, you already have full access (just ask!). Any other companies or agencies are welcome to become partners, which gets you unlimited access, on-site training, technical support, and an opportunity to be involved in directing future model upgrades. There are also several time or run-limited options for accessing the model.

Who Owns the Model?

NEPTUNE was designed and built through the Foothills Research Institute Natural Disturbance Program. It is currently run as a non-profit shareholder agreement with seven partners involved:

- West Fraser Mills Ltd. (Hinton Wood Products, Alberta)
- Alberta Newsprint Company (Alberta)
- Mistik Management Ltd. (Saskatchewan)
- Alberta-Pacific Forest Industries Inc. (Alberta)
- Government of Alberta
- Government of Saskatchewan
- Parks Canada

Parks Canada / Parcs Canada

Alberta Sustainable Resource Development

Alberta-Pacific Forest Industries Inc.

Mistik Management Ltd.

Hinton Wood Products — A Division of West Fraser Mills Ltd.

Saskatchewan Environment

Alberta Newsprint Company

For more information, please contact Dr. David Andison (604-988-0985 or andison@bandaloop.ca)