

Following the Water *Implications* for *Phosphorus*

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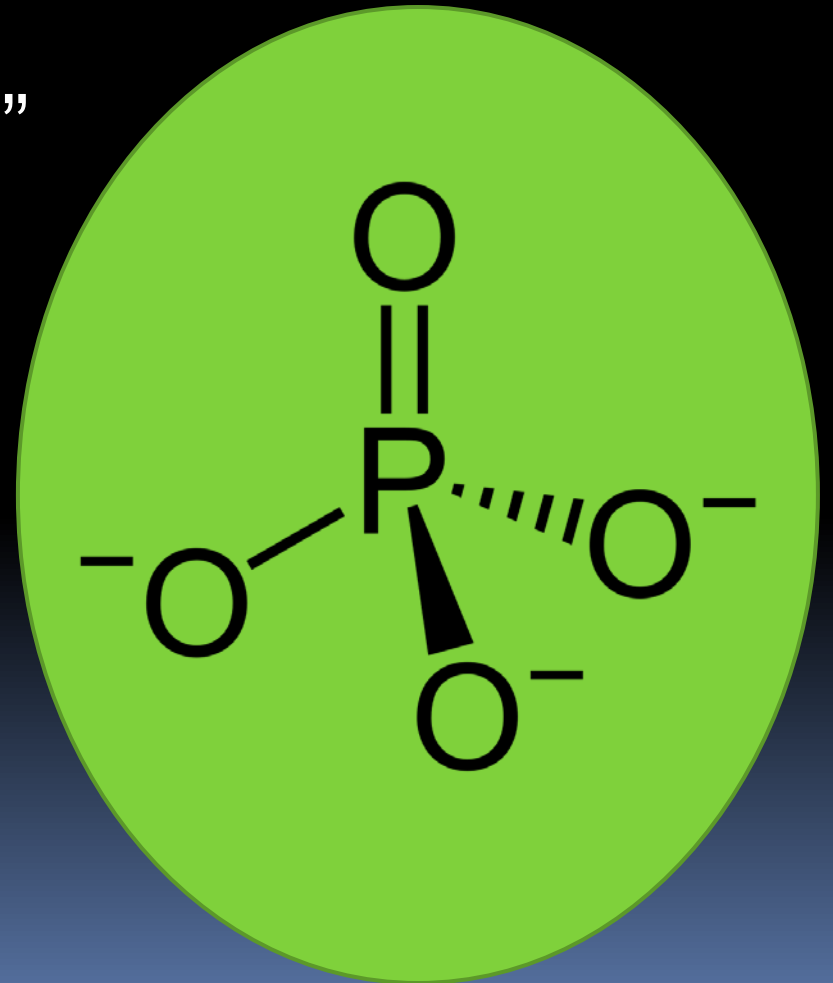
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**WI Department of
Natural Resources**

The Red Cedar
2013



Part 1 – Phosphorus

- P is an element
- Common as “ PO_4^{3-} ”

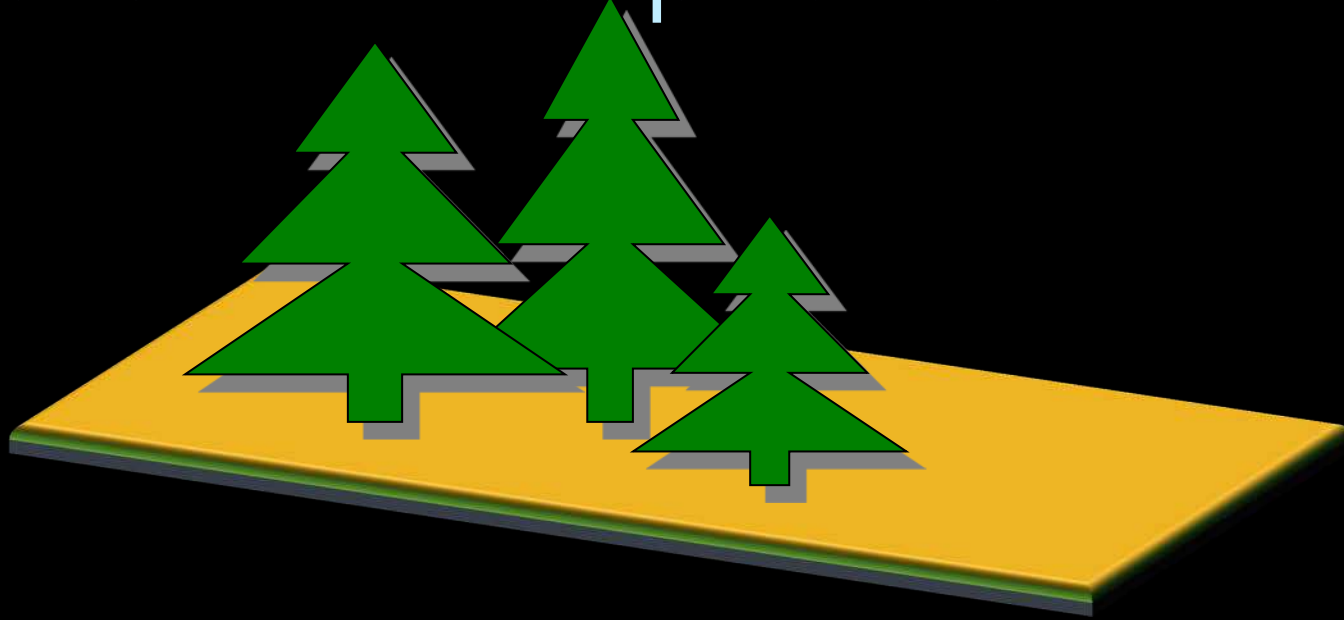


- 
- DNA
 - ATP
 - Membranes
- 

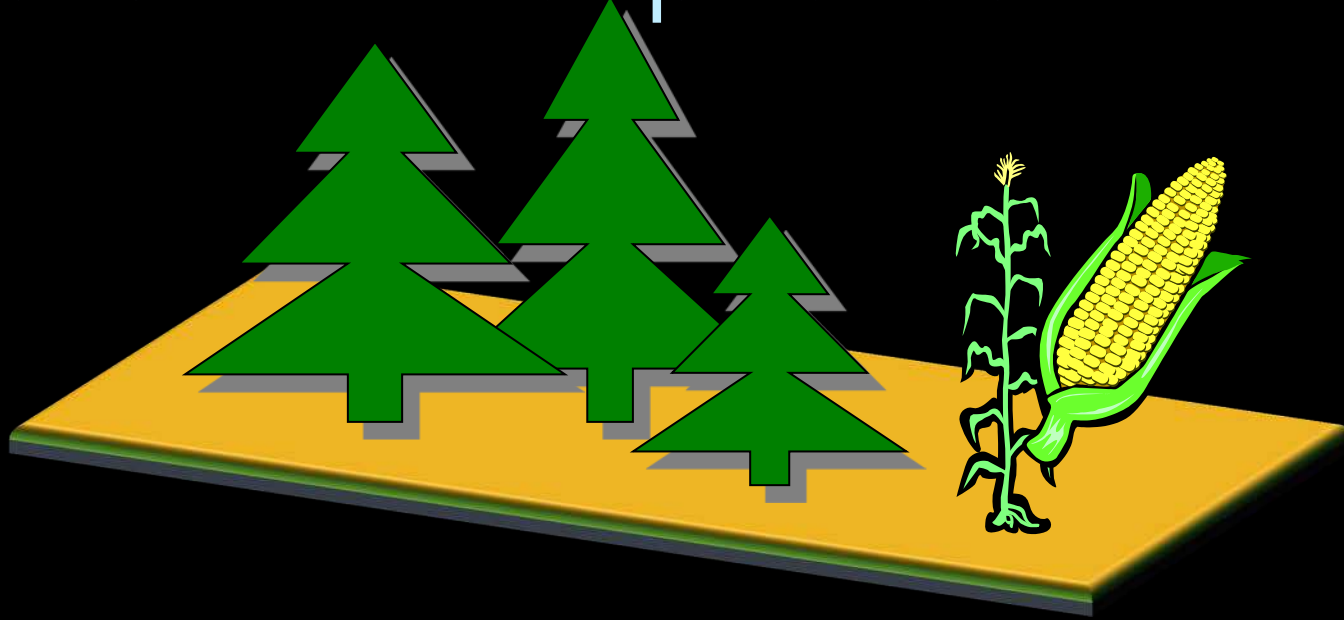
Part 1 – Phosphorus

- Essential element
- Component of plants, microbes, soils

Part 1 – Phosphorus



Part 1 – Phosphorus



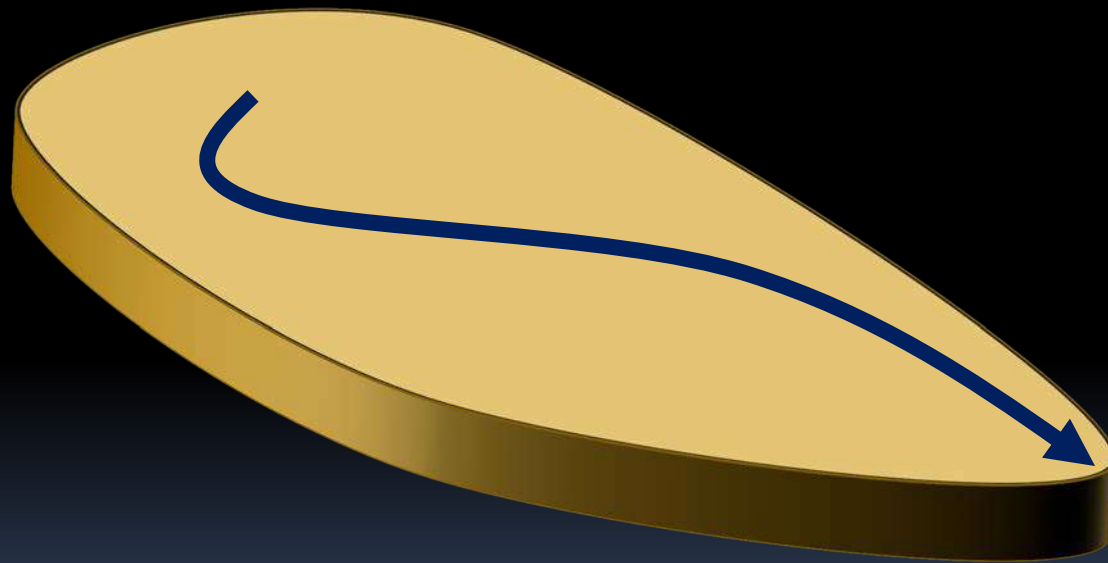
45,000 lb plant P

50,000 lb organic matter P

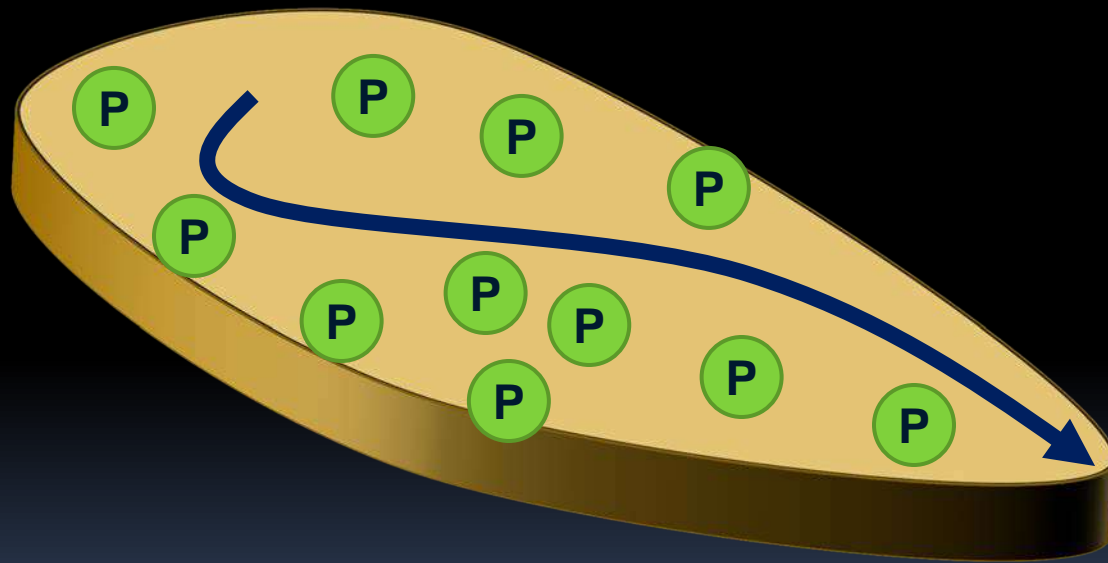
250,000 lbs soil P (top 6")

**350,000
lb P
/sq mile**

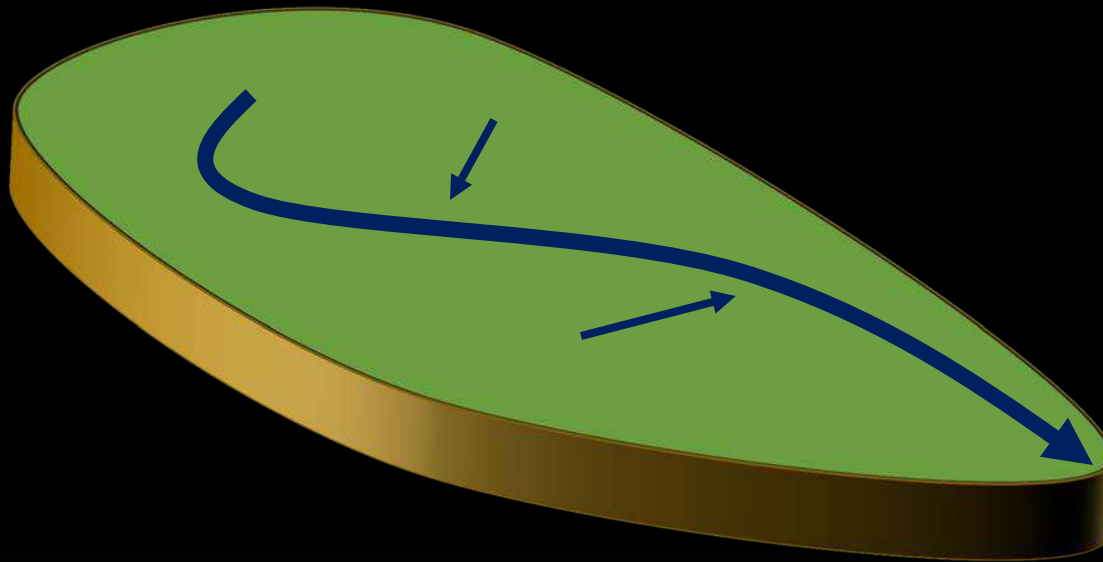
1,800 sq. mile watershed =

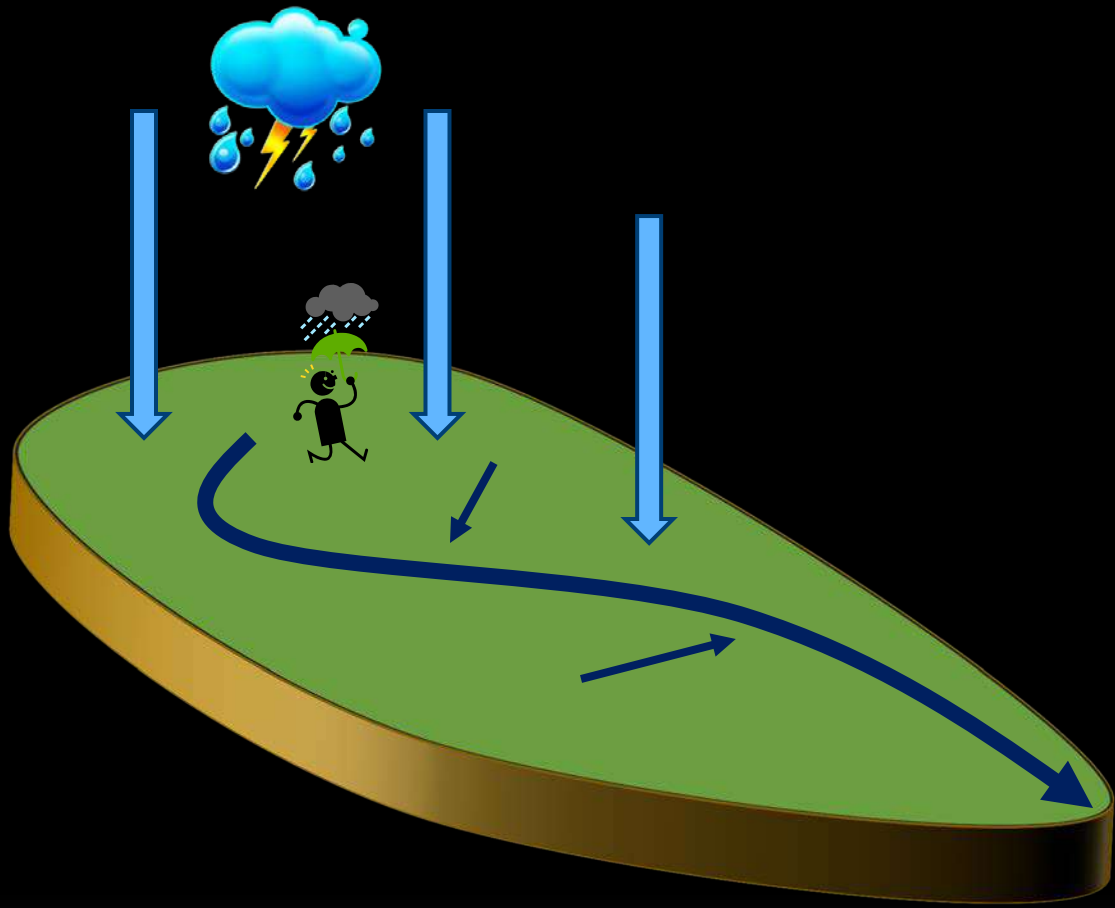


= 600,000,000 pounds of P!



Part 2 – Watersheds



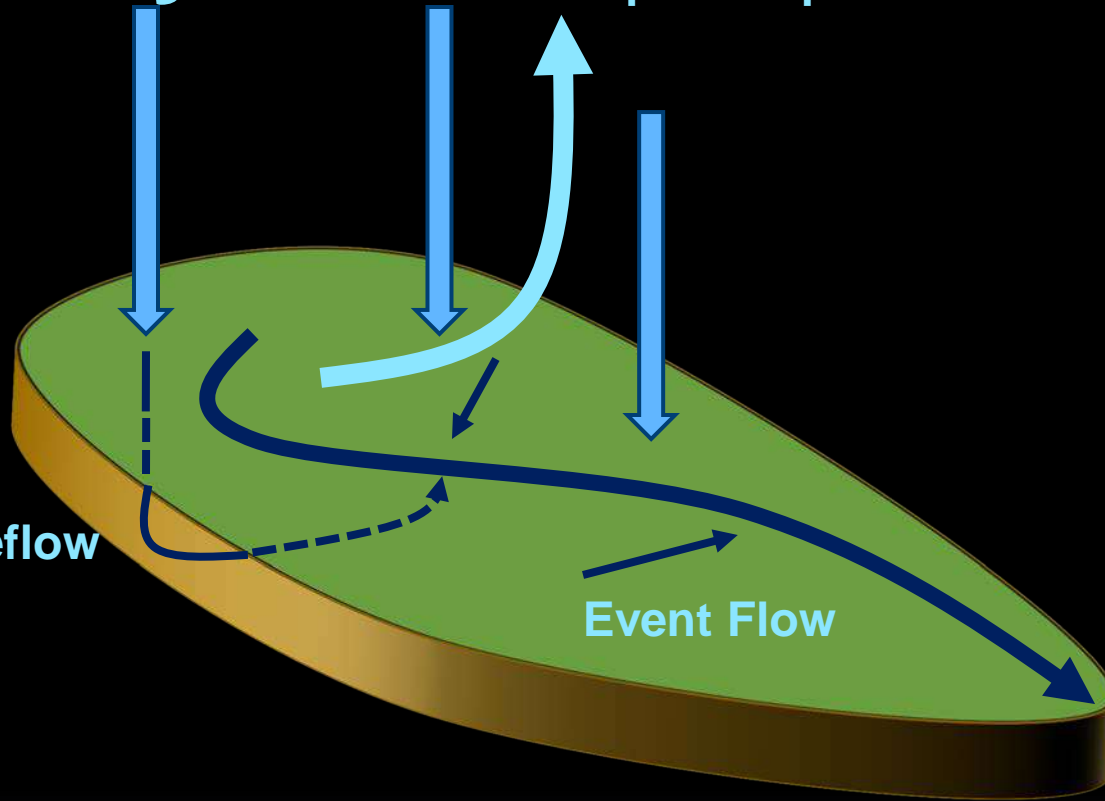


32"/year

Evapotranspiration

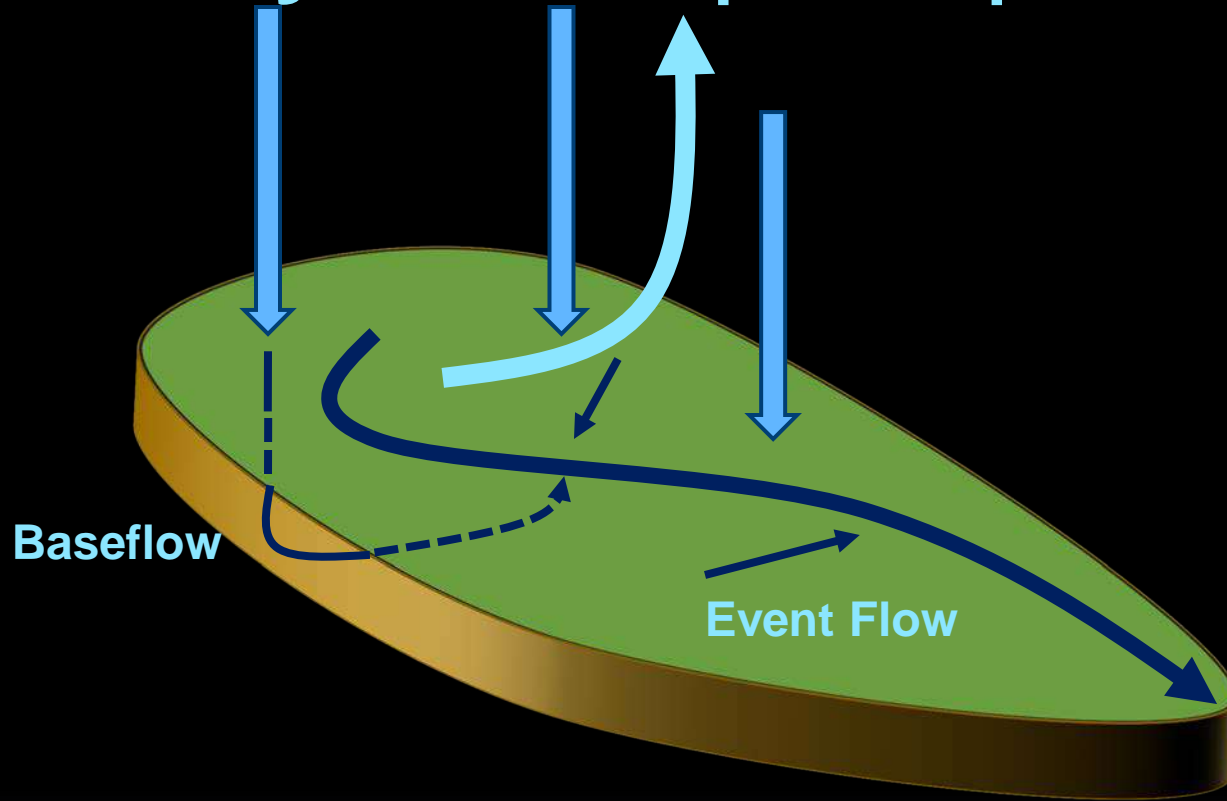
Baseflow

Event Flow



32"/year

Evapotranspiration (22"/year)

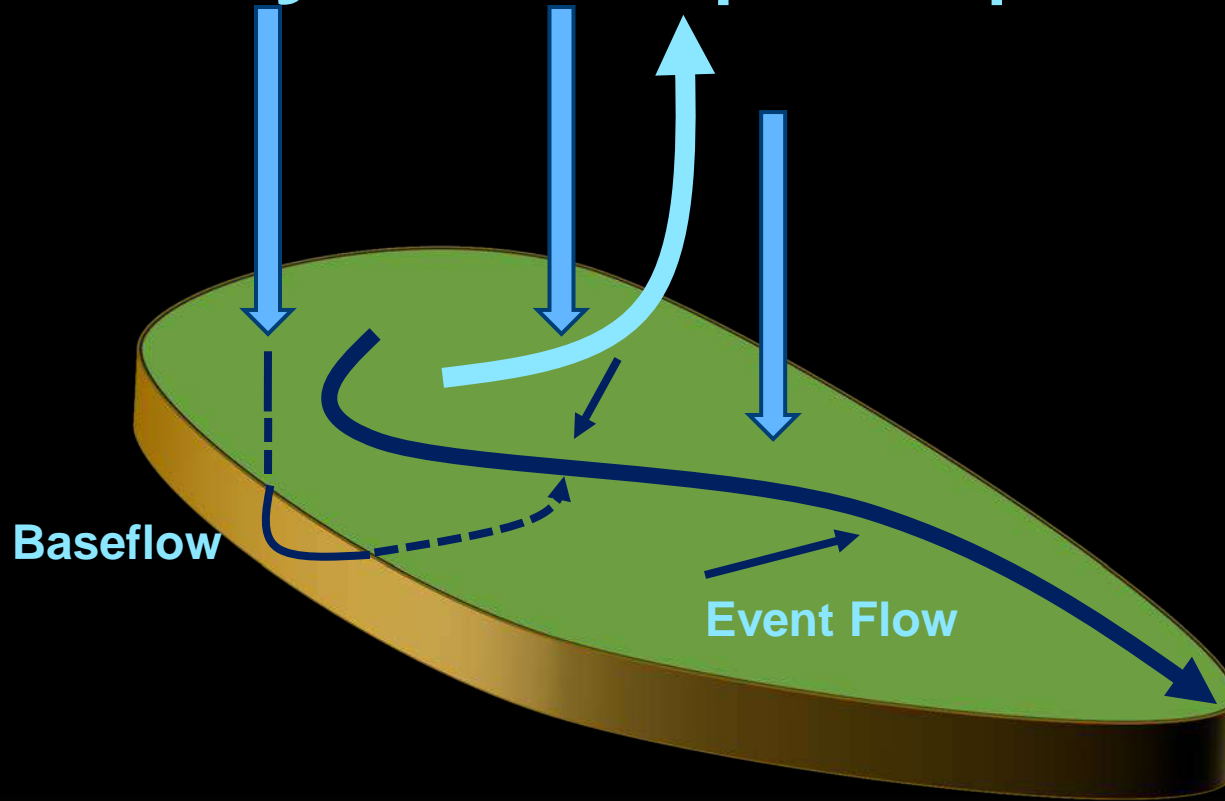


Baseflow

Event Flow

32"/year

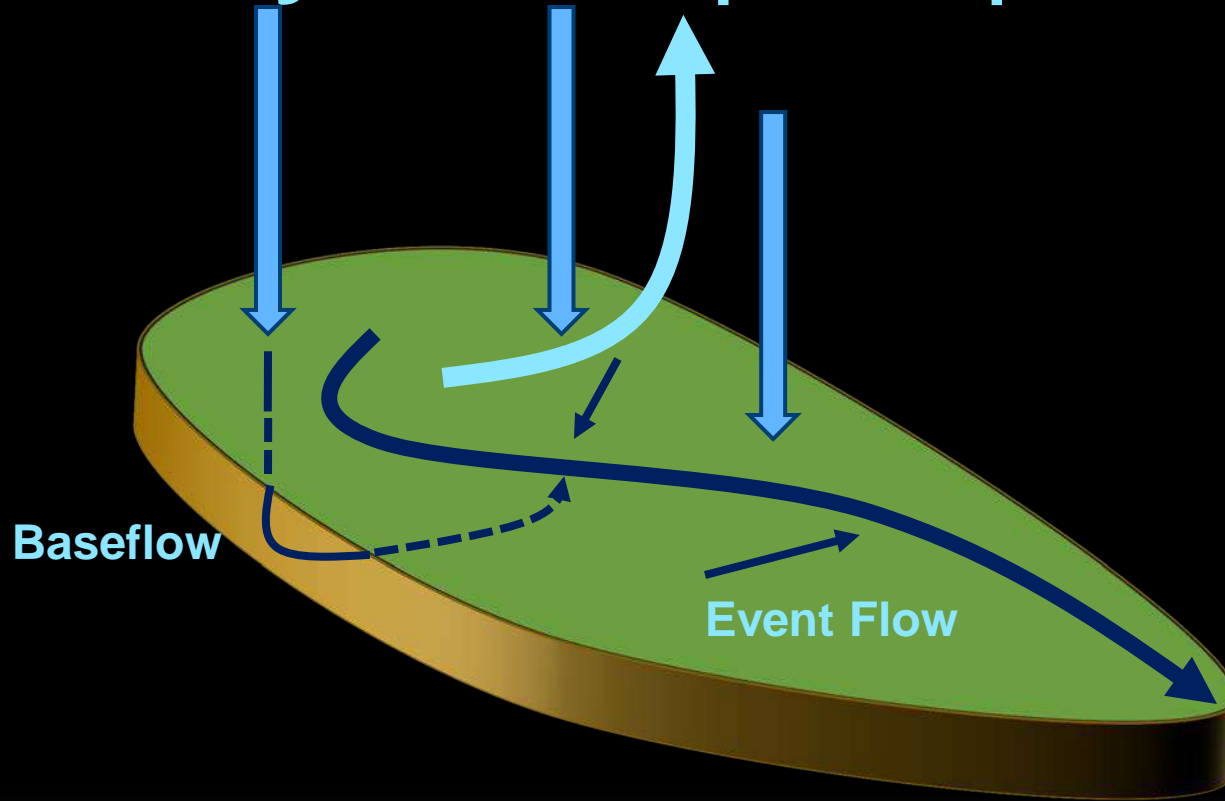
Evapotranspiration (22"/year)



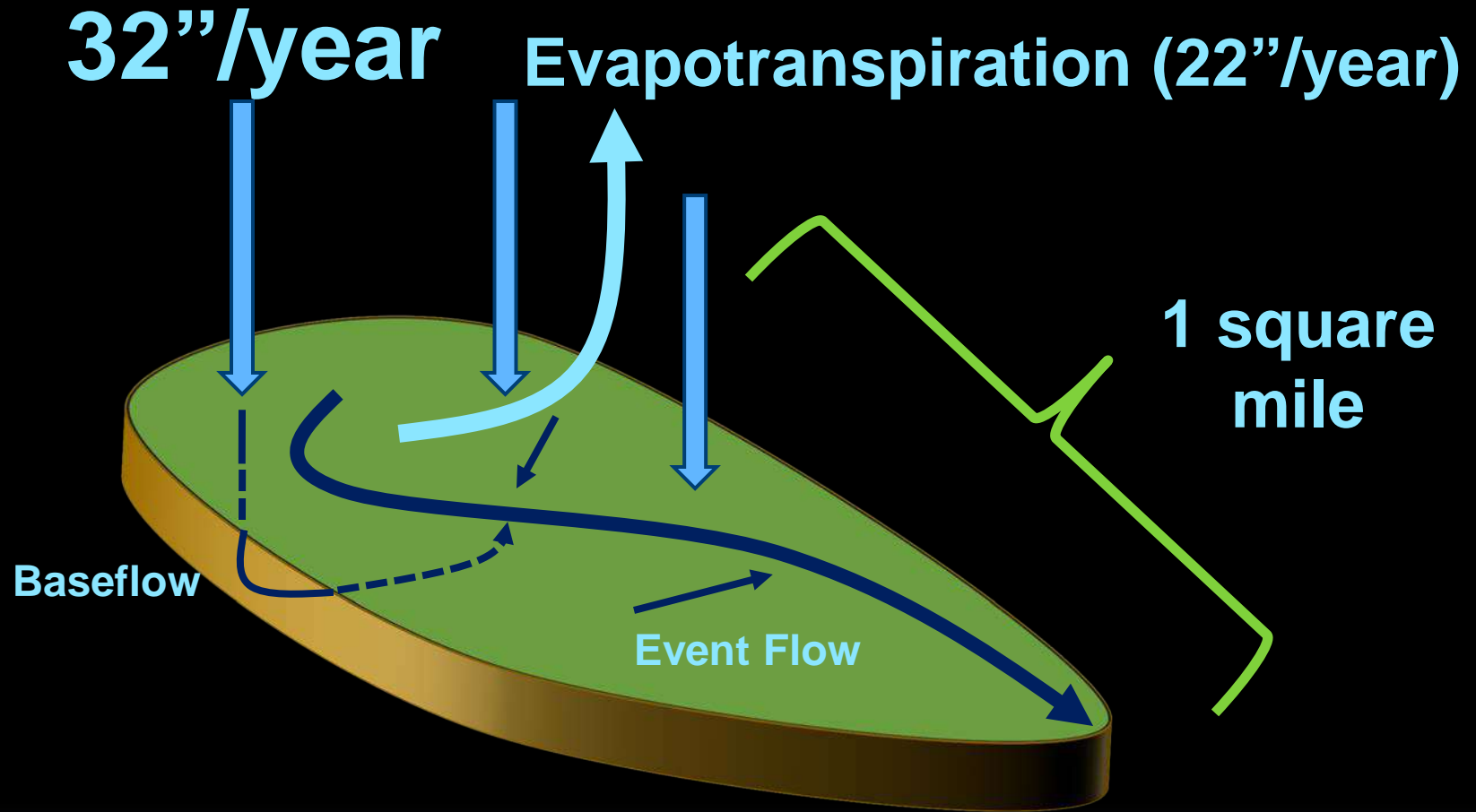
$$32"/\text{yr} - 22"/\text{yr} =$$

32"/year

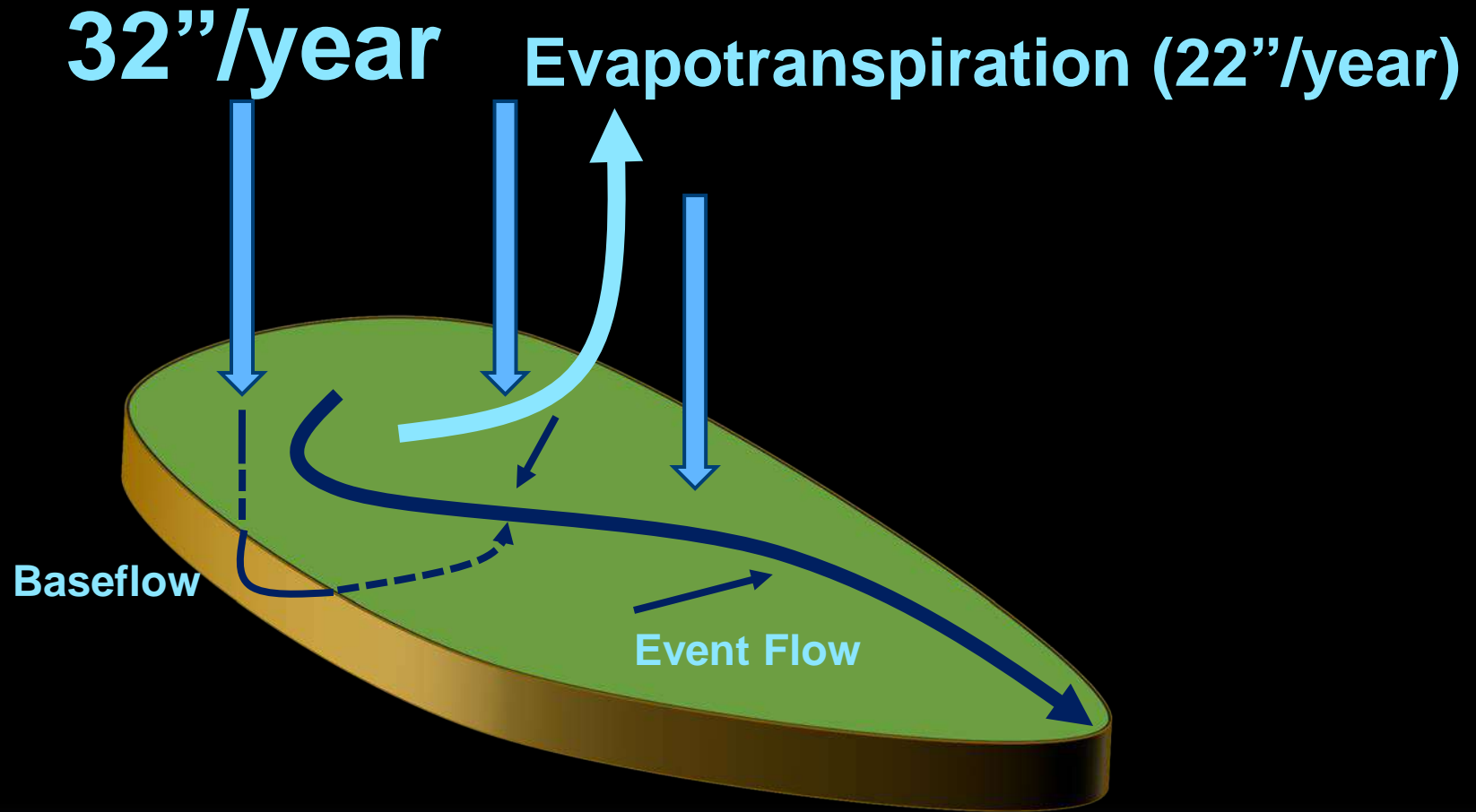
Evapotranspiration (22"/year)



$$32"/\text{yr} - 22"/\text{yr} = 10"/\text{yr}$$

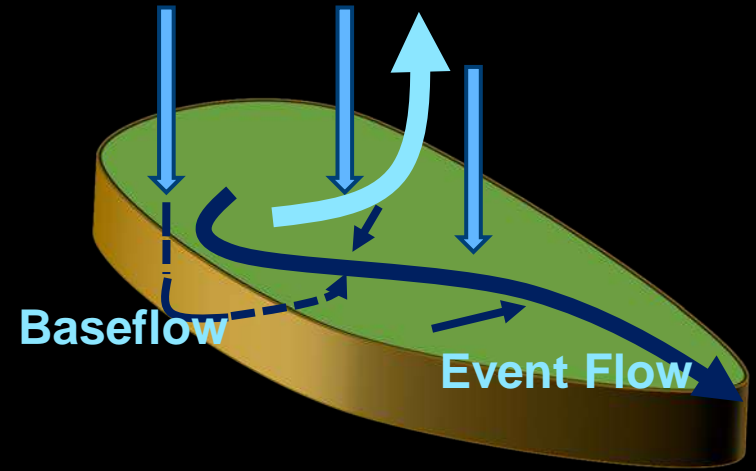


**10 inches /year on 1 square mile...
= 23,000,000 cubic feet /year!**



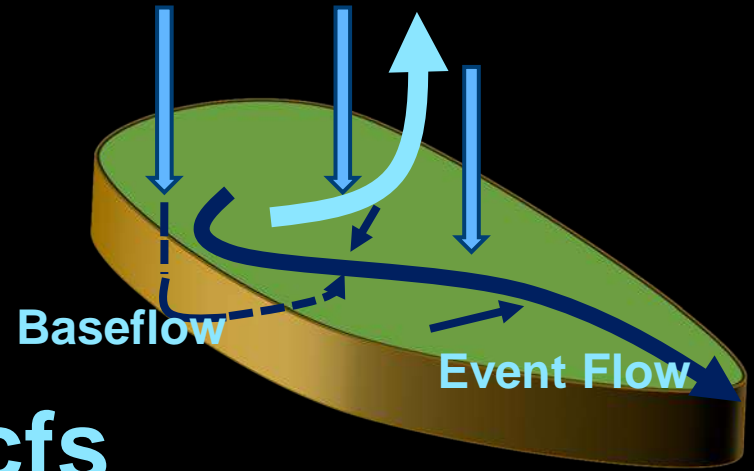
**10 inches /year on 1 square mile...
= 23,000,000 cubic feet /year!
= 0.7 cubic foot every second!**

Really?



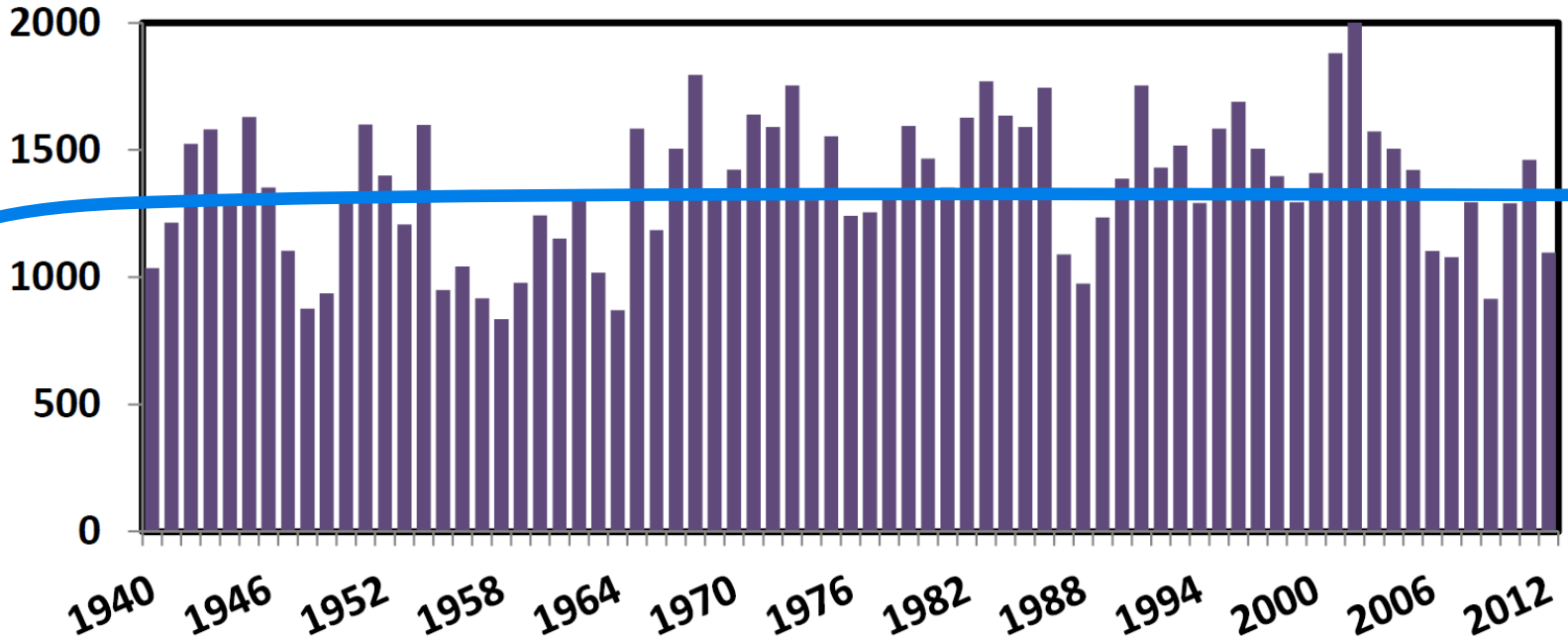
So, if we had an
1,800 square mile watershed
It would generate 1,300 cubic feet
of water every second?

Really?



average ~1350 cfs

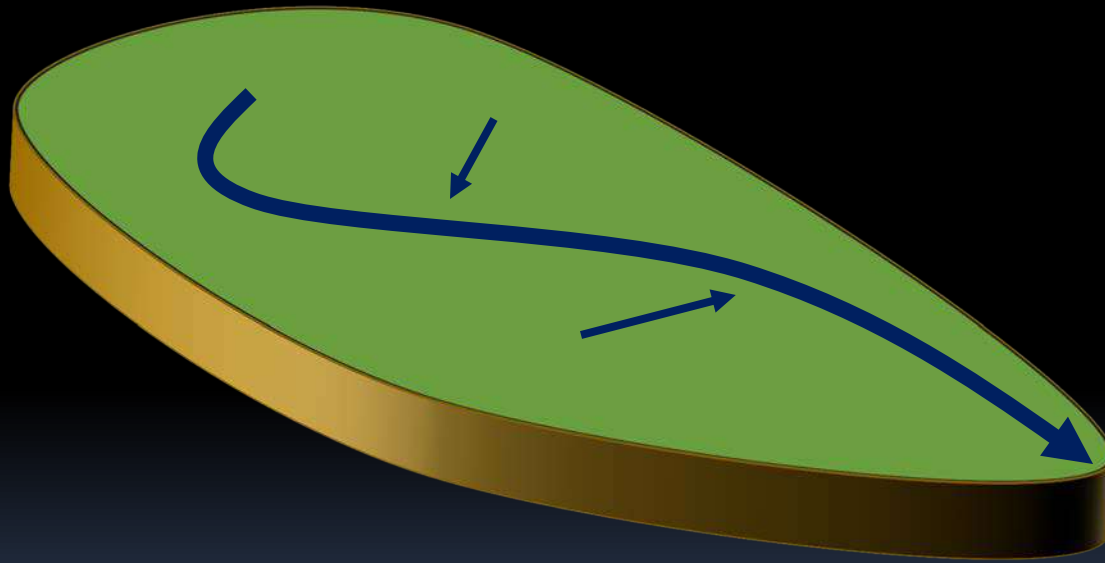
cubic feet/sec (cfs)



USGS Red Cedar River at Menomonie

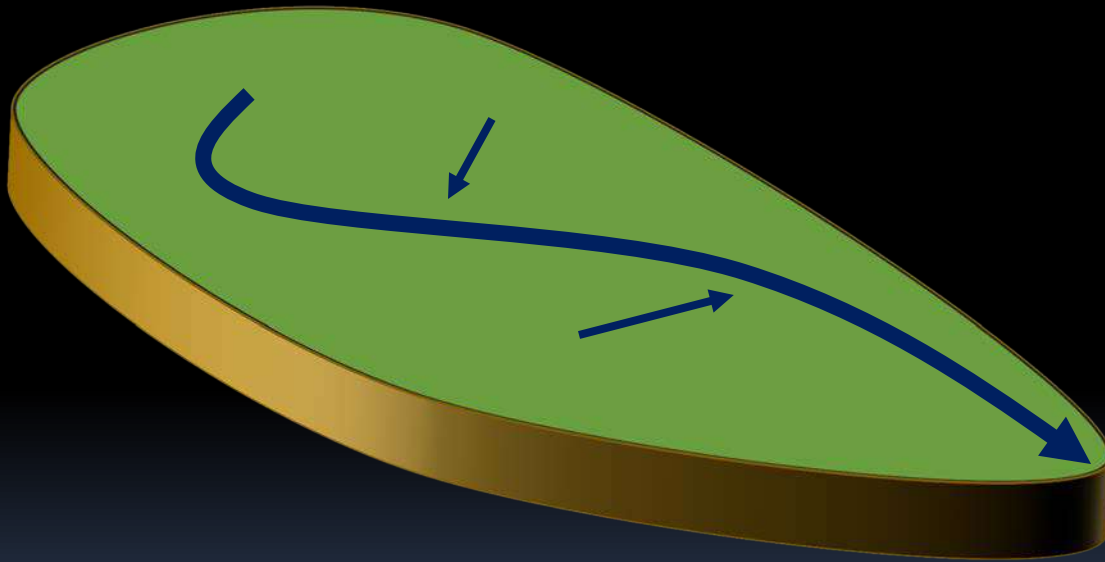
Part 3

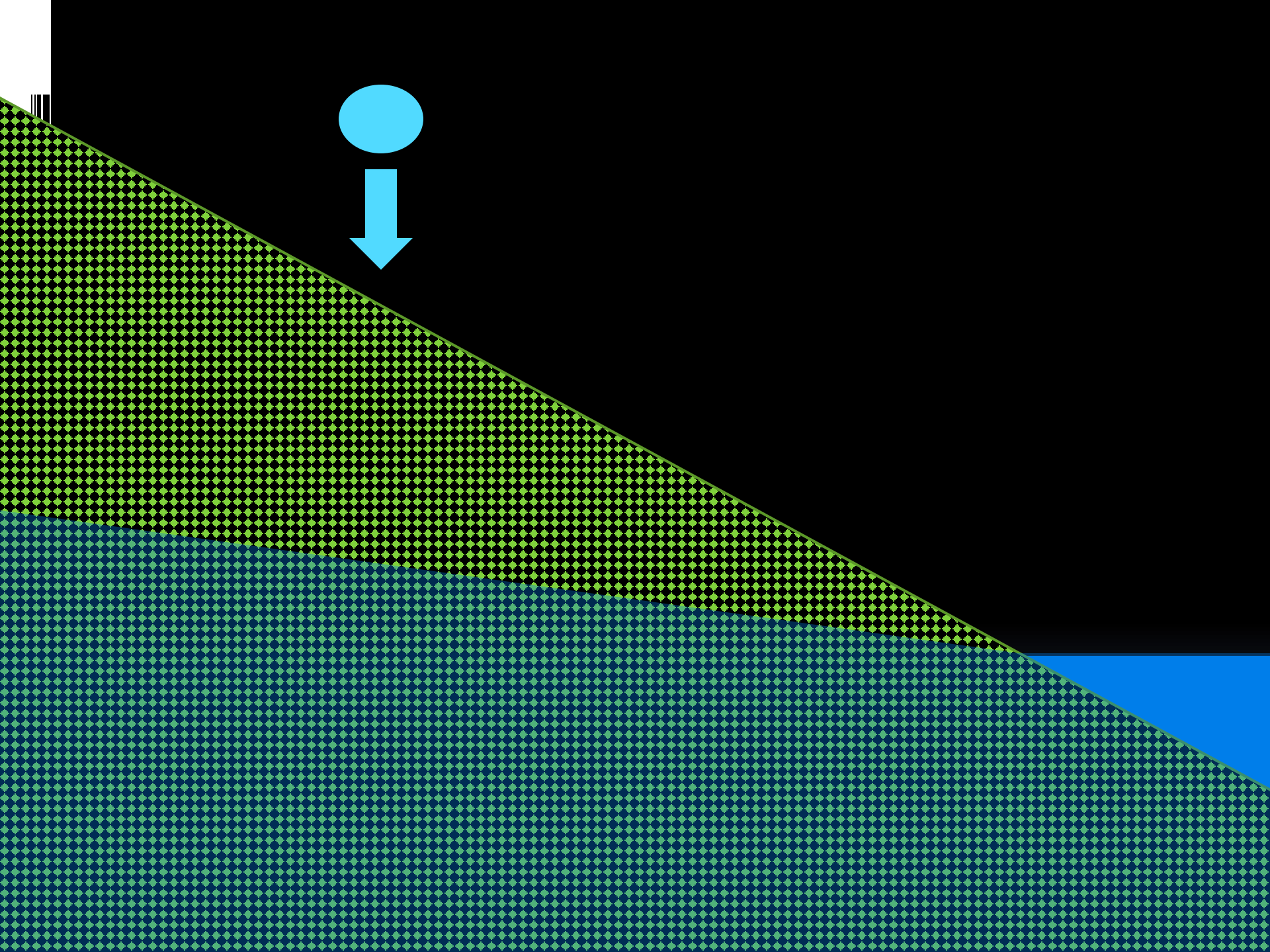
When Land & Water Collide

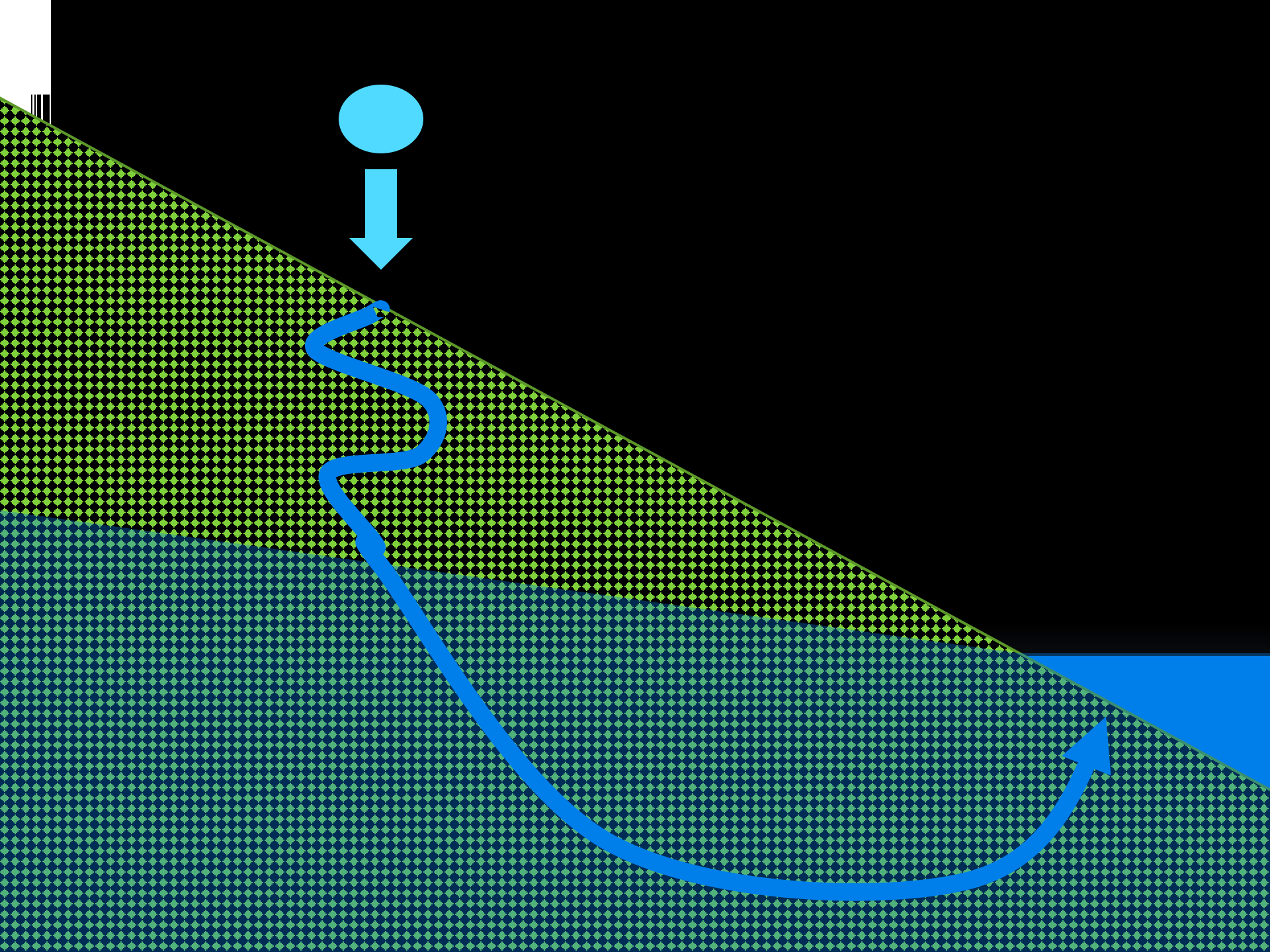


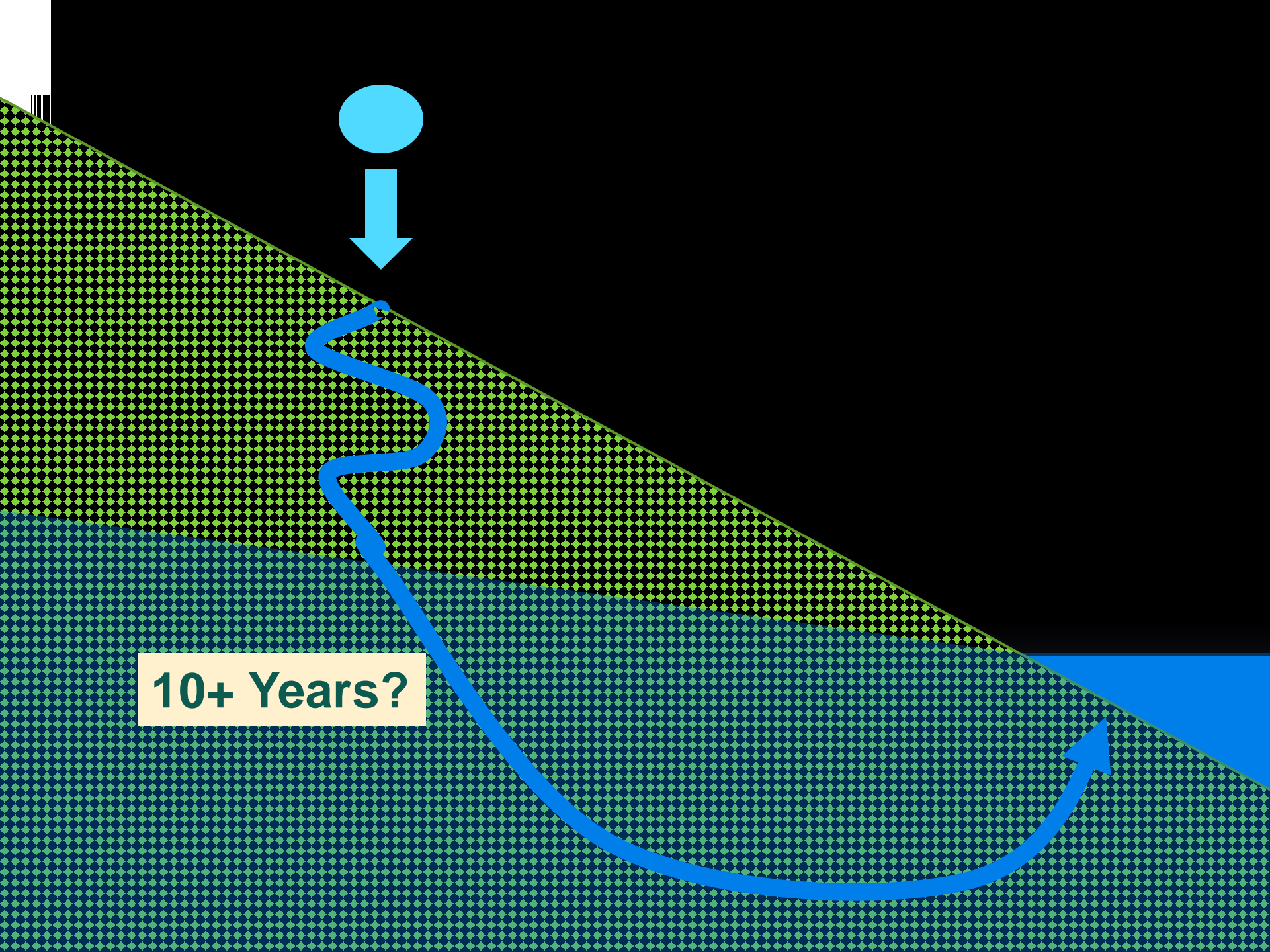
Part 3

or... what happens when you mix millions of pounds of P with billions of cubic feet of water every year!

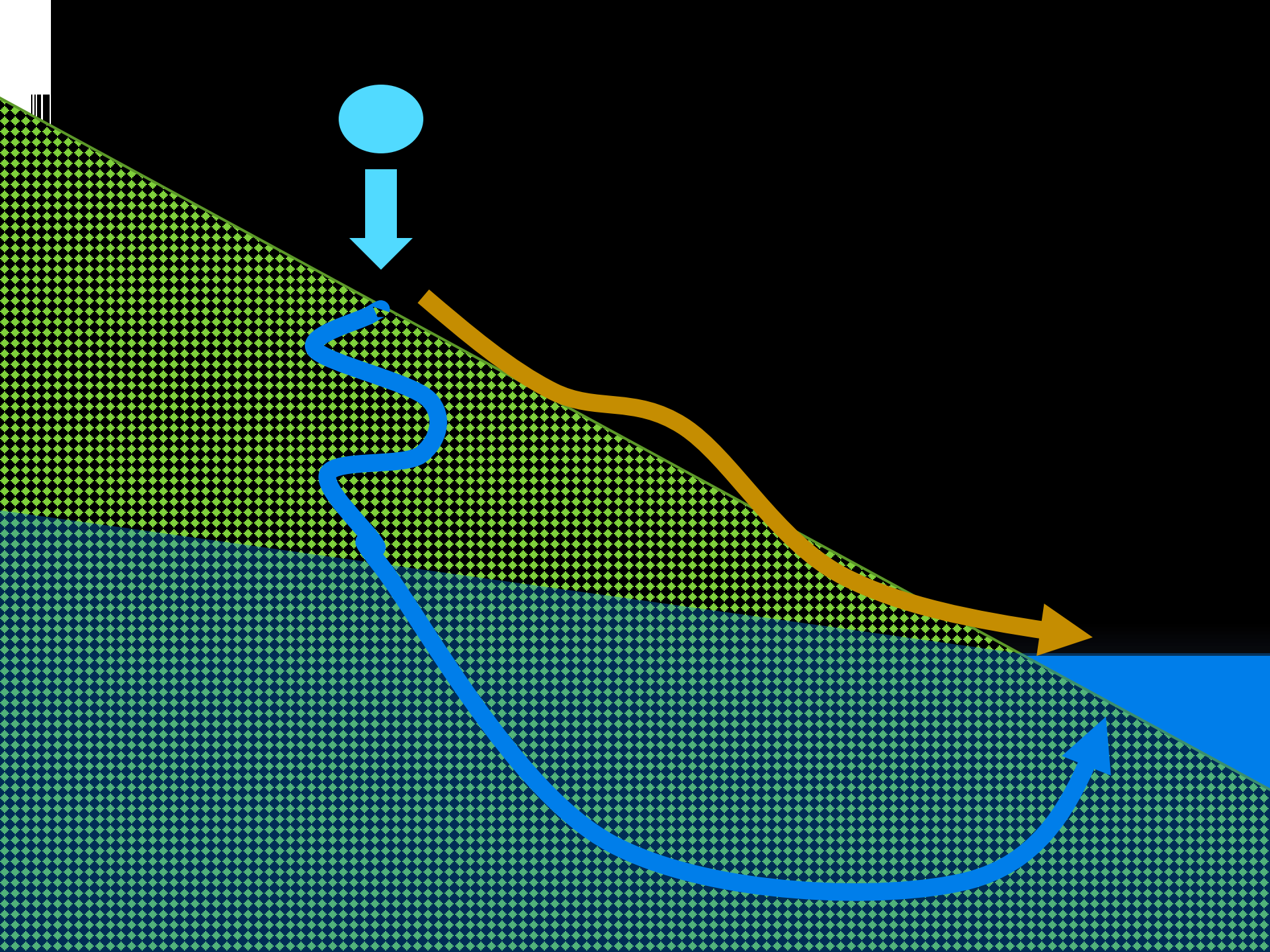


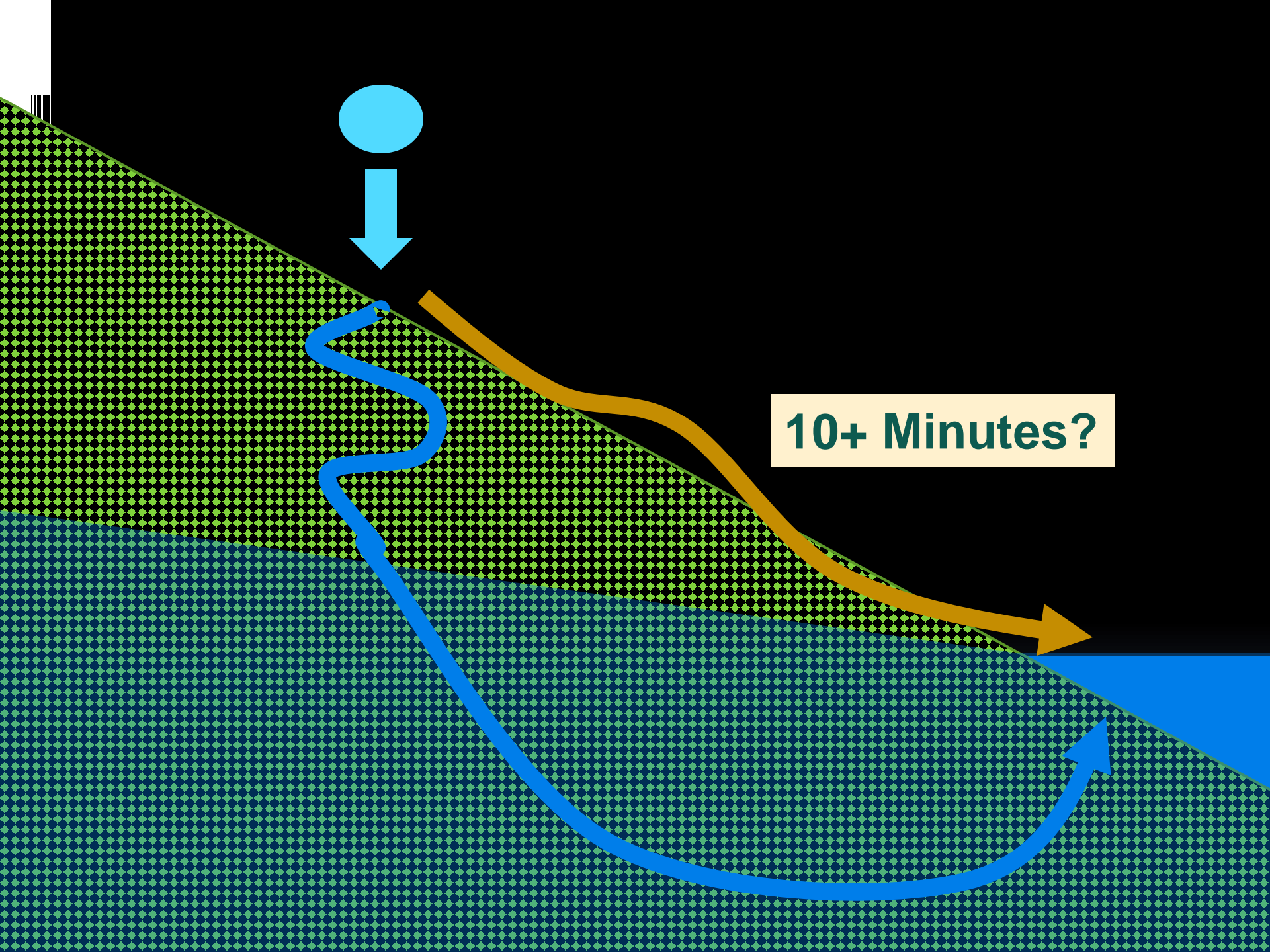






10+ Years?





10+ Minutes?

Important Implications

- Phosphorus is reactive
 - Sticks to solids, used by bacteria and plants
- Infiltrate
 - Low P... say 0.02 mg/l
- Run across the surface
 - Higher P.... say 1.0 mg/l

Important Implications

- Phosphorus is reactive
 - Sticks to solids, used by bacteria and plants
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 - Low P... say 0.02 mg/l
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50 x difference!



Let's do the numbers!

10" @ 0.02 mg/l = 50,000 lbs

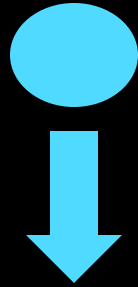
1" @ 1.0 mg/l = 250,000 lbs



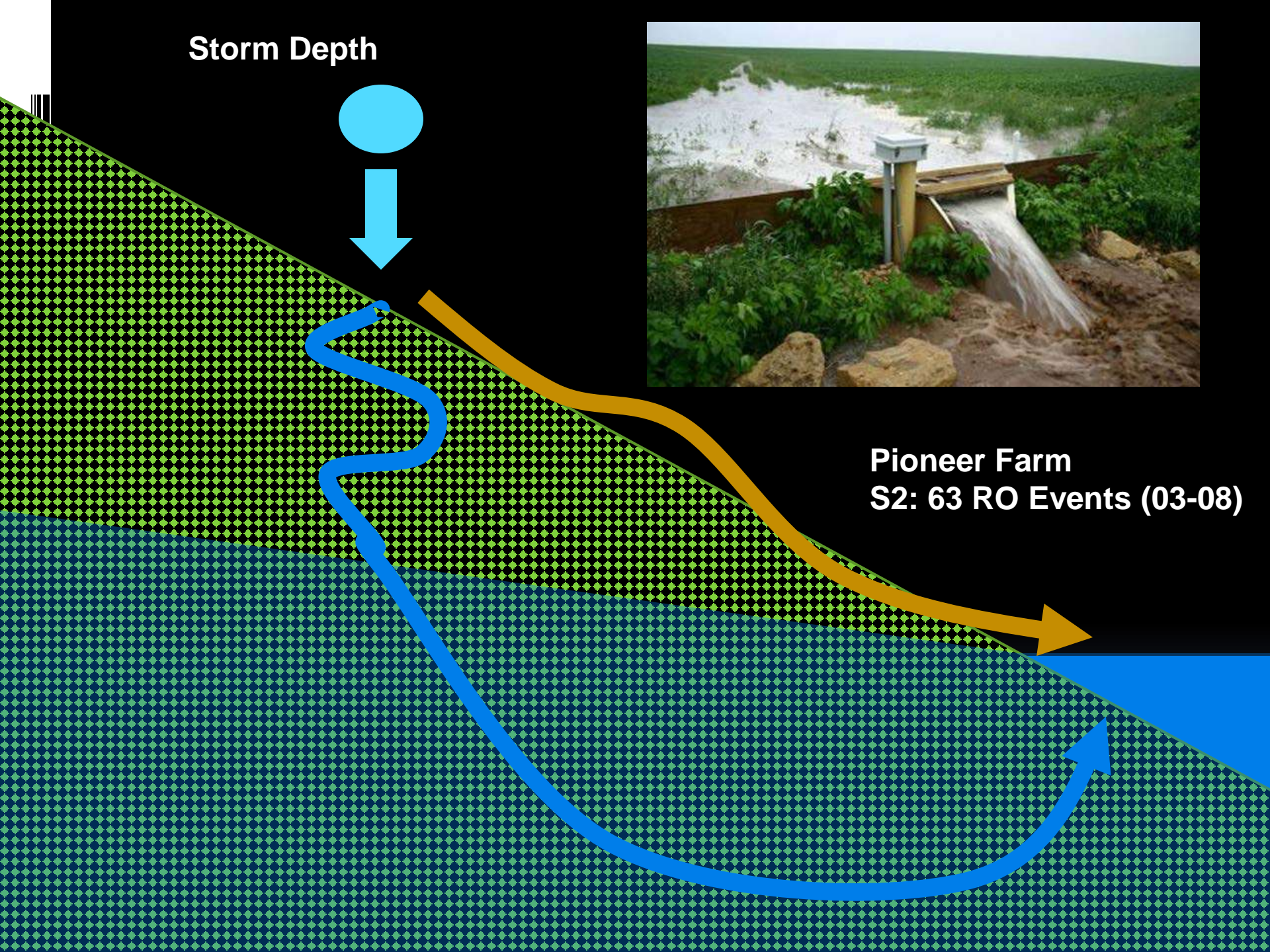
A vertical bar on the left side of the slide, consisting of a white top section with three thin black vertical lines, and a bottom section with four colored rectangular segments: pink, grey, yellow, and a longer pink segment.

Take a closer look

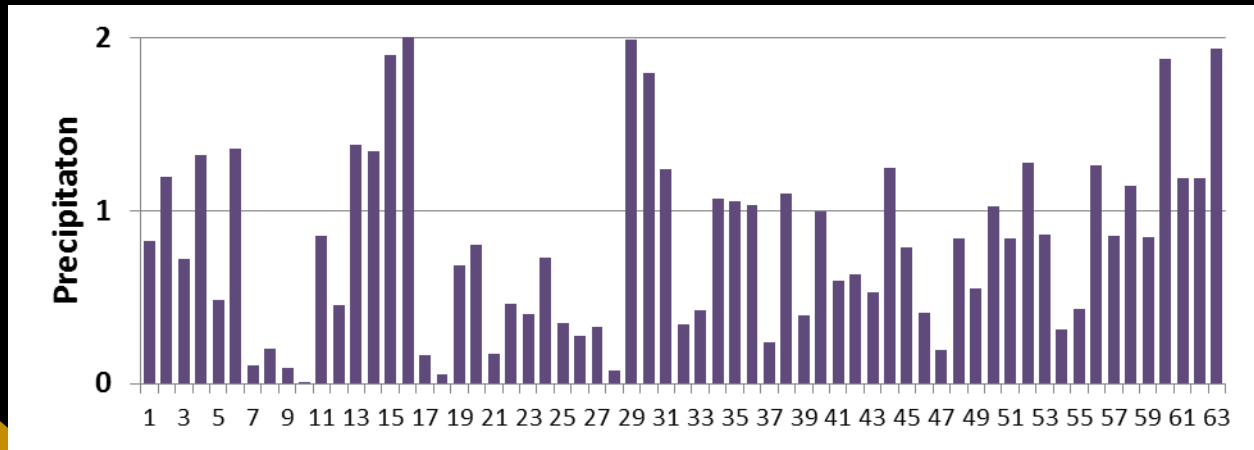
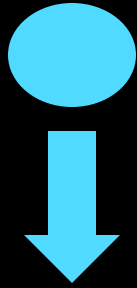
Storm Depth



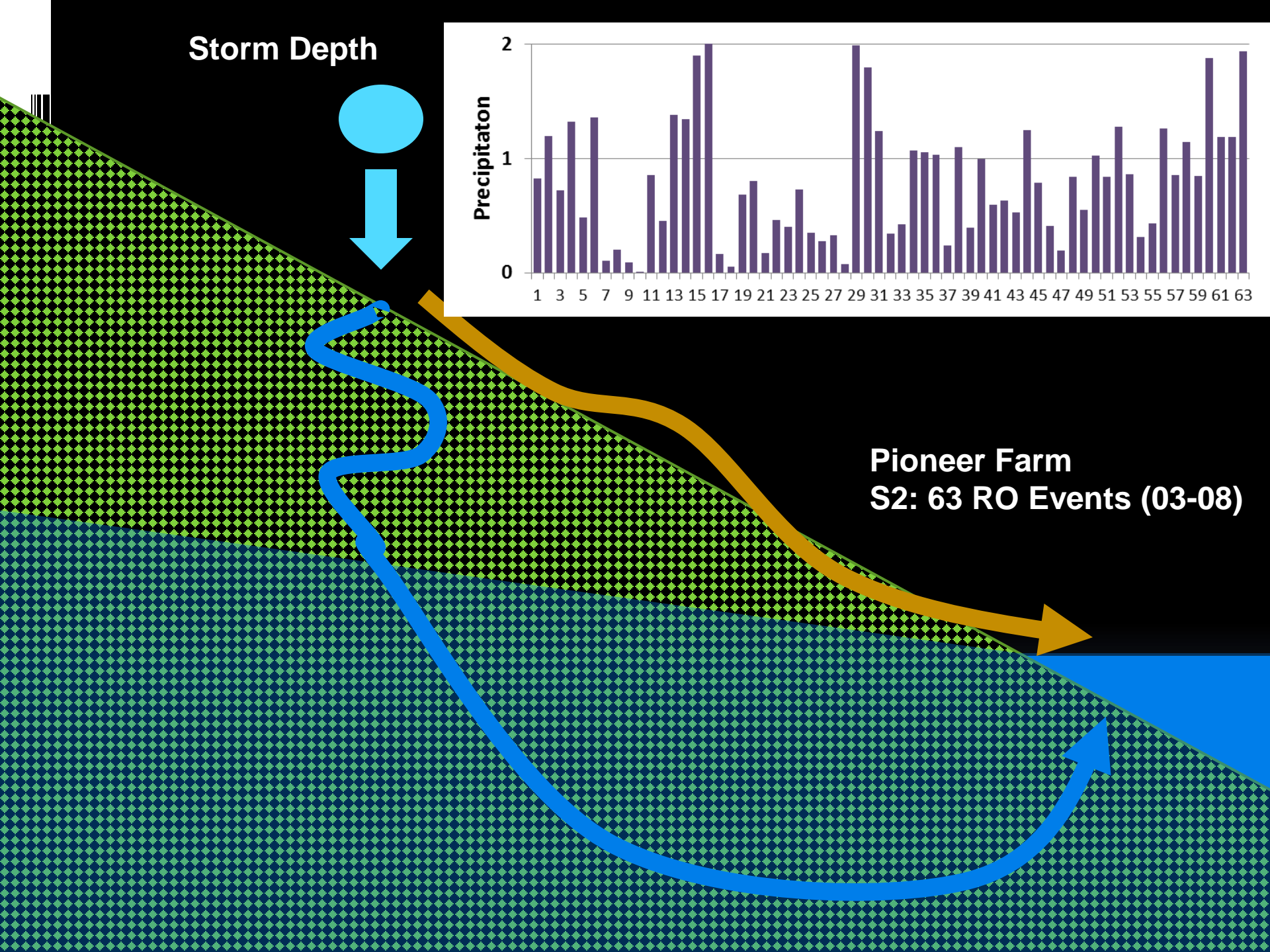
**Pioneer Farm
S2: 63 RO Events (03-08)**



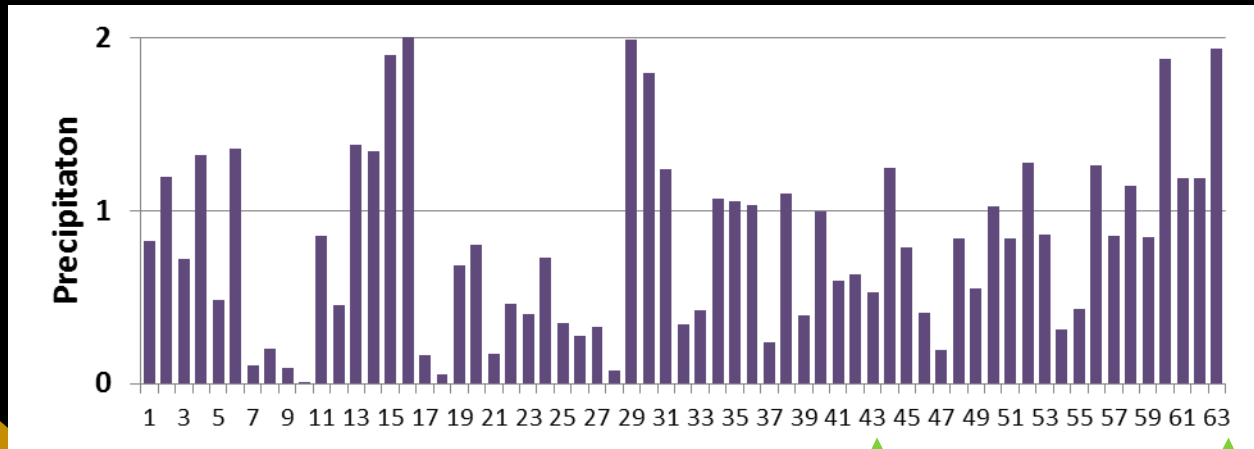
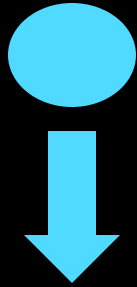
Storm Depth



**Pioneer Farm
S2: 63 RO Events (03-08)**

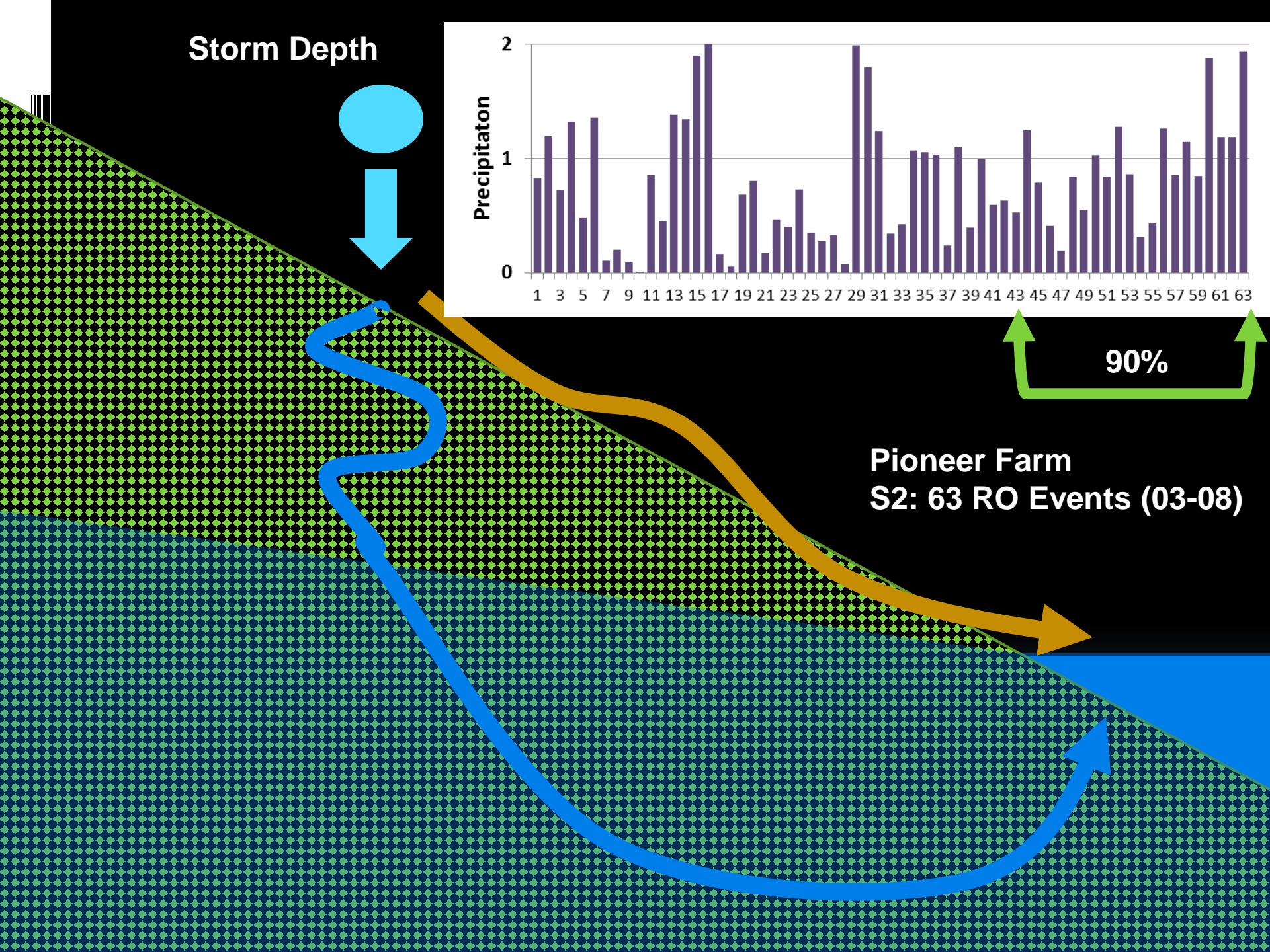


Storm Depth

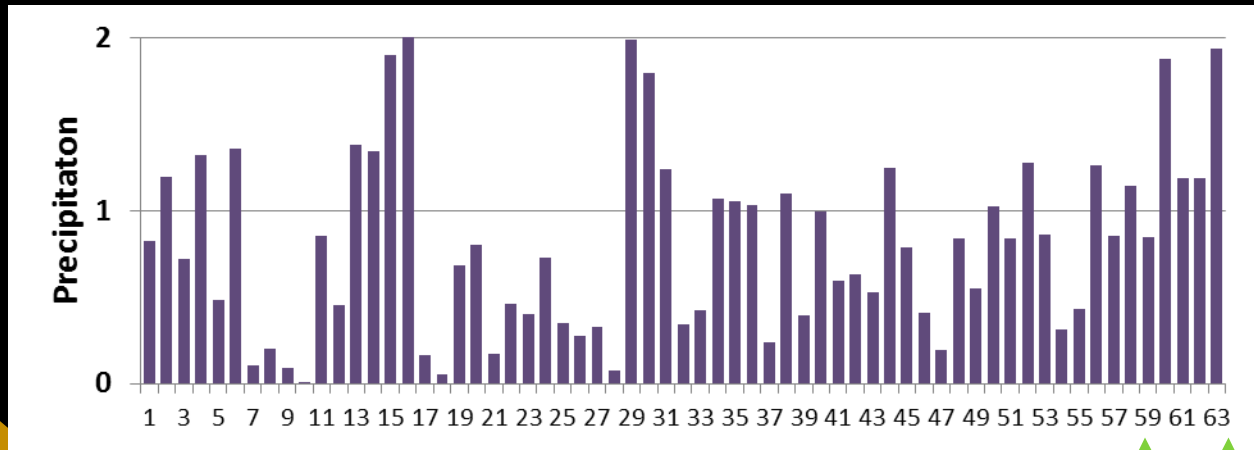
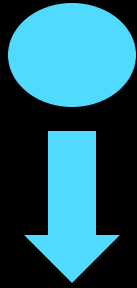


90%

**Pioneer Farm
S2: 63 RO Events (03-08)**

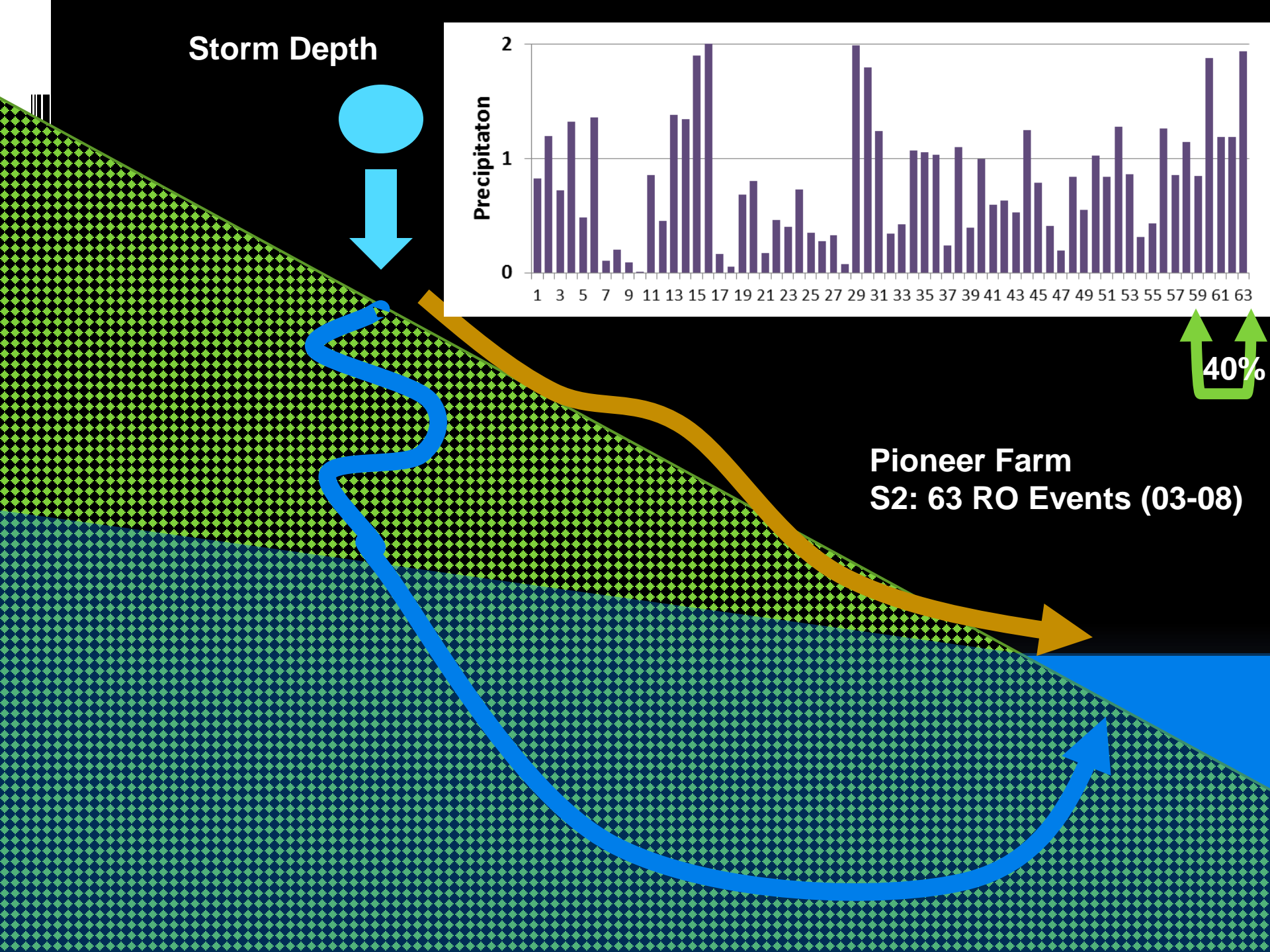


Storm Depth

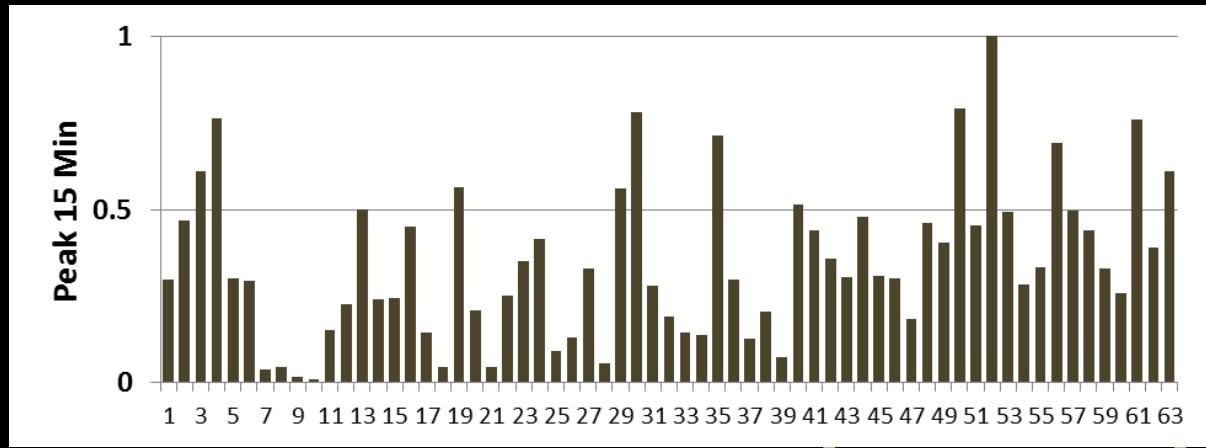
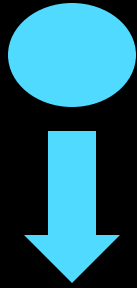


40%

**Pioneer Farm
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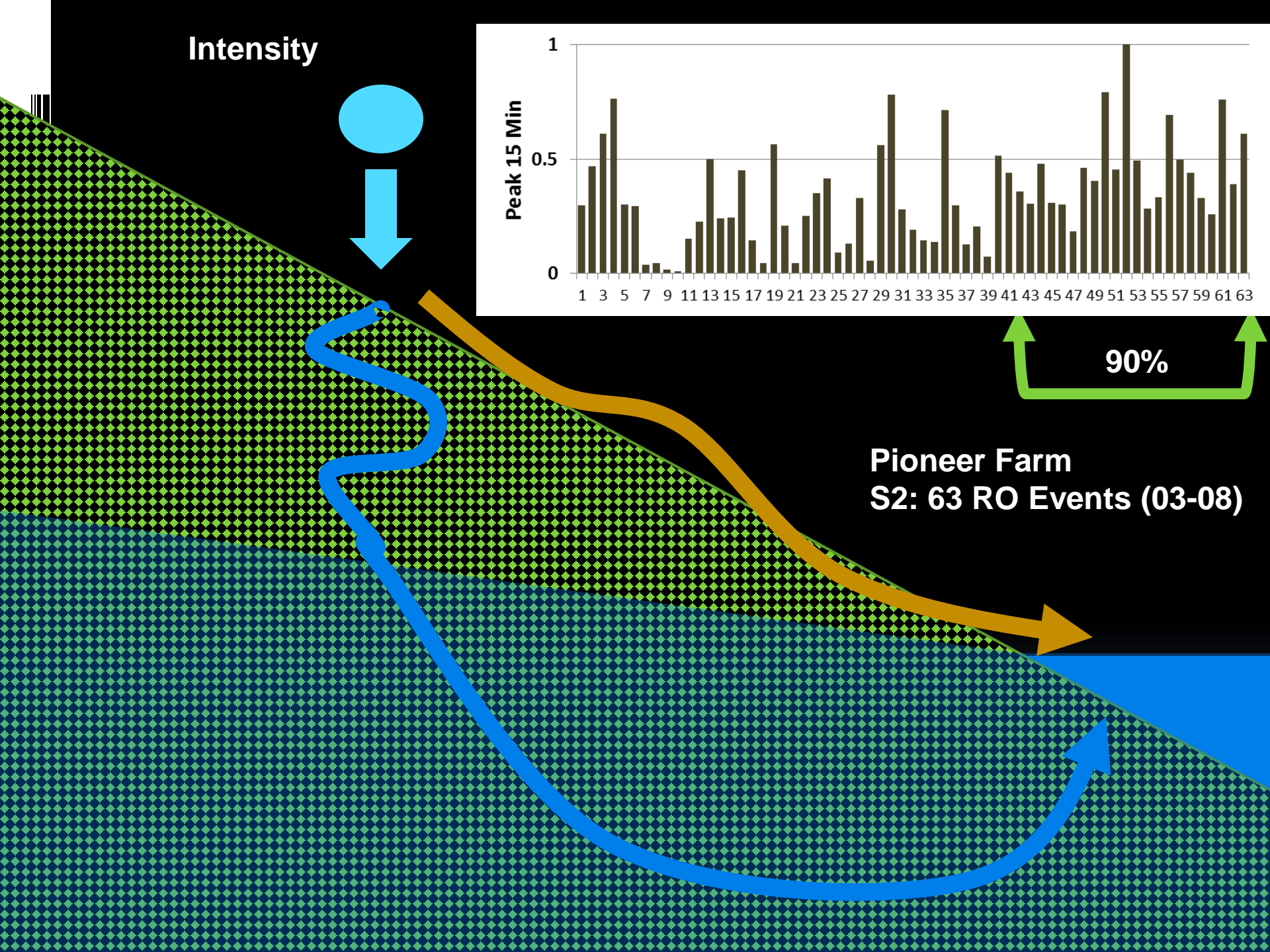


Intensity

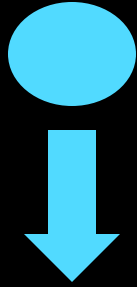


90%

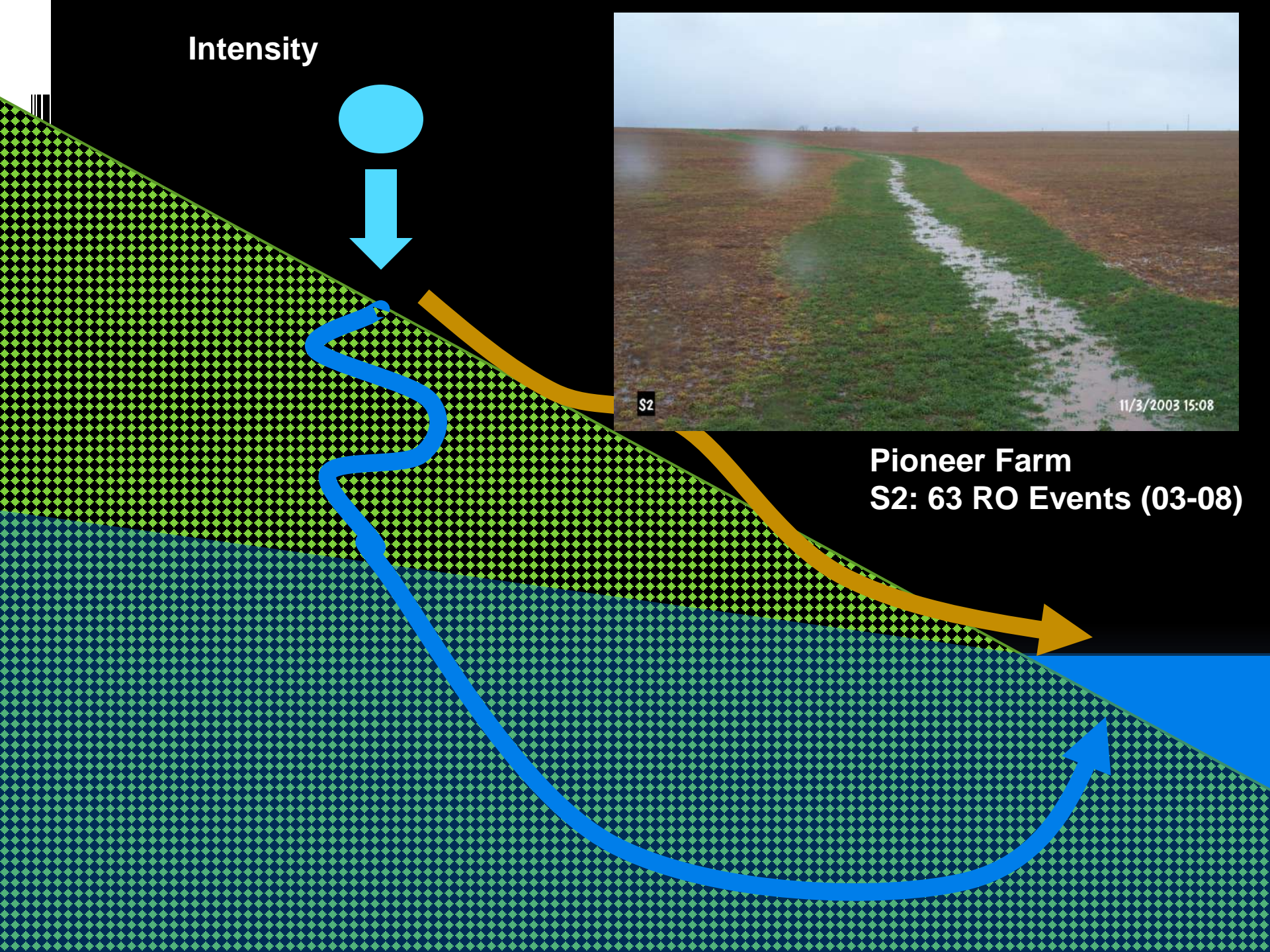
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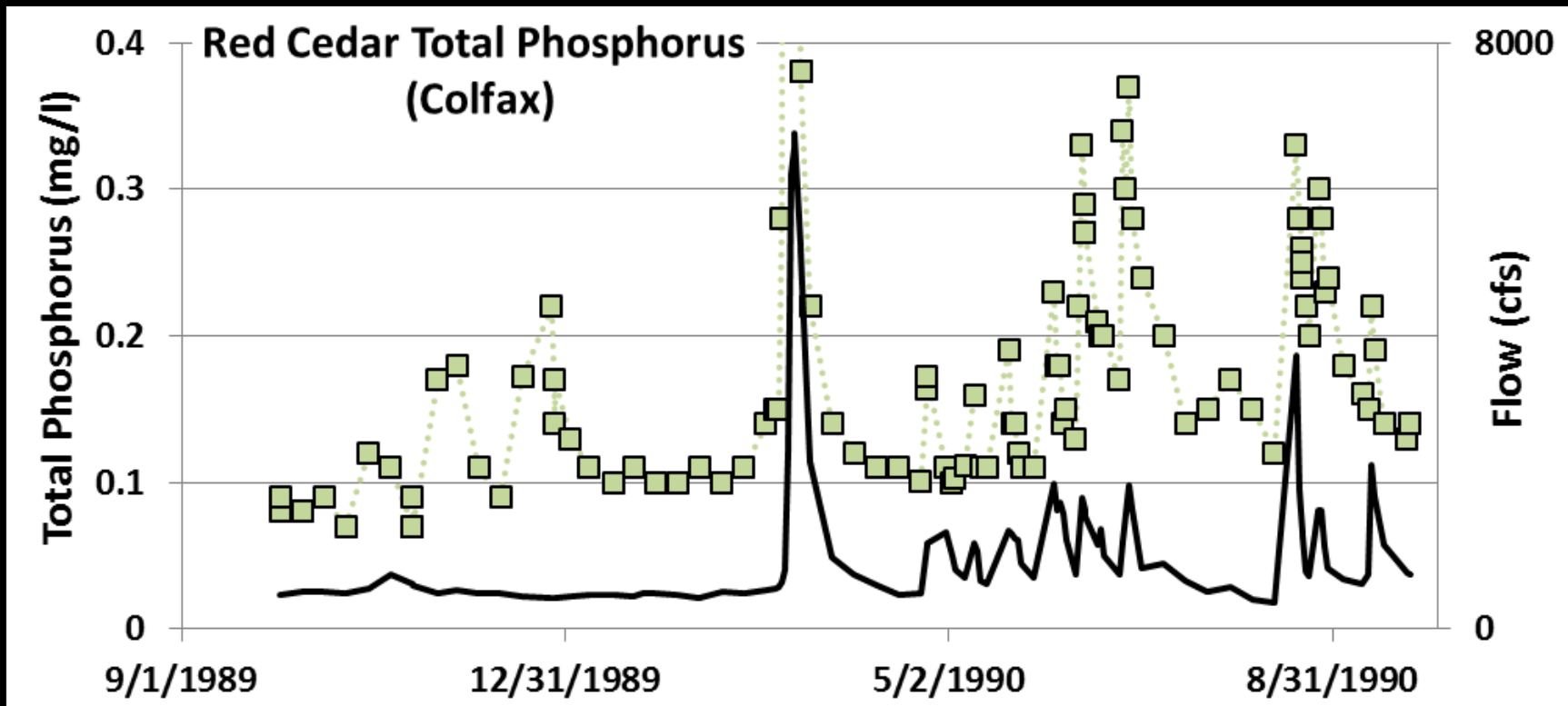
Intensity



**Pioneer Farm
S2: 63 RO Events (03-08)**



Let's end with a look at the phosphorus concentrations in the Red Cedar River



Brief Summary...

- Follow the water
- Lots of P, given opportunity it will migrate
- Make water take the long path to the river

- Thank you
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 - (715) 346-4501

