

- The following Presentation was presented on May 31, 2012 at 6:00 to the Thornton Board of Selectmen and attendees.
- Per the request of the Thornton Board of Selectmen.
- Location: 16 Merrill Access Rd. Thornton, NH 03285.
- A Copy of the presentation was mailed to Mark Decoteau (Waterville Valley Town Administrator),
- Attendance list following this page.

# Selectmen Meeting

May 31, 2012

6:00 p.m.

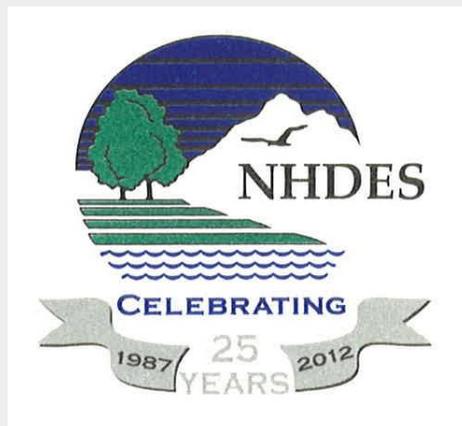
Sign In Sheet

**PLEASE PRINT YOUR NAME AND ADDRESS.**

Thank you!

1. Tammie Beaulieu Town Admin Thornton 16 Merrill Access Rd. Thornton
2. Chief Moller PD
3. Julie Morton
4. STEVE Morton
5. Marianne Peabody
6. Jim Gallagher NHDES Dam Bureau
7. Chuck Corliss NHDES Dam Bureau
8. Steve Doyon NHDES Dam Bureau
9. BILL DAUER USFS
10. TOM WAGNER USFS
11. Nancy Decoteau
12. Mark Decoteau Town of WV
13. JIM MAGHEE T/O WV
14. CHRIS BRIGGS TOWN OF WV / THORNTON RES.
15. Roger Jaborn Thornton Selectman
16. STEVE DOYON NHDES DAM BUREAU
17. \_\_\_\_\_
18. \_\_\_\_\_

# NH Department of Environmental Services Dam Bureau



Chuck Corliss  
Dam Safety Engineer

May 31, 2012

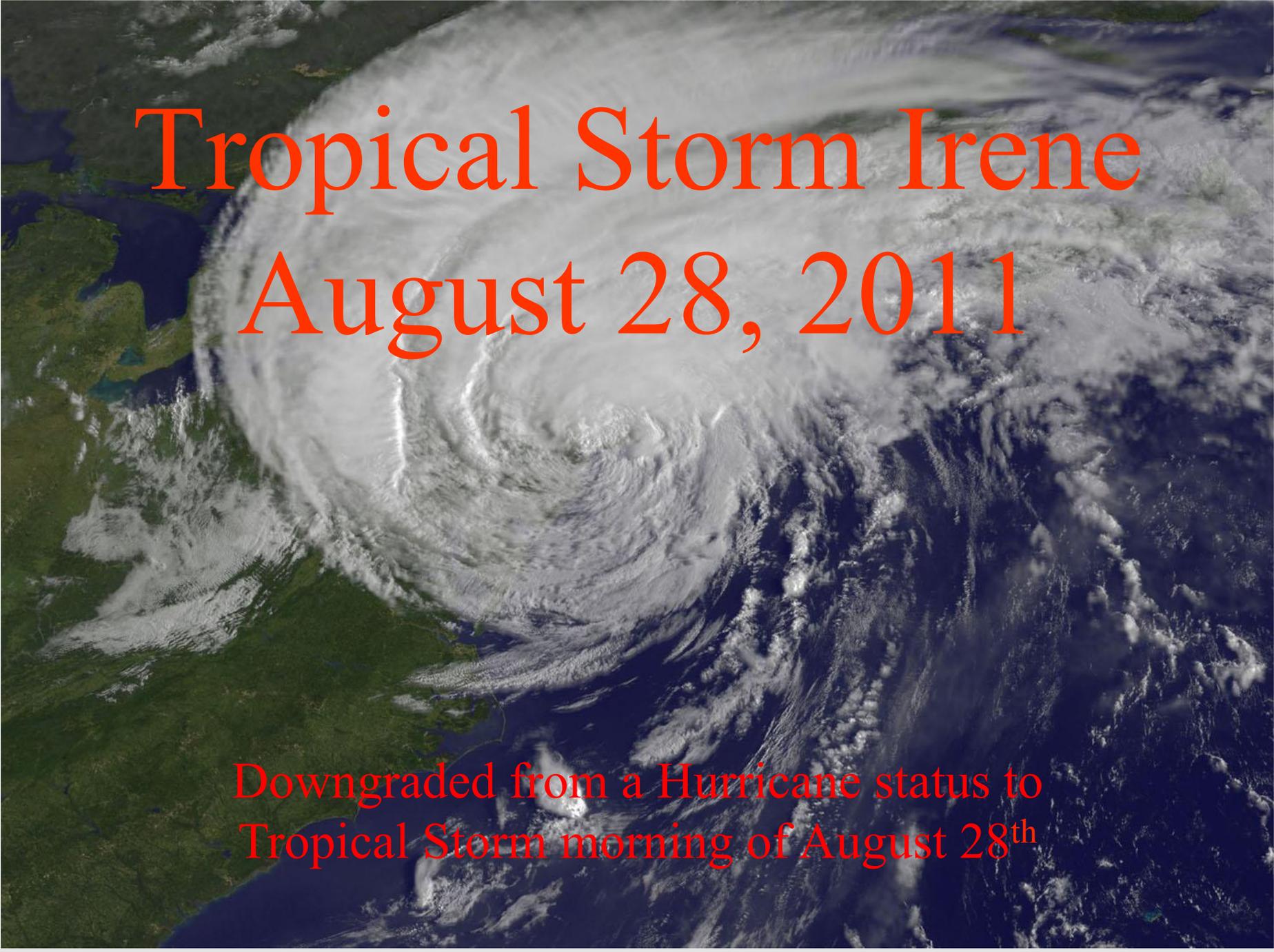
# Presentation Goal

Determine the amount of downstream incremental flow along the Mad River that was associated with the operation of the flashboards at Snow's Pond Dam during Tropical Storm Irene.

# Agenda:

- Rainfall of 8-28-2011
- Snow's Pond Dam & Watershed
- Snow's Brook Roadway Crossing
- Campton Pond Dam & Watershed
- Upper Portion of the Campton Pond Dam Watershed
- Mad River Cross Section
- Conclusions

# Rainfall of 8-28-2011

A satellite image of Tropical Storm Irene, showing a large, well-defined eye and a dense, swirling cloud structure over the Atlantic Ocean. The storm is positioned over the eastern coast of North America, with the Gulf of Mexico and the Atlantic Ocean visible. The text is overlaid in red on the image.

# Tropical Storm Irene

## August 28, 2011

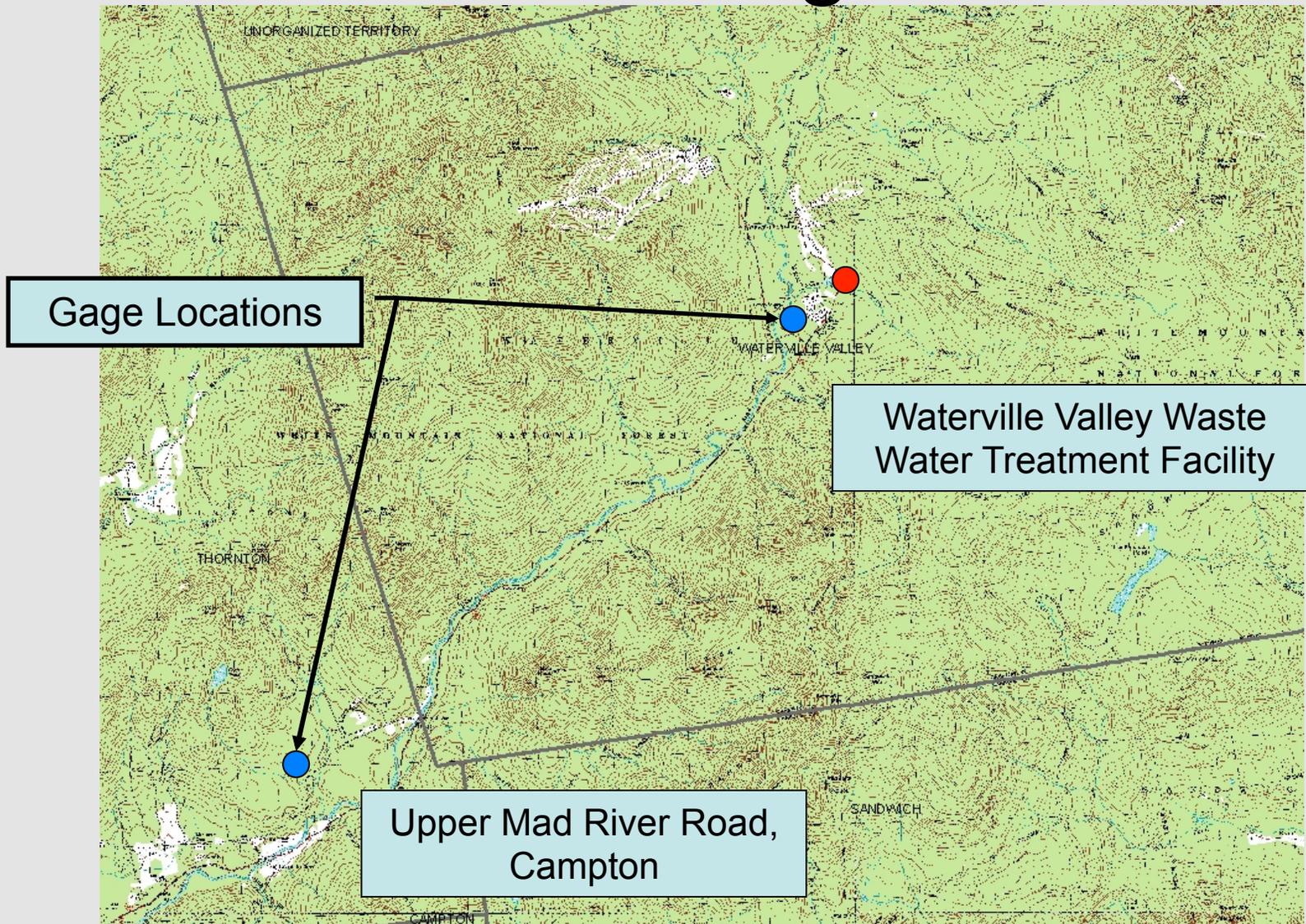
Downgraded from a Hurricane status to  
Tropical Storm morning of August 28<sup>th</sup>



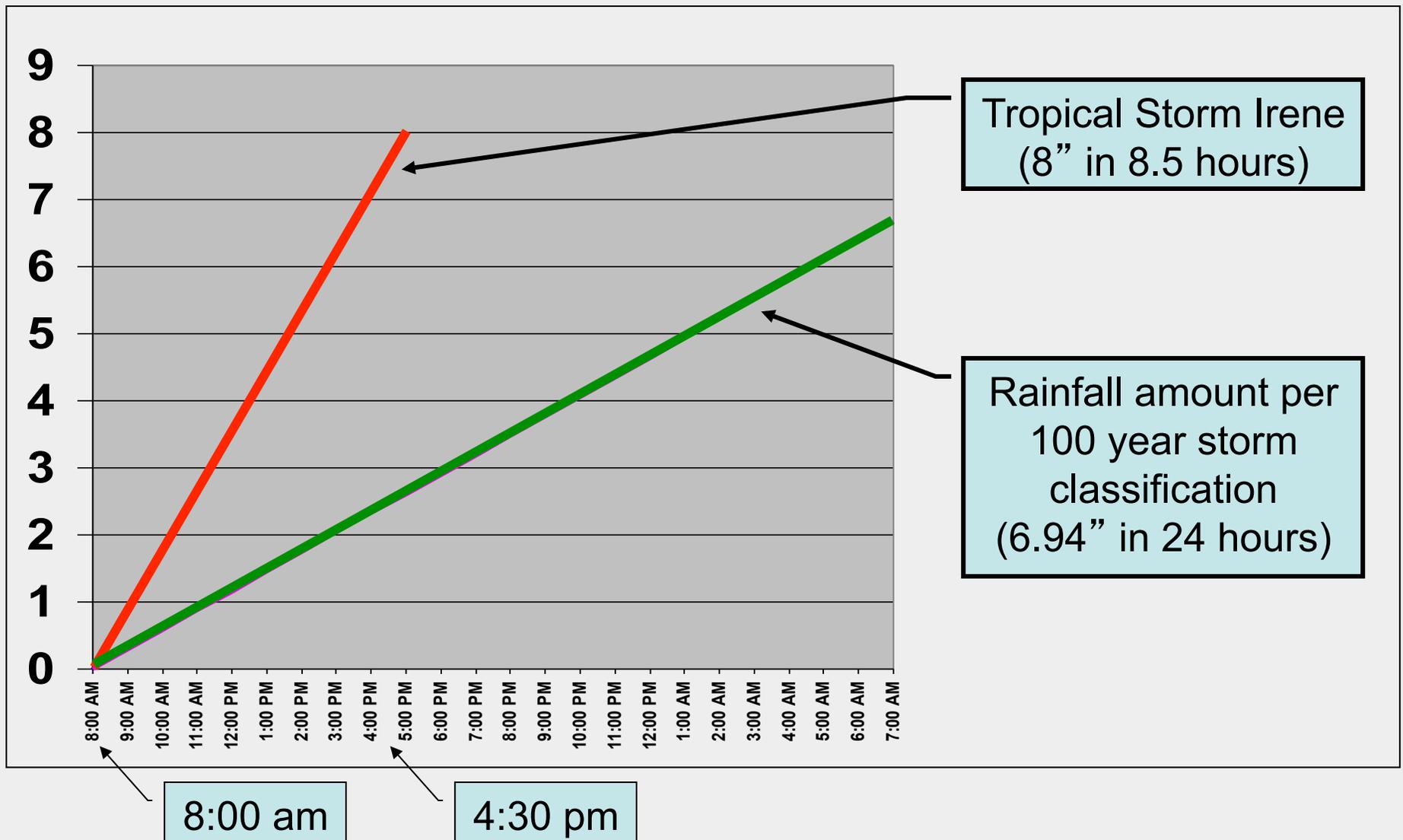
# Correspondence with National Weather Service, Gray Maine

- “We have precipitation for the State, but do not have any data specifically for the Mad River basin.. We do have radar data and we can share that with you. Radar estimates in the Mad River Basin were between 10 and 12 inches. The heaviest rain fell over the last 4 hours of the event from about 12PM to 4PM when rainfall rates were near or over 4 inches per hour. There was also a heavier band of rain that came through early in the morning between 1AM and 5AM, however the afternoon rain was much heavier”

# Rainfall Gage Data



# Tropical Storm Irene Rainfall



- Month of August 2011, rainfall amounts:  
6.55" prior to Tropical Storm Irene  
(4.42" normal average for month of August).

3.50" of this total occurred the Sunday  
prior to Tropical Storm Irene.

Note: Ground had a significant level of saturation  
prior to August 28

# Service Station, Downtown Plymouth



July 1, 1973

October 22, 1975

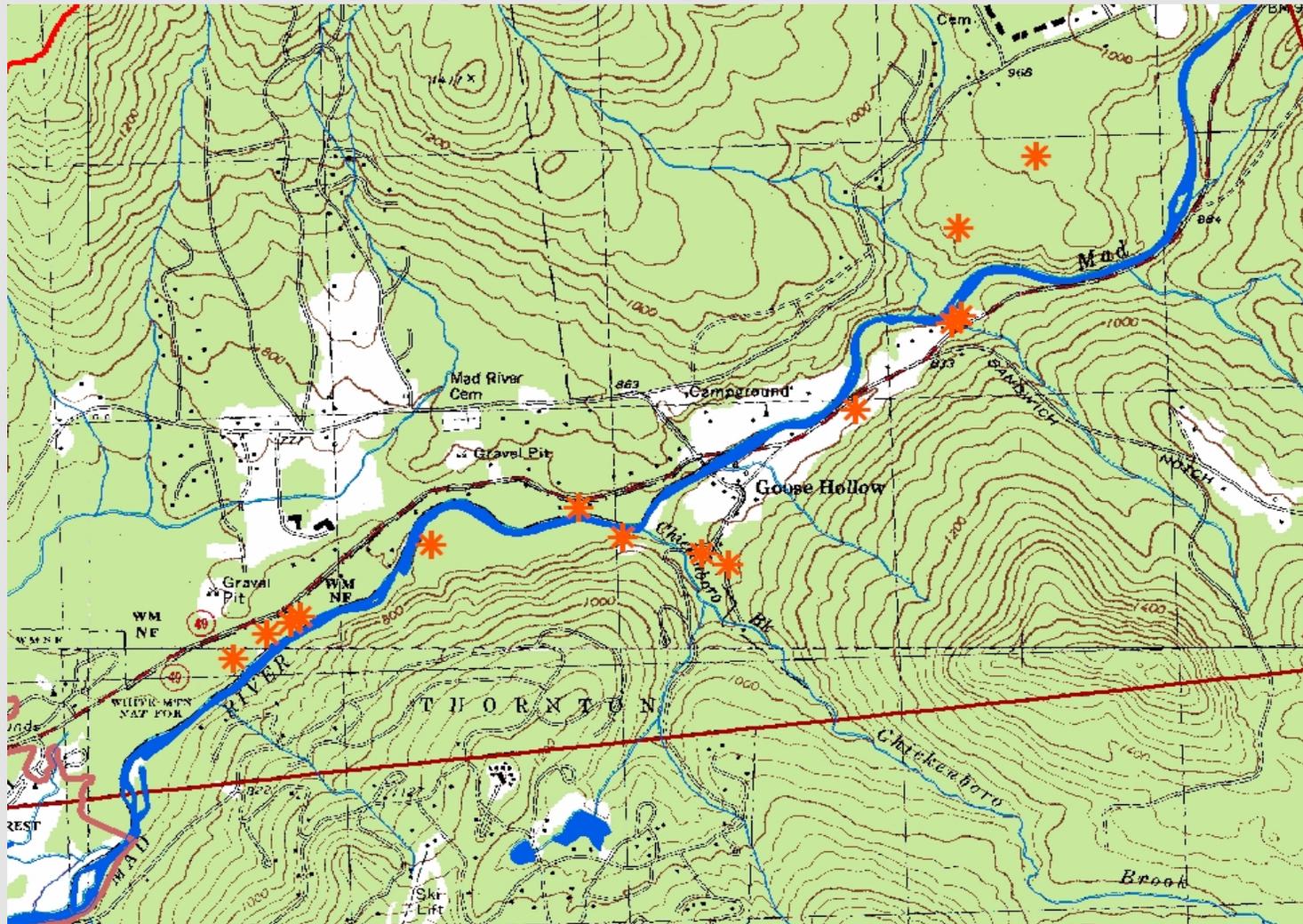
February 12, 1981

January 28, 1986

August 28, 2011

# Survey Respondents

Located 6.9 to 9.5 miles downstream of  
Snow's Pond Dam



# **Snow's Pond Dam & Watershed**

# Snow's Pond Dam

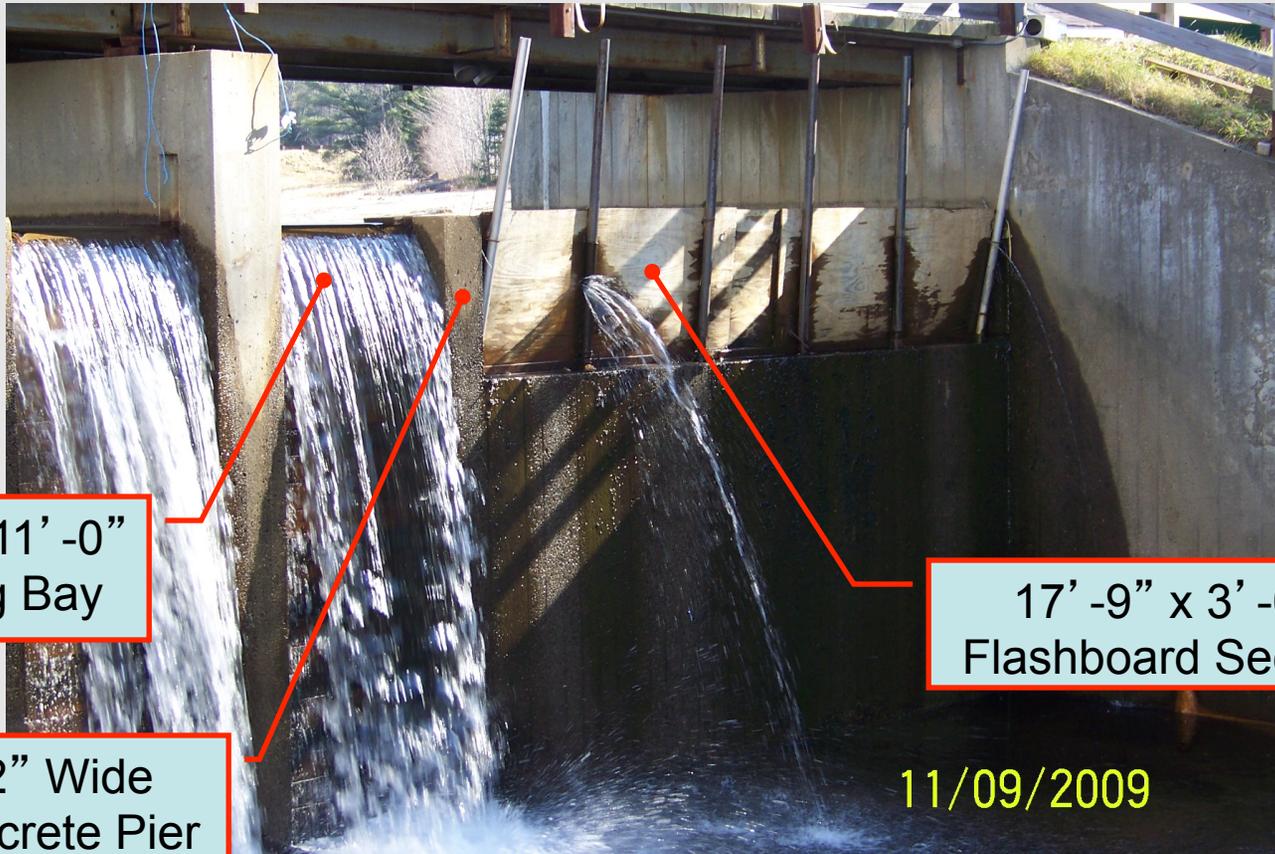


# Aerial View of Snow's Pond



# Snow's Pond Dam

## Stoplog and Flashboard Systems



4' -0" x 11' -0"  
Stoplog Bay

12" Wide  
Concrete Pier

17' -9" x 3' -0"  
Flashboard Section

11/09/2009

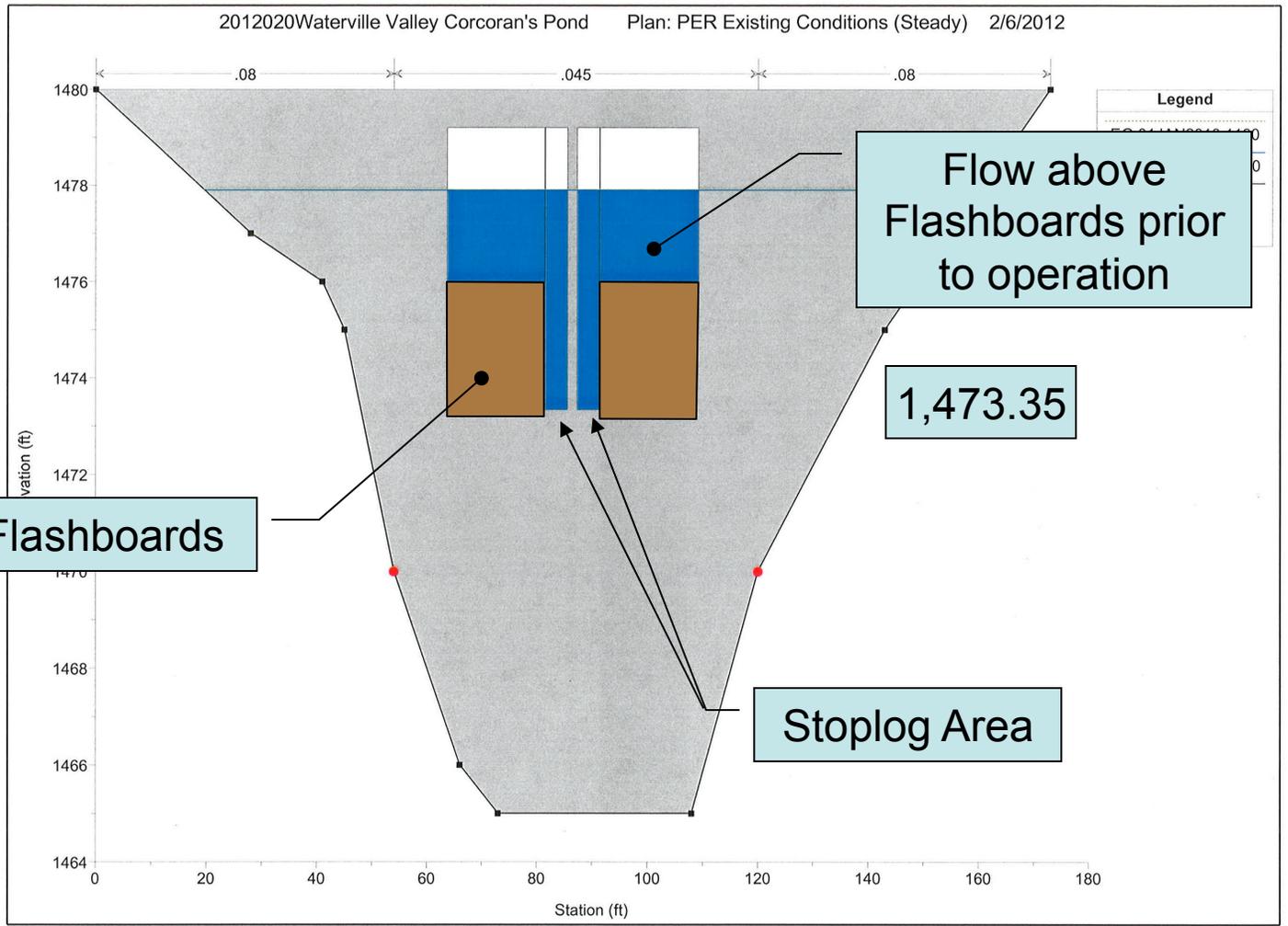
# Snow's Pond Dam Outlet Cross Section

1,480.00

1,477.90

1,476.00

1,473.00



# Snow' s Pond Dam

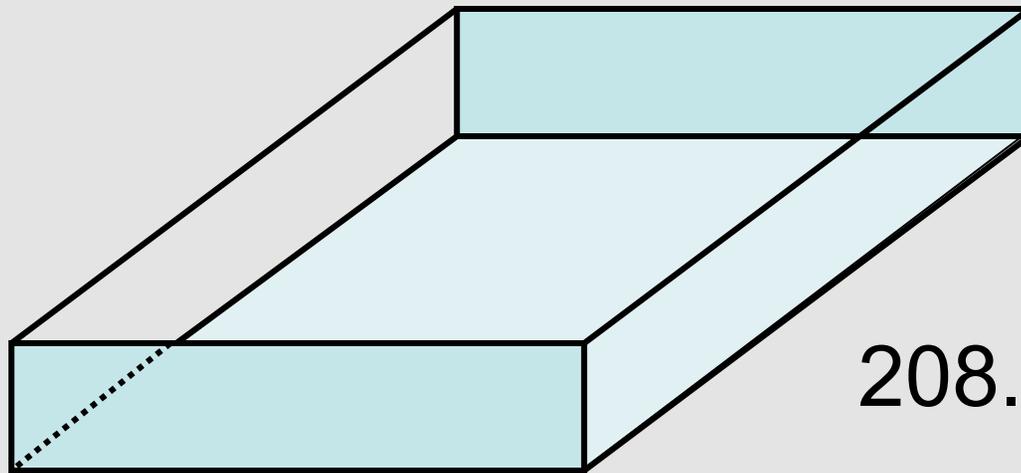
- General Information:
  - Normal pool elevation = 1,476.0 (top of flashboards).
  - Pond surface area = 4.9 acres, Say 5.0 acres.
  - Top of dam elevation = 1,480.0.
  - Stoplogs placed to elevation = 1,475.75 (Normal day).
- Saturday August 27, 2011:
  - 5:00 pm, 2 stoplogs removed to elevation 1,474.79.
  - 7:00 pm, 3 more stoplogs removed to elevation 1,473.35.
  - Noted in Owner' s Operation, Maintenance and Response Plan (OMR).
- Sunday August 28, 2011, Tropical Storm Irene:
  - 10:00 am Pond Level at elevation 1,473.35, top of stoplogs.
  - 1:30 Flashboards bent over approximately 30 degrees, pond elevation 1477.00.
  - 2:00 +/-, Flashboards operated with water level 25" below top of dam, elevation 1,477.92.
  - Storage from base of flashboards to height of pond during Tropical Storm Irene, at 23" above flashboards = 24.9 acre-ft.

# Snow' s Pond Dam

- General Information:
  - With computer software, HydroCAD 10.0, HEC RAS 4.0 and Excel spreadsheets models computed and compared pre and post flashboard flows at the dam and downstream cross pipes.
- Calculations/Analysis:
  - Pre flashboard operation; Flow = **591 cfs** at dam (cubic feet per second).
  - Post flashboard operation; Flow = **1,564 cfs** at dam.
  - Assumed incremental flow due to flashboard operation = **973 cfs**
  - A flow of 1,564 cfs would fill Snow' s Pond in 12 minutes.

# 1 Acre-Foot

208.7 feet



1 foot High

208.7 feet

43,560 Cubic Feet of Volume



# **Snow's Brook Roadway Crossing**

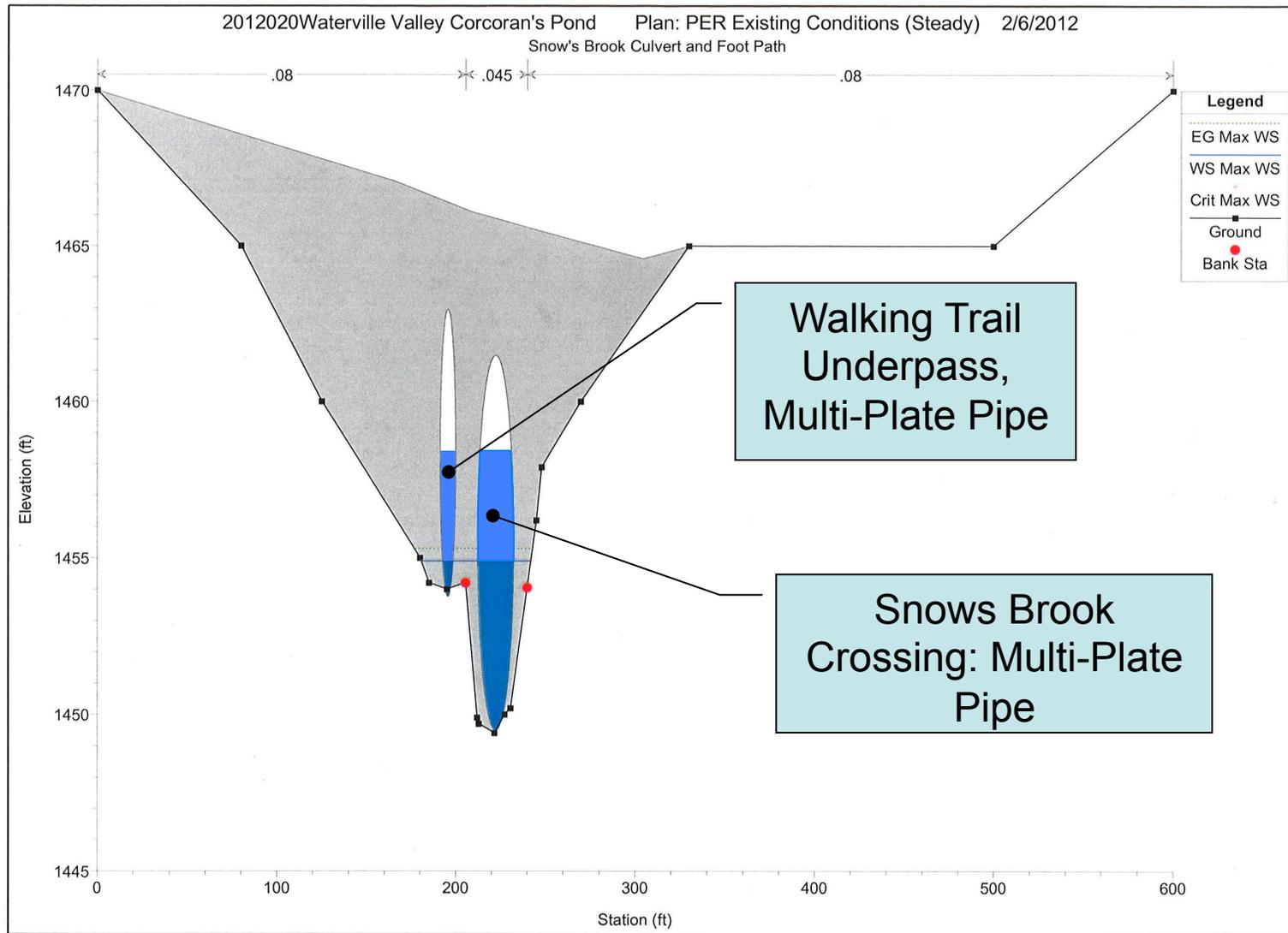
# Snow's Brook Road Crossing Downstream View



# Snow's Brook Road Crossing



# Snow's Brook Roadway Cross Pipes Cross section



# Snow' s Brook Road Cross Pipes

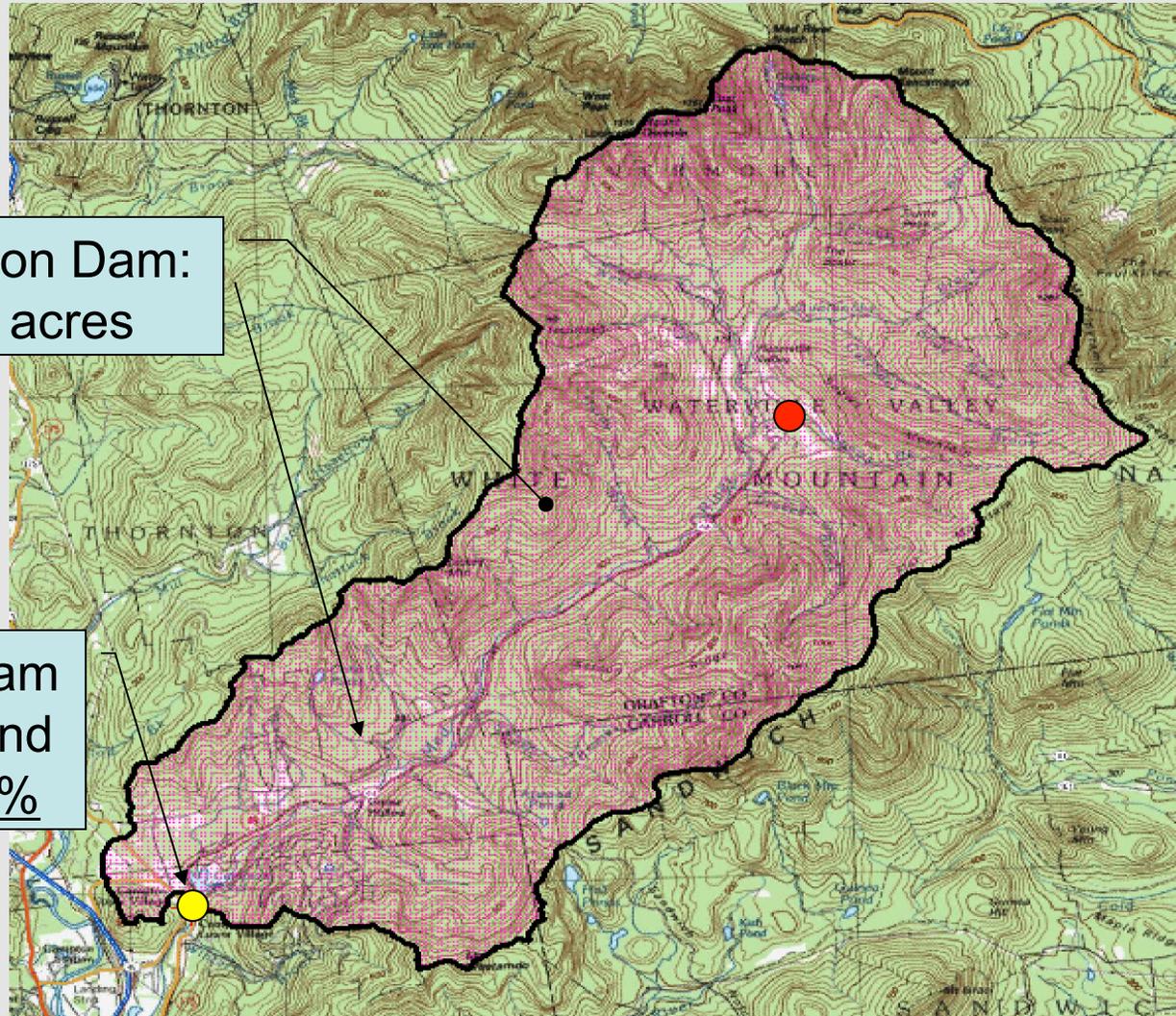
- General Information:
  - With computer software, HydroCAD 10.0, HEC RAS 4.0 and Excel spreadsheets models computed and compared pre and post flashboard flows at the dam and downstream cross pipes.
  - Calculated flow from Snow' s Pond Dam slightly above flow volume calculated at debris line observed at upstream end of cross pipes.
- Calculations/Analysis:
  - Post flashboard operation, calculated flows at Snow' s Brook Roadway = **1,448 cfs**
  - For analysis, used higher number of **1,564 cfs** from Snow' s Pond Dam
  - Assumed incremental flow due to flashboard operation = **973 cfs**

# Campton Pond Dam & Watershed

# Campton Pond Dam



# Campton Dam Watershed

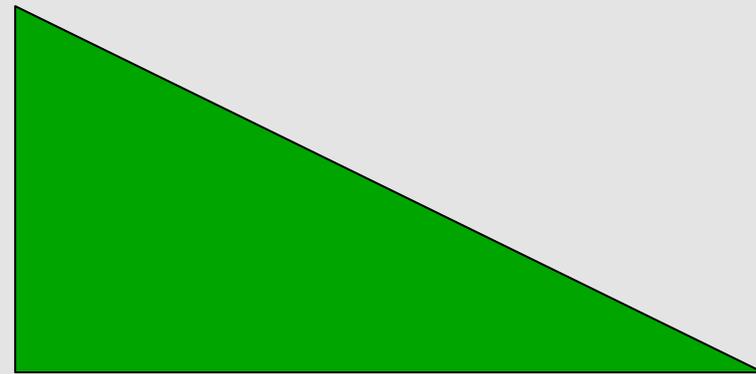


To Campton Dam:  
37,100 acres

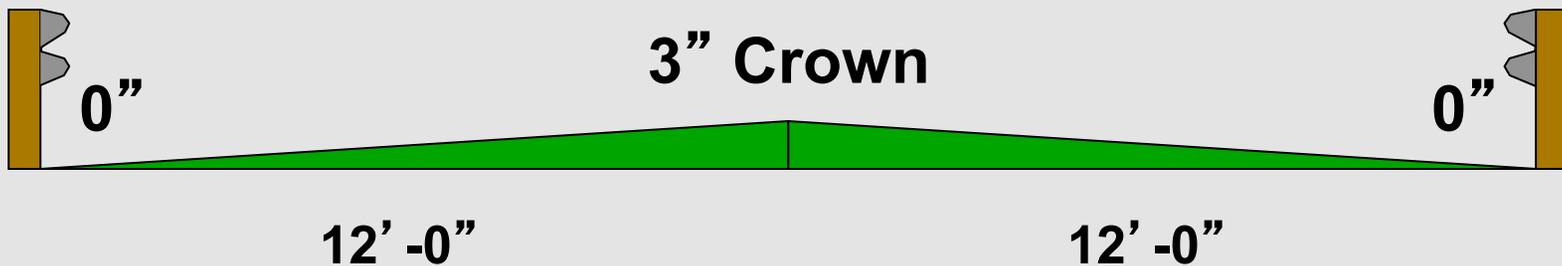
Campton Dam  
Average Land  
Slope 25.4%

# 25.4% Average Slope

3' -0"  
1/2"

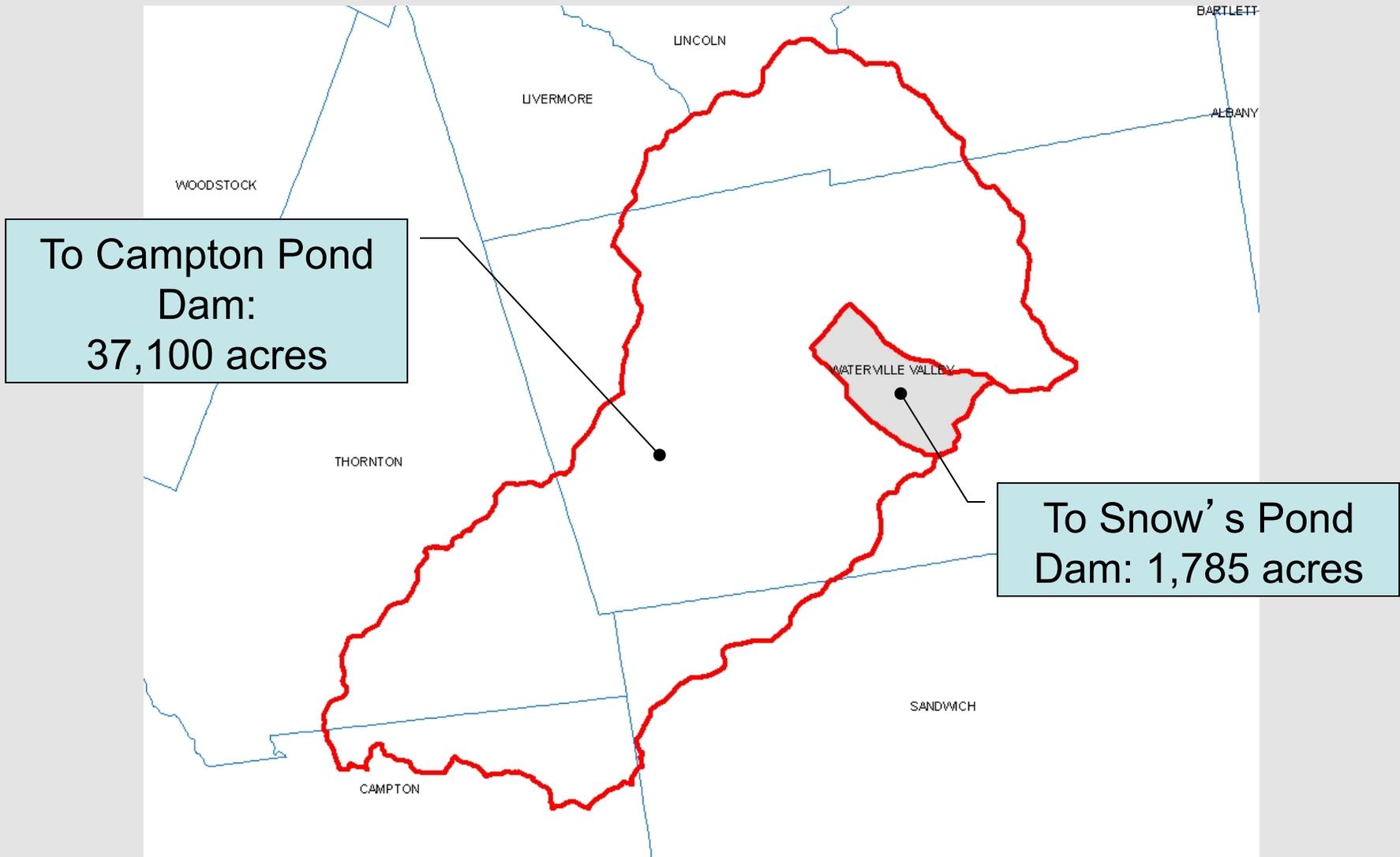


12' -0"

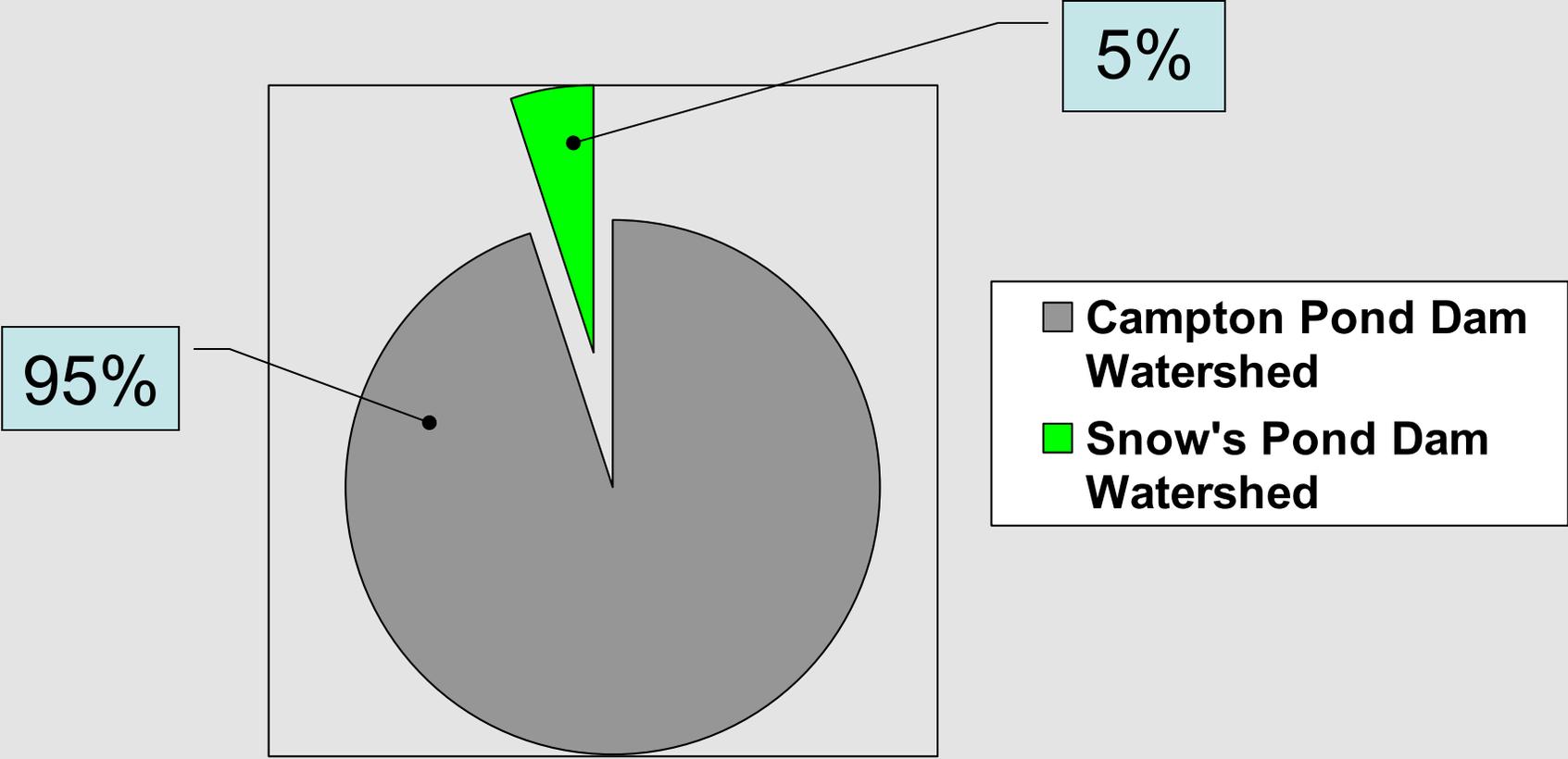


Example: Roadway Cross slope = 2%

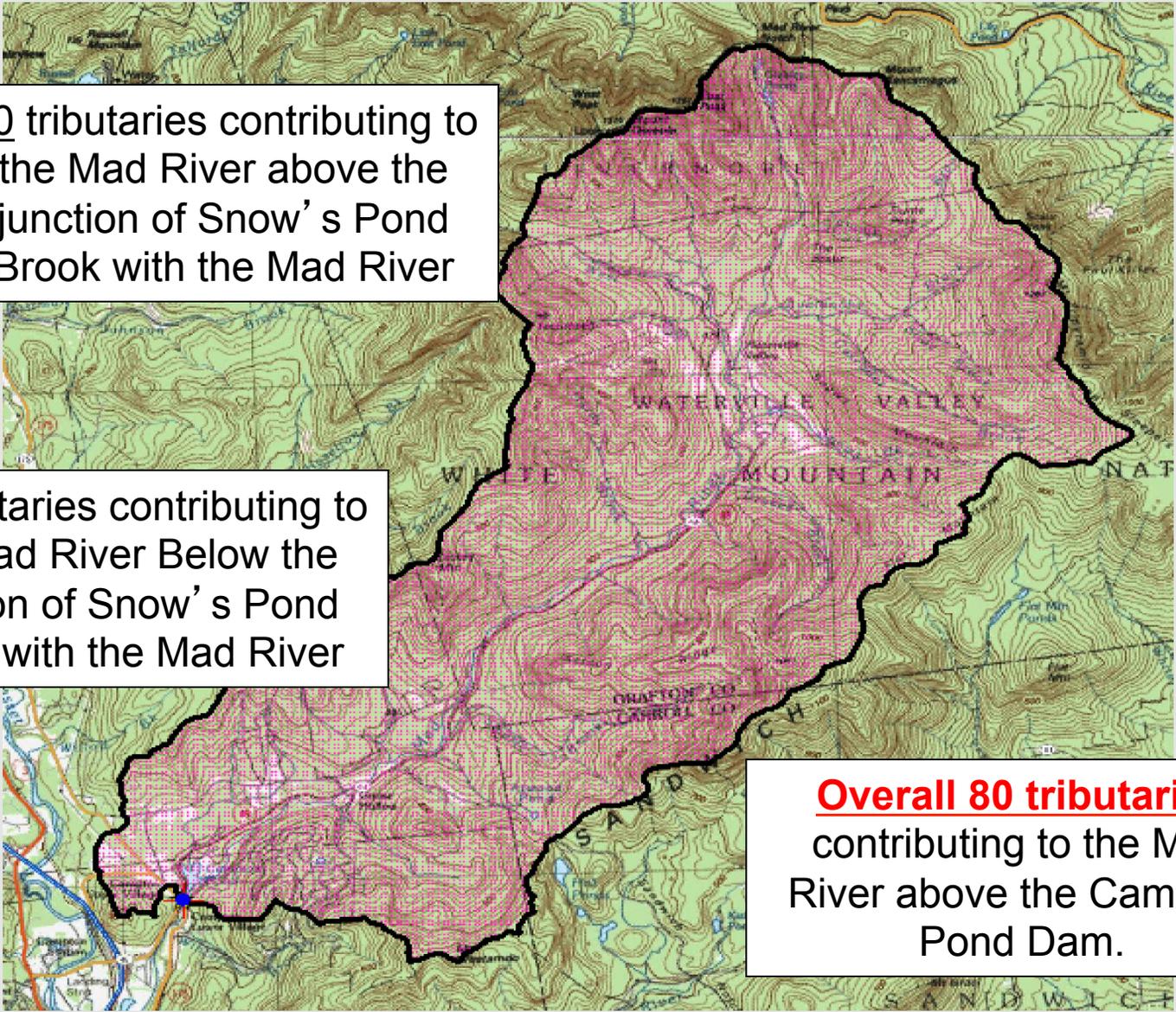
# Watershed Areas



# Watershed Areas



# Contributing Water Sheds - Overall



20 tributaries contributing to the Mad River above the junction of Snow's Pond Brook with the Mad River

60 tributaries contributing to the Mad River Below the junction of Snow's Pond Brook with the Mad River

**Overall 80 tributaries** contributing to the Mad River above the Campton Pond Dam.

# Campton Pond Dam Photo



# Campton Dam, 7" Below Spillway Abutments at Height of Flow



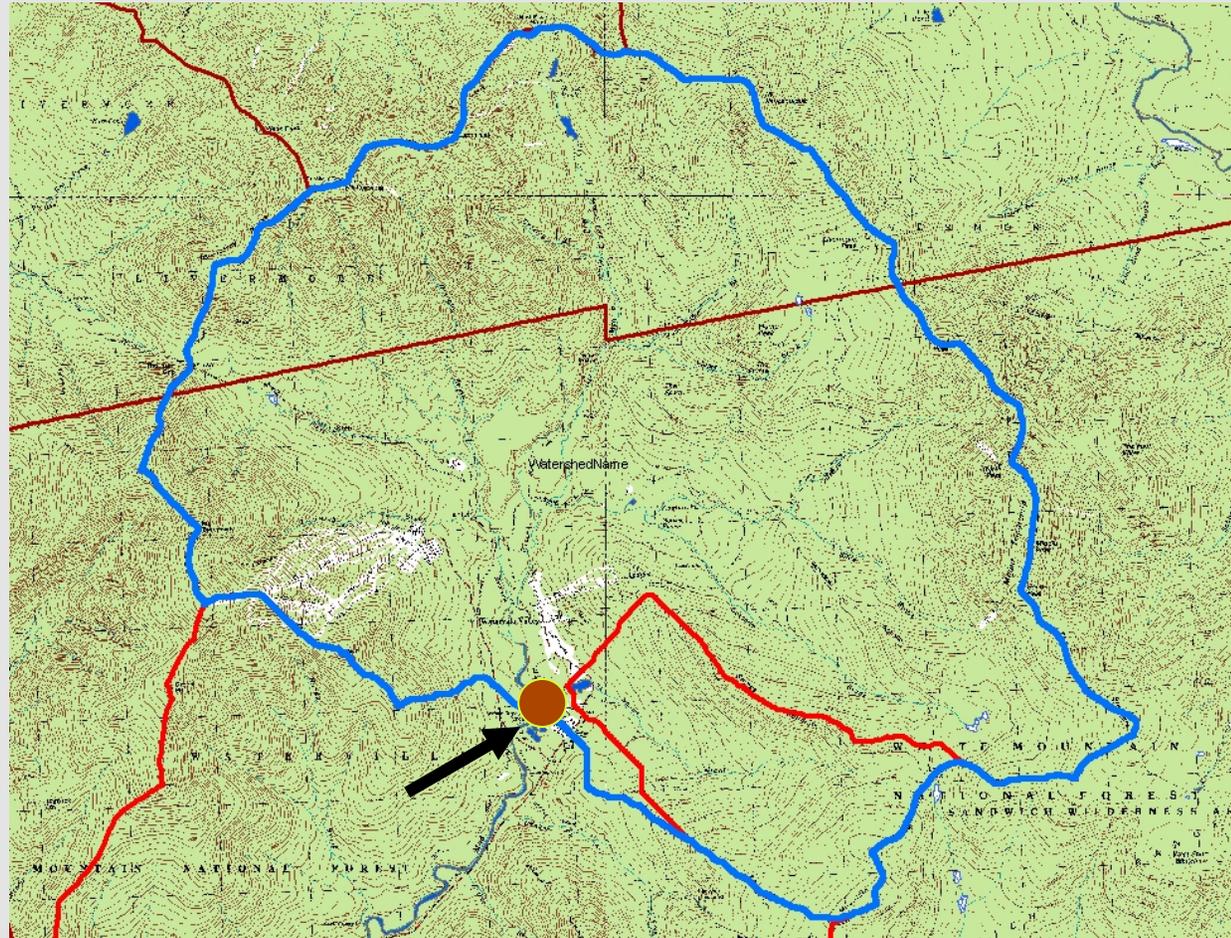
# Campton Pond Dam

## Calculations/Analysis for 8-28-2011:

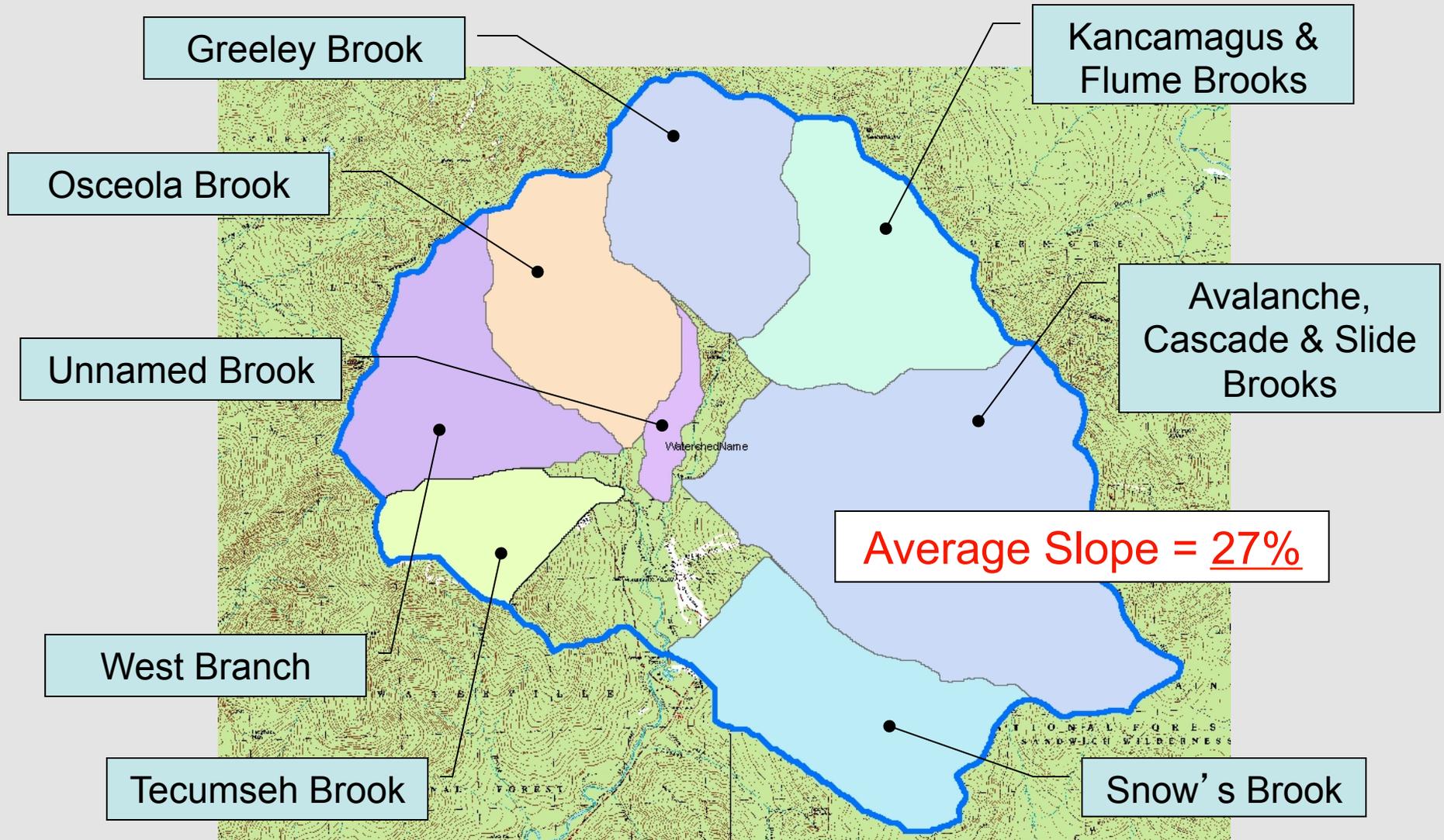
- Peak flow = approximately **14,420 cfs**
- Peak impoundment level: 7” below the top of the dam.

# Upper Portion of the Campton Pond Dam Watershed

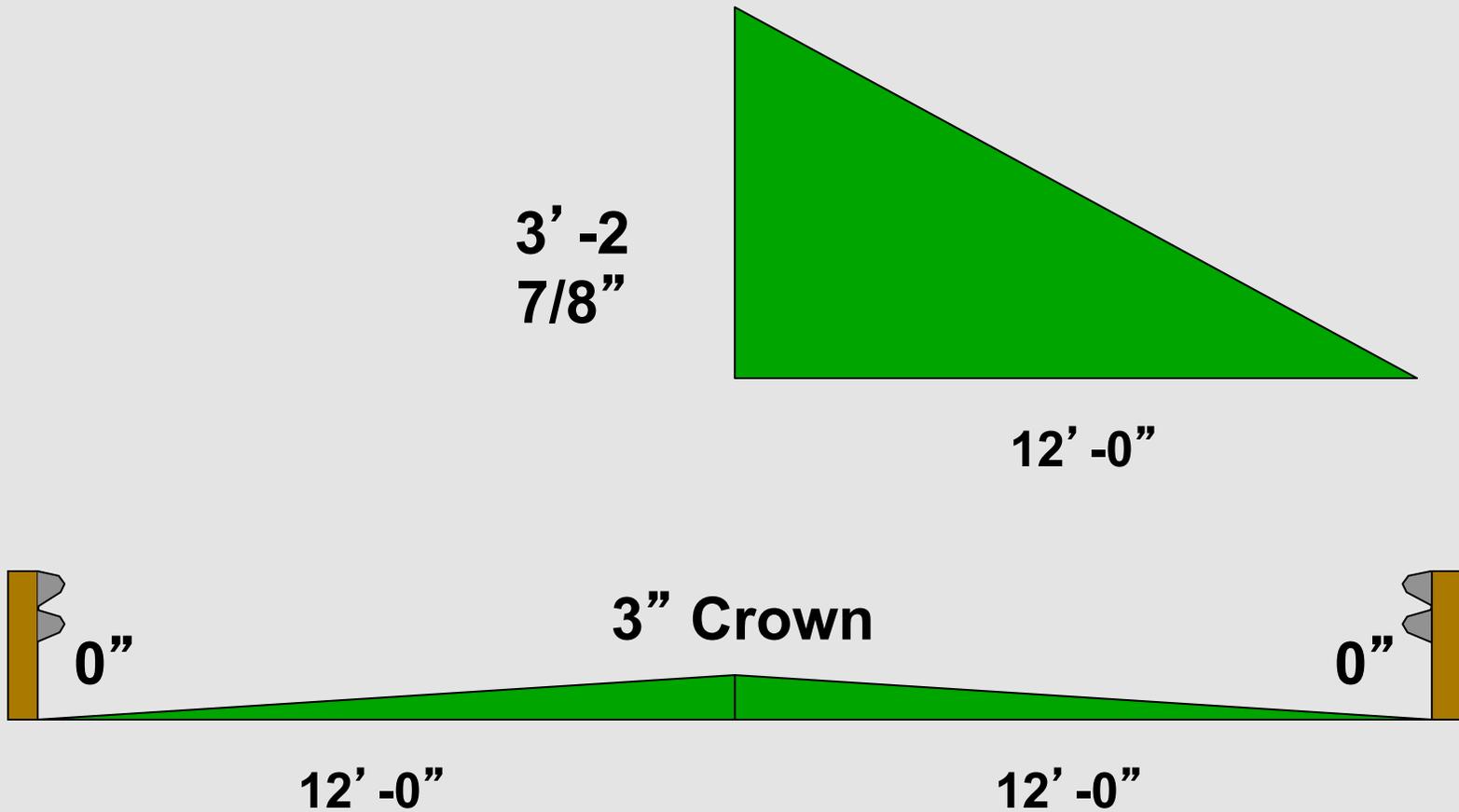
Junction of Snow's Pond Brook with Mad River  
15,760 acres above junction (43% of Campton  
Pond Dam's watershed)



# Major Contributing Watersheds

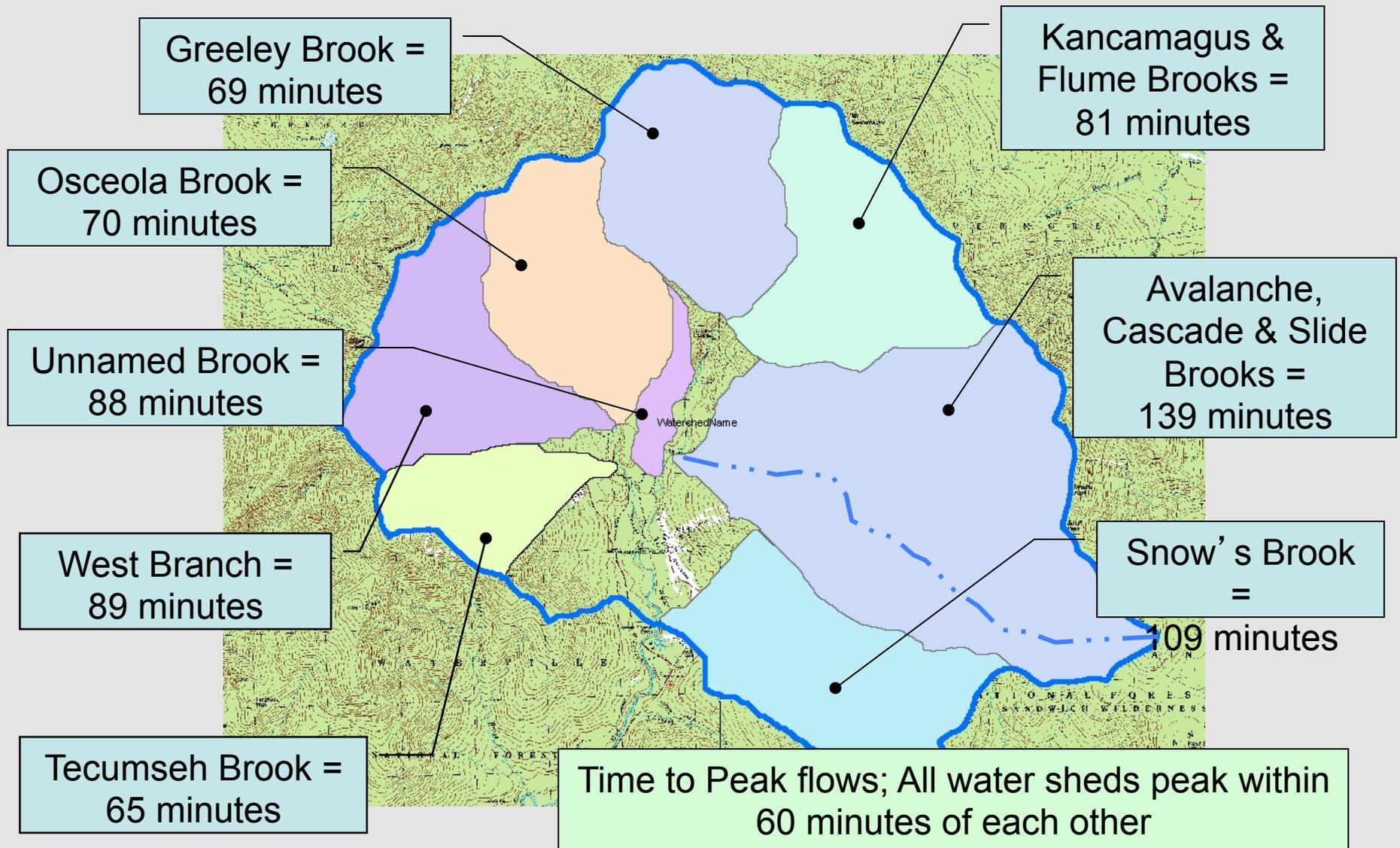


# 27% Average Slope



Example: Roadway Cross slope = 2%

# Contributing Watershed Timing



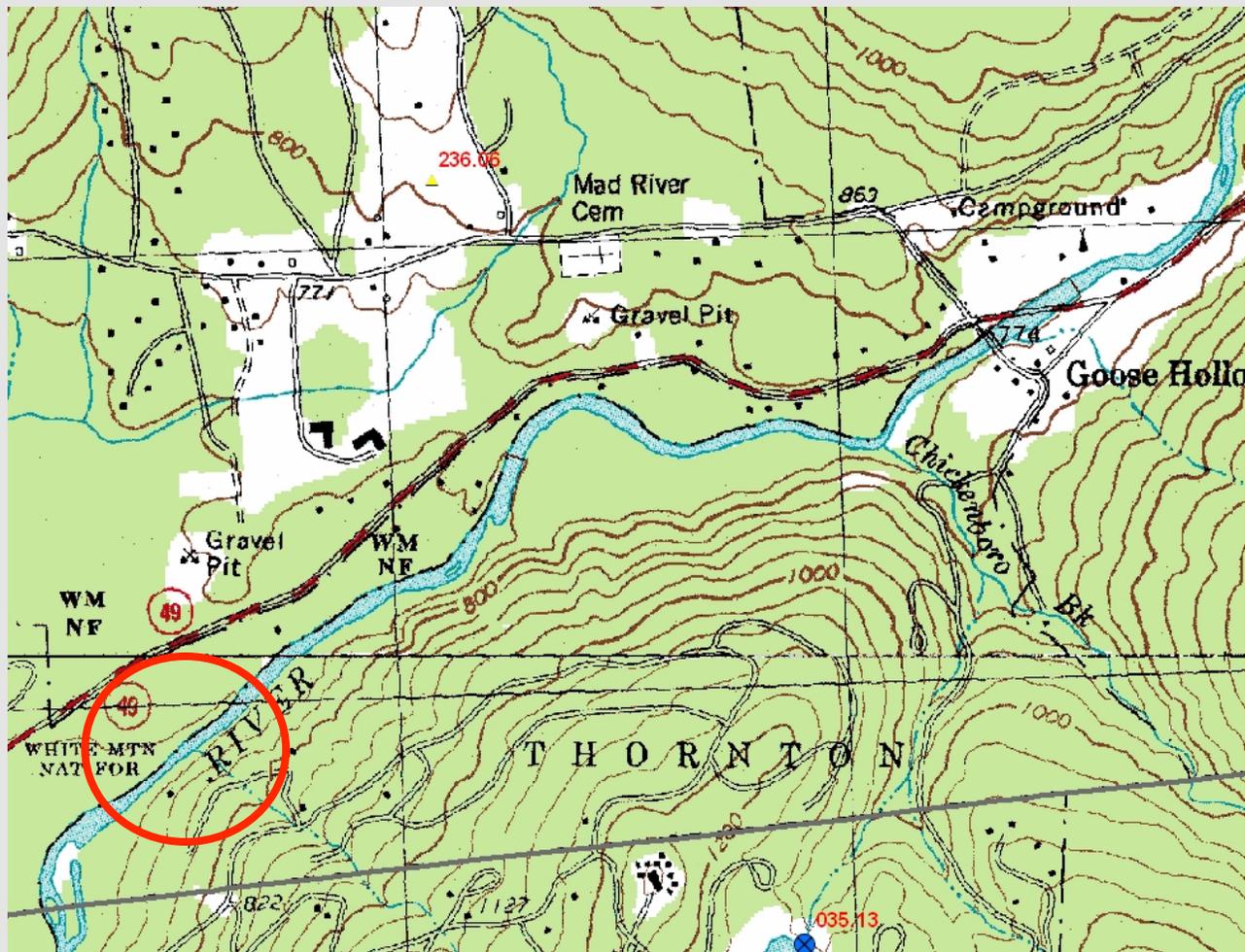
# Mad River Cross Section

# Mad River Cross Section

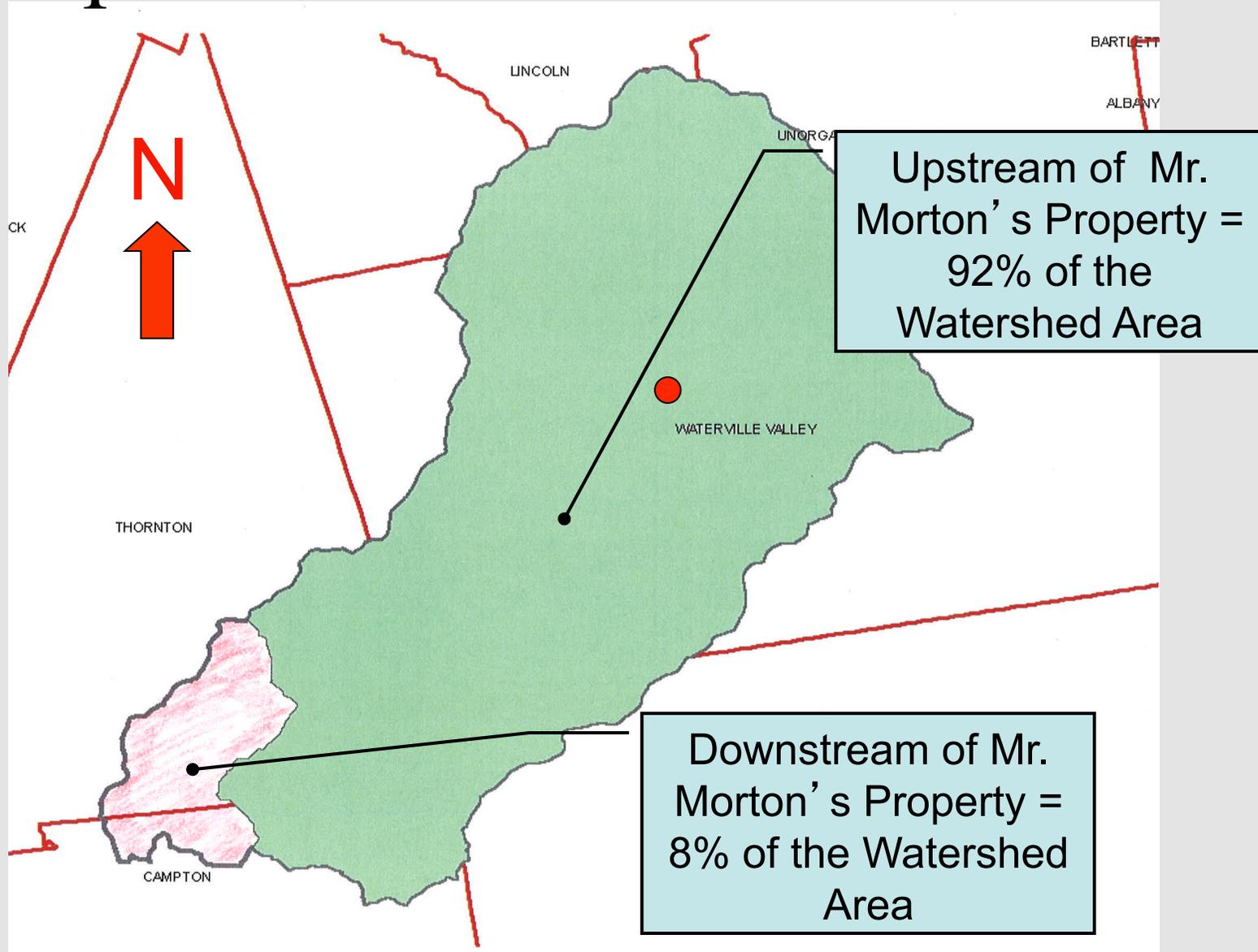
- General Information:

- Located on property of Mr. Morton, Rte 49 Thornton NH
- Surveyed October 18<sup>th</sup>, NHDES staff.
- High water marks were identified with Mr. Morton
- Develop calculations showing flow during Tropical Storm Irene that could be compared with flows following the flashboard operation at Snow's Pond Dam.

# Mad River Cross Section Survey



# Campton Pond Dam Watershed Area



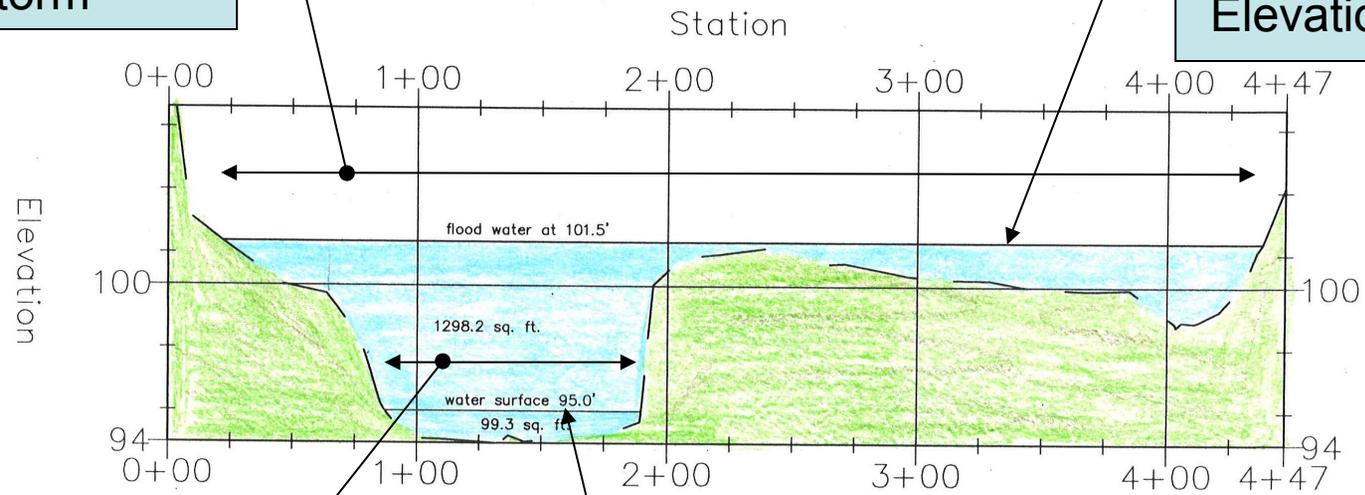


# Mad River Cross Section

Approx 416 foot wide river during storm

Alignment — (6) PROFILE

8-28-2011  
Elevation 101.5



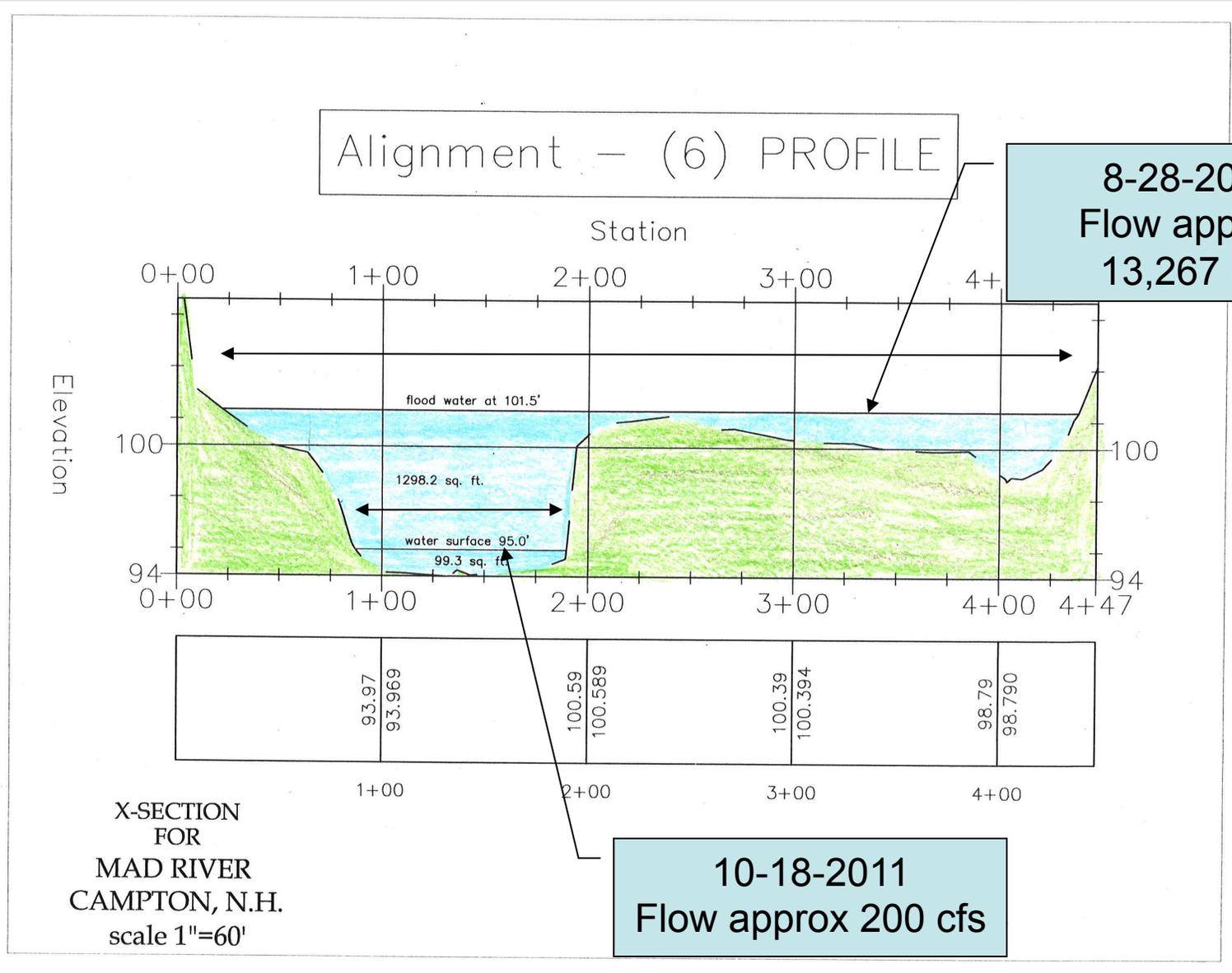
104 foot wide river normal flow

X-SECTION FOR  
MAD RIVER  
CAMPTON, N.H.  
scale 1"=60'

10-18-2011  
Elevation 95.0

93.97	93.969	100.59	100.589	100.39	100.394	98.79	98.790
1+00		2+00		3+00		4+00	

# Mad River Cross Section



# Mad River Cross Section

## Calculations/Analysis for 8-28-2011 :

- Flow = **13,267 cfs** (cubic feet per second).
- Velocities = from 1.6 fps to above 13.9 (feet per second).

# Campton Pond Dam, October 1959

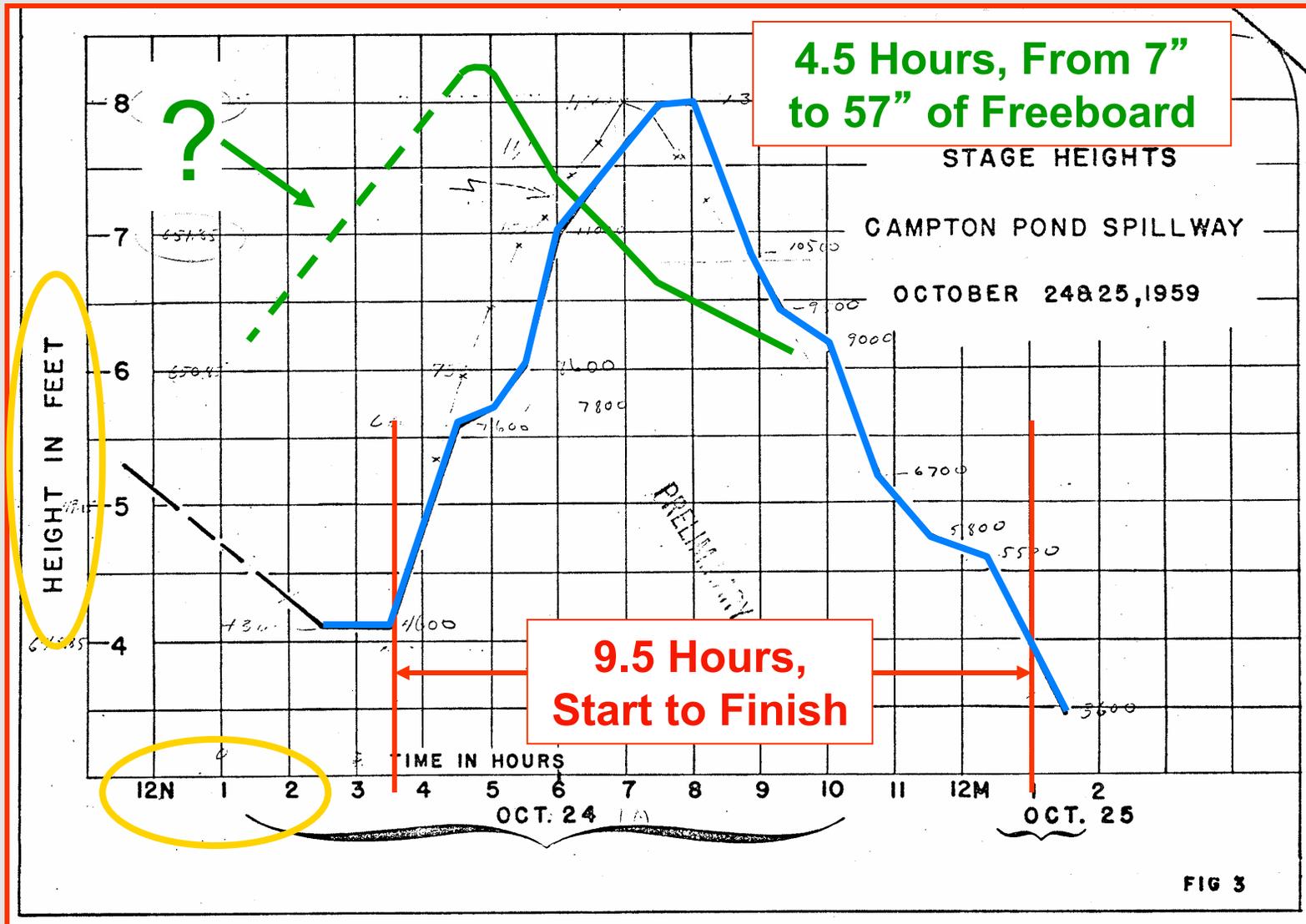
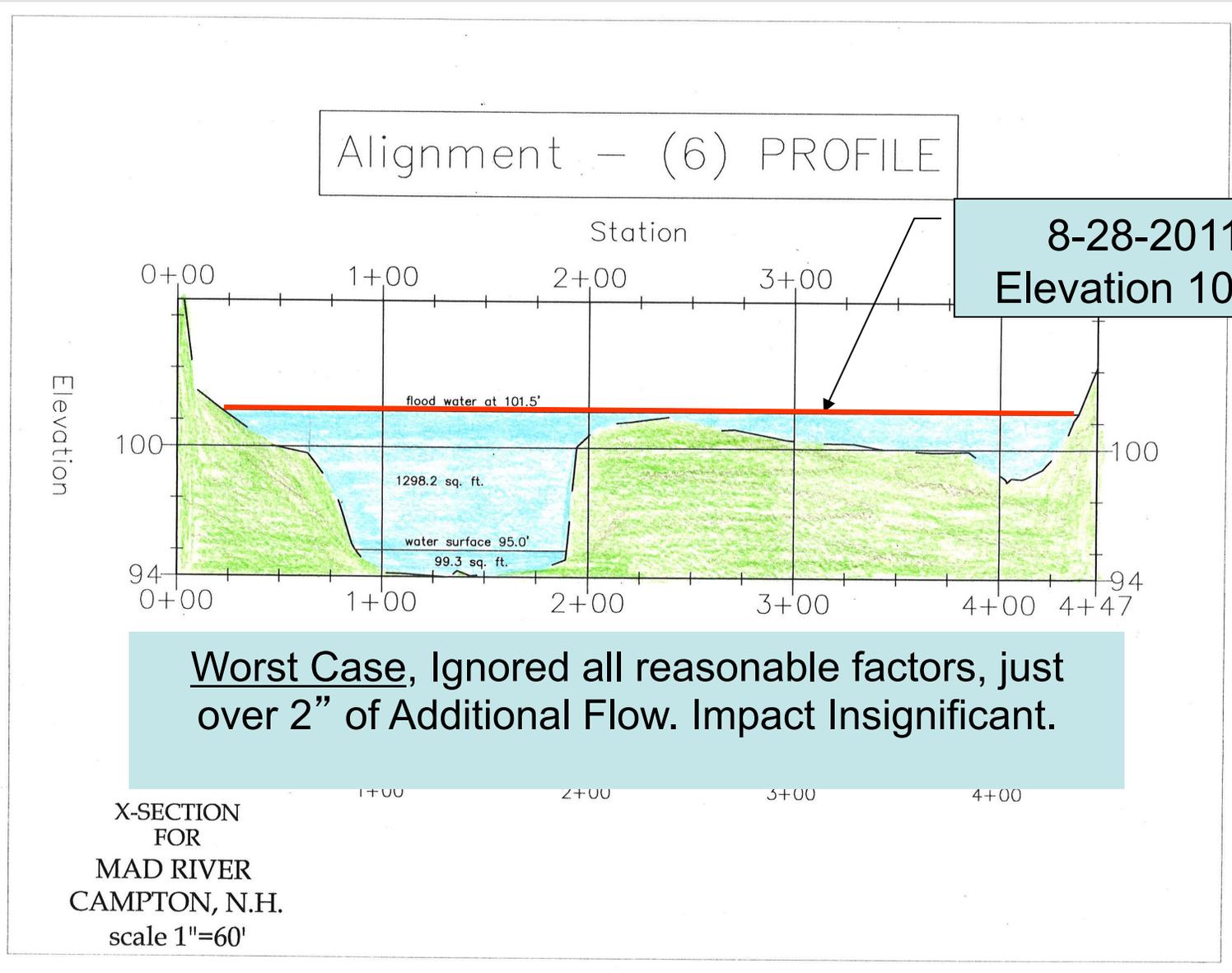


FIG 3

# Analyses Facts

- Surveyed Mad River cross section is located 9.5 miles downstream from Snow's Pond Dam. 15 Miles from the start of the river at Greeley Pond.
- Cross Pipes at Snow's Brook Road did not overtop and flows resulted in minimal washout damage on the downstream slope adjacent to the pedestrian underpass.
- On site observation was that flashboard operation was not instantaneous, noted by Waterville Valley staff, analysis assumed worst case, sudden operation (catastrophic). Partial or slow operation is consistent with the actual operations of other dams.
- Rainfall for the month of August, saturated ground increasing runoff.
- Peak flows from post flashboard operation at the Snow's Pond Dam were factored to account for velocity differences and then applied to the Mad River Cross Section.

# Conclusions



# Conclusions

- Incremental difference to Mad River's elevation at Mr. Morton's property cross section due to operation of Snow's Pond Dam's flashboards, ignoring all reasonable dispersion factors is just over 2".
- Estimated travel time in the Mad River to Mr. Morton's property; travel distance of 9.5 miles = 65 minutes, equals approximately 3:05 arrival time from operation of flashboards at Snow's Pond Dam (approximately 2:00).

A satellite image of a large hurricane system over the Atlantic Ocean. The hurricane is characterized by a dense, swirling cloud structure with a prominent eye and a well-defined eye wall. The surrounding clouds are thick and white, contrasting with the dark blue of the ocean and the green and brown of the landmasses visible on the left side of the frame. The word "Questions?" is overlaid in a large, red, serif font across the center of the hurricane.

# Questions?

**Chuck Corliss**  
**Dam Safety Engineer, NHDES**  
**603-271-4130**  
**[Charles.Corliss@des.nh.gov](mailto:Charles.Corliss@des.nh.gov)**