Evaluating Soil Property Information on a Landscape

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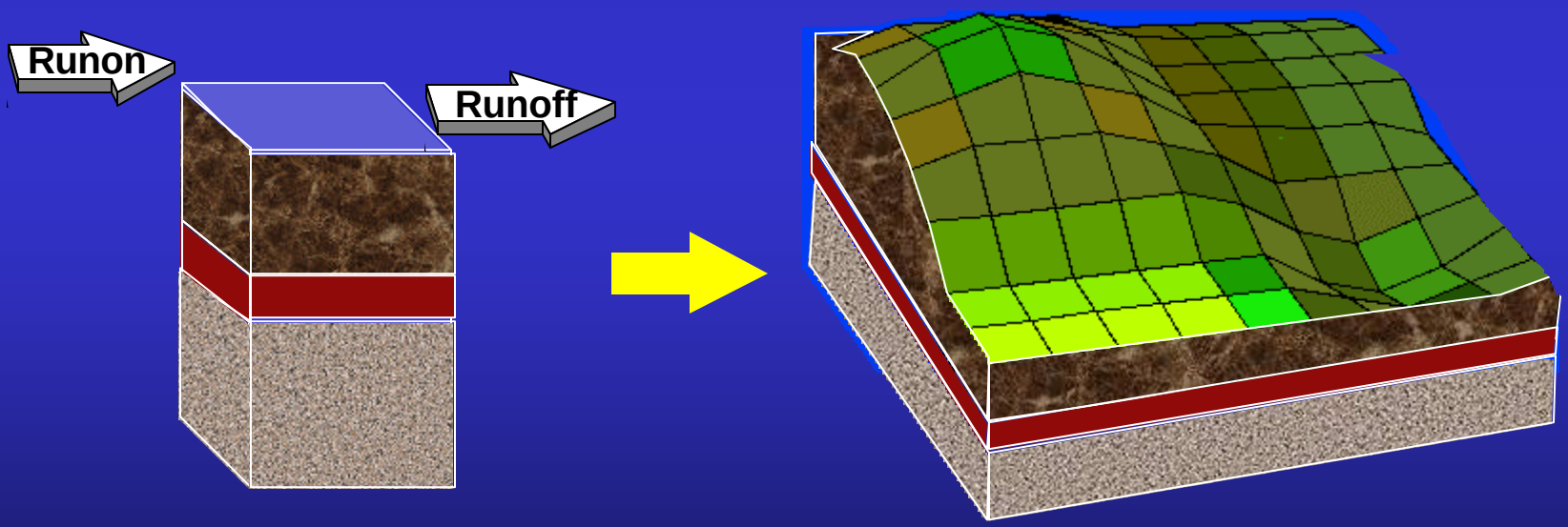
PALMS (Precision Agricultural-Landscape Modeling System)

Soil/canopy model → Runoff model



Objective

- Incorporate measurements of soil attributes from various sources to create a systematic dataset that will enhance understanding of landscape processes to be used in practical applications

- Determine which measurable soil attributes are most important for improving the utility of landscape models

Outline

I. Requirements of an appropriate landscape model

II. Existing tools for mapping soil properties

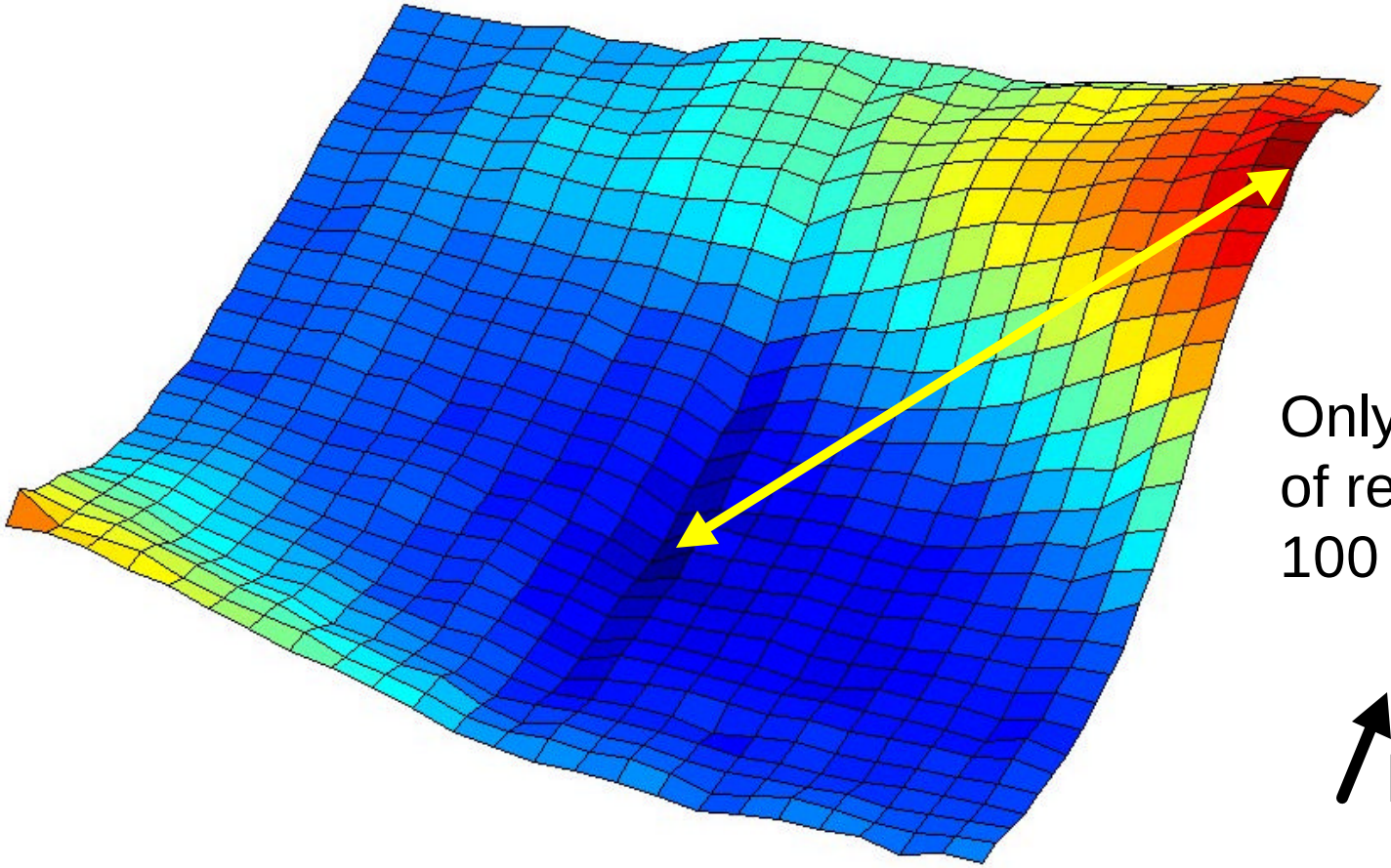
III. 3 Strategies for mapping soil properties

IV. 3 Strategies evaluated by a landscape model

3 Strategies for Mapping Soil Properties

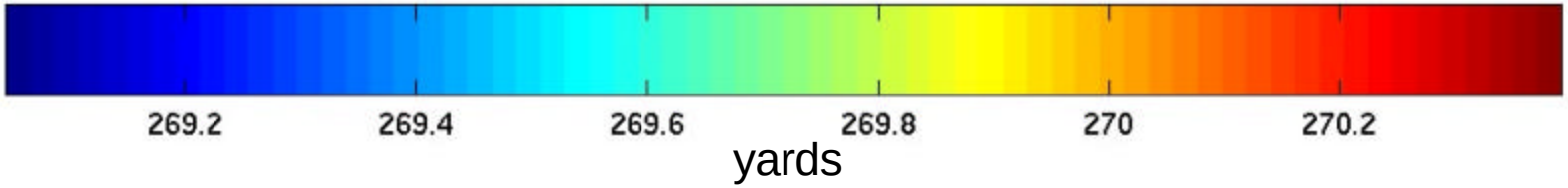
1. Soil survey and Topographic maps
2. Soil Survey, Differential GPS, Models using yield maps
3. DGPS, Electrical conductivity survey sensors, Core measurements, Penetrometer survey

GPS Topography



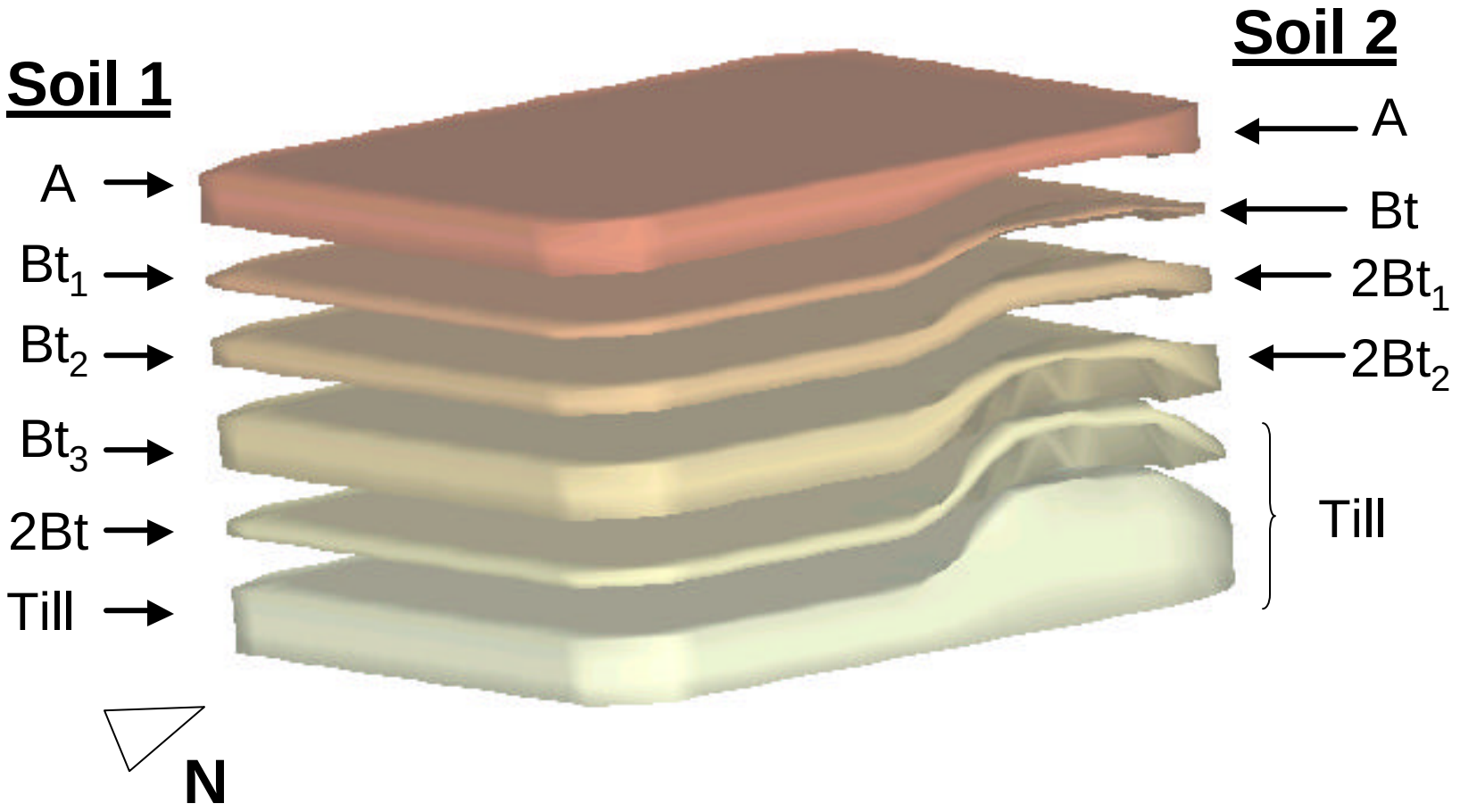
Only 4 ft
of relief in
100 yds

N

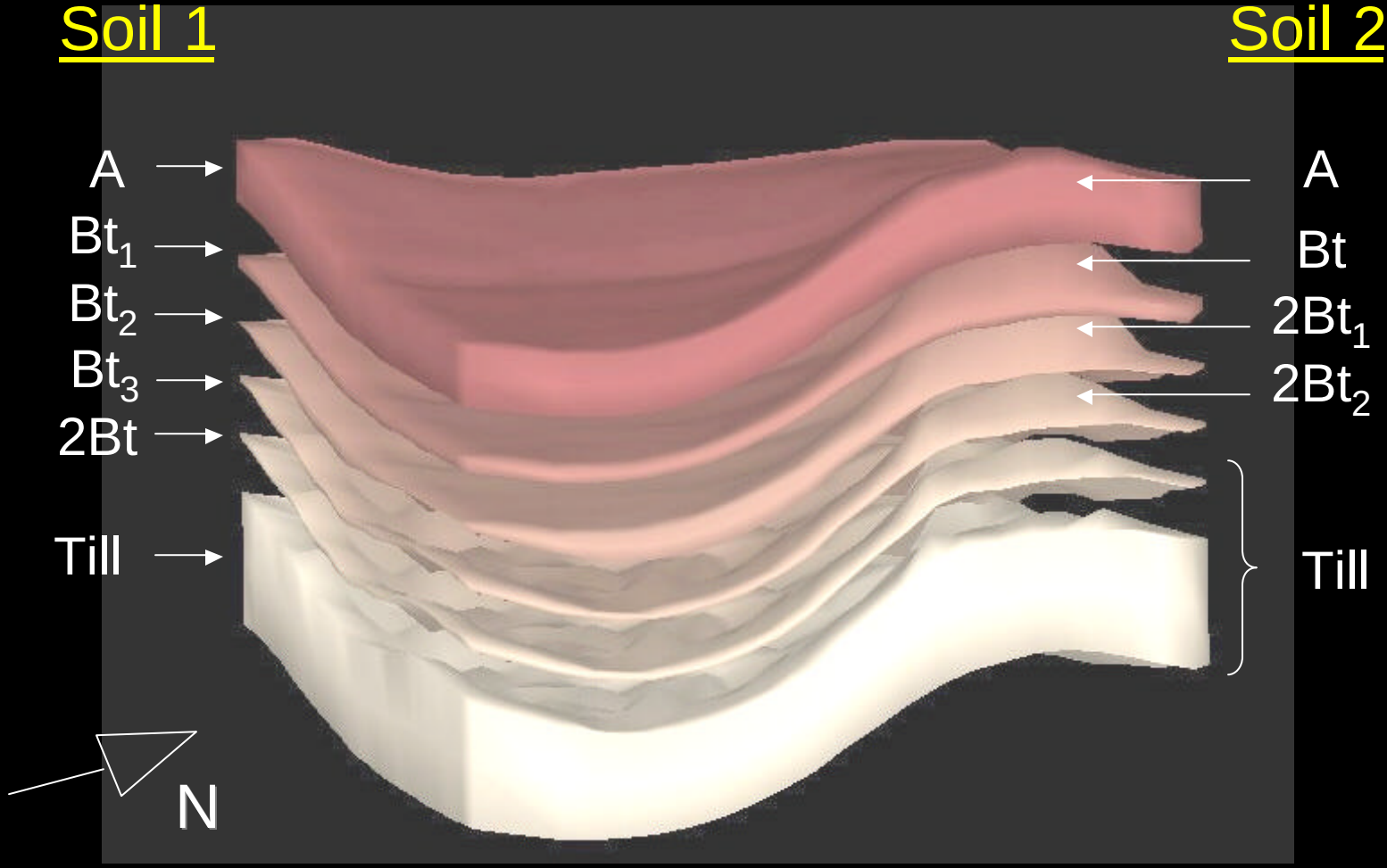


Soil Survey & Topographic Maps

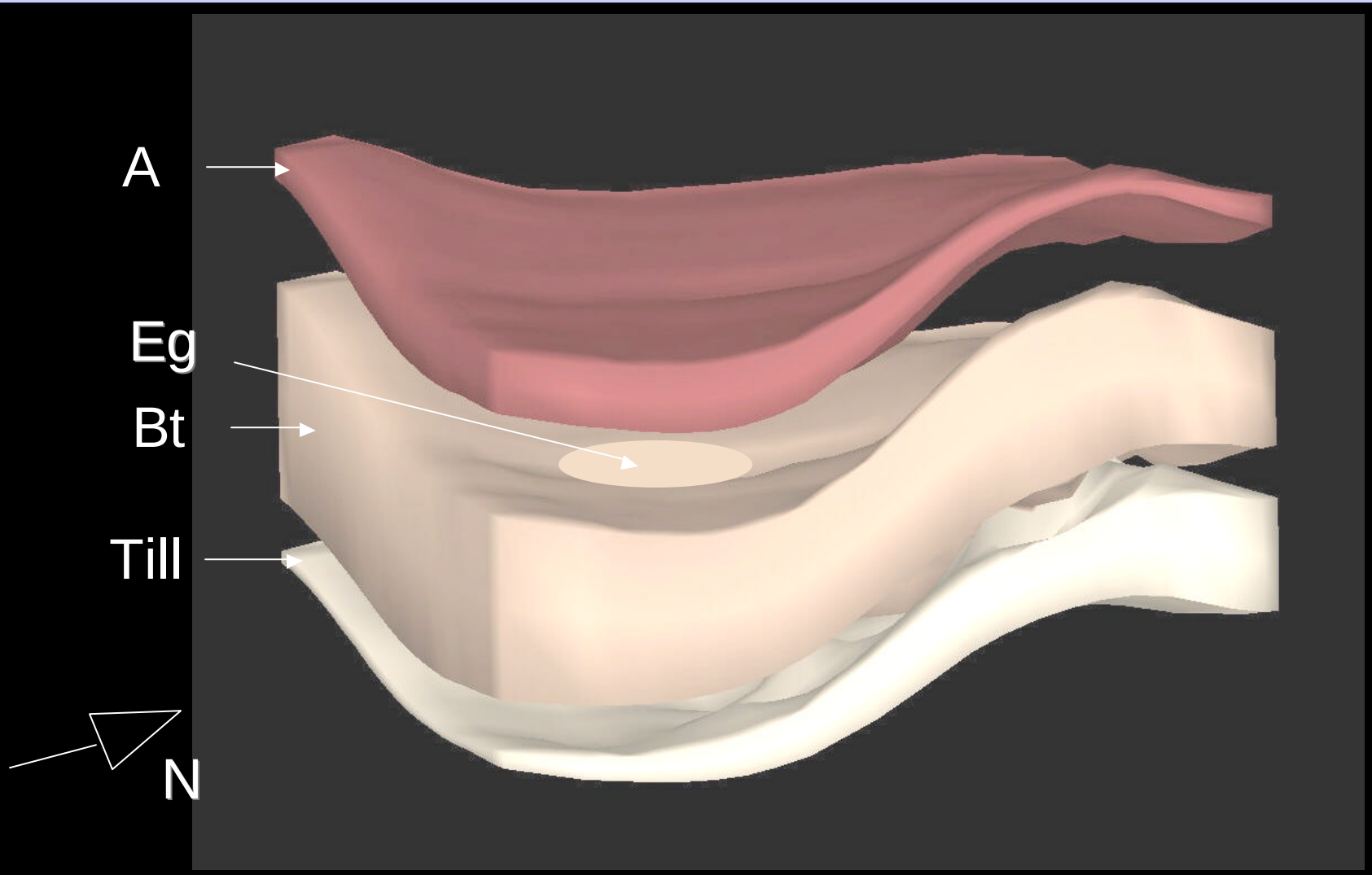
- No Slope



Differential GPS Topography & Plant-Available Water Map



Landscape Survey Sensors, Penetrometer, & Core Subsampling



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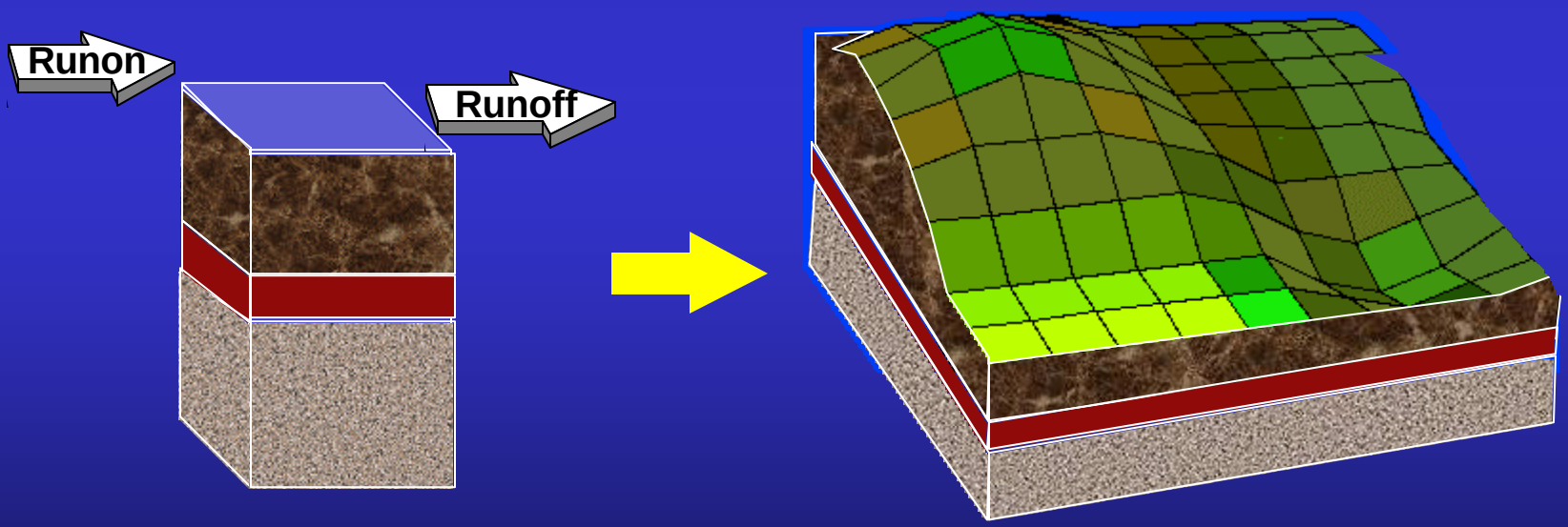
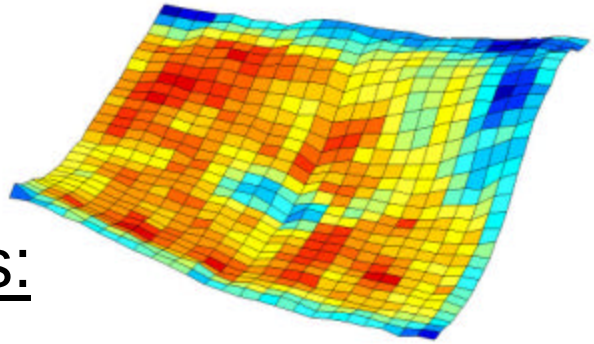


1999 Yield
Average Rainfall

Measured Yield:



Ave: 128 (0.11) Bu Ac^{-1}

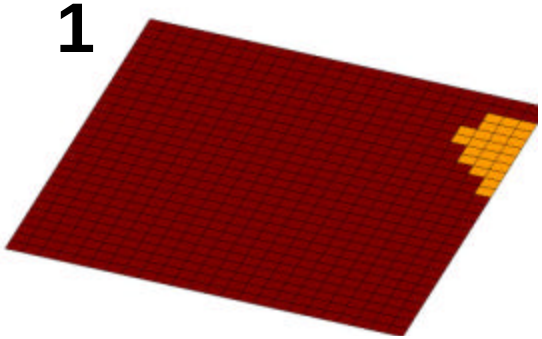
Landscape Maps:

Ave: 157 (0.03) Bu ac^{-1}
RMSE: 32 Bu ac^{-1}

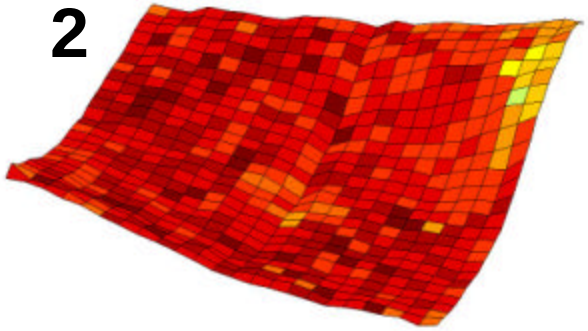
Ave: 149 (0.03) Bu ac^{-1}
RMSE: 21 Bu ac^{-1}

Ave: 154 (0.04) Bu ac^{-1}
RMSE: 28 Bu ac^{-1}

1



2



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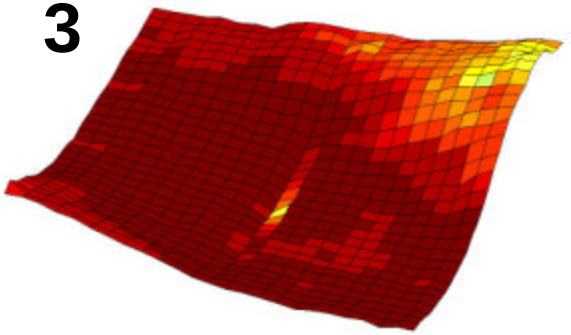
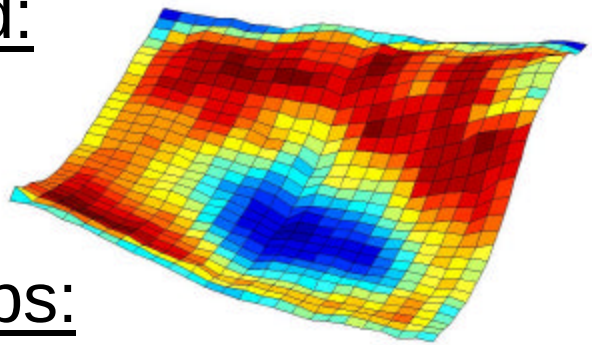


Bu ac^{-1}

2000 Yield
Wet Spring

Measured Yield:

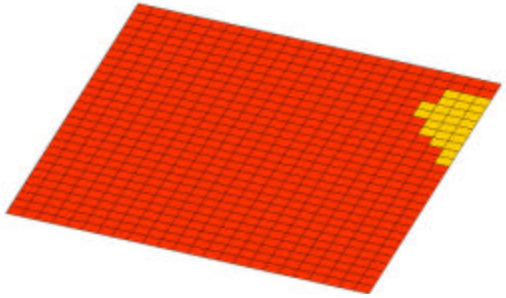


Ave: 106(0.44) Bu ac^{-1}

Landscape Maps:

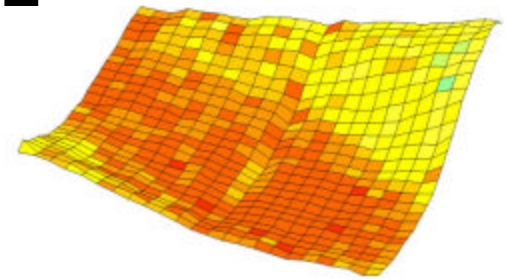
1

Ave: 143(0.03) Bu ac^{-1}
RMSE= 59 Bu ac^{-1}



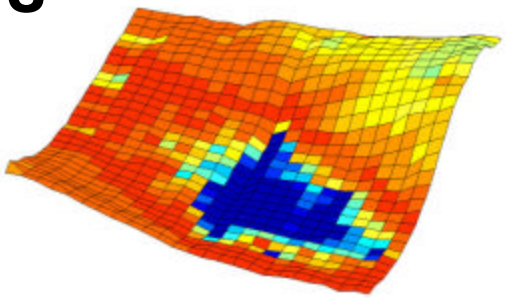
2

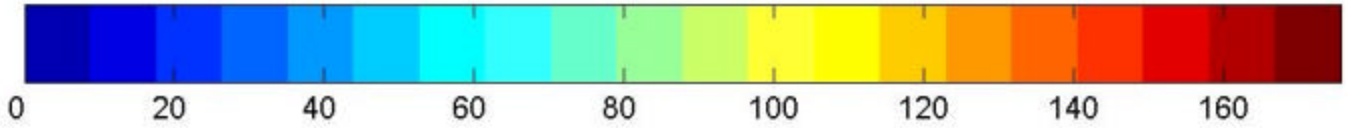
Ave: 124(0.09) Bu ac^{-1}
RMSE= 55 Bu ac^{-1}



3

Ave: 120(0.19) Bu ac^{-1}
RMSE= 50 Bu ac^{-1}





Bu ac^{-1}

Summary

- Better topographic information than a USGS topographic map is essential particularly with runoff

- Spatial distribution of the root limiting or impermeable horizon is essential

Conclusions

- Information on the spatial (x,y,z) distribution of contrasting soil materials over a landscape is essential for improving the utility of landscape models