FAIRFAX COUNTY PARK AUTHORITY

M E M O R A N D U M

TO: Chairman and Members
Park Authority Board

VIA: Kirk W. Kincannon, Director

DATE: April 21, 2016

Agenda

Committee of the Whole
Wednesday, April 27, 2016 – 8 p.m.
(or immediately following the board meeting)
Boardroom – Herrity Building
Chairman: William G. Bouie
Vice Chair: Ken Quincy

1. Lake Accotink Sustainability Study Update – with Presentation by Consultant – Information*

*Enclosures

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Committee Agenda Item
April 27, 2016

INFORMATION

Lake Accotink Sustainability Study Update – with Presentation by Consultant (Braddock and Lee Districts)

The Park Authority acquired Lake Accotink in 1965 through the Federal Lands to Parks Program. The rapid expansion of development upstream of the lake since 1965 has resulted in the recurrent and increasing rate of siltation in the lake. The siltation has drastically reduced the surface area of Lake Accotink as well as the depth, once 23 feet deep and now approximately three to five feet deep. Increased siltation has degraded the health of the lake, reducing populations of fish, invertebrates, and bottom communities while providing a conduit for pollutants. As a recreational lake, the reduced depth significantly impacts boating operations and the impacted fish population reduces the lake's attractiveness for recreational fishing.

To combat this recurring issue, the lake was dredged in the early 1960s and mid-1980s with the most recent dredging completed in 2008 when 193,000 cubic yards of accumulated silt was removed from the lake increasing the average depth of the lake by two feet to a minimum depth of four feet at a cost of approximately $10,000,000. Sedimentation in the lake is a constant process that needs to be addressed through dredging if current recreational use of the lake is desired to remain. Based on the most recent estimated sedimentation rate dredging would need to occur every 15 years to return the lake to the depth after completion of the 2008 dredging. Lack of nearby disposal options for the dredged soils will result in increased costs to dredge the lake in the future.

The Board of Supervisors approved the allocation of $179,000 in carryover funds in September 2014 to allow staff to investigate and develop sustainable options for the lake as part of moving forward with a master plan revision effort for Lake Accotink Park. Based on the predicted re-siltation rate of the lake and the high cost of dredging staff is investigating alternative sustainable solutions to the lake siltation problem both from an ecological and fiscal perspective. Staff engaged the services of the engineering consulting firm of Burgess & Niple (B&N) to provide site and bathymetric surveys for the lake. B&N teamed with Wetland Studies & Solutions (WSSI) to develop options for addressing the lake siltation issues as part of the sustainability study. The lake sustainability study includes high level estimated costs associated with each option. The final results will include photo simulation graphics taken from various vantage points around the park to help stakeholders better visualize the outcome of each option. This information will be used by staff to knowledgably engage and share options with Board of Supervisor and community members to establish a course of action to improve Lake Accotink Park.

Committee Agenda Item
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Options that are being evaluated address a variety of approaches including:

1) Continuation of the current operation, which included dredging of the lake on a 15 to 20 year cycle.
2) Establishment of a sediment forebay within Accotink Creek above the lake.
3) Establishment of a sediment forebay within the lake toward the inflow area.
4) Construction of smaller “beaver dam” type structures up stream of the lake intended to trap sediment.
5) Alteration to the lake using a combination of the above that would allow the county to receive credit towards its Chesapeake Bay Total Maximum Daily Load (TMDL) reduction goals.
6) Alteration of the existing dam to return the lake to a single thread channel while retaining a reduced area of open water that would be offline from the primary channel.
7) Alteration of the existing dam to return the lake to a single thread channel and reclaiming the existing lake area as wetlands.

When the final report is received, it will be shared with members of the Park Authority Board as well as interested members of the Board of Supervisors. To further the discussion with the community regarding the options for Lake Accotink, a public meeting has been set for May 16, 2016.

FISCAL IMPACT:
None

ENCLOSED DOCUMENTS:
Attachment 1: Vicinity Map

STAFF:
Kirk W. Kincannon, Director
Aimee L. Vosper, Deputy Director/CBD
Sara Baldwin, Deputy Director/COO
David Bowden, Director, Planning & Development Division
Cindy Walsh, Director, Resource Management Division
Todd Johnson, Director, Park Operations Division
Barbara Nugent, Director, Park Services Division
Judy Pederson, Public Information Officer
Sandy Stallman, Manager, Planning & Development Division
Gayle Hooper, Landscape Architect, Planning & Development Division

ATTACHMENT 1

PROVIDENCE DISTRICT

LITTLE RIVER TURNPIKE

MASON DISTRICT

BRADDOCK DISTRICT

BRADDOCK ROAD

LAKE ACCOTINK PARK

ROLLING ROAD

KEENE MILL ROAD

LEE DISTRICT

FAIRFAX COUNTY PARKWAY

SPRINGFIELD DISTRICT

OX ROAD

MOUNT VERNON DISTRICT

Fairfax County Park Authority

12055 Government Center Parkway, Suite 406
Fairfax, VA 22035-1118

Phone: 703-324-8700
www.fairfaxcounty.gov/parks

LAKE ACCOTINK PARK

7500 ACCOTINK PARK ROAD, SPRINGFIELD VA 22150

VICINITY MAP

JANUARY 20, 2016

Feet
0 1,000 2,000 4,000 6,000

N

Lake Accotink Sustainability Plan
Summary of Potential Alternatives

Presented by:

Frank R. Graziano, P.E.

fgraziano@wetlandstudies.com

Dillon M. Conner, PLA

dconner@wetlandstudies.com

April 27, 2016

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Presentation Agenda

1) *Lake Sustainability Issues*

2) *Efforts to Date*

3) *Sustainability Alternatives*

4) *Pollutant Removal Credit Possibilities*

5) *Summary*

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Lake Sustainability Issues

- *Original "Springfield Dam" built in 1918 (removed 1922)*
- *Current concrete spillway and dam constructed in 1940 for Ft Belvoir*
- *Acquired by FCPA 1967*

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Lake Sustainability Issues

Sedimentation is the natural process in which material (such as stones and sand) is carried to the bottom of a body of water and forms a solid layer.

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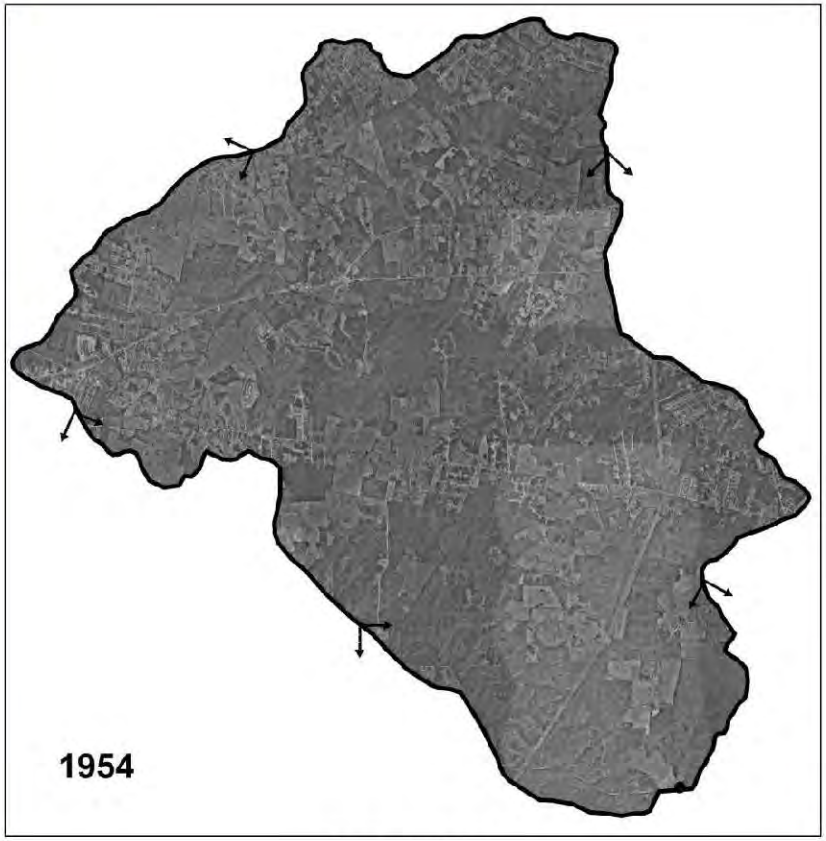
Lake Sustainability Issues



Lake Accotink Park
WSSI #22647.01
Original Scale: 1" = 1 mile

Aerial Source: Fairfax County GIS

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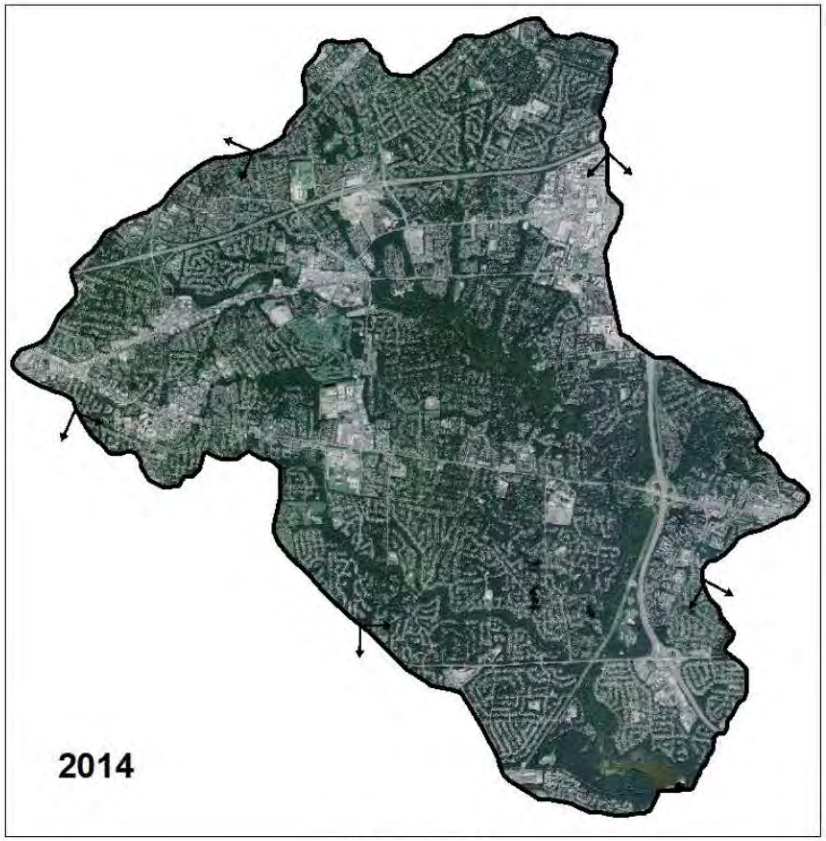

Lake Accotink Park
WSSI #22647.01
Original Scale: 1" = 1 mile

Aerial Source: NAIP

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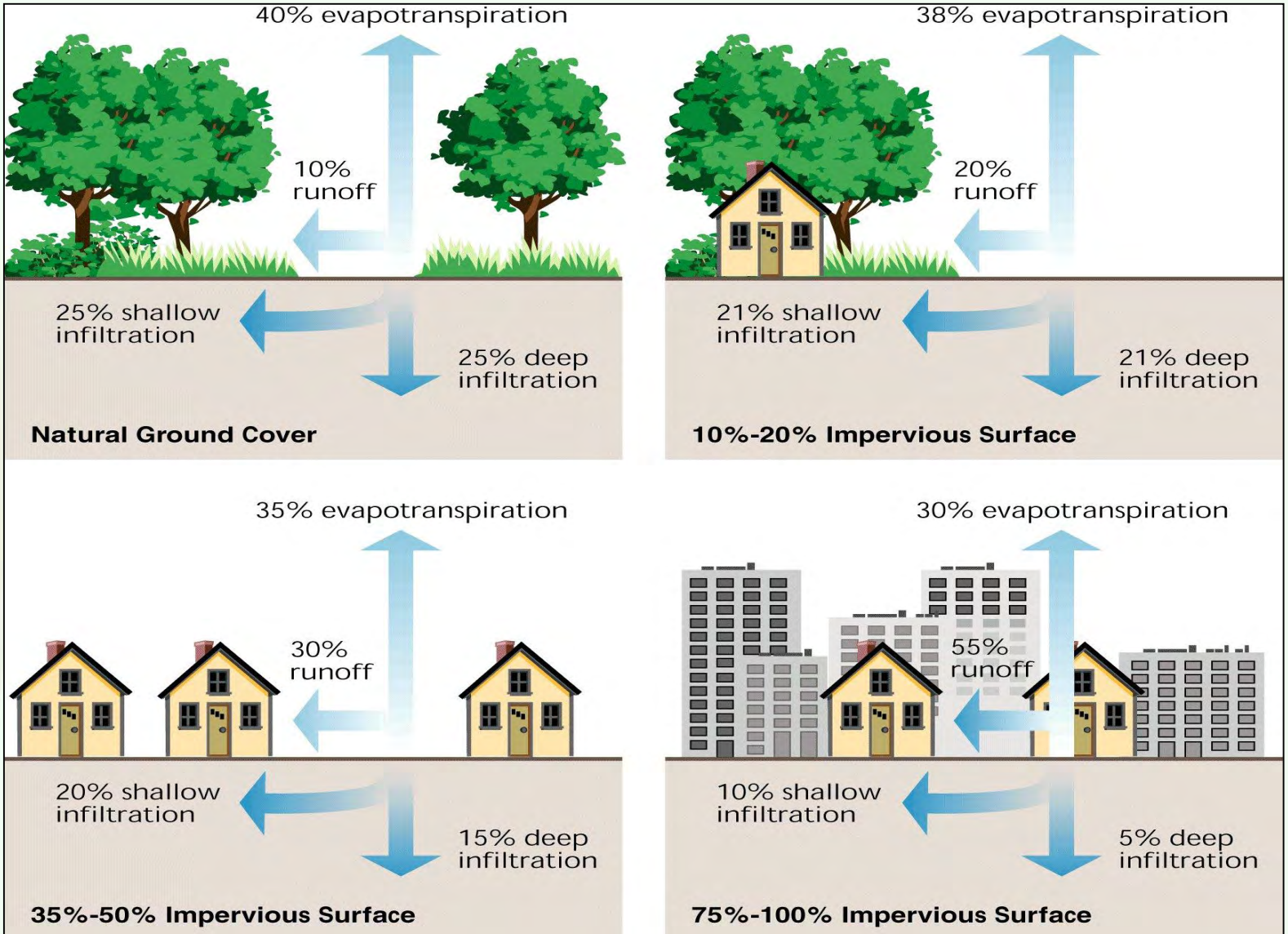
Lake Sustainability Issues

Why are streams eroding??

Source: The Federal Interagency Stream Restoration Working Group



Lake Sustainability Issues

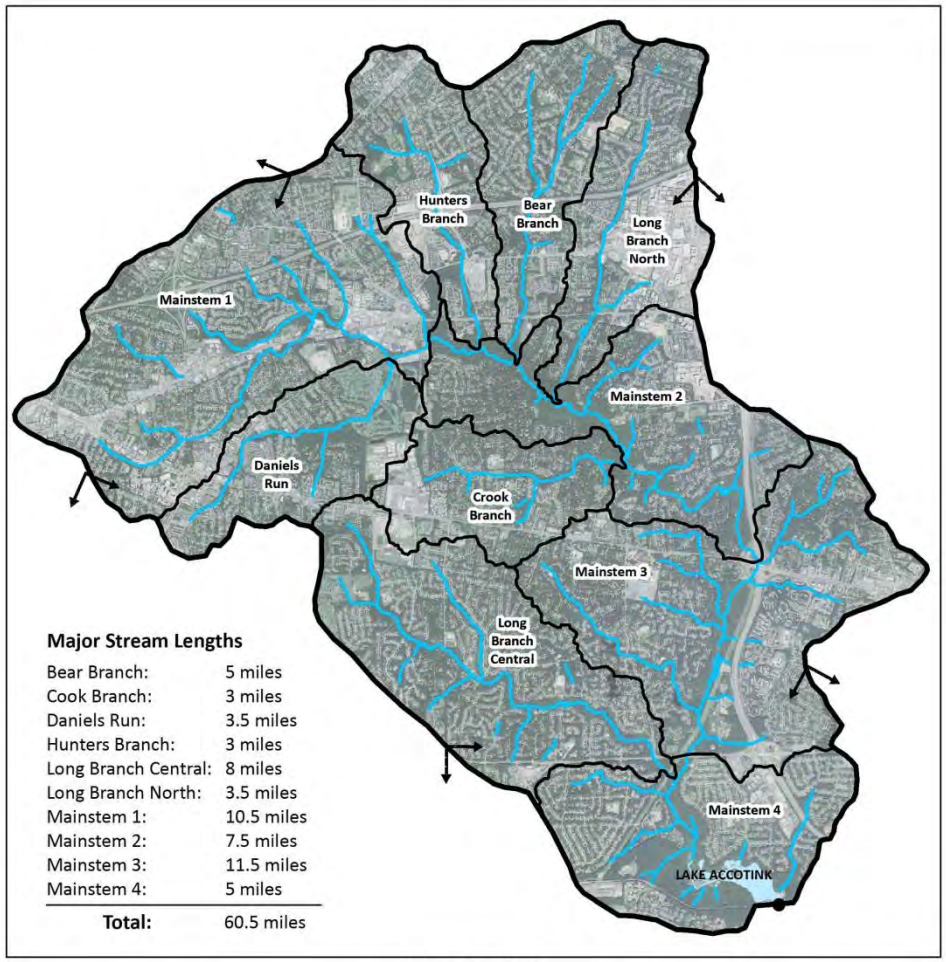
Typical urban streams? Yes. But these tributaries also drain directly into Lake Accotink.

Lake Sustainability Issues

Continuing problem of sedimentation and associated loss of lake function:

- Since 2011, **90,895 c**y have been deposited, mostly in the upper region.
- Sedimentation rate = **22,750 cy/yr**.
- Based on the source (primarily streambank erosion), this will continue until the streams have stabilized – could be decades!

Lake Sustainability Issues



Lake Accotink
Watershed, Subwatersheds, & Major Streams
WSSI #22647.01
Original Scale: 1" = 1 mile

Aerial Source: NAIP. Summer 2014.

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Lake Accotink Drainage Area
31 mi²

Stream Length
60.5 miles

Impervious Cover
30%

Presentation Agenda

1) *Lake Sustainability Issues*

2) ***Efforts to Date***

3) *Sustainability Alternatives*

4) *Pollutant Removal Credit Possibilities*

5) *Summary*

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Efforts to Date

Previous Dredging Studies

- ***Diagnostic and Feasibility Study for the Restoration of Lake Accotink***
  (NUSAC Incorporated, 1982)

- ***F.X. Browne Sedimentation Studies 1983-1988***
  (Associated with 1985 Dredge Event)

- ***Lake Accotink – Sediment Management Program Study***
  (HDR Engineering, Inc., January 2002)

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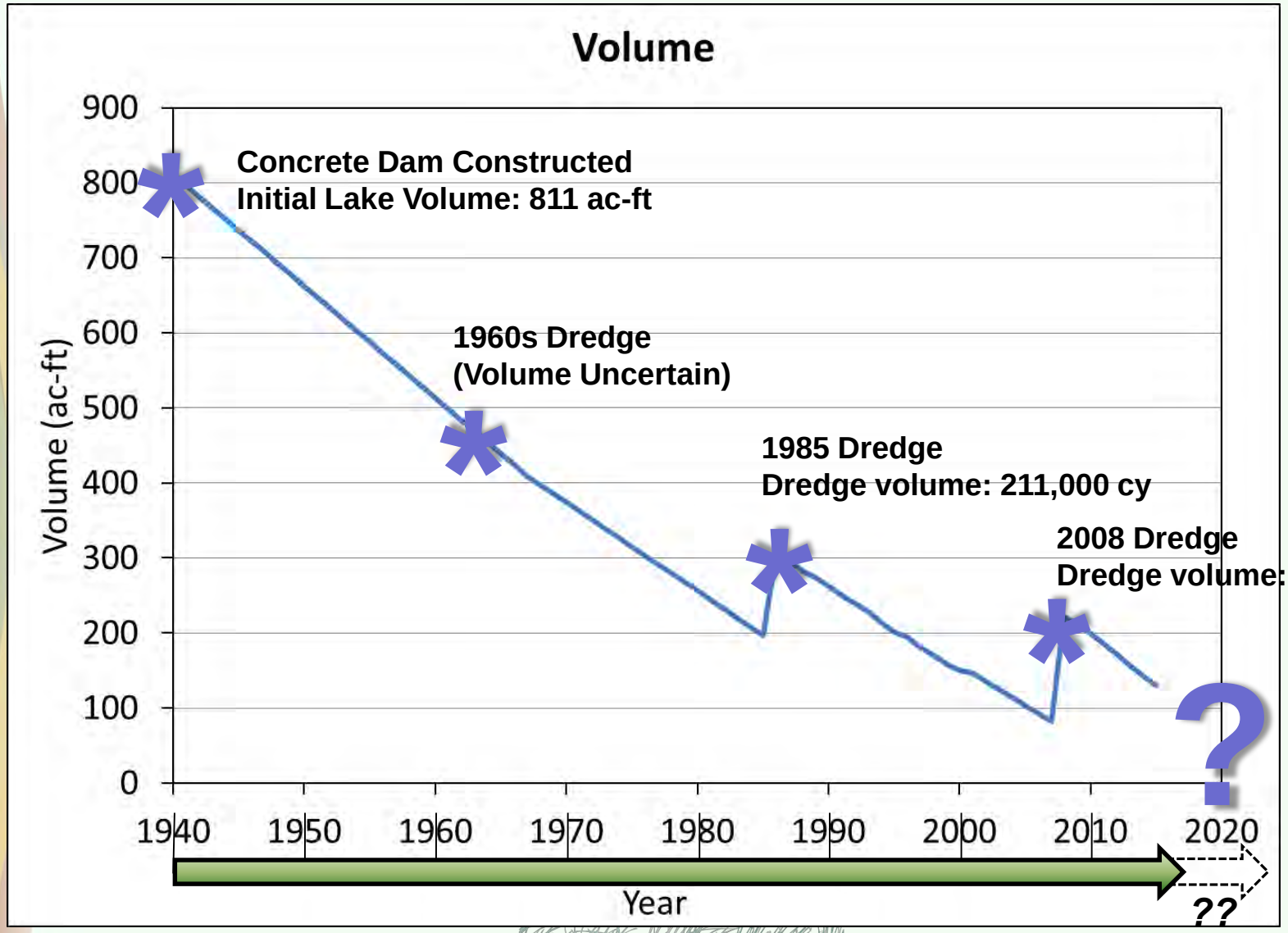
Efforts to Date



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Efforts to Date

Efforts to Date

Lake Accotink

FAIRFAX COUNTY, VA

L:\22000s\22600\22647.01\GIS\Historic Aerials\1954_Lake Accotink.mxd

NORTH

Photo Source: Fairfax County GIS

0 300 600 1,200 Feet

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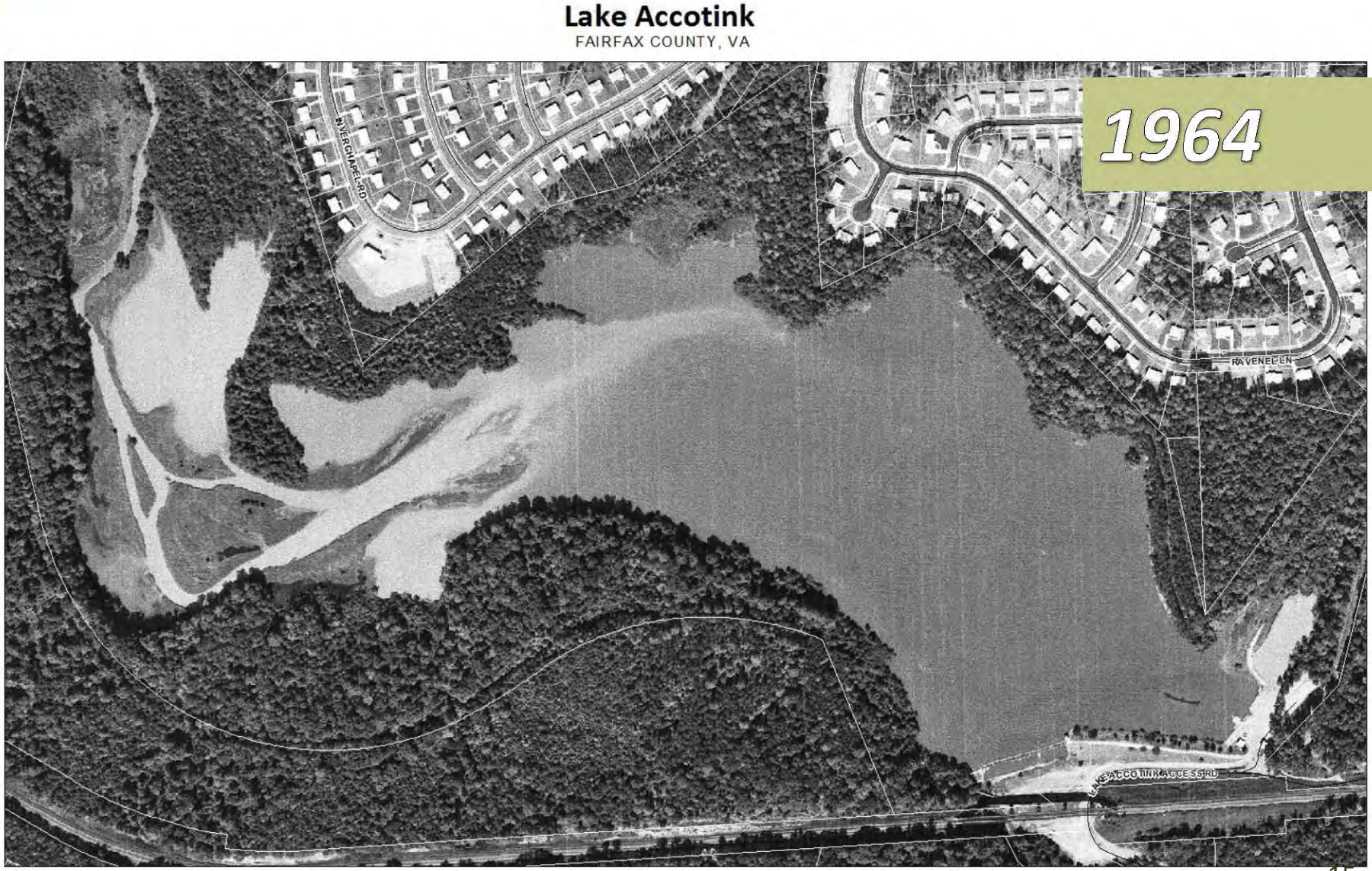
Efforts to Date



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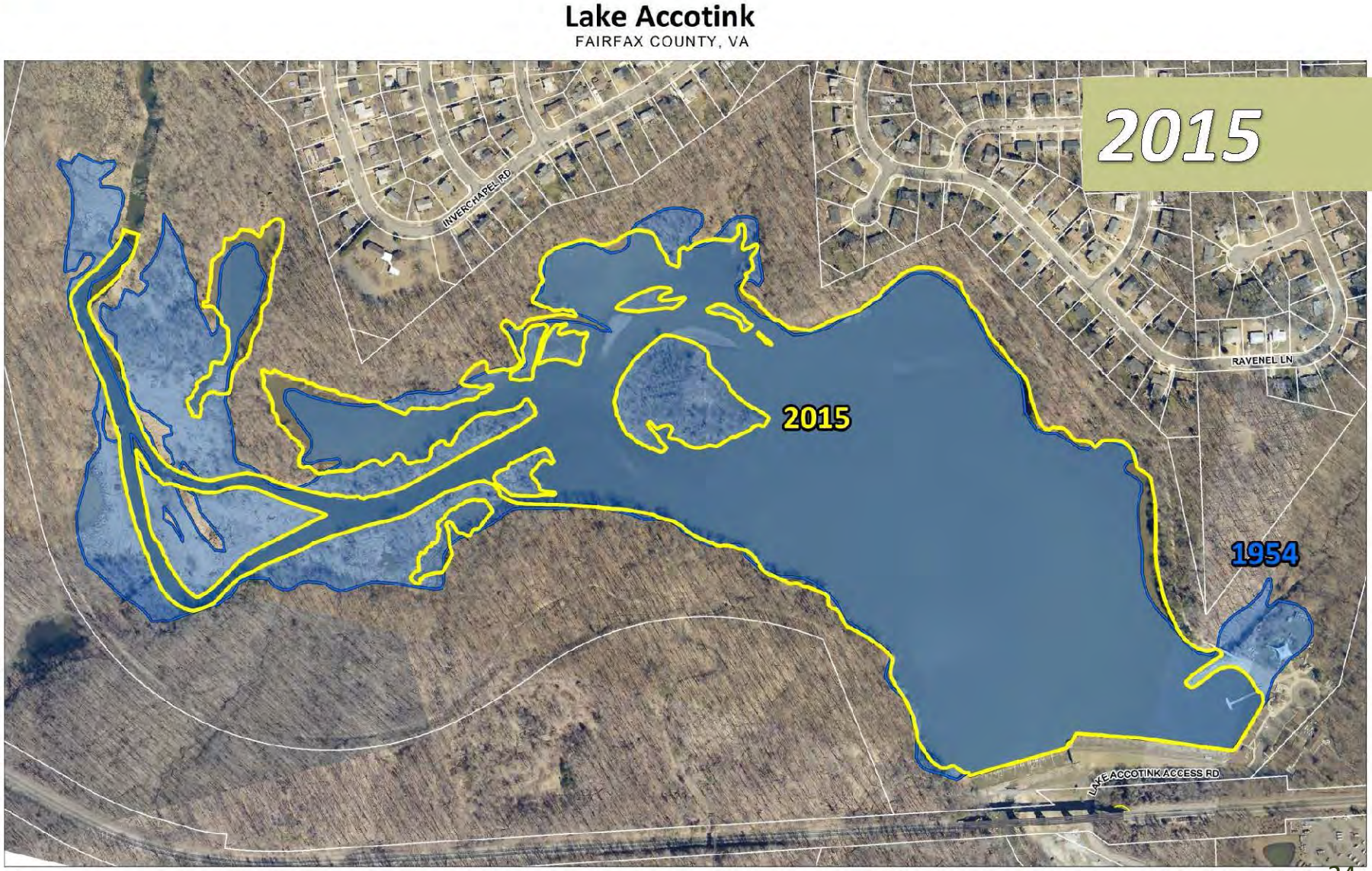

Presentation Agenda

1) *Lake Sustainability Issues*

2) *Efforts to Date*

3) ***Sustainability Alternatives***

4) *Pollutant Removal Credit Possibilities*

5) *Summary*

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2016 Lake Sustainability Study

Study Goal

To investigate alternatives for the management of Lake Accotink, taking into account the sediment influx.

Alternatives

DREDGE ALTERNATIVES

A. Continue with current operation (major dredge every 15-20 years).
B. Construct a sediment forebay immediately above the lake.
C. Construct a sediment forebay within the upper lake.
D. Construction of smaller "beaver dam" type structures upstream of the lake in line with the stream.

STREAM ALTERNATIVES

E. Alteration of the dam to return to a single-thread channel (land is reclaimed - reforested, wetland creation, or open space).
F. Alteration of the dam to return the lake to a single thread channel, with smaller "off-line" ponds

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2016 Lake Sustainability Study
Continued Dredging

ALTERNATIVE
A

Location

- Within main body of the lake, primarily in the upper end.

Goal

- To restore average depth to 5-8 ft for recreational boating. Remove approximately 200,000 cy.

Maintenance Dredging

- Approx. 15-20 year cycle.

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2016 Lake Sustainability Study
Continued Dredging

ALTERNATIVE A

Pros

- Only requires action every 15 years.
- The lake is maintained as a recreational resource.
- Retains current baseline for sediment reduction for water quality downstream.

Cons

- Dredging does not significantly enhance water quality of the lake.
- Recreational use of the lake is impacted for long periods of time during dredge (years).
- An offsite disposal area would be required.
- Expense.

Planning Level Cost	Range of Potential Costs
Design/Construction	$18,000,000 - $22,000,000

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2016 Lake Sustainability Study

Upstream Forebay

ALTERNATIVE **B**

Location

- Just upstream of the main pool

Configuration

- Surface Area – 13.3 ac
- Depth – 8 ft
- Volume – 94 ac-ft
- Sized for 15% of Tv

Maintenance Dredging

- Average Trap Efficiency ~ 20% (can be increased with larger volume).
- Requires “temporary” on-site disposal area to be viable.

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2016 Lake Sustainability Study

Upstream Forebay

ALTERNATIVE B

Pros

- Reduce sediment influx to main lake.
- Yearly or biennial maintenance dredging would not impact main lake.
- Increased duration between larger dredging events.
- The lake is maintained as a recreational resource.

Cons

- Alternative would require an initial full dredge of the lake.
- Wetland impacts (~ 5 ac).
- Yearly or biennial maintenance dredging would be required.
- Will still require dredging of the main lake, although at greater intervals.
- Maintenance dredging requires area on-site to prepare sediment to be transported off site.

	Unit	Quantity	Unit Cost Range	Range of Potential Costs	ost Range	Ra
ction	cy	152,000	$80 - $100	$12,160,000 - $15,200,000	- $100	$12
redging[1]	cy	15,000	$100 - $120	$1,200,000 - $1,500,000	) - $120	$1

2016 Lake Sustainability Study
In-Lake Forebay

ALTERNATIVE **C**

Location

- Around “island” – essentially the 2008 dredge footprint.

Configuration

- Surface Area – 13.3 ac
- Depth – 8 ft
- Volume – 94 ac-ft
- Sized for 15% of Tv

Maintenance Dredging

- Average Trap Efficiency ~ 20%. Can be increased with larger volume.
- Requires “temporary” on-site disposal area to be viable.

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2016 Lake Sustainability Study

In-Lake Forebay

ALTERNATIVE C

Pros

- Reduce sediment influx to main lake, increasing duration between larger dredging events.
- Lesser impacts to wetland in comparison to Alternative B (mostly open water).
- The lake is maintained as a recreational resource.

Cons

- Alternative would require an initial full dredge of the lake.
- Yearly or biennial maintenance dredging would impact main lake
- May reduce BMP credit due to reduced lake volume.
- Will still require dredging of the main lake, although at greater intervals.
- Maintenance dredging requires area on-site to prepare sediment to be transported off site.

Planning Level Cost

	Range of Potential Costs
Design/Construction	$12,160,000 - $15,200,000
Maintenance Dredging[1]	$1,200,000 - $1,500,000

[1]Assumes biennial – depends on capture efficiency

2016 Lake Sustainability Study
In-line "Beaver Dams"

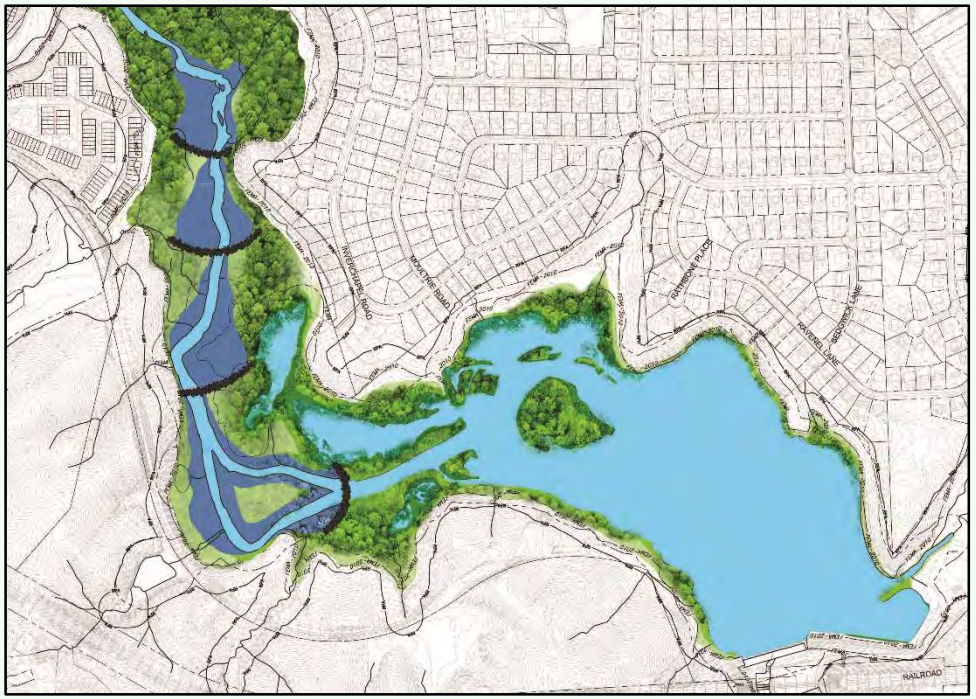
ALTERNATIVE **D**

Location

- Upstream and within Accotink Creek.

Configuration

- Sheet pile "walls" within the channel to encourage sediment deposition. Rough capacity estimate of up to12,000 cy per structure over time (variable).
- Will convert existing forested wetland areas to "beaver swamps" over time.



Maintenance Dredging

- Reduced frequency in main lake.
- "Beaver ponds" not accessible for dredging.

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2016 Lake Sustainability Study

In-line "Beaver Dams"

ALTERNATIVE D

Pros

- Sediments are trapped upstream.
- Inexpensive to install.
- Can install more or less as desired within the Accotink main channel throughout the County.
- Reduced erosion in vicinity of the structure.
- The lake is maintained as a recreational resource.

Cons

- Alternative would require an initial full dredge of the lake.
- Impacts to existing wetlands.
- Limited capacity of "beaver ponds", not easily dredged.
- One time sediment capture. Limited impact on extending the initial dredge of the lake.

Planning Level Cost

	Assume 4 Structures
Design/Construction	*$600,000*

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2016 Lake Sustainability Study
Sediment Disposal

- Alternatives A, B, C, and D will all require an initial dredging of the lake as the first phase of the project.
- Alternatives B and C will require annual/biennial maintenance dredging and the ability to process dredge material on-site to be financially viable.
- Alternative D is a one-time option.

Ultimate disposal of dredge material will require trucking to off-site location for any of the dredge options.

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2016 Lake Sustainability Study
On-Site Sediment Disposal

- Preliminary analysis of potential locations.
- Will require further study to align with chosen lake alternative.
- Removal of sediment will entail impacts to surrounding communities.

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2016 Lake Sustainability Study
Single Channel with Reclaimed Land

ALTERNATIVE E

Location

- Stream along northern shore, reclaimed remaining footprint (reforest, wetlands, open space).

Configuration

- Stream Creation Length – 3,300 lf.

Maintenance Dredging

- Not necessary.

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2016 Lake Sustainability Study

Single Channel with Reclaimed Land

ALTERNATIVE

E

Current View

2016 Lake Sustainability Study

Single Channel with Reclaimed Land

ALTERNATIVE

E

Concept Image

2016 Lake Sustainability Study
Single Channel with Reclaimed Land

ALTERNATIVE E

Pros

- Eliminate sediment deposition and need for dredging.
- No significant excavation.
- Creation of habitat and wetlands.

Cons

- Channel creation in "wet" sediments – additional study necessary for best method.
- Will no longer trap sediments/pollutants – regulatory implications? Downstream impacts need further study.
- Potential impacts to downstream water quality -further study required.
- No open water for recreational purposes.

Planning Level Cost

Range of Potential Costs	
Stream Restoration	$990,000 - $1,980,000
Dam Retrofit	$500,000
Planting	$250,000 - $350,000

(no maintenance dredging)

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2016 Lake Sustainability Study

Single Channel with Smaller Lake

ALTERNATIVE F

Location

- Stream along southern shore, smaller "off-line" lake/wetlands along northern shore.

Configuration

- Lake Surface Area – 18.5 ac
- Depth – 8 ft
- Stream Length – 2,500 lf

(90 ft wide (bankfull), 6 ft deep, transports sediment)

Maintenance Dredging

- Not necessary

2016 Lake Sustainability Study

Single Channel with Smaller Lake

ALTERNATIVE F

Pros

- Eliminate sediment deposition and need for dredging.
- "Off-line" lake water quality should be greatly enhanced as storm flows bypass.
- Depicted grading "balances" (no offsite disposal).
- Retention of open water for recreational uses.

Cons

- Significant earth moving operation with "wet" sediments – additional study necessary.
- Will no longer trap sediments/ pollutants - regulatory implications? Downstream impacts need further study.
- Expensive implementation cost.
- Likely a multi-year project.

Planning Level Cost

	Range of Potential Costs
Design/Construction	$8,250,000 - $16,500,000
Stream Restoration	$1,250,000 - $2,000,000
Dam Retrofit	$500,000
Planting	$125,000 - $175,000

(no maintenance dredging)

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2016 Lake Sustainability Study

Single Channel with Smaller Lake

ALTERNATIVE

F

Current View

2016 Lake Sustainability Study

Single Channel with Smaller Lake

ALTERNATIVE

F

Concept Image

2016 Lake Sustainability Study

Single Channel with Smaller Lake

ALTERNATIVE

F

Current View

2016 Lake Sustainability Study

Single Channel with Smaller Lake

ALTERNATIVE

F

Concept Image

2016 Lake Sustainability Study
Comparison of Alternatives

Option	Life Span	Estimated Cost	Annualized Cost[1]
Forebays (In-lake or Upsream)			
- Initial	50	$13,680,000	$2,077,002
- Annual	1	$1,350,000	
- Periodic (Main Lake)	40	$4,500,000	
Current Operation	15	$20,000,000	$1,676,000
Single Thread with Lake	50	$14,650,000	$569,885
Beaver Dams	3	$600,000	$212,100
Single Thread, no Lake			
- Initial	50	$2,135,000	$133,052
- Annual	1	$50,000	

[1] 3% Interest Rate

Presentation Agenda

1) *Lake Sustainability Issues*

2) *Efforts to Date*

3) *Sustainability Alternatives*

4) ***Pollutant Removal Credit Possibilities***

5) *Summary*

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Presentation Agenda

1) Lake Sustainability Issues

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4) Pollutant Removal Credit Possibilities

5) Summary

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2016 Lake Sustainability Study

Summary

1) ***Discussed current watershed issues and concerns and the impacts to Lake Accotink***

2) ***Overview of efforts to date***

3) ***Several alternatives presented as to how Lake Accotink could be managed:***

   A. Continue with current operation (major dredge every 15-20 years).

   B. Construct a sediment forebay immediately above the lake.

   C. Construct a sediment forebay within the upper lake.

   D. Construction of smaller “beaver dam” type structures upstream of the lake in line with the stream.

   E. Alteration of the dam to return the lake to a single thread channel (land is reclaimed - reforested, wetland creation, or open space).

   F. Alteration of the dam to return the lake to a single thread channel, with smaller “off-line” ponds.

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2016 Lake Sustainability Study

4) ***Each option is quite different, but some common challenges/considerations***:

- Dredge-related forebay alternatives require temporary on-site disposal to be financially viable.
- Ultimate disposal of material will require trucking off-site.
- Many alternatives involve wetland impacts.
- Dam removal alternatives may have regulatory implications and requires additional study to assess downstream impacts such as flooding and ultimate deposition of accumulated sediments.

5) ***<u>Stakeholder input is essential!!</u>***

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