# Stream Credit Determination Methods: Lessons Learned and Food for Thought

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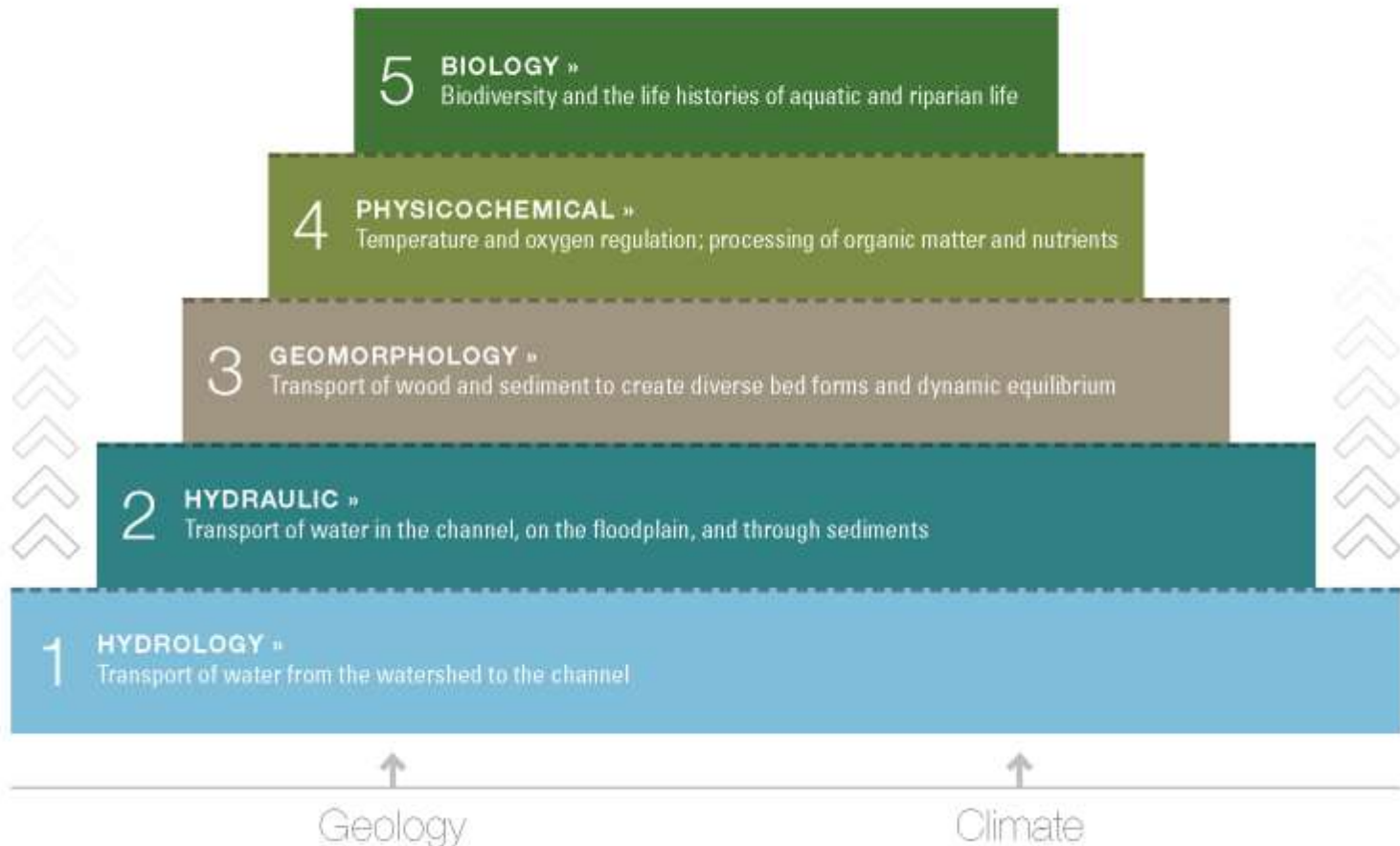
In-Lieu Fee Mitigation Training Webinar Series: Credit Determination

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**Stream Functions Pyramid**

A Guide for Assessing & Restoring Stream Functions » OVERVIEW

5 **BIOLOGY »**
Biodiversity and the life histories of aquatic and riparian life

4 **PHYSICOCHEMICAL »**
Temperature and oxygen regulation; processing of organic matter and nutrients

3 **GEOMORPHOLOGY »**
Transport of wood and sediment to create diverse bed forms and dynamic equilibrium

2 **HYDRAULIC »**
Transport of water in the channel, on the floodplain, and through sediments

1 **HYDROLOGY »**
Transport of water from the watershed to the channel

Geology          Climate

![StreamMechanics logo]

# For More Information on Stream Functions Pyramid Framework

- [www.stream-mechanics.com](http://www.stream-mechanics.com)
  - Download book
  - Workshops
  - New applications
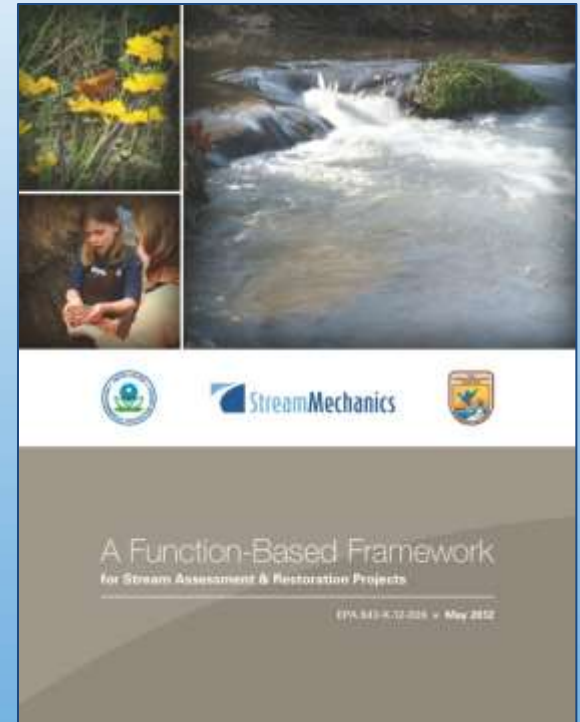
Number 1:
Rigid buffer widths can limit other forms of functional uplift

# Buffer Width Food for Thought

- Consider an average width, rather than fixed width.

- Consider a width measured from the Belt Width.

- Buffers for channel stability can be narrower than buffers for Physicochemical lift, e.g., nitrogen removal and temperature regulation.

# Number 2:
# Sinuosity is good *and* bad

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Stream Length
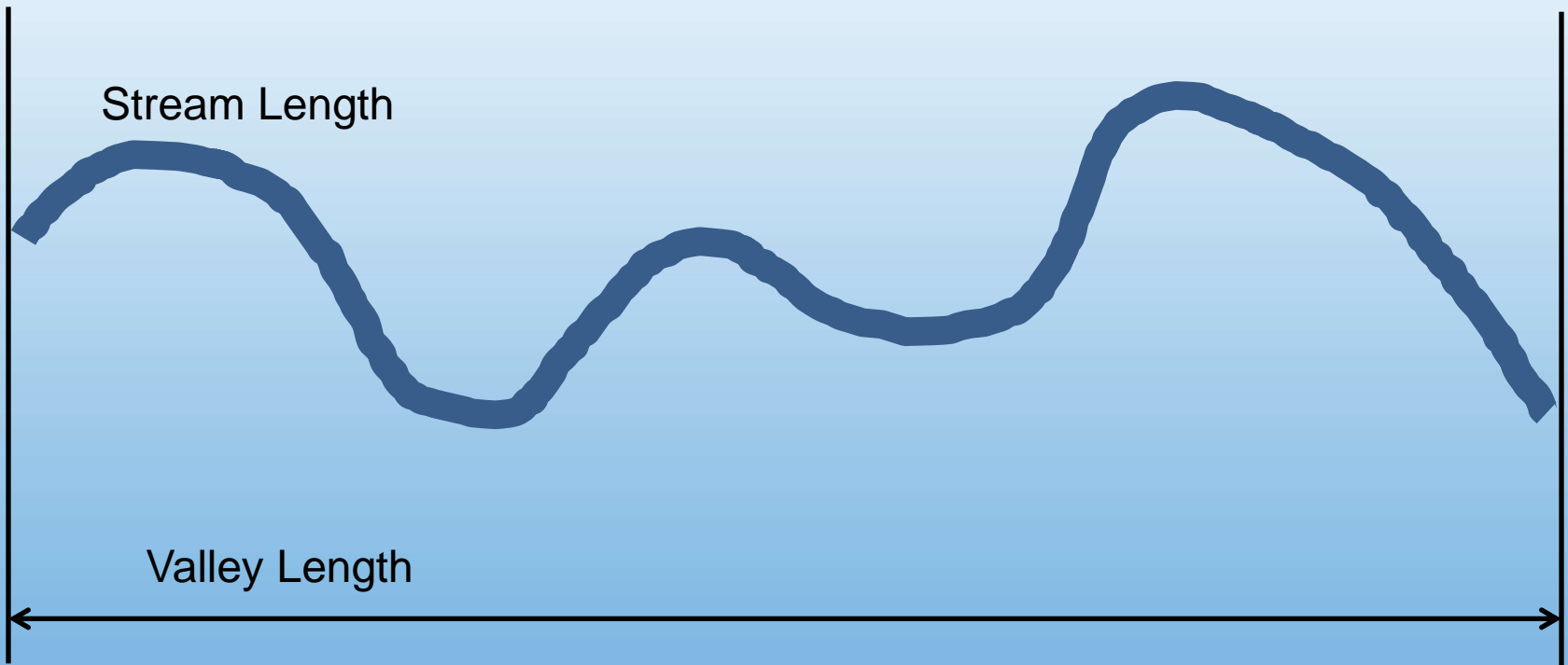
Valley Length

Sinuosity = Stream Length / Valley Length

# Number 2:
# Sinuosity is good *and* bad

Good

Bad



Photo Credit: Michael Baker Corporation

# Sinuosity Food for Thought

- Use Sinuosity as a method for achieving Physicochemical functional uplift.

- Set an upper limit by stream type to avoid credit chasing.

  – Use design review as an aid here.

- Consider a different multiplier for existing stream length and NEW stream length

Number 3:
When is it okay to "restore"
one side of the stream
and when is it not okay?

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Okay

Buffer

Runoff

Cropland
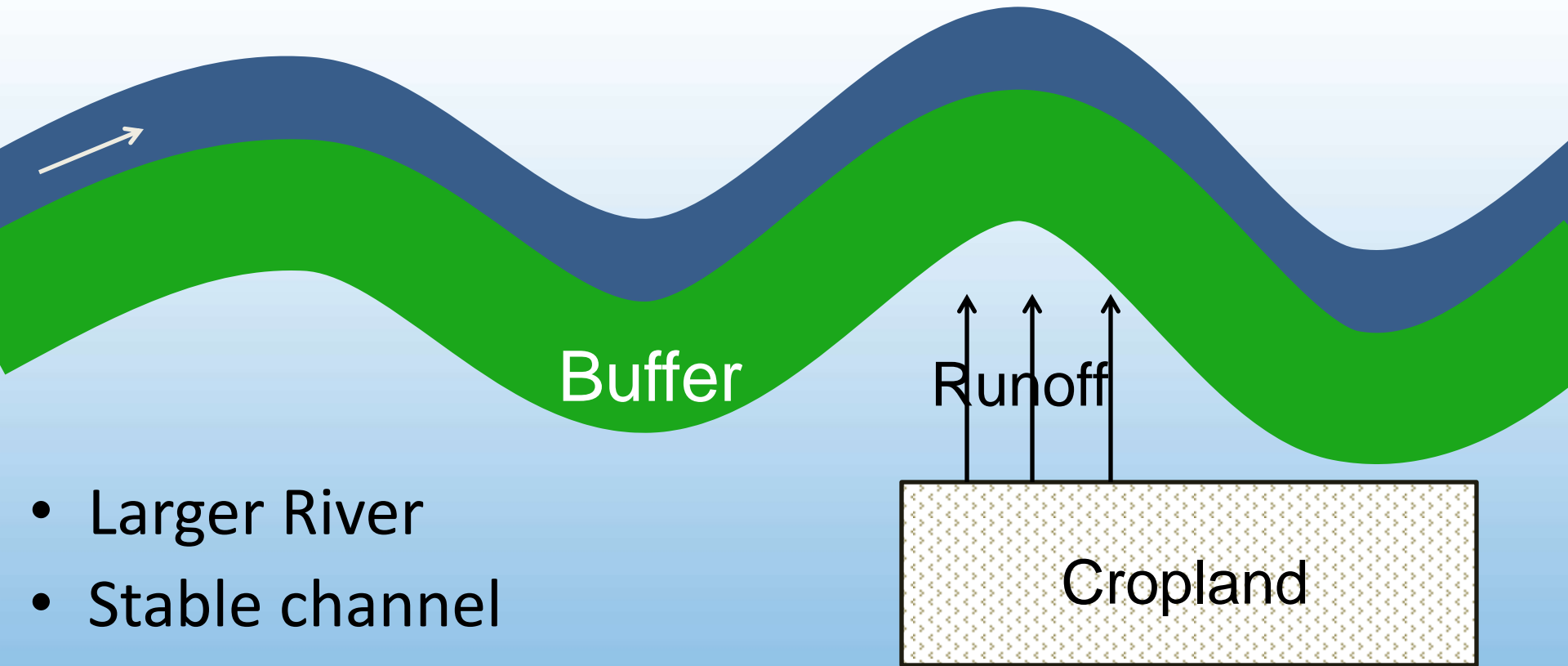
- Larger River
- Stable channel
- Connected to floodplain
- Treat runoff from adjacent sources
- Landscape connectivity

# Not Okay

- Most projects, especially mitigation
- Unstable geometry
- Incised
- System-wide adjustments
- Changing watershed conditions
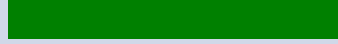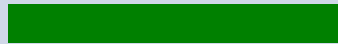
# Number 4:
# Developing a Function Based Approach to Credit Determination

- Many SOPs calculate stream <u>restoration</u> credits based on changes to dimension, pattern, and profile.

- It's time for a change.

- Credits should be based on improvements to functional capacity.
  - This is not as hard as it sounds!

# Communicating Functional Lift

| Functional Category | Function-Based Parameter | Pre-Restoration Condition | Post- Restoration Condition |
|---|---|---|---|
| Hydrology | Runoff | 🟩 | 🟩 |
| Hydraulics | Floodplain Connectivity | 🟥 | 🟩 |
| Geomorphology | Bed Form Diversity | 🟨 | 🟩 |
| Geomorphology | Lateral Stability | 🟨 | 🟩 |
| Geomorphology | Riparian Vegetation | 🟥 | 🟩 |
| Geomorphology | Large Woody Debris | 🟥 | 🟩 |
| Physicochemical | Temperature | 🟨 | 🟩 |
| Physicochemical | Nutrients | 🟨 | 🟩 |
| Biology | Aquatic Insects | 🟨 | 🟩 |
| Biology | Fish Communities | 🟨 | 🟩 |

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## Healthy Watershed

## Reach Scale Restoration

# Communicating Functional Lift

| Functional Category | Function-Based Parameter | Pre-Restoration Condition | Post- Restoration Condition |
|---|---|---|---|
| Hydrology | Runoff | 🟨 | 🟨 |
| Hydraulics | Floodplain Connectivity | 🟥 | 🟩 |
| Geomorphology | Bed Form Diversity | 🟨 | 🟩 |
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| Geomorphology | Large Woody Debris | 🟥 | 🟩 |
| Physicochemical | Temperature | | 🟩 |
| Physicochemical | Nutrients | 🟨 | 🟨 |
| Biology | Aquatic Insects | 🟥 | 🟨 |
| Biology | Fish Communities | 🟥 | 🟨 |

# Restoration 2

Impaired Watershed

Reach Scale Restoration

# Restoration 1 Credits

- Reach scale restoration downstream of healthy watershed.

- High probability of restoring **Level 5** functions.

- Maximum credits. I like 1.0 credit/ft

# Restoration 2 Credits

- Reach scale restoration downstream of impaired watershed.

- High probability of restoring **Level 3** functions.

- Maximum credits < Restoration 1, maybe 0.8 credits/ft

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# Thank You