San Jose Watershed Forest Estate Modelling

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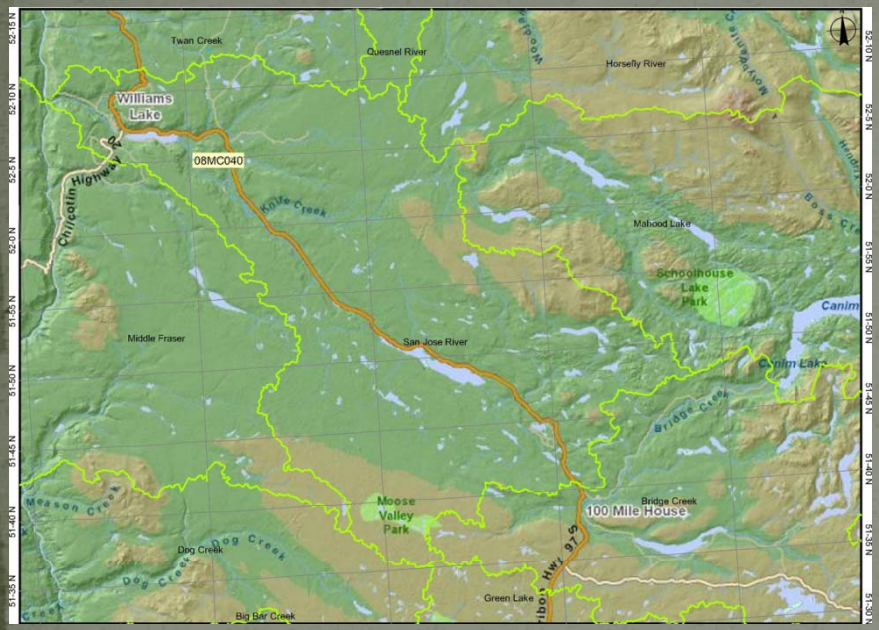
Forests And Water

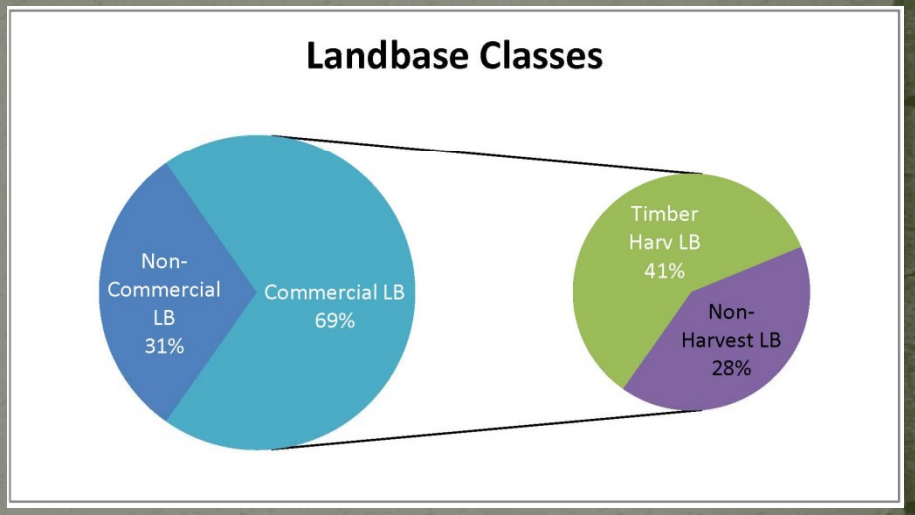
- Hydrology is affected by the forest
  - Tree density, size and growth rates influence the input of moisture into the soil and how rapidly it is removed from the soil, because trees:
    - intercept snow and rain on their crowns
    - draw water from the soil
    - shade the ground
  - To model hydrology in the future, we started with the forest

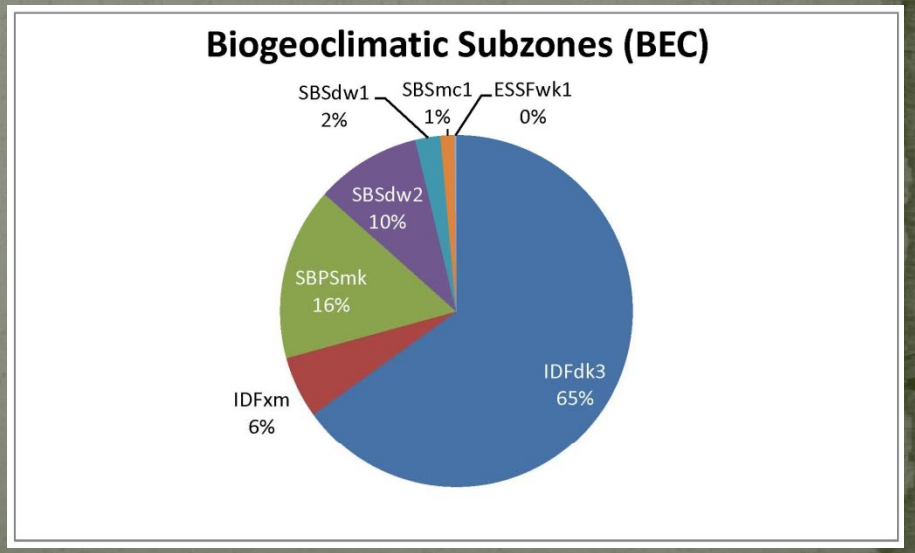

Twan Creek
Quesnel River
Horsefly River
Williams Lake
08MC040
Chilcotin Highway
Knife Creek
Mahood Lake
Schoolhouse Lake Park
Middle Fraser
San Jose River
Bridge Creek
Moose Valley Park
100 Mile House
Dog Creek
Green Lake
Big Bar Creek
52-15 N
52-10 N
52-5 N
52-0 N
51-55 N
51-50 N
51-45 N
51-40 N
51-35 N
51-30 N

Land Base

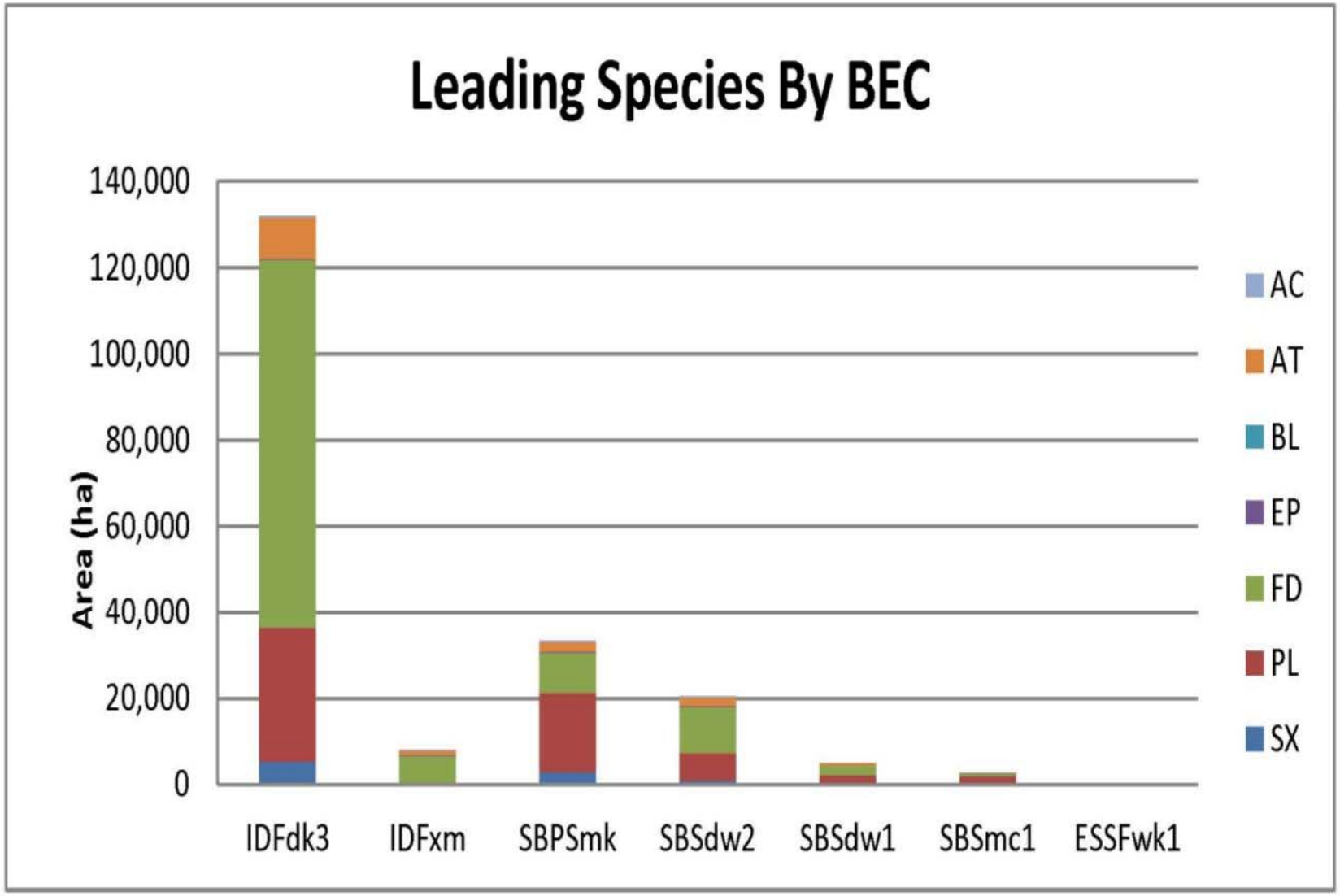


Land base	Forest	Non-Forest	Total
Buffer	129,208	15,747	144,955
San Jose Watershed	212,959	27,579	240,538
Total	342,168	43,326	385,494





Forest Estate



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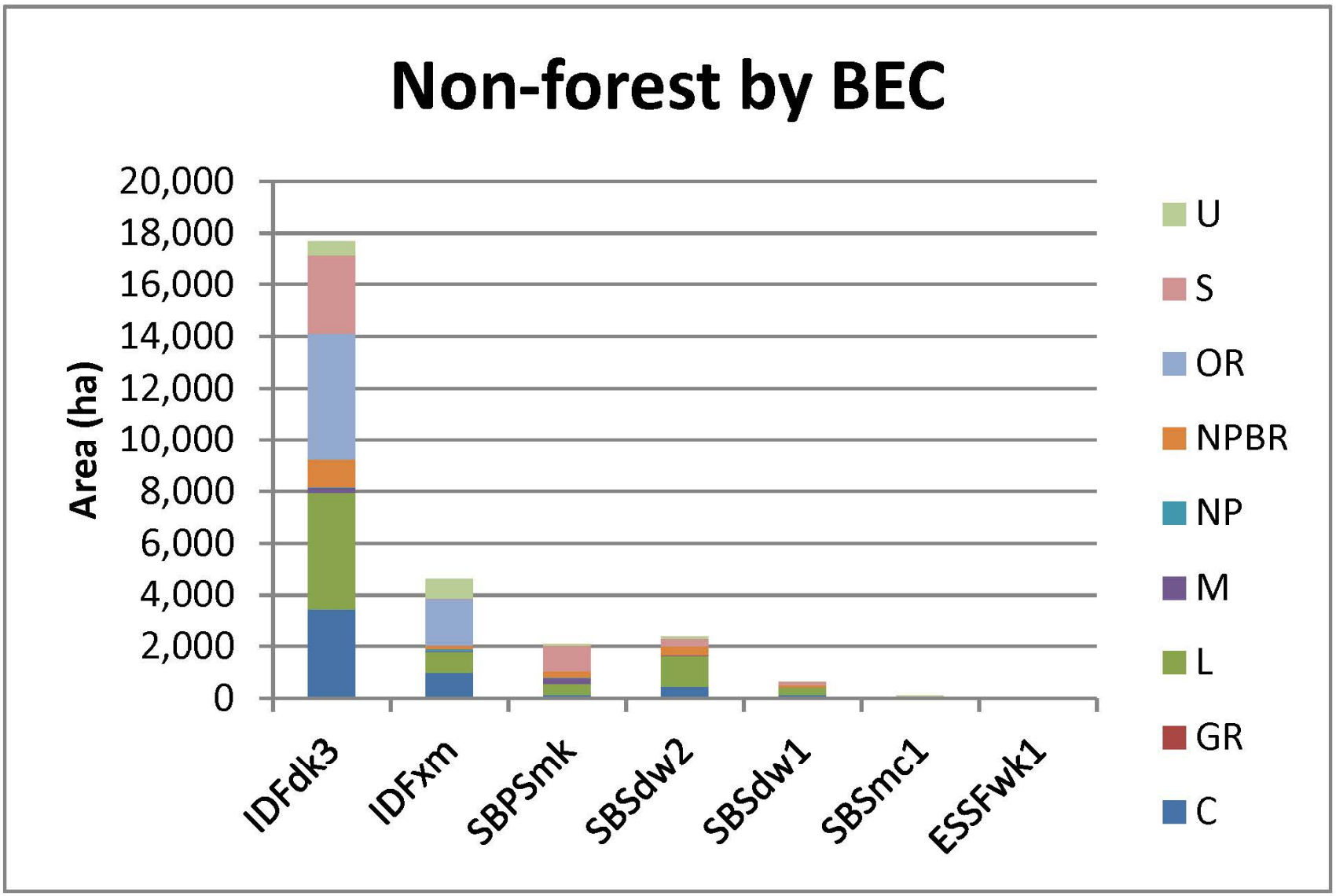
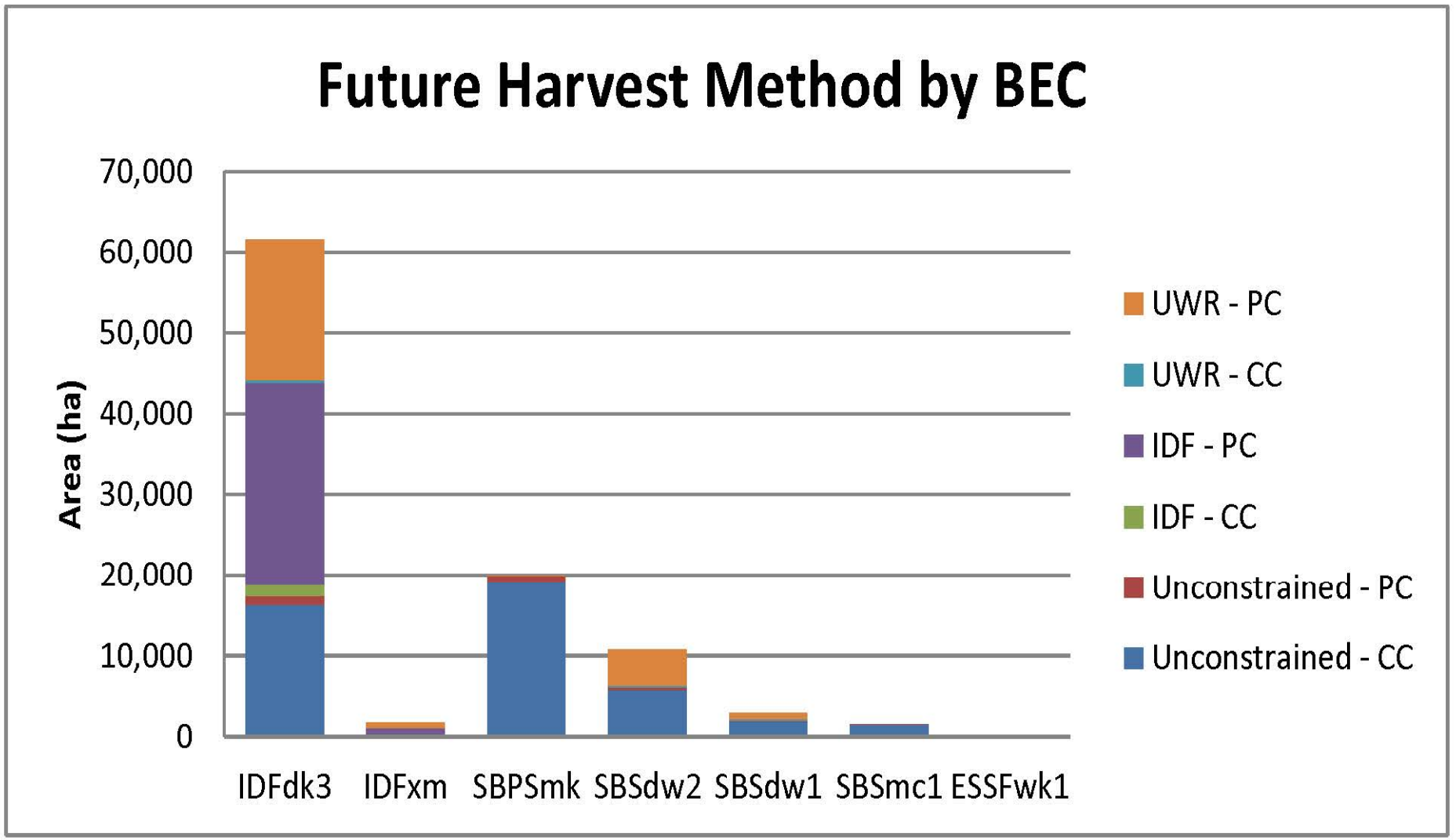
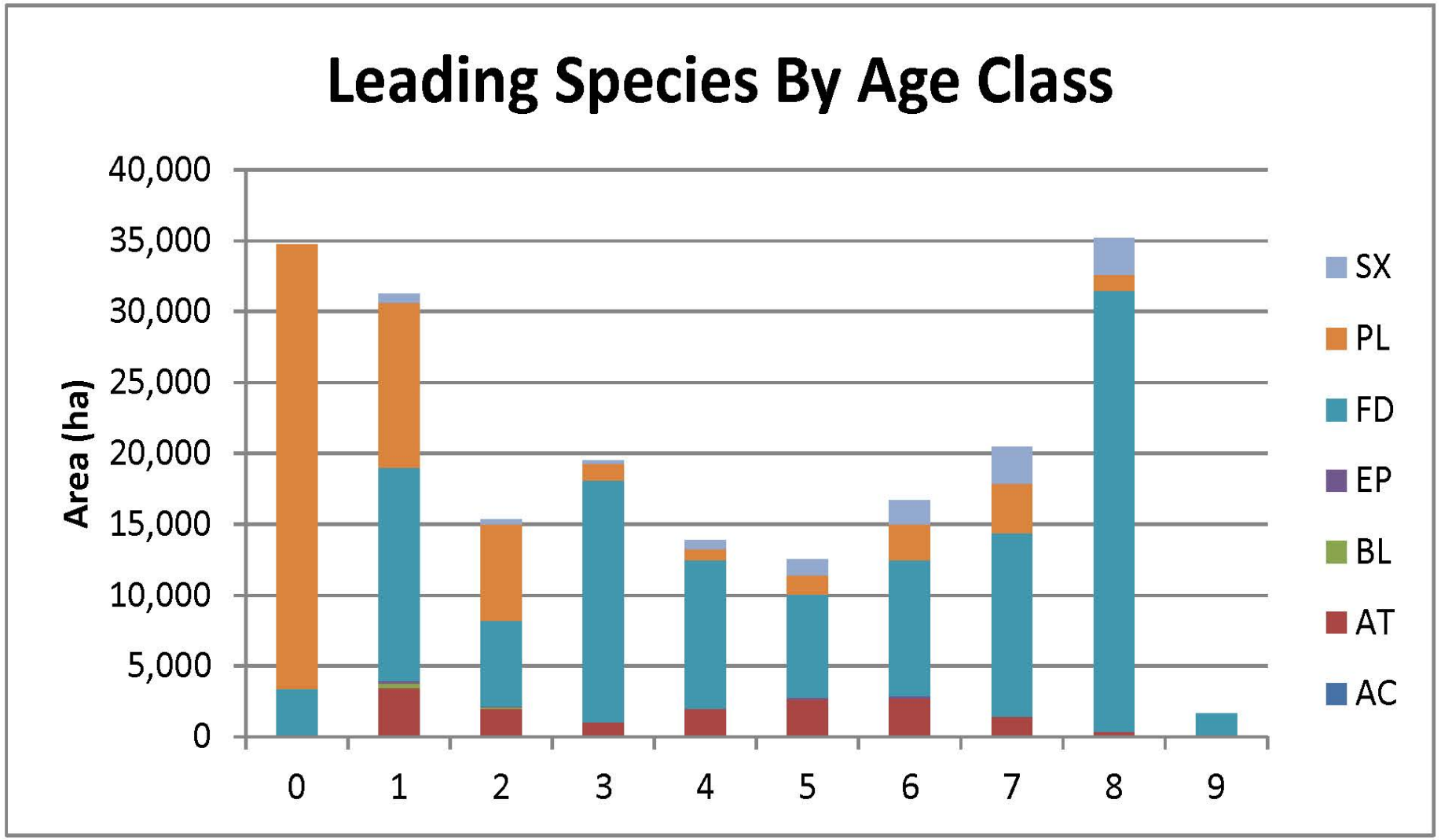


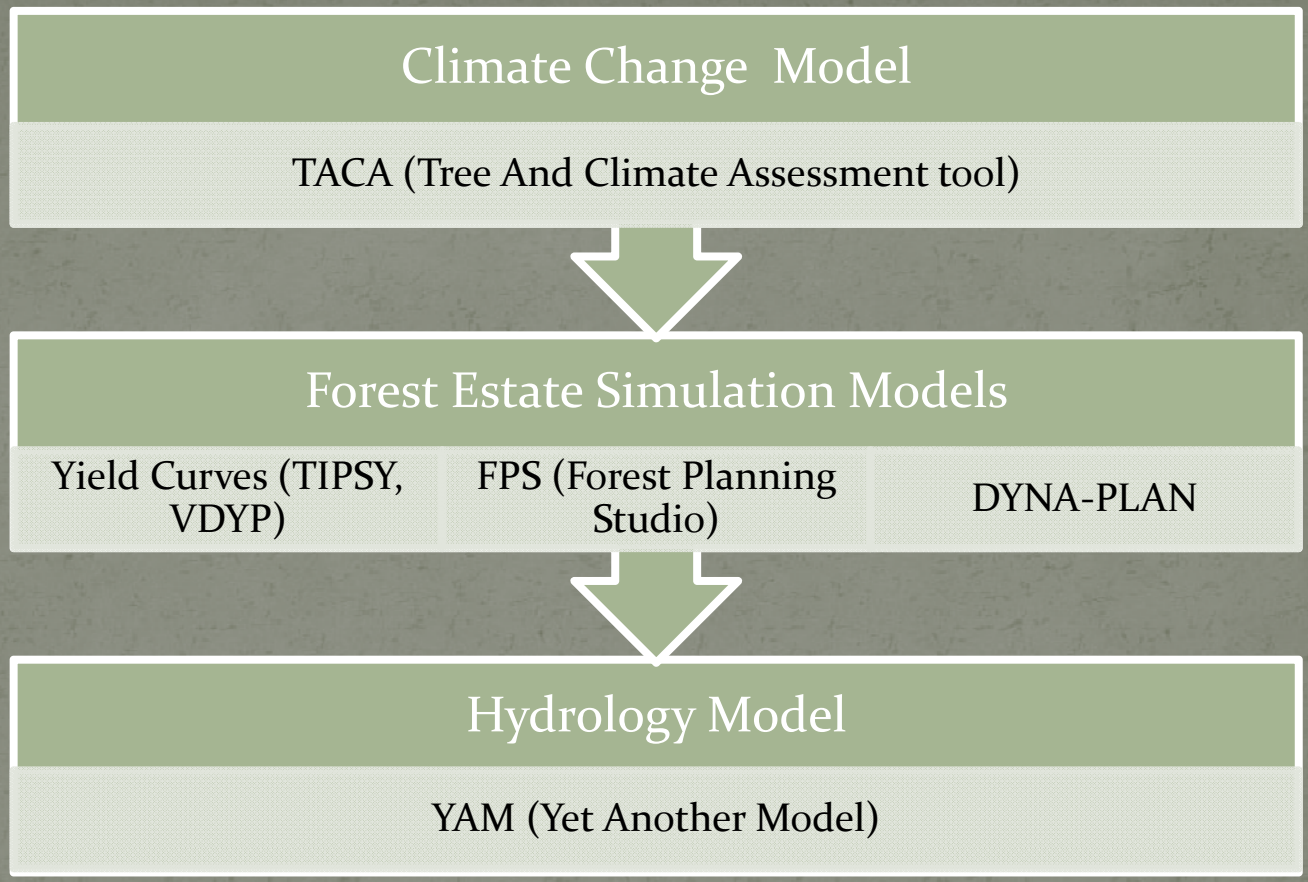
Forest Estate



Forest Estate



Models Feed Information Down the Line



- To model hydrology, we need to know about forest structure and composition through time
- To model forests, we need to know about the impacts of climate change

Forest Estate Models

- FPS (Forest Planning Studio)
  - Received climate change from an ecological model (TACA)
  - Yield curves for each stand, now and after cutting
  - Methods based upon timber supply review (TSR).
  - Assumptions the same or very similar to past TSR projects for the Williams Lake Timber Supply Area (TSA) except
    - new forest cover
    - harvest depletions
    - new requirements e.g. ungulate winter range requirements
- Dyna-Plan
  - Spatially explicit forest estate model
    - Implements natural disturbances
    - seeks optimal harvest schedules.
  - Same climate change and yield inputs
  - Stands (9 ha cells) belong to an ecosystem group
    - similar attributes (volumes, snags, coarse woody debris, etc.) for a given age.
    - multiple eligible treatment regimes
  - Select timing and regimes for each to best meet defined objectives

Forest Estate Modeling

- Integration of a wide range of issues that influence land base condition over time.
  - Forest growth
  - Forest harvesting (where, when, how, amount)
  - Regeneration practices (species, densities, delays)
  - Non timber forest values
    - Visuals
    - Wildlife
    - Water
    - Recreation
  - Natural disturbances and mortality (fire, pests, disease)
- Predict landscape condition and production capacity over time

Key Landscape Model Assumptions

- **MPB Impacts**:
  - Salvage logging assumed to be completed.
  - Remaining lodgepole pine is mostly dead and will be left to fall down/decay and then regenerate naturally over 100+ yrs.
    - If pine leading and >= 40 yrs old, set to age zero in model
    - If pine was a smaller component, its volume was removed from the stand and other attributes were adjusted as needed.
    - Pine <40 was not altered.

Key Landscape Model Assumptions

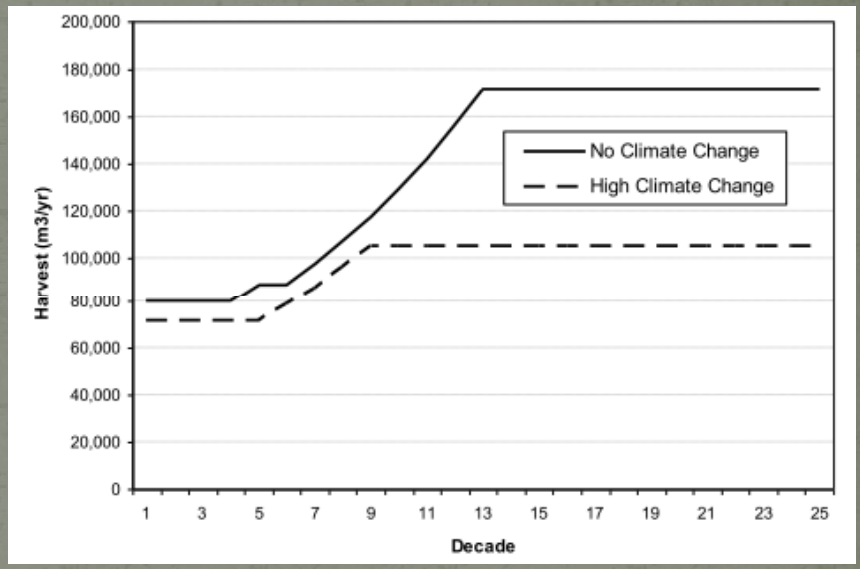
- **Partial harvesting** assumed in Ungulate Winter Range areas and in many Douglas fir stands.
  - Simple approach using TIPSY curves due to lack of readily accessible data. (Prognosis preferred)
  - E.g. Stands with 3 entries were split into 3 spatial entities that could be completely harvested using staggered timing. Treated much like a group selection harvest.
- Harvesting limited by **visual concerns, greenup** and **watershed disturbance** limits where applicable.

Reflecting Climate Change

- Changing growth rates over time (some stands better off, some worse).
- Mortality from drought (2%/yr) applied if growth rates for a stand fell to zero.
- Increase in levels of fire disturbance
  - Based on ecosystem type
  - Average was a 40% increase in fire disturbance
- Increase in losses (mortality) from pests that does not get salvaged (unsalvaged losses).

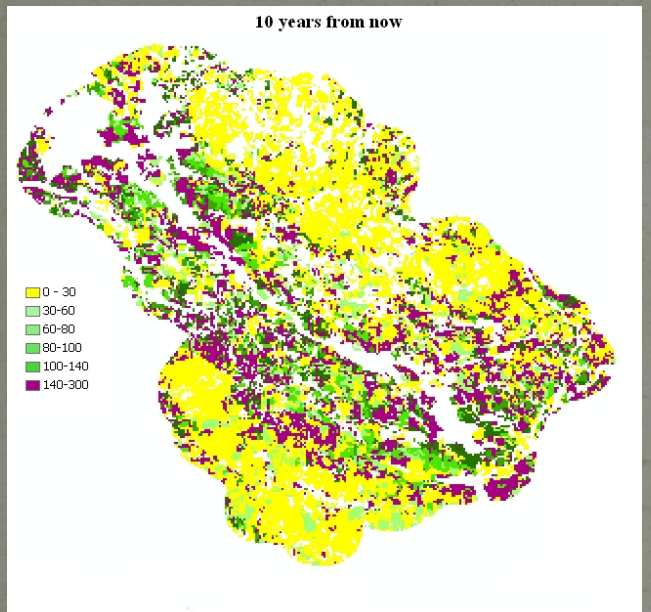
Landscape Projections

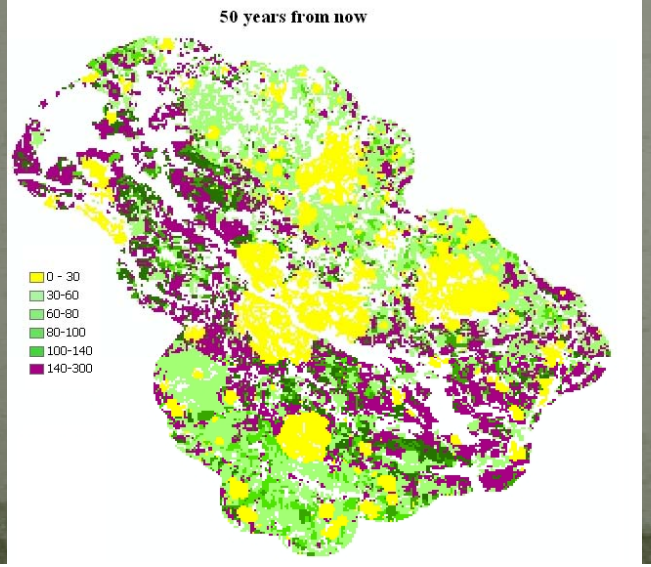
- Harvest level initially depressed but increases over time.
  - High % of young stands
  - Many older stands have reduced volume as pine is no longer viable.
- Climate change causes reduced harvest levels.
  - Losses to fire and pests
  - Lower avg productivity (e.g. lodgepole pine in IDF)



Forest Change Over Time

No Climate Change

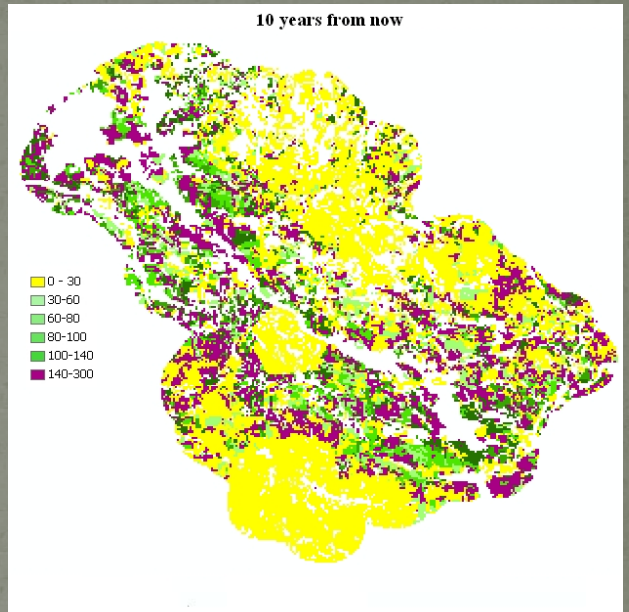


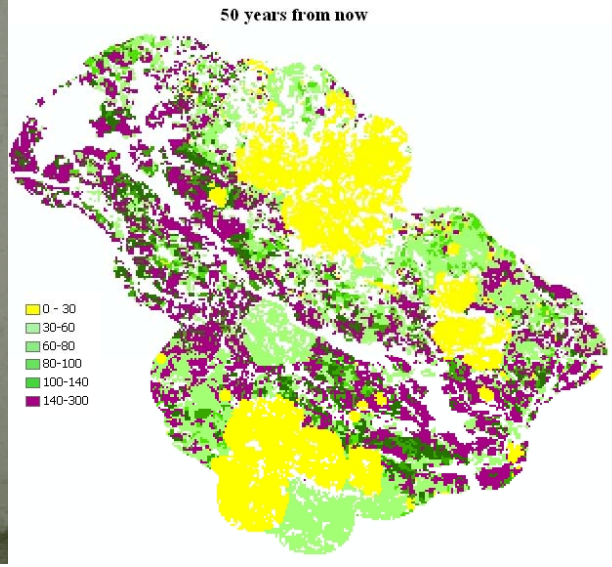


10 Years

50 Years

High Climate Change





Handoff to Hydrologists

- A spatial map with attributes describing each polygon over time was created;
  - 10 yr increments
  - Forested
    - Age
    - Height
    - Crown closure / basal area
    - Species
  - Non Forested
    - Water
    - Rock
    - Agriculture,
    - Etc.

Questions?