

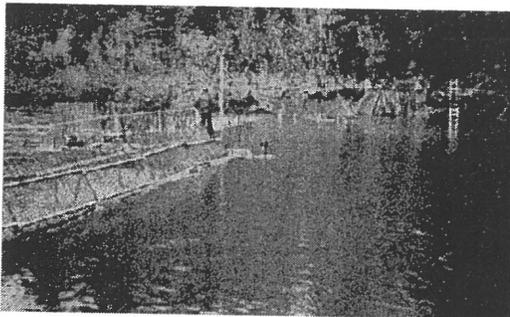
Description of "Inwater" Drought Related Projects Proposed by WDFW

The following is a general list of projects which are anticipated to be necessary to provide free passage of fish, and operation of fishways and hatchery facilities throughout the state as a result of the 2001 drought. This list was derived from experience with previous droughts such as those which occurred in 1977 and 1994. The actual number and location of drought related projects is difficult to predict, and will be dependent on the severity of the drought and surface flows in various streams throughout of the state. Drought conditions are expected to last throughout the summer months and perhaps into November. Fish species which migrate in late summer and fall are expected to be most affected.

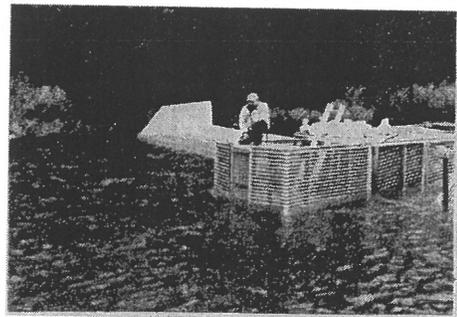
1. Weirs/Traps (Temporary and modifications to Permanent structures)

It is anticipated that installation of temporary weirs and traps will be necessary throughout the state in selected streams with low flows due to drought conditions. Trapping will be necessary to; prevent disease, capture brood stock in areas where passage is hindered or blocked, provide passage for wild fish, and to trap and spawn fish artificially where nature spawning beds may be inaccessible or dewatered.

Weirs are typically installed using equipment or by hand. Little channel modification and disturbance is necessary, as the structures are set on the bed, and the weirs are designed to be installed where variable bed contours and elevations exist. Sand or gravel bags or concrete blocks are used to provide ballast and structural integrity to the temporary weir.



Fish Weir



Fish Weir and Trap

2. Fishways/Fish Ladders - (Temporary and modifications to Permanent structures)

Temporary fishways or ladders may need to be installed to provide temporary fish passage over barriers resulting from low flows. Passage may be necessary at natural barriers, culverts, and irrigation diversions. Temporary fishways will consist of prefabricated wood or metal modular structures which would either be installed by hand or with the use of small equipment such as a rubber tired back hole. In some instances prefabricated denils or "Alaskan Steep Passes" may be used to provide temporary passage over barriers. It is anticipated that not more than a total of 10 of these structures would be needed state wide. Priority will be given to passage barriers for federally listed species, including Bull Trout, and adult anadromous fish.

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3. Temporary Channel Modifications

It is currently anticipated that channel modifications will be necessary in various streams throughout the state to provide passage for migrating juvenile and adult fish. Most projects will involve the modification of shallow riffles and gravel bars to provide fish passage. Channel modifications will typically involve some combination of excavation and/or berming to provide sufficient water depth for fish passage.

Berms constructed of native gravels, concrete blocks, logs, straw bales, or sand and gravel bags may be used to check up water to a sufficient depth to provide passage. Typically a series of several notched berms will be used to provide a passive passage structure resembling a temporary pool-and-weir fishway. Berms constructed with bales, blocks or similar mechanisms are preferred where it is necessary to minimize bed alteration and disturbance, and where Corps 404 permit approval has not been achieved. Full suspension will be used when placing or removing berm materials to minimize bed and bank disturbance. Plastic or visqueen sheeting will be used to seal the berms to minimize subsurface percolation and to concentrate flows within the fish passage notches.

Other stream bed modifications involve the excavation or redistribution of bed material to provide fish passage. Often it is most efficient to use berms and excavation in combination to provide fish passage while minimally altering the natural channel configuration. Excavation is typically applied by cutting or pushing a shallow channel through a gravel bar or riffle to provide passage. Excavation is shallow and typically involves excavation of the top 18 inches or less of bed material, and must be conducted in a manner to prevent breaking the bed armor which may result in long term channel responses. Supervision and training of work crews is necessary prevent inadvertent long term channel responses and associated adverse impacts.

Projects shall be considered and implemented, where feasible, in the following sequential order of preference:

- a. Work shall only occur where passage impediments are evident or imminent. Priority will be given to federally listed fish species.
- b. Bed, bank, and riparian disturbance shall be minimized by limiting the degree or magnitude of the channel modification work to that necessary to provide passage. Equipment shall only be used when performing work by hand is not feasible, as determined by WDFW habitat biologists.
- c. Adverse impacts the bed, banks, and riparian vegetation not avoided shall be repaired and restored upon project completion. At project conclusion

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the Area Habitat Biologist will determine if the channel modifications must be restored to the original configuration, or if fewer impacts would result by leaving the channel in the altered configuration..

- d. All foreign material will be removed from the stream when the drought is determined to be over.
- e. If channel modification to achieve fish passage involves excavation, and Corps 404 permit approval has not been achieved, the excavated spoils shall be placed outside of the OHWM of streams.

It is anticipated that channel modifications will be necessary at approximately 50-60 locations throughout the state to provide for fish passage. About 20 to 25 percent of these projects could be completed using labor crews and hand held equipment. The remaining channel modification projects would involve the use of a rubber tired or tracked backhoe. Most of the work will be performed with WDFW personnel and equipment. It is not anticipated that these projects will involve the disturbance of more than 50 cubic yards of material. There may be a few locations on larger rivers where more extensive channel modifications will be necessary, such as on the lower Quillayute River. The number of channel modifications necessary will be dependent on climate conditions and the severity of the drought throughout the state.

4. Pump intake Modifications and Sump maintenance

Low stream flows are expected to increase the need for maintenance associated with WDFW water intake systems. Most WDFW water intakes are associated with hatchery facilities and rearing ponds and are non-consumptive water uses. Some combination of berming or excavation at these pump intakes may be necessary to provide sufficient water depth to operate the pumps without damage. In a few instances it may be necessary to excavate a shallow channel through dry gravel bars between the pump intake and the main channel of the stream. To minimize the volume of material excavated for sumps, concrete blocks or rock can be placed around the perimeter of the sump below grade. Most of these maintenance activities are covered under existing maintenance permits.

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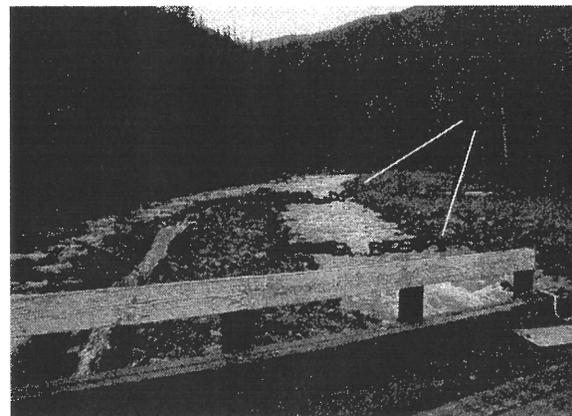
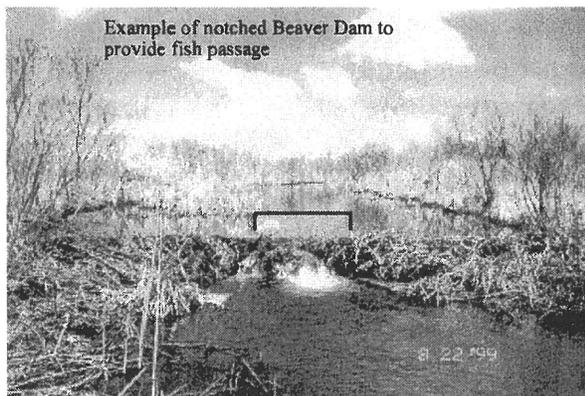
5. Modification of Permanent Structures and Diversions

Low flow conditions may require the modification of some existing permanent structures. Most of these structures are associated with hatchery facilities, fishways, and weirs. In some instances, excavation of a channel through gravel deposits between the inlet and outlet of a fish ladder will be required to provide fish access to and from the fish ladder. Dryden and Tumwater Dams on the Wenatchee River, and the City of Yakima's diversion dam on the Naches River, will likely require some modifications during low stream flows to ensure passage of anadromous fish, including species listed as threatened or endangered under the ESA.

The stream bed in the vicinity of permanent hatchery facilities may have to be modified to provide access for returning adult salmonids into the hatchery. Channels may have to be deepened using excavation and berming techniques to provide access. In some instances a fish weir and trap may have to be installed well downstream of the hatchery if there are insufficient flows to provide upstream adult salmonid migration.

6. Beaver Dam Modifications

Although some beaver dams are modified annually to provide adult fish passage, it is expected that drought conditions will result in a greater number of beaver dams which will be impassable. Beaver dams would be notched during the migration periods for adult fish. The notches would be created by hand using hand held equipment or by using a backhoe. The dam would only be breached to the extent necessary to provide fish passage. The notch would not extend below the elevation of the deposited sediments above the dam to prevent the release of fines downstream. Sticks and woody debris would be placed within the stream channel downstream of the dam to provide instream habitat. Plastic noise makers and strips of plastic sheeting would be placed near the notched dam to discourage the beavers from immediately rebuilding the dam. Explosives will not be used to notch beaver dams.



Example of Notched Berms to provide fish passage.