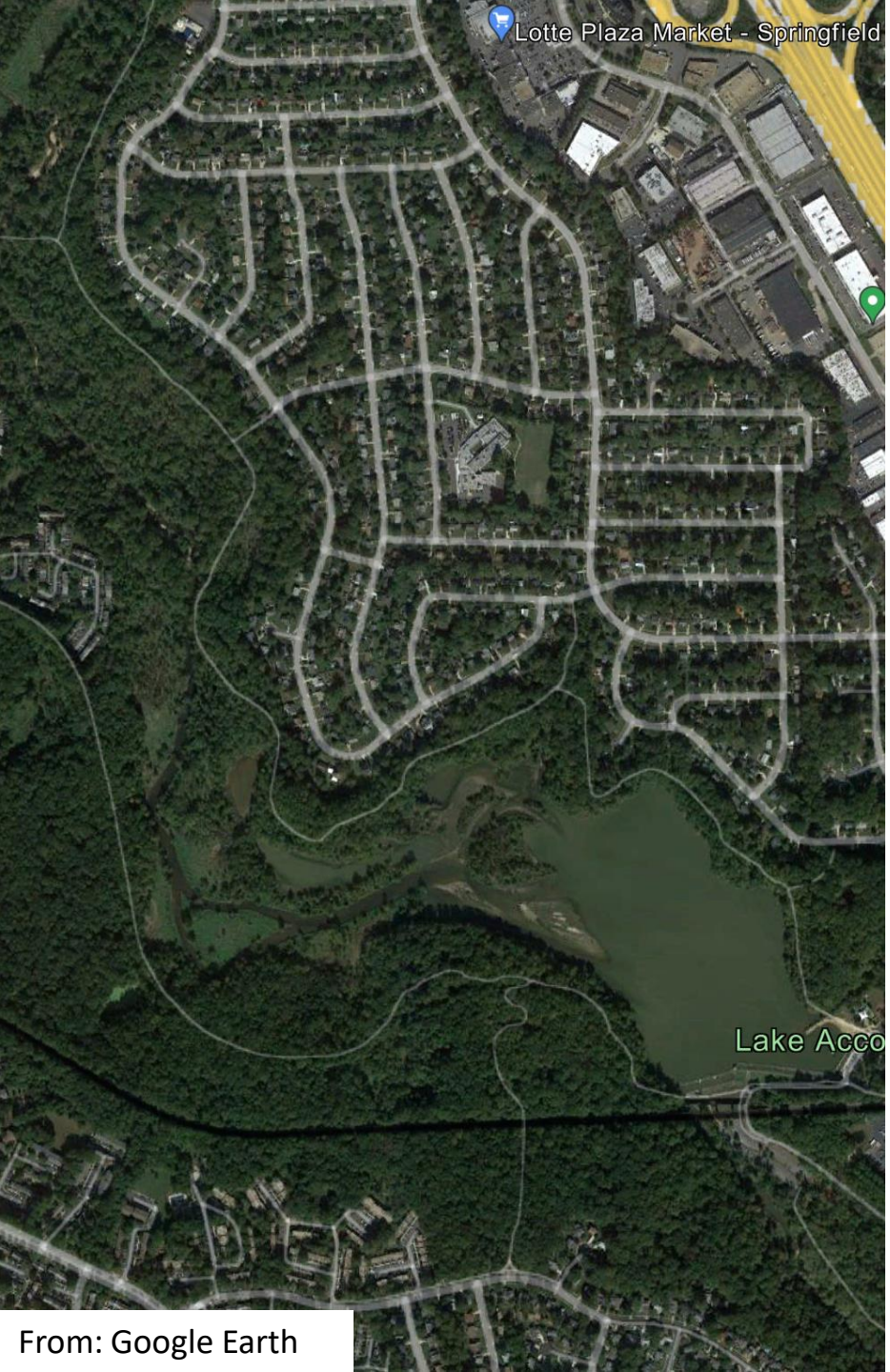


From: Google Earth

LAKE ACCOTINK FORECASTING

TASK FORCE MEETING – NOVEMBER 6, 2023

CRAIG TAYLOR

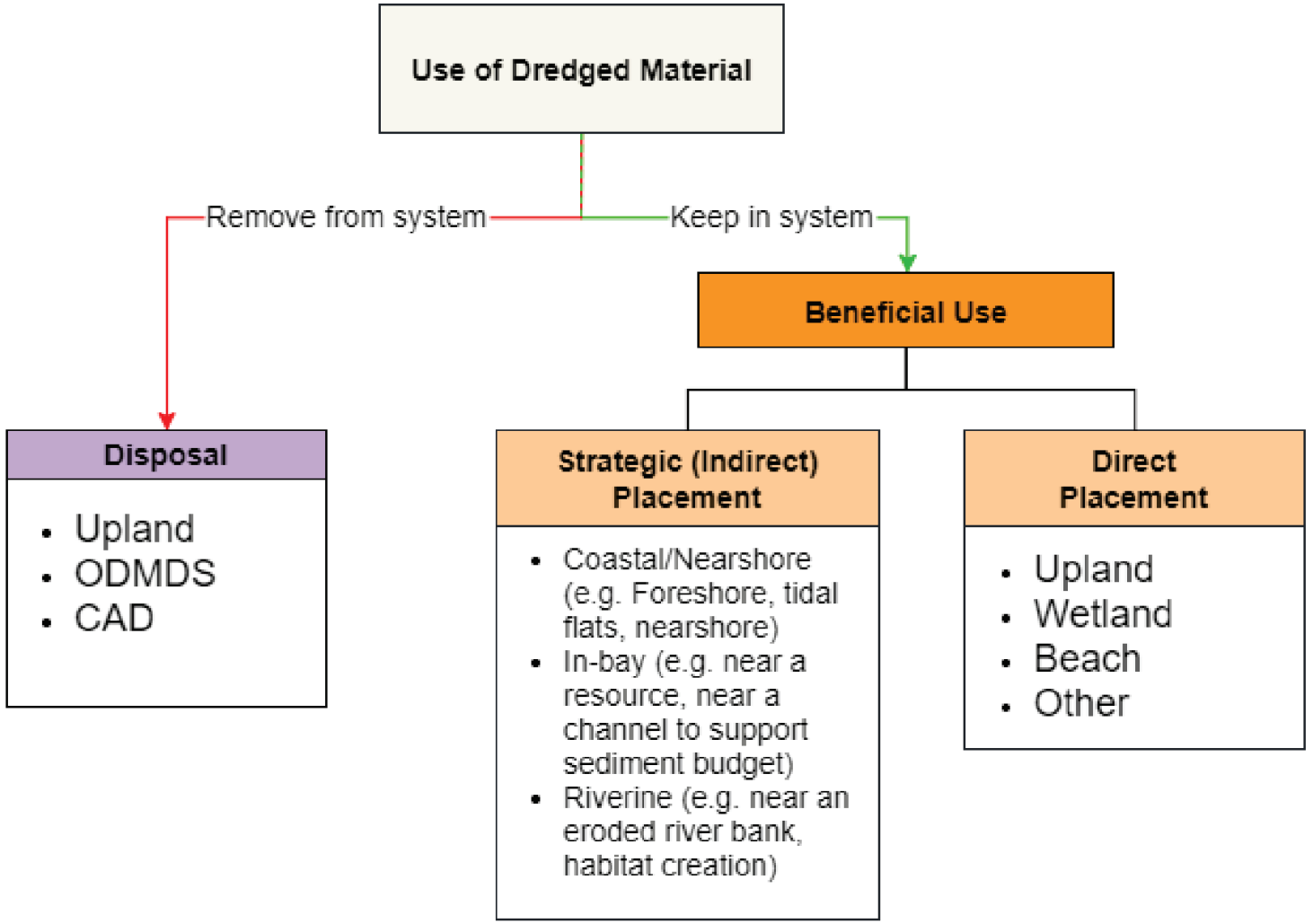
Note: all materials in this presentation are based on high-level assessments and should be considered preliminary.

LimnoTech
Water Environment | Scientists Engineers

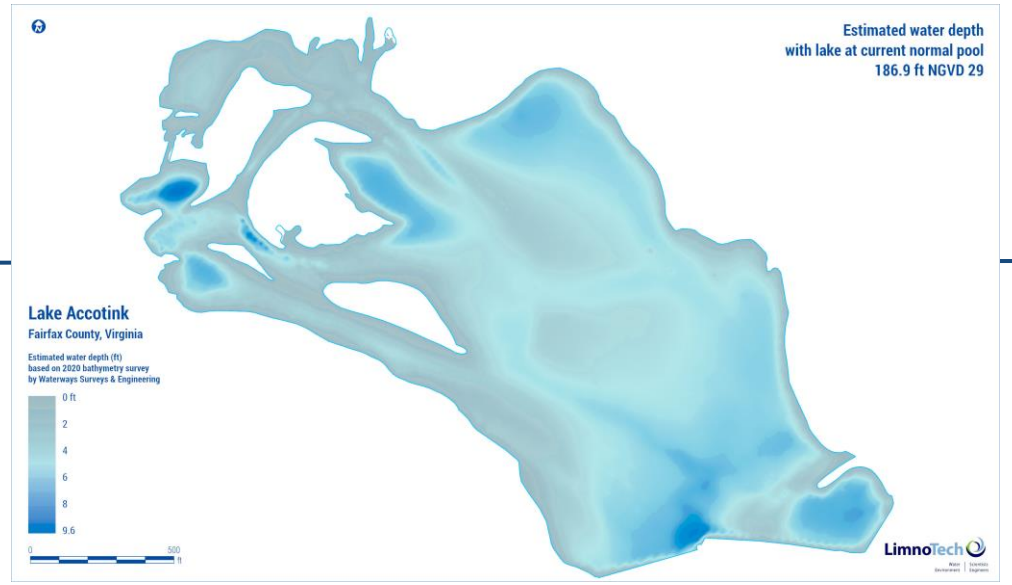
2.7 Lake vs Wetland Regulatory Question

- Both lakes and wetlands can be included in Waters of the US and receive similar regulatory protections.
- The strongest regulations come into play when applying for permits to alter either a lake or wetland.
  - Invasive species management
  - Habitat restoration
  - Bank stabilization
  - Aquatic organism passage
  - Dam Removal
  - Major geomorphic/shape restoration
  - Beneficial reuse of sediment
  - Filling
  - Removal of from Waters of the US

2.7 Lake vs Wetland Regulatory Question



Regulatory Questions



- 4.5 Regulatory requirements regarding the dam...
  - No action is taken and the dam is left as is.
  - A managed wetland is created and the dam is left as is.
  - A managed wetland is created and the dam is modified.
  - The dam is partially or wholly removed and Accotink Creek returned to a flowing stream.

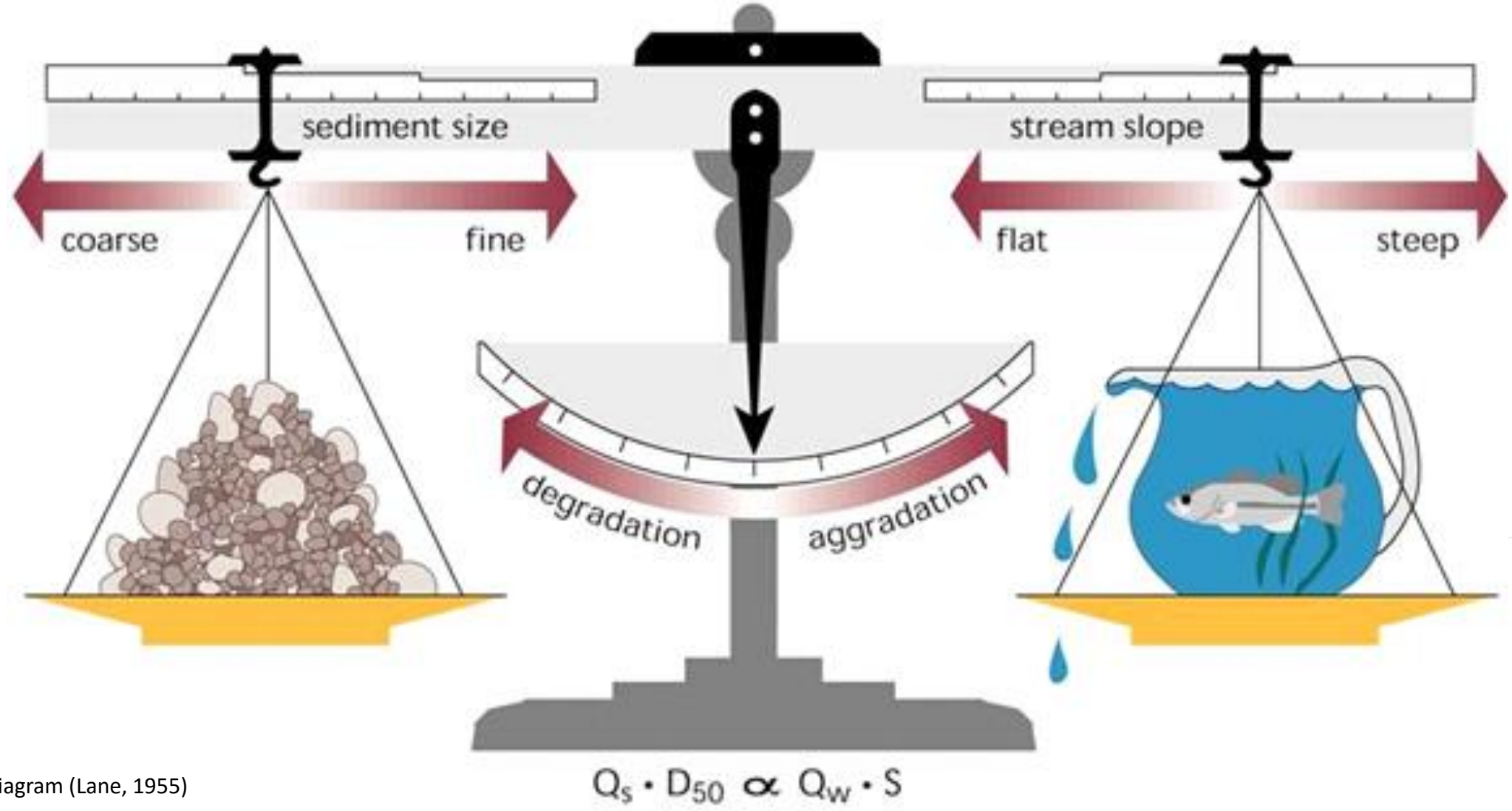
- Sediment captured/stored within the lake is considered “liquifiable.” From a dam regulation perspective, its volume is counted the same was stored water volume.
  - This means that the regulatory requirements for the dam will remain the same for the lake, wetland, partial removal scenarios.

- A full removal of the dam will eliminate all dam regulation from the site but will require a one-time dam removal permit.

Sediment Transport Under Various Dam Scenarios

- 4.5 Describe ... potential impacts on sediment fate and transport downstream in Accotink Creek for the following scenarios:
  - No action is taken and the dam is left as is.
  - A managed wetland is created and the dam is left as is.
  - A managed wetland is created and the dam is modified.
  - The dam is partially or wholly removed and Accotink Creek returned to a flowing stream.

Sediment Transport Under Various Dam Scenarios



Lane's Diagram (Lane, 1955)

3.3 How large and deep could an open water feature be?

- Dredging and reuse is a sediment balance exercise.
- If you were to dredge Zone 4 & 5 down 3 feet, the spoils would fill most of zone 2 & 3.

3.4 Would an open water feature need to be dredged periodically?

- Yes, the total sediment load to the lake will be similar in the future.
- The transport through the upstream stream/wetland portions of the site will be relatively efficient. Consequently, a smaller lake area will fill in perceptibly faster.
- Beneficial reuse of sediment should be considered a stop-gap or delaying strategy. Eventually, dredging and offsite transport will be necessary to maintain a lake area.
  - Manual sediment bypassing of the dam is likely not feasible.

3.5 How to optimize lake size?

- Eliminate or reduce the need for pipelines and offsite processing areas,
- Utilize existing open spaces in Lake Accotink Park for operations,
- Maximizing the extent to which dredged sediment can be kept and used onsite, and
- Minimize impacts from trucking materials out?

6 Maintenance of a Managed Wetland

- 6.1 What would be required to manage a wetland complex?
  - The main management effort will likely be invasive species management. Beyond that, a wetland complex can be managed similar to a lake.
- 6.2 What would maintenance cycles look like?
  - Invasive species management is typically an ongoing challenge with annual maintenance cycles. These may include chemical treatment, water level manipulations, and selective harvesting.
- 6.3 How much would maintenance cost?
  - Cost really cannot be assessed without a comprehensive operations and maintenance plan.
  - Cost is largely a question of priorities.
  - After any initial establishment maintenance costs, it is reasonable to assume that the annual maintenance costs will be similar in all invasives management scenarios.
  - Longer-term dredging operations can be expected to be the most expensive management option.

Sediment Loads

- 7.1 What are the current sediment loads in Accotink Creek and what are the likely trends for sediment generation in the future?
- 7.2 What loads are leaving the lake in its current condition?
- 7.3 How will these loads change if no action were taken?
- 7.4 What would the loads leaving the lake be like if the lake were managed as a wetland?
- 7.5 What would the sediment loads be in Accotink Creek if the dam were removed?

- Sediment transport is highly variable and difficult to quantify.
  - "If you can estimate sediment transport within a factor of four, you are doing pretty good."
    - Dr. Chris Paola, Professor of Geology & Geomorphology

Sediment Loads to Lake Accotink

- The USGS has utilized their gage data to estimate suspended sediment loads to Lake Accotink.

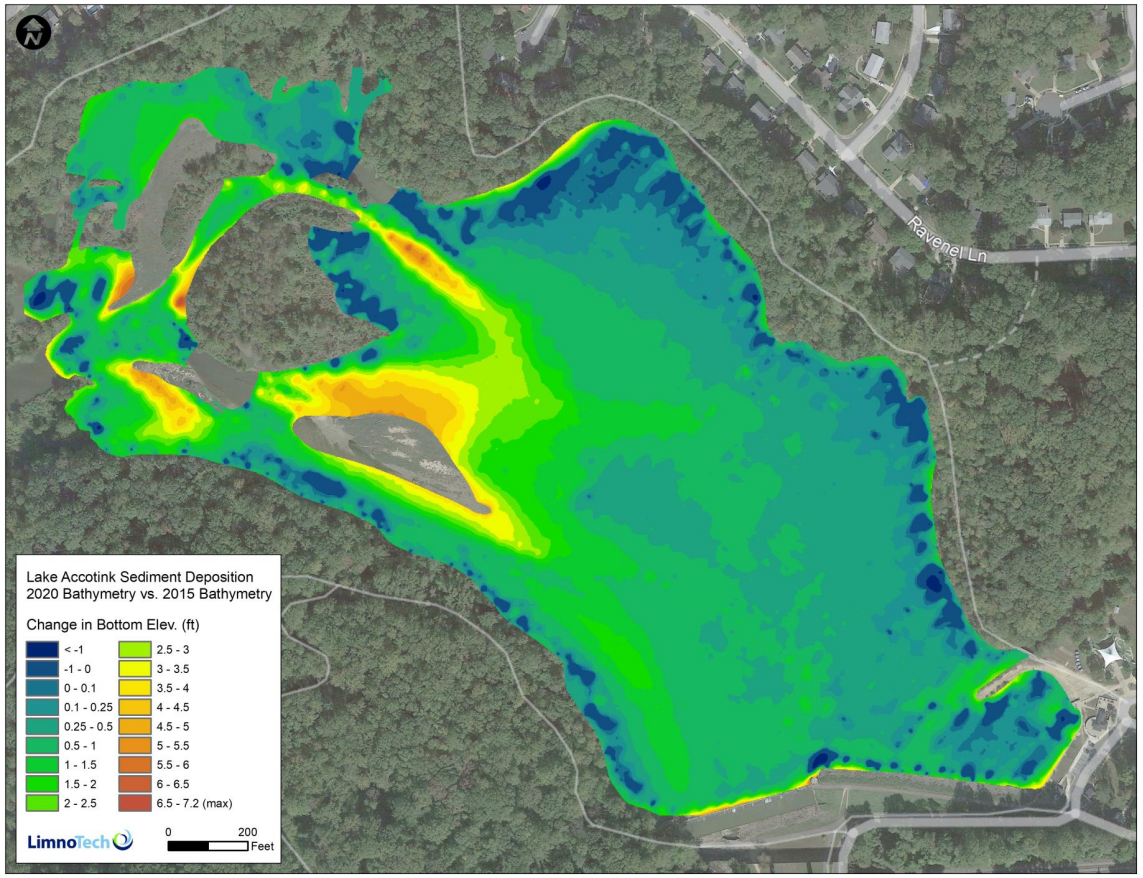
Water Year	Accotink Creek (WRTDS-K)	Long Branch (Surrogate)	Total load to Lake Acc
2014	27,700,000	2,945,876	30,645,876
2015	6,010,000	1,537,426	7,547,426
2016	8,960,000	1,351,470	10,311,470
2017	14,000,000	7,423,491	21,423,491
2018	31,300,000	11,027,030	42,327,030
2019	14,700,000	10,294,552	24,994,552
2020	11,900,000	7,233,527	19,133,527

Units are in pounds

Average Annual Loads Based on USGS Gage Data 2014-2020*	Suspended Sediment Load in lbs	SS Load in Tons	Cubic Yards @ 45 lbs/cf	Cubic Yards @ 94 lbs/cf
Average SS Load	22,340,482	11,170	18387	8802
Average Total Load	25,678,714	12,839	21,135	10,118

- Please note:
  - The total loads assume that bedload is 13% of the total load.
  - These are modeled estimates based on the best available data for the Accotink Creek and Long Branch Central watersheds, but there is no way to determine an exact "true" load.

SEDIMENT CAPTURE WITHIN THE LAKE



- The upstream end of the lake infilled appreciably from May 2015 to November 2020.
- Estimated total infill volume = 45.9 acre-ft (1,999,404 ft^3)
- Annual Infill Summary

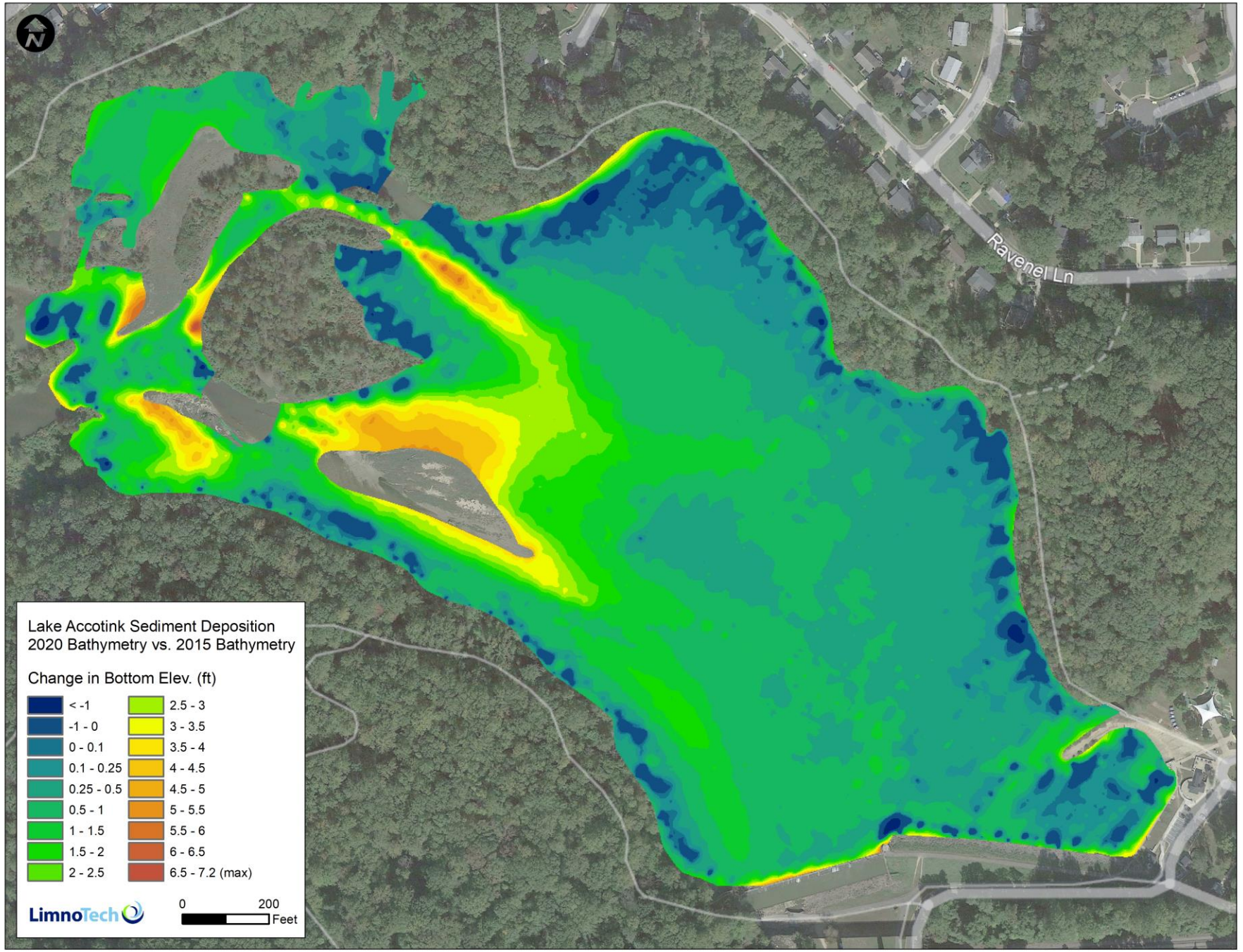
	Pounds	Volume (ft^3)	Volume (CY)
Avg Annual Capture	16,358,825	363,529	13,464

- Average Sediment Capture Rate = ~64%

SEDIMENT DELIVERY TO LOWER ACCOTINK CREEK

Average load moving over the dam:
- 9.3 Million lbs per year
- 4,700 tons per year.

These numbers are based on the best information available, but they should be utilized with caution.



Sediment Delivery to Lower Accotink Creek

- The sediment removal efficiency of the lake can be expected to decrease each year.

- Eventually, the capture efficiency will drop to zero for all scenarios other than continual dredging.
  - Including a fully built out wetland and full dam removal scenario.

7.6 How will these (sediment) loads affect downstream resources:

- How will they impact instream fauna? (Mussels)
  - Most healthy streams need bedload sediment.
  - Accotink Creek already has high suspended sediment concentrations.
  - Mussel beds are common downstream of a dam, but that is a transient habitat. The dam removes the fine sediment which can foul a mussel bed, but it also removes the bedload sand which is necessary to sustain mussel beds.
- How much sediment could be expected to be captured by the floodplains?
  - Floodplain capture of sediment is typically are relatively small number due to the fact that capture only occurs during flood events. A will connected floodplain can be expected to flood almost annually.
- How might these loads affect Gunston Cove?
  - The total sediment load delivered to Gunston Cove may or may not be influenced by Lake Accotink. That cannot be determined with the available data.
- How could these effects be mitigated?
  - Continually dredge the lake, target sediment management strategies else where in the watershed.

Regulatory impacts of increase sediment loads

- 7.7 What regulatory implications are there for Fairfax County due to increased sediment loads downstream of Lake Accotink and how much could mitigating these increased loads cost?
  - The County does receive sediment reduction credits for Lake Accotink in the Chesapeake Bay TMDL.
  - The County is actively perusing additional TMDL credits through other restoration activities.
  - The County believes the additional cost to offset the Lake Accotink credits via other restoration activities is manageable.
  - Dredging is traditionally one of the most expensive load reduction strategies because it needs to be done repeatedly.