

Optimizing soil productivity in the context of climate change

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Outline:

- **Context and background**
- **Climate change**
- **MPB salvage and soil disturbance**
- **Minimizing detrimental soil disturbance**
- **Optimizing soil productivity**

Context and background

Forest and Range Practices Act, Forest Planning and Practices Regulation

Interpretations, Damage to the environment. For the purpose of section 46 (1) and (1.1) of the Act, "damage" means any of the following that adversely alters an ecosystem: **(d) soil disturbance, (g) changes to soil.**

Practice requirements, An agreement holder other than a holder of a minor tenure who is carrying out timber harvesting must not cause the amount of soil disturbance on the **net area to be reforested** to exceed the following limits:

- (a) if the standards unit is predominantly comprised of **sensitive soils**, **5%** of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (b) if the standards unit not is **not** predominantly comprised of **sensitive soils**, **10%** of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (c) 25%** of the area covered by a **roadside work area**.

Context and background



Vision: Sustainability of Forest and Range Resources Through Science and Stewardship

Forest and Range Practices Act, Forest Planning and Practices Regulation:

Forest Stewardship Plans content. The objective set by government for soils is, **without unduly reducing the supply of timber from British Columbia's forests**, to **conserve the productivity and the hydrologic function of soils**.

Context and background



Terms of Reference for a Special Investigation

Soil Disturbance Special Investigation

OBJECTIVE

To assess the extent to which legislation pertaining to soil disturbance has been complied with and to examine the magnitude, compliant or non-compliant with current legislation, of soil disturbance levels and, to the extent possible, its consequences on soil productivity.

Districts: Quesnel and Vanderhoof

Forest Practices Board: Daryl Spencer and Glen Pilling

Reporting: Spring 2009?

Context and background

- Regional soil scientists (Stéphane Dubé NIR, Bill Chapman and Graeme Hope, SIR) called in by C&E to consult on soil disturbance/MPB salvage logging
- FREP results indicate that there is extreme soil disturbance associated with some MPB salvage logging
- Soils Team consulted with Forest Practices Board on Soil Disturbance Special Investigation focused on soil disturbance/MPB salvage logging

Climate change

It may be that:

- Extent and severity of insects and disease will increase
- Salvage logging will become a larger portion of total harvesting
- Harvesting dead stands is different from harvesting live stands
- Reduced evapotranspiration results in wetter soils
- Wetter soils reduce windows of operability
- Increases in precipitation would exacerbate this
- Productive areas (fine textured, seepage) are hardest hit by concentrated soil disturbance
- Economic pressures complicate decision-making
- MPB is the tip of the iceberg...

MPB salvage and soil disturbance

- 29% in block disturbance (5%, 10%)
- 59% RWA (25%)
- damage to the environment

Image © 2008 Province of British Columbia

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38 m

Pointer 52°08'05.68" N 121°36'06.06" W

Streaming ||||| 100%

Eye alt 131 m

MPB salvage and soil disturbance



MPB salvage and soil disturbance



Ruts fill with water

MPB salvage and soil disturbance



Should have built a road

9 1:01 PM

MPB salvage and soil disturbance



Poor rehab

MPB salvage and soil disturbance



Dying seedling in poor rehab

MPB salvage and soil disturbance



Extreme rutting

MPB salvage and soil disturbance



Soil structure destroyed

MPB salvage and soil disturbance

**C & E Pilot
Project**

**FREP Special
Project**

High definition aerial photographs

**Cutblocks in Quesnel and Central Cariboo
Districts**

MPB salvage and soil disturbance

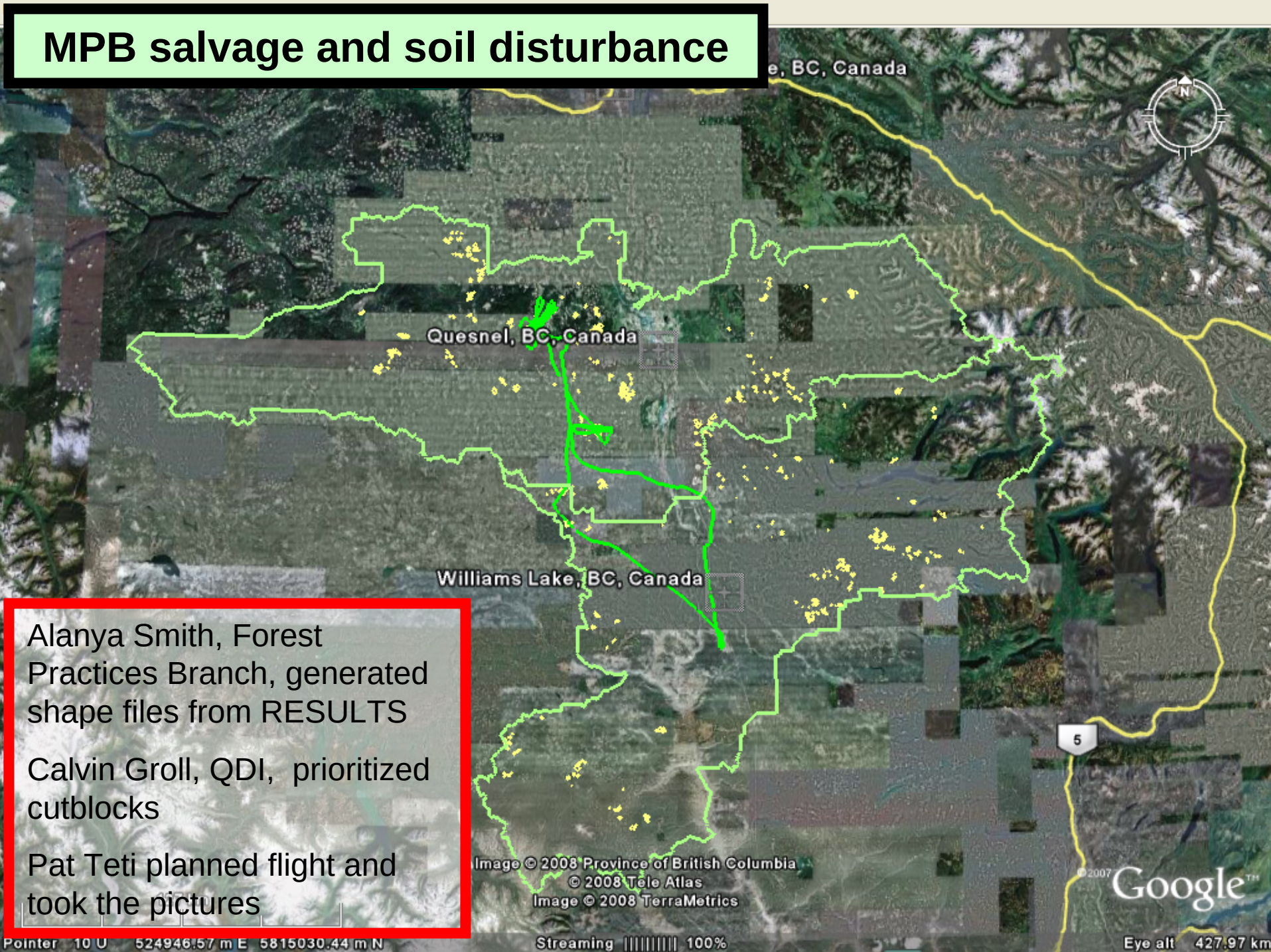
C&E Pilot project (2008/9)

Pilot project on aerial reconnaissance for soil disturbance in MPB salvage areas

Pat Teti and Bill Chapman (SIR), Calvin Groll (Quesnel), Alex Norquay (Central Cariboo), Shannon Berch (Research Branch), Alanya Smith (Forest Practices Branch)

- districts prioritize areas of concern from 2007 cutblocks from RESULTS
- Pat Teti takes aerial photos of MPB salvage cutblocks in districts
- district C&E staff with regional scientists assess blocks using photos
- district C&E prioritizes blocks of concern and acts

MPB salvage and soil disturbance



Alanya Smith, Forest Practices Branch, generated shape files from RESULTS

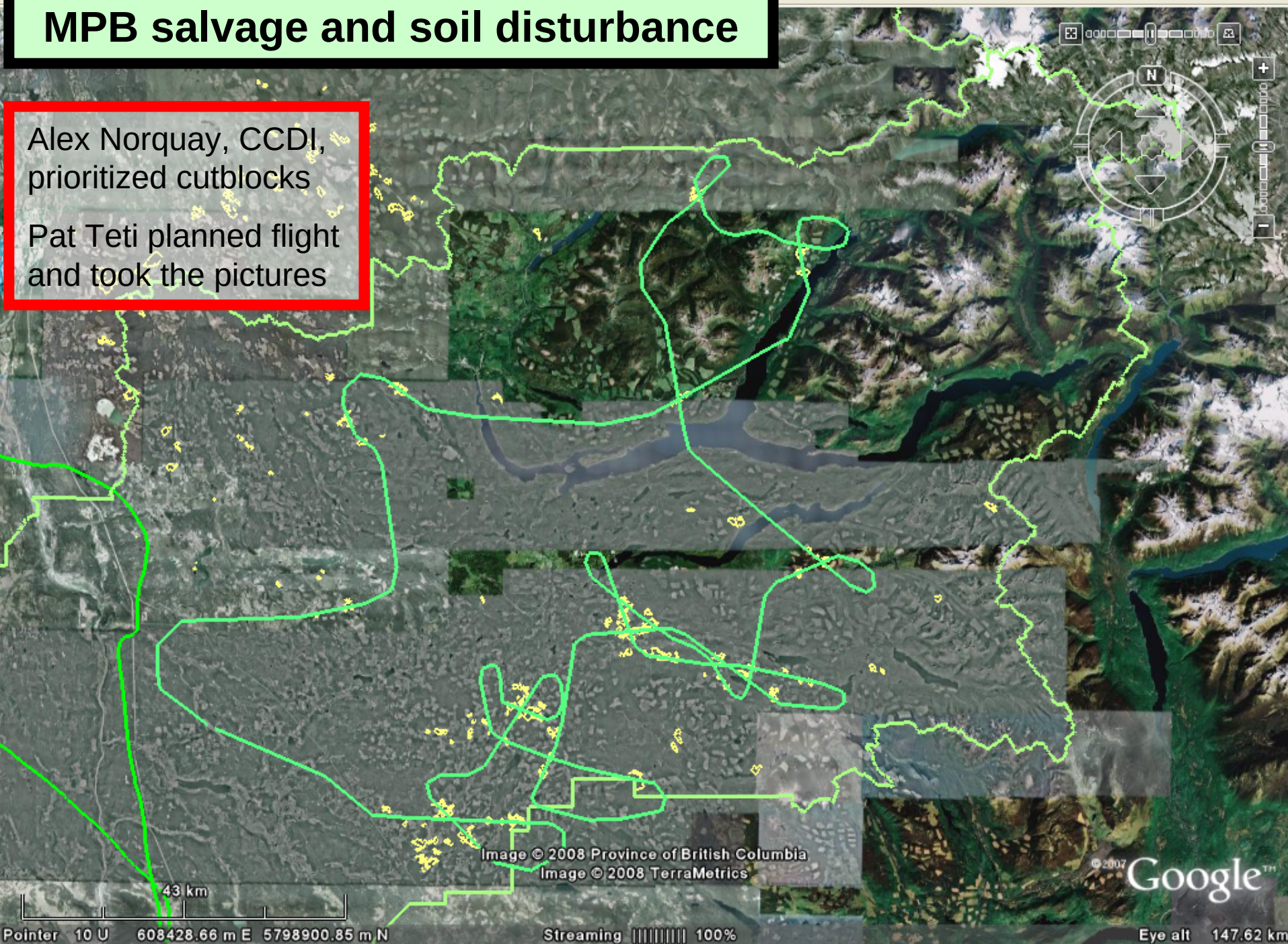
Calvin Groll, QDI, prioritized cutblocks

Pat Teti planned flight and took the pictures

MPB salvage and soil disturbance

Alex Norquay, CCDI,
prioritized cutblocks

Pat Teti planned flight
and took the pictures



MPB salvage and soil disturbance

FREP Special Project (2008-2010)

Integrated assessment of 6 key FRPA values in MPB salvage area

Shannon Berch (Research Branch), Alanya Smith (Forest Practices Branch, FREP), Kerri Howse (Stewardship, Central Cariboo), Mike Pelchat (Stewardship, Quesnel), and Resource Value Team Leaders

- high definition aerial photographs for FREP data collection
- 6 key resource values: soils, visuals, water quality, stand level biodiversity, timber harvest, riparian/fish passage
- is MPB salvage logging affecting long term forest productivity?
- is there a need to change policy?

Minimizing detrimental soil disturbance

"Forestry isn't rocket science, it's much more complicated!"
Dr. Fred Bunnell, UBC

"I shall not today attempt further to define the kinds of
material ...
but I know it when I see it."
Potter Stewart, Associate Justice, US Supreme Court

Minimizing detrimental soil disturbance

MPB salvage measures:

- Determine soil sensitivity correctly
- Stratify appropriately
- Plan logging, layout and rehab carefully
- Focus harvesting on winter months; avoid spring, wet summer, wet fall in wetter sites or portions of harvesting unit
- Train foresters and equipment operators well
- Use low ground pressure equipment, hoe chucking, designated trails or other innovative harvesting strategies
- Retain areas with live trees, advanced regen, understory vegetation
- ...

Minimizing detrimental soil disturbance

Roadside processing areas, in particular debris clean up can result in a lot of compaction

Forwarder trails, some are corduroyed with tree limbs and non-merchantable logs to protect soils but then corduroy is left in place

Crossings of Non Classified Drainages, skidding in permanent or ephemeral drainages results in ruts and altered drainage

Pushing the limit of ground based equipment onto steep slopes (SE), associated risks of rutting and drainage channels, operator safety, and WorkSafe BC rules

Proactive field techs, BCTS is unique in having field techs who monitor how things are going and can give feedback to contractors before things go too bad

Training in soil conservation, improve and revitalize

Optimizing soil productivity

- Map the landscape by inherent productivity based on soil nutrients and moisture ('Triad' forest management)
- Identify sites where dead wood (woody debris) is especially important to productivity and biodiversity (biomass harvesting)
- Identify cost-effective interventions that can be used on high productivity sites to maximize productivity (silviculture)
- Identify sites where single factors, that might be economically treated, are limiting growth, e.g. boron deficiency or impenetrable Bt horizons
- Think of ways to reduce permanent roads and landings even further (e.g. forwarder based systems, construction & rehab of winter in-block roads)
- Examine ways in which global warming and $\uparrow\text{CO}_2$ levels might be advantageous to forest productivity and develop strategies that will position our forests to take advantage of these potentially positive changes
- ...