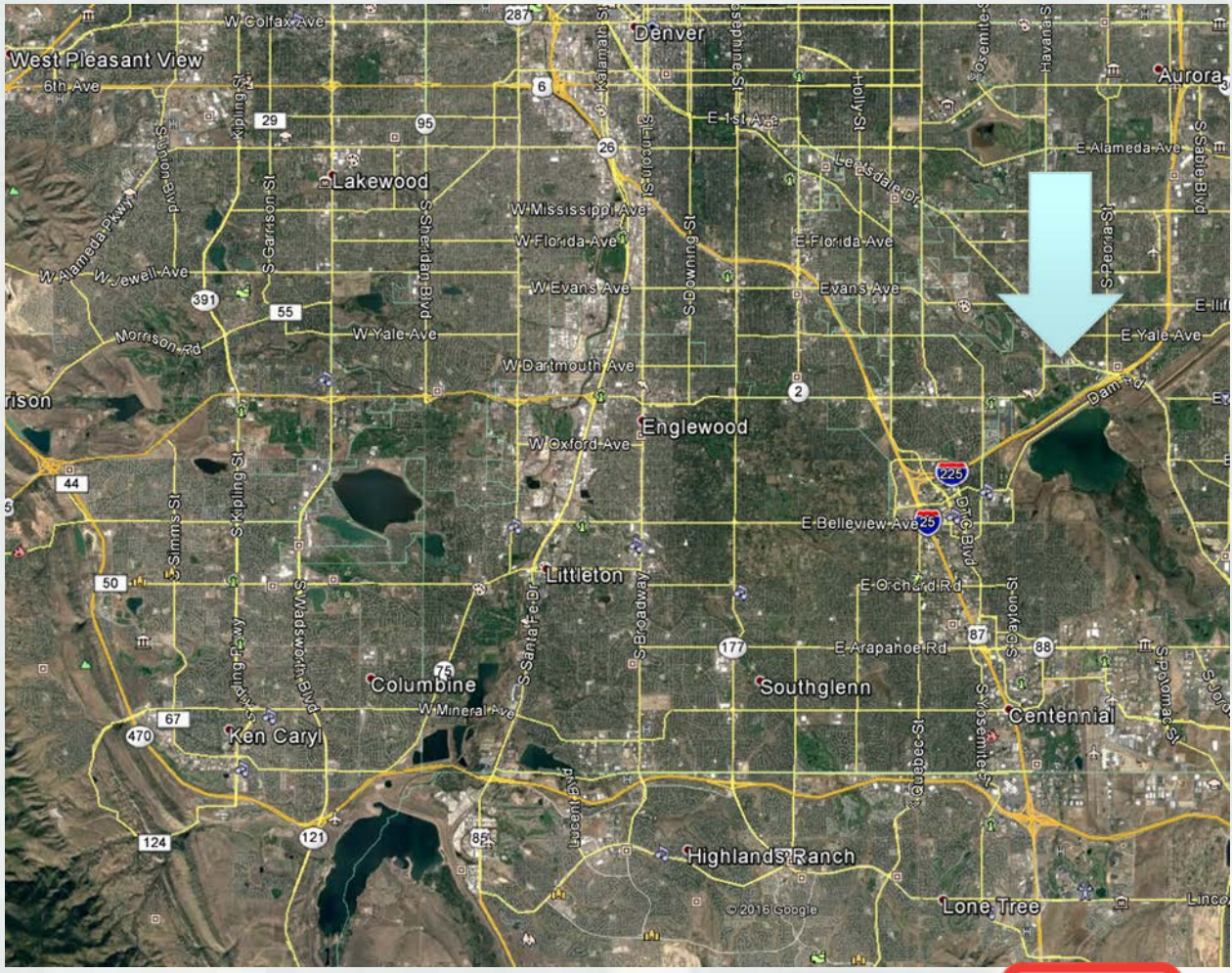
FY18 RSM IPR

Omaha District – NWO

Cherry Creek Dam Pressure Flushing Case Study

BLUF: Cherry Creek Dam, operated by the Omaha District US Army Corps of Engineers (USACE), undertakes a pressure flushing event annually. This flush is done by the Tri-Lakes O&M staff to ensure that deposited sediment does not affect the operability of the discharge gates. This project proposes to take advantage of the 2017/8 flushes, partner with the Bureau of Reclamation (BoR) on a case study, and develop comprehensive review of the benefits and impacts of reservoir flushing in the context of Regional Sediment Management.



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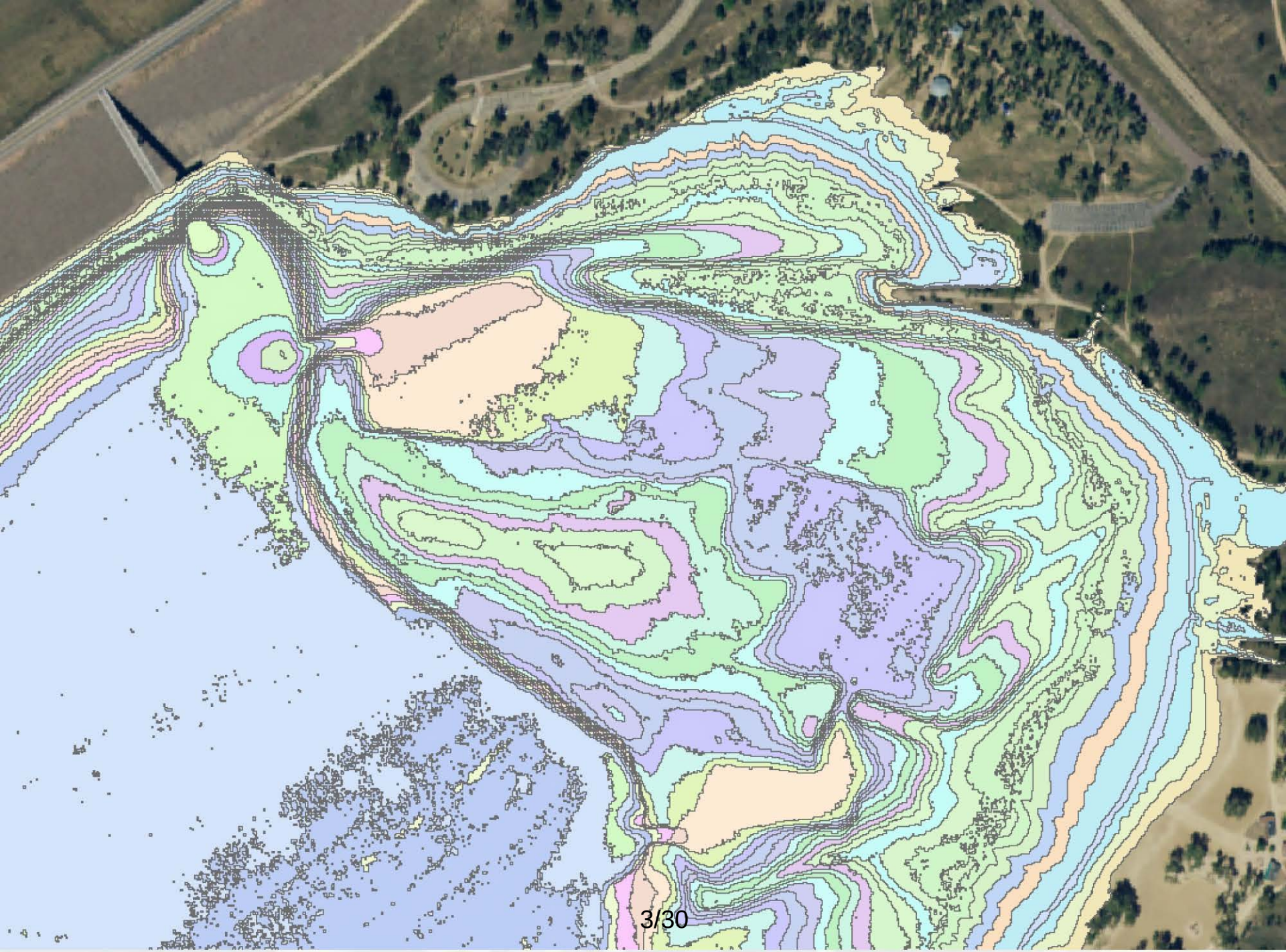
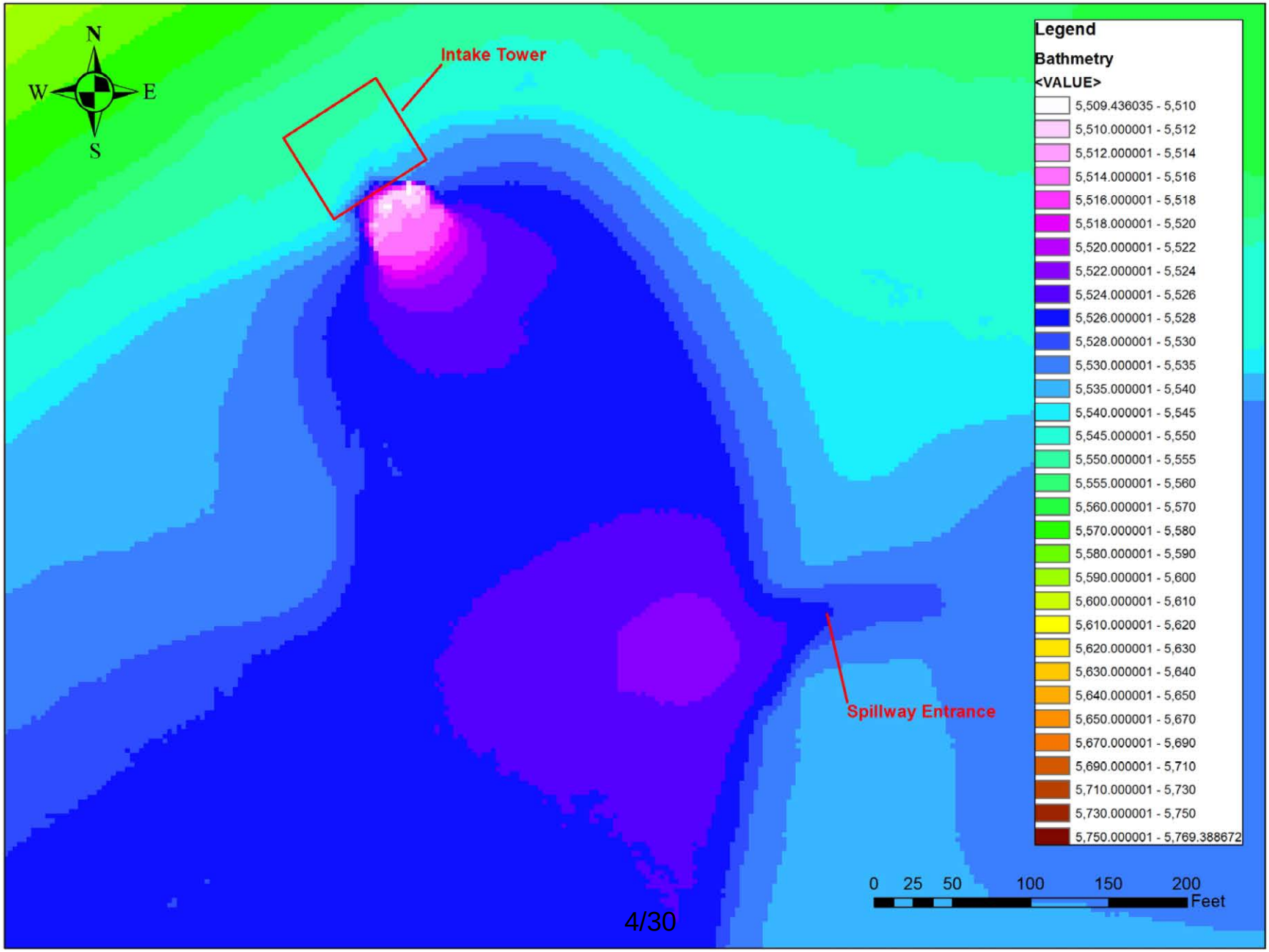
Cherry Creek Dam Pressure Flushing Case Study

Approach

(including Tools/Models/Data Used)

- Bureau of Reclamation has a 2-yr research unit on pressure flushing
- Team with BoR, USGS, City of Denver, and Denver Water to monitor and measure the pressure flush in May 2017 and May 2018
- Low flow flush (250cfs per gate) in 17
- High flow flush (1350cfs per gate) in 18
- BoR will complete multidimensional models for pressure flushing predication
- BoR providing multibeam surveys and reservoir sed samples
- Will develop a sed budget for flush and examine flush efficiency – with a goal of reducing the water needed for flushing

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Feet

2017 Cherry Creek Flushing Operation Schedule

Tues May 23, 2017

Scheduled Time (MDT)	Task	Actual Start Time	Actual End Time
2:30pm	Gate 1 release 50 cfs and leave at 50 cfs overnight. Notes:		

Wed May 24, 2017

Scheduled Time (MDT)	Task	Actual Start Time	Actual End Time
8:55	Gate 1 closed. Notes:		
9am	Gate 3 release 250 cfs for 15 minutes. Notes:		
9:15	Gate 3 closed. Notes:		
9:20	Gate 1 release 250 cfs for 15 minutes. Notes:		
9:35	Gate 1 closed. Notes:		
9:40	Gate 2 release 250 cfs for 15 minutes. Notes:		
9:55	Gate 2 closed. Notes:		
10am	Gate 4 release 250 cfs for 15 minutes. Notes:		
10:15	Gate 4 closed. Notes:		
10:20	Gate 5 release 250 cfs for 45 minutes for USGS flow measurement. Notes:		
11:05	Gate 5 closed. Notes:		
11:10	Reset to required State release. Notes:		

Gate Settings (for one service gate) at lake elevation ~ 5550 ft-msl

50 cfs release = 0.20 feet

250 cfs release = 1.00 feet

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Cherry Creek Dam Pressure Flushing Case Study

Partners

Participant Contacts

US Army Corps of Engineers, Cherry Creek Dam Flush Operations

Joe Maxwell	Operations Project Mgr	720-982-6020
Scott Franklin	Civil Engineer	303-507-1368
Tim Rose	Ranger, Natural Resources	720-276-5303
Carl Voss	Engineer Tech	303-507-7443
Sandor Rebek	Engineer Tech	720-988-0365
Clyde Ullrich	Maintenance	720-816-5301

US Army Corps of Engineers, Omaha Water Control

Katie Seefus	Civil Engineer	402-995-2309

US Army Corps of Engineers, Omaha Sediment Engineering

Dan Pridal	Hydraulic Engineer, Sediment Section Chief	402-995-2336
Paul Boyd	Hydraulic Engineer	402-253-6752
Bill Williams	Hydraulic Engineer	402-995-2920

Cherry Creek State Park

Jason Trujillo	Park Manager	303-518-1659

City of Denver, Cherry Creek and Trail downstream of Cherry Creek Dam

Erick Anderson	Parks & Rec, Chief Inspector, Citywide Ops	303-514-3380
Joe Alire	Parks & Rec, Operations Supervisor	303-916-4421
	Park Rangers Hotline	303-331-4050
	Police Dept, Emergency	911
	Police Dept, Non-Emergency	720-913-2000

US Bureau of Reclamation, Sediment and River Hydraulics Group

Kent Collins	Hydraulic Engineer	303-868-0572
Blair Greimann	Hydraulic Engineer	303-517-8130

USGS

Greg Smith	Lakewood Field Office Chief	303-941-0550

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Omaha District – NWO

Cherry Creek Dam Pressure Flushing Case Study

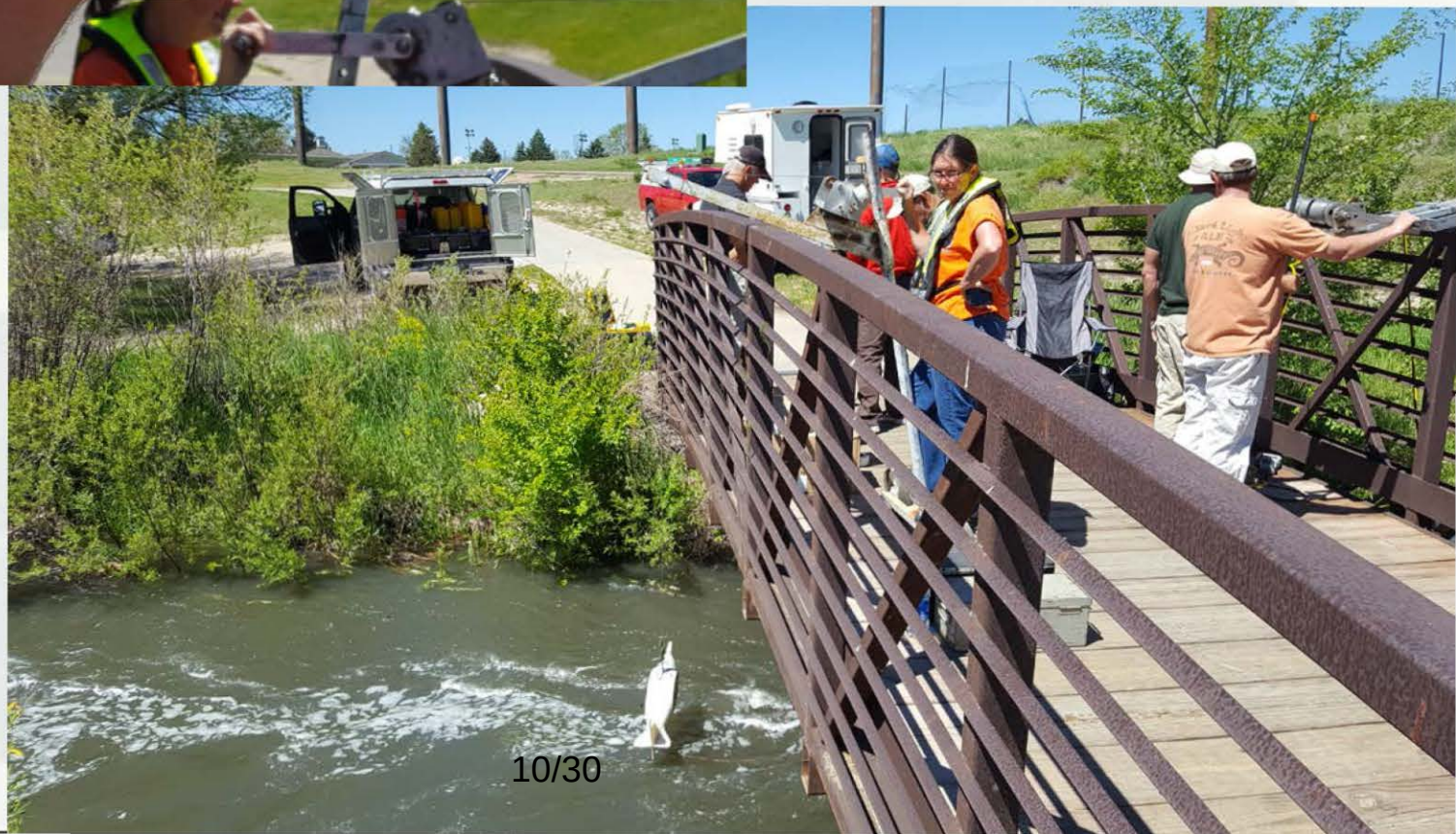
Value to the Nation

- Pressure flushing used at more reservoirs than first thought
- Most times the flush magnitude and duration is an historic SWAG
- Being able to model pressure flushing will allow better prediction of flush efficiency, possibly reducing water usage.
- May be a viable management action for other reservoirs
- Coordinate discharge measurements with USGS to update rating curves at gages in Denver.

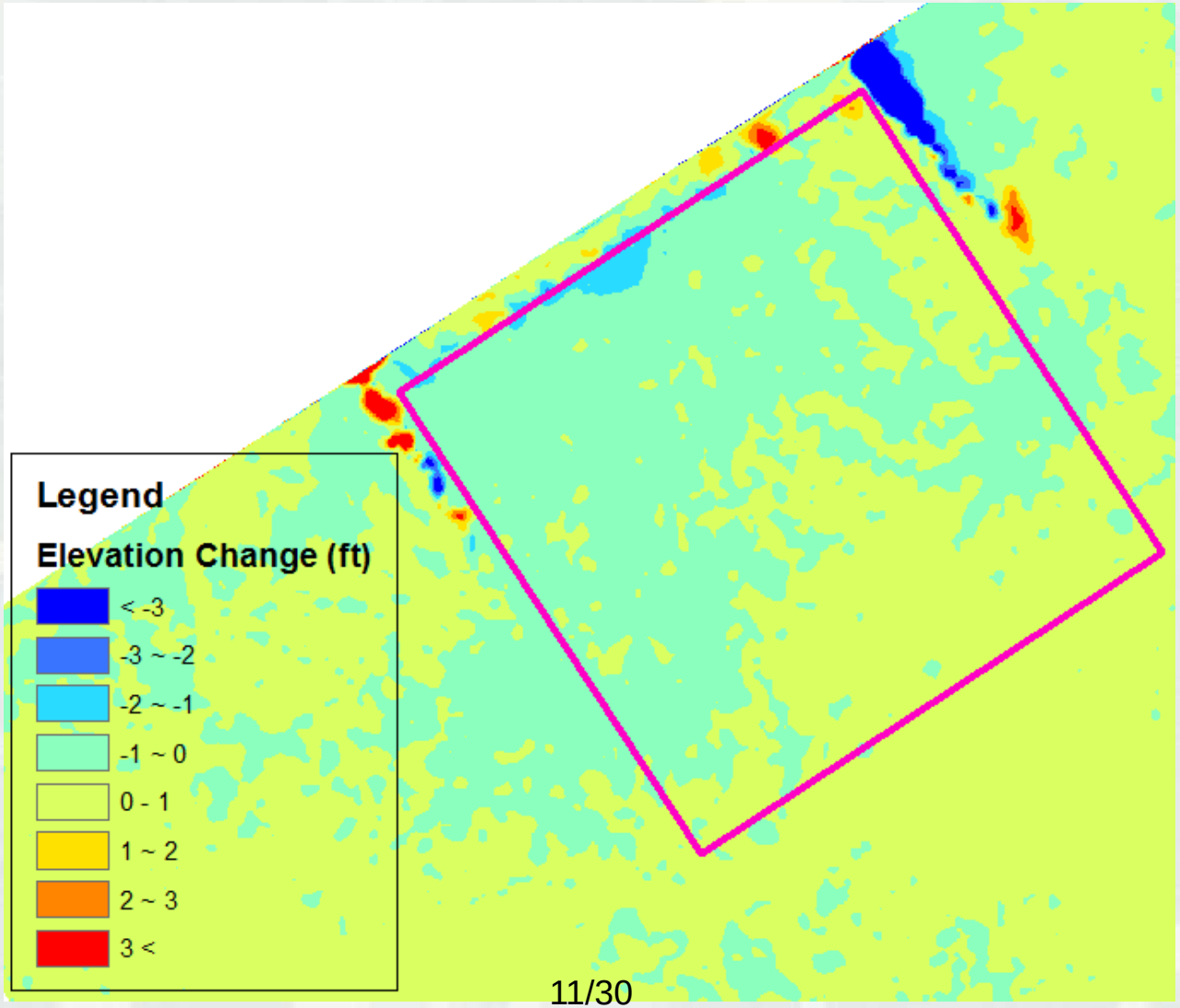
Schedule

- 2017 Flush on 24May2017
- This week – surveys and sed samples in reservoir
- 22May2018 – downstream channel surveys
- 23May2018 – flush and post surveys


0.49



Volume Change Comparison from Multibeam Surveys



Estimating Sediment Transported in Flush

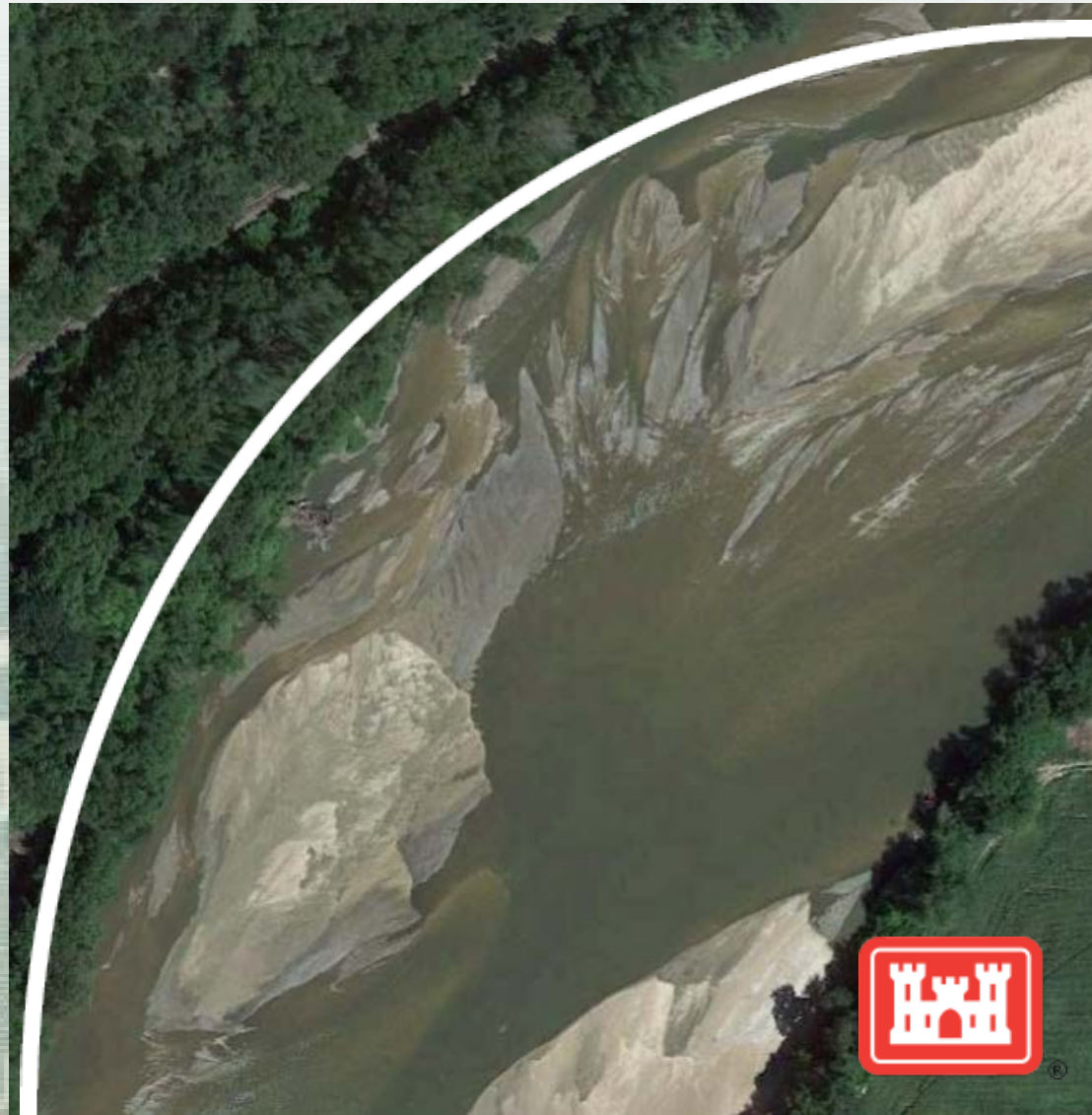
- RSM Proposal asks for “Amount of Sediment moved through this RSM project?”
- I’ve always answered Zero…….
- For 2017 Cherry Creek Pressure Flush……..
- Using difference in DEM’s = 137 CF!!!!!
- Using sediment budget (flow x concentration x time x density) = 51 CF…..

Plans for 2018 Flush

- May 23rd, 2018
- Discharge @ 1300 cfs, up from 250 cfs
- Similar monitoring plan
- Sampling location will be moved due to flooding
- If you're in Denver next week, come see it!

RSM-U Workshop on Reservoir Management (for engineers)

June 11-15, 2018
Univ. of Kansas,
Lawrence, KS



U.S. Army Corps of Engineers
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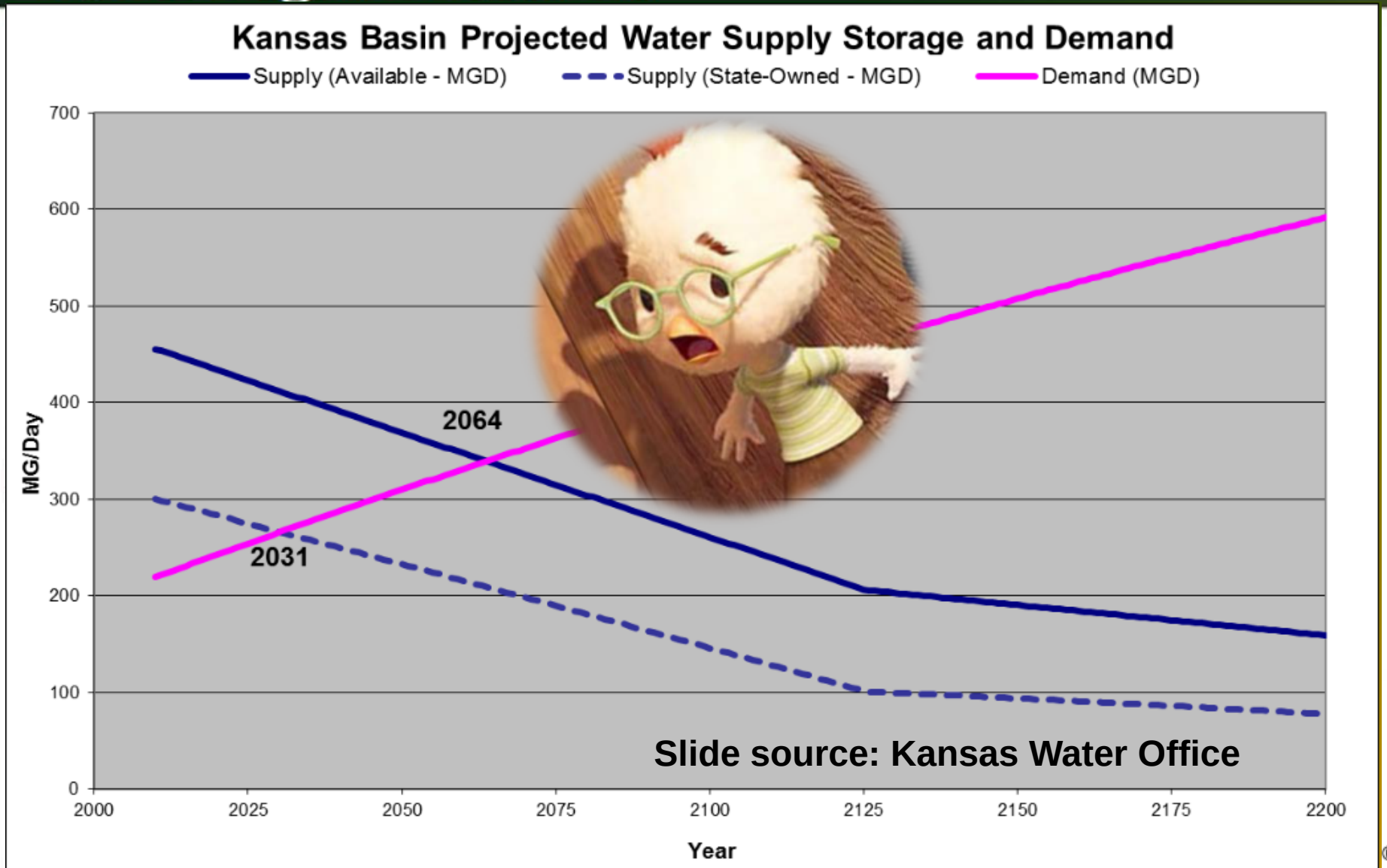
Supply – Demand Graphs

- 2% drought condition



Paonia Reservoir, 1961

Paonia Reservoir, October 2014

voir is 25% full of sediment

Source: Collins and Kimbrel, 2015
http://acwi.gov/sos/pubs/3rdJFIC/Contents/9C-Collins.pdf

Why does it matter to RSM?

- Many of our inland river systems are sediment starved, due to collection of sediment in reservoirs
- The reservoir and river system are interconnected – any management action for reservoirs has a direct regional effect on downstream river channels, including navigation channels and ports, marinas, etc.
- RSM has been a project sponsor for modeling improvements associated with reservoirs

Why Do a Workshop on Reservoir Management?

- Significant growth globally in active management of sediment in reservoirs – likely the result of reduced benefits due to age.
- Management agencies (USACE, Reclamation, NRCS, States) are increasingly looking to regain reservoir storage capacity to slow the loss of benefit
- Prepare USACE Engineers to support risk-based decisions about reservoir management

Who it is for?

- Engineers and scientists who are interested in the numerical analysis of sediments in reservoirs
- Content will focus on using data to develop predictive estimates of the effectiveness of sediment management alternatives.
- Not all modeling, but good exposure to using numerical models for reservoirs

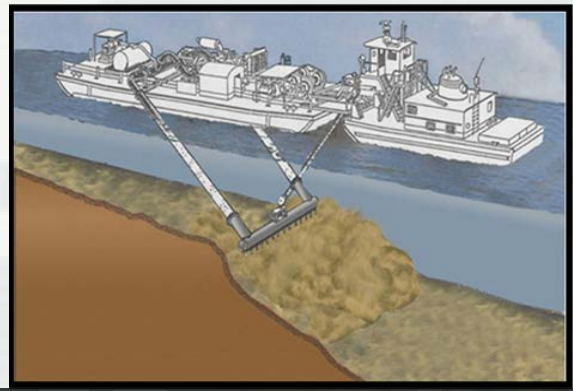
Management Options w/Case Studies

- Sediment yield reduction
- Sediment bypass
- Sediment pass-through (routing, sluicing)
- Drawdown flushing
- Pressure flushing
- Hydrosuction
- Inlet extension
- Density current venting
- Hydraulically assisted density current venting
- Sediment focusing
- Dredging
- Reallocation
- New reservoirs/dam raises

Pass sediment downstream

Reactionary

Photo: Gregory L. Morris



Workshop Details:

- June 11-15, 2018
- On campus of University of Kansas
- No tuition!
- 49 registered
- Site visit to reservoir flush
- Instructors:
  - Dr. John Shelley, NWK
  - Dr. Paul Boyd, NWO
  - Dr. Ian Floyd, ERDC-CHL
  - Mr. Travis Dahl, ERDC-CHL
  - Dr. Stanford Gibson, IWR-HEC
  - Dr. Blair Greimann, BoR
- H&H CoP and USSD have requested the workshop

How did the 2017 Reservoir Workshop go?

- 25 participants
- Great discussion on the unknowns in the Regulatory environment
- Developed a group of case studies brought by participants
- Site visit limited by lightning!
- Interest from Regulatory in doing again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