Focus on data gaps identified during last biennium

- Scour monitors deployed to measure scour near existing reds
- Measured existing large woody debris at several locations in mainstem Chehalis and tributaries
- Estimate of amount of sediment/wood that would be retained in impoundment(s)
- Transport of sediment through impoundment (HEC-RAS model)
Scour Monitors

• Scour monitors deployed near redds at six sites in mainstem Chehalis between South Fork and upper end of potential impoundment (RM 88 to 116)
• 5,840 cfs flow (1.5-year recurrence): water depth 4-8 feet over monitors, gravel up to 64 mm moved, 0 to 0.8 feet of scour/fill
• 14,000 cfs flow (4-year recurrence): water depth 6-10 feet over monitors, gravel up to 300 mm moved, 0.5 to several feet of scour/fill (many monitors not found)
• Summary: sediment in upper Chehalis very mobile—still recovering from 2007 event (channel filled with up to 10 feet of sediment in some places during that event)
• Existing conditions—little wood in channel (less than 10% of Fox and Bolton target)
• Huge amount of wood moved through system in 2007, but most wood was moved out of wetted channel onto floodplain by flood or subsequently removed
Potential Wood/Debris Input to Impoundments

Note: 2007 - estimated to be 500-year event; wood input estimated over 3 million cu yd

$R^2 = 0.9569$
• Dam designed to pass sediment; impounds water only during floods
• Estimated six times over 27 years
• Each impoundment lasts approximately 1 month
FRO Operations – Sediment

Sediment deposition in river over this range of reservoir elevations (RM108 to RM114.5).

- Reservoir Inflow (cfs)
- Reservoir Outflow (cfs)
- Reservoir Pool Elevation (ft)
HEC-RAS Sediment Transport

- HEC-RAS model of potential impoundment area—RM 107 to 118
- Used Ackers-White total load transport equation (suspended and bed load)
- Incoming total sediment load estimated from USGS suspended load rating curve at Doty (added 5% bedload; grain size based on substrate sampling)
- Inflow and sediment inputs at four major tributaries
- Little calibration data available, used October to December 2015 flows/scour monitor data, limited extent
- 1988 to 2015 long-term run for existing conditions, FRO and FRFA
- 2007 event not handled well by model; huge sediment inputs/debris torrents—not included in results
Sediment Modeling – FRO

![Graph showing sediment storage over river miles with Existing Conditions, FRO, and FRO Reservoir Fluctuation Zone markers.](image-url)
FRO Operations and Channel Conditions

- Sediment would be deposited and re-worked throughout impounded channel length (RM 108 to 115)
- Increased fine sediment but would clear out of channel (several years between impoundment episodes)
- Channel widening in places with decreased riparian vegetation
FRFA – Sediment

- FRFA would impound water at all times and would trap all sediment and wood coming in from upstream.
- Fluctuation zone between RM 114 and 117.
FRFA – Modeling Results

![Graph showing sediment storage over river miles with Crim Creek Delta highlighted.]

- **Sediment Storage (tons)**
  - 120,000
  - 100,000
  - 80,000
  - 60,000
  - 40,000
  - 20,000
  - 0
  - -20,000

- **River Mile**
  - 107
  - 109
  - 111
  - 113
  - 115
  - 117
  - 119

- **Legend**
  - Existing Conditions
  - FRFA
  - FRFA Reservoir Fluctuation Zone
• River between RM 108 and 114 would become reservoir
• Delta would form at upstream end of impoundment (mainstem and in major tributaries)
• Between RM 114 and 117 sediment would accumulate when reservoir rises; then a new channel would be cut as reservoir drops—high fine sediment levels
Summary

• Existing channel in potential impoundment area has very mobile substrate (result of 2007 sediment)
• Little large woody debris in Chehalis River (most removed after 2007 storm)
• Large woody debris storm volumes estimated for potential impoundment
Summary cont.

• FRO
  o Sediment would be deposited and re-worked throughout impounded channel length (RM 108 to 115)
  o Increased fine sediment but would clear out of channel
  o Channel widening in places with decreased riparian vegetation

• FRFA
  o River between RM 108 and 114 would become reservoir
  o Delta would form at upstream end of impoundment (tributaries too)
  o Between RM 114 and 117 sediment would accumulate when reservoir rises; then a new channel would be cut as reservoir drops—high fine sediment levels
Data Gaps

• HEC-RAS model: limited calibration data; results could be improved by additional data collection (bedload transport and channel change measurements)
Questions/Discussion