AASHTO Extreme Weather Events Symposium

Vermont's Road and Rivers - Managing for the Future



May 22, 2013

PLANET EARTH

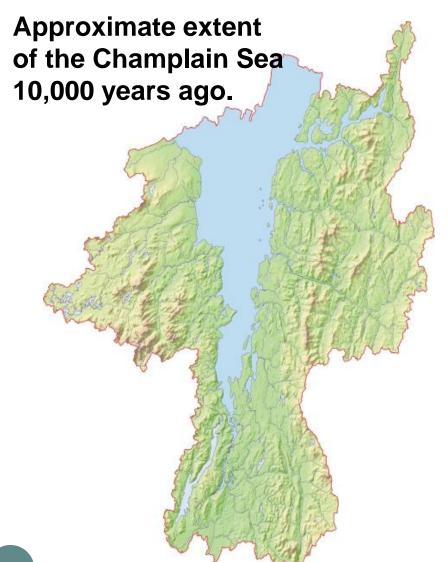


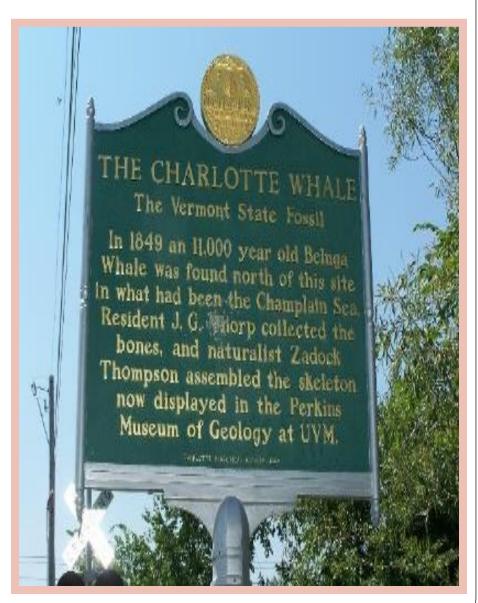
MANY MANY YEARS AGO



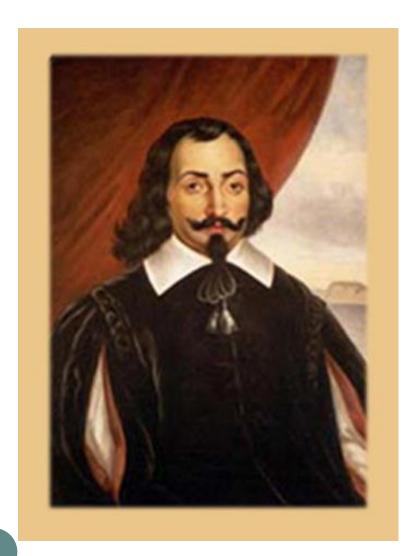
23,000 years ago there was more than 8,000 feet of glacier over Vermont

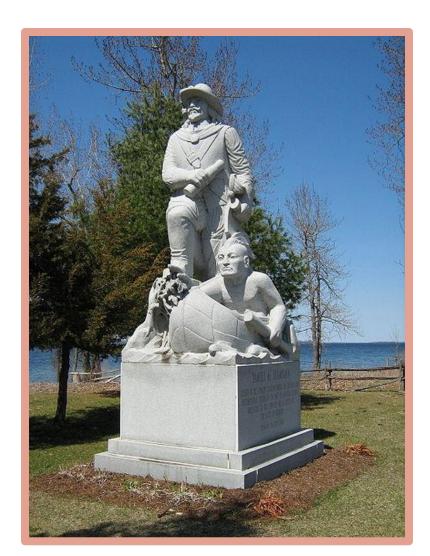
MANYYEARS AGO



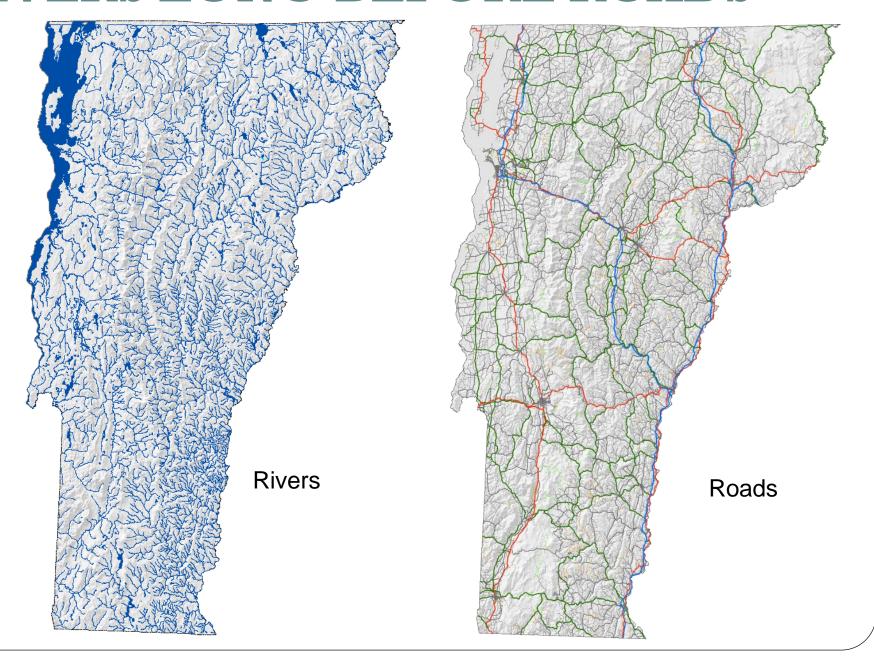


1609 – Samuel de Champlain EXPLORES THE LAKE





RIVERS LONG BEFORE ROADS



VERMONT'S LANDSCAPE HAS



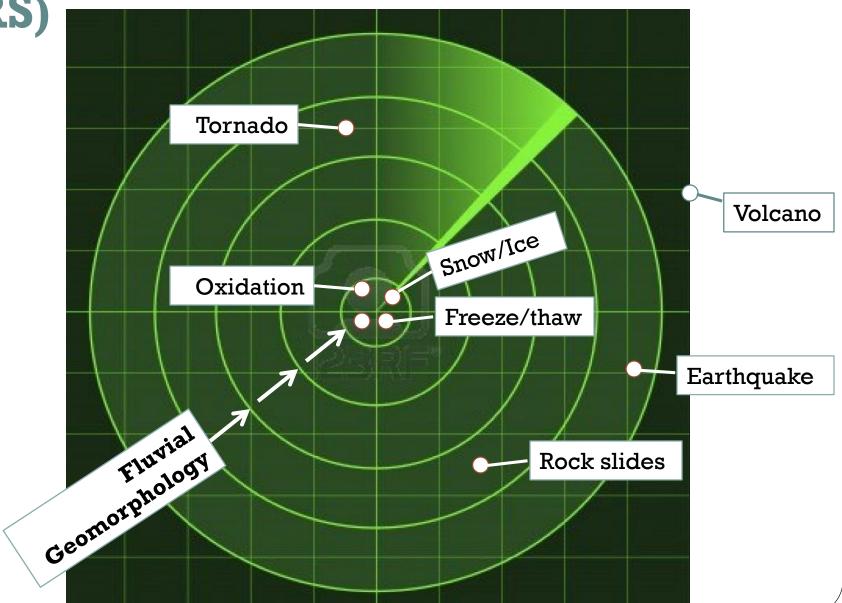
REFORESTED
OVER THE PAST
100 YEARS

Topsham, VT 1907 vs. 2007



VT's RESILIENCY RADAR SYSTEM

(RRS)



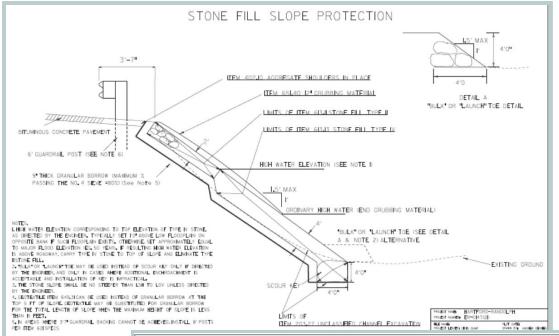
VTrans HYDRAULICS MANUAL UPDATES

- Vermont's old manual focused on hydraulic capacity of structure (water only). The new manual will employ a "river science" approach and consider hydraulic capacity, sediment and debris.
- The new manual will likely allow for more risk based design in terms of roadway safety and stream stability. A structure on town road with an ADT of 2000 over a unstable channel will be designed differently than a town road structure with and ADT of 20 over a stable channel.
- The new manual will parallel language in the latest stream alteration permit. This will make the process more clear to people unfamiliar with the design and permitting process (FEMA).

Buels Gore, Chittenden County, VT



SIDE SLOPE DESIGN



STONE FILL SLOPE PROTECTION WITH STONE TOE WALL ITEM 402.10 ACCREGATE SHOULDERS IN PLACE ITEM 65L40 I2* CRUBBING MATERIAL LIMITS OF ITEM SIGNISTONE FILL TYPE II LIMITS OF 613-13 STONE FILL TYPE IV BITUMINOUS CONCRETE PAVEMENT 6' GUARDRAL POST (SEE NOTE 6) HIGH WATER ELEVATION (SEE NOTE 7) 9" THICK CRANLLAR BORROW IMAXIMUM % PASSING THE NO. 4 SEVE =80%) (See Note 9) INTERPORTE EMPORTED HELL OF CHECKET THE STOCK OF THE THE LESST DEPOCH OF THE DEST OF THE CHECKET THEOREMS OFFER SHALL OF MORELS, AND APPROPRIES OF THE CHECKET THE SHALL OF THE SHALL OF MORE AND AND THE STOCK SHALL OF MORE AND AND AND ADMITTED THE SHALL OF MORE OF SHARPOON. THE SHALL OF WARRIET (SHAPPOILE MORE SHALL OF THE S ITEM 613.15 5 FT RIPRAP, HEAVY TYPE (MOD.) (SEE 6"-I2" OFFSET ORDINARY HIGH WATER (END GRUBBING MATERIAL) ROCKS ON ADJACENT THERS. S.FOOTER ROCK SHALL BE EVERDOED BELOW THE CHANNEL A WINNER OF 40°OR A CONTRACTOR SHALL CAREFULLY SELECT AND PLACE NOMICUAL STONES TO MANIMUSE CONTACT ATTH ADJACENT STOKES, S, TO EXTENT PRACTICAL STOKES SHALL OF TOWARD EMBANAMENT TO RETTER RESET SLOWER. 6' MAXIMUM EXPOSED TOE WALL IB* MINIMUM 4' MINIMUM EMBEDMENT EXISTING GROUND PEN TEM 62 SPECS. T. HICH WATER ELEVATION CORRESPONDING TO TOP ELEVATION OF TYPE IN STONE, AS CHECTED BY THE PRIMEER, TYPICALLY SET TO ABOVE LOW PLOCOPLAN ON OPPOSITE SHAW F SUCE PLOCOPLAN DOUTS, OTHERWISE, SET AMPOINMENTED EQUAL TO MAJOR PLOO BLEVATIN, SELO, SO VERALLY RESULTING MEN MATER ELEVATION IS ABOVE DOLONAY, CARRY TYPE IN STONE TO TOP OF SLOPE AND ELIMINATE TYPE II ISEE NOTE 3) LIMITS OF AND COMMENTS AND COMMENTS AND COMMENTS OF THE STORE SLOPE SHILL BE NO STEEPED THAN LEN TO LAW LALESS OFFITED OF THE BOARDS.

IN THE BOARDS.

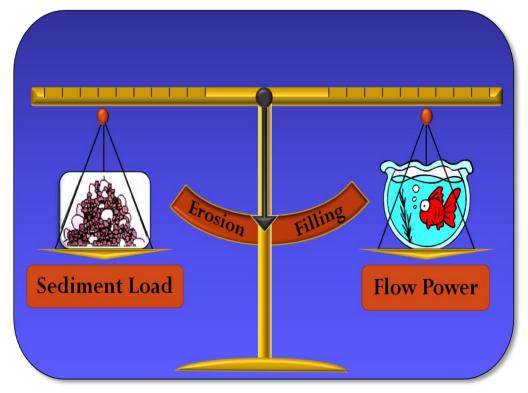
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- New typical sections used by OPS on slope repairs adjacent to rivers.
- In the past they had dumped stone down the slope, lots of time further constricting the river channel.
 - Now they are working backwards. With the help of fluvial geomorphologists we are defining a stable channel dimensions and building the slope to match that as best possible.

FLOOD AND EROSION HAZARDS

The flood-related processes, erosion and deposition, are the physical adjustments

by which rivers
Maintain an
equilibrium
condition



FLOOD AND EROSION HAZARDS

Ironically, those **flood** processes, which erode and deposit sediment, form level lands that are the most easily developed for roads and buildings, and, at the same time, are the most hazardous.



FLOOD AND EROSION HAZARDS

Managing public infrastructure in erodible, hazardous areas requires the knowledge to minimize conflicts with the channel adjustment processes imperative to the maintenance of equilibrium conditions.

For instance:

How does road and bridge infrastructure change flow and sediment regimes or channel slope, depth, and roughness and cause disequilibrium, where severe erosion hazards may follow?



VERMONT'S ROAD AND RIVER TRAINING: TIER 1

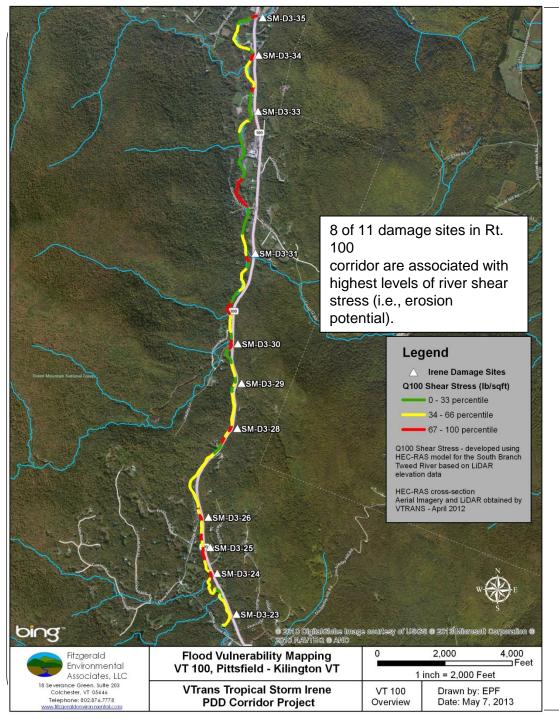
A History of River Management

TRAINING TOOLS



TRAINING TOOLS





FORCASTING: Flood Vulnerability Mapping Using LiDAR Data

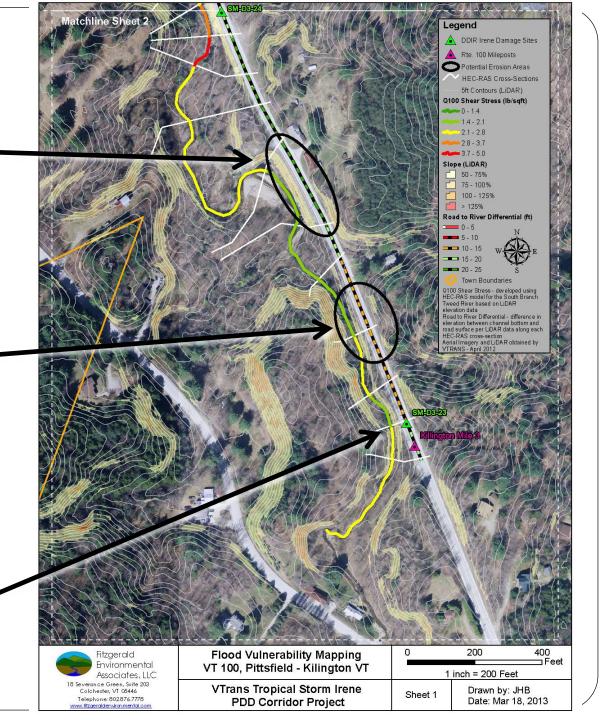
Process-based approach to identify and prioritize risk in river-roadway corridors:

- Hydrologic and hydraulic modeling (HEC-RAS) to quantify river and floodplain erosion potential.
- 2. LiDAR slope mapping to identify slopes >100% in between roadway and river.
- 3. Identify areas of roadway with limited relief from river that are susceptible to erosion during flood events.





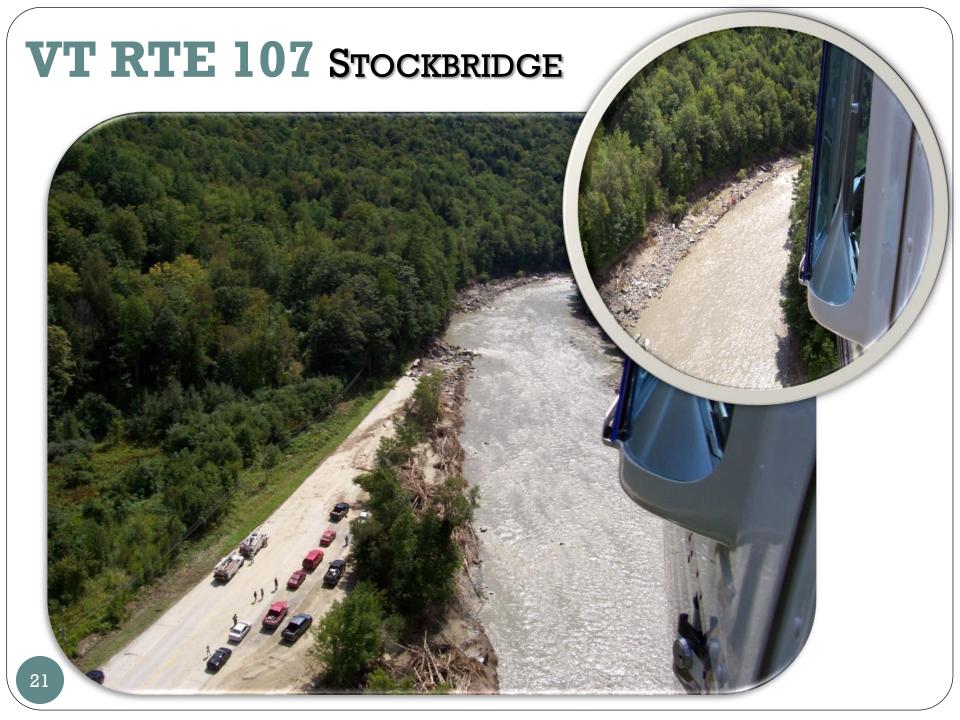




US 4







TRANSPORTATION UPDATE

Irene has fundamentally changed how VTrans operates and that change process – focused on

<u>innovation</u> – is ongoing.





ROADS AND RIVERS TRAINING PROGRAM

 The Tier One training module can be accessed through the following link:

http://wsmd.vt.gov/rivers/roadstraining/

- The class is expected to take approximately 1.5 to 2 hours to complete, and it is free of charge.
- This training is recommended for engineers, technicians, equipment operators, highway foreman and others. Please feel free to share it with anybody who might be interested in learning more about how river systems work.