Issues, uncertainties, and research needs for juvenile lamprey passage

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What passage issues will juvenile lampreys face during their downstream migration?
Water diversions and dams
Effectiveness of common fish screen materials to protect lamprey ammocoetes
Nearly 80% of water diversions in the Pacific Northwest are unscreened & can pose a major risk to fish*

*FRIMA 2002-04 report
What about the other 20%?

Criteria for screen design, operation, and protection of fish largely from studies of salmonids.
Goal

Develop criteria for design and operation of fish screens that minimize entrainment, injury, and mortality to lamprey.
Screen types

Profile bar (1.75 mm)

Intralox (1.7 mm)

Perf. plate (2.4 mm)

12 & 14 g woven wire
Methods
No. of fish entrained

Profile Bar

Interlock

Perforated Plate

12-Ga Wire Cloth

14-Ga Wire Cloth

Fish Length (mm)
Probability of entrainment

![Graph showing probability of entrainment for different fish total lengths and materials.](image-url)

- **Probability of entrainment**
- **Fish total length (mm)**
- **Materials:**
  - Interlock
  - Vertical bar
  - Perforated plate
  - 12-g wire cloth
  - 14-g wire cloth
Summary

- Screens offered varying levels of protection
- Fish < 46 mm entrained by all screens
- Impingement common for all sizes of fish
- PP and IL performed the best
- Wire cloth screens performed the worst

➢ Use PP or IL
➢ Replace wire cloth screens
Current and future research

• UPScale
• Test APPROACH & SWEEPING velocities
• Test different screen types
  – Vertical, rotary drum, etc.
  – Cleaning structures
• Field studies
  – Entrainment
Fish Passage Routes

Spill (Conventional or Surface)

Spillway

Powerhouse

Forebay

Tailrace

Turbine Intake

Turbine

Juvenile Bypass Systems

Juvenile Bypass outfall

Juvenile Fish Transportation

Raceways

Loading Dock

Office & Fish Handling

Barge
Dam passage issues

- Dam approach distribution
- Route of passage
- Guidance?
- Diel and seasonal passage characteristics
- Post-passage condition
- SAR’s
- Technologies for monitoring
To fully understand the passage characteristics—and life history—of juvenile lampreys will require effective tagging technology and protocols.
PIT tagging
JSATS tagging

Photos courtesy of PNNL
Future research

• Mark/recapture studies using PIT-tagged fish

✓ General passage characteristics at dams
✓ Travel & migration timing
✓ Disease status (fungus)
✓ Growth rates
✓ Adult homing & migrations
✓ Support genetics work
✓ Passage of undisturbed adults

• JSATS studies

✓ Dam approach behavior
✓ Specific routes of passage
✓ Travel time
✓ Survival
Thanks