

## Sodom Dam Fish Passage and Dam Removal Preliminary Alternatives

### PRELIMINARY FOUNDATION ALTERNATIVES

The foundation alternatives are as follows. Each foundation alternative includes both unique elements and possibly other elements that are shared with one or more alternatives.

- **Interim Action**, upgrade current conditions, fish passage and management.
- **Fish Passage**, maintain existing river corridor conditions and management but provide fish passage at each diversion structure including Sodom Dam, Shear Dam, and Spillway Dam.
- **Restore Calapooia River** as the primary channel.
- **Make Sodom Ditch** the primary channel.
- **Variable flow management** transitioning from Sodom Ditch as the main channel to the Calapooia River as the main channel over time.

The following alternatives discussion is a summary, more detail will be provided over the coming months as the project progresses. The following information is intended to be used for discussion points and the summaries should provide a sufficient overview of the concepts developed to date.

#### 1. INTERIM ACTION

Under this short term alternative, the current river corridor conditions and river management would largely continue with specific upgrades as recommended in prior reports. State Parks and landowners would need to maintain the bifurcation point to ensure water delivery to both the Calapooia River and Sodom Ditch. We would expect the river channels to remain on their current trajectories with the Calapooia River channel continuing to fill with sediment and the Sodom Ditch continuing to enlarge. Fish passage improvements at Shear and Sodom dams would be implemented as recommended in prior reports. A schedule and plan would have to be developed to replace the deteriorated dams and meet current fish passage criteria and dam safety requirements. Further planning for water delivery to Thompson's Mills would have to be developed that includes ongoing sediment and debris removal at the bifurcation point.

A range of treatments could be employed that would improve water delivery and sediment transport as part of the Interim Action. Potential treatments would include excavating portions of the Calapooia River channel and seasonally placing additional check boards at Sodom Dam. This management approach would be similar to how Sodom Dam was operated when Thompson's Mills was used for hydroelectric power generation.

We do not believe that this alternative is a viable solution to the existing fish passage barriers and likewise would not be supported by the watershed council, landowners, or technical team members. Therefore, we will not discuss this alternative in more detail at this time.

## **2. FISH PASSAGE ALTERNATIVE**

Under this alternative, fish passage would be provided at each of the diversion structures in the project area. Fish passage solutions would be developed for Sodom Dam, Shear Dam, and the Spillway Dam, and could involve rebuilding each of the diversion dams if deemed necessary. Current river corridor conditions and river management would largely continue unchanged. This alternative would address fish passage but would not address other larger scale problems in the project area such as flooding, bank erosion on Sodom Ditch, water delivery to users, or the need for channel maintenance at the bifurcation.

### **2.1 Actions**

- Replace or retrofit Sodom Dam, Shear Dam, and Spillway Dam with fish ladders or bypass channels to pass fish.
- Increase conveyance capacity of Calapooia River channel to ensure water delivery to Calapooia River water users.
- Increase management of Sodom Dam structure to route more water into the Calapooia River channel.
- Maintain dredging authorization and dredge bifurcation area when necessary to remove deposited sediment and debris.

### **2.2 Benefits**

- Reestablish anadromous fish linkage through migration corridor.
- Improve consistency of flows in Calapooia River channel.
- Maintain surface water delivery to Calapooia River and Sodom Ditch irrigators.
- Maintain current operation of Thompson's Mills.
- Improve stability of diversion structures and meet current fish passage criteria.

### **2.3 Costs and Risks**

- Continued channel maintenance at bifurcation.
- Is not enough water to provide fish passage at all times and may be difficult for upstream passage in July for spring Chinook.
- Does not address larger scale stability of Calapooia River or Sodom Ditch.
- Does not address flooding issues on the Calapooia River or erosion on Sodom Ditch.

- Stability of grade control structures and fish passage solutions including sedimentation of fish ladders if they are utilized.
- Does not address continued water delivery to users on the Calapooia River or Sodom Ditch.

### **3. RESTORE THE CALAPOOIA RIVER**

The Calapooia River would be selected as the primary channel for the system. The Calapooia River channel would convey baseflows and a majority of high flows. Sodom Dam would be replaced with a series of grade control structures that would maintain channel stability, direct flows to the Calapooia River channel, and allow flood flows to access the Sodom Ditch. Sodom Ditch would effectively function as a flood relief channel. Over time, we would expect the Sodom Ditch to silt in, vegetate, and narrow in a similar fashion as the Calapooia River channel is now exhibiting.

The following sections include the actions, benefits, and costs and risks associated with the Calapooia River Alternative.

#### **3.1 Actions**

- Replace Sodom Dam with a primary grade control structure set to allow flood flow conveyance at an agreed upon elevation.
- Remove Shear Dam and restore channel.
- Remove Spillway Dam and restore slough area.
- Install recirculation (offline) system for demonstration milling at Thompson's Mills.
- Restore Calapooia channel by excavating approximately 1.5 million cubic yards of fine sediment.
- Relocate approximately 10 homes near flow area that could be affected or restore channel in different location.
- Address water rights for 5 water right holders affected on Sodom Ditch.
- Upgrade I-5 bridge and 3 other bridges for county roads.

#### **3.2 Benefits**

- Restore historical Calapooia River channel.
- Remove antiquated diversion dam structures.
- Control channel elevation, avoid uncontrolled dam failures.
- Reduce channel maintenance at Calapooia River-Sodom Ditch bifurcation.
- Reestablish anadromous fish migration corridor.
- Higher quality instream and riparian habitat in Calapooia River than in Sodom Ditch.

- Restored channel may reduce flood risk by having better flow conveyance and Sodom Ditch as an overflow relief.
- Reduce bank erosion on Sodom Ditch.

### **3.3 Costs and Risks**

- Cost of restoring channel in Calapooia River and bridge replacements.
- Flood risk to residences adjacent to Calapooia River. Would most likely have to relocate some residences or restore channel in different area.
- Changes to historical hydromechanical/hydroelectric network associated with Thompson's Mills.
- Water rights for users on Sodom Ditch.
- Migratory fish stranding in Sodom Ditch due to attraction flows when Sodom Ditch is activated.

## **4. MAINTAIN SODOM DITCH AS PRIMARY CHANNEL**

The Sodom Ditch would be selected as the primary channel for the system. The Sodom Ditch channel would convey baseflows and a majority of high flows. Sodom Dam would be replaced with a series of grade control structures that would maintain channel stability, direct flood flows to the Calapooia River channel which would provide limited flood relief, and provide fish passage through the former dam site. The Sodom Ditch would continue to expand over time as the channel meanders as it seeks to balance discharge, sediment, and debris. Without maintenance, the Calapooia River channel would continue to silt in.

The following sections include the actions, benefits, and costs and risks associated with the Maintain Sodom Ditch as the Primary Channel Alternative.

### **4.1 Actions**

- Replace Sodom Dam with natural grade control designed to achieve continuous fish passage and promote Sodom Ditch as the primary channel.
- Enhance Sodom Ditch to handle full flows and provide improved habitat.
- Remove Shear Dam and Spillway Dam.
- Install recirculation (offline) system for demonstration milling at Thompson's Mills.
- Develop alternatives for approximately 8 water rights on the Calapooia River such as converting surface water diversions to groundwater withdrawals.
- Allow Calapooia River to continue to fill in over time and transition from river channel to series of disconnected ponds and sloughs.
- I-5 bridge recently upgraded, upgrade with 2 other bridges for county roads.

## 4.2 Benefits

- Lower construction costs since Calapooia River will not have to be cleared or excavated, fewer bridges, no homes to relocate.
- Reduce channel maintenance at Calapooia River-Sodom Ditch bifurcation since no longer actively maintaining Calapooia River.
- Reestablish continuous anadromous fish migration corridor.
- Lower flood risk and bank erosion for Calapooia River landowners.

## 4.3 Costs and Risks

- Loss of the Calapooia River channel over time although still activated at high flows.
- Groundwater pumping costs for irrigators on the Calapooia River and to operate Thompson's Mills.
- Water right issues for irrigators on the Calapooia River.
- Bank erosion and bed stability concerns on Sodom Ditch as natural river processes begin to increase.
- Flooding concerns on Sodom Ditch.
- Less instream habitat in Sodom Ditch due to shorter channel length relative to Calapooia River channel.
- Water temperature issues related to narrower riparian zone and greater potential for agricultural land erosion due to narrow riparian zone.
- Stability of grade control structures and transition into Sodom Ditch near bifurcation.
- Changes to historical hydromechanical/hydroelectric network.
- Migratory fish stranding in Calapooia River due to attraction flows when Calapooia River is activated.

## 5. VARIABLE FLOW MANAGEMENT

The Variable Flow Management (VFM) Alternative would include installing a flow control structure at the Sodom Dam site. Initially, Sodom Ditch would be managed as the primary channel conveying river flows. The Calapooia River would be modified to the extent possible based on stakeholder input and funding. The Calapooia River channel would be used as a flood relief channel with a sufficient volume of water delivered to the channel to allow the river to naturally increase its capacity. Over time, the invert elevation of the flow control structure would be raised so that more discharge is delivered to the Calapooia River channel and less water would be allowed in Sodom Ditch. Ultimately, the Calapooia River would be the primary channel and Sodom Ditch would be converted to a flood relief channel.

The VFM alternative would require a long-term approach (perhaps 10-20 years depending on the magnitude of runoff events) to increasing the Calapooia River's capacity in order to reestablish the Calapooia River channel as the primary channel at a lower cost than would be

expected under the Restore the Calapooia River Alternative. The control structure could be automated with controls being stage-dependent. The following sections include the actions, benefits, and costs and risks associated with the VFM Alternative.

## **5.1 Actions**

- Replace or retrofit Sodom Dam with a variable elevation structure that could be adjusted over time to control the distribution of flow between the Calapooia River and Sodom Ditch. Potentially relocate the structure to the bifurcation area.
- Increase the capacity of the Calapooia River channel through excavation and vegetation clearing.
- Manage the distribution of flow over time (10-20 years) to transition the primary channel from the Sodom Ditch to Calapooia River.
- Replace Shear Dam and Spillway Dam with grade control structures to provide fish passage.
- Place a groundwater pump or piped water withdrawal system from Sodom Ditch to ensure water delivery to Thompson's Mills to maintain historical preservation.
- Convert surface water diversions on Sodom Ditch to groundwater withdrawals once base flows are entirely in the Calapooia River channel.
- Relocate residences and other impacted infrastructure adjacent to the Calapooia River.
- Maintain bifurcation area as necessary to avoid sediment and debris deposition.

## **5.2 Benefits**

- Moderate construction costs extended over time since Calapooia River will not have to be cleared or excavated entirely by equipment. Diverting flow into the Calapooia River channel over time will mobilize sediment and increase the channel capacity.
- Would allow the situation to be adaptively managed. Management could be adjusted depending on river response.
- Reestablish anadromous fish migration corridor and best aquatic habitat.
- Lower flood risk and bank erosion for Calapooia River landowners over time.

## **5.3 Costs and Risks**

- Longer period of likely more intensive management to ensure Calapooia River channel is increasing in capacity over time. Not a quick fix that would be more susceptible to changes in funding and philosophies.
- Near-term continuation of erosion in Sodom Ditch.
- Water right issues for irrigators on the Calapooia River in short-term, water rights issues on Sodom Ditch in long-term.

- Flooding concerns on Sodom Ditch and Calapooia River depending on time frame point of reference.
- Stability of grade control structures.
- Migratory fish stranding potential.