# Stream Gradient and Anadromous Fish Use in the Skagit and Samish River Basins
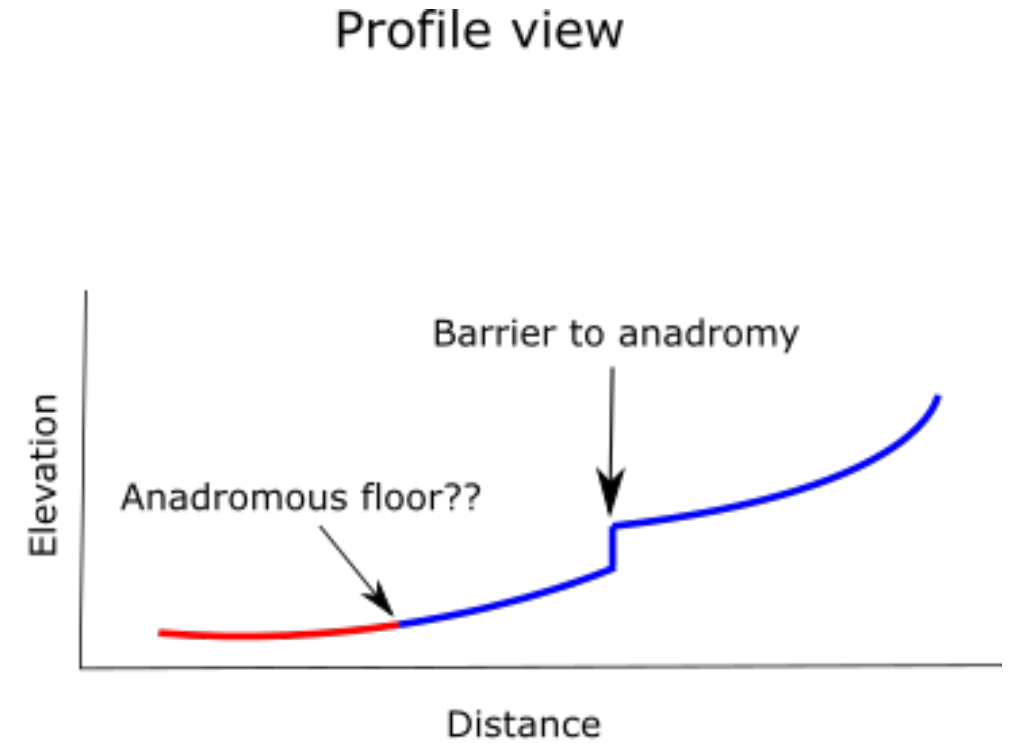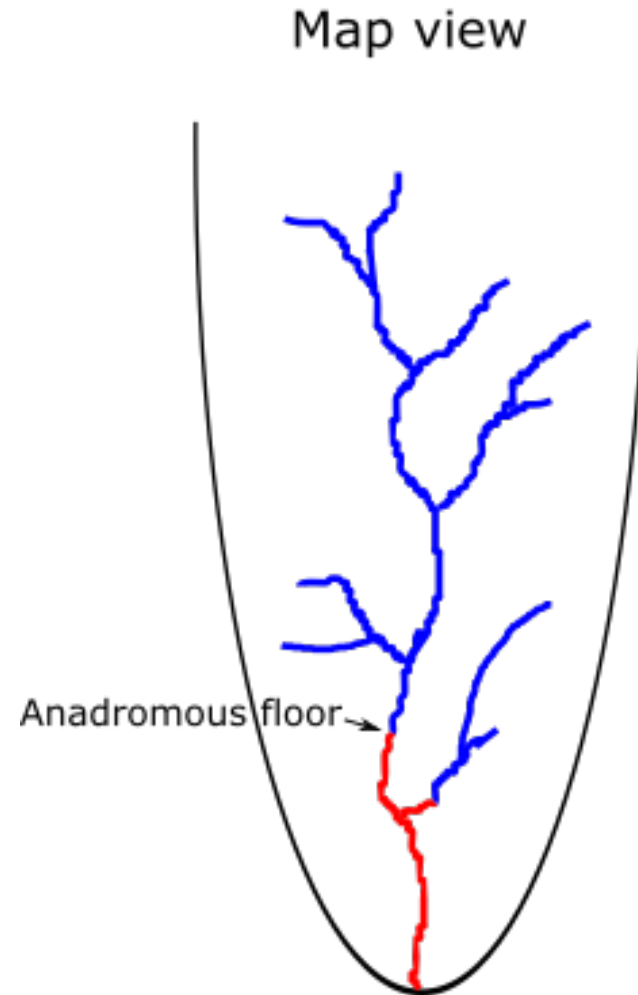
**Gus Seixas,** *Skagit River System Cooperative*

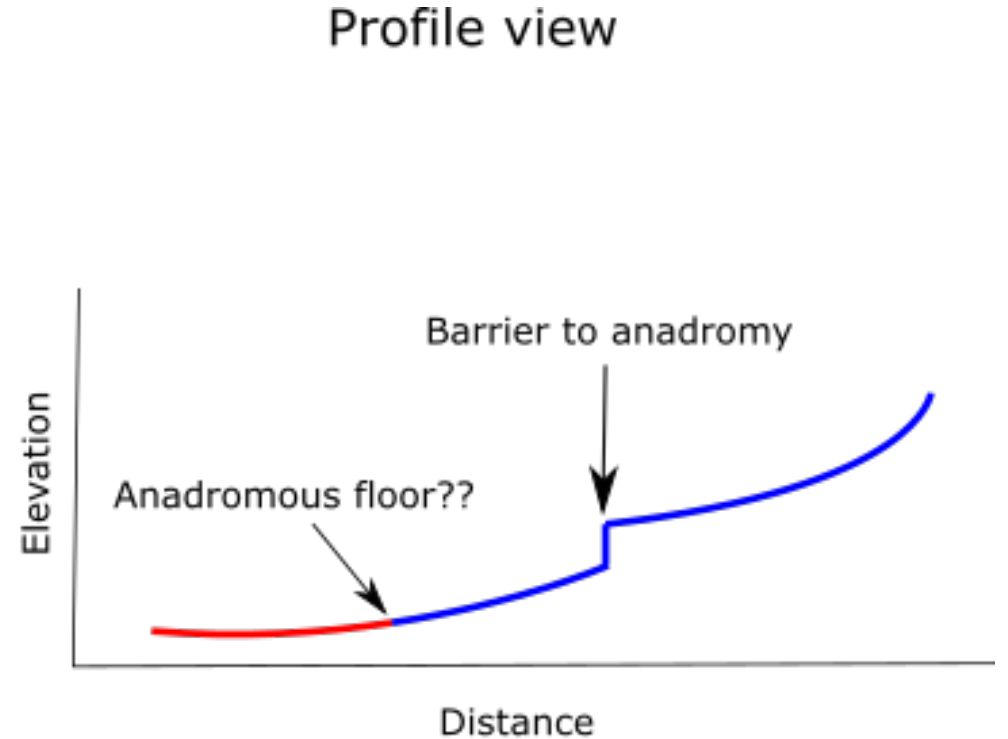Mike Olis, *Skagit River System Cooperative*

Derek Marks, *Tulalip Tribes*

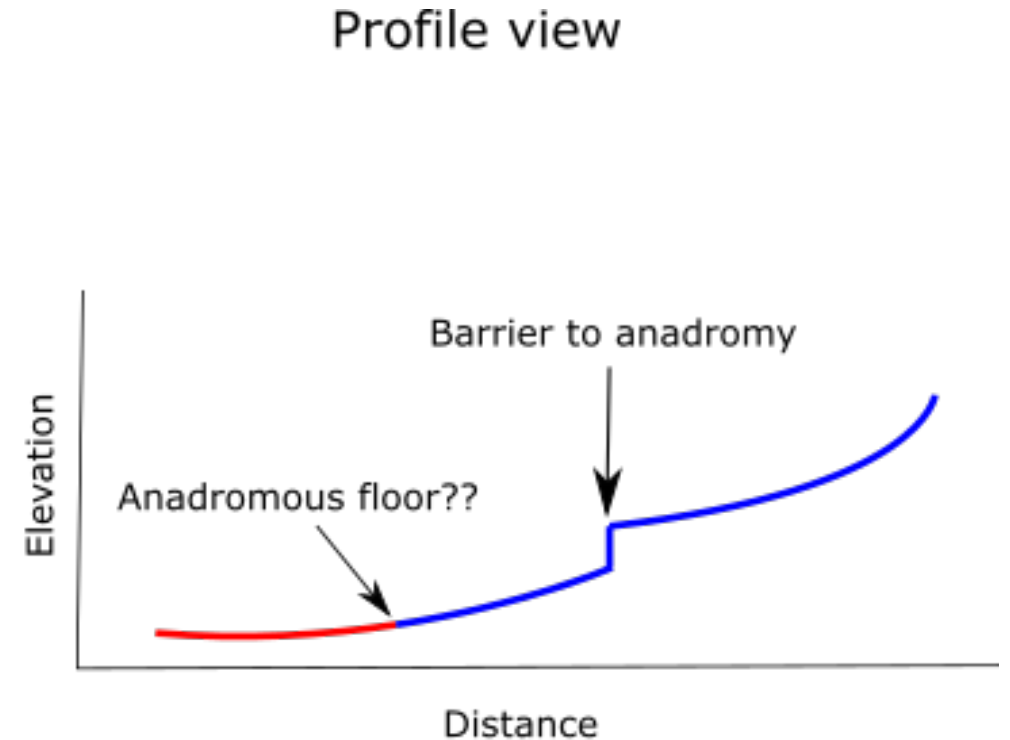Ash Roorbach, *NWIFC*

# The anadromous floor concept



Map view

Profile view

# Objectives

- Describe how anadromous fish distributions relate to stream gradient in the Skagit and Samish river basins.

Profile view

Barrier to anadromy

Anadromous floor??

Elevation

Distance

# Objectives

- Describe how anadromous fish distributions relate to stream gradient in the Skagit and Samish river basins.

- Provide information that can be used to determine a stream gradient threshold that defines presumed anadromous use.

Profile view

# DATA

- **lidar data:**

# DATA

- **lidar data:** 2016 North Puget and 2015 Glacier Peak acquisitions.

# DATA



- **lidar data:** 2016 North Puget and 2015 Glacier Peak acquisitions.

- **Anadromous fish observations:**

# DATA

- **lidar data:** 2016 North Puget and 2015 Glacier Peak acquisitions.

- **Anadromous fish observations:** SSHIAP Coho data collected by a Technical Advisory Group for a habitat limiting factors analysis (early 2000s).

# Barrier categories

## No barriers

- Natural barrier = No.
- 119 points.
- Represents 31% of the dataset.

# Barrier categories

## Unconfirmed Natural barriers

- Natural barrier = Unknown.
- 112 points.
- Represents 29% of the dataset.

# Barrier categories

## Known natural barriers
- Natural barrier = Yes.
- 91 points.
- Represents 24% of the dataset.

# Barrier categories



## End of channel

- Natural barrier = EOC.
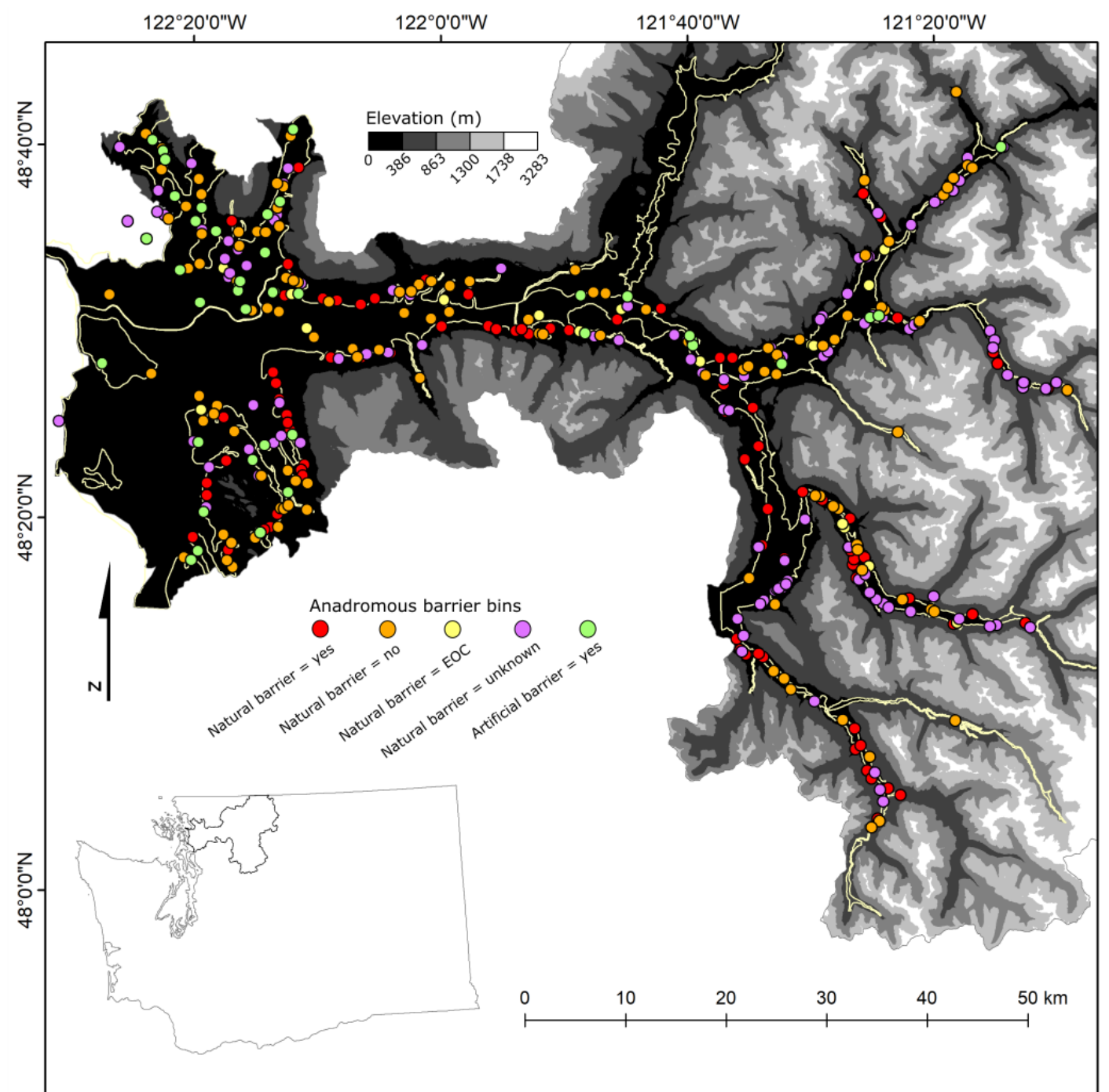- 23 points.
- Represents 6% of the dataset.

# Barrier categories



## Known artificial barriers

- Artificial barrier = Yes.
- 42 points.
- Represents 12% of the dataset.

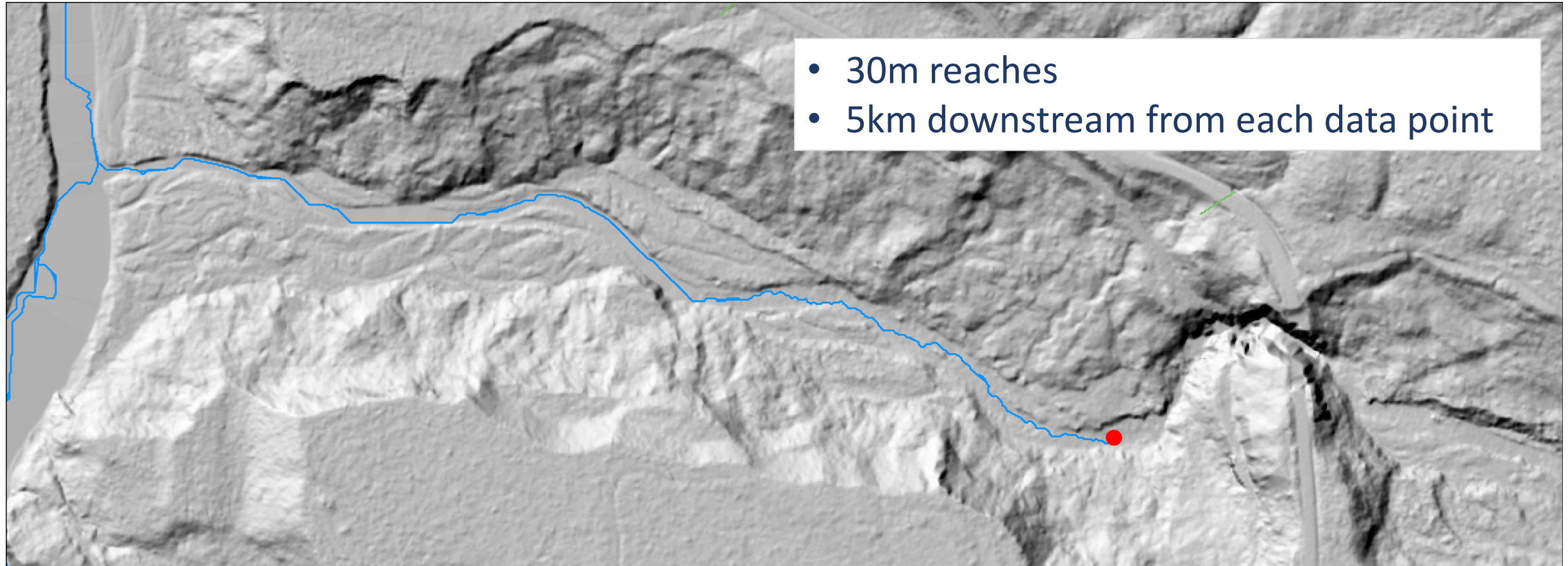Coho distribution in the Skagit and Samish River basins
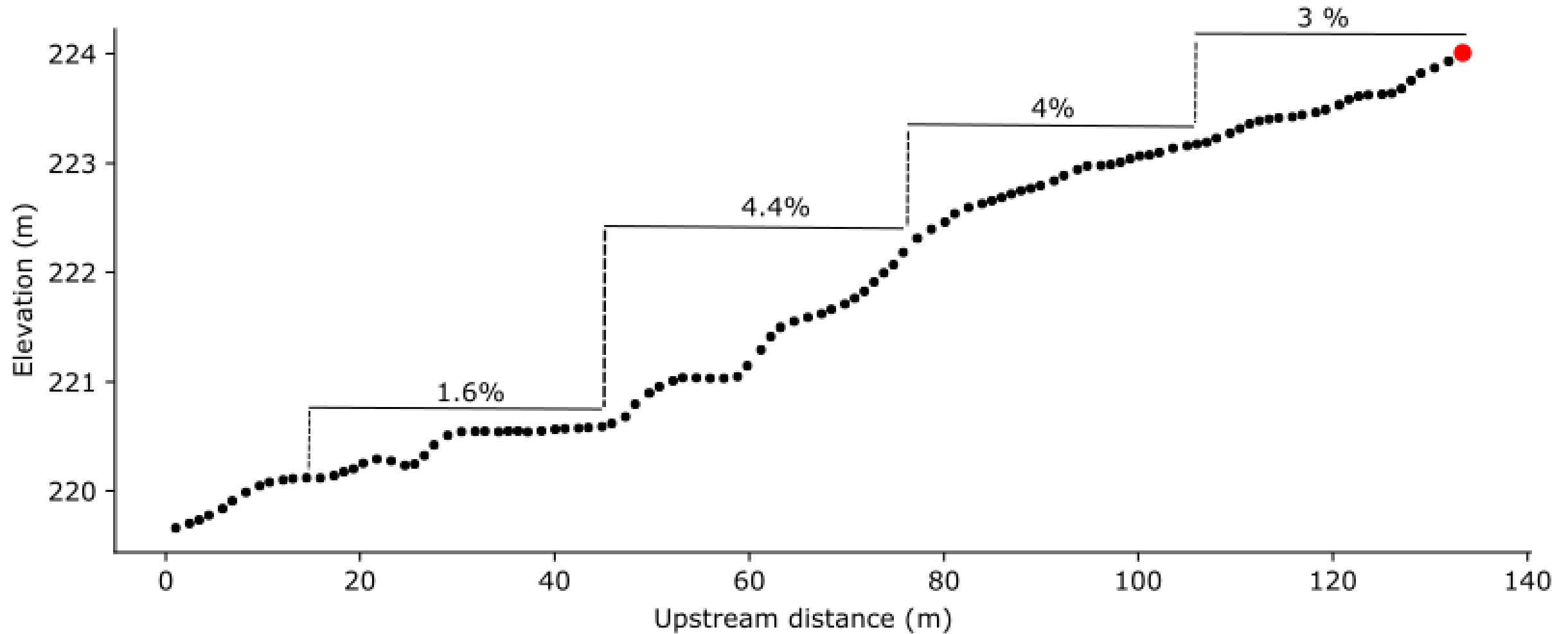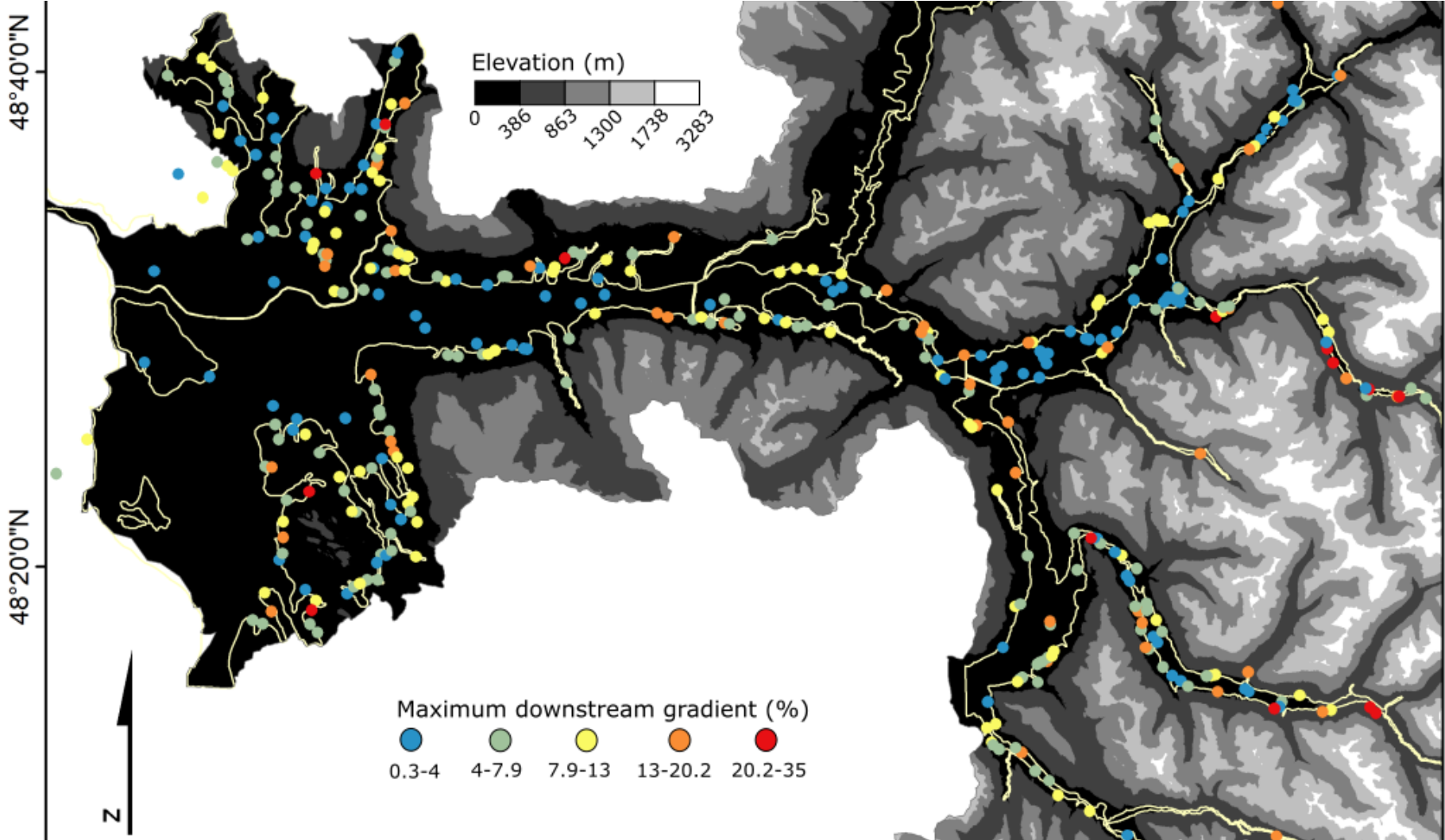
# Interpretation of the barrier categories



=?

# Methods: measuring downstream gradients



- 30m reaches
- 5km downstream from each data point
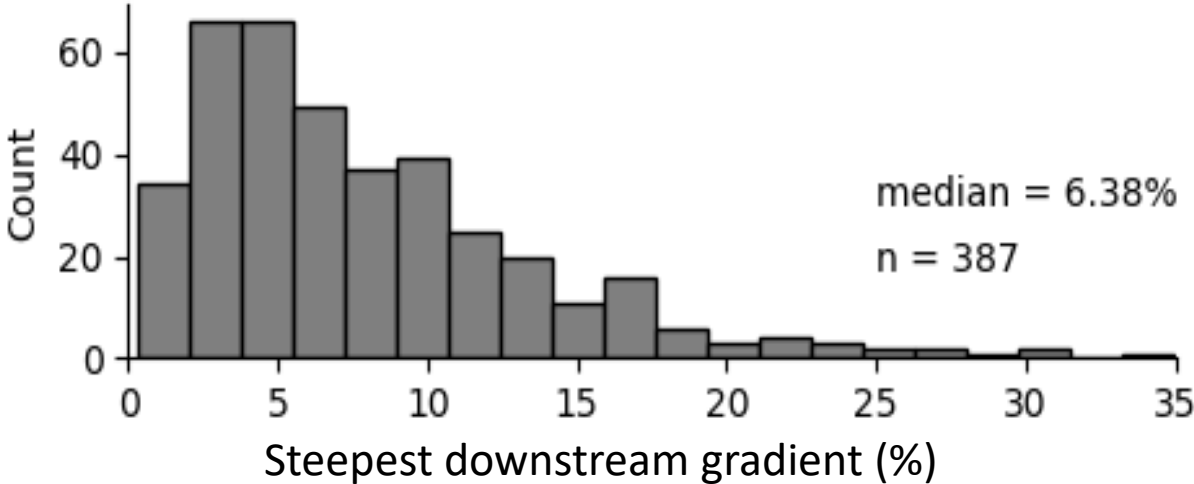
# Methods: measuring downstream gradients

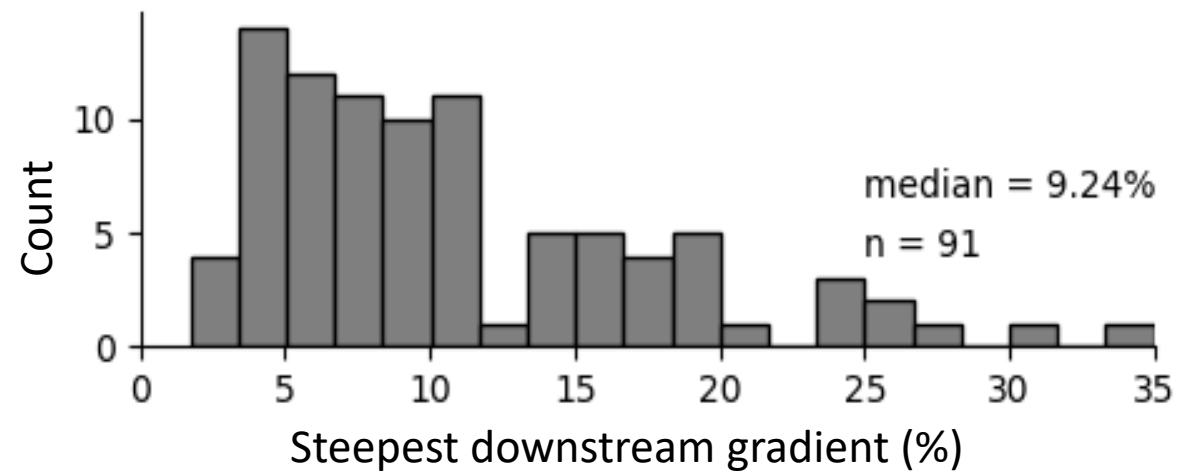# Results of the stream gradient analysis

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All categories:

# Results of the stream gradient analysis

Natural barrier = Yes

# Results of the stream gradient analysis
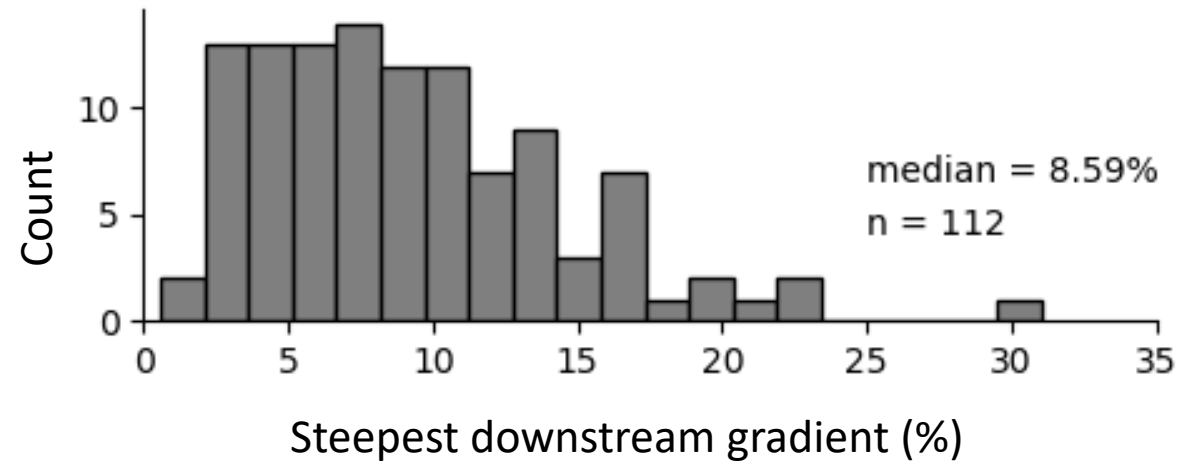
Natural barrier = unknown

*Table 2. Maximum downstream gradient results. 5th-95th percentiles are shown in 15% increments.*

| Category | N. | Min. | Max. | 5th | 20th | 35th | 50th* | 65th | 80th | 95th | 1st reach** |
|----------|-----|------|------|-----|------|------|-------|------|------|------|-------------|
| All points | 387 | 0.3 | 35 | 1.1 | 3.4 | 4.8 | 6.4 | 8.9 | 11.7 | 18.8 | 27 |
| Nat. bar. = yes | 91 | 1.7 | 35 | 3.6 | 5.1 | 7 | 9.2 | 11.4 | 16.4 | 25 | 36 |
| Nat. bar. = no | 119 | 0.3 | 28.2 | 0.7 | 2.2 | 3.5 | 4.7 | 5.9 | 8.1 | 14.2 | 14 |
| Nat. bar. = EOC | 23 | 0.5 | 14.1 | 0.7 | 1.6 | 2.4 | 2.6 | 3.4 | 4.2 | 5 | 17 |
| Nat. bar. = unk. | 112 | 0.6 | 31 | 2.7 | 4.5 | 6.3 | 8.6 | 10.5 | 13 | 19.2 | 36 |
| Art. bar. = yes | 42 | 1.1 | 16.5 | 1.9 | 3.8 | 5 | 6.3 | 8.6 | 10.5 | 13.5 | 31 |

* 50th percentile represents the median.
** Percent of points in each category for which the steepest 30 m reach was the first reach downstream of the Coho distribution point.
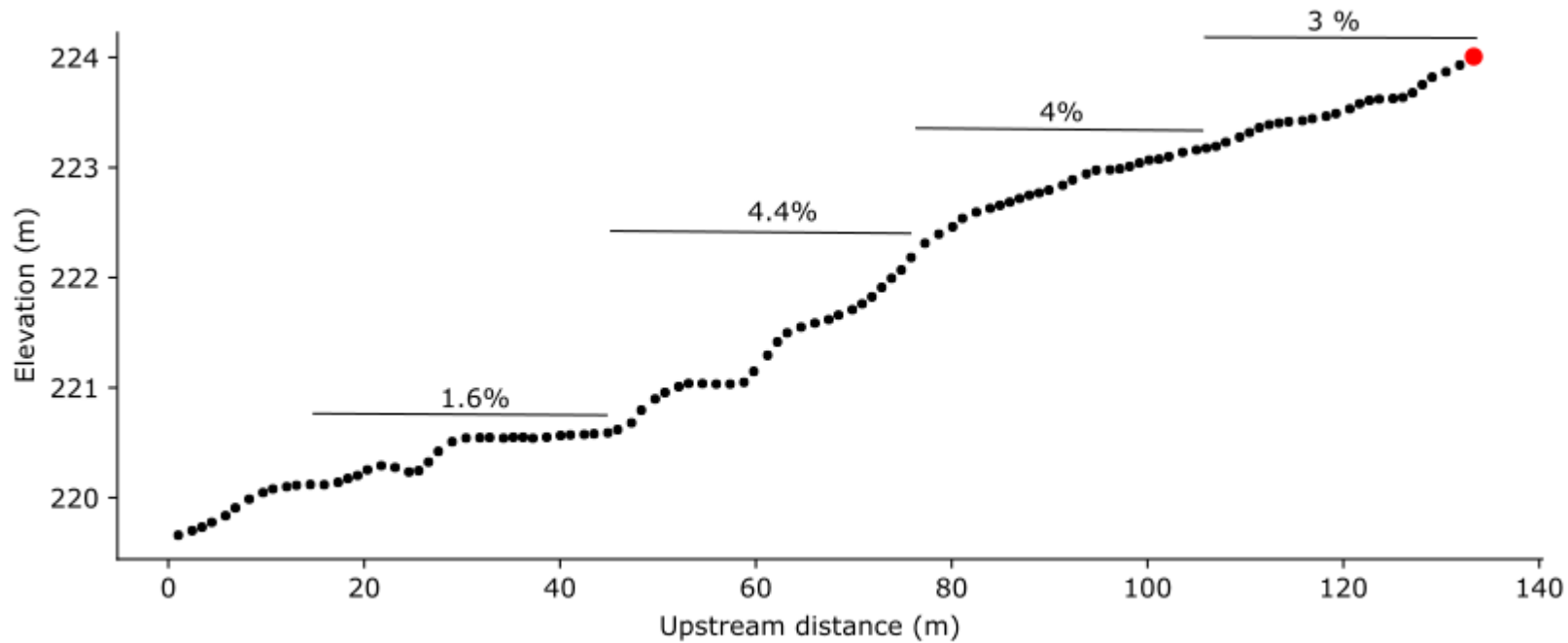
# Discussion

Only 17-36% of the steepest reaches were directly below their fish distribution point.

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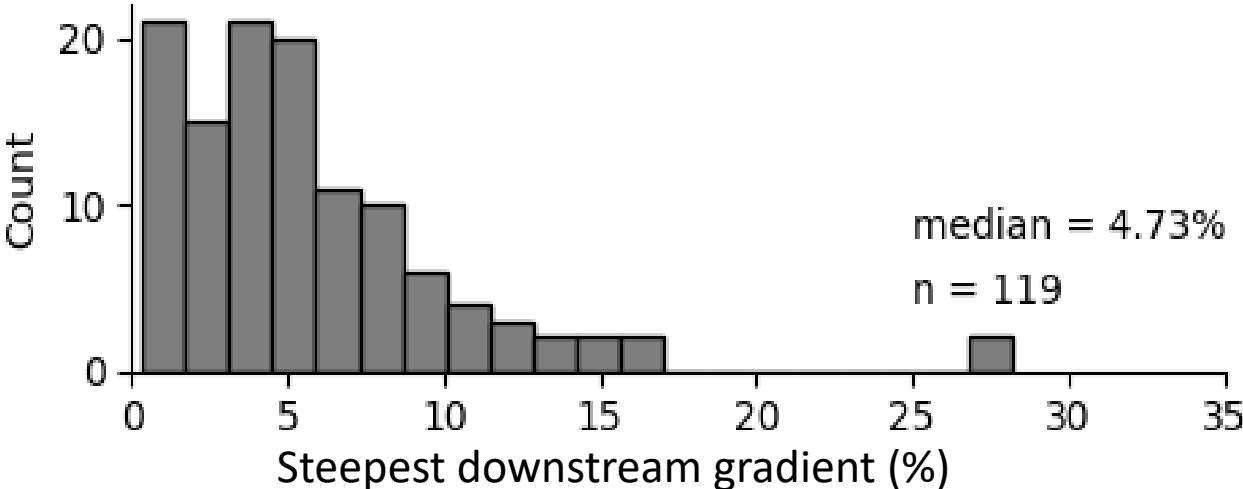
Thank you!

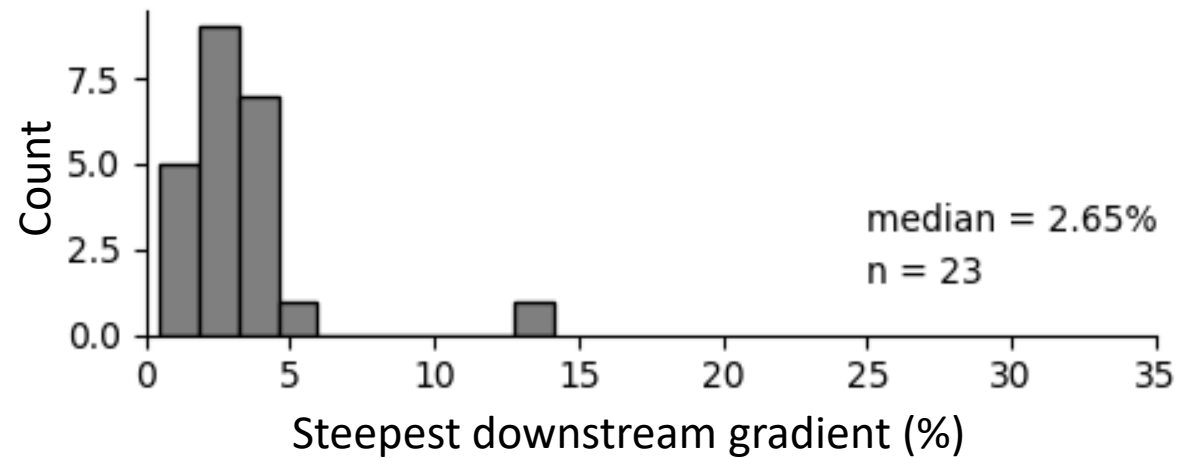Gus Seixas: gseixas@skagitcoop.org, 360-399-5526

# Results of the stream gradient analysis
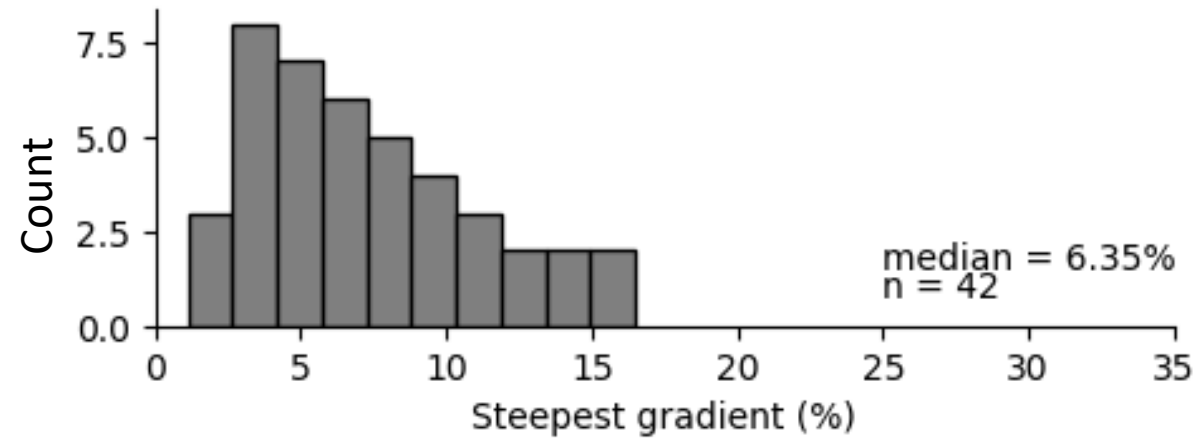
Natural barrier = No

# Results of the stream gradient analysis

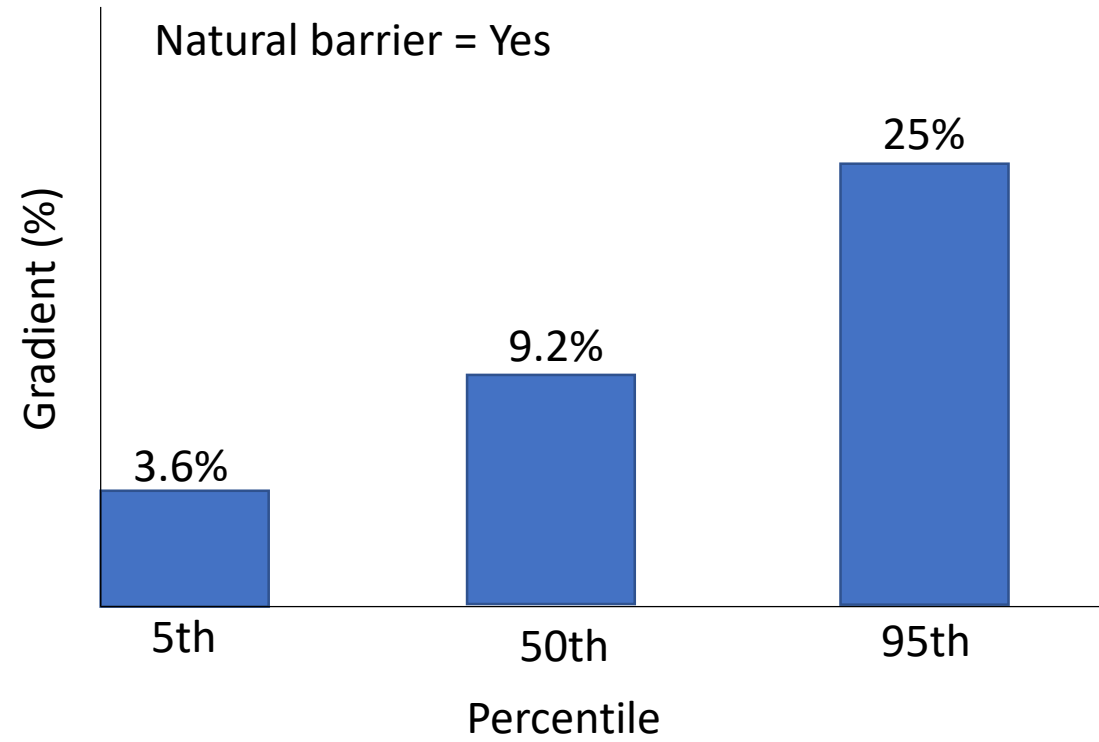Natural barrier = end of channel

# Results of the stream gradient analysis

Artificial barrier = Yes

Anadromous floor recommendation criteria