

## **Suggested Changes to the Farmers Screen Criteria:**

FCA is requesting that the criteria for the Farmers Screen reflect the knowledge gained through the installation and operation of 20 screens as well as the results of 2 biological tests performed by the USGS Biological Services Division. FCA would like the Farmers Screen to become an approved technology with the requested modified criteria incorporated into the NMFS criteria document. The specific requests for changes to the current criteria are listed below.

### **Requested Revisions:**

The current criteria will be stated first and the suggested change will follow:

In the **Siting** section of the current Farmers Screen criteria:

Current:

- **Bypass Water:** Generally, for screens 100 cfs and smaller, a minimum of 15% of the total diverted flow must be maintained for transporting fish and debris across the plane of the screen. For screens 100 to 500 cfs, a minimum of 10% of the total diverted flow must be available for proper operation.

Suggested:

- **Bypass Water:** Bypass flow must be available at all times for proper screen operation and fish protection. Bypass flow must be sufficient to meet all other design criteria as bypass flow quantities are a function of screen design and operation. Specifically, sweeping velocity and depth of water criteria will determine the minimum bypass flow necessary for proper screen function.

**Rationale:** The original requirement was an estimate based on one screen installation. Obviously bypass flow quantities are a function of sweeping velocities, depth of water, and the opening at the distal end of the screen. As a percentage of flow, necessary bypass flow to maintain screen function and fish protection is quite low for large screens (5% for 65 cfs, for instance) and is quite high for small screens (50% for 0.5 CFS). A statement that bypass flow must always be available in sufficient quantities to meet all other criteria provides protection without causing unnecessary design constraints. This would be consistent with NMFS criteria for bypass flow for other technologies.

In the **Design** section of the current Farmers Screen criteria:

Current:

- **Sweeping velocity ( $V_s$ ):** The water traveling parallel to the plane of the screen should have a sustained velocity throughout the entire length of the screen, averaging about 4 to 8 ft/s in order to achieve the maximum cleaning dynamics and fish protection. A taper wall is usually required to maintain correct velocity parameters.

Suggested:

- **Sweeping velocity ( $V_s$ ):** The water traveling parallel to the plane of the screen should have a minimum velocity of approximately 30 times the approach velocity to achieve effective cleaning dynamics and fish protection.

**Rationale:** The sweeping velocity should be tied to the approach velocity. The potential to impinge debris or fish is dependent on both the approach velocity and the sweeping velocity. As the approach velocity increases, the sweeping velocity should be increasing as well to minimize the exposure time to the screen surface. A sweeping velocity of approximately 30 times the approach velocity would more accurately state where the sweeping velocities should be in relation to the approach velocity. Experience and observation gained through testing and project development has demonstrated that as approach velocities increase, there is a corresponding increase in sweeping velocity. Inversely, the sweeping velocity can be lower when the approach velocity is relatively low due to the lower chance of impingement.

Current:

- **Depth of water over screen:** The depth of water over the entire screen area should be maintained at a uniform level between one and two feet. The actual depth will vary as a function of screen size and overall hydraulic conditions. A taper wall is usually required to maintain a uniform water surface elevation over the plane of the screen.

Suggested:

- **Depth of water over screen:** The depth of water over the entire screen area should be a function of approach velocity and sweeping velocity criteria as well as input from local fish biologists regarding species present, timing, and fish sizes. Water depth should not be below 6 inches and typically should not exceed 18 inches.

**Rationale:** The depth of water over the screen was set based on one screen installation. At the time of installation, that screen had a backwater issue that caused the water over the screen to be almost 24 inches deep. When the backwater influence was removed, the water depth over the screen was decreased to 12 inches, at which point the cleaning dynamics of the screen dramatically improved as did the sweeping velocities. Subsequent installations have shown that proper depth is a function of screen size and should not be based on the original Farmers Screen installation. Small screens lose cleaning dynamics with depths of 12 inches due to a loss of sweeping velocities. Small screens operating at depths of 6 to 9 inches have improved cleaning dynamics and much improved sweeping velocities. Also, small screens are typically located on small tributaries with less total flow available which in turn limits bypass flow available.

**Summary:**

FCA respectfully requests that the Farmers Screen be accepted as an approved technology and that the suggested changes to the Farmers Screen criteria be accepted and included in the NMFS Anadromous Salmonid Passage Facility Design document. The accumulated research, testing, and in situ performance information all show that the Farmers Screen is a technology that protects fish, reduces operation and maintenance, and provides one another good alternative for screening diversions with specific site characteristics.