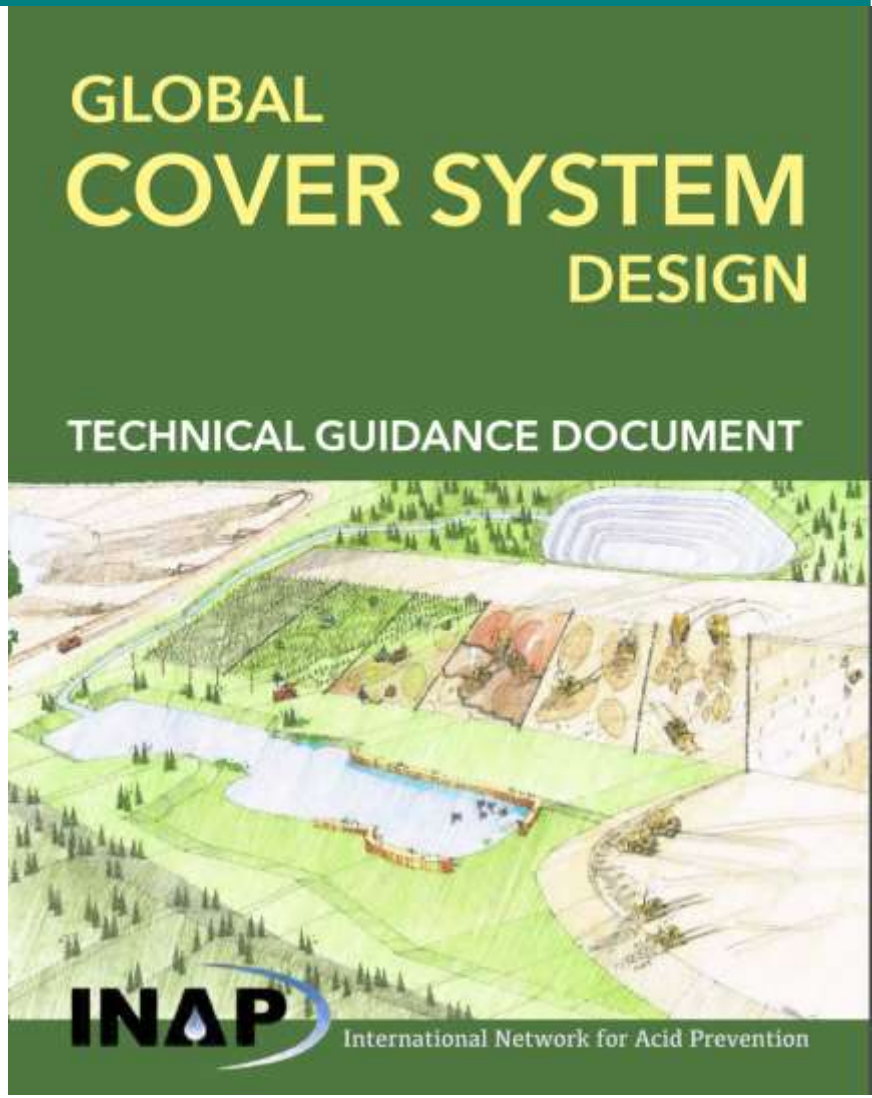
Overview of INAP's Global Cover System Design Guidance Document



25th BC MEND ML-ARD Workshop

Vancouver, BC

November 28/29, 2018

Mike O'Kane; 10@100

O'Kane Consultants

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Where to get this Document?

INAP

The International Network for Acid Prevention

Members Area

HOME | ACID DRAINAGE | PARTNERS | GARD GUIDE | ICARD | RESEARCH | NEWSLETTERS

Research

Research Projects

Over the years, INAP has instigated and funded a number of key acid drainage research projects to fill knowledge gaps. Cutting-edge technologies are studied, acid drainage (AD) measures at specific sites are examined, and literature reviews are undertaken to summarise AD state-of-the-art.

WHAT WE DO

INAP's objective is to reduce the liability associated with sulphide mine materials. This is pursued in three ways:

1. Networking and Information-sharing
2. Technology Transfer
3. Gap-driven Research

Global Cover System Design – Technical Guidance Document (November 2017)

The Global Cover System Guidance Document, like the GARD Guide, is intended as a best practice summary to assist mine operators, designers, and regulators to address issues where cover systems can be employed. This document builds on previous technical guidance documents on cover system design, construction, and performance monitoring. The Global Cover System Guidance Document will be of interest to individuals who are seeking more detailed information than what is outlined in Section 6.6.6 of the GARD Guide – Engineered Barriers.

A holistic framework for management of reactive materials during operations and at closure is the pillar of the document. The framework for cover system design is presented at a high level, suitable for readers with minimal technical background. It is presented at a conceptual level, using a hierarchy of climate, geology and materials, and topography, leading to an understanding of the patterns of water movement on a specific landscape. Ultimately, these elements will govern how cover systems perform, and it is up to designers to manipulate them to achieve desired performance.

This document presents a conceptual model of how cover system designs might affect contaminant and acidity loading. This model attempts to determine when the varying roles of the cover system design (e.g. control of net percolation or oxygen ingress), might influence loadings. Acknowledgment of these unique relationships provides an opportunity to optimize ML/ARD management in a cost-effective manner. Other key concepts discussed within the document are the role cover systems play over the life of the mine from early conceptualization to long-term performance monitoring considerations.

Application of the holistic framework is achieved through the use of a cover system design tool that walks users through relevant climatic factors to optimize cover system design alternative for a desired performance design criteria. This allows users to understand what a realistic objective is when developing cover system design alternatives based on site-specific climate conditions. Additionally, the tool refers to specific elements integral to the design where an in text commentary is provided. The tool helps identify where potential for management exists on the site, leading to the selection of the most appropriate form of prevention.

The information provided within the tool is not a replacement for site-specific classification and engineering required for cover system design. However, the tool is a means of beginning early conceptualization to help focus further investigation at a site level and to begin to form realistic expectations for cover system performance at an early stage of a project.

→ Click here for the final report (12.4 MB)

http://www.inap.com.au

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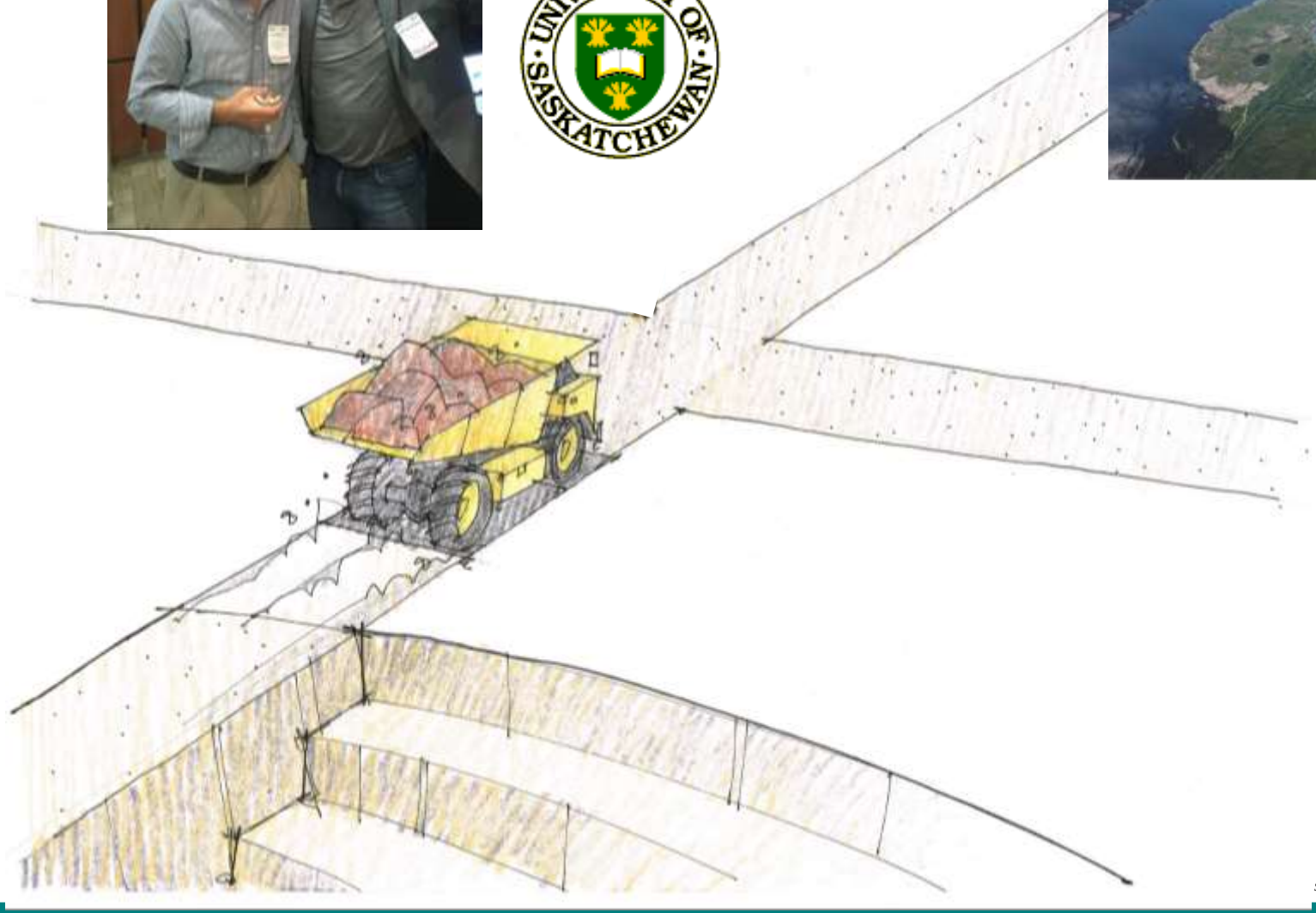
Specialists in Geochemistry and Unsaturated Zone Hydrology

…Where to Start

…Where to Start

- ***Dr. Lee Barbour***



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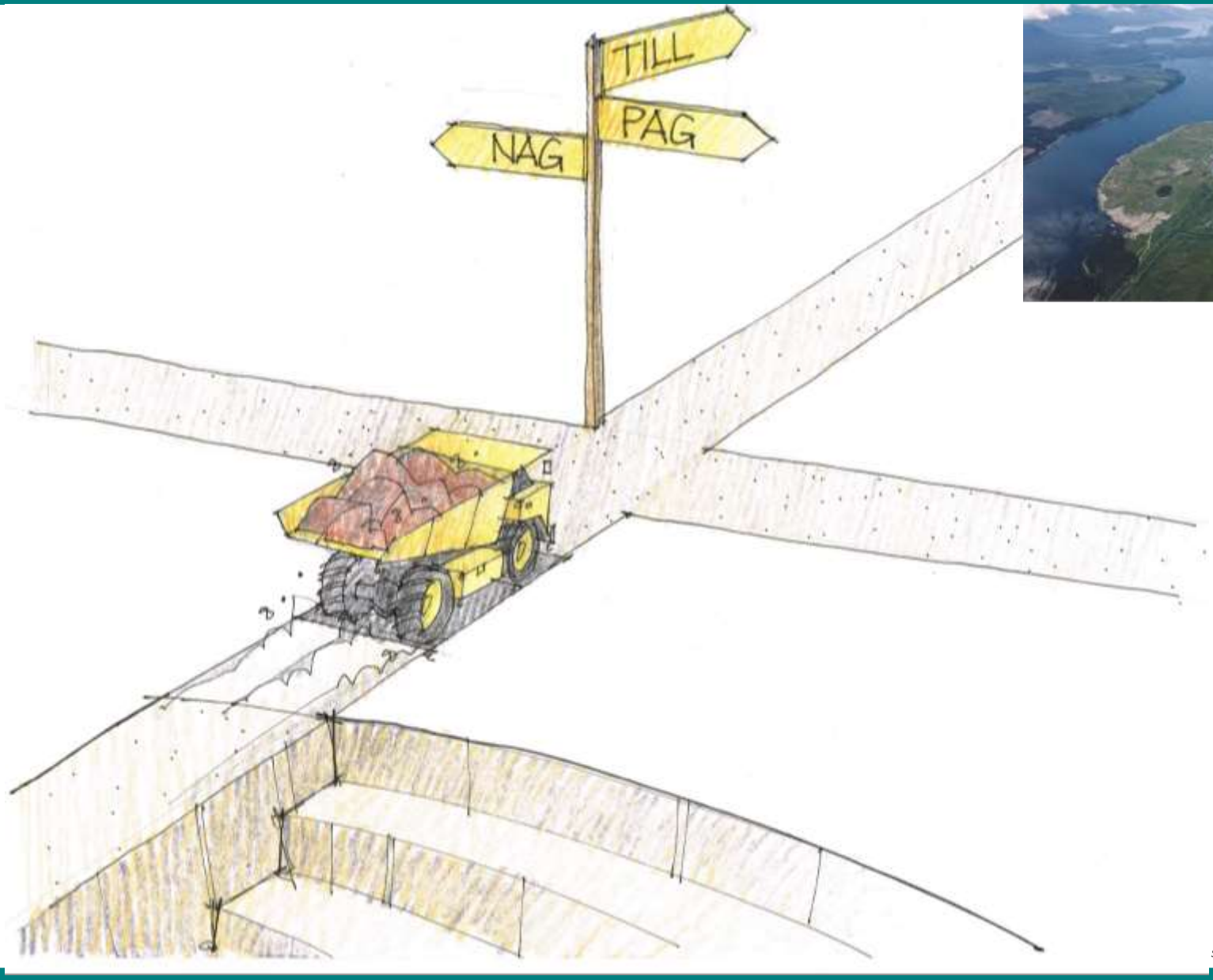

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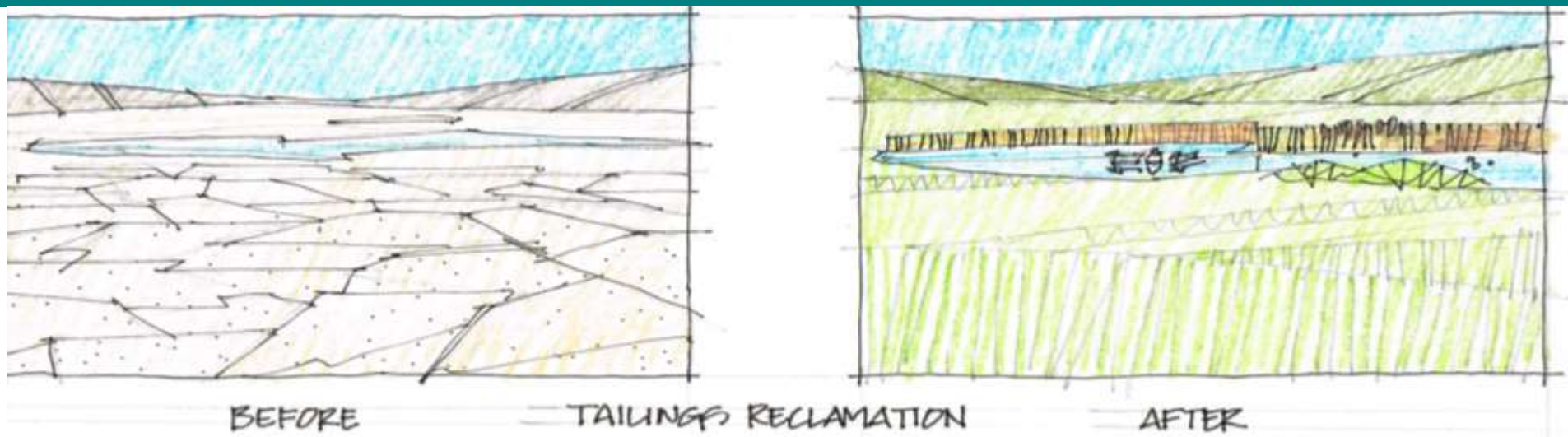
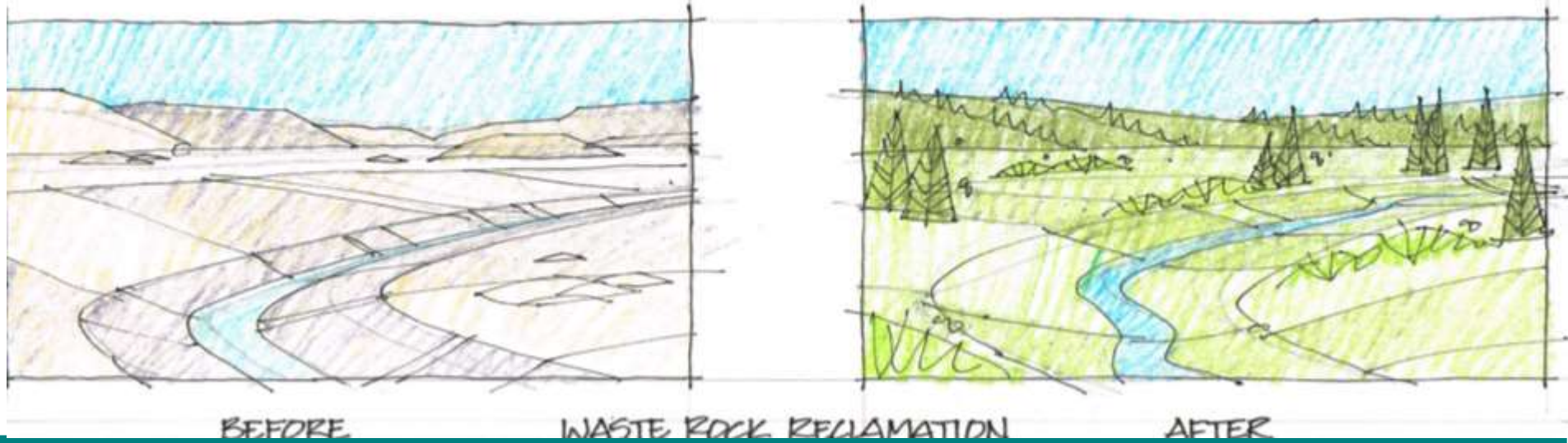
…Where to Start

3:00-3:30 **Equity Silver Mine, 25 Years into Closure**

Cody Meints and Mike Aziz (Goldcorp Inc. - Equity Silver)

…Where to Start





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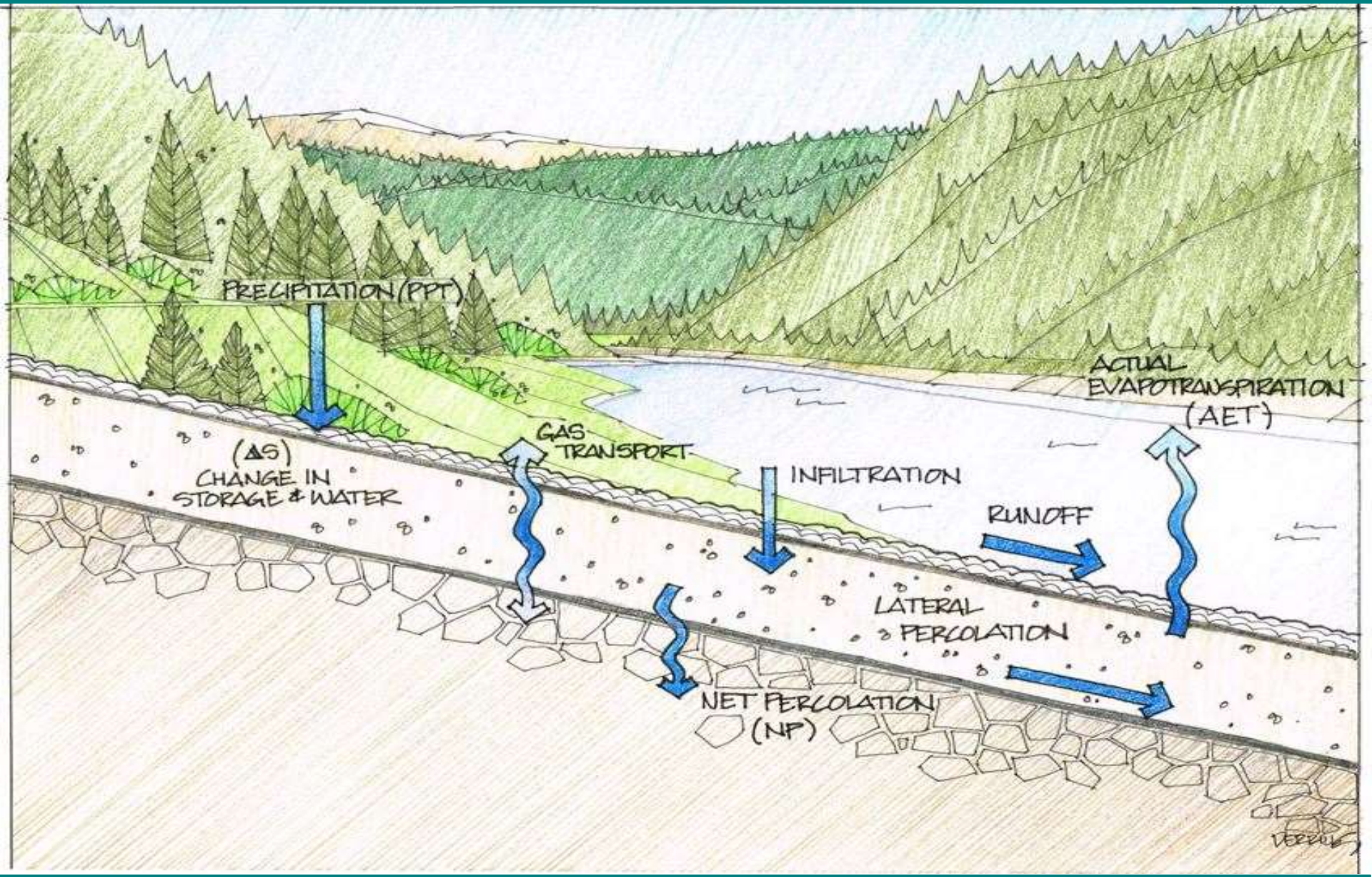

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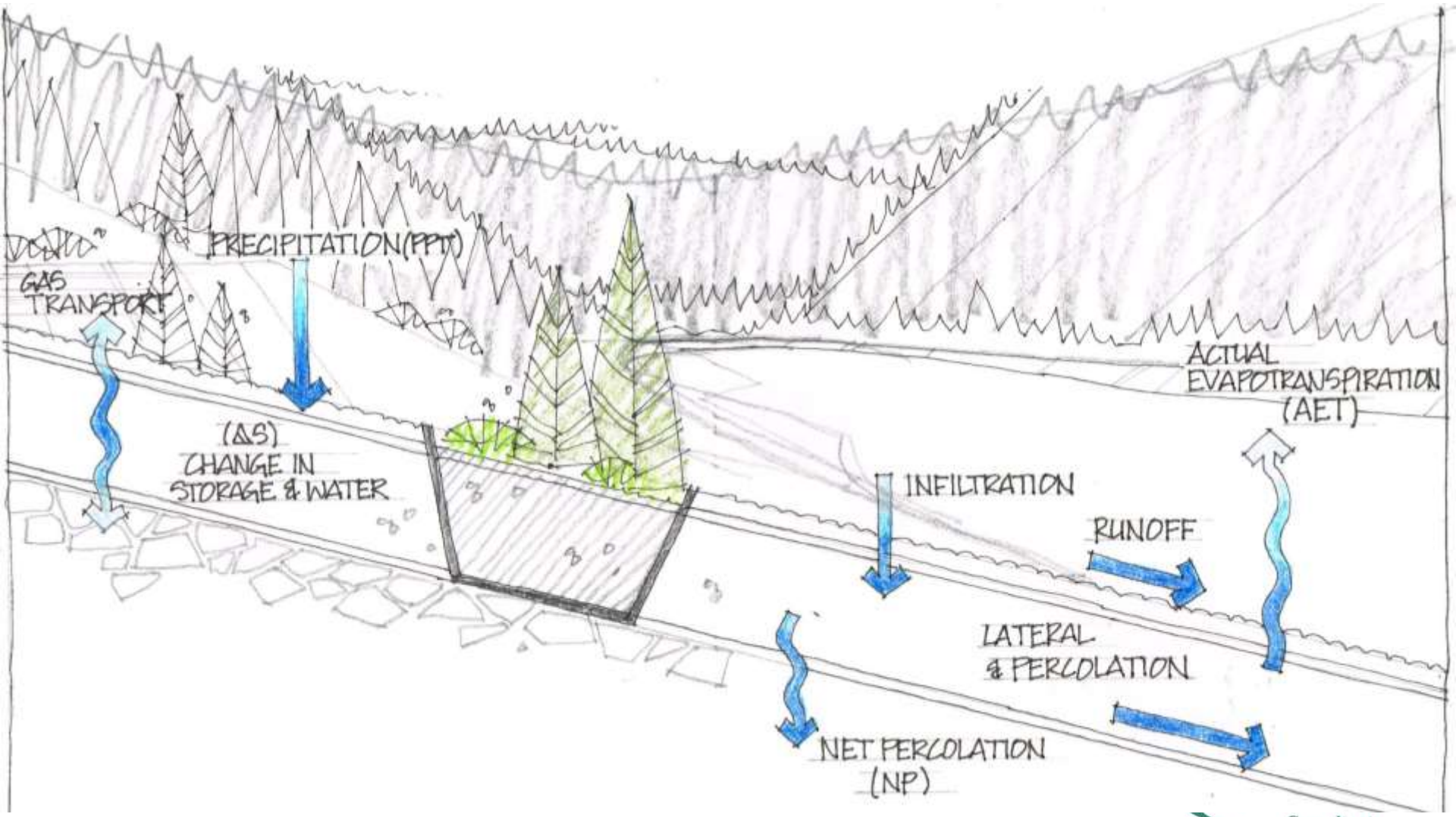
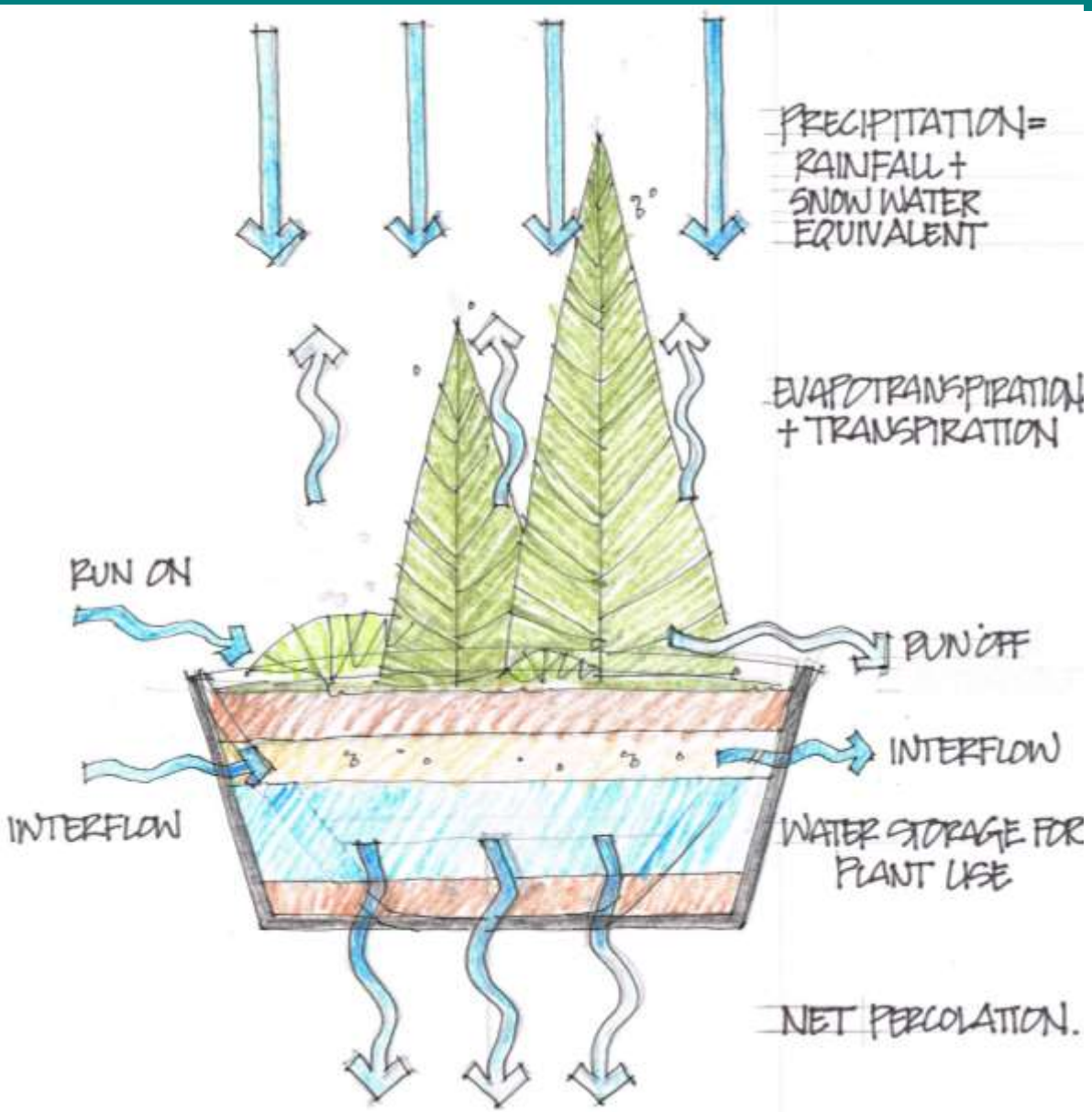


…so… Your Gardening?…

…Building the *"Right-Sized Flower Pot"*



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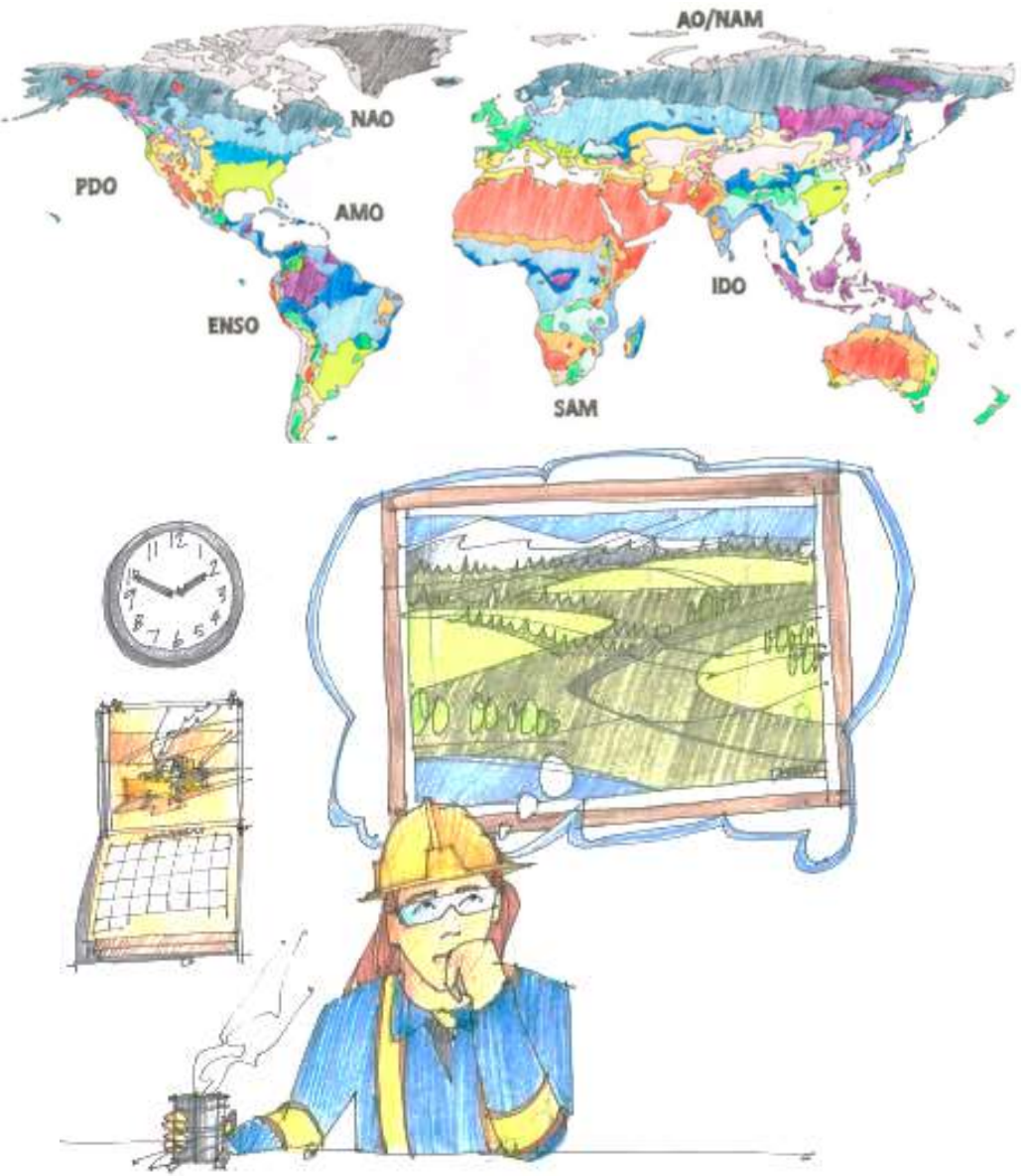
The Design Tool…



- ***Decision Tree Framework***
- ***High Level… but***
  Enhanced Conceptualization of Realistic Performance Expectations
- ***Before…***
  Numerical Modelling
- ***That also…***
  provides for a better starting point when do start modelling

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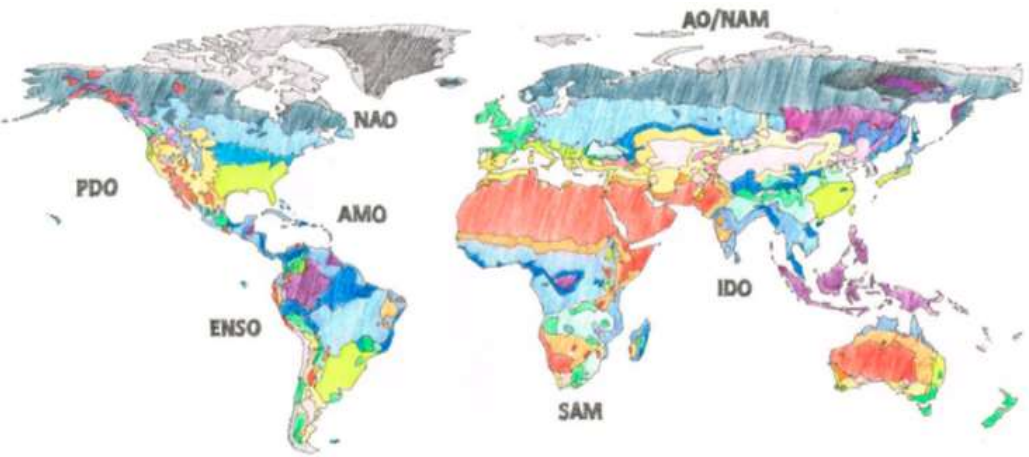


- ***Decision Tree Framework***

GARD Guide

Climate Classification

Reactive Material → Major Climate Type → Seasonal Precipitation Regime → Seasonal Temperature Regime

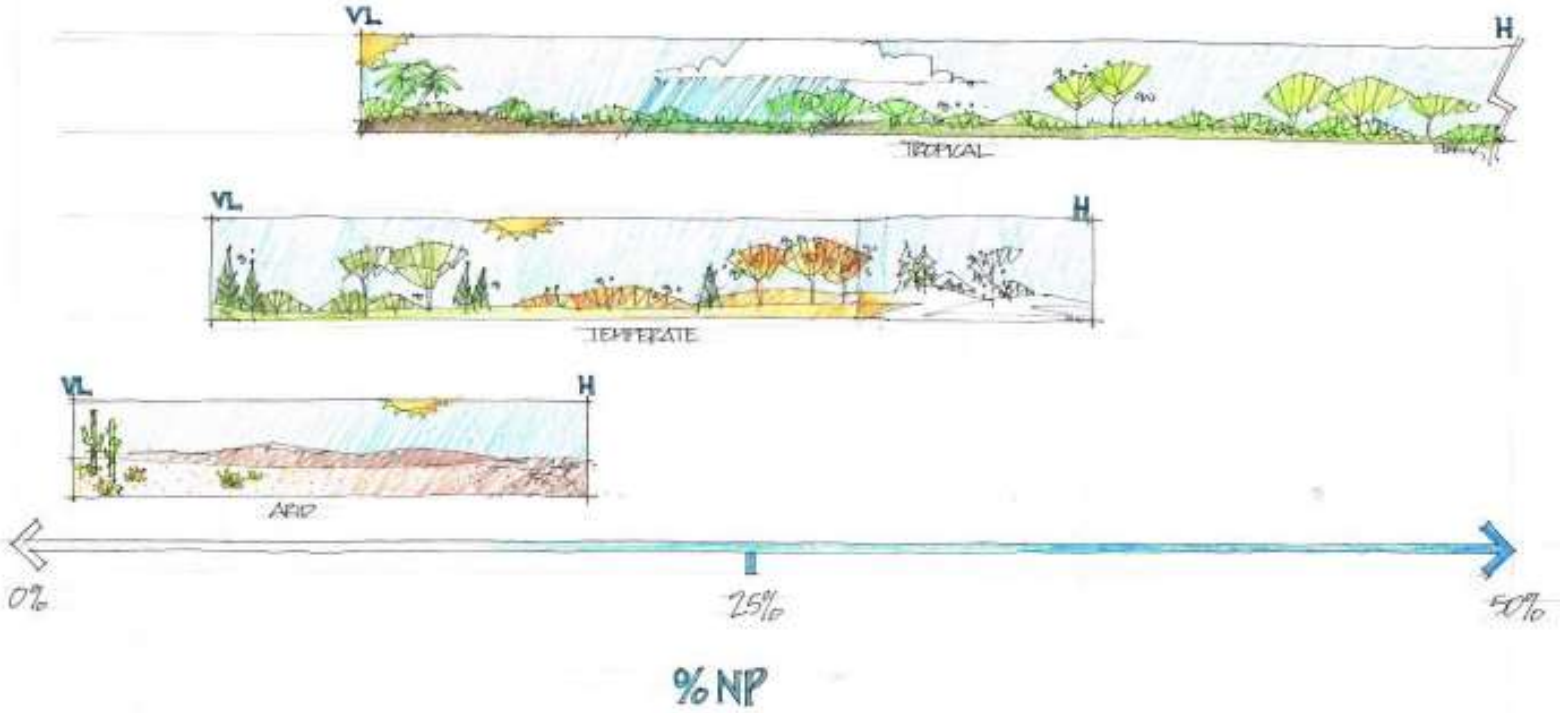
Cover System Design Performance

Kinetic Control (Oxygen) → O2 Performance Criteria Desired (mol/m2/yr) → Cover System Alternatives → Preferred Cover System Design Alternative

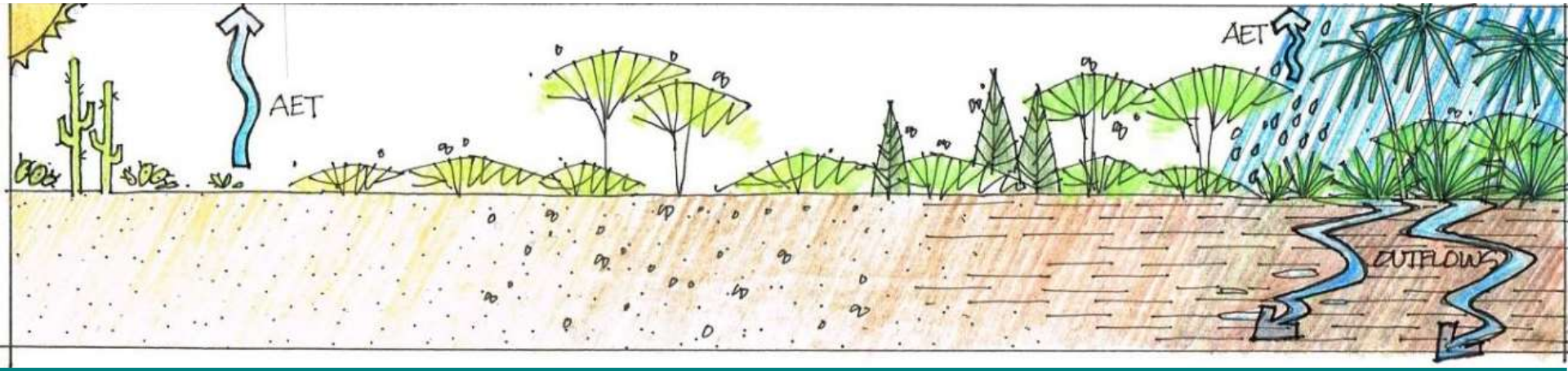
Solubility Control (Net Percolation) → NP Performance Criteria Desired (% PPT) → Cover System Alternatives → Preferred Cover System Design Alternative

Conceptual Cover System Design

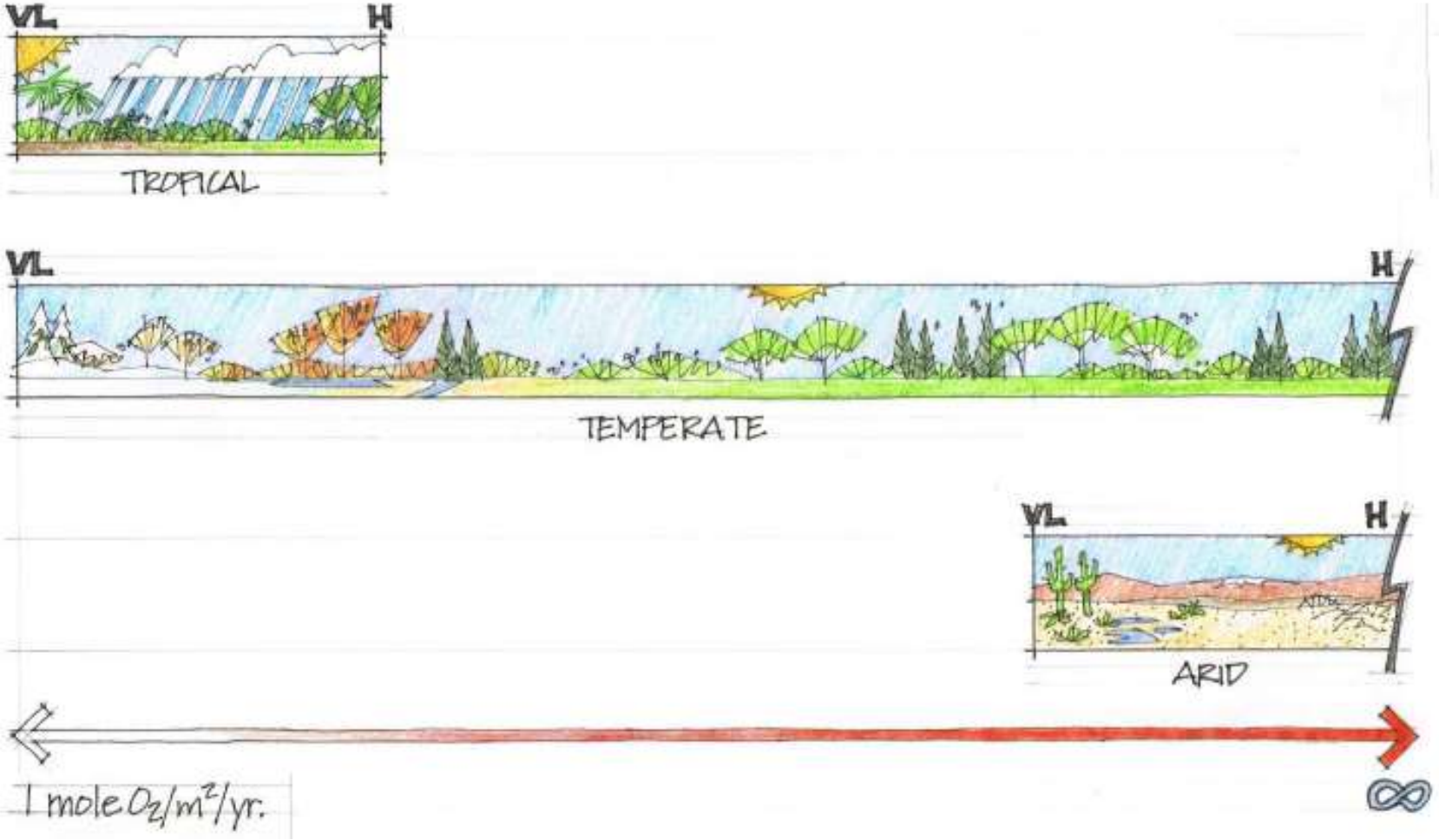
The Design Tool… *Net Percolation*



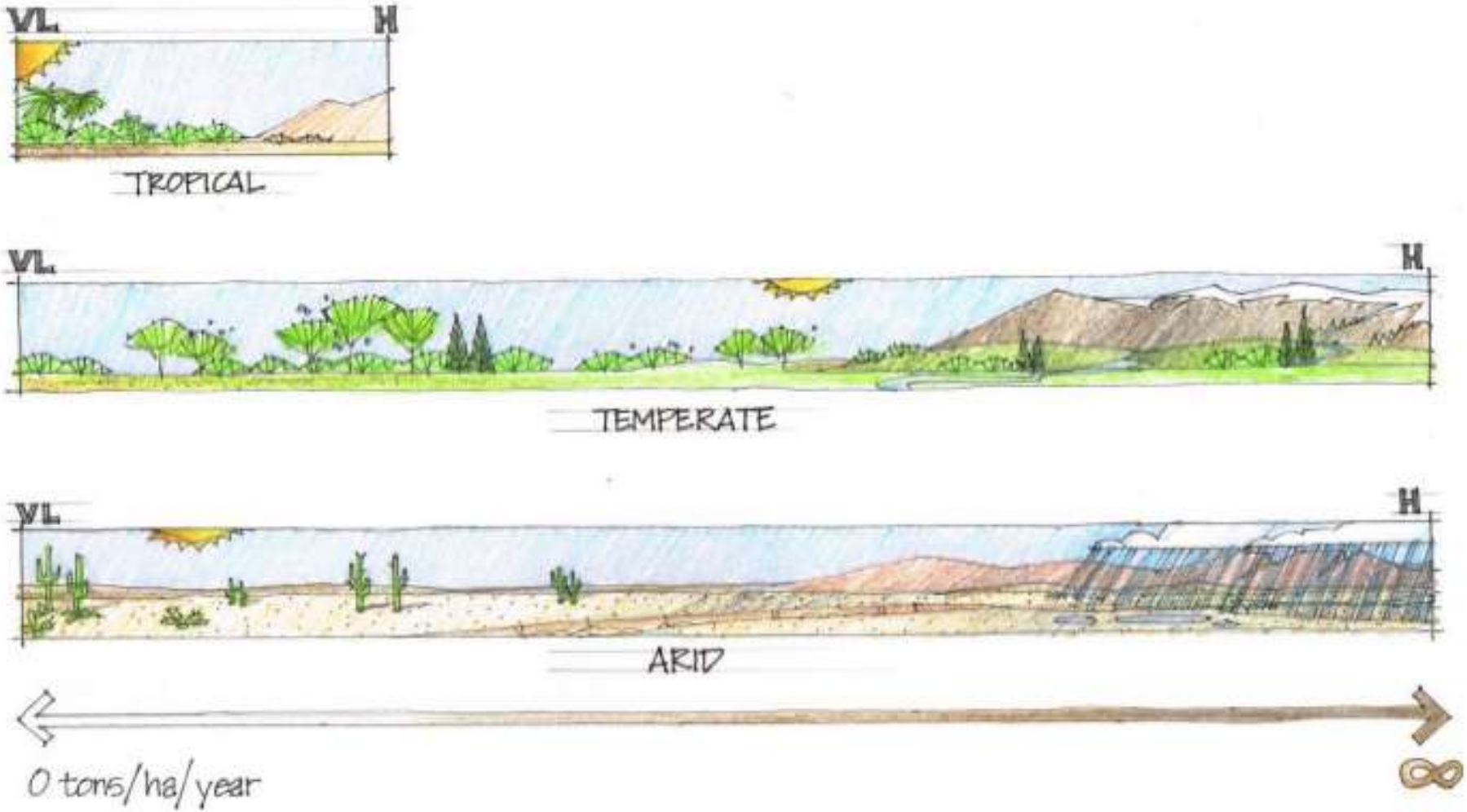
- ***Site-Specific Controls on Mechanisms / Processes Influencing Performance?***



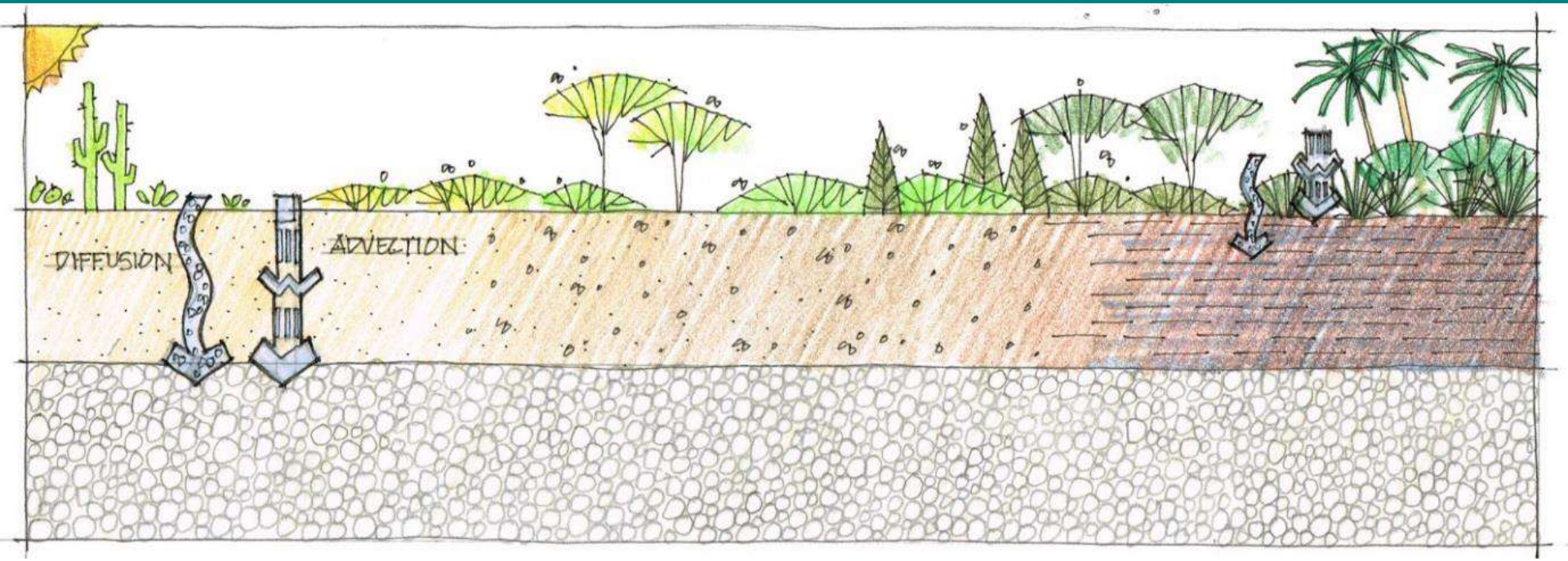
The Design Tool…*Oxygen Ingress*



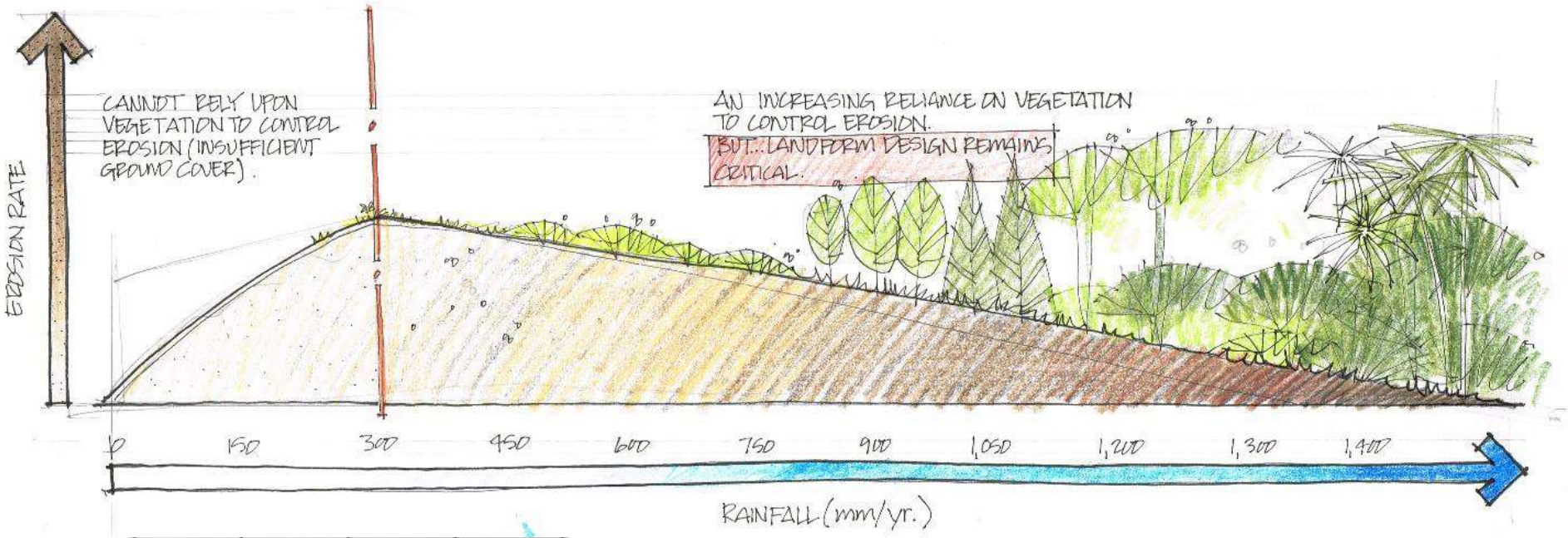
The Design Tool…*Erosion*

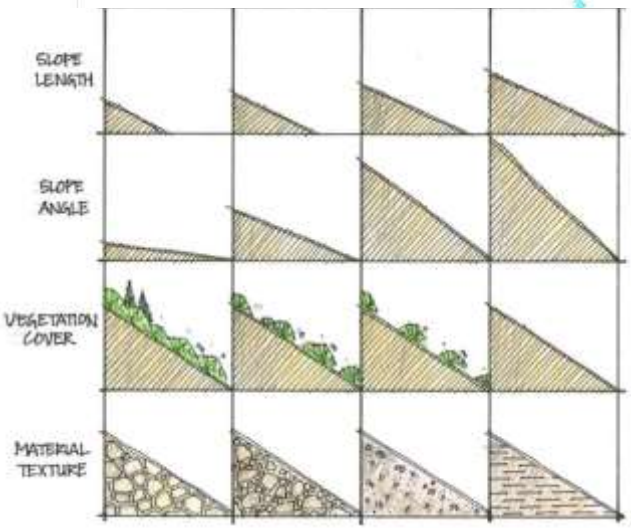


The Design Tool…*Site Specific Controls*



The Design Tool…*Site Specific Controls*





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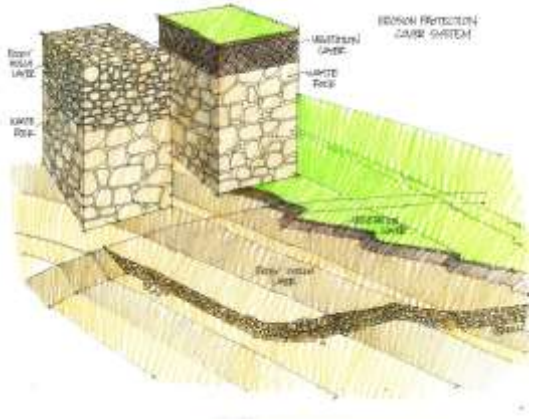
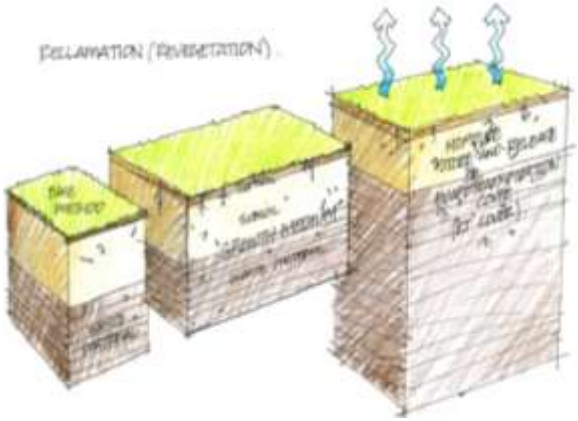
Cover System Types

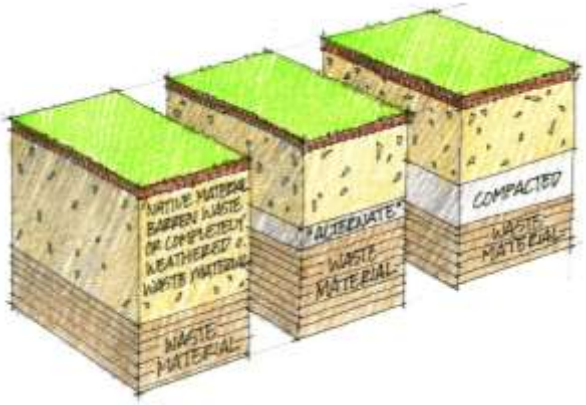
Erosion Protection



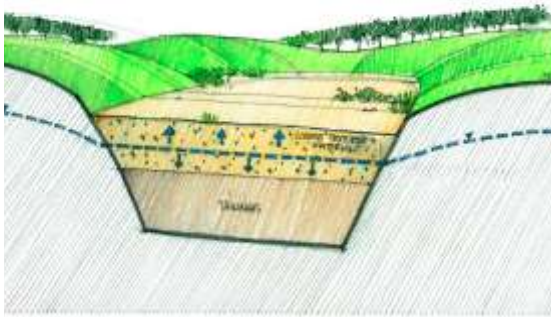
Reclamation / Revegetation



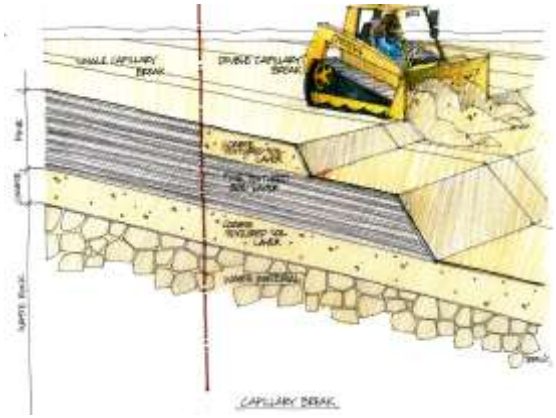
Moisture Store-and Release and Enhanced S&R



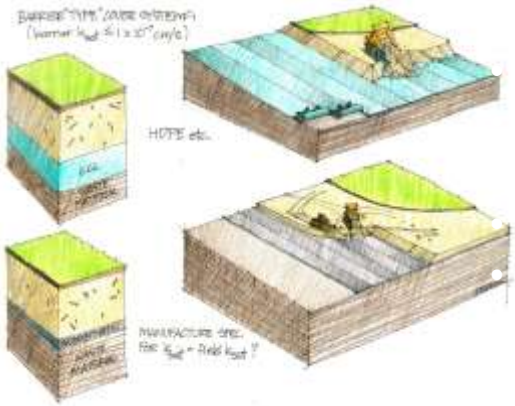
Saturated Layer



Capillary Break



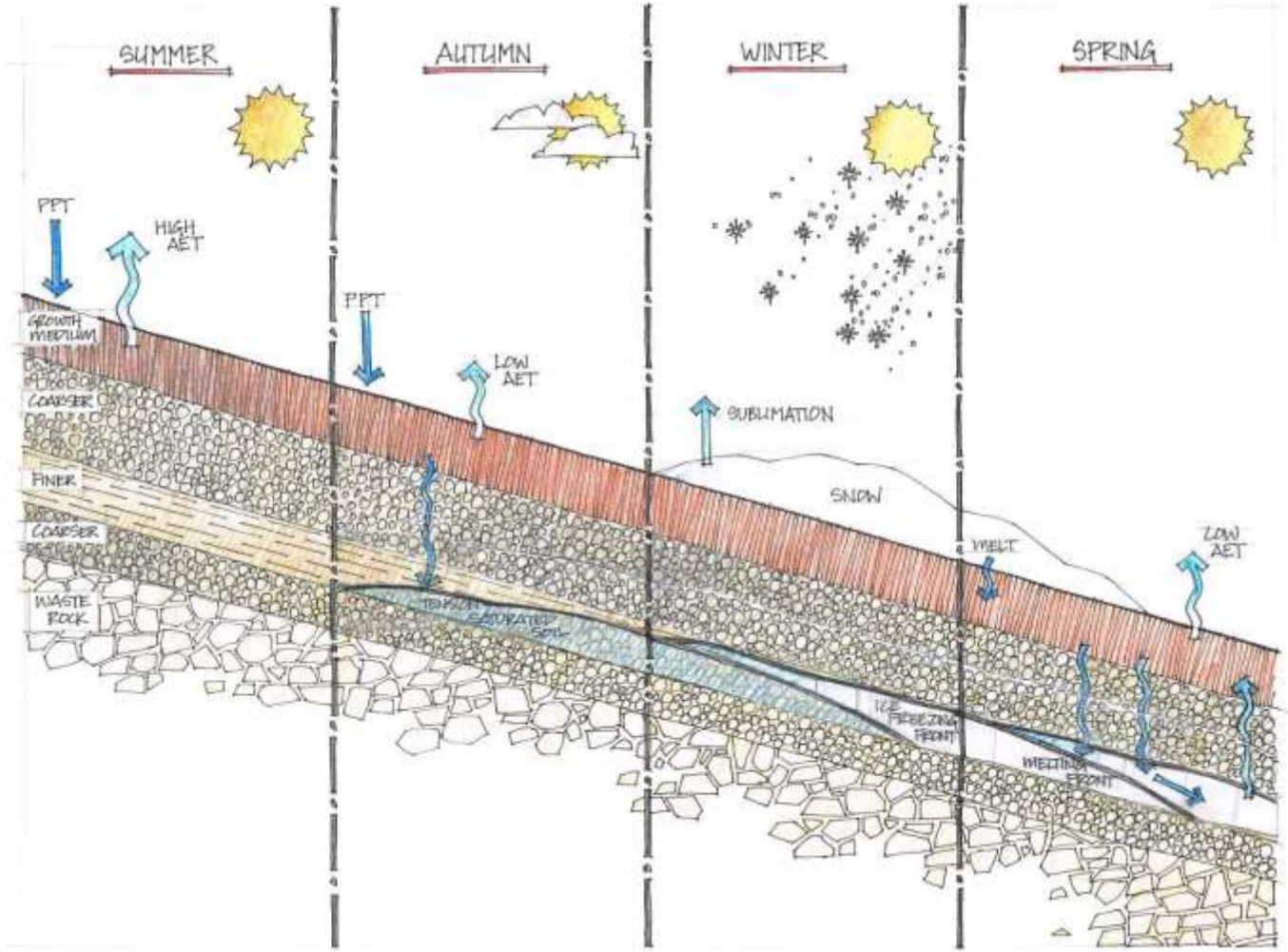
Barrier Type ($k_{sat} \leq 1 \times 10^{-7}$ cm/s)



- CCL
- LLDPE
- GCL
- GCLL
- BGM
- Frozen

Cover System Types – a focus on Climate Influences

SFCBD Cover System…
Seasonally Frozen Capillary Break Diversion



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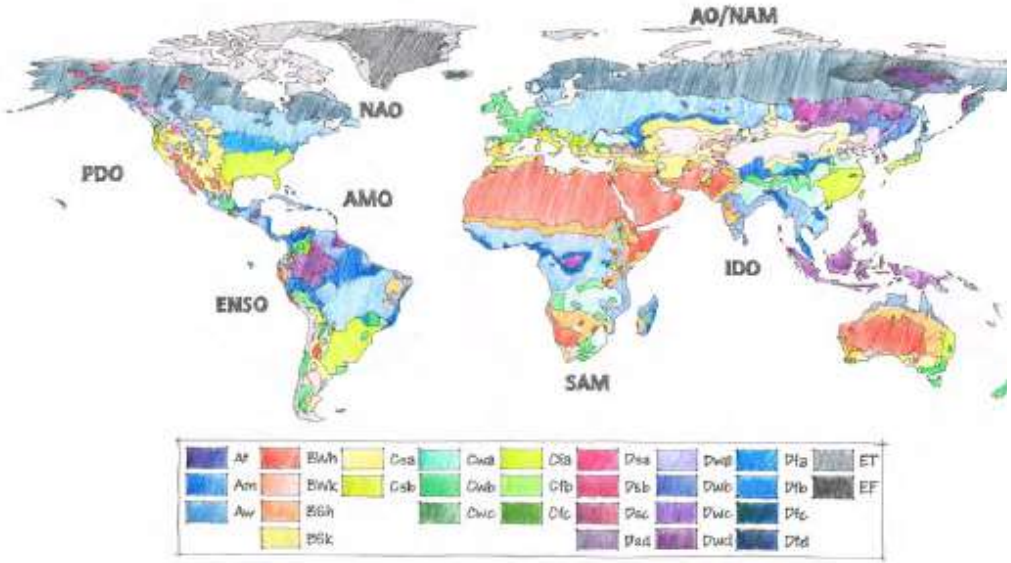
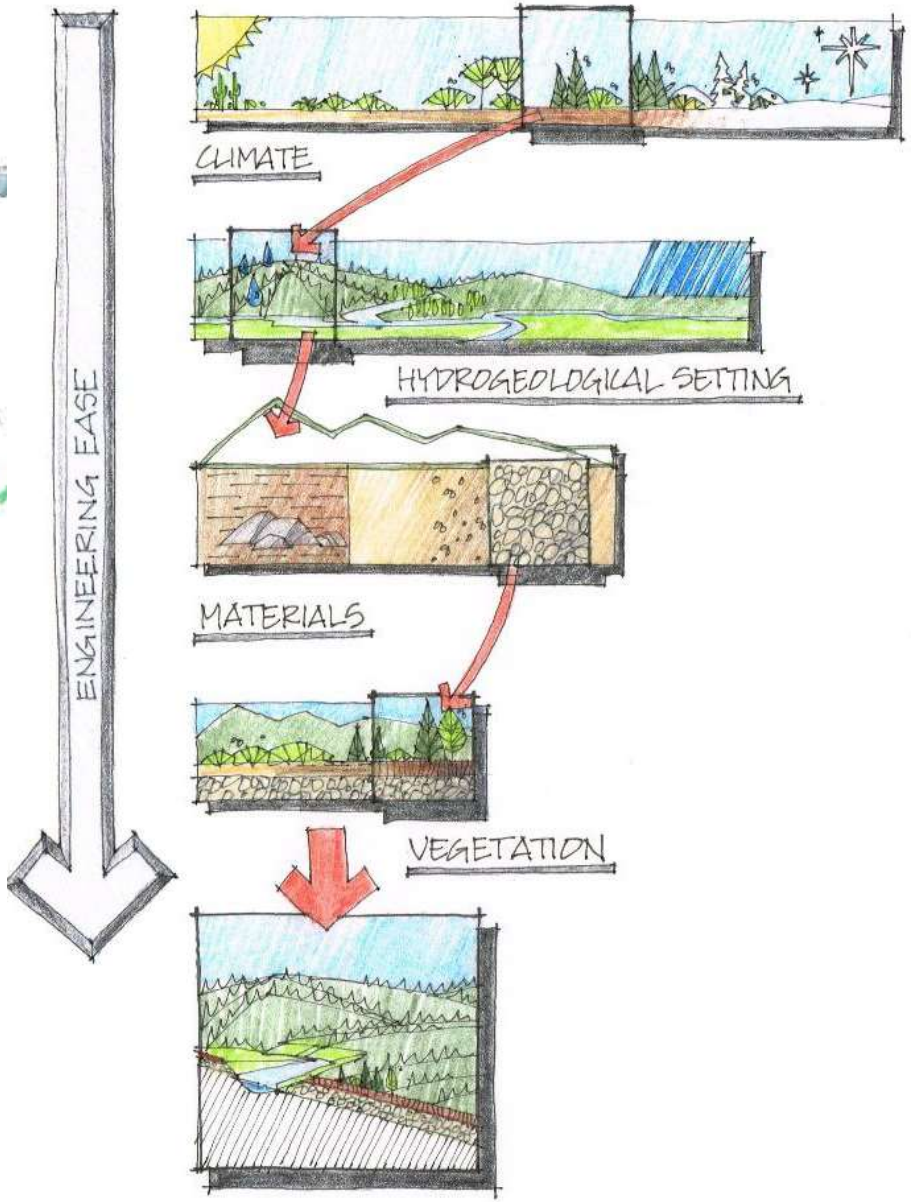
The Design Tool… *Climate, our first design filter*

Köppen-Geiger





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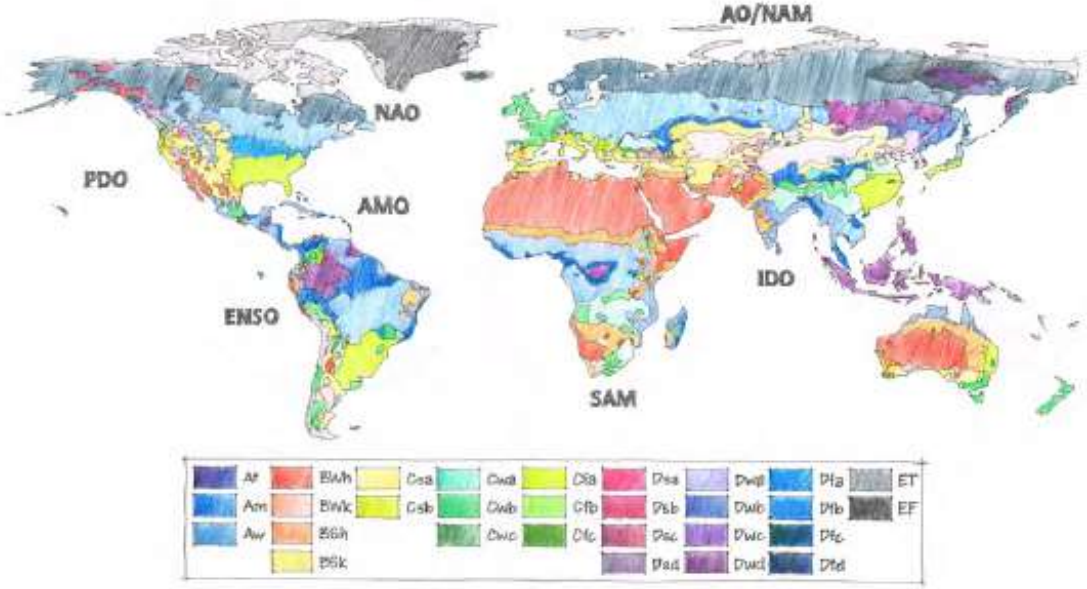

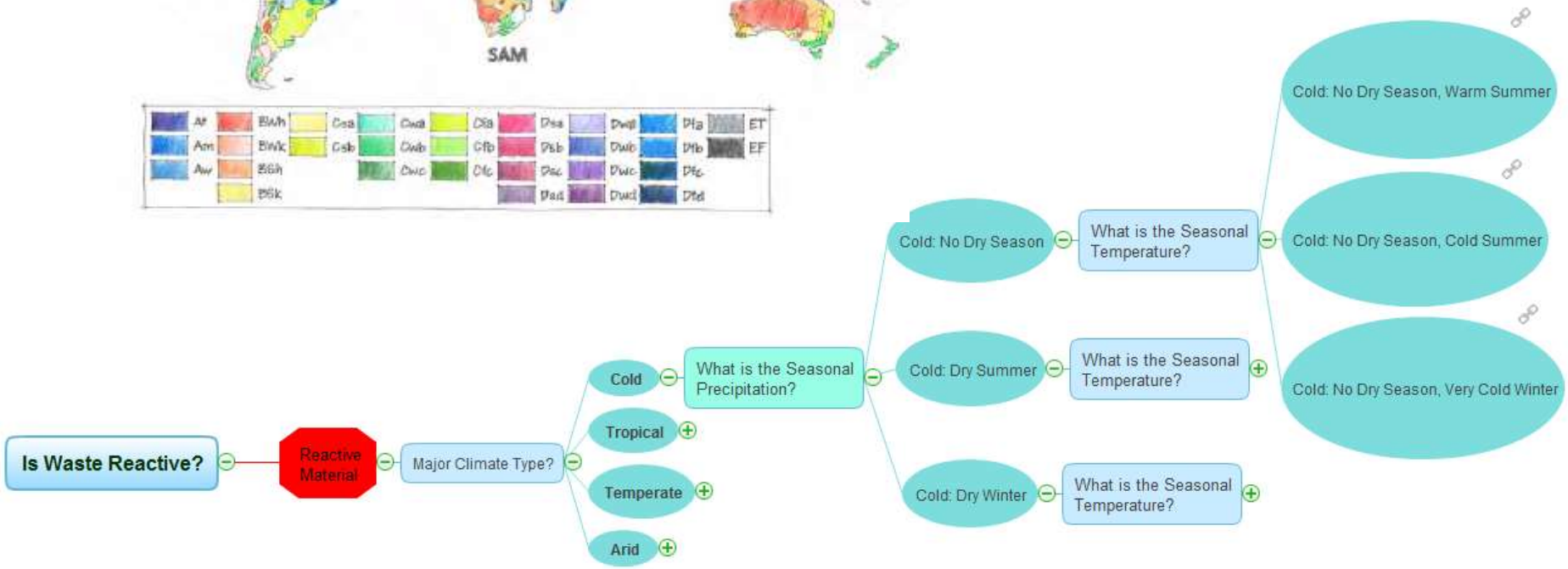

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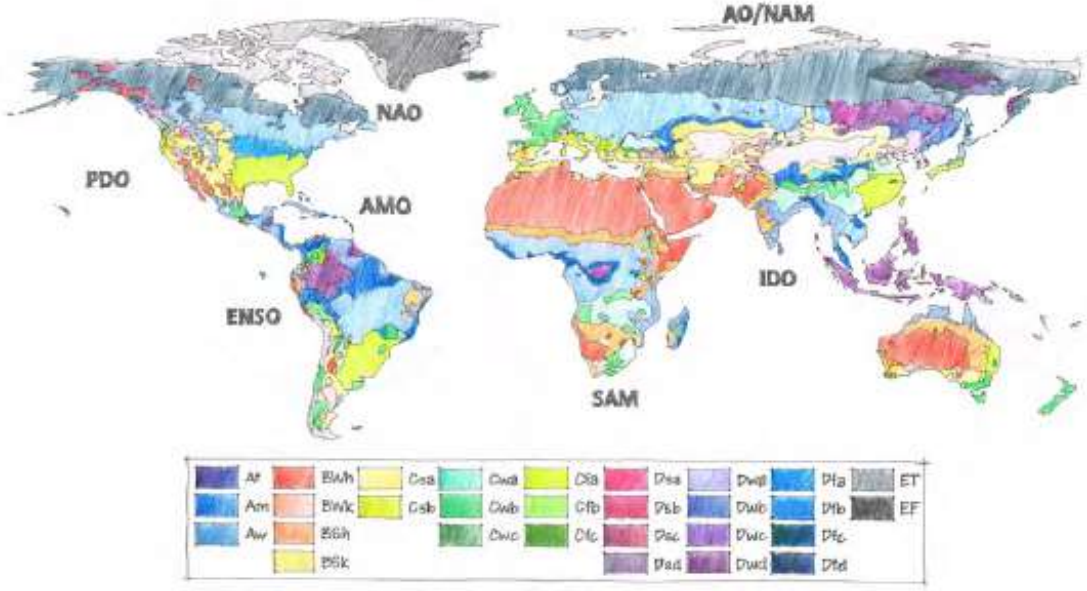
Optimizing during Planning

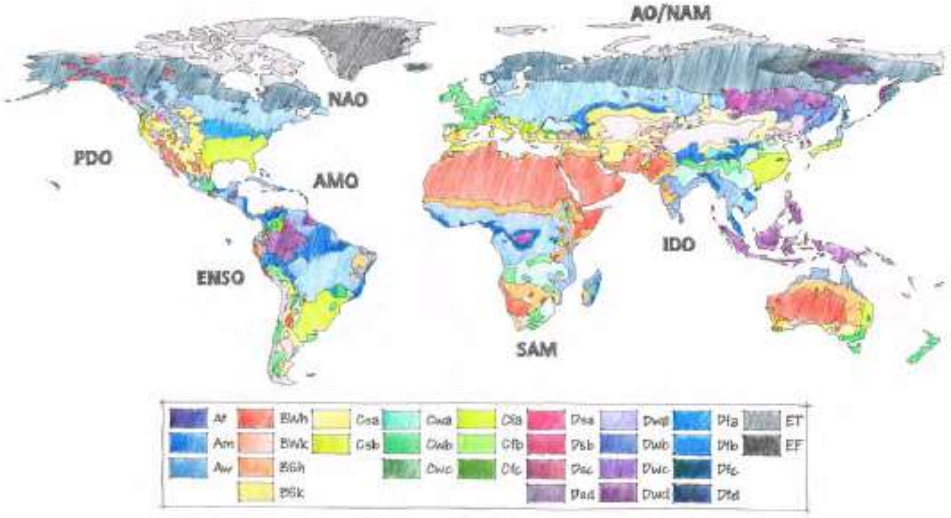
Köppen-Geiger



- ***Site - Yukon Territory, Canada:***
  Currently Dsc
  Cold: Dry Summer,
  Cold Summer

Optimizing during Planning

Köppen-Geiger



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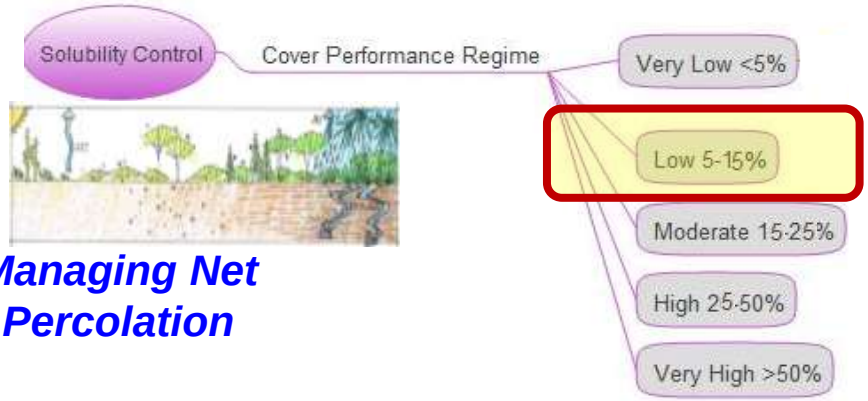
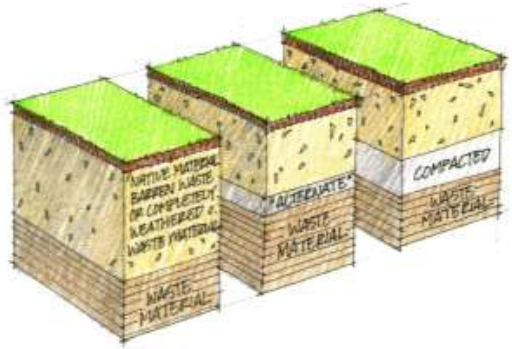


Managing Net Percolation

Enhanced Store and Release "Type" Cover System



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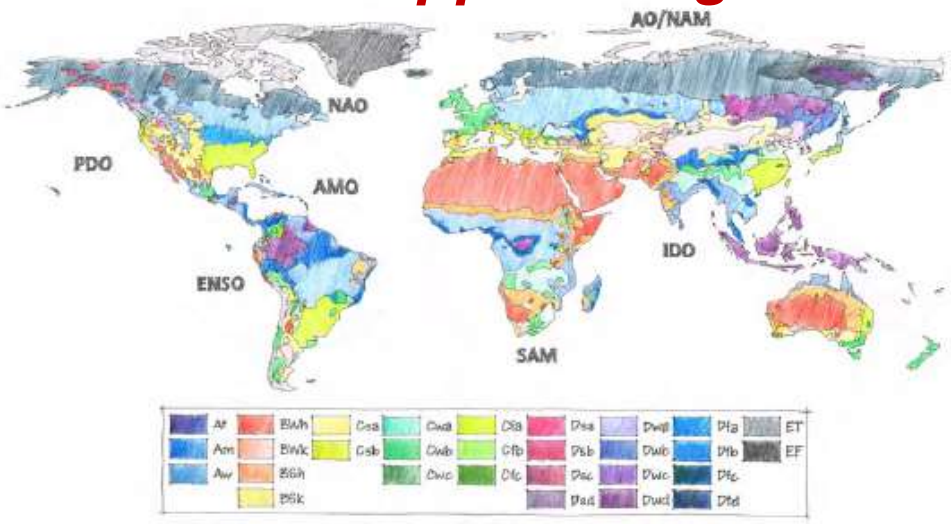

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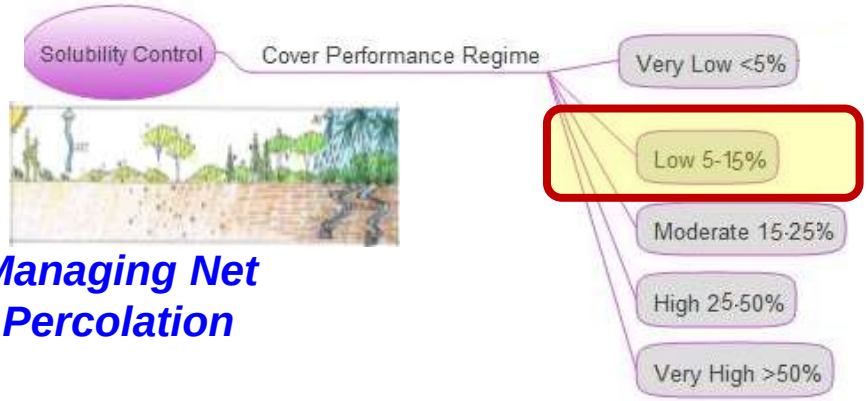

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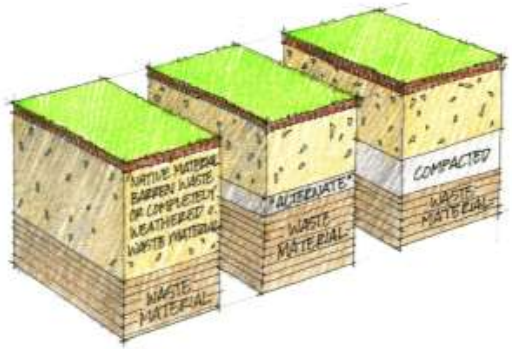

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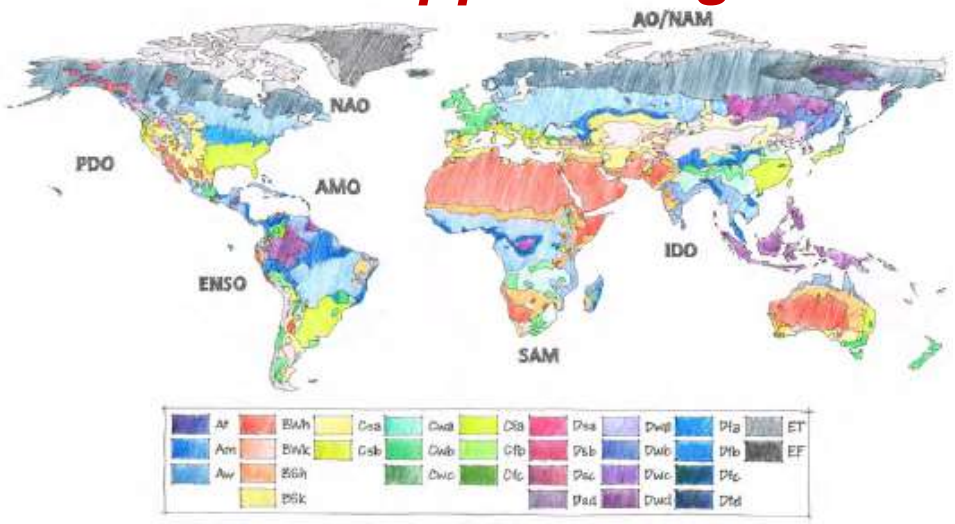

- ***Site - Yukon Territory, Canada:***
  w/ Climate Change Dsb
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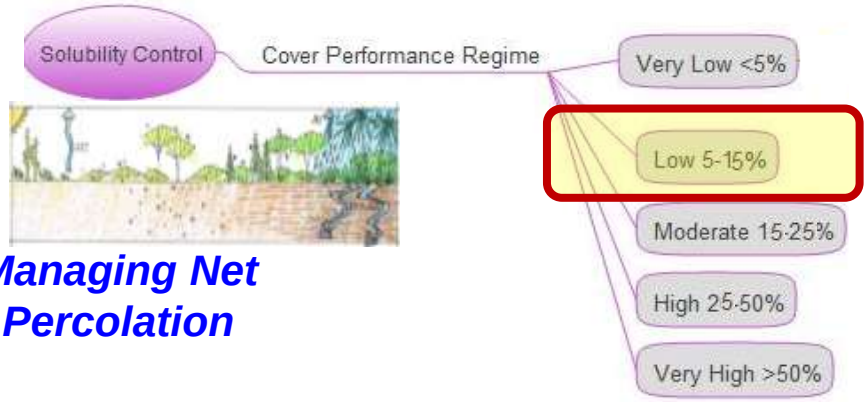

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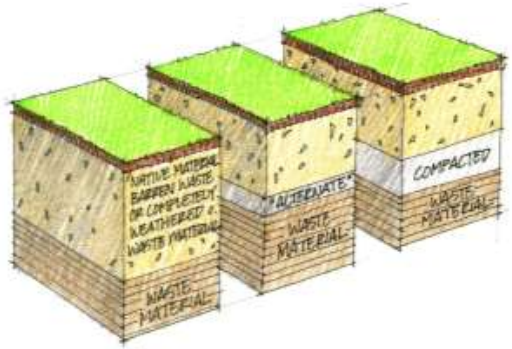

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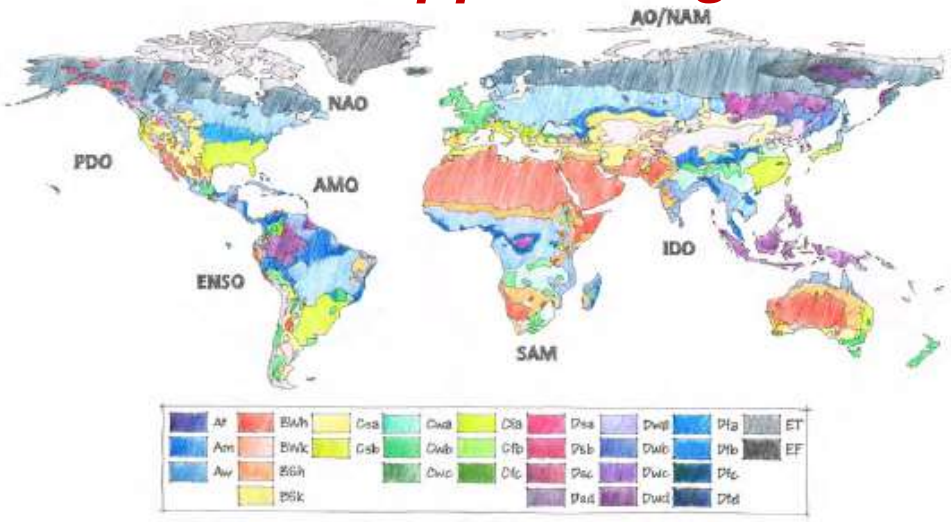

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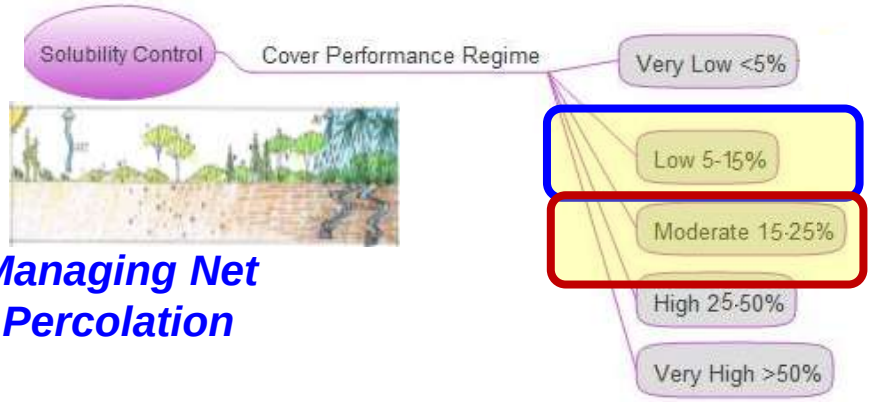

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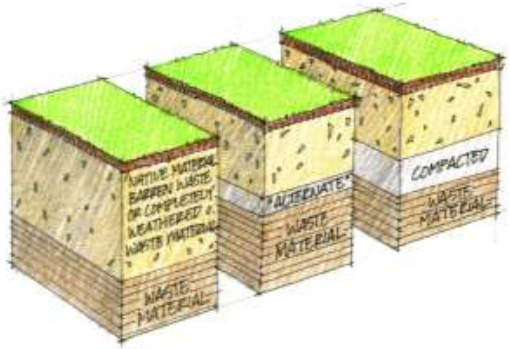

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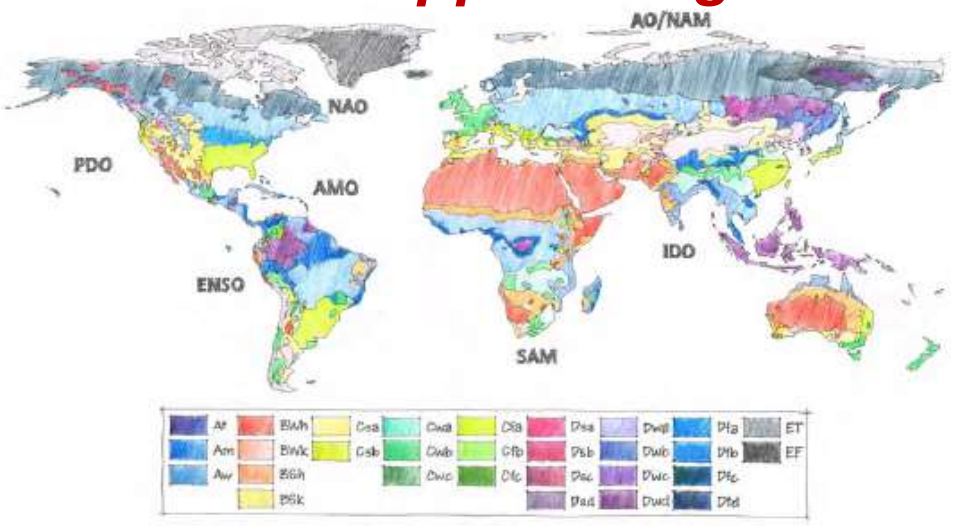

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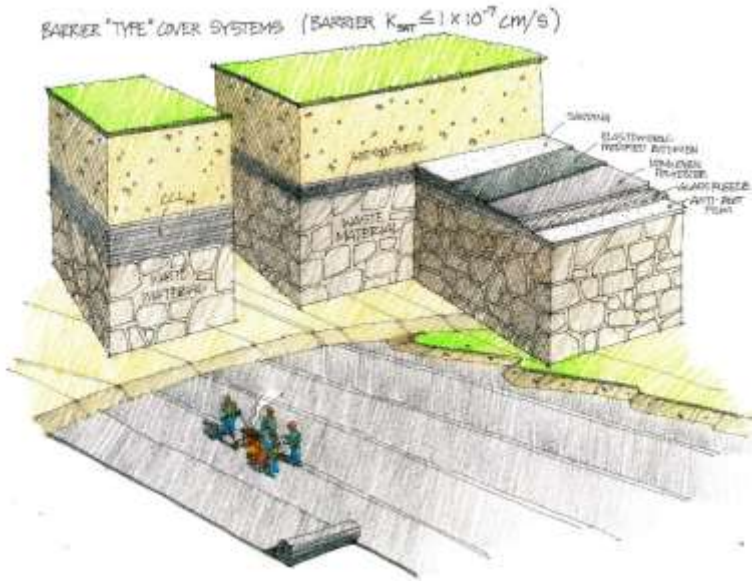

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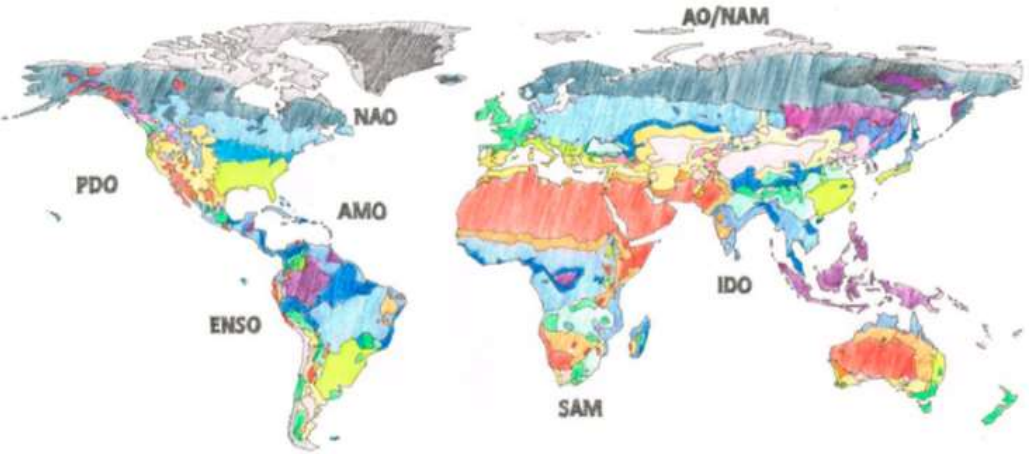
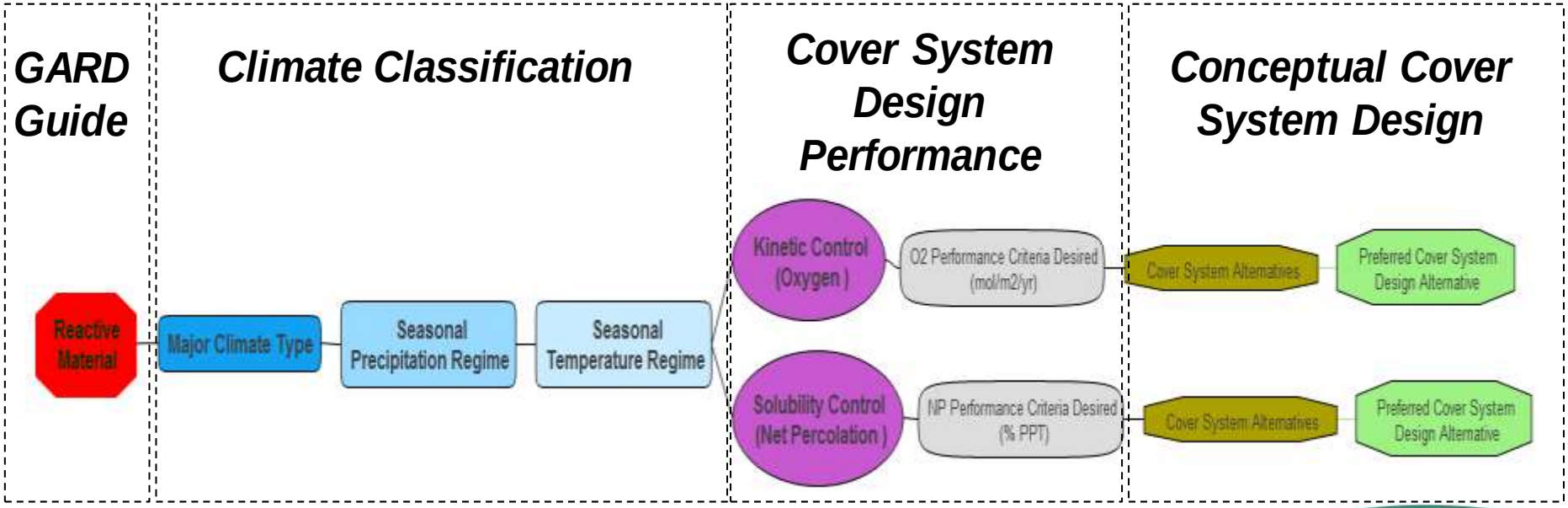
The Design Tool…



- ***Decision Tree Framework***



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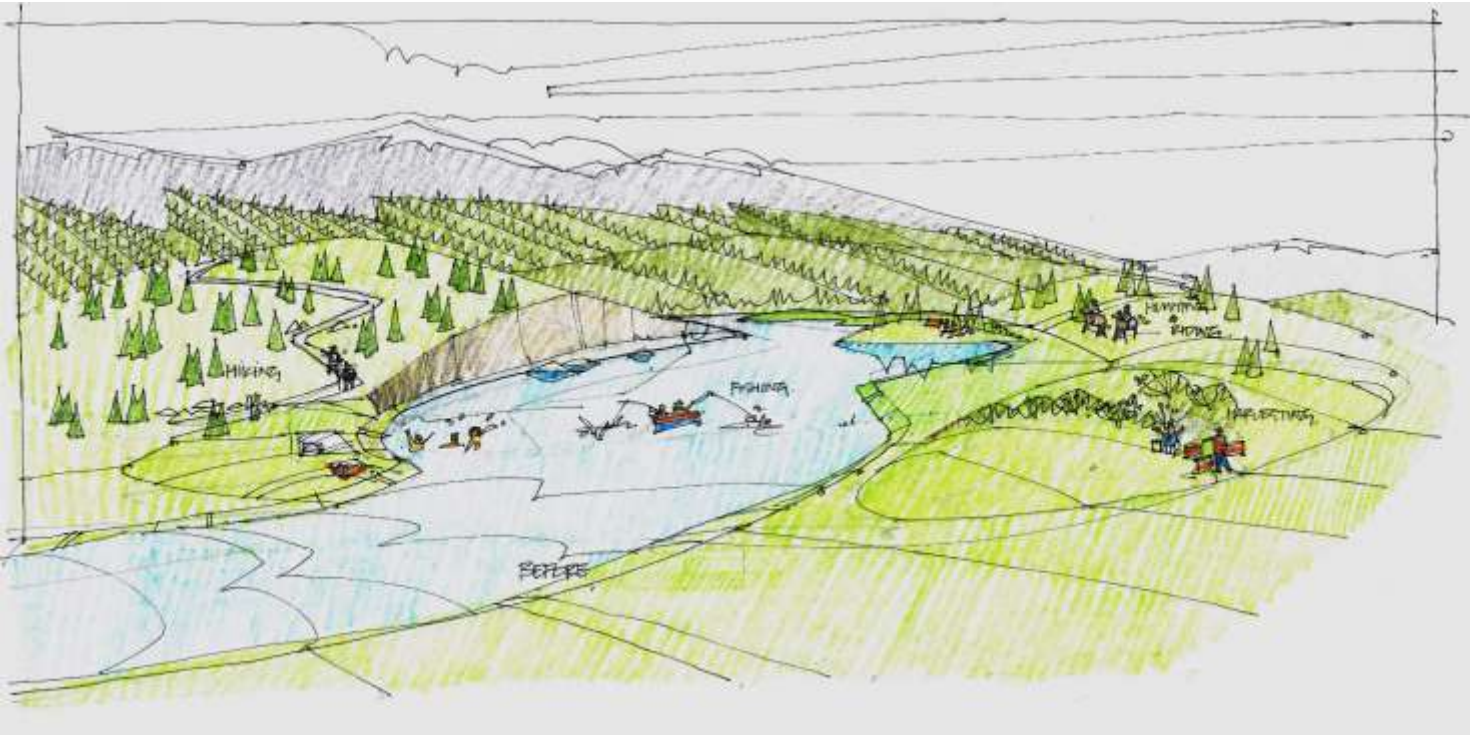
How would I Suggest using the Document?



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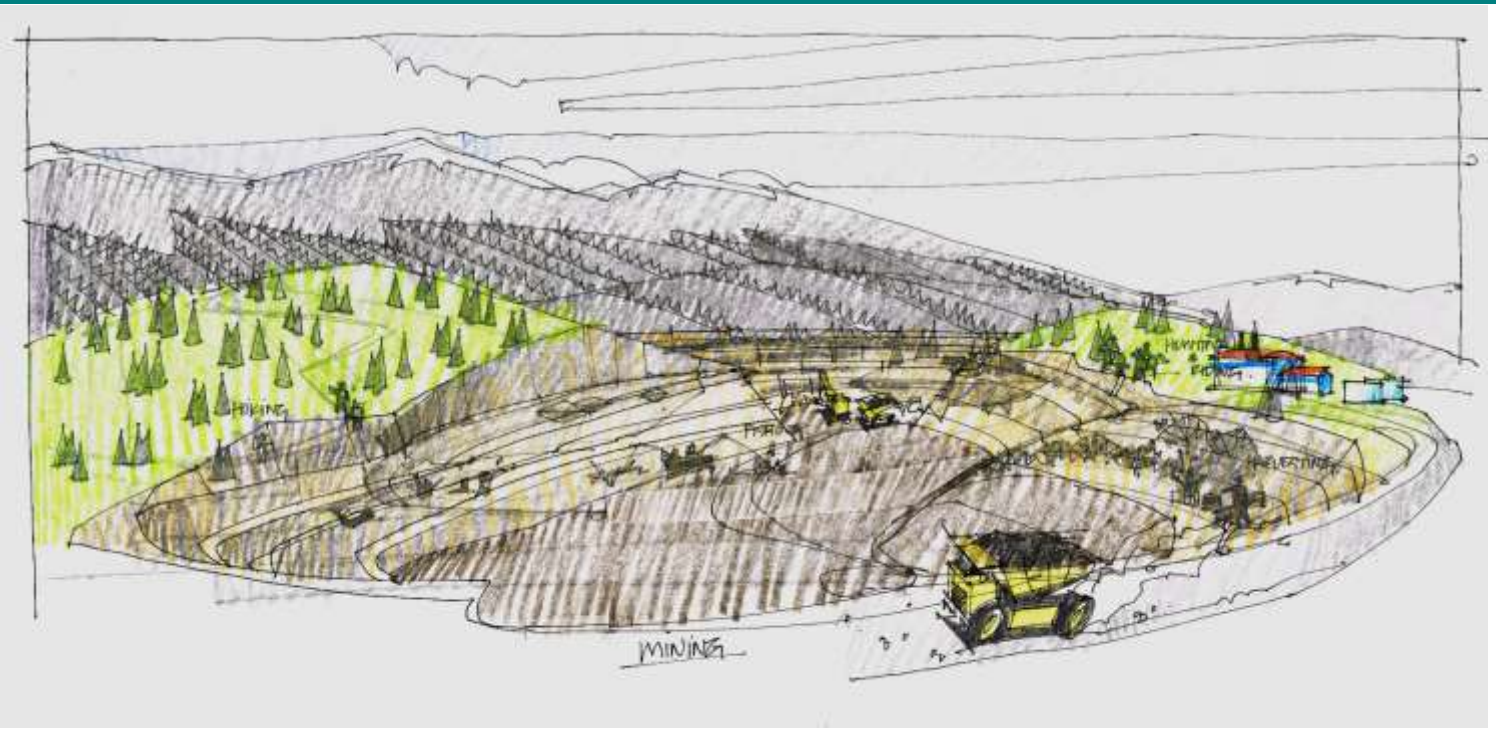
How would I Suggest using the Document?



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How would I Suggest using the Document?

11th ICARD IMWA 2018 Annual Conference South Africa

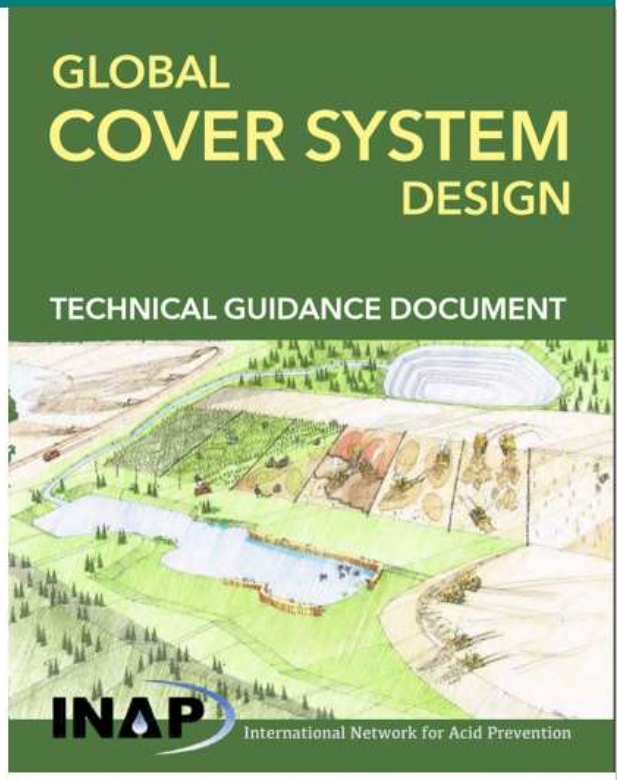
A New Tool for Managing Risk at your site – INAP's Global Cover System Design Guidance Document

11th ICARD-IMWA 2018 Conference

Pretoria, South Africa

Keynote Presentation, Wednesday, September 12, 2018

Mike O'Kane, P.Eng.
O'Kane Consultants



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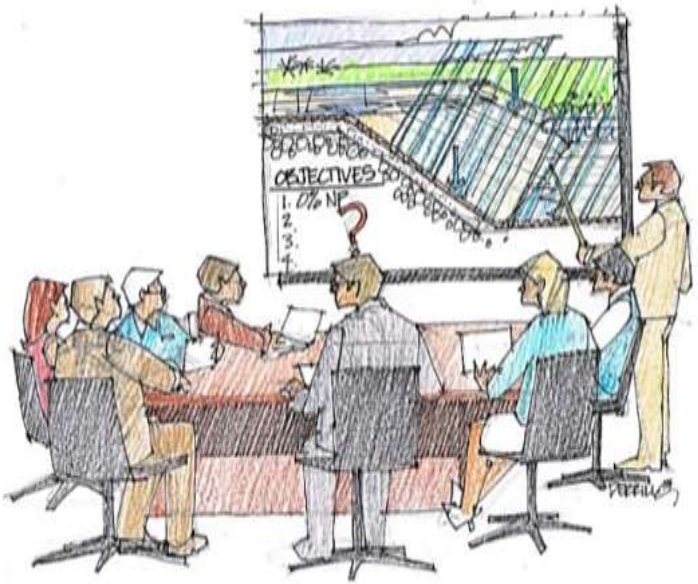
Briefly… a Focus on Risk Management

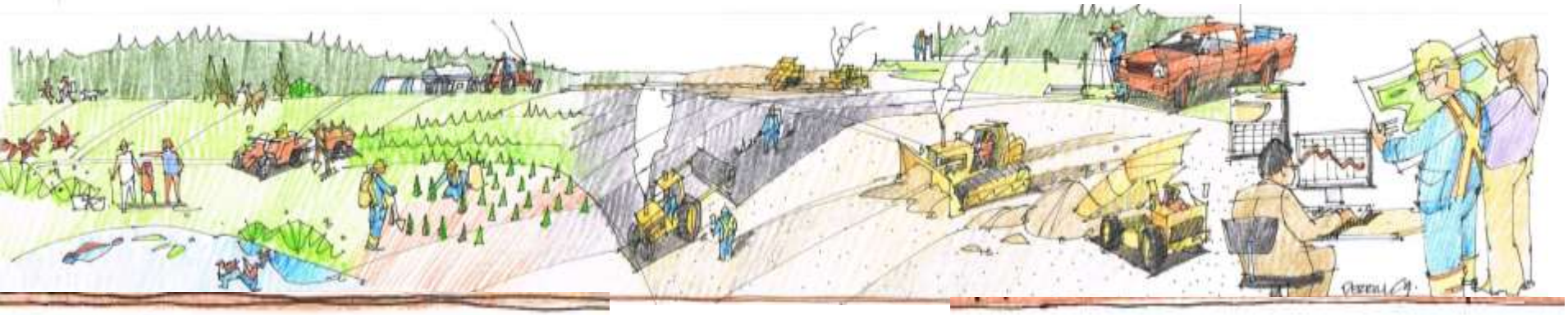
Start at the End…

…What is your Returning Land Use Plan?

and therefore…

…your Objectives?





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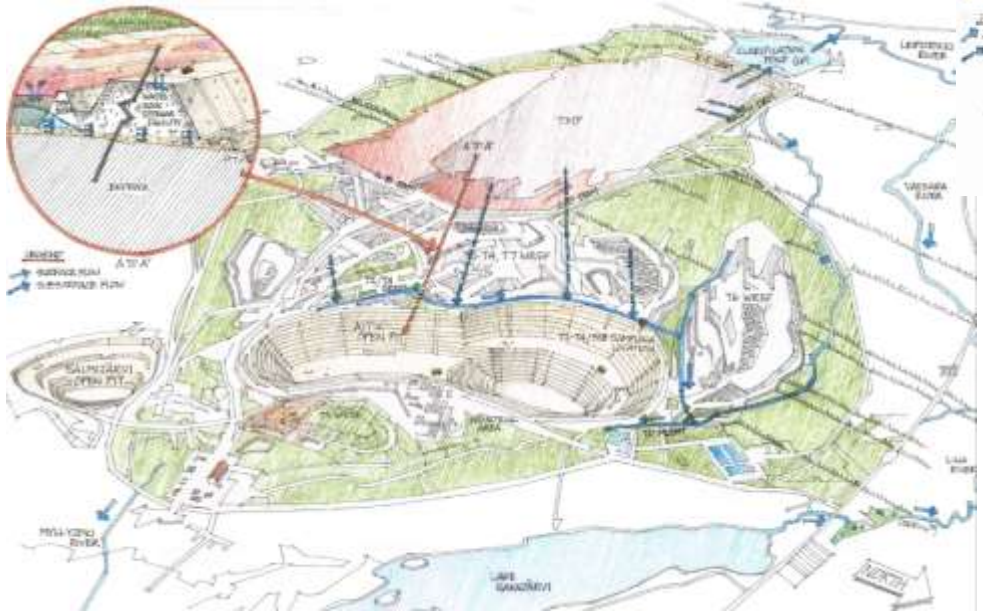
Risk to Opportunity:
When, Where, How to use the Document

Recognize and Communicate:

…Different Temporal Scales

…Different Risk Profiles



Closure Planning:

Mine-Life-Cycle

Planning and Operations:

Life-of-Mine (LOM)

…next 3 to 6 mths

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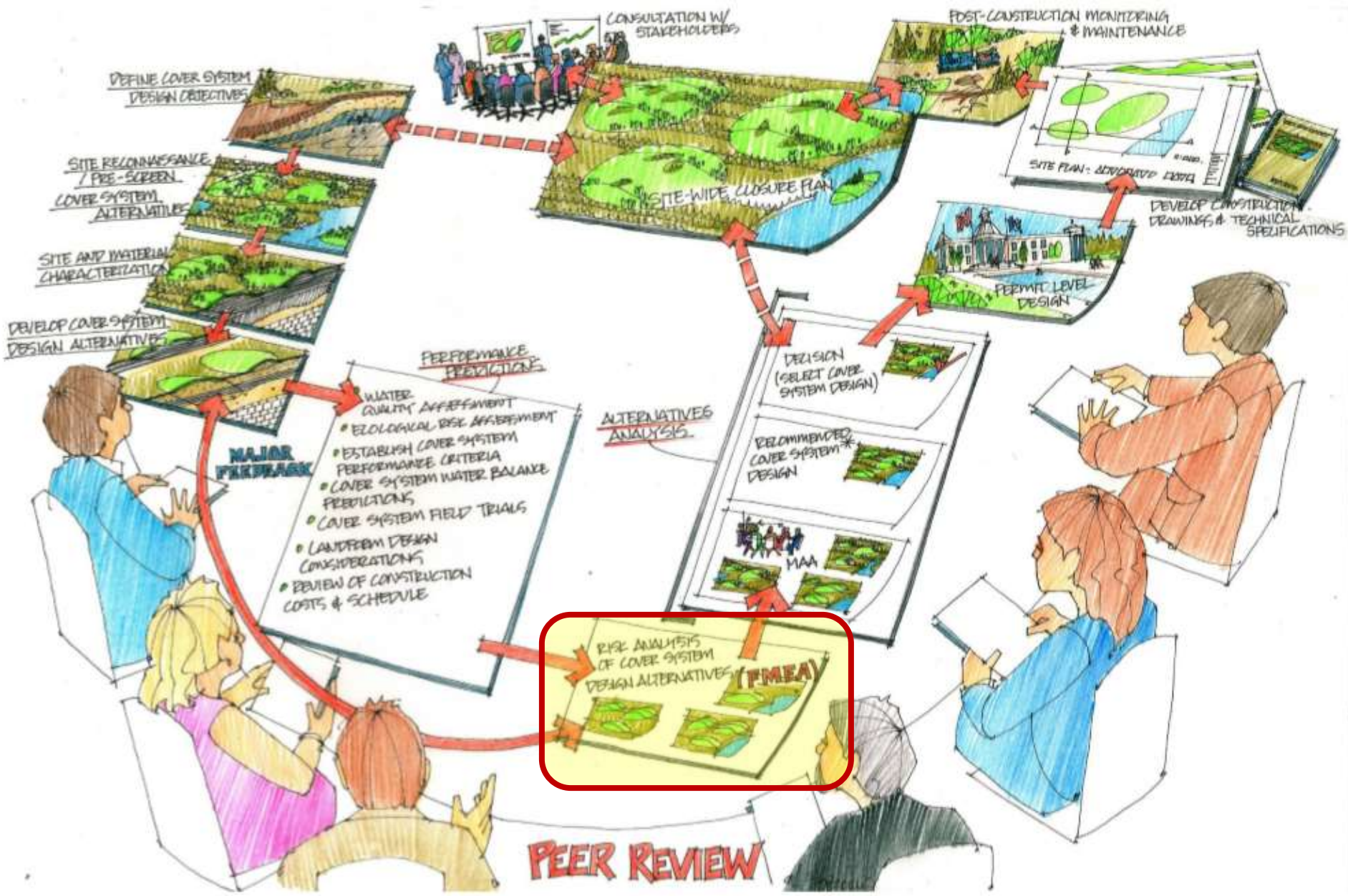
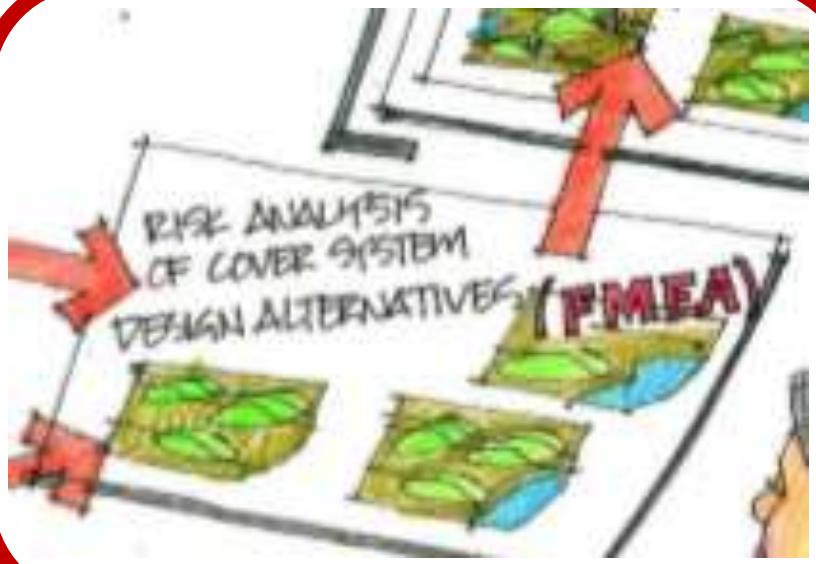
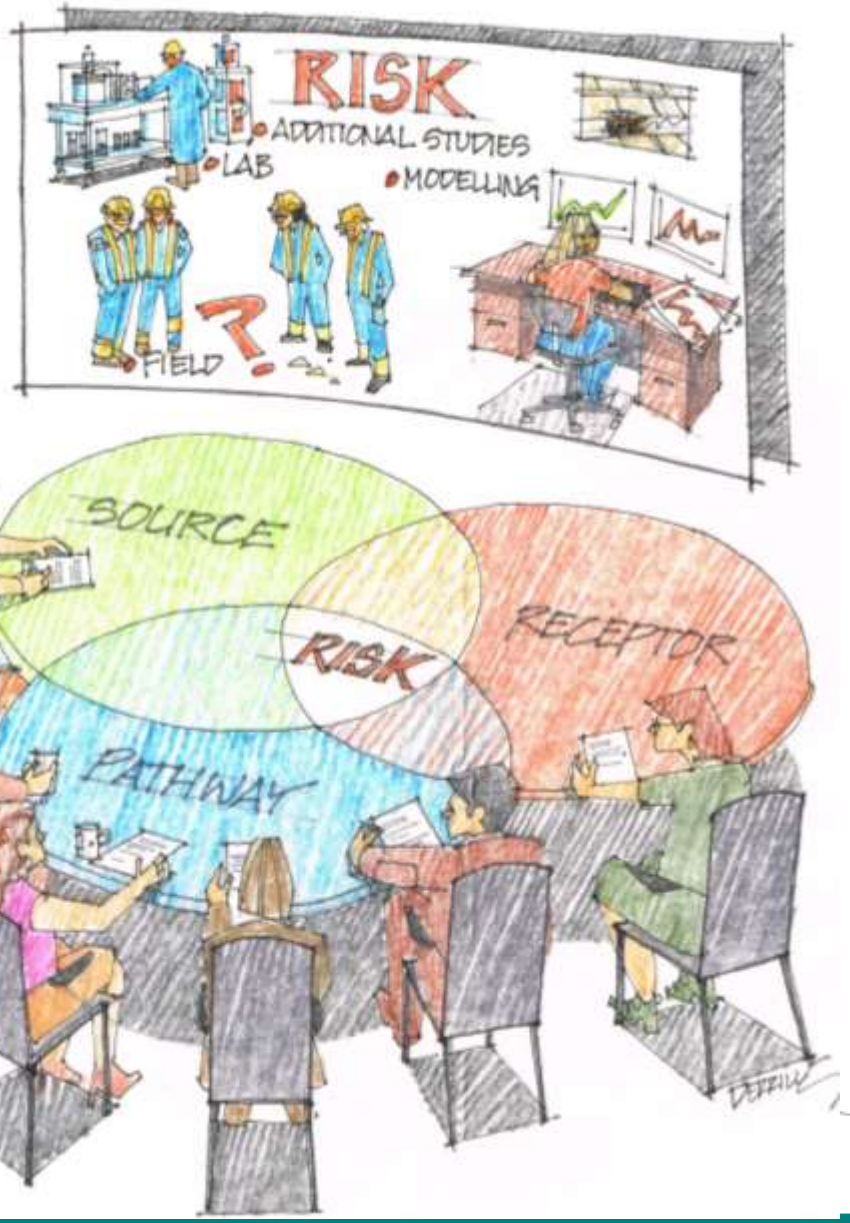
Briefly… a Focus on Risk Management

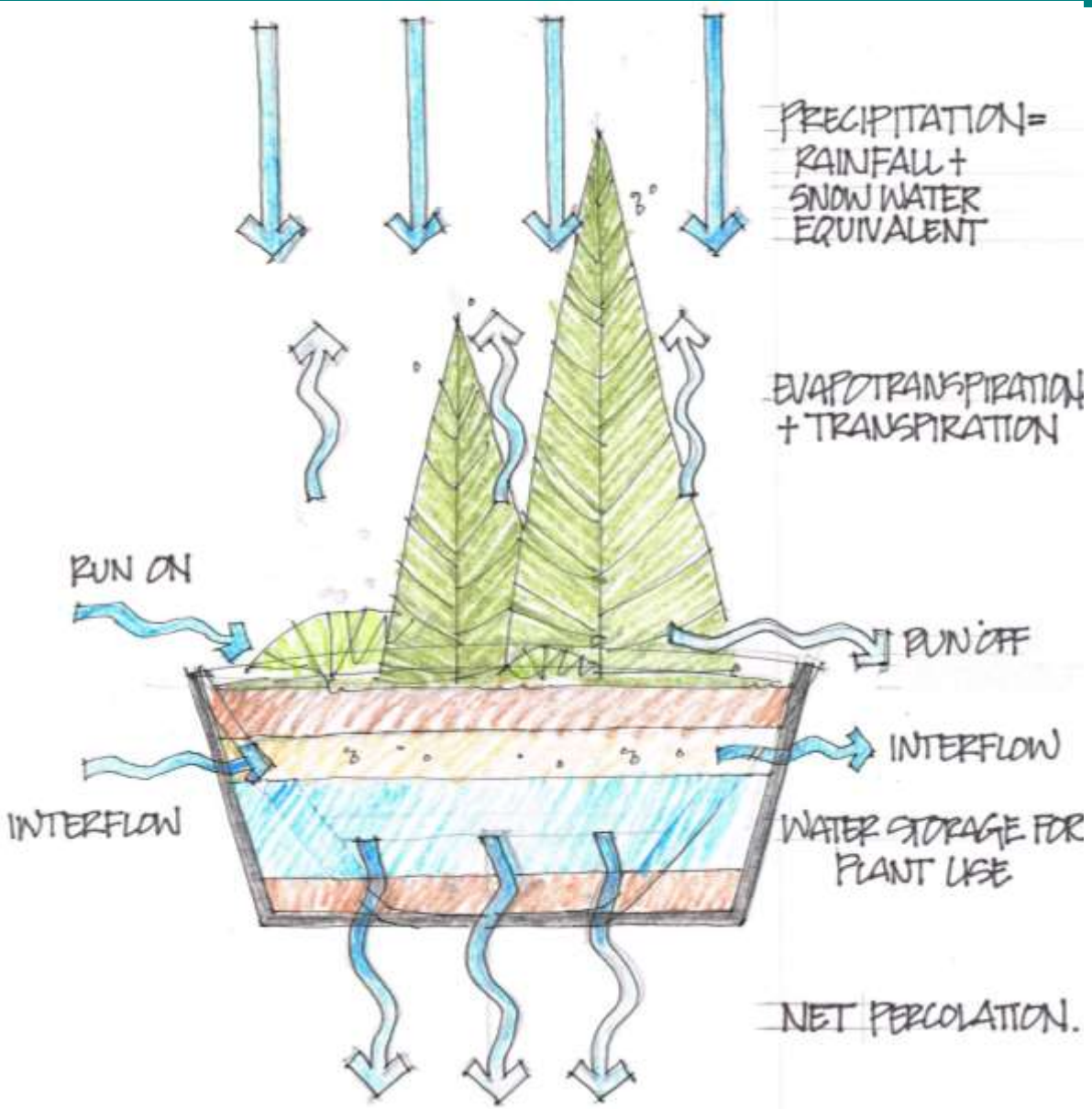


Briefly… a Focus on Risk Management





…Your: *"Right-Sized Flower Pot"*



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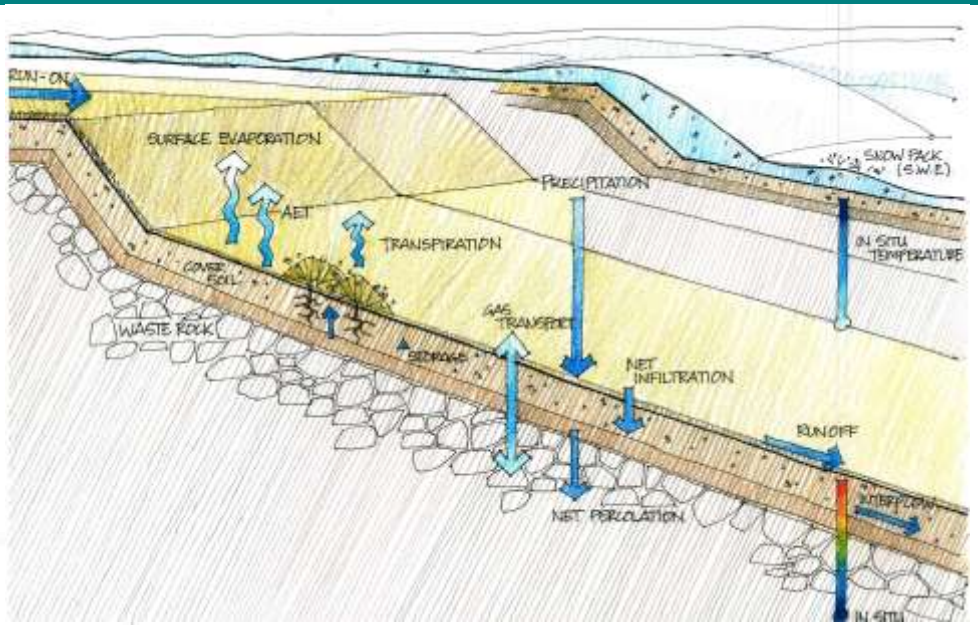
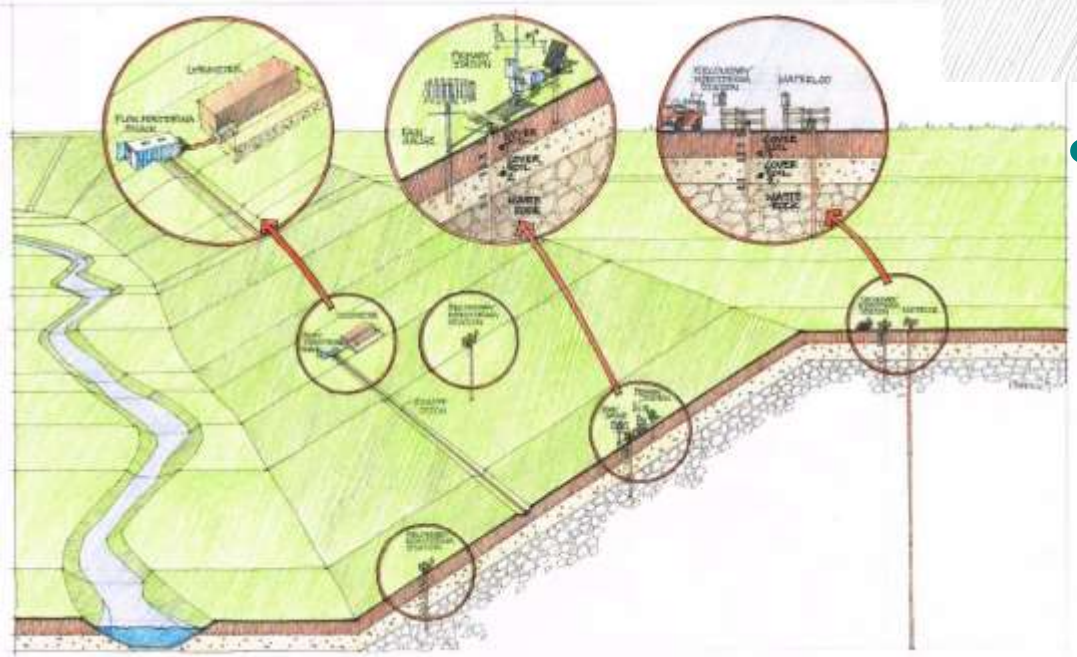
Specialists in Geochemistry and Unsaturated Zone Hydrology

Performance Monitoring

- ***Design, Construction, and Monitoring of Cover System Field Trials***
  - ***Objective?***
  - ***Spatial and Temporal Scale?***
  - ***Cover System Types?***





- ***Monitoring of a Commercial Scale Landform***
  - ***Spatial and Temporal Scale?***
  - ***Where and What to Monitor?***

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Acknowledgements

- ***International Network for Acid Prevention***
  - **Terry and Andrea Chatwin**
  - **Gilles Tremblay**
  - **Rens Verburg, Golder Associates**

***Gord McKenna**, PhD, PEng, PGeo*

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- ***Dr. Lee Barbour***

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Thank You!

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