# Lewis River Stranding Monitoring Study Plan

*Draft for Aquatic Coordination Committee*

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# Objectives

- Identify measurable factors affecting potential stranding, the relationship of such factors to each other, and the time frame and season within which stranding may occur.

- Evaluate spawning and rearing habitat from Merwin Dam to the downstream end of Eagle Island across a range of minimum flow operational conditions.

# General Approach

- **Field evaluation at four minimum flows**
  - Assess lowest flows first
- **Identify Potential Stranding Zones (PSZs)**
- **Delineate life stage-specific salmonid habitat downstream of Merwin Dam**
- **All mapping conducted on aerial photographs**

# Approach: Criteria Used to Identify Potential Stranding Zones

- Potholes or depressions without egress

- Gradient less than 5%

- Substrate consisting of cobble and gravel



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# Approach: Criteria used to Identify Potential Stranding Zone



Potholes or depressions without egress



Potholes or depressions without egress



Gradient less than 5%
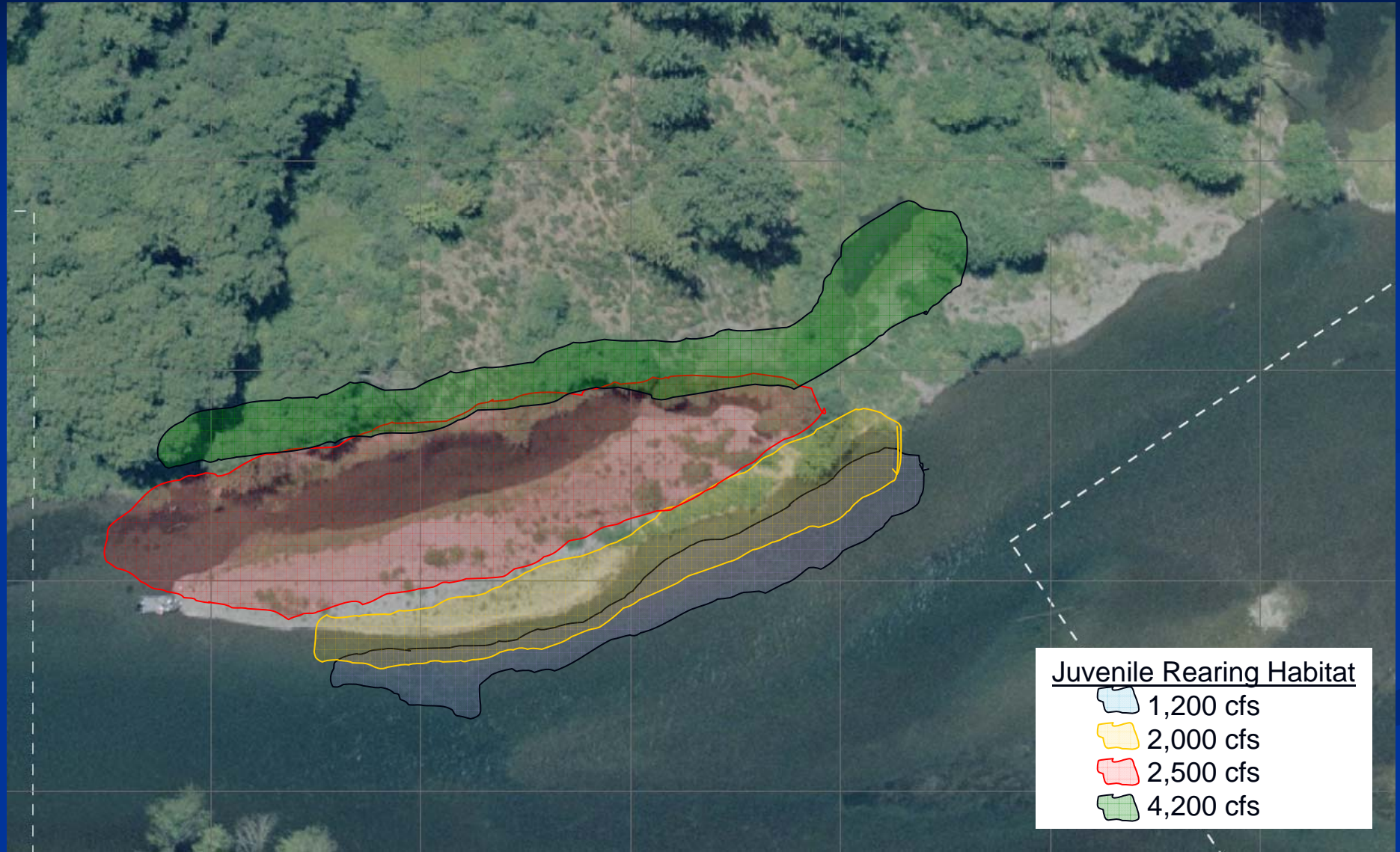


Substrate consisting of cobble and gravel

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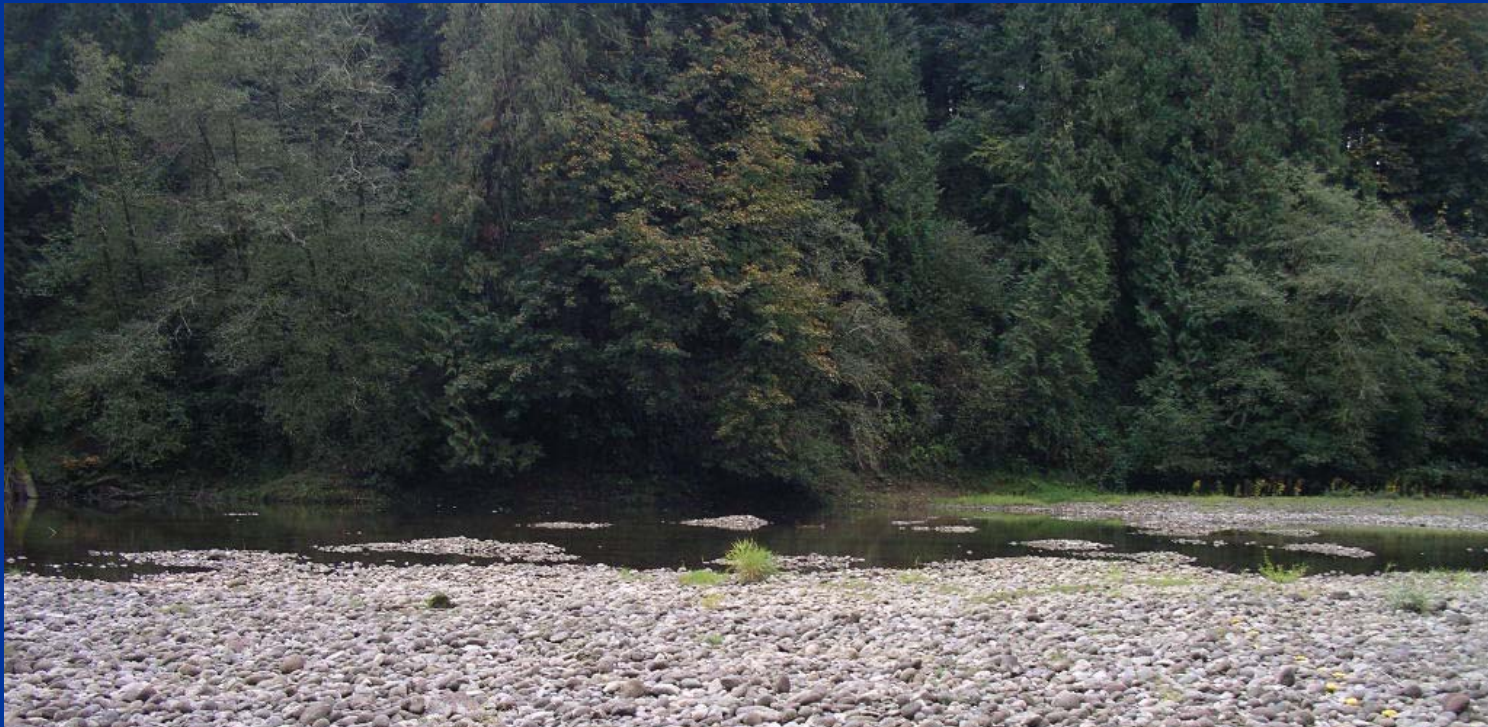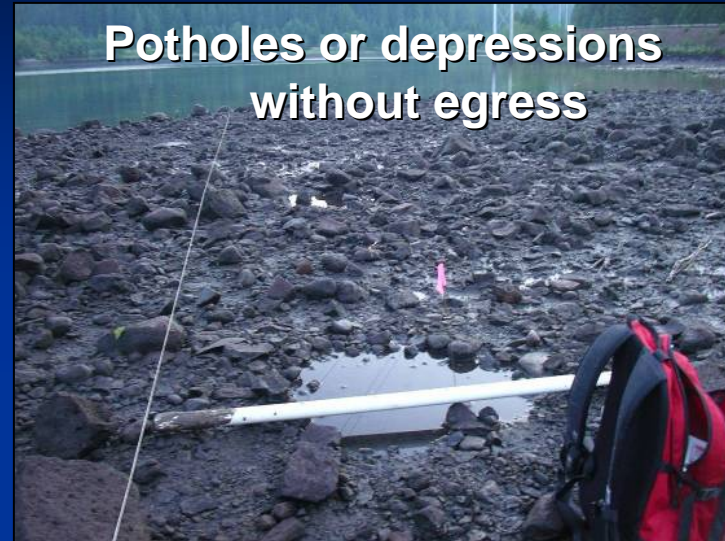
# Approach: Criteria Used to Evaluate Habitat

| Life stage | Habitat characteristic | Range of "good" values | Supporting literature |
|---|---|---|---|
| *Chinook salmon* | | | |
| Spawning | Depth | 0.15–1.2 m (0.5–4 ft) | Primary: Lewis River Habitat Suitability Index Curves based on 0.5 suitability (PacifiCorp 2004) Secondary: Bovee (1978), Bell (1986), and Bjornn and Reiser (1991) |
| | Velocity | 0.3–1.1m/s (1.0–3.5 ft/s) | Primary: Lewis River Habitat Suitability Index Curves based on 0.5 suitability (PacifiCorp 2004) Secondary: Bovee (1978), Bell (1986), and Bjornn and Reiser (1991) |
| | Substrate ($D_{50}$) | 11–69 mm (0.4–2.7 in) | Primary: Kondolf and Wolman (1993) Secondary: Thompson (1972) |
| Fry rearing | Depth | <0.6 m (<2.0 ft) | Primary: Everest and Chapman (1972) Secondary: Lister and Genoe (1970), Stuehrenberg (1975) |
| | Velocity | <0.2 m/s (<0.7 ft/s) | Primary: Everest and Chapman (1972) Secondary: Lister and Ganoe (1970), Stuehrenberg (1975), Thompson (1972) |
| Juvenile rearing | Depth | 0.3–1.1 m (1.0–3.5 ft) | Primary: Lewis River Habitat Suitability Index Curves based on 0.5 suitability (PacifiCorp 2004) Secondary: Everest and Chapman (1972) |
| | Velocity | 0.03–0.5 m/s (0.1–1.5 ft/s) | Primary: Lewis River Habitat Suitability Index Curves based on 0.5 suitability (PacifiCorp 2004) Secondary: Hardin-Davis et al. (1991), Everest and Chapman (1972) |
| *Coho salmon* | | | |
| Spawning | Depth | 0.15–0.9 m (0.5–3.0 ft) | Primary: Lewis River Habitat Suitability Index Curves based on 0.5 suitability (PacifiCorp 2004) Secondary: Thompson (1972) as cited in Bjornn and Reiser (1991) |
| | Velocity | 0.09–0.8 m/s (0.3–2.7 ft/s) | Primary: Lewis River Habitat Suitability Index Curves based on 0.5 suitability (PacifiCorp 2004) Secondary: Thompson (1972) as cited in Bjornn and Reiser (1991) |
| | Substrate ($D_{50}$) | 5–35 mm (0.2–1.4 in) | Primary: Kondolf and Wolman (1993) Secondary: None |
| Fry rearing | Depth | <0.24 m (<0.8 ft) | Primary: Bugert et al. (1991) Secondary: Bisson et al. (1982), Sullivan (1986), Dolloff (1983) |
| | Velocity | <0.1 m/s (<0.3 ft/s) | Primary: Bjornn and Reiser (1991) Secondary: Reeves et al. (1989) |
| Juvenile rearing | Depth | 0.15–1.4 m (0.5–4.5 ft) | Primary: Lewis River Habitat Suitability Index Curves based on 0.5 suitability (PacifiCorp 2004) Secondary: Sheppard and Johnson (1985), Dolloff and Reeves (1990) |

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# Approach: Guilding Habitat Criteria

| Guild name | Minimum polygon area ($m^2$) | Cover type and/or substrate criteria | Velocity (m/s) | | Depth (m) | |
|---|---|---|---|---|---|---|
| | | | Minimum | Maximum | Minimum | Maximum |
| **Spawning guilds** | | | | | | |
| Chin/Chum | 4.3 | $D_{50}$ of 10–65 mm | 0.3 | 1.1 | 0.15 | 1.5 |
| Stld/Coho | 2.8 | $D_{50}$ of 10–40 mm | 0.3 | 0.9 | 0.15 | 0.9 |
| **Fry rearing guilds** | | | | | | |
| Chin/Chum | 2 | none | none | 0.2 | none | 0.6 |
| Stld/Coho | 2 | none | none | 0.15 | none | 0.3 |
| **Juvenile rearing guilds** | | | | | | |
| Chin | 2 | none | 0.03 | 0.5 | 0.3 | 1.1 |
| Coho | 2 | Within 1 m (3 ft) of cover | none | 0.14 | 0.15 | 1.4 |
| Stld | 2 | none | 0.09 | 0.8 | 0.2 | none |

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Approach: Field Mapping (habitat evaluation)

Juvenile Rearing Habitat
1,200 cfs
2,000 cfs
2,500 cfs
4,200 cfs

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# Minimum Flow Requirements

| Period | Flow (cfs) |
|---|---|
| July 31–October 15 | 1,200 |
| October 16–31 | 2,500 |
| November 1–December 15 | 4,200 |
| December 16–March 1 | 2,000 |
| March 2–15 | 2,200 |
| March 16–30 | 2,500 |
| March 31–June 30 | 2,700 |
| July 1–10 | 2,300 |
| July 11–20 | 1,900 |
| July 21–30 | 1,500 |

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# Flow Selection

| Target flow (cfs) | Season and rational | Stranding assessment objectives | Habitat assessment objectives |
|---|---|---|---|
| 1,200 | Late summer (July 31 through October 15) and during WDFW fall spawning surveys. Target flow is also similar (within 300 cfs) to summer (July 21–30). | Assess dewatering risk for redds and stranding risk for juveniles when flows are reduced during fall spawning surveys. | Assess habitat availability during low flow conditions. |
| 2,000 | Winter (December 16 through March 1). Target flow is also similar (within 100 cfs) to summer (July 11–20). | Assess stranding risk for juveniles. | Assess habitat availability during low flow conditions for rearing. |
| 2,500 | Fall (October 16 through October 31), winter (March 16 through March 30). Target flow is also similar (within 300 cfs) to flows occurring during winter, spring, and summer (March 2 through July 10). | Assess stranding risk for vulnerable emergent fry and juveniles. | Assess habitat availability for spawning and rearing during moderate flow conditions. |
| 4,200 | Early winter (November 1 through December 15). | Assess stranding risk for juveniles. | Assess habitat availability for rearing during high flow conditions. |

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# Analysis and Reporting

- **GIS analysis**
- **Synthesis of stranding risk (species, life stage, season, flows)**
- **Habitat maps**
- **Critical flows for habitat and stranding risk**
- **Critical changes in flow likely to affect stranding risk and habitat availability**



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