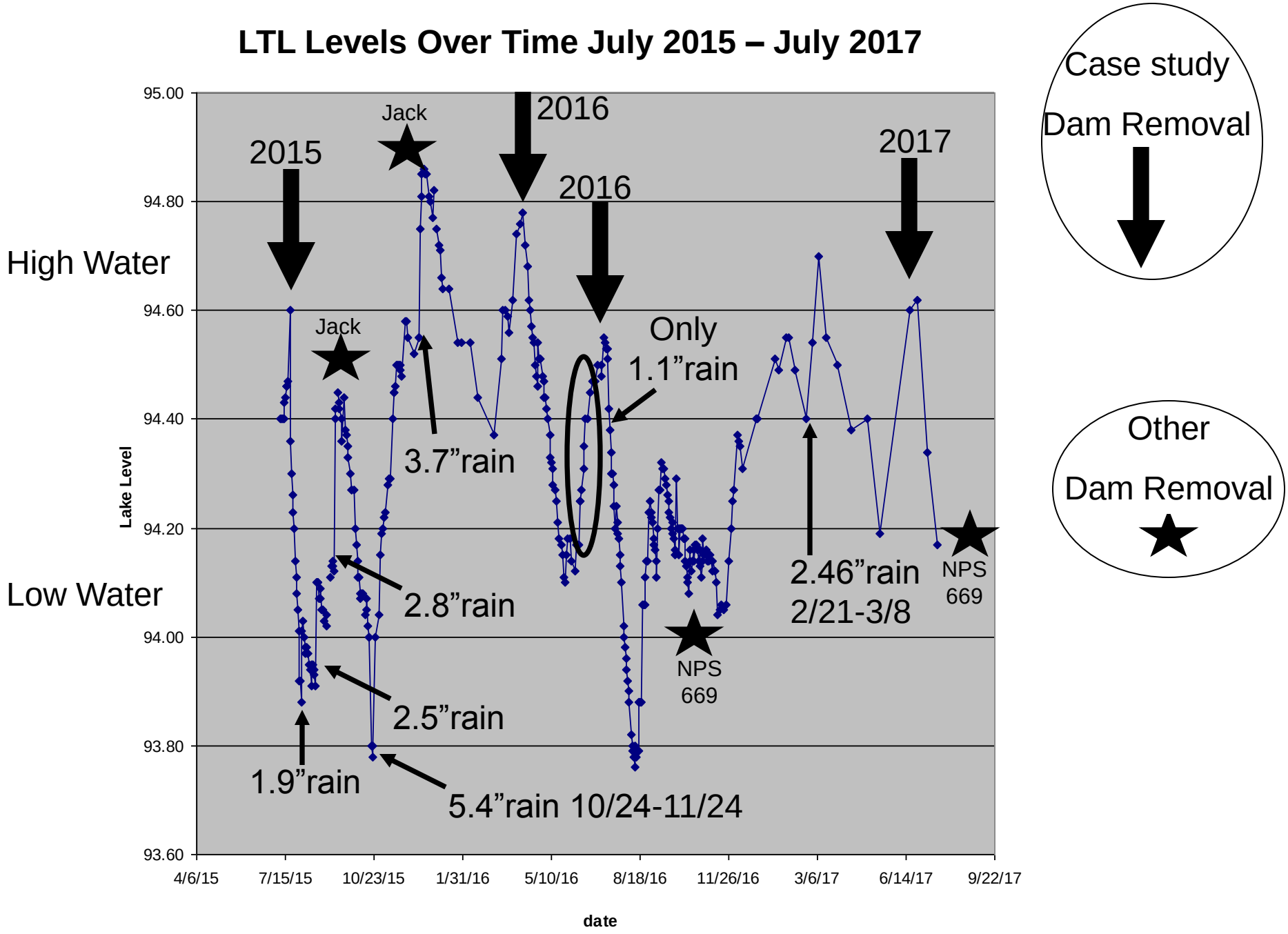
Little Traverse Lake
WATER LEVELS

Preliminary 2015-2017 data analysis

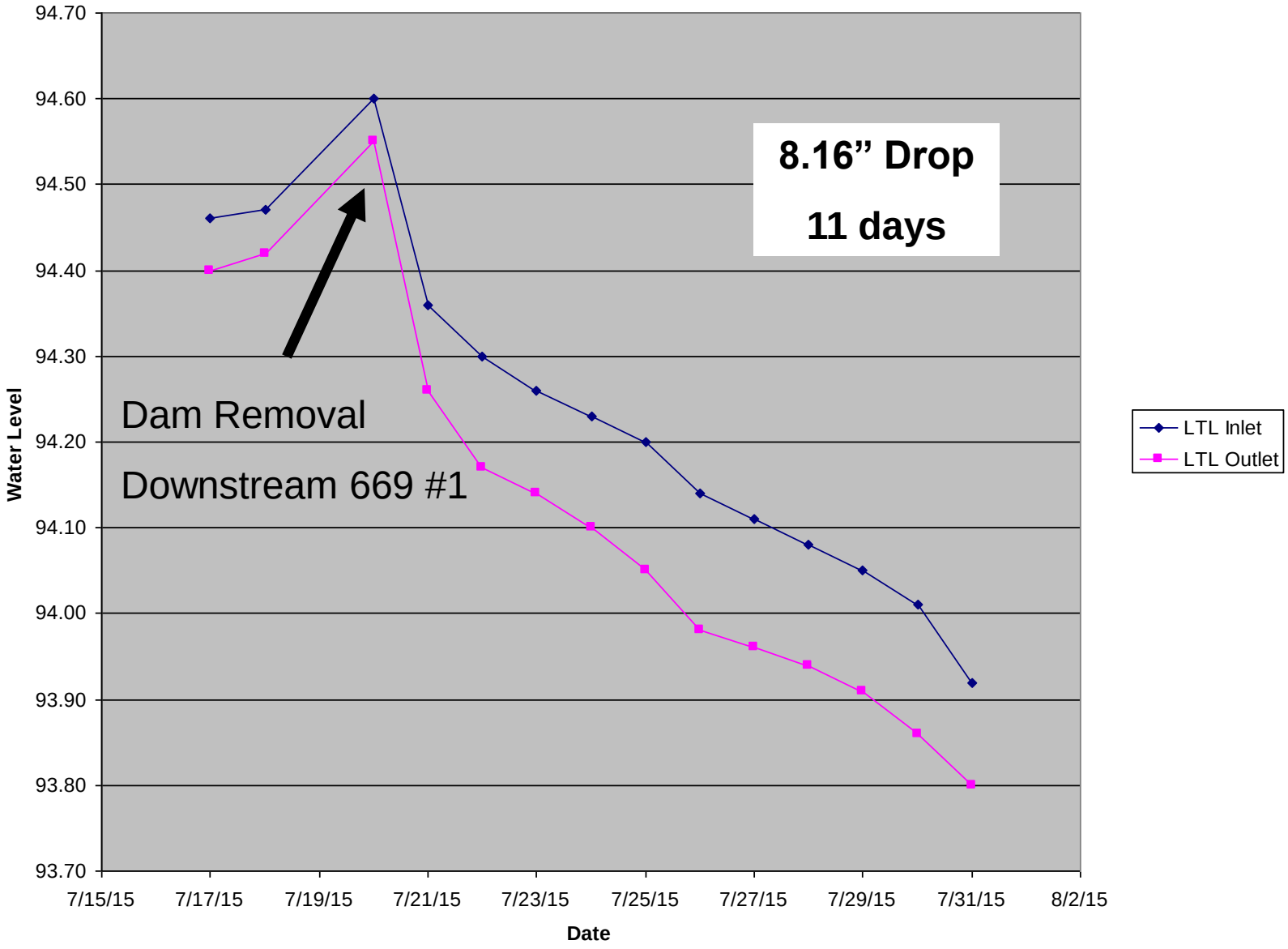
Summary presented at
LTLPOA Annual Meeting
August 5, 2017

Water Level Factors

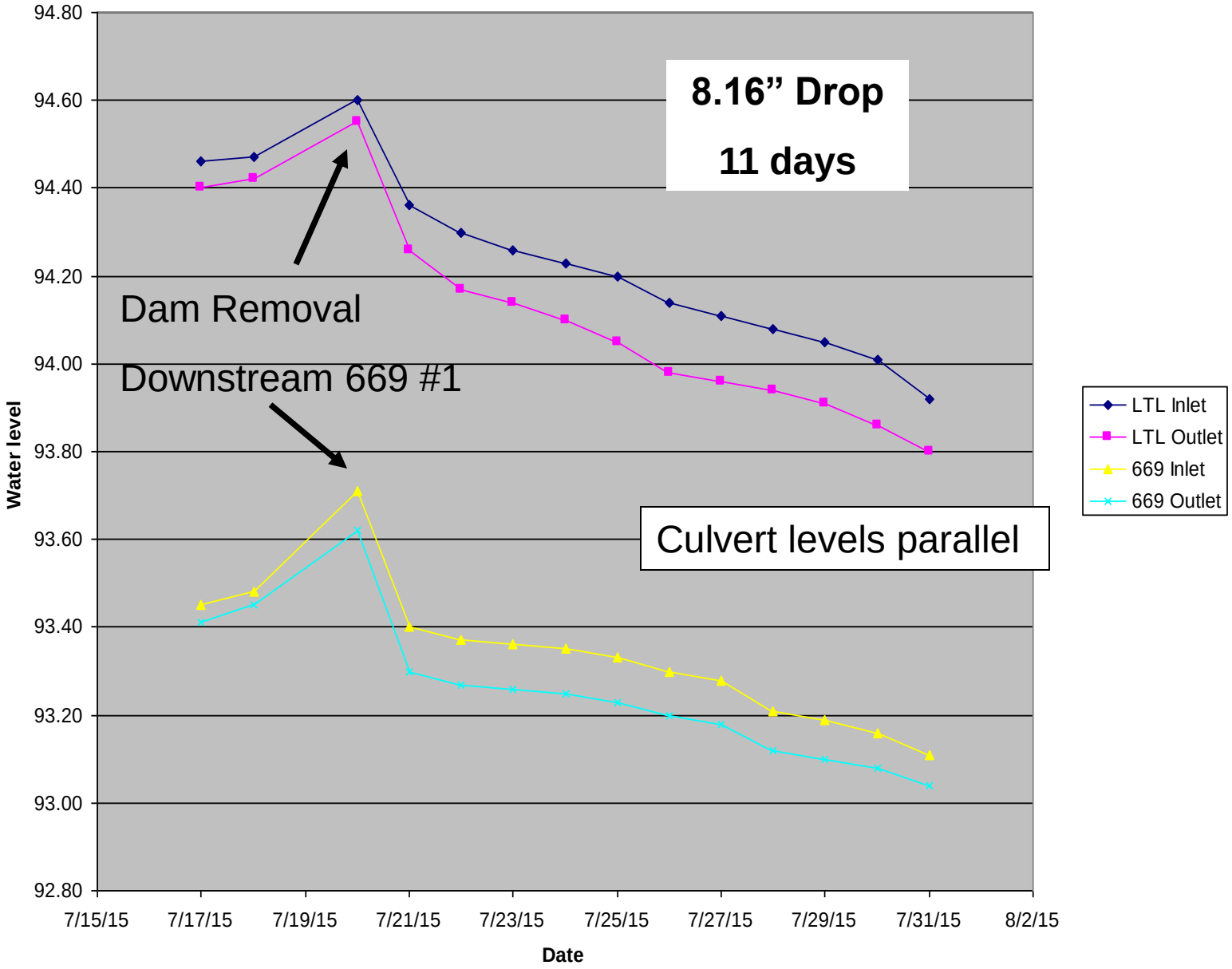
- BEAVER DAMS
  - Between Little Traverse Lake (LTL) and CR 669
  - Downstream from CR 669
- CULVERTS
  - CR 669
  - Traverse Lake Road (TLR)
- Seasonal Rain (100 or 500 year rain events)
  - *Historically never had past LTL flooding with regular dam clearing*
  - *No dams cleared for 3 years prior to fall 2013 heavy rain event – multiple dams including 4.0 feet dam had flooded area's water table)*
  - *Historic Rainfall Average September-October 14.0";*
    Sept-Oct 2013 21.7"; Sept-Oct 2015 19.5" (2013 only 11% higher)


LTL Levels Over Time July 2015 – July 2017
Case study
Dam Removal
Other
Dam Removal
High Water
Low Water
2015
2016
2016
2017
Jack
Jack
Only
1.1”rain
3.7”rain
2.8”rain
2.5”rain
1.9”rain
5.4”rain 10/24-11/24
2.46”rain
2/21-3/8
NPS
669
NPS
669
Lake Level
95.00
94.80
94.60
94.40
94.20
94.00
93.80
93.60
4/6/15
7/15/15
10/23/15
1/31/16
5/10/16
8/18/16
11/26/16
3/6/17
6/14/17
9/22/17
date

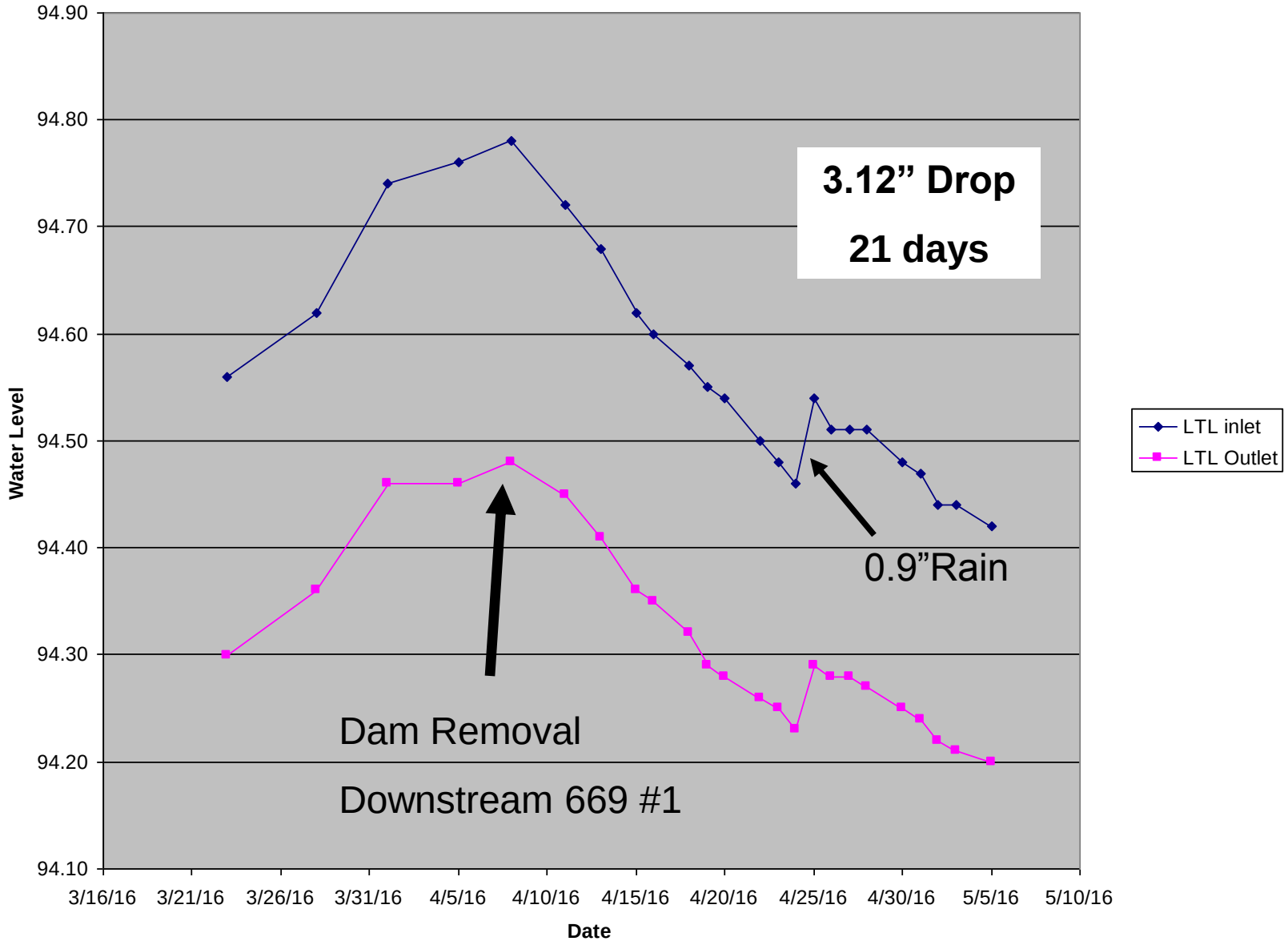
July 20, 2015 Dam Removal



July 20, 2015 Dam Removal – 2 culvert comparison



April 13, 2016 Dam Removal



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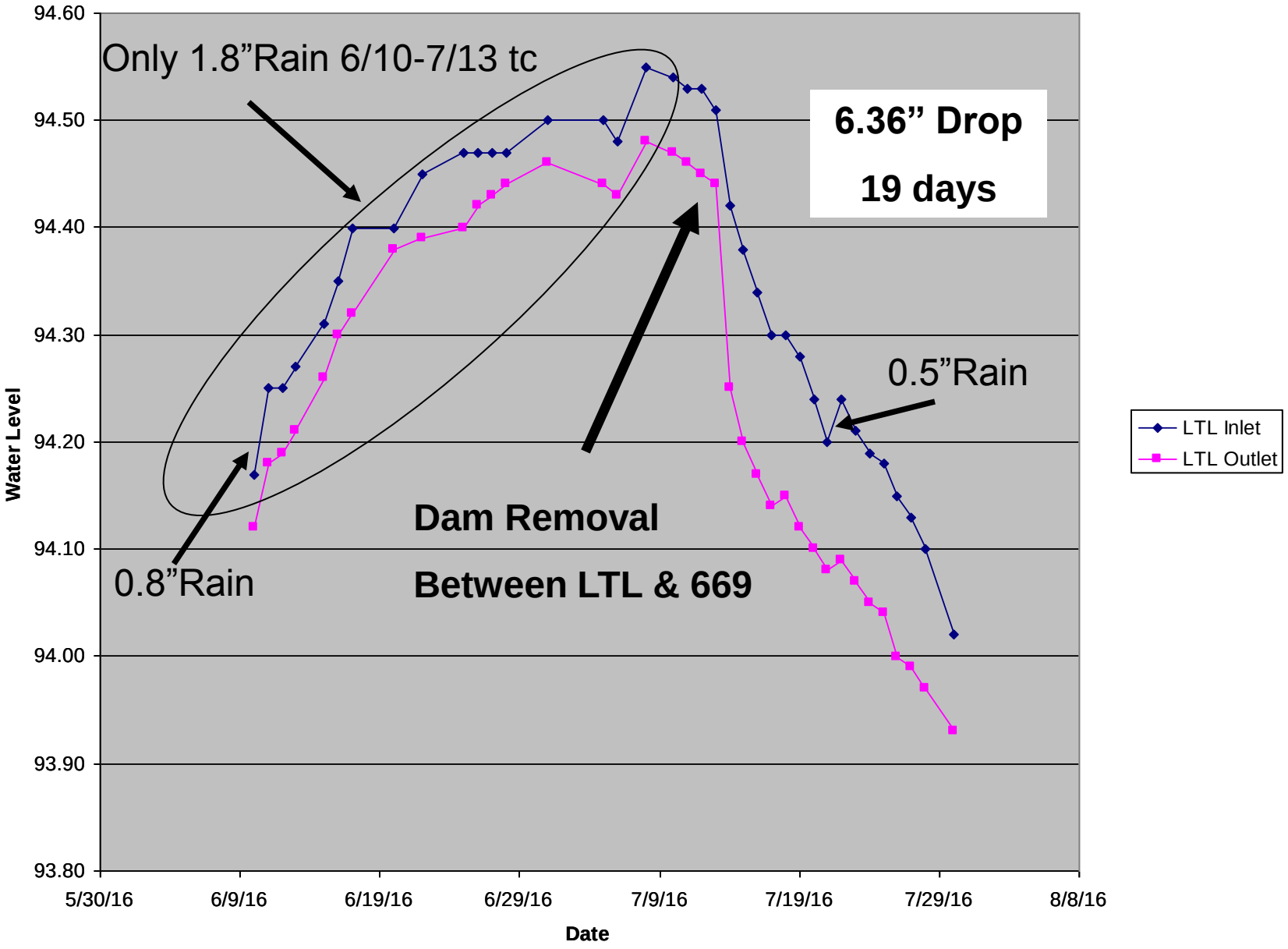
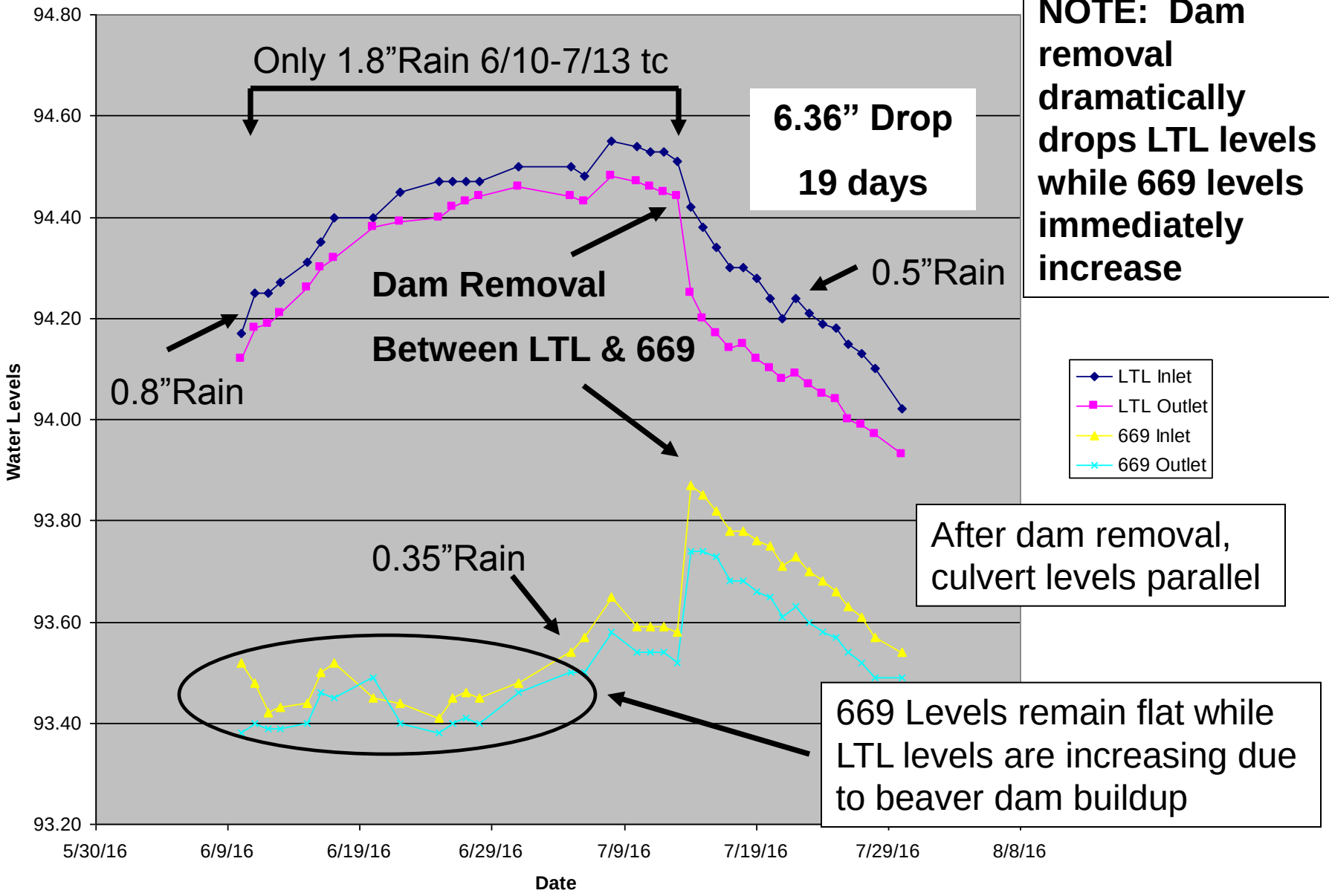
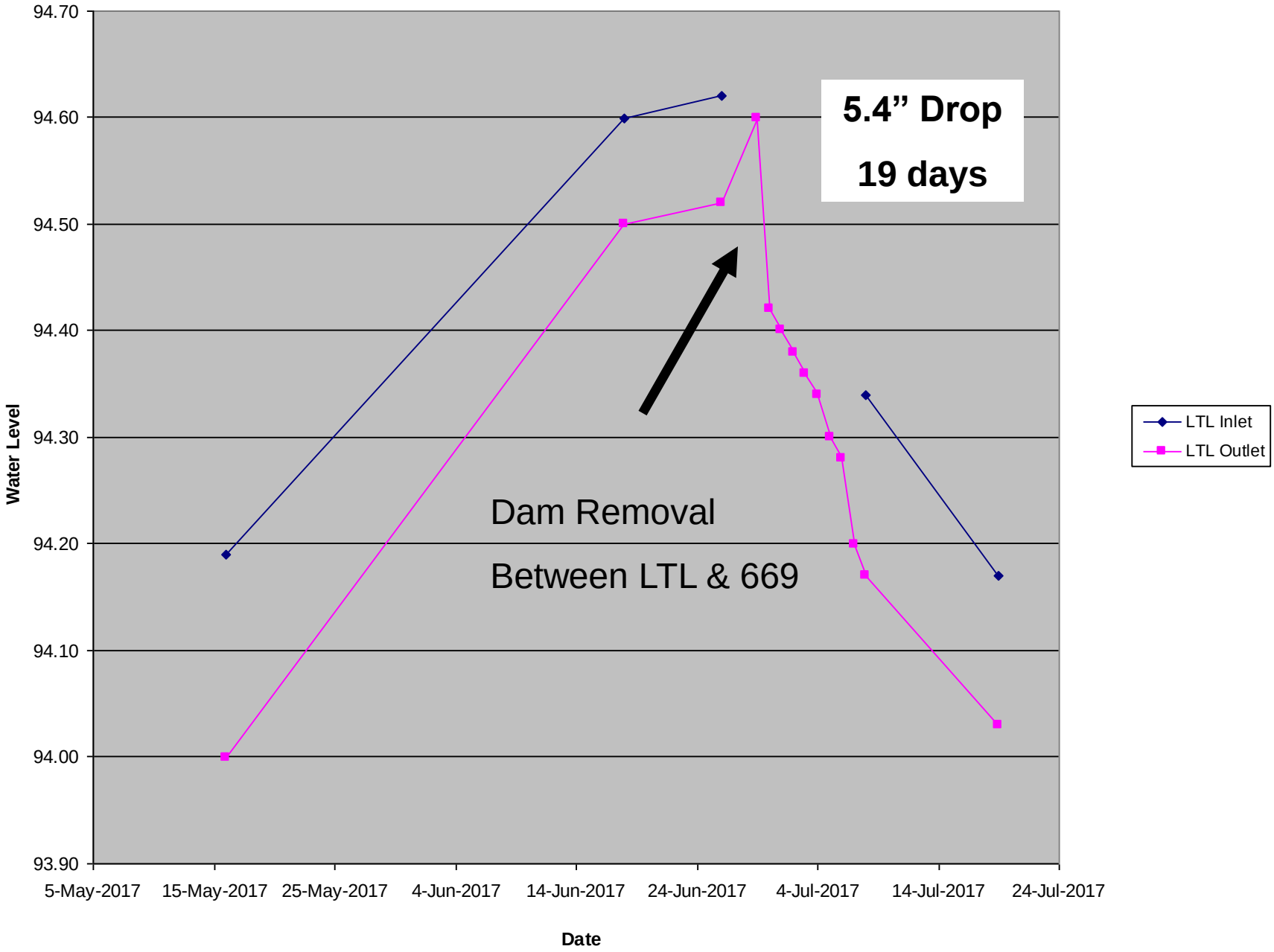


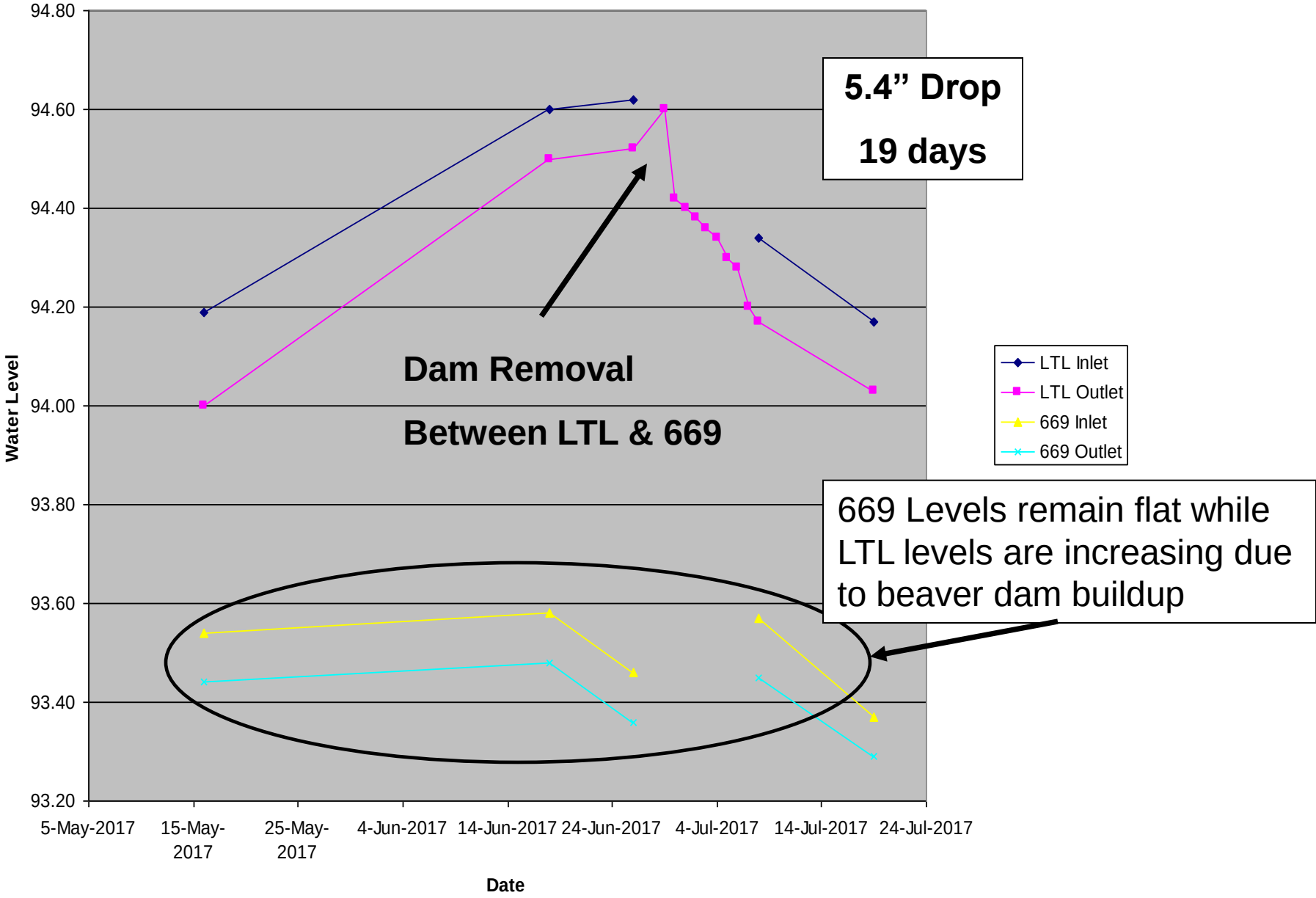
July 13, 2016 Dam Removal – 2 culvert comparison



June 29, 2017 Dam Removal



June 29, 2017 Dam Removal – 2 culvert comparison



Conclusion: LTL - CR669 Dams

- Dams between LTL and CR 669 increase water levels
- Removal of dams between LTL and CR 669 show dramatic and rapid drop in water levels
- TLR culvert is able to respond and lower water levels quickly – culvert not a restricting factor in dropping level
  - *Inlet and outlet parallel drop in water levels*
- This section of creek must remain free of beaver dam activity at all times

Dams Downstream CR 669

- NPS requiring additional studies
- Impact less predictable than between culverts
- Size and location of dams critical

  (Dam #1 impacts levels at CR 669 and also TLR)

- Seasonal timing of removal important
  - *Clear dams pre-fall rains & pre-spring rains to lower "bathtub level" and increase "bathtub capacity" of lake to handle seasonal rainfall events*

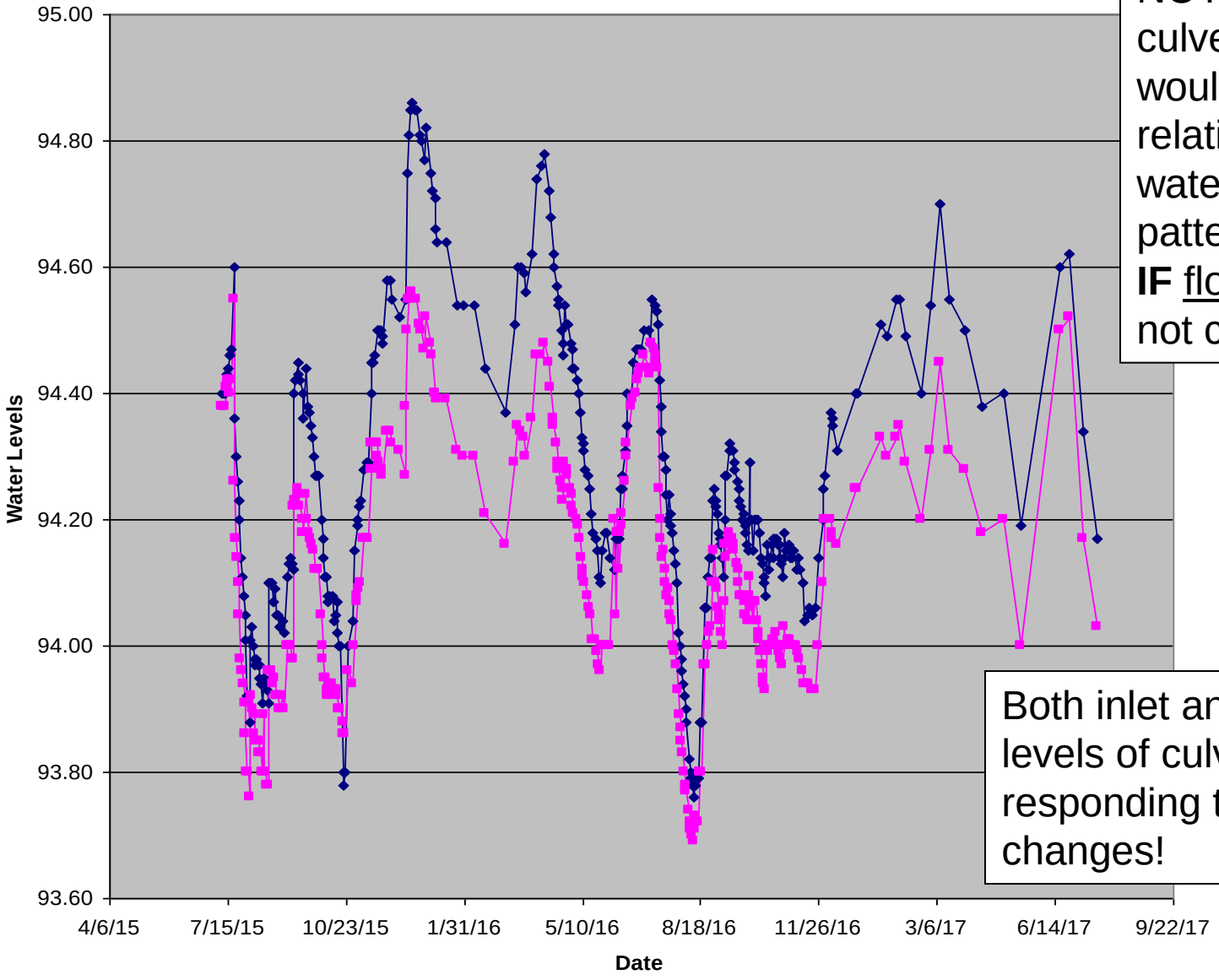
Culvert Restrictions

- The amount of culvert restriction should be reflected in the differential between inlet and outlet

- If culverts causing high water levels, then the inlet-outlet differential should be significant *(only small difference observed)*

- If restrictive, the inlet-outlet culvert differential should increase significantly after rain events *(only slight increase observed with rainfall events)*

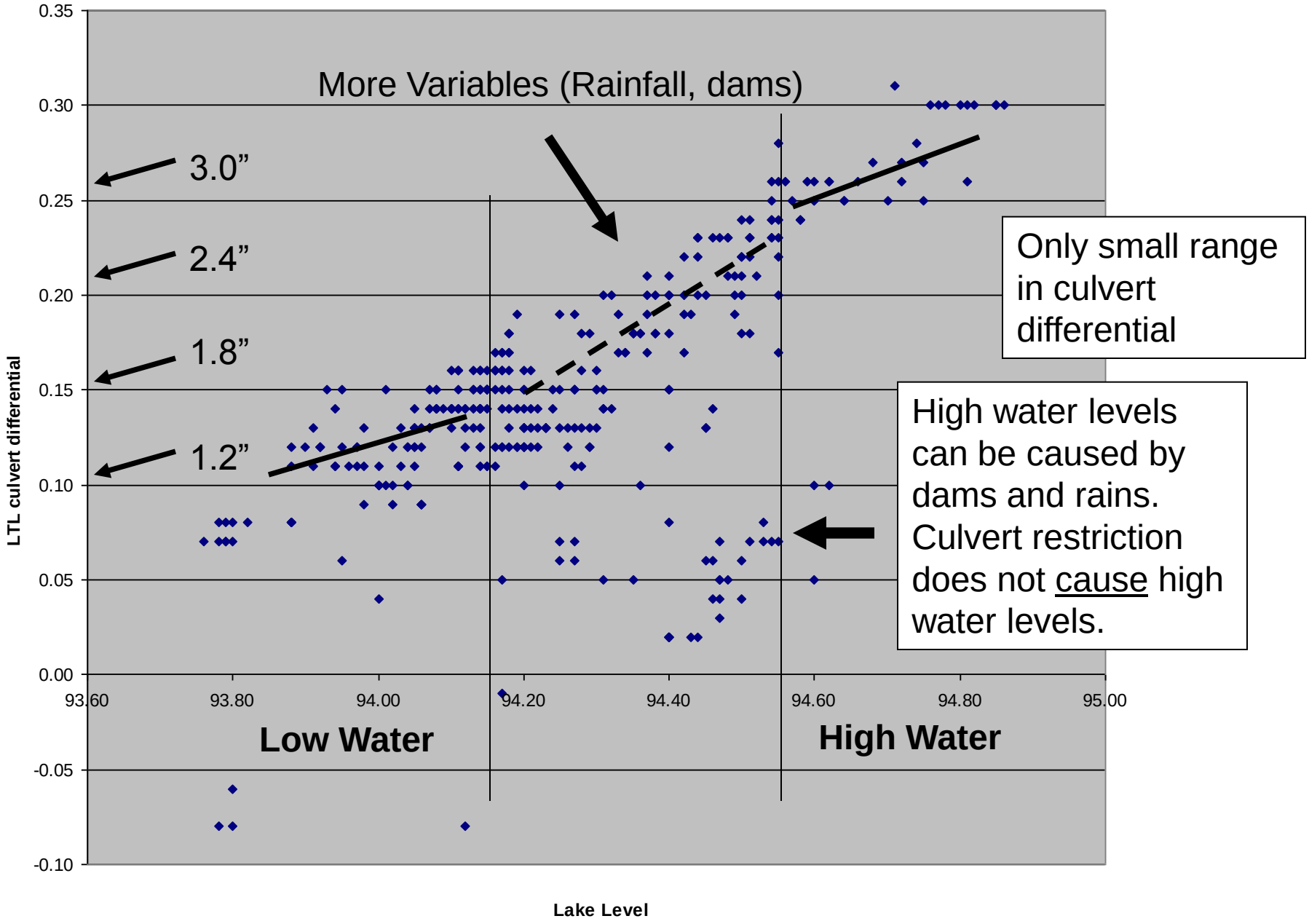
LTL Inlet vs Outlet water levels over time



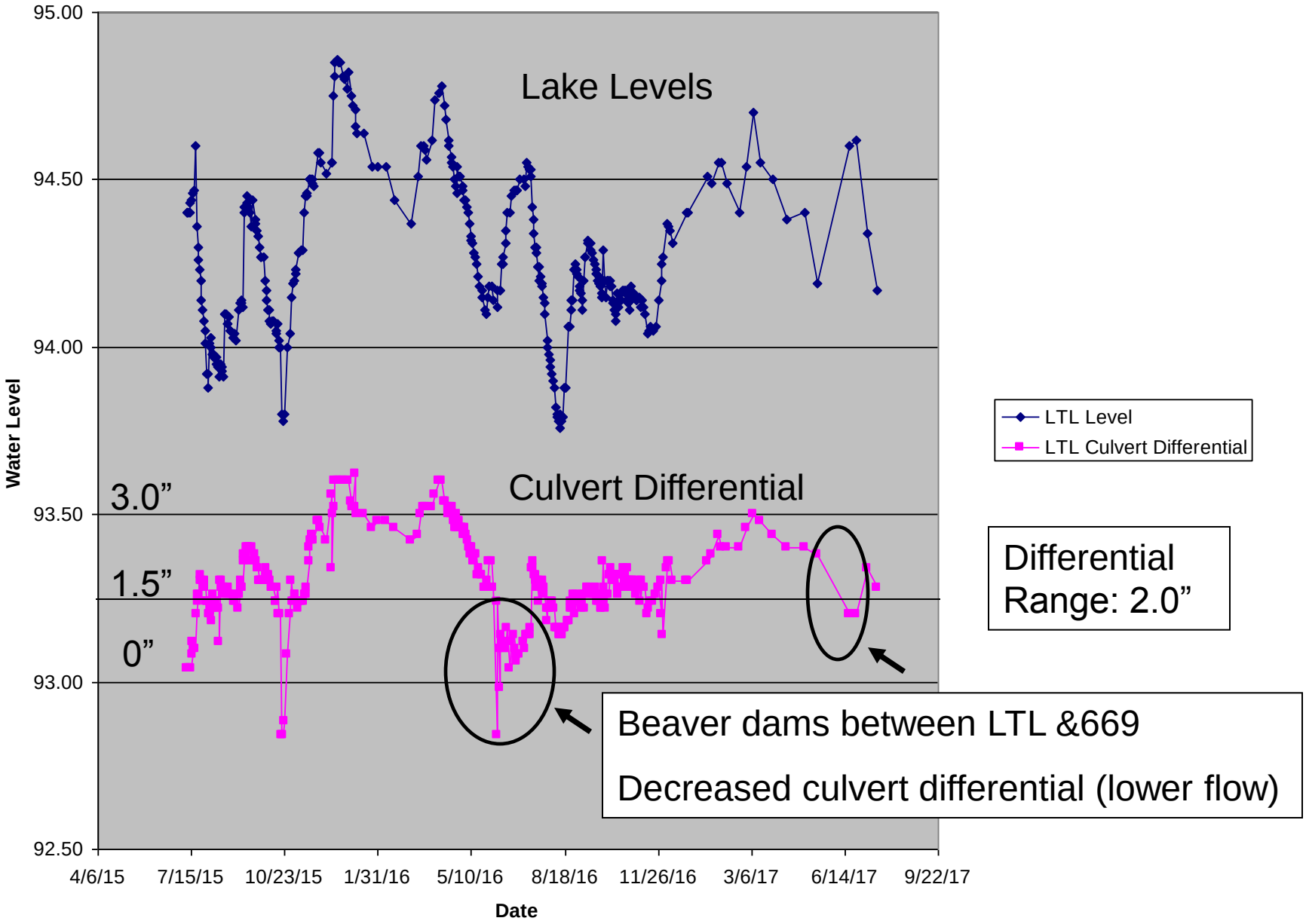
NOTE: If no culverts exist, would still see relatively same water level patterns (outlet) – **IF** flow volumes do not change

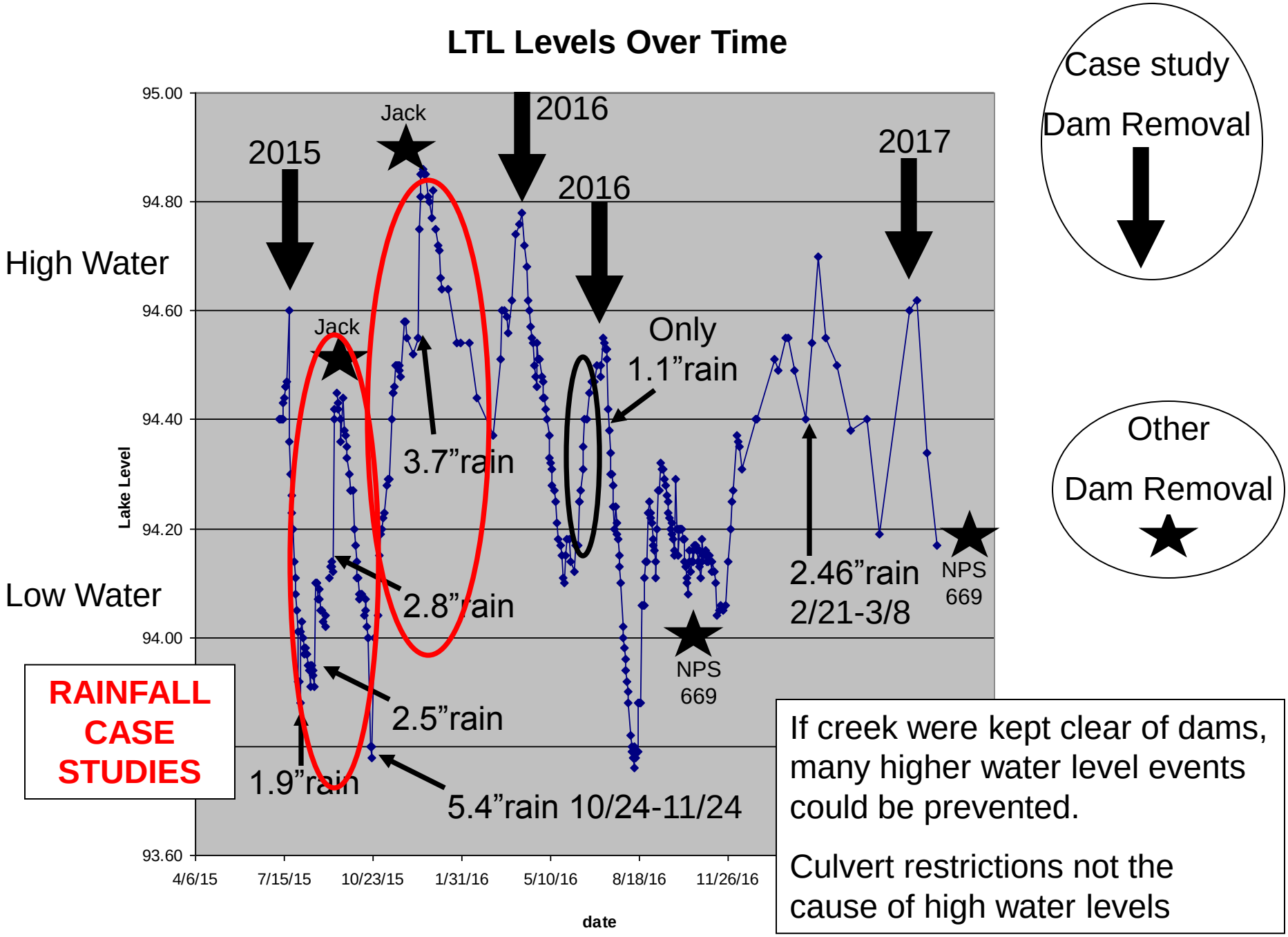
Both inlet and outlet levels of culvert responding to water changes!

LTL Culvert Differential: Inlet - Outlet



LTL Level vs Culvert Differential (inlet-outlet)

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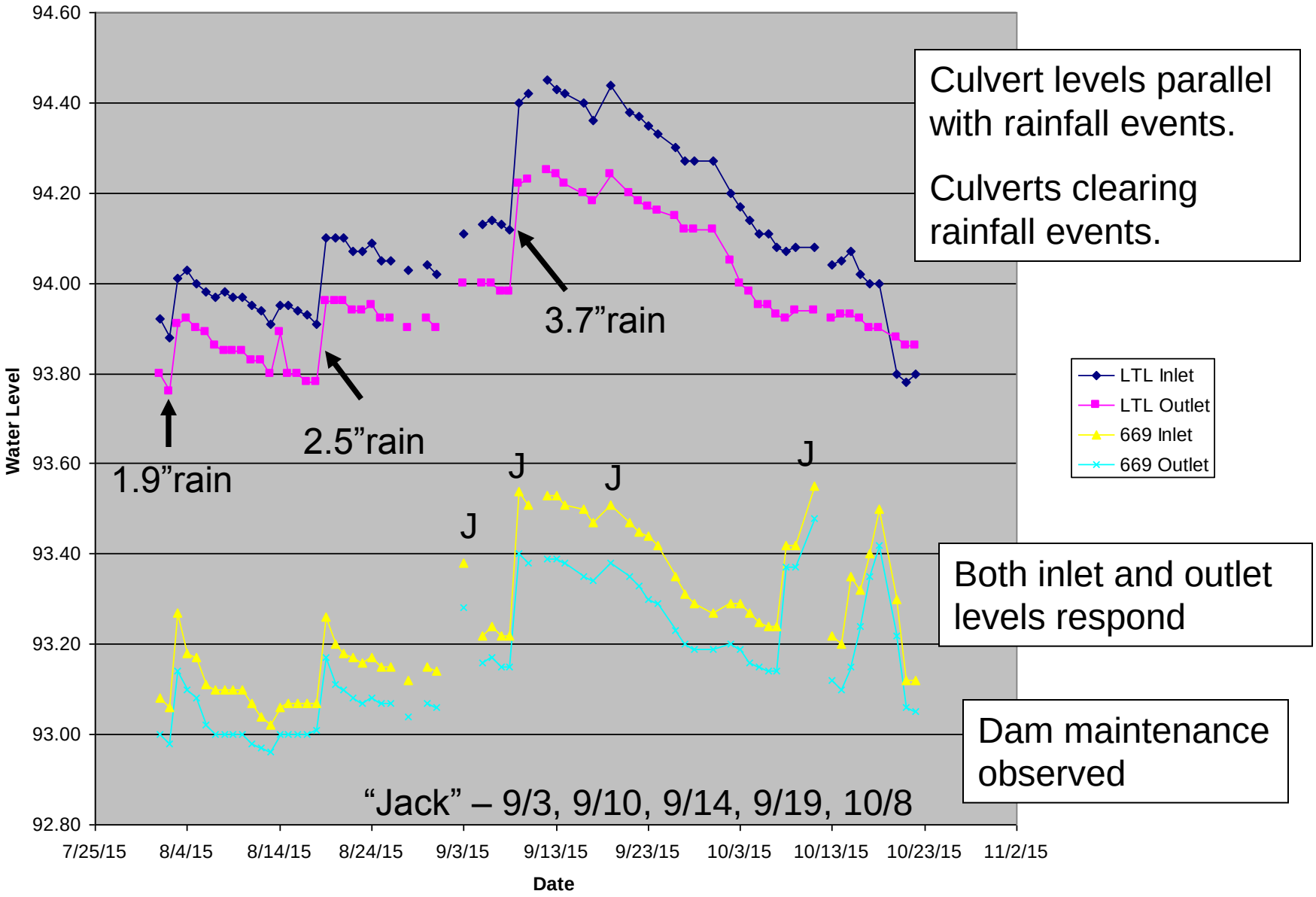
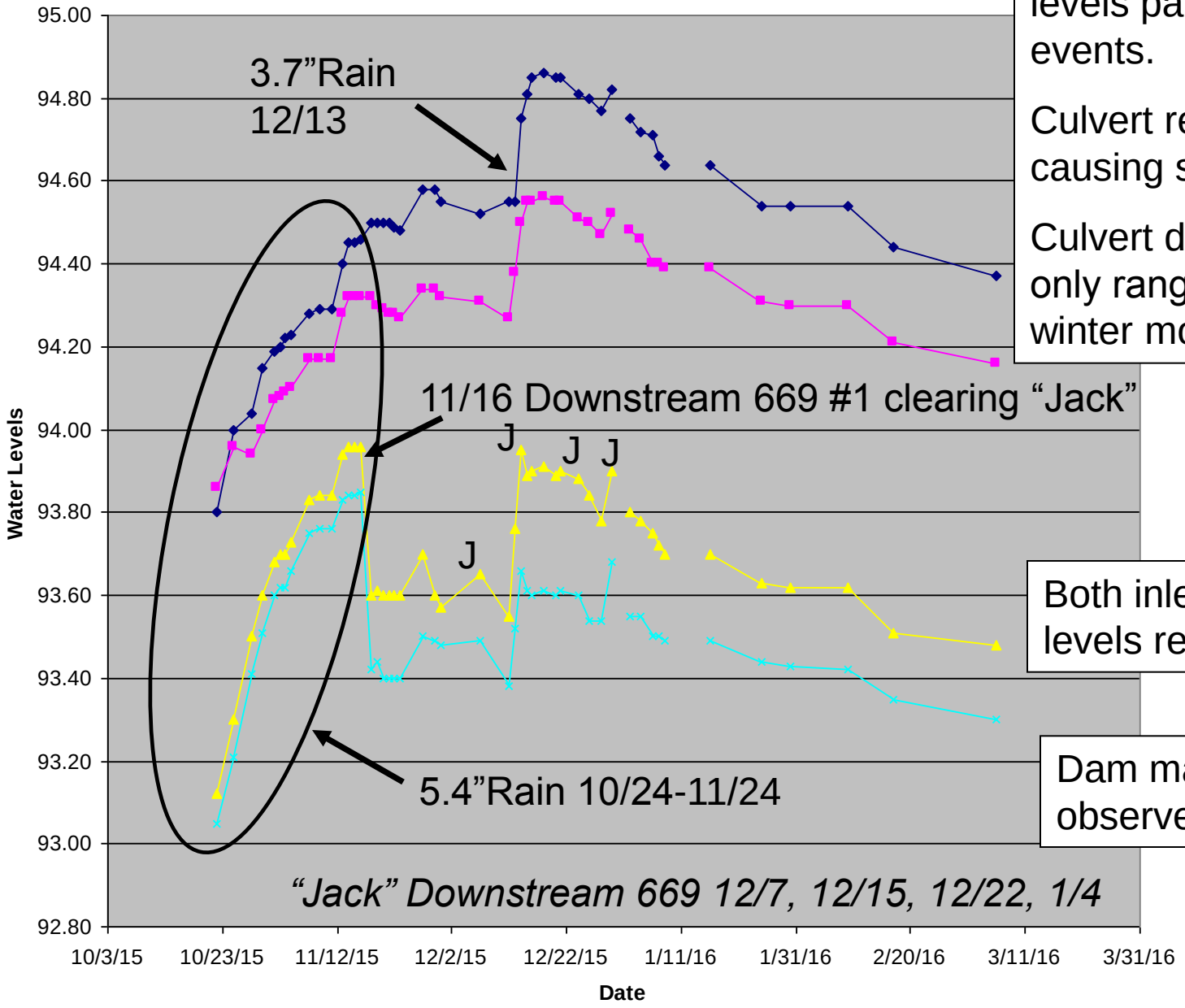
2.5”rain
1.9”rain
5.4”rain 10/24-11/24
Only 1.1”rain
2.46”rain 2/21-3/8
RAINFALL CASE STUDIES
If creek were kept clear of dams, many higher water level events could be prevented.
Culvert restrictions not the cause of high water levels

Summer-Fall 2015 Rainfall – Culvert Comparisons



Fall 2015-2016 Rainfall – Culvert Comparisons



Stream and culverts levels parallel rainfall events.

Culvert restriction not causing stream levels

Culvert differentials only range 1.5” - 3.5”, winter more than fall

Both inlet and outlet levels respond

Dam maintenance observed

Conclusions: Culvert Restriction

- Amount of TLR culvert restriction small (2” from inlet to outlet)
- Dam removal shows ability of culvert to lower lake levels 5” within 2 weeks - inlet and outlet drops parallel
- Culvert show ability to reduce lake levels following large rainfall events.
- High water levels have been caused by dams and rainfall events. Culvert inlet and outlet levels parallel resulting stream changes. *Current culvert restrictions not the <u>cause</u> of high water levels.*
- Benefit of culvert replacement may be minimal – if dams are clear, culverts could keep up with draining normal rainfall events

Gosling Predictions

LITTLE TRAVERSE LAKE
SUMMARY OF FLOOD LEVEL CONTROL ALTERNATIVES

Alternative	Advantages	Disadvantages
No Action	- No cost	-Doesn't relieve flooding
1. Install additional culverts next to existing culverts (multi-tube)	- Lower cost - No change to low water level - mimics full width flow	- Doesn't dramatically reduce high water -Generally not preferred by MDEQ
2. Remove existing culverts and replace with higher capacity culverts	- Provides less high flow restriction - mimics full width flow - lower cost than bridge	- May lower "normal" lake level - Doesn't dramatically reduce high water
3. Remove existing culverts and replace with clear span bridge	- Provides no high flow restriction - Provides full width flow - highest cost	- May lower "normal" lake level - Doesn't dramatically reduce high water -Lake levels may still be impacted by beaver dams
4. Keep existing culverts but remove all beaver dam restrictions	- Lower cost - Lower lake levels during normal flow	- May lower "normal" lake level - High water level difficult to predict, but culverts will still impede flow during high flow period -Lake levels may still be impacted by beaver dams in future - Requires regulatory approval from NPS
5. Replace all culverts with bridges and remove all beaver dam restrictions	- Provides no high flow restriction - Provides full width flow - highest cost	- May lower "normal" lake level - High water level difficult to predict -Lake levels may still be impacted by beaver dams in future - Requires regulatory approval from NPS

"Doesn't dramatically reduce high water" - May lower "normal" lake level

Culvert Unknowns

- What impact will replacing culvert have on “normal” water levels?
- What will be the impact on flow volumes and amount of water moved?
- Will lake levels go lower during summer, creating a new set of issues?
- What is the process to establish a minimum water level if needed to correct a new problem?
  - Court order? More studies? More money and permits?
- These questions should be answered *before* culvert replacement.

Possible Course of Action
Remove one variable at a time!

- Updated Gosling report coming out this fall
- (1) keep Shalda Creek clear of beaver dams between LTL & CR 669 (Need volunteers or $ donations)
- (2) monitor beaver dam activity and impact downstream from CR 669 – clear seasonally (NPS approval required)
- (3) replace culvert at CR 669 and study impact on water levels and changes in creek flow volumes (CR 669 grant)
- (4) determine need and impact of TLR culvert replacement after above action steps – and identify impact on low water level and ability to regulate

Lake and Stream Survey

Notes and References

INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

County: Leelanau August, 1949
Lake or stream: Little Traverse Lake

Township Cleveland T 29N R 13W Sec 10-11 Inc.

Two rainbows were reported caught in summer of 1948. Reported trout streams enter the lake. An inlet enters from Lime Lake and rainbows are reported present in that lake. The outlet leads to Lake Michigan through a culvert across which it is reported boards are placed to raise the lake level. There are no screens.

Northern pike fishing is reported good in the winter.

Jason Day, I. A. Rodeheffer

Unfortunately, to establish a minimum water level today, the process requires extensive data from studies ($), petition by more than a majority of residents, and a court order ($)

C: Lansing, District, Region

Form 2760--8-50--5M

Summary presented August 5, 2017

Little Traverse Lake Property Owners Association

Presentation: Jeff Schutz, Chairman, Water Level Committee

Preliminary Data Analysis: David Skjaerlund, PhD

Data is readings from inlet and outlet gauges at TLR and CR 669

Rainfall data is Maple City data recorded by NOAA (except where noted, TC data used when Maple City data is incomplete)