Spatial & temporal patterns & processes controling duff moisture content

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Duff & forest fires

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  - Seedlings do poorly where duff remains

Duff consumption & regeneration patterns

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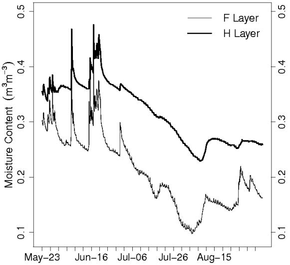

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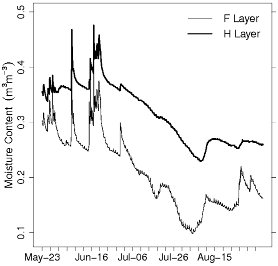
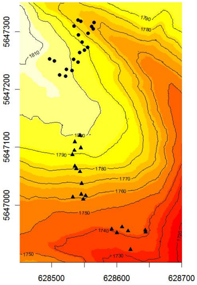
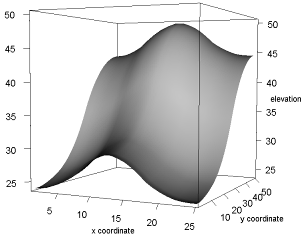
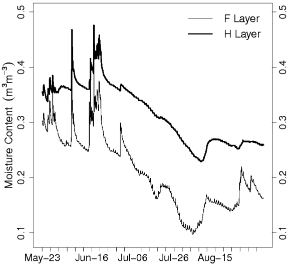


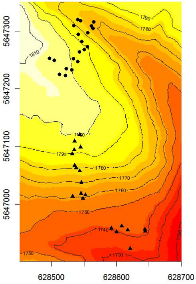


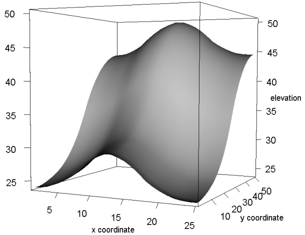


Objectives

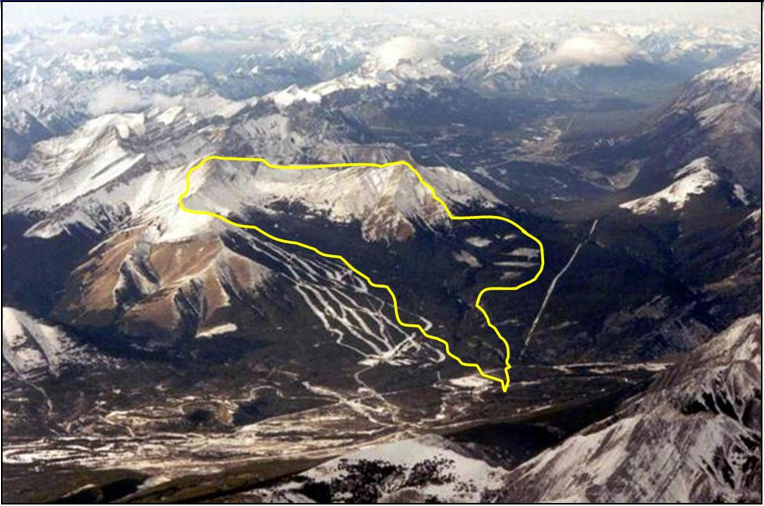
- Establish & model the processes controlling the duff water budget
  - In time (dry vs. transient periods) and
  - space (hillslopes)
  - Using both field experimentation and modeling







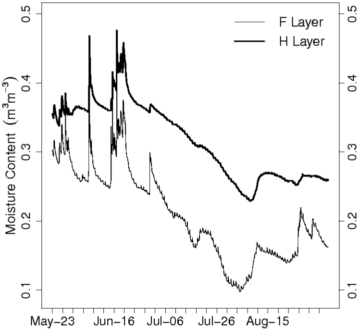
Research Watershed



- Marmot Basin - Kananaskis, Alberta $\approx 9.6\mathrm{km}^2$

Transient & Dry Periods

- Two periods evident



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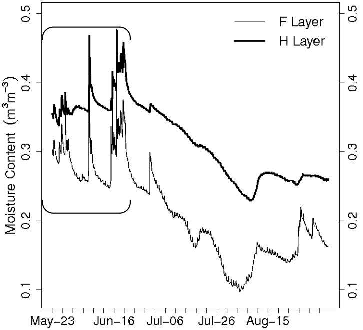

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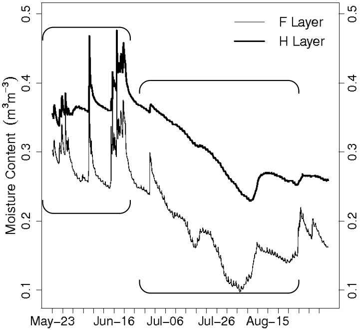
  - Diurnal drying pattern (Dry Periods)



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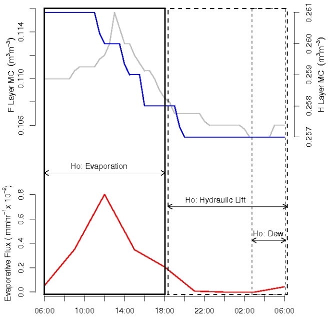

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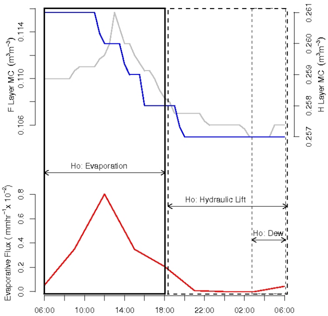

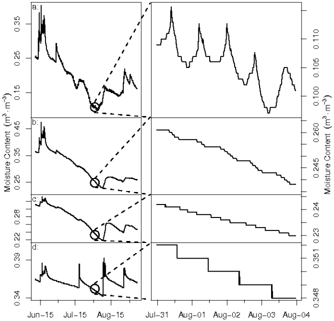

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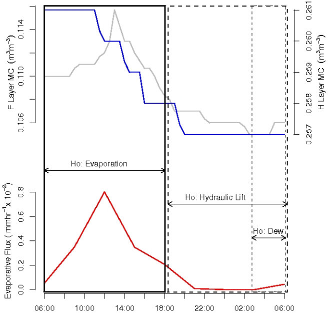

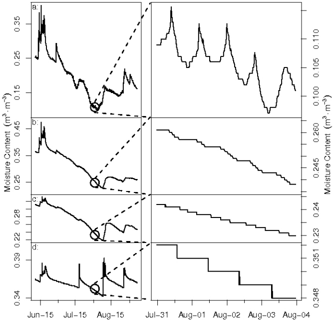

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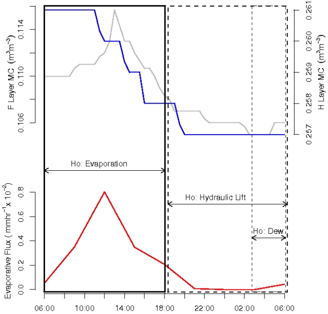
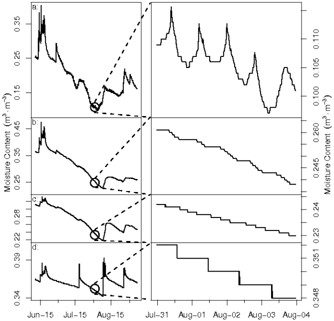
     - Disconnected from duff





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- Overall mass balance

$$\frac{d}{dt}\int_{V_n} M dV_n = \int_{\Gamma_n} \mathbf{m}\cdot\mathbf{n} d\Gamma_n + \int_{V_n} \nu dV_n \qquad (1)$$

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$$\frac{d}{dt}\int_{V_n} Q dV_n = \int_{\Gamma_n} \mathbf{q}\cdot\mathbf{n} d\Gamma_n + \int_{V_n} \omega dV_n \qquad (2)$$

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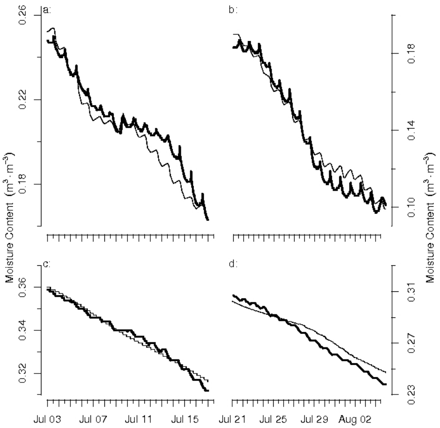

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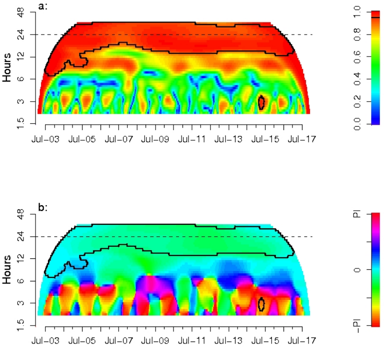

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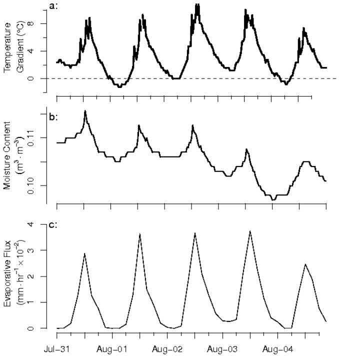

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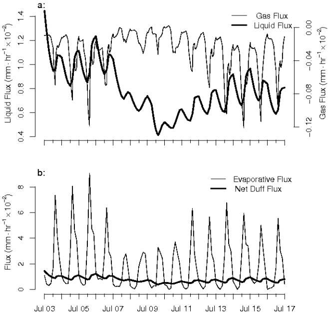
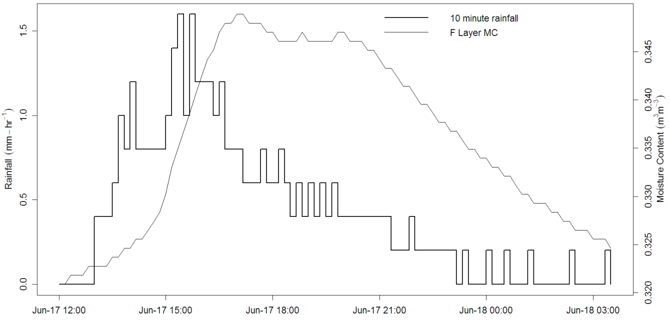
  - Due to coupled transport of liquid and vapor between F and H layer



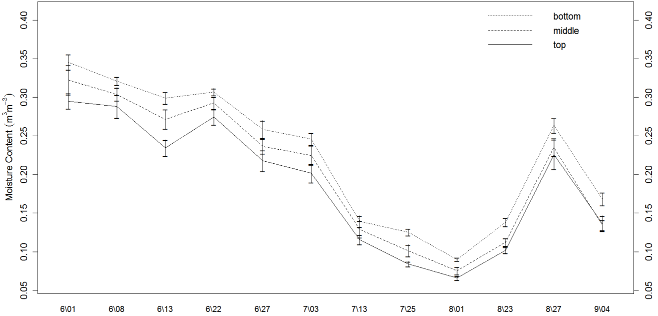
Rapid Redistribution

- Rapid movement during and immediately following rainfall



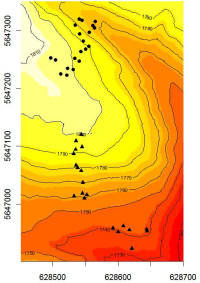
Rapid Redistribution

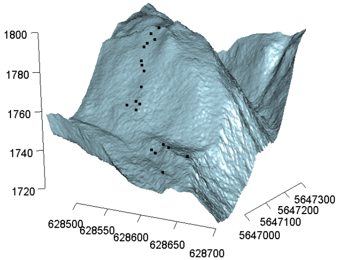
- Rapid movement during and immediately following rainfall
- Results in spatial patterns across some hillslopes



Hillslopes

- Two experimental hillslopes





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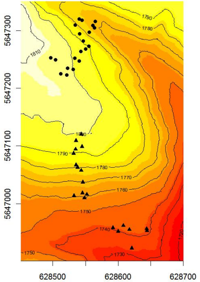

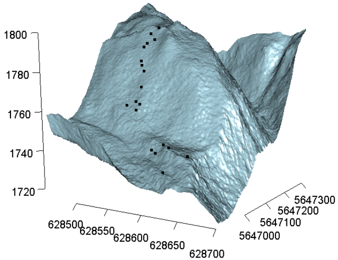

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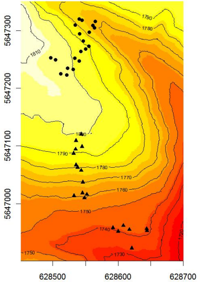

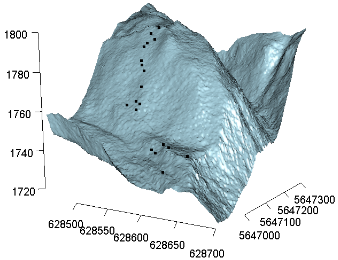

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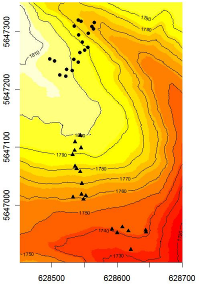

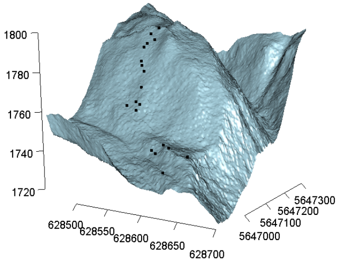

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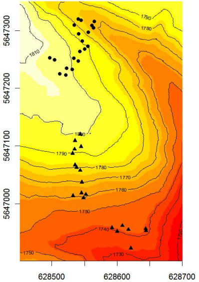

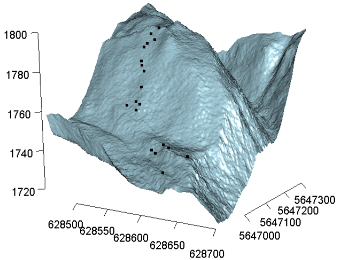

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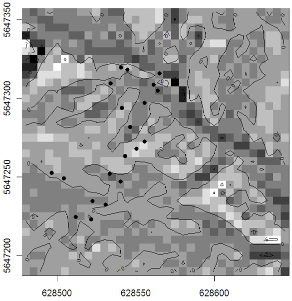

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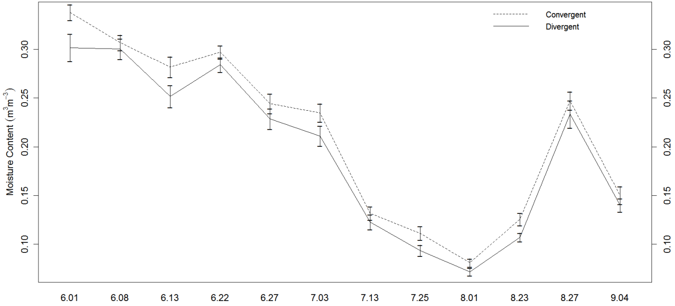
    - Hillslope "shape" (convergent versus divergent)



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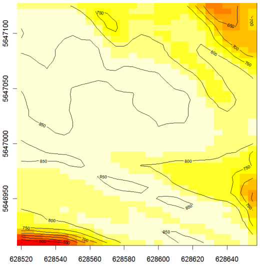
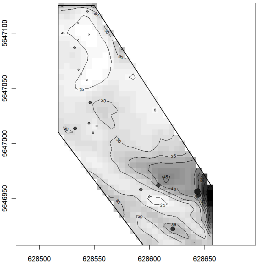
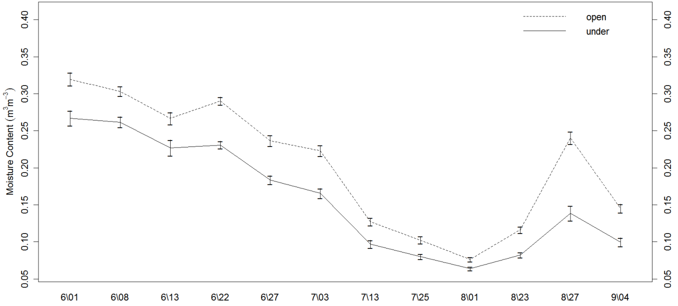




Canopy Influence

- Interception major impact spatially



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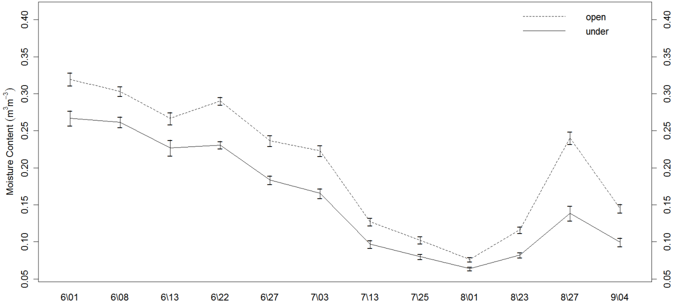

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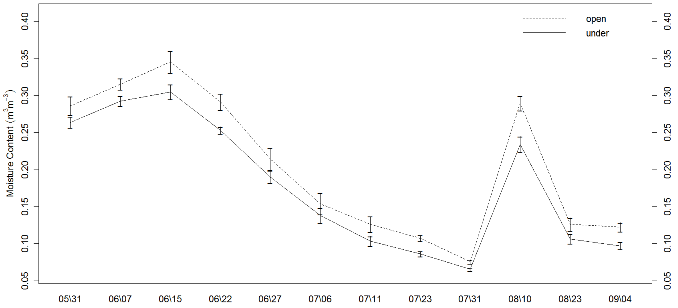

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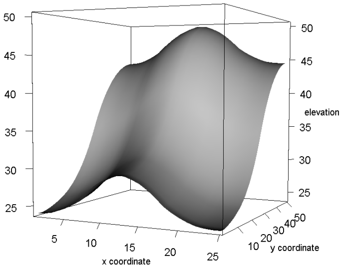

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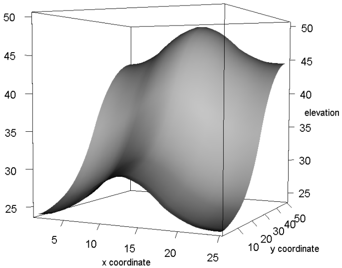

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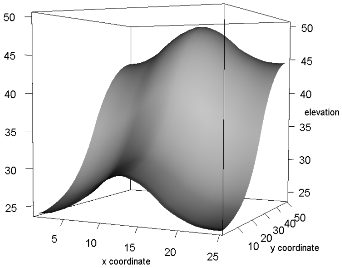
- Regularly spaced canopy



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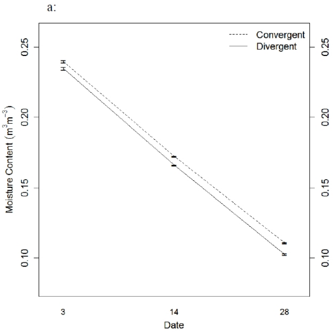

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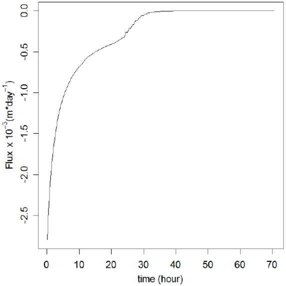

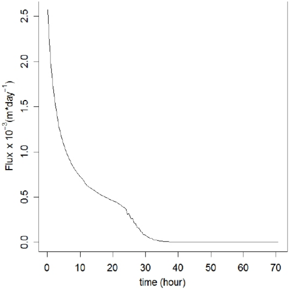

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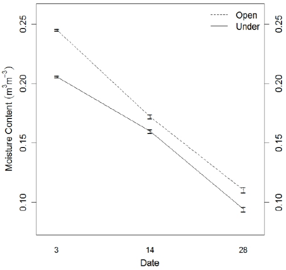

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  - Shows rapid redistribution able to recreate pattern
  - Shows canopy cover also has a large affect

Thank You, Merci

- Family, friends, foes, and field flunkies who've helped with this research
  - Kaden & Nadine
  - Dr. Johnson
  - Lindsey Park
  - Heather Conquergood
  - Marianne Chase
  - Paul Moquin
  - Ellen Lea

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