



Summer Lake and River Level 2010: What's Happening? July 24, 2010



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Cowichan Lake Level and River Flow

Summary

- History of the weir and purpose
- How river flow and lake level are managed
- What's happening in 2010?
- What happened in previous years?
- How can water be better managed?



Dynamic Environment Cowichan Lake and Cowichan River

Cowichan River Skutz Falls

**This is what
we will be talking
about today**



**November
(200cms+)**

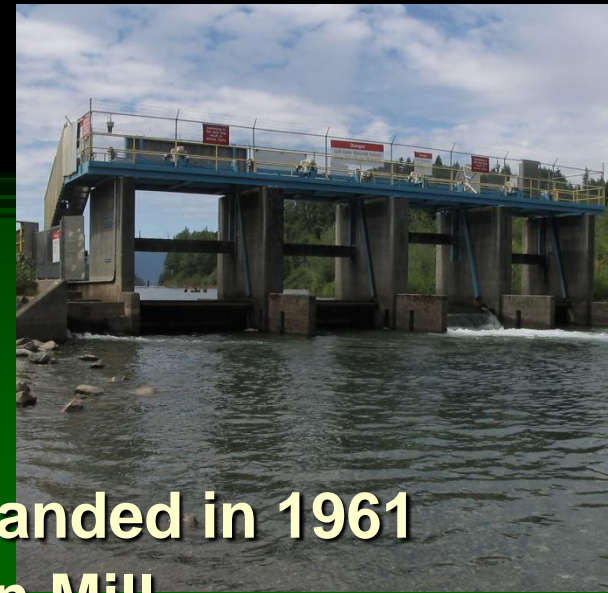


**August
(4-7cms)**

Cowichan Lake Weir

History

- Weir constructed in 1957 and expanded in 1961 by BCFP for water supply for Crofton Mill
- Stores almost 60 million m³ (0.97 m deep) of water in Cowichan Lake (summer storage = 4% of total average annual outflow from the lake)
- Originally designed to maintain 7 m³/s in Cowichan River from July to October (about 16 weeks).
- On average 6 cm of storage is about 1 week supply (but depends on lake inflow)



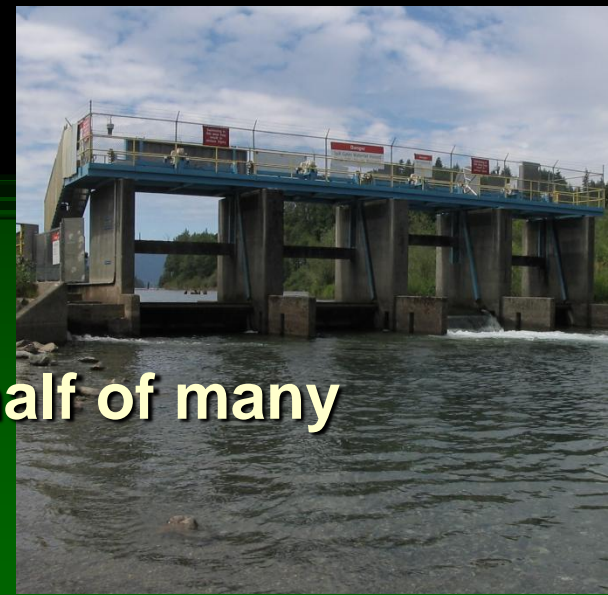
Cowichan Lake Weir

History

Operated by Catalyst Paper on behalf of many water users in the watershed:

- Industry
- Municipal treated sewage dilution and municipal water supply (both directly (Crofton) and indirectly through ground water (North Cowichan/Duncan))
- Fisheries / River Habitat Health
- First Nations/Cultural Importance and
- Recreation (both in the river and in the lake)

7 m³/s flow in the river from July to October satisfies these needs

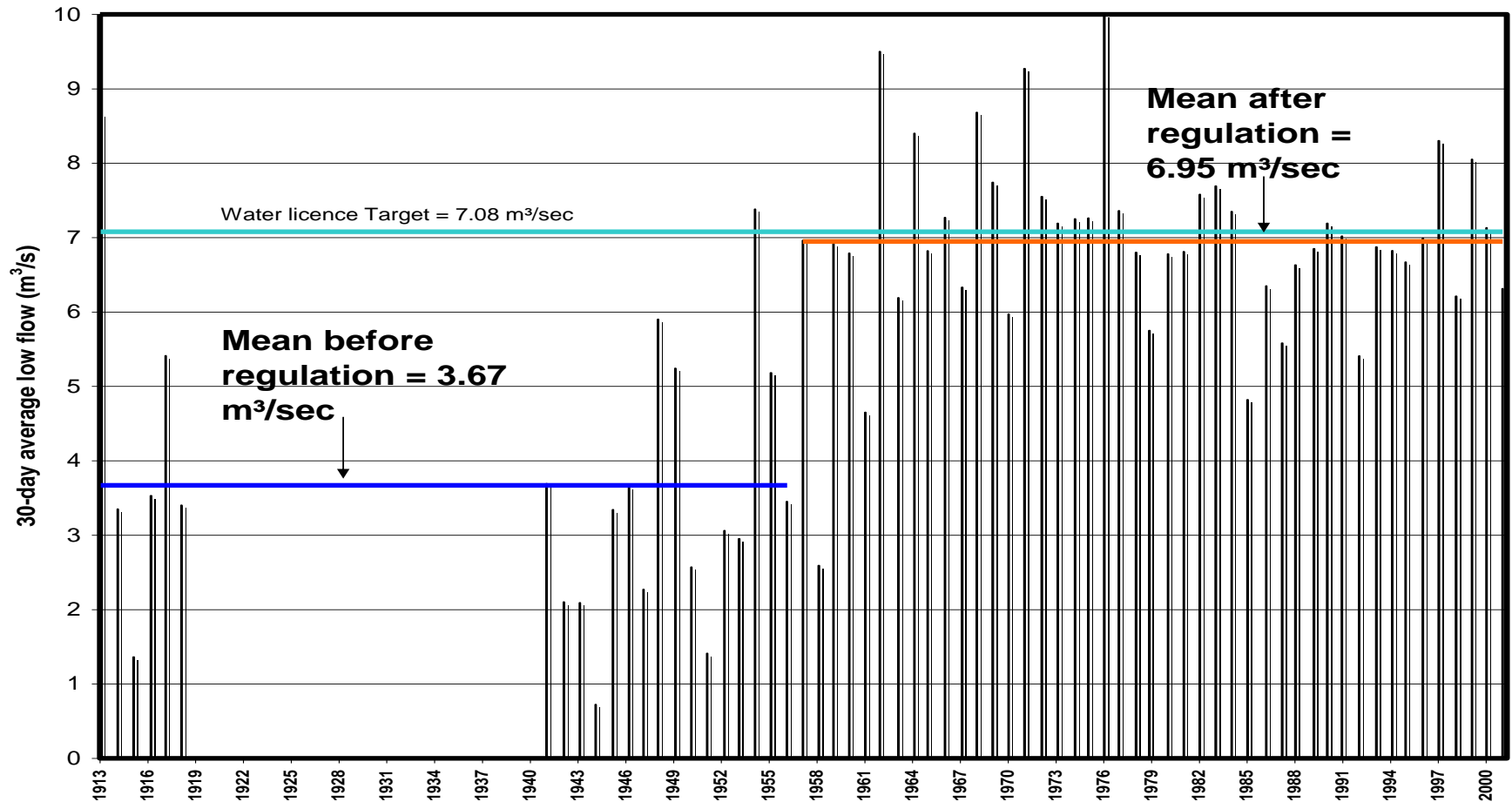




What good does the weir do?

Summer river mean water flows have doubled since 1957

08HA002 Cowichan River at Lake Cowichan



One thing to keep in mind...

Lake level always depends on inflow (flow from tributary streams and rainfall) and outflow (Cowichan River flow and evaporation)

When inflow larger than outflow \Rightarrow lake level increases

When inflow less than outflow \Rightarrow lake level falls

Weir typically controls spring/summer lake levels by:

1. Decreasing flow in spring to less than or equal to inflow to store water behind weir
2. Releasing flow in the summer greater than inflow to maintain summer baseflow

How are lake levels and river flows managed?

Some definitions

Full Storage Level (FSL) – water level at top of the weir

Zero Storage Level (ZSL) – below this lake level flow in the river would drop below $7 \text{ m}^3/\text{s}$.

Control period – Typically April 1 to September/November depending on rain



Water levels during typical year

Full Supply

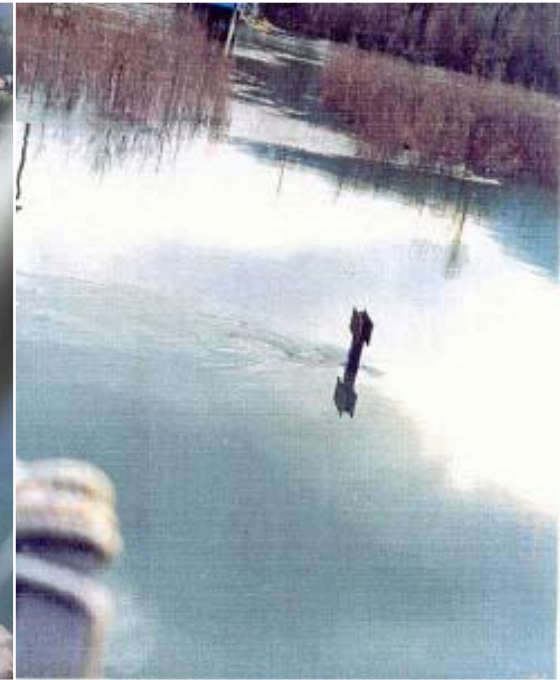
Zero Storage

No Control

April to Early July

**End of
October**

November



Direction of Flow⁰

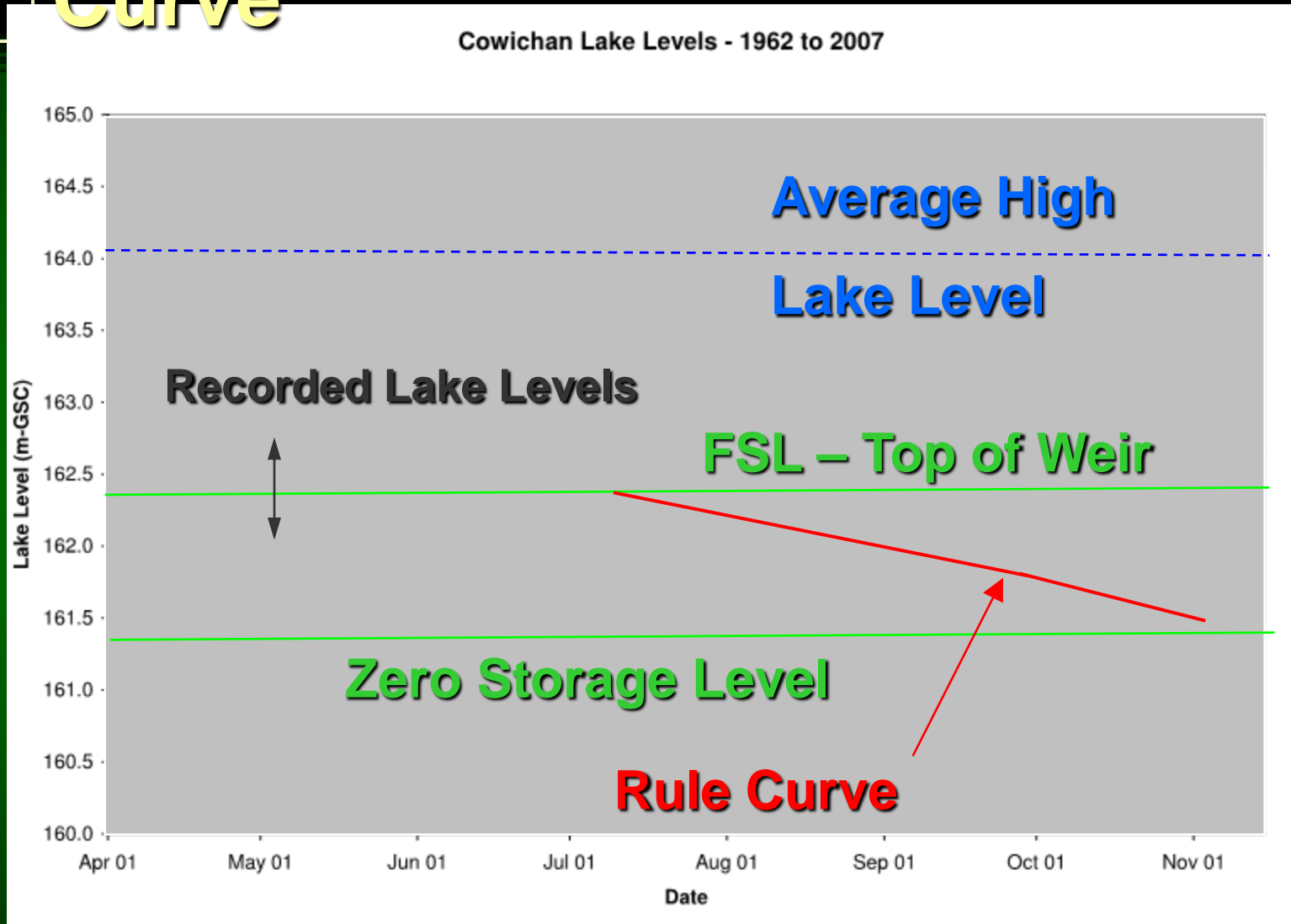
How is water managed?

Ideally:

- 1. Lake at Full Supply Level on July 9th**
- 2. River flow 7 m³/s from June 15th until return of fall rains (late September to early November)**
- 3. Also spring flows of 25 m³/s and 15 m³/s prior to June 15th.**

But depends on inflow

How is water managed: Rule Curve



Ideally lake level at FSL July 9 then falls along Rule Curve



How is water managed: Rule Curve

What happens when lake levels do not follow rule curve because of below/above normal inflow?

Cowichan River Ad-hoc Committee makes recommendation on required change in river flow

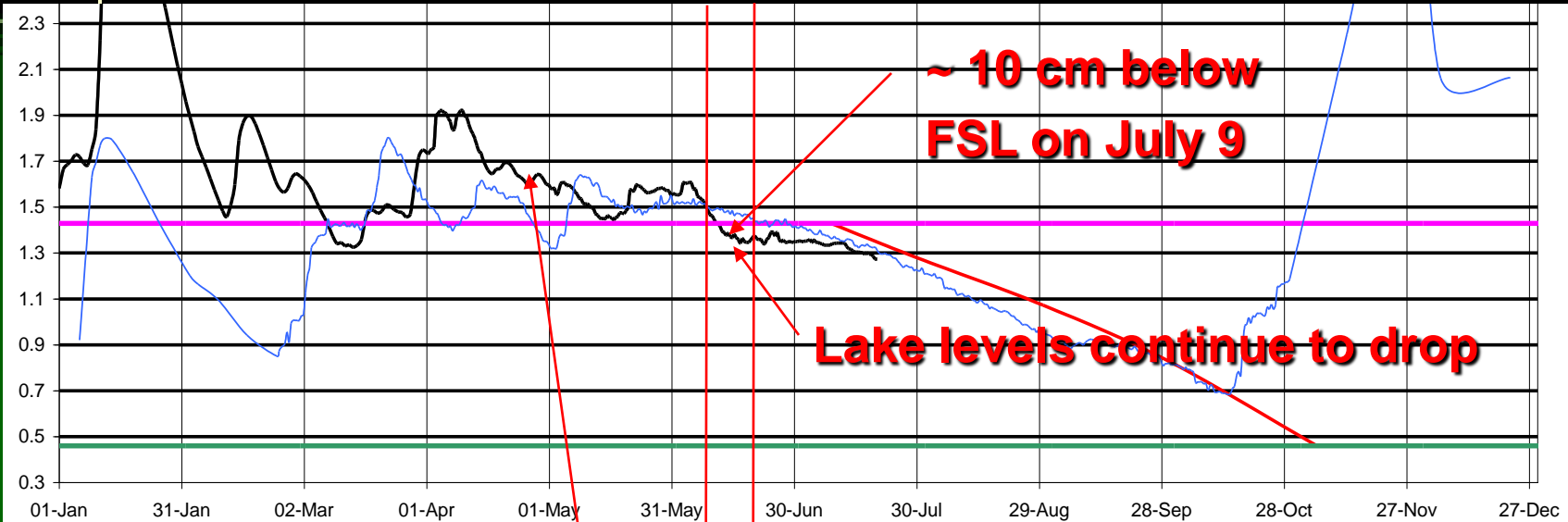
Recommendation is submitted to MoE for approval

What's happening this year?

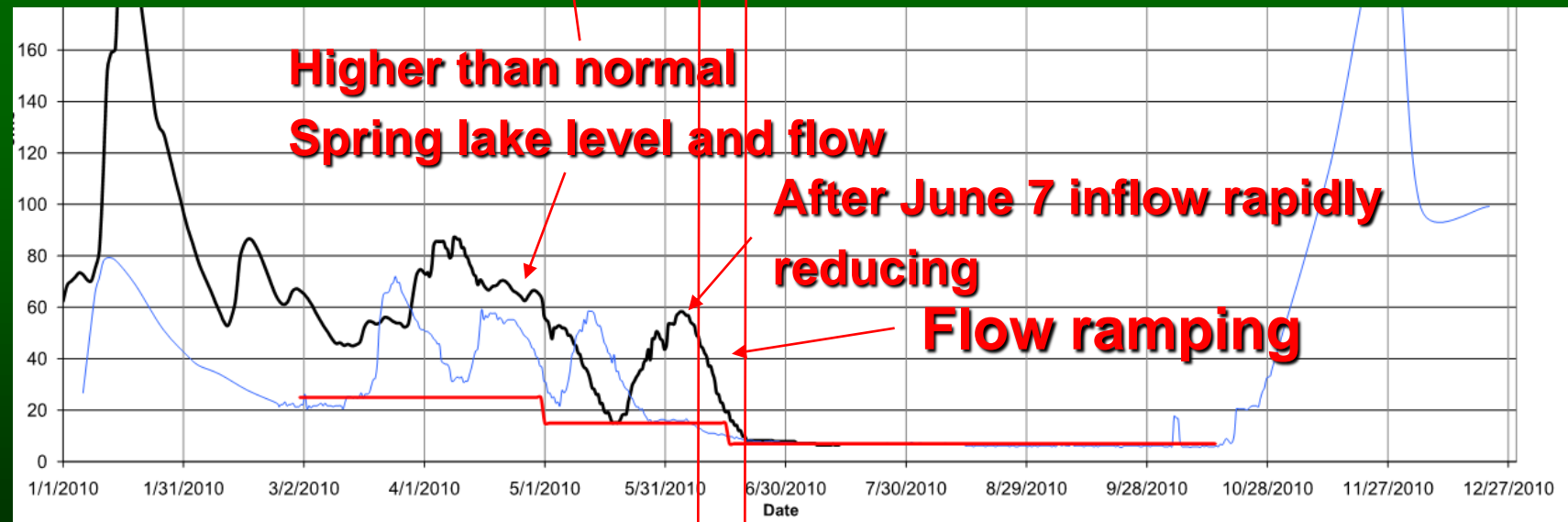


2010: What is happening?

Lake Level (m)



River Flow (m³/s)



2010: What is happening?

- Could not control flows until lake level FSL + 10 cm (4 “) – MoE Requirement

- Ramping rate restricted how quickly flows in river could be reduced

Lake level could not be “held” at FSL (would require dropping flows in the river too quickly)

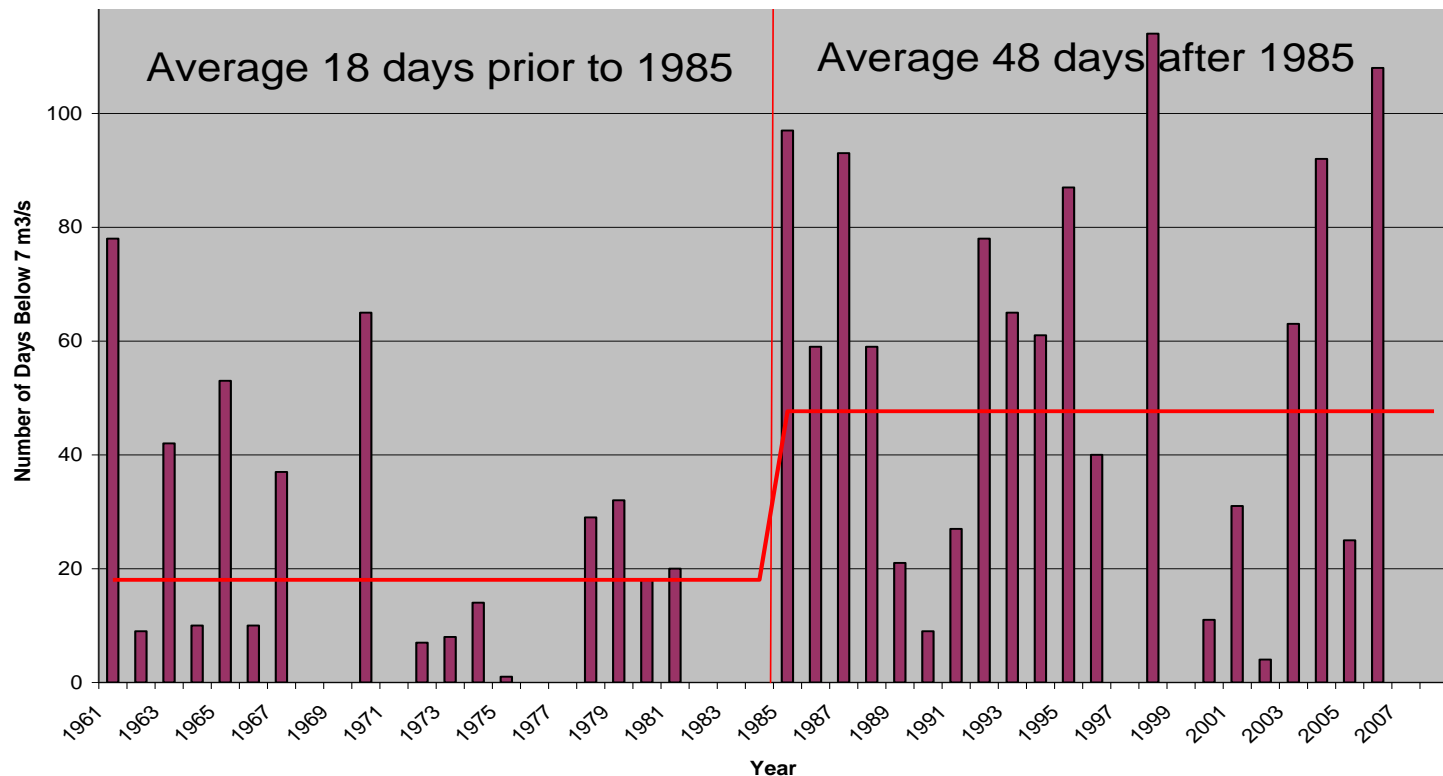
- Result - > Lake level was 10 cm below FSL on July 9th and river flow reduced to 6.5 m³/s

Past summers

2010 is a wet yearwhat about a dry year?

Having to reduce flows below 7 m³/s is becoming more common

NUMBER OF DAYS BELOW 7 m³/s



Past Summers

About 37% less summer inflow since mid-80s

What is likely causing reduced inflow

- 1. Less spring/summer rainfall (16% less)**
- 2. Less snowpack**
- 3. Increased summer temperatures/evaporation**
- 4. Possible Other (land use, changes in how data was recorded, etc.)**

How can water be better managed

- 1. Current tool (rule curve) developed in the 1960s for managing water to the mill.**
- 2. Many other factor's must now be considered:**
 - 1 - Fisheries requirements (spring flows, ramping rates)**
 - 2 – Recreation needs (river flow and summer lake levels)**
 - 3 – Other uses (treated wastewater dilution, first nations cultural values – bathing, etc.)**
 - 4 – Changing pattern of inflow**

Current rule curve is not flexible enough

How can water be better managed

Approach - Rule Curve vs. Rule Band

Rule band allows lake levels to rise/fall within a specified range depending on inflow to the lake while maintaining $7 \text{ m}^3/\text{s}$ in the river.

Defines what is to happen when water levels are outside of the band based on defined risk and potential impacts to all stakeholders.

How can water be better managed

Approach - Rule Curve vs. Rule Band

Allows for capture of some summer rainfall (if it occurs) which provides:

- 1. More water to support flows during longer dry summers**
- 2. Water for optional fish pulses (short increases in river flow in the fall)**

How can water be better managed

Approach - Rule Curve vs. Rule Band

At the same time, better defines when river flows should be changed...

increased above 7.0 m³/s when lake levels above the band

reduced below 7.0 m³/s when lake levels below the band.



How can water be better managed

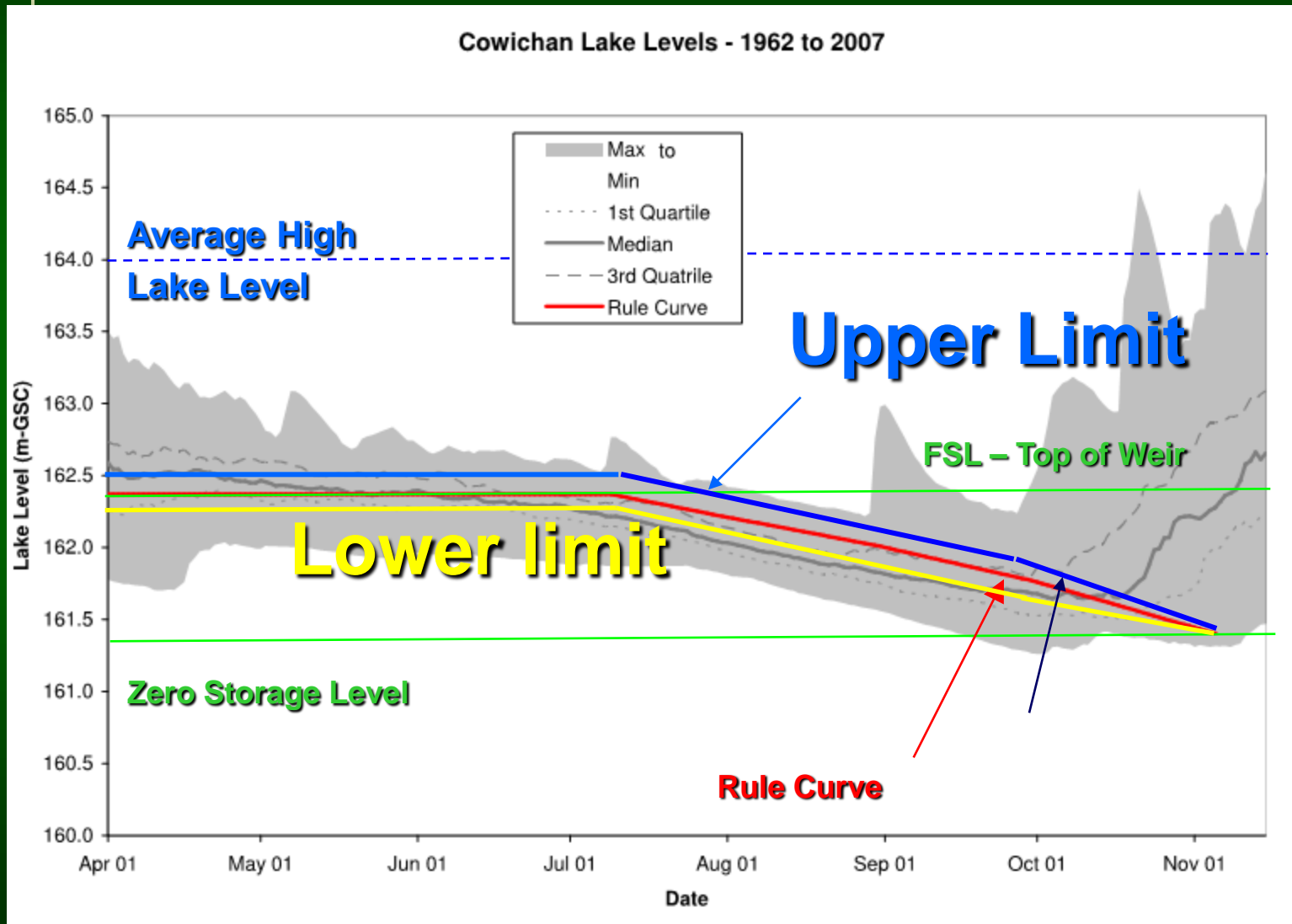
Approach - Rule Curve vs. Rule Band

Finally,

Provides more flexibility in managing lake level/river flow prior to July 9 to better maintain lake levels at FSL in most years.

How can water be better managed

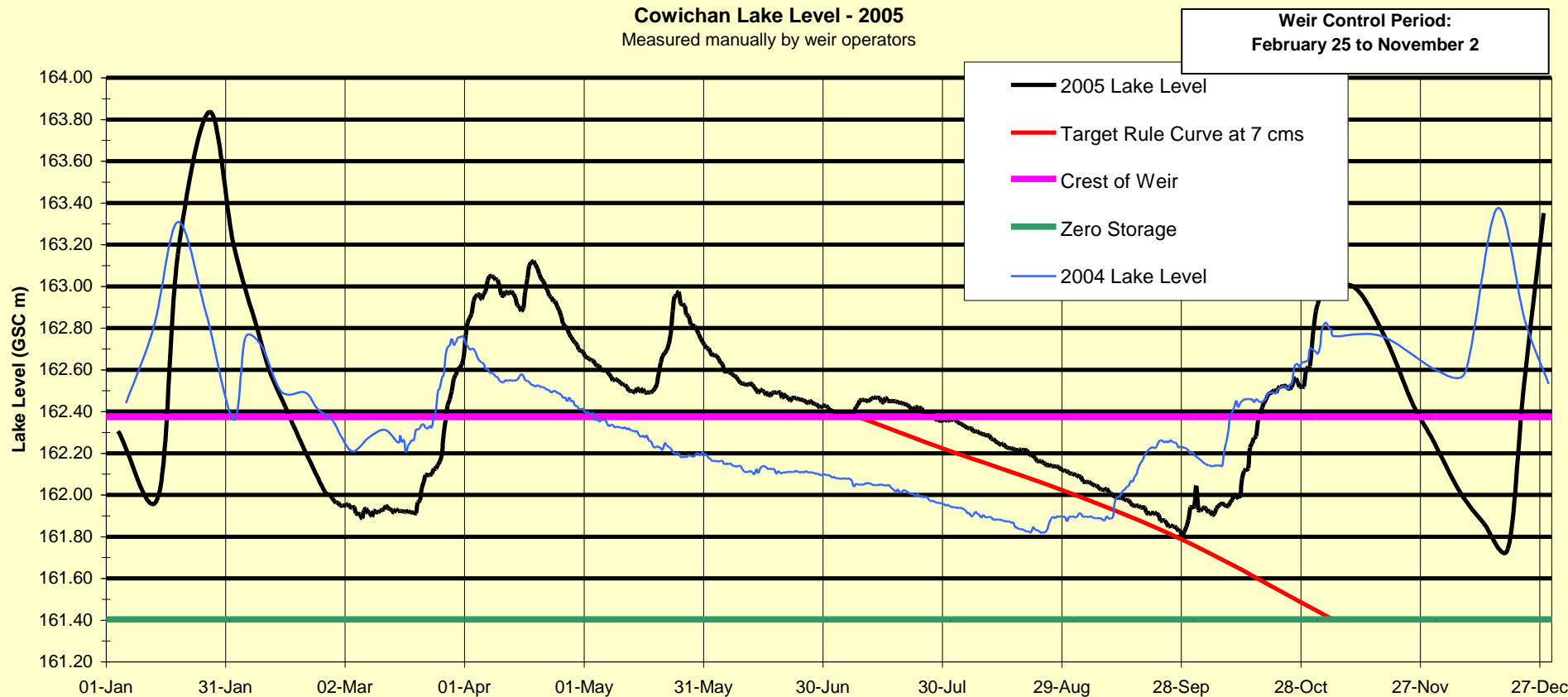
Example Rule Band





What could it look like?

Summer of 2005



Wetter than average condition

Resulted in levels to be higher than curve

OPTIONS

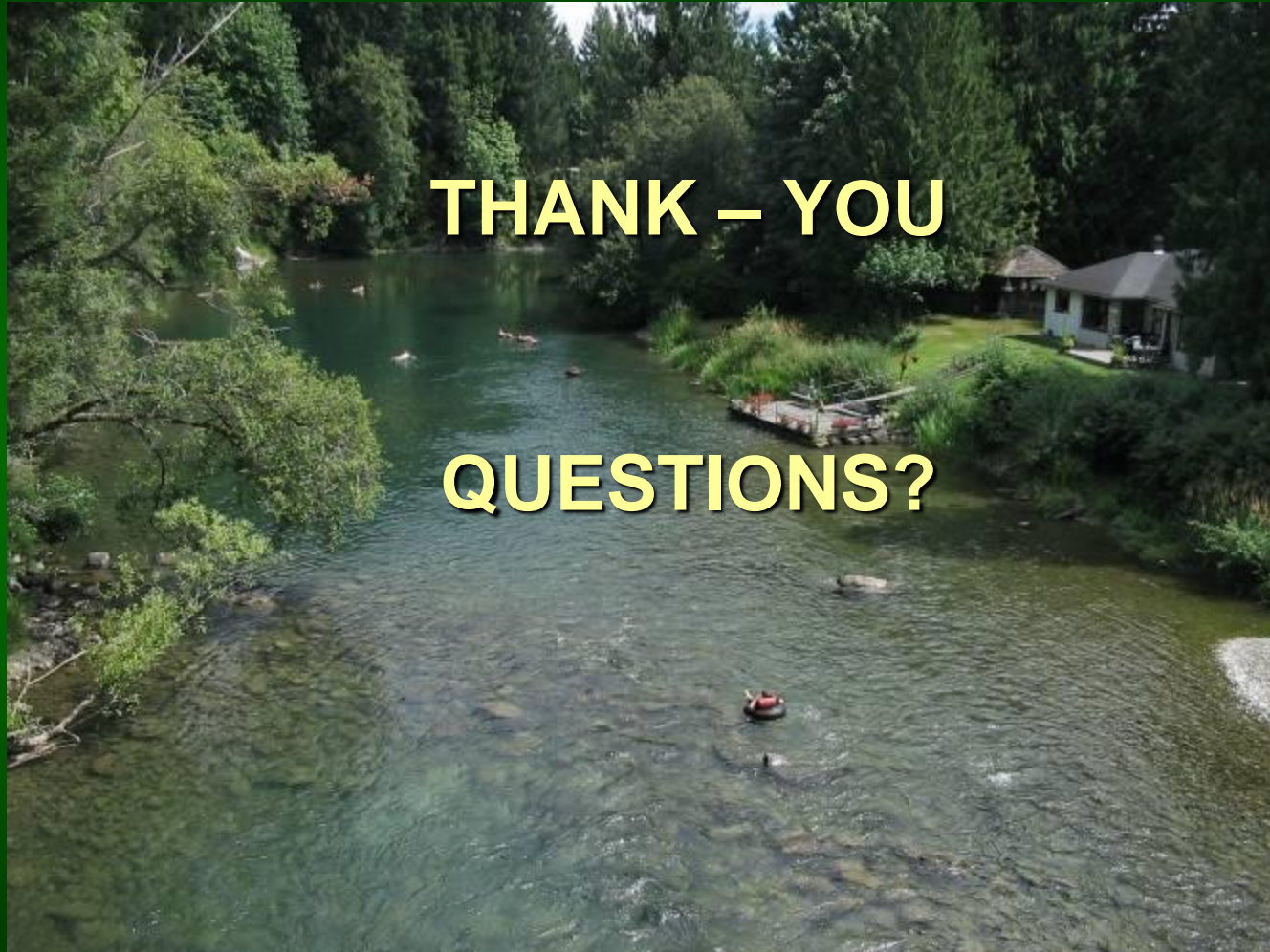
1. Status Quo – Continue to use existing rule curve

- Lake Level/River Flow similar to recent years
- Continue ad-hoc management
- Risk of running out of water by end of summer
- Need to reduce flows below 7 m³/s more often
- Impacts to downstream

2. Rule Band – Update to rule curve

- **Flexibility within defined range in managing both lake level and river flow**
- **Better defines what to do when water level not within the defined range (based on risk and impacts)**
- **Better able to meet FSL on July 9th**
- **Ability to capture some summer rainfall (if it occurs) for later release**
- **Results in some variation in spring/summer lake levels (but within past recorded range)**

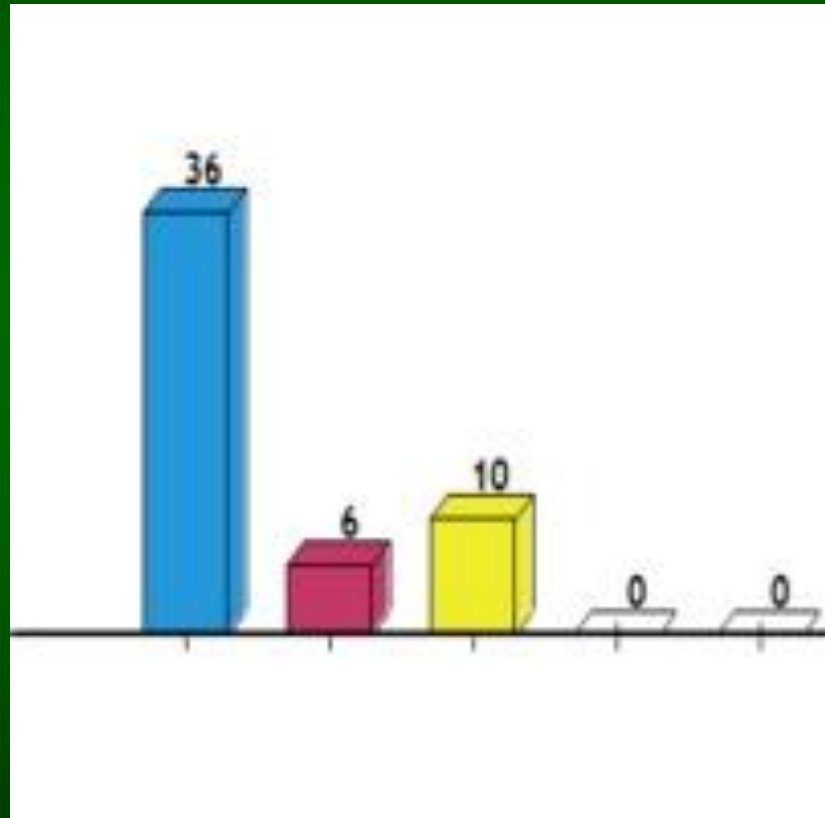
Cowichan Lake Outlet



Audience Question #7

Did this session help you understand the factors that effect summer water levels?

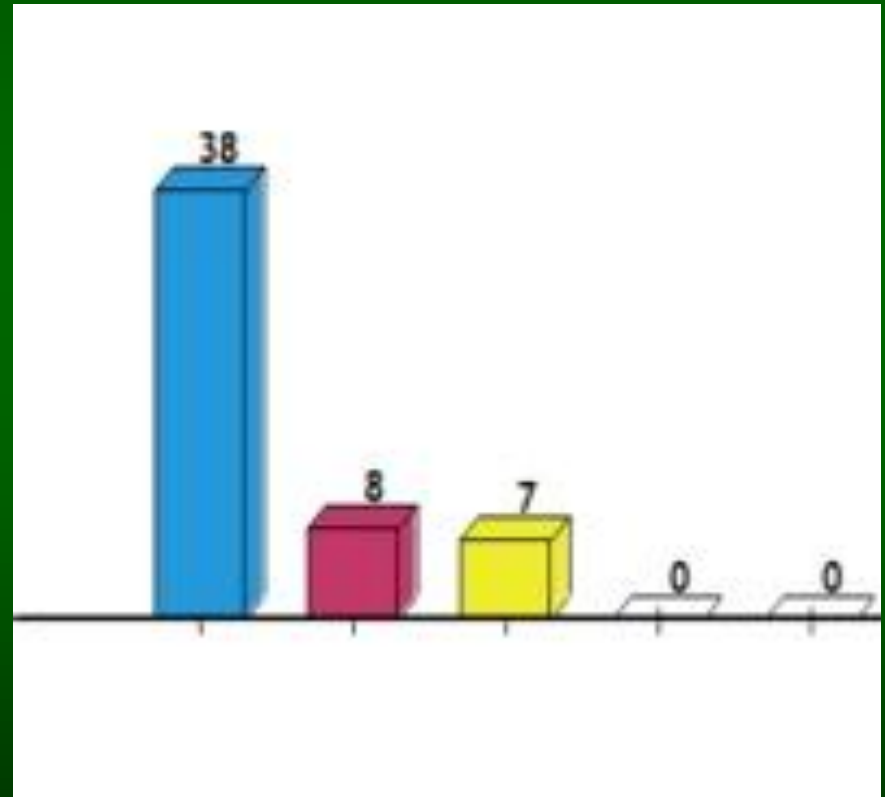
- **A. Yes, I get it.**
- **B. No, I need more time and information.**
- **C. Somewhat**



Audience Question #8

Did this session help you understand the difference between the rule band and the rule curve approach to managing lake levels and river flows?

- **A. Yes, I get it.**
- **B. No, I need more time and information.**
- **C. Somewhat**



Audience Question #9

Are you supportive of further study and exploration of the rule band approach to manage water levels in the lake and river?

- A. Yes
- B. No
- C. Undecided

