

# 2017 Western Bridge Preservation Partnership Meeting

May 2017

Colorado Department of Transportation



# geoHazards



# Sink holes







# Debris flow





# Landslides





# Embankments







# Rockslides





# Rockfall





MILE  
2  
6  
5  
50





*Sooo, what is it you would say ... you are doing here?*



Promote awareness of geohazards  
Discuss bridges and geohazards ...  
Incite discussion on asset optimization





Glenwood Canyon  
Thanksgiving Day 2004,  
rockslide initiates  $\approx 1,300$   
feet above Interstate 70









Damage from 2004 incident



Damage from 2010 slide





# Rock shed – mitigation concept







# I-70 Glenwood Canyon

February 2016







Example of damage from slide  
Initiation of 2016  
rockslide in Glenwood  
Canyon





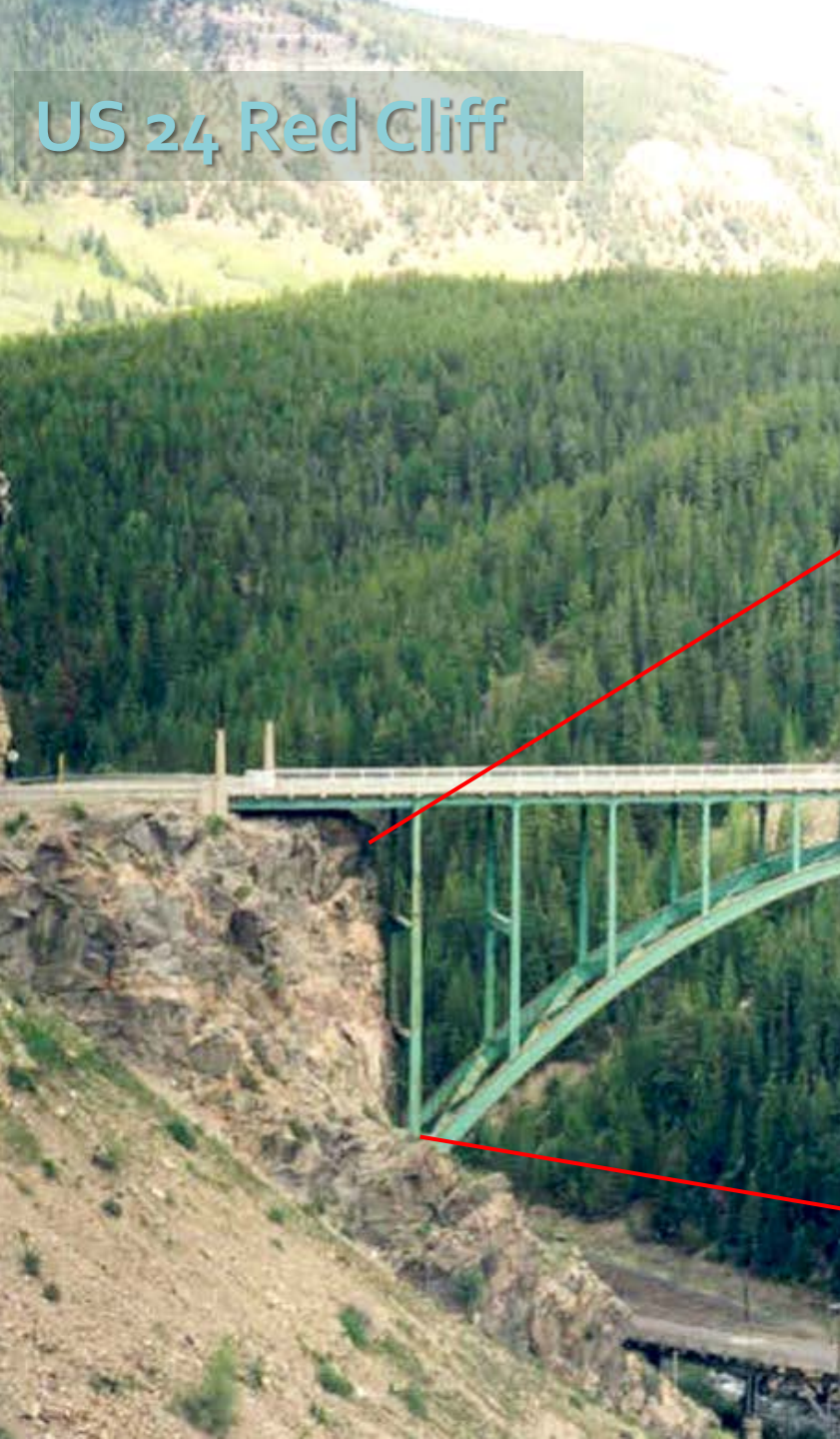
# Mitigation – Rockfall Fence (5,000 kJ)



08.04.2016



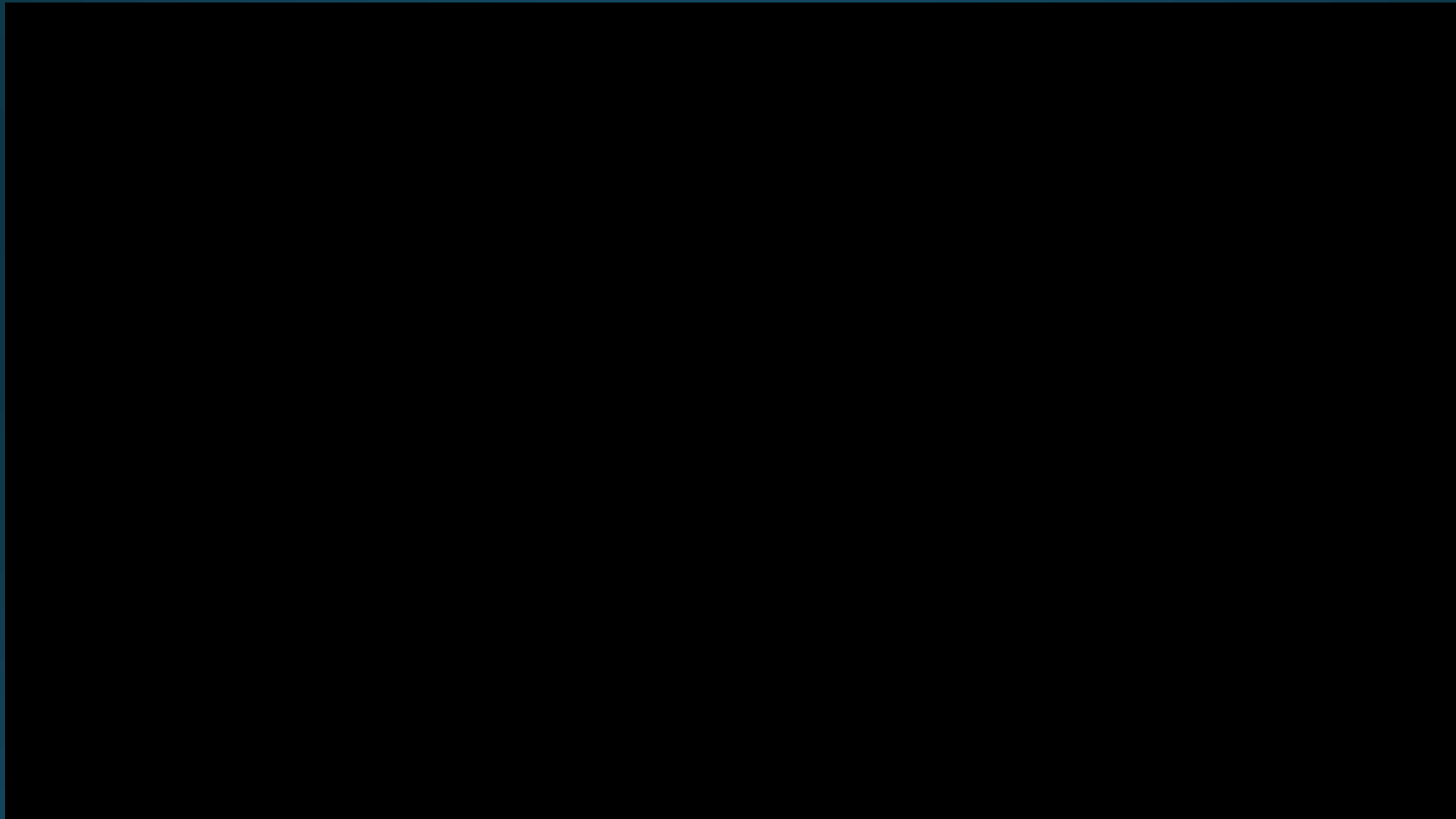
# US 24 Red Cliff



## Rockfall









# US 24 Waldo Canyon – Mitigation option







How do our assets  
affect our ability to  
get from one place  
to another?





# Asset Management



Taiwan, 2010





# Risk Based Geohazards Management Plan

Measure the effect geohazards have on the transportation system by measuring risk to,

*Safety*

*Mobility*

*Maintenance/System Preservation,*

Risk measured by cost,

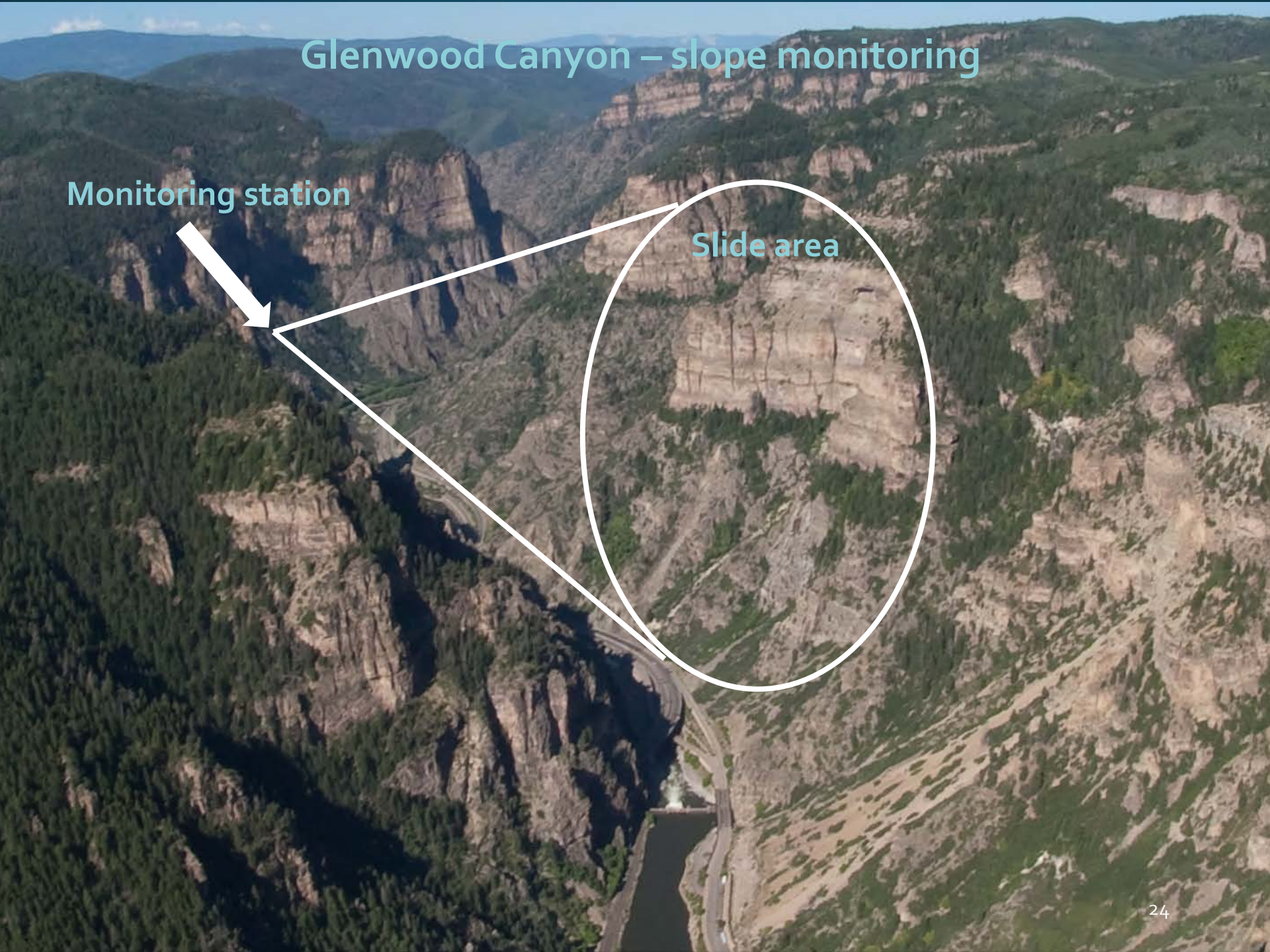
Incorporation into CDOT's Asset Management Program



## Glenwood Canyon – slope monitoring

Monitoring station

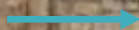
Slide area





View from monitoring station

2004



2010





# I-70 Glenwood Canyon (Radar) – data

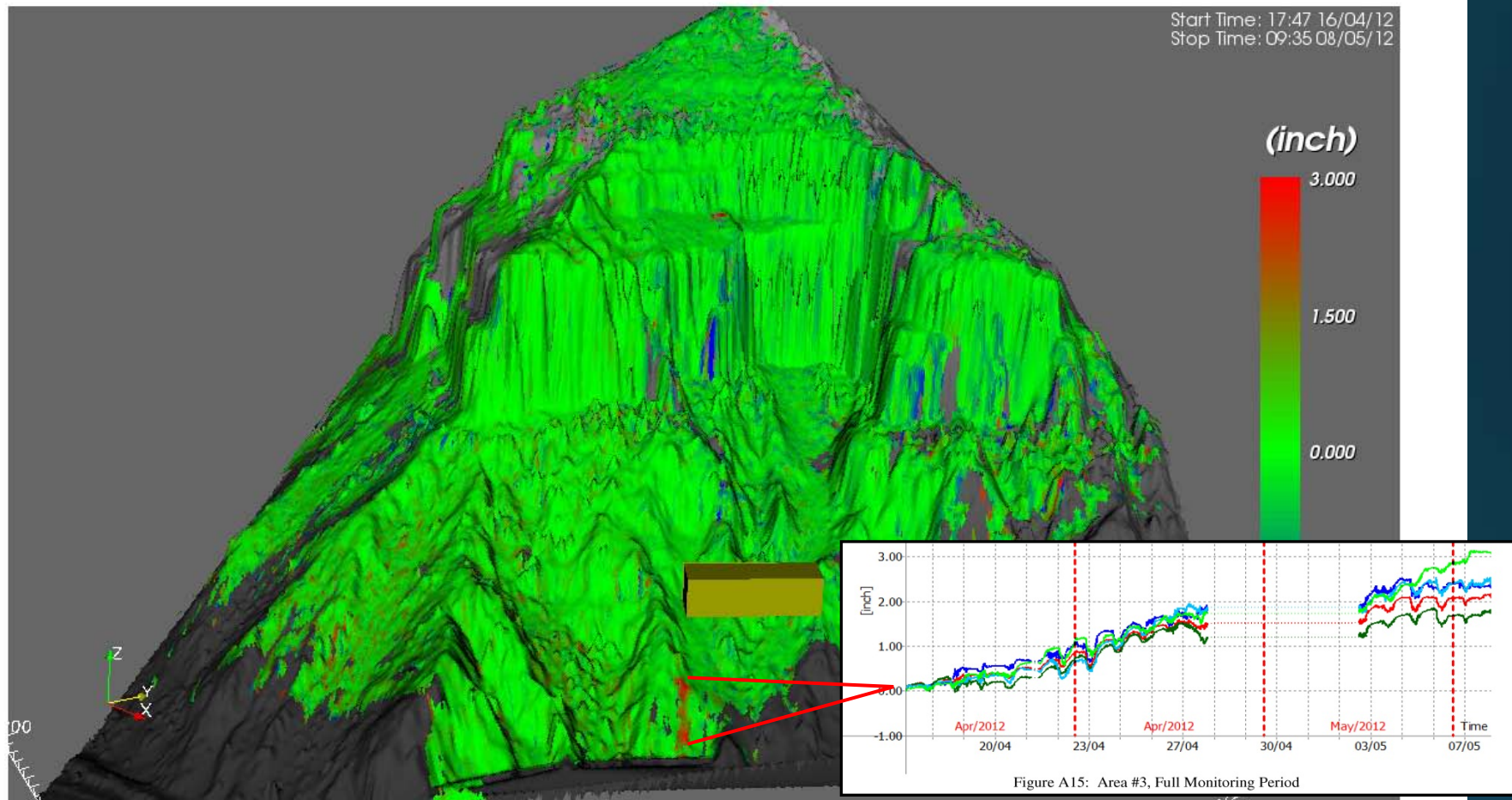


Figure A6: Data Overview, Full Monitoring Period



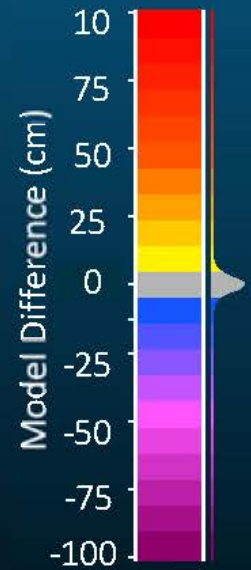
Example of slow displacement

Example of rockfall

Perspective view, scale varies.

Example of spurious change (tree)

Example of debris slide



Detection  
Limit  $\pm 5$  cm

40 m

# Remote sensing as a decision tool?





Thank you