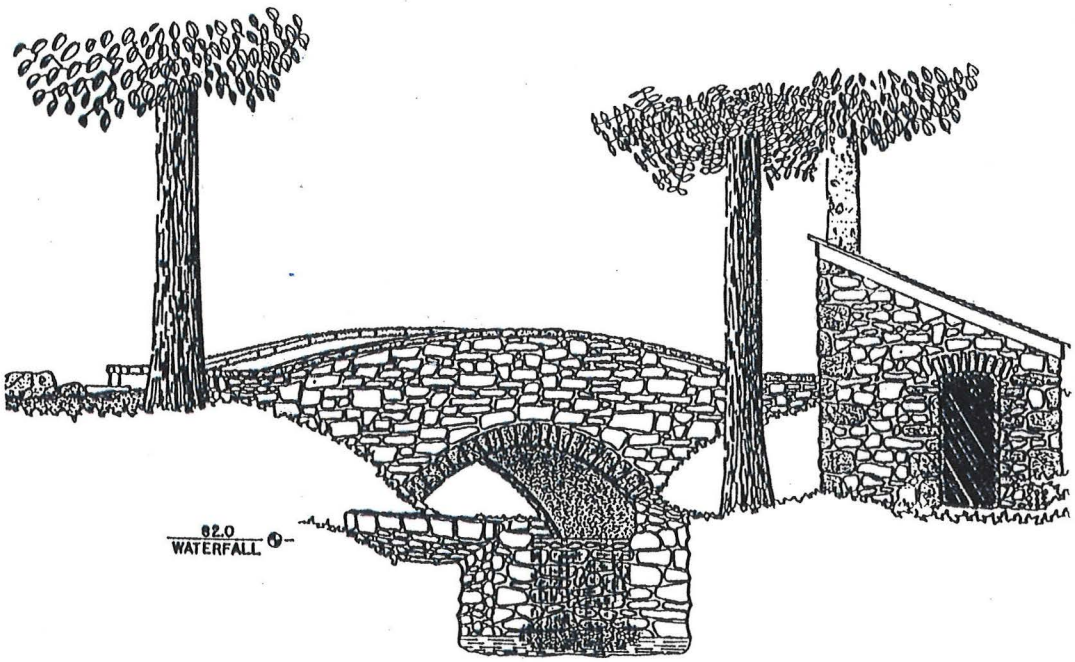
LANDSCAPE PRESERVATION MAINTENANCE PLAN

DUMBARTON OAKS PARK



Olmsted Center for
Landscape Preservation

National Park Service

April 1997

LANDSCAPE PRESERVATION MAINTENANCE PLAN

DUMBARTON OAKS PARK

Prepared by
Olmsted Center for
Landscape Preservation



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for

Rock Creek Park
National Park Service
and
The Friends of Montrose and Dumbarton Oaks Parks
through a
National Park Service Challenge Cost-Share Program
Partnership Agreement

April 1997

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Landscape Preservation Maintenance Plan

for

DUMBARTON OAKS PARK
ROCK CREEK PARK
NATIONAL PARK SERVICE

Preface

The Landscape Preservation Maintenance Plan for Dumbarton Oaks Park has been prepared to assist with the stabilization and care of historic landscape features on an interim basis until (1) a retention pond/wetland habitat area can be constructed at the northern end of the park to serve as a "holding/controlled-release area" for extensive stormwater runoff from adjacent developed sites which exceeds the capacity of the channel of the stream through the park, causing severe damage to designed dams and water features along it, and (2) a Cultural Landscape Report can be prepared which includes specific treatment recommendations for the preservation, restoration and/or rehabilitation of all park landscape features. Note that implementation of **any** permanent treatment of the stream and its related dams, paths and other features would be futile until **after** the retention pond has been constructed to protect them from continuing damage.

Thus this plan provides recommendations for protecting and stabilizing existing landscape features and preventing further wear and deterioration of the streambank, dams, circulation features, and plantings in three areas of the site to ensure that the historic character of the landscape is preserved. The framework of the plan can be readily expanded into a comprehensive preservation maintenance plan for all areas and features within the park. Separate, but concurrent, efforts will deal with the design and construction of the stormwater retention pond/wetland habitat area and the preparation of a Cultural Landscape Report.

The plan was initiated in the summer of 1996 with a meeting of the project advisory group to discuss project objectives and park needs. An on-site inventory and condition assessment was conducted in the fall of 1996 by Darwina Neal, Co-Project Leader, Steve Strach, Co-Project Leader, Cynthia Cox, Chief of Maintenance, Rock Creek Park (ROCR), Dan Hodgson, Maintenance Mechanic Supervisor, ROCR, Brian Stephenson, Member, Friends of Montrose and Dumbarton Oaks Park, Jim Ingram, Member, Friends of Montrose and Dumbarton Oaks Park, Jane MacLeish, Member, Friends of Montrose and Dumbarton Oaks Park, Doug Curtis, Hydrologist, National Capitol Region, and Charles Pepper, Manager Preservation Maintenance, Olmsted Center for Landscape Preservation. Historic information and base maps prepared by the Historic American Buildings Survey (HABS) and the draft Cultural Landscape Inventory (CLI) prepared by Mark Davidson were utilized in the preparation of this plan. The management zones and treatment modules initially defined in the CLI were altered for this report based on recommendations from the park and project participants. Alterations were limited to renaming and re-numbering areas of the landscape to facilitate feature inventory and site management.

The notebook is divided into two main sections which address the Streambank/Waterway Features and

Lovers Lane Entrance/Forsythia Hill. Each section contains a detailed inventory, condition assessment, recommendations for preservation work needed, and background information on individual features. Site maps which define the project area are provided at the front of the plan. A preservation maintenance calendar which provides a schedule to guide important routine and cyclic preservation maintenance activities for the features addressed in this project, and an appendix which provides reference information are included at the back of the plan.

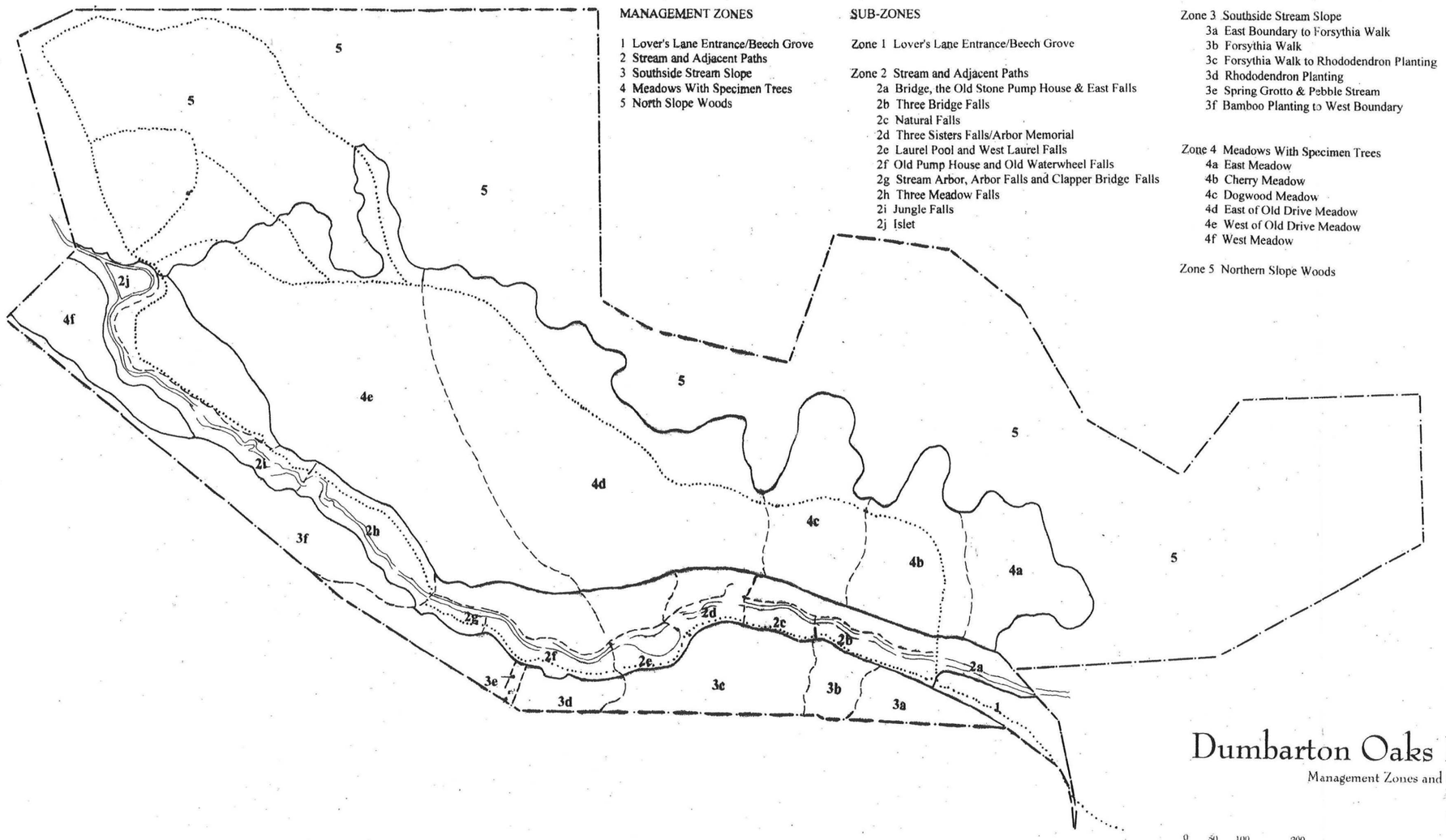
Since a Cultural Landscape Report (CLR) has not been completed for the site, this document should serve as an interim strategy to preserve important landscape features until a comprehensive treatment plan is prepared. Until the CLR is prepared, all landscape features should be considered important and should be preserved, protected and/or replaced in kind. Features which are removed and cannot be replaced should be carefully documented for future reference. If the approved treatment plan results in an alteration of the existing landscape, the recommendations in this report should be revised to support the new management needs at the site.

This plan is designed to be expanded and periodically updated as preservation maintenance operations are completed or as new information becomes available. Continued documentation of work completed, including the stabilization, repair, removal and replacement of landscape features is imperative for the long term success of this plan.

Charles Pepper
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Brookline, Massachusetts

Darwina L. Neal
Chief Landscape Architect
National Capital Region
Washington, DC

April 1997



MANAGEMENT ZONES

1 Lover's Lane Entrance/Beech Grove
2 Stream and Adjacent Paths
3 Southside Stream Slope
4 Meadows With Specimen Trees
5 North Slope Woods

SUB-ZONES

Zone 1 Lover's Lane Entrance/Beech Grove

Zone 2 Stream and Adjacent Paths
- 2a Bridge, the Old Stone Pump House & East Falls
- 2b Three Bridge Falls
- 2c Natural Falls
- 2d Three Sisters Falls/Arbor Memorial
- 2e Laurel Pool and West Laurel Falls
- 2f Old Pump House and Old Waterwheel Falls
- 2g Stream Arbor, Arbor Falls and Clapper Bridge Falls
- 2h Three Meadow Falls
- 2i Jungle Falls
- 2j Islet

Zone 3 Southside Stream Slope
- 3a East Boundary to Forsythia Walk
- 3b Forsythia Walk
- 3c Forsythia Walk to Rhododendron Planting
- 3d Rhododendron Planting
- 3e Spring Grotto & Pebble Stream
- 3f Bamboo Planting to West Boundary

Zone 4 Meadows With Specimen Trees
- 4a East Meadow
- 4b Cherry Meadow
- 4c Dogwood Meadow
- 4d East of Old Drive Meadow
- 4e West of Old Drive Meadow
- 4f West Meadow

Zone 5 Northern Slope Woods

Dumbarton Oaks Park

Management Zones and Sub-Zones

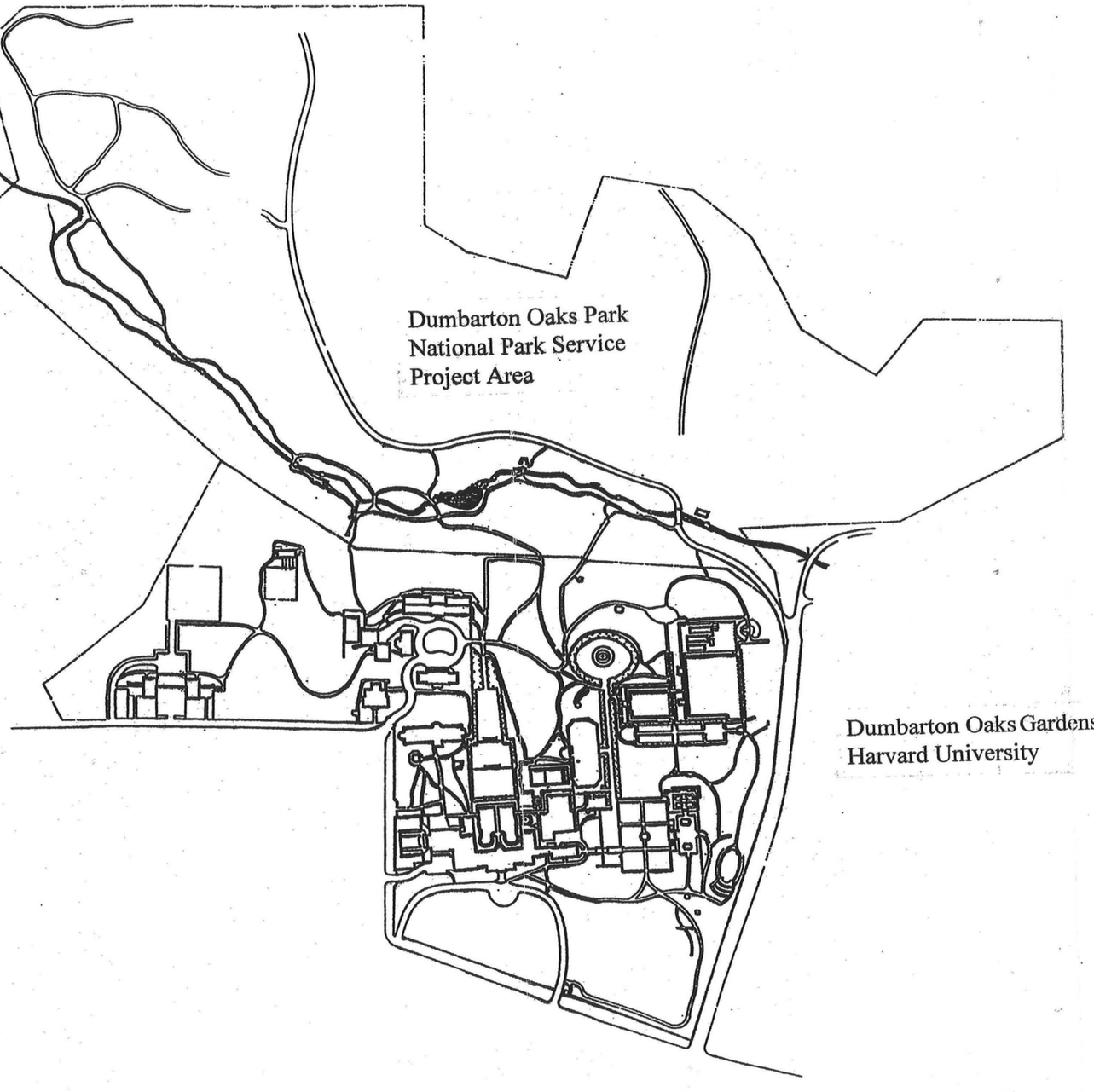
April 1997

0 50 100 200

Scale: 1" = 100'

NORTH

Base Line Data Taken From Draft Cultural Landscape Report For Dumbarton Oaks Park, October 1996.



Dumbarton Oaks

Property Map

April 1997

REDUCED REPRODUCTION
NOT TO SCALE

NORTH

BASE LINE DATA TAKEN FROM HABS REPORT, 1989

Dumbarton Oaks Park

INVENTORY - Dams

Management Zone

Subzone	Subzone Name	Dam Number	Dam Name
2	Stream & Adjacent Paths		
a	Bridge, the Old Stone Pump House & East Falls	1	East Falls
b	Three Bridge Falls	2	Three Bridge Falls (1 of 3)
b	Three Bridge Falls	3	Three Bridge Falls (2 of 3)
b	Three Bridge Falls	4	Three Bridge Falls (3 of 3)
c	Natural Falls	5	Natural Falls
d	Three Sisters Falls/Arbor Memorial	6	Three Sisters Falls (1 of 3)
d	Three Sisters Falls/Arbor Memorial	7	Three Sisters Falls (2 of 3)
d	Three Sisters Falls/Arbor Memorial	8	Three Sisters Falls (3 of 3)
e	Laurel Pool and West Laurel Falls		Laurel Pool
e	Laurel Pool and West Laurel Falls	9	West Laurel Falls
f	Old Pump House and Old Waterwheel Falls	10	Old Waterwheel Falls
f	Old Pump House and Old Waterwheel Falls		Spring Grotto

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal,Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October, 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

INVENTORY - Dams

Management Zone

Subzone	Subzone Name	Dam Number	Dam Name
2	Stream & Adjacent Paths		
g	Stream Arbor, Arbor Falls and Clapper Bridge Falls	11	Arbor Falls
g	Stream Arbor, Arbor Falls and Clapper Bridge Falls	12	Clapper Bridge Falls
h	Three Meadow Falls	13	Three Meadow Falls (1 of 3)
h	Three Meadow Falls	14	Three Meadow Falls (2 of 3)
h	Three Meadow Falls	15	Three Meadow Falls (3 of 3)
i	Jungle Falls	16	Jungle Falls (1 of 4)
i	Jungle Falls	17	Jungle Falls (2 of 4)
i	Jungle Falls	18	Jungle Falls (3 of 4)
i	Jungle Falls	19	Jungle Falls (4 of 4)

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal,Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October, 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Dams

Management Zone

Subzone Number & Name Dam Number & Name	Comments on condition
2 Stream & Adjacent Paths	
a Bridge, Old Stone Pump House & East Falls Dam #: 1 East Falls	Erosion ruts on right side above wall; terra-cotta drain on left w/outlet on face of wall; pipe on pool bottom.
b Three Bridge Falls Dam #: 2 Three Bridge Falls (1 of 3)	Retaining wall missing 20' on right; erosion of soil around sewer line on right.
b Three Bridge Falls Dam #: 3 Three Bridge Falls (2 of 3)	Extreme washout at left and right wingwalls.
b Three Bridge Falls Dam #: 4 Three Bridge Falls (3 of 3)	Right retaining wall upstream of dam side in good condition.
c Natural Falls Dam #: 5 Natural Falls	Minor erosion at several points on left and right.
d Three Sisters Falls/Arbor Memorial Dam #: 6 Three Sisters Falls (1 of 3)	Left stone retaining wall is falling due to undercutting (wooden bridge).
d Three Sisters Falls/Arbor Memorial Dam #: 7 Three Sisters Falls (2 of 3)	Erosion along right bank.
d Three Sisters Falls/Arbor Memorial Dam #: 8 Three Sisters Falls (3 of 3)	Water leaking through buttress wall; some erosion behind left/right wingwalls.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Dams

Management Zone Subzone Number & Name Dam Number & Name	Comments on condition
2 Stream & Adjacent Paths	
e Laurel Pool and West Laurel Falls Laurel Pool	Some erosion on left bank; extensive siltation.
e Laurel Pool and West Laurel Falls Dam #: 9 West Laurel Falls	Retaining wall missing on right 25' downstream of dam.
f Old Pump House and Old Waterwheel Falls Dam #: 10 Old Waterwheel Falls	Stone wall running approximately 80' beyond dam protecting right bank from erosion.
f Old Pump House and Old Waterwheel Falls Spring Grotto	
g Stream Arbor, Arbor Falls and Clapper Bridge Falls Dam #: 11 Arbor Falls	Downstream erosion on right bank caused by flow from dam #12.
g Stream Arbor, Arbor Falls and Clapper Bridge Falls Dam #: 12 Clapper Bridge Falls	Heavy siltation behind dam.
h Three Meadow Falls Dam #: 13 Three Meadow Falls (1 of 3)	Extremely heavy siltation.
h Three Meadow Falls Dam #: 14 Three Meadow Falls (2 of 3)	Severe damage resulting from fallen tree; flank stones missing.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Dams

Management Zone

Subzone Number & Name Dam Number & Name	Comments on condition
2 Stream & Adjacent Paths	
h Three Meadow Falls Dam #: 15 Three Meadow Falls (3 of 3)	Minor erosion along banks.
i Jungle Falls Dam #: 16 Jungle Falls (1 of 4)	Minor erosion along banks.
i Jungle Falls Dam #: 17 Jungle Falls (2 of 4)	Severe erosion on left bank.
i Jungle Falls Dam #: 18 Jungle Falls (3 of 4)	Missing downstream wall; scoured pool downstream side below falls; two flankstones missing.
i Jungle Falls Dam #: 19 Jungle Falls (4 of 4)	Silt covers dam structure almost entirely, essentially protecting it, although water is completely out of designed channel.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Preservation Alternatives
Streambank and Waterway Features

Protection

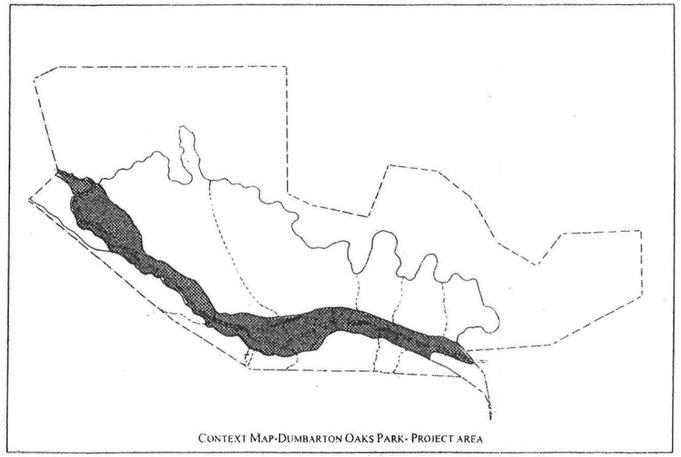
- Photodocument existing condition of all dams
- Cut back vegetation to allow access to all areas
- Locate, document and collect only stones which are impeding water flow; stockpile adjacent to related dam - i.e. upstream of where stones are found.
- Collect mortar samples from dams/stone masonry structures and have composition analyzed

Protection and *Stabilization*

- Photodocument existing condition of all dams
- Cut back vegetation to allow access to all areas
- Locate, document and collect only stones which are impeding water flow; stockpile adjacent to related dam - i.e. upstream of where stones are found
- Collect mortar samples from dams/stone masonry structures and have composition analyzed
- *Underpin and/or brace all wing walls where undercutting has occurred*
- *Backfill selected areas behind walls using material removed from streambed, if appropriate; otherwise, import clean fill as needed*
- *Reinforce the face of backfilled areas with sandbags, geotextiles, and/or soil stabilizers*
- *Sandbag all washed out, undercut and eroded areas along banks and adjacent to wing walls, retaining existing course of water flow; stockpiled stones can be used to hold down sandbags*

Protection, Stabilization and *Repair*

- Photodocument existing condition of all dams
- Cut back vegetation to allow access to all areas
- Locate, document and collect only stones which are impeding water flow; stockpile adjacent to related dam - i.e. upstream of where stones are found
- Collect mortar samples from dams/stone masonry structures and have composition analyzed
- Underpin and/or brace all wing walls where undercutting has occurred
- Backfill selected areas behind walls using material removed from streambed, if appropriate; otherwise, import clean fill as needed.
- Reinforce the face of backfilled areas with sandbags, geotextiles, and/or soil stabilizers
- Sandbag all washed out, undercut and eroded areas along banks and adjacent to wing walls, retaining existing course of water flow; stockpiled stones can be used to hold down sandbags
- *Remove siltation from stream bed and pull remaining plugs.*
- *Reset missing, dislodged and damaged stones where there is an obvious match between shape of stone, location where it was found and void to be filled.*
- *Build and backfill sandbag walls to widen eroded trails*
- *Re-establish missing or deteriorated plantings along streambank to minimize erosion*
- *Remove all stones/walls added during previous stabilization efforts which were not based on historic documentation*
- *Replace plugs, monitor siltation, remove as necessary to "flush" stream channel*



CONTEXT MAP-DUMBARTON OAKS PARK- PROJECT AREA

Emergency Stabilization: Install notched weir(s) in eroded channel along path from stream edge back, as far as necessary (see detail below).

Dam #18: Jungle Falls (3 of 4)
Emergency Stabilization: Remove vegetation to allow access to dam. Salvage large stones from streambed and stockpile; remove upstream and downstream gravel from streambed; sandbag left bank above and below dam to stabilize, and use stones to "hold" face of sandbags.
Repair: Repair work to be determined upon completion of emergency stabilization and further inspection.
Note: Spring/Summer 1997 Priority

Dam #16: Jungle Falls (1 of 4)
Emergency Stabilization: Sandbag left downstream bank.
Repair: Repair work to be determined upon completion of emergency stabilization and further inspection.

Dam #19: Jungle Falls (4 of 4)
Emergency Stabilization: Remove vegetation to allow access to dam. Silt which covers dam structure is essentially protecting it, although water is completely out of designed channel.
Repair: None needed.

Dam #14: Three Meadow Falls (2 of 3)
Emergency Stabilization: Remove vegetation to allow access to dam.
Repair: Remove siltation.

Dam #17: Jungle Falls (2 of 4)
Emergency Stabilization: Remove vegetation to allow access to walls and dam. Salvage large stones and use gravel in streambed to fill face of left bank; sandbag on top of gravel to face entire bank and lay salvaged stones at base of bank.
Repair: Repair work to be determined upon completion of emergency stabilization and further inspection.
Note: Spring/Summer 1997 Priority

Dam #13: Three Meadow Falls (1 of 3)
Emergency Stabilization: Remove vegetation to allow access to dam.
Repair: Remove siltation.

Dam #8: Three Sisters Falls (3 of 3)
Emergency Stabilization: Sandbag behind left and right wingwalls to prevent further erosion.
Repair: Replace 3-4 round stones in left wall to prevent further deterioration; remove siltation.

Dam #15: Three Meadow Falls (3 of 3)
Emergency Stabilization: Salvage large stones from streambed and stockpile; remove gravel/sandbar downstream and use to fill/stabilize left bank; sandbag left bank to stabilize, and use stockpiled stones to "hold" face of sandbags until permanent treatment is determined.

Dam #12: Clapper Bridge Falls
Emergency Stabilization: Sandbag behind left wingwall and slope below.
Repair: Remove siltation; sandbag behind right wall to raise and retain path.

Dam #11: Arbor Falls
Emergency Stabilization: Sandbag downstream right bank below dam.
Repair: Fill and sandbag washout at path edge at end of right downstream wall to create a safe path surface.
Note: Spring/Summer 1997 Priority

Stream Arbor

Spring Grotto

Dam #10: Old Water Wheel Falls
Emergency Stabilization: Sandbag behind dam on right.
Repair: Remove siltation.

Old Pump House

Dam #9: West Laurel Falls
Emergency Stabilization: Add sandbags to fill right bank gap and sandbag right downstream bank to prevent further erosion.
Repair: Remove siltation.

Dam #7: Three Sisters Falls (2 of 3)
Emergency Stabilization: Sandbag right bank void to prevent further erosion, and remove and stockpile loose stones from streambed below dam; remove angular stones from behind dam.
Repair: Remove siltation.

Dam #6: Three Sisters Falls (1 of 3)
Emergency Stabilization: Sandbag immediately behind left wingwall and on right at transition between dam and retaining wall; sandbag right bank, downstream of wooden bridge.
Repair: Remove siltation from above dam as much as possible, without damaging roots in streambed; remove stones from streambed and reset into existing left retaining wall, just above wooden bridge.

Dam #5: Natural Falls
Emergency Stabilization: Sandbag downstream bank on right of "natural falls."
Repair: Remove siltation.

Dam #3: Three Bridge Falls (2 of 3)
Emergency Stabilization: Sandbag extreme washout at left and right wingwalls to hold banks.
Repair: Remove siltation.

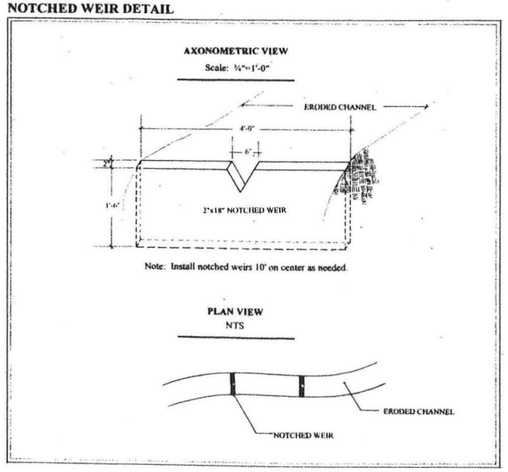
Dam #2: Three Bridge Falls (1 of 3)
Emergency Stabilization: Sandbag behind left and right wingwalls to prevent further erosion.
Repair: Remove siltation.

Dam #1: East Falls
Emergency Stabilization: None needed.
Repair: Remove siltation behind dam and remove and stockpile downstream stones to "free" water flow; underpin left and right wingwalls. Park will repair broken drain line behind left wingwall and backfill.

Dam #4: Three Bridge Falls (3 of 3)
Emergency Stabilization: Sandbag behind left wingwall, as well as to fill voids on right bank adjacent to dam.
Repair: Replace dam "lip" stones permanently; remove left sapling closest to dam and hand-excavate to find wall above dam; leave larger sapling whose roots are "holding" the bank. Remove siltation.
Note: Use as a model project to be completed cooperatively by Friends and Park

Laurel Pool
Emergency Stabilization: Sandbag along left bank.
Repair: Remove siltation.

NOTCHED WEIR DETAIL



Notes:

1. All waterfall locations, site features and topography are relative only, since they have not been measured, but are based on previous work/report plans. A comprehensive topographic and utility survey is needed as the base for the Cultural Landscape Report and permanent treatment recommendations.

2. References to left and right wingwalls are in relation to looking downstream, or east, so that "left" would be on the north side of the stream and "right" would be on the south side.

Dumbarton Oaks Park

Streambank and Waterway Features
Emergency Stabilization and Repair Work Recommendations

April 1997

0 25 50 100
Scale: 1"=50'

NORTH

BASE LINE DATA TAKEN FROM DRAFT CULTURAL LANDSCAPE REPORT FOR DUMBARTON OAKS PARK, OCTOBER 1996.

Dumbarton Oaks Park

EMERGENCY STABILIZATION - Dams

Management Zone Subzone Dam Number & Name	Emergency Stabilization Work Needed
2 Stream & Adjacent Paths	
a Bridge, the Old Stone Pump House & East Falls Dam #: 1 East Falls	None needed.
b Three Bridge Falls Dam #: 2 Three Bridge Falls (1 of 3)	Sandbag behind left and right wingwalls to prevent further erosion.
b Three Bridge Falls Dam #: 3 Three Bridge Falls (2 of 3)	Sandbag extreme washouts at left and right wingwalls to hold banks.
b Three Bridge Falls Dam #: 4 Three Bridge Falls (3 of 3)	Sandbag behind left wingwall, as well as to fill voids on right bank adjacent to dam. Note: Use as Spring/Summer 1997 model project for priority completion with Friends Group.
c Natural Falls Dam #: 5 Natural Falls	Sandbag downstream bank on right of "Natural Falls."
d Three Sisters Falls/Arbor Memorial Dam #: 6 Three Sisters Falls (1 of 3)	Sandbag immediately behind left wingwall and on right at transition between dam and retaining wall; sandbag right bank, downstream of wooden bridge.
d Three Sisters Falls/Arbor Memorial Dam #: 7 Three Sisters Falls (2 of 3)	Sandbag right bank void to prevent further erosion; remove and stockpile loose stones from streambed below dam; remove angular stones from behind dam.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996,and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

EMERGENCY STABILIZATION - Dams

Management Zone Subzone Dam Number & Name	Emergency Stabilization Work Needed
2 Stream & Adjacent Paths	
d Three Sisters Falls/Arbor Memorial Dam #: 8 Three Sisters Falls (3 of 3)	Sandbag behind left and right wingwalls to prevent further erosion.
e Laurel Pool and West Laurel Falls Laurel Pool	Sandbag along left bank.
e Laurel Pool and West Laurel Falls Dam #: 9 West Laurel Falls	Add sandbags to fill right bank gap and sandbag right downstream bank to prevent further erosion.
f Old Pump House and Old Waterwheel Falls Dam #:10 Old Waterwheel Falls	Sandbag behind dam on right.
f Old Pump House and Old Waterwheel Falls Spring Grotto	None needed.
g Stream Arbor, Arbor Falls and Clapper Bridge Falls Dam #:11 Arbor Falls	Sandbag right bank below dam. Note: Spring-Summer 1997 priority.
g Stream Arbor, Arbor Falls and Clapper Bridge Falls Dam #:12 Clapper Bridge Falls	Sandbag behind left wingwall and slope below.
h Three Meadow Falls Dam #:13 Three Meadow Falls (1 of 3)	Remove vegetation to allow access to dam.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996,and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

EMERGENCY STABILIZATION - Dams

Management Zone Subzone Dam Number & Name	Emergency Stabilization Work Needed
2 Stream & Adjacent Paths	
h Three Meadow Falls Dam #:14 Three Meadow Falls (2 of 3)	Remove vegetation to allow access to dam.
h Three Meadow Falls Dam #:15 Three Meadow Falls (3 of 3)	Salvage large stone from streambed and stockpile; remove gravel/sandbar downstream and use to fill/stabilize left bank; face with sandbags and use stockpiled stones to "face" bags until permanent treatment can be implemented.
i Jungle Falls Dam #:16 Jungle Falls (1 of 4)	Sandbag left downstream bank.
i Jungle Falls Dam #:17 Jungle Falls (2 of 4)	Remove vegetation to allow access to walls and dam; salvage large stones and use gravel in streambed to fill face of left bank; sandbag on top of gravel to face entire bank and lay salvaged stones at base of bank. Note: Spring/Summer 1997 priority.
i Jungle Falls Dam #:18 Jungle Falls (3 of 4)	Remove vegetation to allow access to dam; salvage large stones from streambed and stockpile; remove upstream and downstream gravel from streambed; sandbag left bank above and below dam, and use stones to "hold" face of sandbags. Note: Spring/Summer 1997 priority.
i Jungle Falls Dam #:19 Jungle Falls (4 of 4)	Remove vegetation to allow access to dam. Silt which covers dam structure is essentially protecting it, although water is completely out of the designed channel.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996,and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

REPAIR WORK NEEDED - Dams

Management Zone Subzone Dam Number & Name	Repair Work Needed
2 Stream & Adjacent Paths	
a Bridge, Old Stone Pump House & East Falls Dam #: 1 East Falls	Remove siltation behind dam and remove and stockpile downstream stones to "free" waterflow; underpin left and right wingwalls. Park will repair broken drain line behind left wingwall, and backfill.
b Three Bridge Falls Dam #: 2 Three Bridge Falls (1 of 3)	Remove siltation.
b Three Bridge Falls Dam #: 3 Three Bridge Falls (2 of 3)	Remove siltation.
b Three Bridge Falls Dam #: 4 Three Bridge Falls (3 of 3)	Replace dam "lip" stones permanently; remove left sapling closest to dam and hand-excavate to find wall above dam; leave larger sapling whose roots are "holding" the bank; remove siltation. Note: Use as Spring/Summer 1997 model project for priority completion with Friends Group.
c Natural Falls Dam #: 5 Natural Falls	Remove siltation.
d Three Sisters Falls/Arbor Memorial Dam #: 6 Three Sisters Falls (1 of 3)	Remove siltation from above dam as much as possible, without damaging roots in streambed; remove stones from streambed and reset into existing left retaining wall, just above wooden bridge.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

REPAIR WORK NEEDED - Dams

Management Zone Subzone Dam Number & Name	Repair Work Needed
2 Stream & Adjacent Paths	
d Three Sisters Falls/Arbor Memorial Dam #: 7 Three Sisters Falls (2 of 3)	Repair work will be recommended upon completion of emergency stabilization and further inspection.
d Three Sisters Falls/Arbor Memorial Dam #: 8 Three Sisters Falls (3 of 3)	Replace 3-4 round stones in left wall to prevent further deterioration; remove siltation.
e Laurel Pool and West Laurel Falls Laurel Pool	Remove siltation.
e Laurel Pool and West Laurel Falls Dam #: 9 West Laurel Falls	Remove siltation.
f Old Pump House and Old Waterwheel Falls Dam #:10 Old Waterwheel Falls	Remove siltation.
f Old Pump House and Old Waterwheel Falls Spring Grotto	None needed.
g Stream Arbor, Arbor Falls and Clapper Bridge Falls Dam #:11 Arbor Falls	Fill and sandbag washout at path edge at end of right downstream wall to create a safe path surface. Note: Spring-Summer 1997 priority.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

REPAIR WORK NEEDED - Dams

Management Zone Subzone Dam Number & Name	Repair Work Needed
2 Stream & Adjacent Paths	
g Stream Arbor, Arbor Falls and Clapper Bridge Falls Dam #:12 Clapper Bridge Falls	Remove siltation; sandbag behind right wall to raise and retain path.
h Three Meadow Falls Dam #:13 Three Meadow Falls (1 of 3)	Remove siltation.
h Three Meadow Falls Dam #:14 Three Meadow Falls (2 of 3)	Remove siltation.
h Three Meadow Falls Dam #:15 Three Meadow Falls (3 of 3)	Repair work will be recommended upon completion of emergency stabilization and further inspection.
i Jungle Falls Dam #:16 Jungle Falls (1 of 4)	Repair work will be recommended upon completion of emergency stabilization and further inspection.
i Jungle Falls Dam #:17 Jungle Falls (2 of 4)	Repair work will be recommended upon completion of emergency stabilization and further inspection. Note: Spring/Summer 1997 priority.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park

REPAIR WORK NEEDED - Dams

Management Zone

Subzone Dam Number & Name	Repair Work Needed
2 Stream & Adjacent Paths	
i Jungle Falls Dam #:18 Jungle Falls (3 of 4)	Repair work will be recommended upon completion of emergency stabilization and further inspection.
i Jungle Falls Dam #:19 Jungle Falls (4 of 4)	None needed.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal,Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996, and Jim Ingram, Brian Stephenson, Doug Curtis, Darwina Neal, Cynthia Cox, Dan Hodgson, Lauren Gluschik and Steve Strach, January 1997.

Dumbarton Oaks Park
Dam # 1: East Falls

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: a - Bridge, the Old Stone Pump House & East Falls

Historic Significance: The East Falls Dam is one in a series of dams built between 1922 and 1931. The natural hydrological functions of the stream were intentionally interrupted by building dams and retaining walls to create a series of spaces characterized by their architectural structure and resulting water form.

Descriptive Characteristics: The East Falls Dam is just downstream of the stone shed and is composed of stone spill rocks with adjacent stone and mortar retaining walls. There is a terra-cotta drain with its outlet found on the face of the left wingwall. A pipe is located on the bottom of the downstream pool.



Figure 1: East Falls Dam, 1996.

Preservation Practices and Work Procedures:

1996 Condition & Comments:
The structural integrity of the dam is good; there is some scouring under the right wingwall and erosion ruts above this wall. The water flow is staying in the designed channel, however erosion is occurring on the right bank.

Emergency Stabilization:
None needed.
Repair: Remove siltation behind dam; remove and stockpile downstream stones to "free" water flow; underpin left and right wingwalls. Park will repair broken drain line behind the left wingwall and backfill.

Dumbarton Oaks Park
Dam # 1: East Falls

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits. Pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park

Dam # 2: Three Bridge Falls (1 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: b - Three Bridge Falls

Historic Significance: The intent of Three Bridge Falls was to create a rustic transition from the bridge to the woodland. At a controlled location at the first of the Three Bridge Falls, views toward the meadow on the north side of the stream were visible.

Descriptive Characteristics: The first of Three Bridge Falls is located roughly 20 feet upstream from the bridge and 100 feet from the second dam of the series. This dam is constructed of stone spill rocks with adjacent stone and mortar wingwalls. The stones are small, of uniform size, and uncut. An exposed sewer line runs along the right bank of the stream.



Figure 2: Three Bridge Falls (1 of 3), 1996.

Dumbarton Oaks Park

Dam # 2: Three Bridge Falls (1 of 3)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The structural integrity of the dam is good. There is moderate scouring in the channel bed and the water flow is staying in the designed channel except where the right retaining wall is missing 20 feet downstream. Sediment deposits are minimal at the dam, however there is an extensive sediment deposit 20 feet beyond the dam. There is moderate erosion on the right and left banks and around the sewer line along the right bank.

Emergency Stabilization: Sandbag behind left and right wingwalls to prevent further erosion.
Repair: Remove siltation.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dam.

Dumbarton Oaks Park

Dam # 3: Three Bridge Falls (2 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: b - Three Bridge Falls

Historic Significance: The intent of Three Bridge Falls was to create a rustic transition from the bridge to the woodland. Above the second of the Three Bridge Falls, the view across the stream to the northern meadow was fully open. Because of this view, the parallel movement on the opposite side of the stream along the vehicular road becomes evident for the first time.

Descriptive Characteristics: The distance from the lower falls to the middle fall is approximately 34 feet. This dam is constructed of stone spill rocks with adjacent stone and mortar wingwalls and retaining walls.



Figure 3: Three Bridge Falls (2 of 3), 1996.

Dumbarton Oaks Park
Dam # 3: Three Bridge Falls (2 of 3)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The structural integrity of the dam is good however, water flow is re-channeled to the left and right sides of the dam causing extreme washout at the left and right wingwalls. As a result, the right wingwall is 90% missing and several dislodged stones can be found in the stream. The left and right banks are eroding and extensive channel bed scouring is occurring. Sediment deposits are minimal at the dam and moderate 10 feet beyond.

Emergency Stabilization: Sandbag extreme washout at left and right wingwalls to hold banks.
Repair: Remove siltation above dam to improve water flow.

Preservation Maintenance Calendar

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 4: Three Bridge Falls (3 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: b - Three Bridge Falls

Historic Significance: The third of the Three Bridge Falls provides one of the rare glimpses of the formal gardens and just beyond provides an advantage point to see Forsythia Hill. It was designed with a more casual appearance and prepares one for a more natural section of the stream path. All three falls intentionally interrupt the curving stream path and mark vantage points of unique garden features.

Descriptive Characteristics: The upper falls is approximately 64 feet above the middle falls. It is constructed of stone spill rocks with adjacent concrete and stone retaining walls.



Figure 4: Three Bridge Falls (3 of 3), 1996.

Dumbarton Oaks Park

Dam # 4: Three Bridge Falls (3 of 3)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The structural integrity of the dam is fair. The capstones and 75% of the left wingwall are missing. There is extensive sedimentation at the upstream side of the dam consequently, water flow is being channeled to the right side of the dam causing erosion to the right bank. There is extensive erosion to the left bank as well. Channel bed scouring is extensive at the downstream side of the dam resulting in minimal sediment deposits however, severe sedimentation occurs 8 feet beyond. The upstream right retaining wall is in good condition.

Emergency Stabilization: Sandbag behind left wingwall, as well as to fill voids on right bank adjacent to dam.
Repair: Replace lip stones permanently; remove left sapling closest to dam and hand-excavate to find wall above dam; leave larger sapling whose roots are "holding" the bank. Remove siltation from behind dam. Note: Use as a **model project** to be completed cooperatively by Friends and Park.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 5: Natural Falls

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: c - Natural Falls

Historic Significance: The Natural Falls were retained as a feature of the original design. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: Natural Falls is located slightly downstream of the first of Three Sister's Falls. The falls are an accumulation of large and small worn river rocks. There is a significant topography change creating "gentle rapids" and resulting in natural cascading falls. There is a small collection pool below the cascading falls before the stream continues.



Figure 5: Natural Falls Dam, 1996.

Dumbarton Oaks Park
Dam # 5: Natural Falls

Preservation Practices and Work Procedures:

1996 Condition & Comments: There is minimal sedimentation throughout the dam and water flow is not obstructed. Erosion is minor on both left and right banks and sedimentation upstream and downstream is minimal.

Emergency Stabilization: Sandbag downstream bank on right of "Natural Falls."
Repair: Remove siltation from behind dam.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 6: Three Sisters Falls (1 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: d - Three Sisters Falls/Arbor Memorial

Historic Significance: This dam is a significant feature in a highly developed part of the stream path. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: This dam is constructed with stacked stone spill rocks and adjacent concrete and stone retaining walls. The dam is missing several stones and both wingwalls are missing capstones. There is an exposed steel pipe of unknown origin protruding from the structure.

The dam is flanked on both banks by stone seating areas which are connected by a plank bridge across the stream. The south bank is highlighted by a stone bench protruding from a wall of the same cut field stone as the bridge. On the northern bank is a seating area formed by three ashlar stone and mortar walls, which once contained a plaque dedicating it as a memorial to William James Gray, Superintendent of Dumbarton Oaks from 1922 to 1937, and was roofed by a timber arbor. It was variously called both the "Arbor Memorial" or the "Gray Arbor."



Figure 6: Three Sisters Falls (1 of 3), 1996.

Dumbarton Oaks Park

Dam # 6: Three Sisters Falls (1 of 3)

Preservation Practices and Work Procedures:

1996 Condition & Comments:
The structural integrity of the dam is good. Water flows around the left wingwall causing severe channel scouring at the dam's base. The left bank retaining wall, adjacent to the wooden bridge, is falling as a result of undercutting. Moderate erosion can be found on both downstream banks. Sediment deposits are minimal, both up and down stream.

Emergency Stabilization: Sandbag immediately behind left wingwall and right bank at transition between dam and retaining wall; sandbag right bank downstream of wooden bridge.

Repair: Remove siltation from above dam as much as possible, without damaging roots in streambed; remove stones from streambed and reset into existing left retaining wall, just above wooden bridge.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 7: Three Sisters Falls (2 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: d - Three Sisters Falls/Arbor Memorial

Historic Significance: This dam is the second of Three Sisters Falls and is found in a wooded glen. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: This dam is located shortly before the third of the Three Sisters Falls. It is constructed of stacked stones and stone and concrete wingwalls and retaining walls.



Figure 7: Three Sisters Falls (2 of 3), 1996.

Dumbarton Oaks Park

Dam # 7: Three Sisters Falls (2 of 3)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The structural integrity of the dam is fair. The top stones are either missing or found downstream. Severe sedimentation occurs both downstream and upstream of the dam, channeling water around the right wingwall. This is causing severe erosion to the right bank and extensive channel bed scouring downstream. The left bank shows signs of moderate erosion. Both wingwalls are missing stones as well as the top spill stones.

Emergency Stabilization: Sandbag right bank void to prevent further erosion.
Repair: Remove and stockpile loose stones from stream bed below the dam as well as the angular stones from behind the dam; remove siltation from behind dam.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 8: Three Sisters Falls (3 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: d - Three Sisters Falls/Arbor Memorial

Historic Significance: The Three Sisters Falls Dam is the third and last in a series. It creates and marks the eastern end of the Laurel Pool and the beginning of a shady open wooded space. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: The dam, wingwalls, and retaining walls are constructed of stacked stones and mortar.

Preservation Practices and Work Procedures:

1996 Condition & Comments:
The structural integrity of the dam is good. There is severe sedimentation above the dam, causing water to flow around the left wingwall and therefore, extensive channel bed scouring. Water is flowing through the buttress wall.

Emergency Stabilization:
Sandbag behind left and right wingwalls to prevent further erosion.

Repair: Replace 3-4 round stones in the left wall to prevent further erosion; remove siltation from behind dam.



Figure 8: Three Sisters Falls (3 of 3), 1996.

Dumbarton Oaks Park

Dam # 8: Three Sisters Falls (3 of 3)

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park

Dam # 9: West Laurel Falls

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: e - Laurel Pool and West Laurel Falls

Historic Significance: This dam was at the upstream, western end of the Laurel Pool and at the end of the Hazel Walk, a slate walk which led to the gardens. A log bridge was previously located above the Falls. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: The dam is constructed of stone spill rocks with adjacent concrete and stone wingwalls located on both upstream and downstream banks.



Figure 9: West Laurel Falls, 1996.

Dumbarton Oaks Park

Dam # 9: West Laurel Falls

Preservation Practices and Work Procedures:

1996 Condition & Comments: The structural integrity of the dam is good. Water flows around the left and right retaining walls during storms. There is moderate sedimentation and extensive scouring below the dam and extensive sedimentation and moderate scouring upstream. The retaining wall is missing approximately 25 feet downstream.

Emergency Stabilization: Add sandbags to fill right bank gap and sandbag right downstream bank to prevent further erosion.
Repair: Remove siltation from behind the dam.

Preservation Maintenance Calendar

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park

Dam # 10: Old Waterwheel Falls

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: f - Old Pump House and Old Waterwheel Falls

Historic Significance: The ruins of a cast-iron waterwheel were located in the V between two hillocks where the path begins to climb to a high point. Old Waterwheel Falls was located at a ford in the stream across from the water wheel, where a path crossed over into the meadows to the north. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: Large river stones function as spill rocks and an adjacent concrete and stone retaining wall is located on the right bank. The large spill rocks are wide and the width of the falls is short.



Figure 10: Old Waterwheel, 1996.

Dumbarton Oaks Park
Dam # 10: Old Waterwheel Falls

Preservation Practices and Work Procedures:

1996 Condition & Comments: The dam has been partially stabilized, although not in accord with historic documentation, but most of the original structure is intact therefore, the structural integrity is good. However, water flows around the left and right retaining walls during storms and sedimentation is moderate below the falls and severe above the dam. The cap stones have been realigned and do not represent their original positions. There is a stone wall approximately 80 feet down stream protecting the right bank from erosion.

Emergency Stabilization: Sandbag behind dam on right bank.
Repair: Remove siltation from above the dam.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 11: Arbor Falls

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: g - Stream Arbor, Arbor Falls and Clapper Bridge Falls

Historic Significance: The Arbor Falls marked the beginning point of a long embankment wall and stone loggia following the southern bank. This stone structure extends almost half way to the Clapper Bridge Falls and enhances an open view to the meadow. More information regarding the historic significance and design intent of this feature is needed.

Descriptive Characteristics: The dam is constructed of stone spill rocks and adjacent concrete and stone retaining walls on the south bank. It has been partially stabilized and stones have been placed on the south foundation wall, but not based on historic documentation. There is a sewer access manhole on the downstream right bank.



Figure 11: Arbor Falls, 1996.

Dumbarton Oaks Park
Dam # 11: Arbor Falls

Preservation Practices and Work Procedures

1996 Condition & Comments: The structural integrity of the dam is good. Sedimentation is minimal below and quite severe above the dam. Bank erosion is moderate on both left and right banks, however erosion of the right bank appears to be caused by flow from dam number twelve.

Emergency Stabilization: Sandbag downstream right bank below the dam.
Repair: Fill and sandbag washout at path edge at end of right downstream wall to create a safe path surface. Note: this is a Spring-Summer 1997 Priority project.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park

Dam # 12: Clapper Bridge Falls

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: g - Stream Arbor, Arbor Falls and Clapper Bridge Falls

Historic Significance: The Clapper Bridge Falls was the last of the upstream fords along the stream. At this point, the path crossed to a clearing and onto the lower meadow. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: The dam is constructed of stone spill rocks and stone and mortar wingwalls and retaining walls. The dam has been partially restored and both upstream and downstream wingwalls are intact. There is a stone embankment wall that connects this dam with the Stream Arbor.



Figure 12: Clapper Bridge Falls, 1996.

Dumbarton Oaks Park

Dam # 12: Clapper Bridge Falls

Preservation Practices and Work Procedures:

1996 Condition & Comments: The dam has been partially stabilized although not in accord with historic documentation, but the structural integrity is good. Storm water flows outside of the wingwalls. Channel bed scouring is minimal due to heavy siltation above and below the dam; bank erosion is minimal as well.

Emergency Stabilization: Sandbag behind left wingwall and slope below.
Repair: Remove siltation from behind dam; sandbag behind right wall to raise and retain path.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 13: Three Meadow Falls (1 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: h - Three Meadow Falls

Historic Significance: More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: This dam is in poor condition. The only remaining evidence of the dam is a small portion of the stone and concrete wingwall.



Figure 13: Three Meadow Falls (1 of 3), 1996.

Dumbarton Oaks Park
Dam # 13: Three Meadow Falls (1 of 3)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The structural integrity of the dam is unknown due to heavy siltation which covers the dam. Even with the heavy siltation, water flow is not hampered. Channel bed scouring is minimal.

Emergency Stabilization: Remove vegetation to provide access to dam.
Repair: Remove siltation to expose dam.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park

Dam # 14: Three Meadow Falls (2 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: h - Three Meadow Falls

Historic Significance: More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: The dam is in poor condition. It has been heavily damaged and most has washed away. The only remaining evidence of the dam is a small section of the stone and concrete wall protruding from the south bank.



Figure 14: Three Meadow Falls (2 of 3), 1996.

Dumbarton Oaks Park

Dam # 14: Three Meadow Falls (2 of 3)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The dam is in very poor structural condition as a result of damage sustained from a fallen tree. There are several flank stones missing and the water flow has been re-directed to the right side of the channel. Severe erosion of both banks is evident.

Emergency Stabilization: Remove vegetation to provide access to dam.
Repair: Remove siltation to expose dam.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits. Pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 15: Three Meadow Falls (3 of 3)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: h - Three Meadow Falls

Historic Significance: More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: The dam is constructed of stone spill rocks with adjacent concrete and stone retaining walls.



Figure 15: Three Meadow Falls (3 of 3), 1996.

Dumbarton Oaks Park
Dam # 15: Three Meadow Falls (3 of 3)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The dam's structural integrity is unknown due to heavy siltation which completely covers the upper portion of the dam. The stream may have relocated to the left of the channel. Siltation below the dam is minimal. Both downstream banks show extreme signs of erosion.

Emergency Stabilization: Salvage large stones from the stream bed and stockpile. Remove the downstream gravel-sandbar and use to fill and stabilize the left bank. Face dam with sandbags and use stockpiled stones to "face" bags until permanent treatment can be implemented.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park

Dam # 16: Jungle Falls (1 of 4)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: i - Jungle Falls

Historic Significance: This dam marked the first of the Jungle Falls, a series of four falls which got their name from the dense woods in the extreme western section of the park.

Descriptive Characteristics: The dam is constructed of stone spill rocks with adjacent concrete and stone retaining walls.



Figure 16: Jungle Falls (1 of 4), 1996.

Dumbarton Oaks Park

Dam # 16: Jungle Falls (1 of 4)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The dam is in fair condition. Silt deposits are extensive upstream, resulting in a change in the stream flow to the left of the dam. Both downstream banks show extreme signs of erosion. The concrete retaining wall is broken and no longer halts the siltation process. The north downstream bank has been severely washed out.

Emergency Stabilization: Sandbag left downstream bank.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits. Pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 17: Jungle Falls (2 of 4)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: i - Jungle Falls

Historic Significance: More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: The dam is constructed of stone spill rocks with adjacent concrete and stone retaining walls.



Figure 17: Jungle Falls (2 of 4), 1996.

Dumbarton Oaks Park
Dam # 17: Jungle Falls (2 of 4)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The dam is in good condition. There is minimal upstream and downstream siltation, however the stream flow has been redirected to the left of the dam. Channel bed scouring is minimal, but both downstream banks show severe signs of erosion. The left wingwall is missing its flankstones.

Emergency Stabilization: Remove vegetation to provide access to walls and dam. Salvage large stones and use gravel in stream bed to fill face of left bank. Sandbag on top of gravel to face entire bank and lay salvaged stones at base of bank. Note: this is a Spring-Summer 1997 Priority project.

Preservation Maintenance Calendar

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 18: Jungle Falls (3 of 4)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: i - Jungle Falls

Historic Significance: More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: The dam is constructed of stone spill rocks with adjacent concrete and stone retaining walls.



Figure 18: Jungle Falls (2 of 4), 1996.

Dumbarton Oaks Park
Dam # 18: Jungle Falls (3 of 4)

Preservation Practices and Work Procedures:

1996 Condition & Comments: The dam is in poor condition. The bank vegetation is encroaching on the dam and most of the structures are hidden or missing. Two flankstones are missing, as well as a downstream wall. Siltation is severe upstream and stream flow is over the dam and behind the rock wall. Both downstream banks show extensive signs of erosion; there is minimal scouring in the channel bed.

Emergency Stabilization: Remove vegetation to provide access to walls and dam. Salvage large stones from stream bed and stockpile; remove upstream and downstream gravel from stream bed; sandbag left bank above and below dam to stabilize; use stockpiled stones to "hold" face of sandbags.
Note: This is a Spring/Summer 1997 priority project.

Preservation Maintenance Calendar

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park
Dam # 19: Jungle Falls (4 of 4)

Management Zone: 2 - Stream and Adjacent Paths
Sub-Zone: i - Jungle Falls

Historic Significance: More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics: The dam is constructed of stone spill rocks with adjacent concrete and stone retaining walls. It is located approximately 70 feet upstream from the second of the Three Meadow Falls.

Preservation Practices and Work Procedures:

1996 Condition & Comments: The structural condition of the dam is unknown because it is completely buried (except for one end of the left wingwall). There is minimal scouring in the channel bed; both downstream banks show minimal signs of erosion.

Emergency Stabilization: Remove vegetation to provide access to walls and dam. Silt which covers dam structure is essentially protecting it, although water is completely out of designed channel.
Repair: None needed.

Preservation Maintenance Calendar:

Winter: Periodically check for ice damage.
Spring: Remove debris and repair damage resulting from winter storms.
Summer: Remove excessive silt deposits; pull drain plugs to flush out debris and silt accumulations.
Fall: Remove debris which has accumulated behind dams.

Dumbarton Oaks Park

INVENTORY - Circulation

Management Zone / Subzone		Feature Type	Trail Location*	Step Number
3	Southside Stream Slope			
3b	Forsythia Walk	Landing		1-L
		Step		1
		Step		2
		Landing		2-L
		Step		3
		Step		4
		Step		5
		Landing		3-L
		Step		6
		Step		7
		Step		8

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October, 1996.

**Distance along the trail, in feet, from the entrance gate.*

Dumbarton Oaks Park

INVENTORY - Circulation

Management Zone / Subzone		Feature Type	Trail Location*	Step Number
3	Southside Stream Slope			
3b	Forsythia Walk	Landing		4-L
		Step		9
		Step		10
		Step		11
		Step		12
		Step		13
		Step		14
		Step		15
		Step		16
		Landing		5-L
		Step		17

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October, 1996.

**Distance along the trail, in feet, from the entrance gate.*

Dumbarton Oaks Park

INVENTORY - Circulation

Management Zone / Subzone		Feature Type	Trail Location*	Step Number
3	Southside Stream Slope			
3b	Forsythia Walk	Step		18
		Step		19
		Step		20
		Step		21
		Step		22
		Step		23
		Step		24
		Landing		6-L
		Step		25
		Step		26
		Step		27

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October, 1996.

**Distance along the trail, in feet, from the entrance gate.*

Dumbarton Oaks Park

INVENTORY - Circulation

Management Zone / Subzone		Feature Type	Trail Location*	Step Number
3	Southside Stream Slope			
3b	Forsythia Walk	Step		28
		Step		29
		Step		30
		Step		31
		East Path		
		West Path		
1	Lover's Lane Entrance/Beech Grove			
	Trail from Grove Entrance	Trail		
		Trail	75	
		Trail	150	
		Trail	160	

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October, 1996.

**Distance along the trail, in feet, from the entrance gate.*

Dumbarton Oaks Park

INVENTORY - Vegetation

Management Zone

Subzone	Scientific Name	Common Name	ID code*
1 Lover's Lane Entrance/Beech Grove			
	Liriodendron tulipifera	Tuliptree	LT-1
	Fagus grandifolia	American Beech	FG-2
	Fagus grandifolia	American Beech	FG-3
	Maclura pomifera	Osage Orange	MP-4
	Fagus grandifolia	American Beech	FG-5
	Maclura pomifera	Osage Orange	MP-6
	Fagus grandifolia	American Beech	FG-7
	Fagus grandifolia	American Beech	FG-8
	Fagus grandifolia	American Beech	FG-9
	Fagus grandifolia	American Beech	FG-10
3 Southside Stream Slope			
3a East Boundary to Forsythia Walk	*Ulmus americana*	American Elm	UA-11
1 Lover's Lane Entrance/Beech Grove			
	Fraxinus pennsylvanica	Green Ash	FP-12

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October, 1996.

**ID code keyed to Work Needed Map for Forsythia Hill and Lover's Lane Entrance/Beech Grove.* Rev. 5/6/97

Dumbarton Oaks Park

INVENTORY - Vegetation

Management Zone

Subzone	Scientific Name	Common Name	ID code*
1 Lover's Lane Entrance/Beech Grove			
	Fagus grandifolia	American Beech	FG-13
	Juglans nigra	Black walnut	JN-14
3 Southside Stream Slope			
3a East Boundary to Forsythia Walk	*Quercus velutina*	Black Oak	QV-15
3b Forsythia Walk	*Platanus occidentalis*	Sycamore	PO-16
3a East Boundary to Forsythia Walk	*Paulownia tomentosa*	Princess Tree	PT-17
	Liriodendron tulipifera	Tulip Poplar	LT-18
3c Forsythia Walk to Rhododendron Planting	*Acer platanoides*	Norway Maple	AP-19
	Prunus serotina	Black Cherry	PS-20
	Liriodendron tulipifera	Tulip Poplar	LT-21
	Robinia pseudoacacia	Black Locust	RP-22
3b Forsythia Walk	*Forsythia suspensa*	Weeping Forsythia	FS-1&2

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October, 1996.

**ID code keyed to Work Needed Map for Forsythia Hill and Lover's Lane Entrance/Beech Grove.* Rev. 5/6/97

Dumbarton Oaks Park

CONDITION ASSESSMENT - Circulation

Management Zone

Subzone Number & Name	Step Number/Location	Comments on condition
3 Southside Stream Slope		
3b Forsythia Walk	Landing1-L	Covered by encroaching vegetation and soil deposits.
	Step 1	Covered by soil deposits.
	Step 2	Covered by soil deposits.
	Landing2-L	Covered by encroaching vegetation and soil deposits.
	Step 3	Displaced stones.
	Step 4	Covered by soil deposits.
	Step 5	Covered by soil deposits.
	Landing3-L	Covered by encroaching vegetation and soil deposits.
	Step 6	Good condition.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Circulation

Management Zone

Subzone Number & Name	Step Number/Location	Comments on condition
3 Southside Stream Slope		
3b Forsythia Walk	Step 7	Good condition.
	Step 8	Good condition.
	Landing4-L	Loose stones.
	Step 9	Good condition.
	Step 10	Loose stone on west side.
2b	Step 11	Good condition.
3b	Step 12	Good condition.
	Step 13	Good condition.
	Step 14	Good condition.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Circulation

Management Zone

Subzone Number & Name	Step Number/Location	Comments on condition
3 Southside Stream Slope		
3b Forsythia Walk	Step 15	Good condition.
	Step 16	Good condition.
	Landing5-L	Loose stones; covered by encroaching vegetation and soil deposits.
	Step 17	Good condition.
	Step 18	Good condition.
	Step 19	Good condition.
	Step 20	Good condition.
	Step 21	Good condition.
	Step 22	Good condition.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Circulation

Management Zone

Subzone Number & Name	Step Number/Location	Comments on condition
3 Southside Stream Slope		
3b Forsythia Walk	Step 23	Good condition.
	Step 24	Good condition.
	Landing6-L	Good condition.
	Step 25	Good condition.
	Step 26	Good condition.
	Step 27	Good condition.
	Step 28	Goodcondition.
	Step 29	Good condition.
	Step 30	Good condition.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Circulation

Management Zone

Subzone Number & Name	Step Number/Location	Comments on condition
3 Southside Stream Slope		
3b Forsythia Walk	Step 31	Good condition.
	East Path	Covered by soil deposits.
	West Path	Fair condition.
1 Lover's Lane Entrance/Beech Grove		
Trail from Entrance	Trail	9' wide at gate; evidence of stone edge that once lined path; compacted stones; covered with soil; unable to determine whether path extended to wall or not, but it is likely.
	Trail 75	Good condition.
	Trail 150	Drainage swale created by water; stone edge apparent.
	Trail 160	Trail at end of stone wall is 10 feet wide; all new material; stone-edge apparent on both sides; no existing river stones.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Entrance Gate

Management Zone	Feature	Comments on condition
1 Lover's Lane Entrance\Beech Grove		
	Front entrance gates	Original hardware and hinges, possibly some original panels.
	Entrance gate columns	Right gate northern column capstone loose; loose stones; missing bottom right hinge plate.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal,Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Entrance wall

Management Zone	Location	Comments on condition
1 Lover's Lane Entrance\Beech Grove		
	24' feet westward from gate.	Backing stone and facing stones fallen into path; worn path along fence line from wall.
	60' feet westward from gate.	Good condition.
	90' feet westward from gate.	Erosion paths created from runoff originating at Dumbarton Oaks estate fence.
	120' feet westward from gate.	Good condition.
	140' feet westward from gate.	Good condition.
	160' feet westward from gate.	Good condition.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

CONDITION ASSESSMENT - Vegetation

Management Zone

Subzone Number & Name

Tree ID code	Scientific Name	Common Name	Comments on condition
1 Lover's Lane Entrance/Beech Grove			
LT-1	*Liriodendron tulipifera*	Tuliptree	Fair condition; dead branches. Pre-Farrand Period
FG-2	*Fagus grandifolia*	American Beech	Good condition. Pre-Farrand Period
FG-3	*Fagus grandifolia*	American Beech	Good condition. Post Farrand Period
MP-4	*Maclura pomifera*	Osage Orange	Good condition; volunteer beech established in trunk cavity. Pre-Farrand Period
FG-5	*Fagus grandifolia*	American Beech	Good condition; one girdling root. Post Farrand Period
MP-6	*Maclura pomifera*	Osage Orange	DEAD Pre-Farrand Period

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

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Dumbarton Oaks Park

CONDITION ASSESSMENT - Vegetation

Management Zone

Subzone Number & Name

Tree ID code	Scientific Name	Common Name	Comments on condition
1 Lover's Lane Entrance/Beech Grove			
FG-7	*Fagus grandifolia*	American Beech	Good condition; growing into adjacent beech. Post Farrand Period
FG-8	*Fagus grandifolia*	American Beech	Good condition. Pre-Farrand Period
FG-9	*Fagus grandifolia*	American Beech	Fair condition; sap flow at limb crotch. Pre-Farrand Period
FG-10	*Fagus grandifolia*	American Beech	Fair condition; mushrooms indicating internal decay, leaning 30% lean over trail. Pre-Farrand Period
3 Southside Stream Slope			
3a	East Boundary to Forsythia Walk		
UA-11	*Ulmus americana*	American Elm	Fair condition; deadwood, adjacent tree leaning on elm. Farrand Period
1 Lover's Lane Entrance/Beech Grove			
FP-12	*Fraxinus pennsylvanica*	Green Ash	Good condition. Post Farrand Period

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Rev. 5/6/97

Dumbarton Oaks Park

CONDITION ASSESSMENT - Vegetation

Management Zone

Subzone Number & Name

Tree ID code	Scientific Name	Common Name	Comments on condition
1 Lover's Lane Entrance/Beech Grove			
FG-13	*Fagus grandifolia*	American Beech	Good condition. Post Farrand Period
JN-14	*Juglans nigra*	Black walnut	Good condition; adjacent tree limbs crowding walnut. Farrand Period
3 Southside Stream Slope			
3a	East Boundary to Forsythia Walk		
QV-15	*Quercus velutina*	Black Oak	**Hazardous condition.** Pre-Farrand Period
3b	Forsythia Walk		
PO-16	*Platanus occidentalis*	Sycamore	Fair condition; girdling root on trail side, weak leader, poison ivy, invasive honeysuckle, grape vine on or near trunk. Pre-Farrand Period
3a	East Boundary to Forsythia Walk		
PT-17	*Paulownia tomentosa*	Princess Tree	Poor condition. Farrand Period
3a	East Boundary to Forsythia Walk		
LT-18	*Liriodendron tulipifera*	Tulip Poplar	Fair condition; double leader, deadwood, invasive vines on trunk. Farrand Period

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Rev. 5/6/97

Dumbarton Oaks Park

CONDITION ASSESSMENT - Vegetation

Management Zone

Subzone Number & Name

Tree ID code	Scientific Name	Common Name	Comments on condition
3 Southside Stream Slope			
3c	Forsythia Walk to Rhododendron Planting		
AP-19	*Acer platanoides*	Norway Maple	Good condition. Post Farrand Period
3c	Forsythia Walk to Rhododendron Planting		
PS-20	*Prunus serotina*	Black Cherry	Fair condition; invasive vines on trunk. Farrand Period
3c	Forsythia Walk to Rhododendron Planting		
LT-21	*Liriodendron tulipifera*	Tulip Poplar	Fair condition; deadwood, suckers, watersprouts. Grouping of 4 trees; 1 dates to Pre-Farrand Period, 2 date to Farrand Period, and 1 dates to Post Farrand Period
3c	Forsythia Walk to Rhododendron Planting		
RP-22	*Robinia pseudoacacia*	Black Locust	Fair condition; deadwood. Farrand Period
3b	Forsythia Walk		
FS-1&2	*Forsythia suspensa*	Weeping Forsythia	Fair condition; only 2 shrubs remain from historic mass planting.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Rev. 5/6/97

Preservation Alternatives
Forsythia Hill and Lover's Lane Entrance

Protection

- Remove dead, deteriorated, hazardous and diseased wood from all trees
- Remove debris from stairs
- Remove non-historic invasive vegetation (grape, ampelopsis, honeysuckle, poison ivy, etc.)
- Apply 3-4" mulch
- Establish a herbaceous plant/bulb inventory and identification system to map existing plantings and guide replanting projects
- Collect mortar sample from stairs for composition analysis

Protection and *Stabilization*

- Remove dead, deteriorated, hazardous and diseased wood from all trees
- Remove debris from stairs
- Remove non-historic invasive vegetation (grape, ampelopsis, honeysuckle, poison ivy, etc.)
- Apply 3-4" mulch
- Establish a herbaceous plant/bulb inventory and identification system to map existing plantings and guide replanting projects
- Collect mortar sample from stairs for composition analysis
- *Cable two main leaders of Sycamore*
- *Prune to rejuvenate all remaining forsythia*

Protection, Stabilization and *Repair*

- Remove dead, deteriorated, hazardous and diseased wood from all trees
- Remove debris from stairs
- Remove non-historic invasive vegetation (grape, ampelopsis, honeysuckle, poison ivy, etc.)
- Apply 3-4" mulch
- Establish a herbaceous plant/bulb inventory and identification system to map existing plantings and guide replanting projects
- Collect mortar sample from stairs for composition analysis
- Cable two main leaders of Sycamore
- Prune to rejuvenate all remaining forsythia
- *Remove Paulownia and document location (replace in-kind if recommended in CLR)*
- *Replace forsythia in-kind*
- *Prune Cherry to improve condition and form*
- *Reset missing or loose stones in stairway*

DETAIL OF STEPS

West Path
Work Needed: Remove vegetation between rocks and resurface.

East Path
Work Needed: Remove soil to locate stones.

Steps 25-31
Work Needed: Cut back encroaching vegetation.

Steps 17-24
Work Needed: None.

Steps 9-16
Work Needed: Reset stones to the left; remove encroaching vegetation and soil.

Steps 6-8
Work Needed: None.

Steps 3-5
Work Needed: Replace displaced stone, remove soil.

Steps 1 & 2
Work Needed: Remove soil at the edges.

Landing 6-L
Work Needed: None.

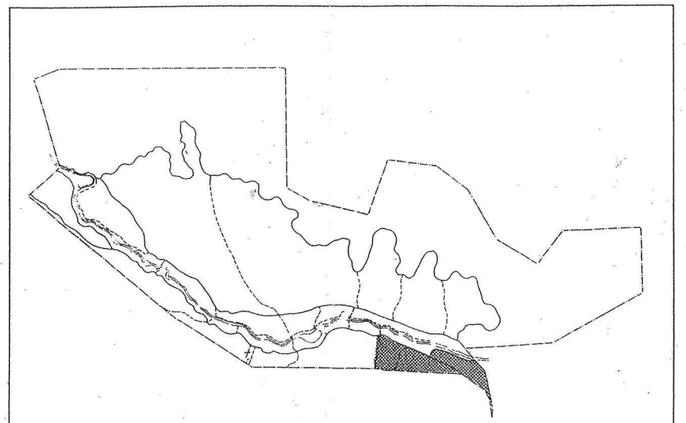
Landing 5-L
Work Needed: Reset stones; remove encroaching vegetation and soil.

Landing 4-L
Work Needed: Reset stones

Landing 3-L
Work Needed: Remove encroaching vegetation.

Landing 2-L
Work Needed: Remove encroaching vegetation and soil.

Landing 1-L
Work Needed: Remove encroaching vegetation and soil.



CONTEXT MAP-DUMBARTON OAKS PARK- PROJECT AREA

KEY to SIGNIFICANCE OF TREES

- ● Pre-Farrand Period
- ○ Farrand Period
- × Post Farrand Period

Based on HABS Report on Dumbarton Oaks
* Only trees labeled were inspected for this portion of the project.

PO-16 *Platanus occidentalis*-Sycamore
Work Needed: Evaluate removal of girdling root; cable leaders; remove poison ivy, honey suckle, and grape vines.

RP-22 *Robinia pseudoacacia*-Black Locust
Work Needed: Remove deadwood.

LT-21 *Liriodendron tulipifera*-Tuliptree
Work Needed: Remove deadwood, suckers, and watersprouts.

AP-19 *Acer platanoides*-Norway Maple
Work Needed: None.

SEE DETAIL OF STEPS ABOVE

FORSYTHIA GATE

PS-20 *Prunus serotina*- Black Cherry
Work Needed: Remove vines and prune to improve shape.

LT-18 *Liriodendron tulipifera*-Tuliptree
Work Needed: Remove deadwood and vines.

PT-17 *Paulownia tomentosa*-Princess Tree
Work Needed: Remove and replace in-kind.

JN-14 *Juglans nigra*-Black Walnut
Work Needed: Remove limb from adjacent tree.

QV-15 *Quercus velutina*-Black Oak
Work Needed: Hazardous tree; remove and replace in-kind.

UA-11 *Ulmus americana*- American Elm
Work Needed: Remove deadwood and adjacent tree.

STONE BRIDGE

FORMAL GARDEN

BEECH GROVE

FG-13 *Fagus grandifolia*-American Beech
Work Needed: None.

FP-12 *Fraxinus pennsylvanica*- Green Ash
Work Needed: None.

FG-10 *Fagus grandifolia*-American Beech
Work Needed: Consider removing and replacing in-kind.

FG-9 *Fagus grandifolia*-American Beech
Work Needed: None.

FG-8 *Fagus grandifolia*-American Beech
Work Needed: None.

FG-7 *Fagus grandifolia*-American Beech
Work Needed: Prune to reduce competition.

MP-6 *Maclura pomifera*-Osage Orange
Work Needed: Remove and replace in-kind.

FG-5 *Fagus grandifolia*-American Beech
Work Needed: Evaluate removal of girdling root.

MP-4 *Maclura pomifera*-Osage Orange
Work Needed: Remove volunteer beech.

FG-3 *Fagus grandifolia*-American Beech
Work Needed: None.

FG-2 *Fagus grandifolia*-American Beech
Work Needed: None.

Lover's Lane Entrance Wall
Work Needed: Repair backing and facing stones at 24' distance point.

LT-1 *Liriodendron tulipifera*-Tuliptree
Work Needed: Remove dead branches

Entrance Gate and Columns
Work Needed: Reset northern column capstone and loose stones; replace bottom hinge plate.

ENTRY GATE

Dumbarton Oaks Park

Forsythia Hill and Lover's Lane Entrance/Beech Grove
Work Needed
Landscape Preservation Maintenance Plan, April 1997

REDUCED REPRODUCTION
NOT TO SCALE

NORTH

BASE LINE DATA TAKEN FROM HABS REPORT, 1989

Dumbarton Oaks Park

WORK NEEDED - Circulation

Management Zone

Subzone

Feature Type & Number/Location		Work Needed
3 Southside Stream Slope		
3b Forsythia Walk		
Landing	1-L	Remove encroaching vegetation and soil.
Step	1	Remove soil at edges.
Step	2	Remove soil at edges.
Landing	2-L	Remove encroaching vegetation and soil.
Step	3	Replace displaced stone.
Step	4	Remove soil.
Step	5	Remove soil.
Landing	3-L	Remove encroaching vegetation and soil.
Step	6	None needed.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

WORK NEEDED - Circulation

Management Zone

Subzone

Feature Type & Number/Location		Work Needed
3 Southside Stream Slope		
3b Forsythia Walk		
Step	7	None needed.
Step	8	None needed.
Landing	4-L	Reset stones.
Step	9	None needed.
Step	10	Reset stones to the left.
Step	11	None needed.
Step	12	None needed.
Step	13	Remove encroaching vegetation and soil.
Step	14	Remove encroaching vegetation and soil.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

WORK NEEDED - Circulation

Management Zone

Subzone

Feature Type & Number/Location		Work Needed
3 Southside Stream Slope		
3b Forsythia Walk		
Step	15	Remove encroaching vegetation and soil.
Step	16	Remove encroaching vegetation and soil.
Landing	5-L	Reset stones; remove encroaching vegetation and soil.
Step	17	None needed.
Step	18	None needed.
Step	19	None needed.
Step	20	None needed.
Step	21	None needed.
Step	22	None needed.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

WORK NEEDED - Circulation

Management Zone

Subzone

Feature Type & Number/Location		Work Needed
3 Southside Stream Slope		
3b Forsythia Walk		
Step	23	None needed.
Step	24	None needed.
Landing	6-L	None needed.
Step	25	Cut back encroaching vegetation.
Step	26	Cut back encroaching vegetation.
Step	27	Cut back encroaching vegetation.
Step	28	Cut back encroaching vegetation.
Step	29	Cut back encroaching vegetation.
Step	30	Cut back encroaching vegetation.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

WORK NEEDED - Circulation

Management Zone

Subzone

Feature Type & Number/Location		Work Needed
3 Southside Stream Slope		
3b Forsythia Walk		
Step	31	Cut back encroaching vegetation.
East Path		Remove soil to locate stones.
West Path		Remove vegetation between rocks and resurface; inventory and map spring bulbs.
1 Lover's Lane Entrance/Beech Grove		
Trail from Entrance		
Trail		None needed.
Trail	75	None needed.
Trail	150	None needed.
Trail	160	None needed.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

Dumbarton Oaks Park

WORK NEEDED - Vegetation*

Management Zone

Subzone

Tree Number & Name		Work Needed
1 Lover's Lane Entrance/Beech Grove		
LT-1	Tuliptree *Liriodendron tulipifera*	Remove dead branches. Pre-Farrand Period
FG-2	American Beech *Fagus grandifolia*	None. Pre-Farrand Period
FG-3	American Beech *Fagus grandifolia*	None. Post Farrand Period
MP-4	Osage Orange *Maclura pomifera*	Remove volunteer beech. Pre-Farrand Period
FG-5	American Beech *Fagus grandifolia*	Evaluate removal of girdling root. Post Farrand Period
MP-6	Osage Orange *Maclura pomifera*	Remove and replace in-kind. Pre-Farrand Period

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

One hazard tree has been identified and should be the first priority for tree work completed.

Rev. 5/6/97

Dumbarton Oaks Park

WORK NEEDED - Vegetation*

Management Zone

Subzone
Tree Number & Name — Work Needed

1 Lover's Lane Entrance/Beech Grove

FG-7 American Beech
Fagus grandifolia
Prune to reduce competition.
Post Farrand Period

FG-8 American Beech
Fagus grandifolia
None.
Pre-Farrand Period

FG-9 American Beech
Fagus grandifolia
None.
Pre-Farrand Period

FG-10 American Beech
Fagus grandifolia
Consider removing and replacing in-kind.
Pre-Farrand Period

3 Southside Stream Slope

3a East Boundary to Forsythia Walk
UA-11 American Elm
Ulmus americana
Remove deadwood and adjacent tree.
Farrand Period

1 Lover's Lane Entrance/Beech Grove

FP-12 Green Ash
Fraxinus pennsylvanica
None.
Post Farrand Period

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

One hazard tree has been identified and should be the first priority for tree work completed.

Rev. 5/6/97

Dumbarton Oaks Park

WORK NEEDED - Vegetation*

Management Zone

Subzone Tree Number & Name	Work Needed
1 Lover's Lane Entrance/Beech Grove	
FG-13 American Beech *Fagus grandifolia*	None. Post Farrand Period
JN-14 Black walnut *Juglans nigra*	Remove limb from adjacent tree. Farrand Period
3 Southside Stream Slope	
3a East Boundary to Forsythia Walk QV-15 Black Oak *Quercus velutina*	**Hazardous tree** Remove and replace in-kind. Pre-Farrand Period
3b Forsythia Walk PO-16 Sycamore *Platanus occidentalis*	Evaluate removal of girdling root; cable leaders; remove poison ivy, honeysuckle, and grape vine. Pre-Farrand Period
3a East Boundary to Forsythia Walk PT-17 Princess Tree *Paulownia tomentosa*	Remove and replace in-kind. Farrand Period
3a East Boundary to Forsythia Walk LT-18 Tulip Poplar *Liriodendron tulipifera*	Remove deadwood and vines. Farrand Period

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

One hazard tree has been identified and should be the first priority for tree work completed.

Rev. 5/6/97

Dumbarton Oaks Park

WORK NEEDED - Vegetation*

Management Zone

Subzone
Tree Number & Name — Work Needed

3 Southside Stream Slope

3c Forsythia Walk to Rhododendron Planting
AP-19 Norway Maple
Acer platanoides
None.
Post Farrand Period

3c Forsythia Walk to Rhododendron Planting
PS-20 Black Cherry
Prunus serotina
Remove vines and prune to improve shape.
Farrand Period

3c Forsythia Walk to Rhododendron Planting
LT-21 Tulip Poplar
Liriodendron tulipifera
Remove deadwood, suckers/watersprouts.
Grouping of 4 trees; 1 dates to Pre-Farrand Period, 2 date to Farrand Period, and 1 dates to Post Farrand Period

3c Forsythia Walk to Rhododendron Planting
RP-22 Black Locust
Robinia pseudoacacia
Remove deadwood.
Farrand Period

3b Forsythia Walk
FS-1&2 Weeping Forsythia
Forsythia suspensa
Prune to rejuvenate and propagate by layer and cuttings.

Inspection completed by Jim Ingram, Jane MacLiesh and Brian Stephenson of the Friends of Dumbarton Oaks Park, and Darwina Neal, Cynthia Cox, Steve Strach, Doug Curtis, Dan Hodgson, and Charlie Pepper of the National Park Service, October 1996.

One hazard tree has been identified and should be the first priority for tree work completed.

Rev. 5/6/97

Dumbarton Oaks Park
Feature Data: Circulation

Management Zone: 1 - Lover's Lane Entrance/Beech Grove
Sub-Zone:

Historic Significance: The circulation system within the park, and the order of progression along it, were important integral components of the original design prepared by Beatrix Farrand. Although the primary connection, and thus the direction of travel, between Dumbarton Oaks Garden and the Park were via Forsythia Gate and steps down Forsythia Hill, the current entrance to the park is through a gate at the bottom of Lover's Lane which Beatrix Farrand originally designed as a secondary entrance. From Lover's Lane Gate, the path proceeded through the Beech Grove, to the bottom of the path from the garden, then followed the south side of the stream until the Clapper Bridge Falls, where it crossed the stream and continued west to the Islet. From this point, the trail passed through a shrub plantation of rhododendrons and mountain laurel and continued back through the woods on the north slope, then via the old road down the hill to the Stone Bridge. The original route then doubled back along the stream and up Forsythia Hill; the current one would leave the park via Lover's Lane.

Descriptive Characteristics: Most of the trail in this management zone is surfaced with washed river stone (1/4"- 1/2" diameter) and compacted gravel. There is evidence that the historic surfacing was gravel with a stone edge. The trail is nine feet wide at the entrance gate and narrows to approximately four feet wide near Forsythia Hill.

1996 Comments/Condition: It appears that the grade of the trail has been raised at the entrance gate. Although it is not certain, it appears that the path width extended from the face of the stone retaining wall on the south side, north toward the stream, to the line of Beech trees, a total of 12' near the gates. Stones that historically lined the trail remain visible in several locations. Most of the trail surface is in good condition in this area.

As of 1996, much of the original trail system exists and is in good condition however, many areas adjacent to the stream have been lost or damaged due to erosion or sedimentation. Other sections are difficult to traverse due to the overgrowth of vegetation

Dumbarton Oaks Park
Feature Data: Circulation

Preservation Maintenance Calendar

Winter-

Remove snow and ice as needed

Spring-

Repair erosion/ruts resulting from winter storms.
Remove surface debris.
Reset edge stones which may have been frost heaved during winter.

Summer-

Inspect surface condition.
Remove vegetation which encroaches on trails.

Fall-

Remove debris.
Repair damage resulting from summer use.
Reset edge stones which may have been dislodged as a result of summer use.

Dumbarton Oaks Park
Feature Data: Forsythia Walk

Management Zone: 3 - Southside Stream Slope
Sub-Zone: b - Forsythia Walk

Historic Significance: The Forsythia Walk was intended to sweep down the slope from Dumbarton Oaks Garden. It was marked by a distinctive sycamore tree at the bottom of the slope and visually enclosed by tulip trees and a magnolia at the edge of the mass shrub planting. These trees framed the view into the meadows in the west of the park.

Farrand's instructions on the upkeep of the forsythia on Forsythia Hill were:

"The Forsythia should be kept pruned each year, so that the heavy wood is taken out of the plants and so that they are not allowed to become too massive or invasive. If all the modeling of the hill is obscured by the mass of Forsythia, it becomes only a tangled, even if lovely, group of planting. The modeling of the hillside is an essential part of its beauty."

Beatrix Farrand also recommends the planting combination for this dell in her original site survey:

"a largeness of forsythia planted on one of the hillsides and in combination with the blue lung wort and daffodils will be attractive at its own moment."

Descriptive Characteristics: Forsythia Walk is comprised of a series of 31 stone steps with six landings, descending to the stream paths and beech grove. The steps were bordered on both sides by a Forsythia hedge and many trees which framed the view into the meadow in the west of the park and was accented by a large Sycamore tree at the base of the steps.

1996 Comments/Condition: The lack of maintenance of this area in the past has led to its deterioration. The sentinel sycamore is still in place, but invasive material has destroyed the original design intent for this section of the park. The views across to the meadow have now been lost as a result of overgrown vegetation. Due to invasive vegetation and siltation, the steps need to be uncovered, cleaned and, in some cases, reset.

Recommended Stabilization Treatment: Collect mortar sample from stairs and have composition analyzed; develop herbaceous plant/bulb inventory and identification system to map existing original plants and guide replanting projects; replant/fill-in gaps using nursery-grown plants of species to match that grown in adjacent Garden area.

Dumbarton Oaks Park
Feature Data: Forsythia Walk

Preservation Maintenance Calendar

Winter-

Remove snow and ice from steps as needed.

Spring-

Remove surface debris from steps.
Resurface as needed using historically correct materials.
Reset stones which may have been frost heaved during winter.

Summer-

Inspect surface condition.
Remove woody and/or exotic vegetation as needed.

Fall-

Remove debris.
Repair damage resulting from summer use.
Resurface as needed using historically correct materials.
Reset stones which may have been dislodged as a result of summer use.

Dumbarton Oaks Park

Tree Feature Data: American Beech - *Fagus grandifolia*

Category:	Deciduous tree
Areas:	1-Lover's Lane Entrance/Beech Grove
Feature Name:	*Fagus grandifolia* (American Beech)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	FG-2, FG-3, FG-5, FG-7, FG-8, FG-9, FG-10, FG-13.

Historic Significance/Appearance/Intent:

An original farm road, lined with mature American beeches, descended the north slope, emerging from a stand of oaks along the road to the south side of the stream. The existing beech trees reflect the natural vegetation that Beatrix Farrand retained and enhanced in her design for the informal portion of the estate. The beech trees and shrub layer were used to enhance and create a formal entrance and evoke a feeling of enclosure.

Descriptive Characteristics:

Habit: A sturdy, imposing tree, often with short trunk and wide spreading crown. Beautiful native species which is restricted for use in large open areas, heights range from 50 to 70 feet, but has been known to reach 100 to 120 feet. The spread is usually less than or equal to the height.

Leaves: Alternate simple ovate- oblong 2" to 5" long 3/4" to 2 1/2" wide, broad-cuneate at base, coarsely serrate, glossy dark green above light green and usually glabrous below.

Buds: Imbricate, slender, 3/4"to 1" long, brown with sharp apex.

Stems: Slender, somewhat zigzag, smooth, shining, silver gray, especially on the older stems.

Bark: Thin smooth light bluish-gray, almost silvery on young shoots but turns dark gray on older trees.

Native Habitat: New Brunswick to Ontario, south to Florida and Texas.

Dumbarton Oaks Park

Tree Feature Data: American Beech - *Fagus grandifolia*

Preservation Practices and Work Procedures:

As the mature beech trees decline and die, in-kind replacements should be planted to ensure continuity and preserve the character of the entrance as originally envisioned by Beatrix Farrand. Since the beech trees are growing naturally in a woodland setting, maintenance practices are recommended for the safety of visitors only and not specifically to maintain specific specimens in perpetuity. The trees should be periodically inspected for their structural integrity. If hazard pruning is necessary, it should be done immediately, regardless of season. However, structural pruning is best done in late winter or early spring before buds enlarge. Cabling is recommended for large specimens only and should be done in winter

Winter:

Prune out dead, damaged, and diseased wood as needed. Prune to maintain structurally open form to prevent wind-throw in heavy storms.

Inspect/Repair/Install cabling as needed.

Spring:

Transplant. Spring is the best time to transplant replacement trees. Moist well-drained soil (pH 5.0 to 6.5) is preferred.

Inspect trees for any pest problems.

Summer:

Water newly transplanted trees so that they receive one inch of water every 10 days. Water mature trees during drought.

Prune in late summer if necessary.

Insects, Diseases, and Cultural Problems:

Insects-

Brown wood borer
Aphids
Beech Scale
Spider Mites
Two-lined chestnut borer
caterpillars

Diseases-

Leaf Spots
Powdery Mildew
Crown Rot
Bleeding Canker
Leaf mottle

Cultural Problems- Very shallow root systems and cannot handle extreme disturbances in root zone. Cannot withstand wet compacted soil with Oxygen levels less than 10%-15%.

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: Seed, 41° for 90 days in moist sand, germination rate is upwards of 95%.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs*. 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation*. Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs*. Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: American Elm - *Ulmus americana*

Category:	Deciduous tree
Areas:	3-Southside Stream Slope
Feature Name:	*Ulmus americana* (American Elm)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	UA-11

Historic Significance/Appearance/Intent:

Farrand Period. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics:

Habit: Three distinct habits are recognized and include the vase-shaped form in which the trunk divides into several erect limbs strongly arched above and terminating in numerous slender often pendulous branchlets, the whole tree a picture of great beauty and symmetry; a form with more widely spreading, less arching branches, often called the "oak-form"; and a narrow form with branchlets clothing the entire trunk.

Leaves: Alternate, simple, ovate-oblong 3-6" long, 1-3" wide doubly serrate, glabrous and rough (or smooth) above, pubescent or nearly glabrous beneath, lustrous dark green in summer, yellow in fall.

Bark: Dark gray with broad, deep intersecting ridges, often scaly

Buds: Light reddish brown, smooth and shining or slightly pale- downy.

Fruit: Rounded, notched disk-shaped samara, 1/2 " long maturing in May-June.

Native Habitat: Newfoundland to Florida, west to the Rockies. Introduced to cultivation in 1752 (Dirr, 1990)

Dumbarton Oaks Park

Tree Feature Data: American Elm - *Ulmus americana*

Preservation Practices and Work Procedures:

Winter:

Prune out dead, damaged, and diseased wood as needed (only in dormant season, if possible). Fresh wounds during summer or early fall can attract the elm bark beetle, carrier of Dutch Elm disease. Prune lightly to maintain structurally open form to prevent wind-throw in heavy storms. Remove watersprouts and sucker growth.

Inspect/Repair/Install cabling as needed.

Spring:

Check soil pH. Elms prefer slightly more acidic soils (pH 4.0 - 7.0). Collect a soil sample and send it to the Cooperative Extension Service for determination of pH, phosphorus and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition.

Lighting Cables are recommended for large elms. Check terminals every 2-3 years to see if they need to be raised. Loosen cables as needed to prevent tree from growing over/around cable.

Transplant. Spring is the best time to transplant replacement trees.

Inspect trees for any branch showing signs of Dutch elm disease. Signs include wilting, yellowing, or leaf drop. Prune entire limb immediately and send cuttings in for positive identification of Dutch elm disease.

Summer:

Inspect trees for any branch showing signs of Dutch elm disease. Signs include wilting, yellowing, or leaf drop. Prune immediately and send cuttings in for positive identification of Dutch elm disease.

Water newly transplanted trees so that they receive one inch of water every 10 days.

Fall:

Cables Inspect cables after wind storms.

Dumbarton Oaks Park

Tree Feature Data: American Elm - *Ulmus americana*

Insects, Diseases, and Cultural Problems:

Insects-

Woolly Elm Aphid	Linden Hopper
Aphids	Elm Leaf Beetle
European Elm Scales	Elm Cockscomb Gall
Clover Mites	Elm Leaf Miner
Two Spotted Spider Mite	Elm Case Bearer
European Red Mite	Elm Bark Beetle
Gypsy Moth	Cankerworms
Forest Tent Caterpillar	Insect Galls
Leaf Hoppers	Lecanium Scale
Rust Mite	Twig Pruner

Diseases-

Dutch Elm Disease
Elm Yellows

Cultural Problems-

Intolerant of Chlorine
Elms frequently produce watersprouts or excessive branches. Prune trees regularly to reduce the size of the pruning cuts needed.

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source (Washington Elm clone)
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: Seed matures mid-March to mid-June; fruit greenish-brown at maturity cold stratify 2-3 months at 41°F for uniform germination.

Cuttings: Early June, 8000 ppm IBA-tale, peat: perlite medium mist.

Grafting: Chip budding July-August. Bench graft Understock in February or March using 1-2 year old scion with side or veneer graft.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs*. 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation.* Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs.* Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: Black Cherry - *Prunus serotina*

Category:	Deciduous tree
Areas:	3-Southside Stream Slope
Feature Name:	*Prunus serotina* (Black cherry)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	PS-20

Historic Significance/Appearance/Intent:

Farrand Period. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics:

Habit: Large tree reaching heights of 50-60 feet.

Leaves: Alternate, simple, oblong-ovate to lance-oblong, 2 to 5" long, and 1-1¾" wide, acuminate, cuneate, serrulate with small in-curved callous teeth. Leaf color is lustrous medium to dark green above and light green beneath and often having long soft shaggy hairs along the midrib; yellow to red in fall.

Flowers: Many small white flowers borne in pendulous racemes 4-6" long in May.

Fruits: Red, changing to black; ⅓" diameter, ripening in August-September, bitter-sweet wine-like flavor.

Native Habitat: Ontario to North Dakota, Texas and Florida. Introduced 1629 (Dirr, 1990).

Dumbarton Oaks Park
Tree Feature Data: Black Cherry - *Prunus serotina*

Preservation Practices and Work Procedures:

Spring-

Transplant. Spring is the best time to transplant replacement trees from the nursery.

Inspect trees for damage caused by aphids, bacterial canker, plum curculio, cankerworms, European fruit lecanium, fall webworm, leafroller, Japanese beetle, spider mite, and black knot.

Summer-

Water newly transplanted trees so that they receive one inch of water every 10 days.

Prune to remove sucker growth. Cherries are susceptible to fungal diseases so sterilize tools between cuts.

Inspect trees for damage caused by aphids, bacterial canker, plum curculio, cankerworms, European fruit lecanium, fall webworm, leafroller, Japanese beetle, spider mite, and black knot.

Fall-

Rake up leaves and fruit. Dispose off-site to interrupt the life cycle of pests.

Insects, Diseases, and Cultural Problems:

Insects-

Aphids suck the juice from the cherry tree leaves and cause the leaves to crinkle or curl downward and are usually covered with sticky coating. Aphids are active during warm weather and tend to attack shoots, watersprouts, cracks, and fresh pruning cuts. Treat with soap if infestation level is high.

Cankerworms eat and shred buds and leaves.
Cherry fruit fly maggots feed on developing fruits.
European lecanium scale
European red mite
Fall webworms
Japanese beetles
Leafroller
Oystershell scale
Tent caterpillars
Oriental fruit moth larvae
Pear Sawfly/Pear Slugs
Plum curculio
San Jose scale
Spider mites

Tree Feature Data: Black Cherry - *Prunus serotina*

Diseases-

Bacterial canker
Cherry leaf spot
Black knot
Brown rot
Powdery mildew

Cultural Problems-

Intolerant of extended periods of wet ground.
Require full sun.
Graft throwbacks - if grafted, may get throwback from rootstock.
Bark is very susceptible to mower damage. Damaged bark can make tree susceptible to fungal diseases.
Cherry trees have a predicted life span of 30-50 years because of their susceptibility to infection by diseases.

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs.* 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation.* Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs.* Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs.* Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: Black Locust - *Robinia pseudoacacia*

Category: Deciduous tree

Areas: 3-Southside Stream Slope

Feature Name: *Robinia pseudoacacia* (Black Locust)

Source of Identification: HABS Report on Dumbarton Oaks Park

Field Numbers: RP-22 (West of Forsythia Walk)

Historic Significance/Appearance/Intent:

This is a significant contributing feature dating to the Farrand Period.

Descriptive Characteristics:

Habit: Upright tree with straight trunk and narrow oblong crown, becoming ragged and scraggly with age; may develop as thicket since it seeds freely and suckers from roots; 30-50' height and 20-30' spread.

Leaves: Alternate, pinnately compound, 6-9" long, 6-9 leaflets, elliptic or ovate, 1-2" long, entire, dark bluish green, glabrous above or slightly pubescent when young.

Bark: Red-brown to black, deeply furrowed into rounded, interlacing fibrous ridges.

Flowers: Perfect, sweet pea-like, white, fragrant, borne in racemes 4-8" long in May to early June.

Fruit: Flat pod, brown-black, 2-4" long, smooth, 4-10 seeded, mature in October, persist through winter.

Native Habitat: Pennsylvania to Georgia, west to Iowa, Missouri and Oklahoma. Introduced 1635 (Dirr, 1990).

Preservation Practices and Work Procedures:

Winter -

Prune out dead, damaged, and diseased wood as needed. Structural pruning is best done during the late summer or early fall because black locust trees "bleed" if pruned in the late winter or early spring.

Inspect/Repair/Install cabling as needed.

Inspect trees for internal decay (fungal conks appear on trunk) and borer damage (hollow wood, bulging bark, sawdust). Remove damaged wood since rotting organisms tend to inhabit borer tunnels and hasten the decline of the tree.

Dumbarton Oaks Park

Tree Feature Data: Black Locust - *Robinia pseudoacacia*

Spring-

Check soil pH. Black locusts prefer a mildly acidic soil (pH 4.5-7.0). Collect a soil sample and send to the Cooperative Extension Service for determination of pH, phosphorous and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition. Encourage vigorous, fast growth to improve the tree's resistance to borers.

Transplant. Spring is the best time to transplant replacement trees.

Inspect tree for pest damage.

Summer-

Structural pruning is best done in the late summer or fall.

Raking. Black locusts tend to drop a lot of small branches after wind storms.

Inspect trees for pest damage.

Fall-

Structural pruning is best done in the late summer or early fall.

Raking. Black locusts tend to drop a lot of small branches after wind storms.

Inspect cables, especially before and after storms.

Insects, Diseases, and Cultural Problems:

Insects -

- Locust borer
- Locust leaf miner
- Locust twig borer
- Putnam scale
- Carpenter worm

Diseases-

- Canker
- Damping off
- Leaf spot
- Powdery mildew
- Witches broom
- Wood decay

Cultural Problems-

- Generally problem free.

Dumbarton Oaks Park

Tree Feature Data: Black Locust - *Robinia pseudoacacia*

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: Scarify before planting. Soak in concentrated sulfuric acid for 1 hour, then rinse thoroughly.

Cuttings: Root cuttings ½-1" diameter dug in spring, cut into 2-3" lengths. Pack in boxes of nearly dry sand and store for 3 weeks to callous. Plant roots in rows; after sprouting, hill up and soil.

Grafting: Bench graft in winter on bareroot cuttings (3/8" diameter cut back to 6" height before use). Scion wood from previous winter cut 6-9" long. Whip or side veneer graft and plunge in moist peat and shade with air temperature 45-70°F. Treat with fungicide to reduce losses from botrytis. Pot up after 6 weeks.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs*. 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation*. Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs*. Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

Dumbarton Oaks Park
Tree Feature Data: Black Oak - *Quercus velutina*

Category:	Deciduous tree
Areas:	3-Southside Stream Slope
Feature Name:	*Quercus velutina* (Black Oak)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	QV-15 (280' northwest of entrance, south of trail)

Historic Significance/Appearance/Intent:
Pre-Farrand Period. This tree is a significant contributing feature.

Descriptive Characteristics:

Habit: This is a large tree reaching 50 to 60 feet in height with a variable spread and irregular crown, extensive taproot, grows best in rich moist, well drained soils, however it can be found on hard clay hill tops.

Fruit: Solitary or paired, 1 1/2"-3/4" long, ovoid to hemispherical, red-brown, with bowl like cup enclosing 1/3-1/2 of fruit.

Leaves: Alternate, simple, oblong, ovate to obovate, 4" to 10" long, half to two-thirds as wide, 7-9 lobes, cuneate to truncate, lustrous dark green above, glabrous beneath except at axil of the veins.

Buds: Imbricate ovate to conical, 1/4" to 1/2" long, narrowed to a sharp point, usually 5-sided, covered with pale- yellowish to dirty gray pubescence.

Bark: is nearly black on old trunks, deeply furrowed vertically, with many horizontal breaks, inner bark bright orange to yellow.

Native Habitat: Main to Florida, west to Minnesota and Texas.

Dumbarton Oaks Park
Tree Feature Data: Black Oak - *Quercus velutina*

Preservation Practices and Work Procedures:

Winter -

Prune out dead, damaged, and diseased wood as needed.

Spring-

Inspect cabling as needed.

Summer-

Inspect trees for pest and disease problems.

Pests, Diseases, and Cultural Problems:

The following list of pests and diseases can occur on oaks. However, in spite of this list, most oaks are durable, long-lived trees.

Pests-

- Various galls
- Scales
- Yellow-necked caterpillar
- Pin oak sawfly
- Saddleback caterpillar
- Oak skeletonizer
- Asiatic oak weevil
- Two-lined chestnut borer
- Flatheaded borer
- Leaf miner
- Oak lace bug
- Oak mite

Diseases-

- Anthracnose
- Basal canker
- Canker
- Leaf blister
- Leaf spots
- Powdery mildew
- Rust
- Twig blights
- Wilt
- Wood decay
- Shoe-string root rot

Tree Feature Data: Black Oak - *Quercus velutina*

Cultural Problems-

Some oaks are difficult to transplant.
Most oaks prefer acidic soil and some develop chlorosis in high pH soils.

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: For most oaks, stratify seed in moist sand or peat for 30 to 60 days at 40°F or directly sow outside and germination will take place in the spring.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs*. 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation*. Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs*. Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

Dumbarton Oaks Park
Tree Feature Data: Black Walnut - *Juglans nigra*

Category:	Deciduous tree
Areas:	1-Lover's Lane Entrance/Beech Grove
Feature Name:	*Juglans nigra* (Black walnut)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	JN-14 (285' west of Entrance, north of trail)

Historic Significance/Appearance/Intent:

This tree is a significant contributing feature dating from the Farrand Period.

Descriptive Characteristics:

Habit: Large tree, 50 to 75' in height and often similar spread when open-grown. Usually develops a full, well-formed trunk which is devoid of branches a considerable (½ to ⅔'s) distance from the ground; the crown is oval to rounded and somewhat open.

Leaves: alternate, pinnately compound, 12 to 24" long, 15 to 23 leaflets, the terminal one often missing, each leaflet 2 to 5" long, ¾ to 2" wide, ovate-oblong to ovate-lanceolate, acuminate, rounded at base, irregularly serrate, at first minutely pubescent above, finally nearly glabrous and somewhat lustrous, dark green, pubescent and glandular beneath, leaves fragrant when crushed, petiole and rachis minutely downy.

Bark: dark brown to grayish black, divided by deep, narrow furrows into thin ridges, forming a roughly diamond shaped pattern.

Buds: pale silky-downy; terminal buds ovate, ⅓" long, scarcely longer than broad; lateral buds smaller, often super-posed, grayish.

Flowers: imperfect (monoecious); male catkins preformed, appearing as small, scaly, cone-like buds, unbranched; female in 2 to 8 flowered spikes.

Fruit: globose glabrous light green nuts average 1½ to 2" thick, grainy surfaced, the sculptured wall (endocarp) is blackish and 1 to 1½" across.

Native Habitat: Massachusetts to Florida, west to Minnesota and Texas. Cultivated 1686 (Dirr, 1990).

Dumbarton Oaks Park
Tree Feature Data: Black Walnut - *Juglans nigra*

Preservation Practices and Work Procedures:

Winter:

Prune out dead, damaged, and diseased wood as needed. Prune to maintain structurally open form to prevent wind-throw in heavy storms.

Inspect/Repair/Install cabling as needed.

Spring:

Check soil pH. Walnut trees prefer deep, rich, moist soils (pH 6.5 - 7.1). Collect a soil sample and send it to the Cooperative Extension Service for determination of pH, and phosphorus and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition.

Transplant. Spring is the best time to transplant replacement trees.

Inspect trees for any pest problems.

Summer:

Water newly transplanted trees so that they receive one inch of water every 10 days.

Prune in late summer if necessary. Walnuts bleed badly if pruned in the spring.

Insects, Diseases, and Cultural Problems:

Insects-

Codling Moth
Walnut Husk Fly
Aphids
Scales
Spider Mites
Walnut Caterpillar

Diseases-

Walnut Blight
Walnut Anthracnose
Crown Rot
Blackline

Cultural Problems-

Walnuts tolerate dry soils but grow much more slowly under these conditions.
Black walnut develops an extensive taproot and is difficult to transplant.

Dumbarton Oaks Park

Tree Feature Data: Black Walnut - *Juglans nigra*

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: Fall plant or 3 to 4 months cold stratification.

Cuttings: Etiolated shoots from juvenile plants, girdled, 1% IBA in lanolin in a 4/5" long band above girdle, covered with aluminum foil, severed from plant, rooted 55% (average) from April to June.

Grafting: Most cultivars are bench grafted on seedling understock. Shield or T-budding might be tried.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs*. 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation*. Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs*. Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

Dumbarton Oaks Park

Shrub Feature Data: Forsythia - *Forsythia suspensa*

Category:	Deciduous shrub
Areas:	3-Southside Stream Slope
Feature Name:	*Forsythia suspensa* (Weeping Forsythia)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	Forsythia Hill Plantings

Historic Significance/Appearance/Intent:

This was one of the more important plantings on which Beatrix Farrand put great emphasis; it was a key design element that framed the walk from the formal gardens down to the Beech Grove and paths. The beginning of this planting is accented by a large sycamore. Beatrix Farrand left explicit instructions to care for these forsythia.

Descriptive Characteristics:

Habit: Upright, arching deciduous shrub, 8-10' tall and 10-12' in diameter almost fountain-like, with slender, long, trailing, pendulous branches; does not flower as heavily as other varieties.

Leaves: Opposite, simple, sometimes 3-parted, coarsely toothed, ovate-oblong -ovate, 2"-4" long, glabrous, medium to dark green above, lighter green below.

Stem: Pith hollow in internodes and solid at the nodes, yellowish brown in color and appears more rounded than F. x intermedia.

Flowers: 1 1/4 to 1" long, golden yellow, four-lobed corolla, March to April, often in clusters of 1-3.

Habitat: *F. suspensa* var. fortunei; in cultivation since 1878 (Dirr, 1990).

Dumbarton Oaks Park

Shrub Feature Data: Forsythia - *Forsythia suspensa*

Preservation Practices and Work Procedures:

Farrand's instructions on the upkeep of the forsythia on Forsythia Hill were:

"The Forsythia should be kept pruned each year, so that the heavy wood is taken out of the plants and so that they are not allowed to become too massive or invasive. If all the modeling of the hill is obscured by the mass of Forsythia, it becomes only a tangled, even if lovely, group of planting. The modeling of the hillside is an essential part of its beauty."

Winter -

Prune out dead, damaged, and diseased wood as needed. Rejuvenative pruning is best done in spring after flowering. Mature shrubs benefit from occasional thinning of older branches. This will also improve light and air circulation.

Spring -

Transplant. The fibrous root system of forsythia transplants readily (bare root or balled and burlapped) and will do well in any soil.

Rejuvenative pruning is essential for maintaining the long-term vitality of the shrub. Immediately after flowering, remove 1/3 of the oldest stems each year for three years.

Insects, Diseases and Cultural Problems:

Insects -

Four-lined Plant Bug
Japanese Weevil
Spider Mites
Northern Root Knot Nematode

Diseases -

Crown Gall
Leaf Spots
Dieback

Cultural Problems-

Usually trouble free.

Dumbarton Oaks Park

Shrub Feature Data: Forsythia - *Forsythia suspensa*

Recommended Replacement Method:

- ■ propagate a genetic clone of the existing plant
- □ graft the existing plant onto another rootstock
- □ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- □ different cultivar with similar characteristics
- □ substitute species with similar characteristics

Propagation Method:

Layering: The easiest method of propagating forsythias.

Seeds: Germinate without pretreatment; 30-60 days at 41°F unifies germination.

Cuttings: Taken between May and September, 1000-3000 ppm IBA. Hardwood cutting root well; early January, peat: perlite medium.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs*. 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation*. Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs*. Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: Green Ash - *Fraxinus pennsylvanica*

Category:	Deciduous tree
Areas:	1-Lover's Lane Entrance/Beech Grove
Feature Name:	*Fraxinus pennsylvanica* (Green Ash)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	FP-12 (275' west of entrance gate, north of trail)

Historic Significance/Appearance/Intent:

Post Farrand Period.

Descriptive Characteristics:

Habit: Softly pyramidal when young, developing an upright, spreading habit at maturity with 3 to 5 main branches and many coarse, twiggy branchlets which bend down and then up at the ends; the crown is extremely irregular and the overall habit somewhat difficult to describe; sometimes rather unsightly.

Leaves: Opposite, pinnately compound, up to 12" long, 5 to 9 leaflets, 2 to 5" long, 1 to 2" wide, ovate to oblong-lanceolate, acuminate, broad-cuneate, crenate serrate or entire, lustrous medium to dark green and essentially glabrous above, pubescent beneath.

Bark: Ashy-gray to gray-brown, furrowed into close diamond -shaped areas separated by narrow interlacing ridges.

Buds: Dark rusty brown, smaller and narrower than those of the White Ash, woolly, set above leaf scar, leaf scars nearly straight across at the top.

Fruit: Samara, 1 to 2" long, ¼" or less wide, wing extending half-way or more down the cylindrical body.

Native Habitat: Nova Scotia to Manitoba, south to northern Florida and Texas. Introduced in 1824.

Dumbarton Oaks Park
Tree Feature Data: Green Ash - *Fraxinus pennsylvanica*

Preservation Practices and Work Procedures:

Winter:

Prune out dead, damaged, and diseased wood as needed. Prune to maintain structurally open form to prevent wind-throw in heavy storms.

Inspect/Repair/Install cabling as needed.

Spring:

Check soil pH. Seems pH adaptable. Collect a soil sample and send it to the Cooperative Extension Service for determination of pH, phosphorus and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition.

Transplant. Spring is the best time to transplant replacement trees.

Inspect trees for any pest problems.

Summer:

Water newly transplanted trees so that they receive one inch of water every 10 days. Water mature trees during drought.

Fall:

Cables Inspect cables after wind storms.

Structural Prune. Prune lightly as needed to improve structural form of tree, remove watersprouts and sucker growth.

Insects, Diseases, and Cultural Problems:

Insects-

- Linden Hopper
- Ash Borer
- Lilac Borer
- Carpenter Worms
- Forest Tent Caterpillar
- Brown-headed Ash Sawfly
- Fall Webworm
- Oyster Shell Scales
- Lilac Leaf Miner
- Ash Flower Galls
- Scurfy Scale

Diseases-

- Leaf Rust
- Leaf spots
- Canker

Tree Feature Data: Green Ash - *Fraxinus pennsylvanica*

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: Seed requires warm (68°F), moist stratification for 60 days, followed by 120 days at 32 to 41°F; cultivars are budded onto seedling understocks.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs.* 1993.

Dirr, Michael. *Manual of Woody Landscape Plants,* fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation.* Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs.* Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs.* Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: Norway Maple - *Acer platanoides*

Category:	Deciduous tree
Areas:	3-Southside Stream Slope
Feature Name:	*Acer platanoides* (Norway maple)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	AP-19

Historic Significance/Appearance/Intent:

Post Farrand Period.

Descriptive Characteristics:

Habit: A medium tree which can reach heights from 35' to 60' feet, rounded symmetrical crown usually with dense foliage and shallow root system.

Leaves: Opposite, simple 4-7 inches across, 5 lobes sharp pointed remotely dentate, lustrous dark green above, with lustrous green below, white milky latex is visible when leaves or petiole is cut.

Buds: Terminal imbricate, 1/4 to 3/8" long, rounded, scales plump, fleshy lustrous, greenish maroon to maroon, essentially glabrous except for pubescence at edge of scales, two accessory buds 1/3 to 1/2' size.

Bark: Grayish black with ridges and shallow furrows.

Flowers: Perfect, yellow or greenish yellow, emerging in April before the leaves, produced in erect, many flowered corymbs.

Fruit: Double winged samara, wide spreading almost completely horizontal, maturing in September - October

Native Habitat: Continental Europe but has spread widely across the U.S. and has escaped from cultivation.

Dumbarton Oaks Park

Tree Feature Data: Norway Maple - *Acer platanoides*

Preservation Practices and Work Procedures:

Norway maples self-sow readily; therefore, annual weeding is necessary to prevent small seedlings from becoming established.

Winter:

Prune out dead, damaged, and diseased wood as needed. Prune to maintain structurally open form to prevent wind-throw in heavy storms.

Inspect/Repair/Install cabling as needed.

Spring:

Check soil pH. Maples prefer slightly more acidic soils (pH 4.5 - 6.5). Collect a soil sample and send it to the Cooperative Extension Service for determination of pH, phosphorus and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition.

Transplant. Spring is the best time to transplant replacement trees.

Inspect trees for any pest problems.

Summer:

Water newly transplanted trees so that they receive one inch of water every 10 days.

Fall:

Inspect/Repair/Install cables after wind storms.

Insects, Diseases, and Cultural Problems:

Insects-

Cottony Maple Scale
Aphids
Lecanium Scale
Rust Mite
Maple skelotonizer
Twig Pruner
Wooly Maple Aphid
Maple Petiole Borer
Greenstriped Maple Worm
Gypsy Moth
Linden Hopper

Tree Feature Data: Norway Maple - *Acer platanoides*

Diseases-

Verticillium wilt
Anthracnose
Leaf Scorch
Internal Decay
Wetwood\slime flux

Cultural Problems-

Self-sows readily

Recommended Replacement Method:

propagate a genetic clone of the existing plant
☐ graft the existing plant onto another rootstock
☐ seedling replacement or transplant from the vicinity
■ nursery stock or other off-site source
☐ different cultivar with similar characteristics
☐ substitute species with similar characteristics

Propagation Method:

Seeds: Fall plant or 3 to 4 months cold stratification.

Cuttings: Etiolated shoots from juvenile plants, girdled, 1% IBA in lanolin in a 4/5" long band above girdle, covered with aluminum foil, severed from plant, rooted 55% (average) from April to June.

Grafting: Most cultivars are bench grafted on seedling understock. Shield or T-budding might be tried.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs.* 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation.* Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs.* Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs.* Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: Osage Orange - *Maclura pomifera*

Category:	Deciduous tree
Areas:	1-Lover's Lane Entrance/Beech Grove
Feature Name:	*Maclura pomifera* (Osage-Orange)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	MP-4, MP-6

Historic Significance/Appearance/Intent:

Pre-Farrand Period. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics:

Habit: Medium size tree with heights reaching 40-50 feet, develops a short trunk with rounded irregular crown composed of stiff spiny interlacing branches.

Leaves: Alternate, simple 2 to 5" long, 1 to 3" wide, ovate to oblong-lanceolate, broadly cuneate to subcordate acuminate at base, usually entire, glabrous and somewhat lustrous, dark green above, lighter and glabrous beneath.

Bark: Ashy-brown to orange-brown or dark orange-brown, irregular longitudinal fissures and scaly ridges.

Buds: terminal-absent, laterals -small globular, brown, depressed and partially embedded into bark, 5 scaled, 1/2" long spines found in proximity of buds, spines exude milky latex when cut.

Fruit: Large (3) 4-6" wide globose syncarpe of drupes, covered with mamillate yellow-green rind forming in September.

Native Habitat: Arkansas to Oklahoma and Texas but grown far out of its native range. Introduced in 1818 (Dirr, 1990).

Dumbarton Oaks Park
Tree Feature Data: Osage Orange - *Maclura pomifera*

Preservation Practices and Work Procedures:

Winter:

Prune out dead, damaged, and diseased wood as needed.

Inspect/Repair/Install cabling as needed.

Spring:

Check soil pH. Osage-Oranges prefer highly acidic soils . Collect a soil sample and send it to the Cooperative Extension Service for determination of pH, and phosphorus and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition.

Transplant. Spring is the best time to transplant replacement trees.

Inspect trees for any pest and disease problems.

Summer:

Water newly transplanted trees so that they receive one inch of water every 10 days.

Structural Pruning is best done during the late summer to reduce bleeding. Prune lightly as needed to improve the structural form of tree; remove watersprouts and sucker growth.

Fall:

Inspect cables after wind storms.

Insects, Diseases, and Cultural Problems:

Insects-

None serious.

Diseases-

Leaf spot

Cultural Problems-

Very tough and durable native trees, transplants readily, tolerant of high winds, high heat, dryness, extreme wetness, and high and low pH.

Dumbarton Oaks Park

Tree Feature Data: Osage Orange - *Maclura pomifera*

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: Should be stratified in for 30 days at 41°F or soaking in water for 48 hours.

Cuttings: Collected in July with 100% rooting 42 days with IAA; softwood cuttings had 30% rooting with 5000-10000 IBA solution, hardwood cuttings take in January.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs.* 1993.

Dirr, Michael. *Manual of Woody Landscape Plants,* fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation.* Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs.* Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs.* Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: Princess Tree -*Paulownia tomentosa*

Category:	Deciduous tree
Areas:	3-Southside Stream Slope
Feature Name:	*Paulownia tomentosa* (Princess Tree)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	PT-17 (east of Forsythia Walk)

Historic Significance/Appearance/Intent:

Farrand Period. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics:

Habit: Fast growing tree, similar to catalpa, grows to heights of 30-40' feet, irregular forms.

Leaves: Opposite, simple, broad-ovate to ovate 5-10" long and wide acuminate, cordate, entire, dark green and slightly pubescent above and tomentose beneath.

Flowers: Panicle formed in summer individual flower buds appear as light brown to purplish-light violet with yellow stripes inside, 2" long and vanilla scented. pubescent spheres through winter.

Fruit: Ovoid, beaked dehiscent capsule quite persistent in throughout the year.

Native Habitat: Native of China and found from New York to Georgia. Introduced in 1834 (Dirr, 1990).

Dumbarton Oaks Park

Tree Feature Data: Princess Tree -*Paulownia tomentosa*

Preservation Practices and Work Procedures:

Winter:

Prune out dead, damaged, and diseased wood as needed. Prune to maintain structurally open form to prevent wind-throw in heavy storms.

Inspect/Repair/Install cabling as needed.

Spring:

Check soil pH. Collect a soil sample and send it to the Cooperative Extension Service for determination of pH, phosphorus and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition.

Transplant. Spring is the best time to transplant replacement trees. Transplants readily, balled and burlapped in early spring into rich, moist, well-drained soil.

Inspect trees for any pest problems.

Summer:

Water newly transplanted trees so that they receive one inch of water every 10 days.

Fall:

Inspect cables after wind storms.

Insects, Diseases, and Cultural Problems:

Insects-

None serious.

Diseases-

leaf spot
twig canker
mildew

Cultural Problems-

No problems of concern: very tough and durable trees, prefers full sun but can handle shade. Withstands air pollutants.

Dumbarton Oaks Park

Tree Feature Data: Princess Tree -*Paulownia tomentosa*

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: New seeds has germinate with 90% success in 19 days with alternating temperatures between 68°F and 86°F degrees, along with eight hours of light during the 86°F phase; seeds do well under mist system. Tissue culture is very successful, see HortScience 20: 760 (1985); (Dirr, 1990).

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs.* 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation.* Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs*. Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: Sycamore - *Platanus occidentalis*

Category:	Deciduous tree
Areas:	3-Southside Stream Slope
Feature Name:	*Platanus occidentalis* (Sycamore)
Source Of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	PO- 16 (Base of Forsythia Walk)

Historic Significance/Appearance/Intent:

Pre-Farrand Period. More information regarding the historic significance of this feature will be documented in the Cultural Landscape Report.

Descriptive Characteristics:

Habit: Large tree, with massive trunk and wide spreading open crown of large crooked branches. Can reach heights from 75' to 150'. One of the larger eastern tree species next to *Liriodendron tulipifera.* Habit is best described as irregular, however one of the more striking trees in winter with the white mottled bark in the upper reaches of the canopy. Usually found along stream banks or deep moist rich soils.

Leaves: Alternate, simple, 4 to 9" wide, 3 to 5 lobed, with shallow sinuses and broad triangular lobes, truncate to cordate, coarsely toothed lobes, floccose-tomentulose when young, at maturity pubescent only along veins beneath medium to dark green.

Buds: Terminal -absent, laterals -large, 1/4" to 3/8 " long, conical, blunt pointed, smooth , shiny reddish brown, with single visible scale formed within petiole base.

Bark: Red to gray-brown and scaly near base, exfoliating on upper trunk exposing creamy-white bark, actually the best asset of the tree.

Fruit: Multiple globose fruit of achenes, 1" across, born on 3"-6" peduncle 1 per stalk.

Native Habitat: Ranges from Maine to Ontario and Minnesota, south to Florida and Texas, introduced in 1640 (Dirr, 1990).

Preservation Practices And Work Procedures:

Winter -

Prune out dead, damaged, and diseased wood as needed. Inspect for interior decay and pest damage. Disinfect tools between cuts to prevent spread of canker stain disease.

Spring-

Monitor for anthracnose. Although the species generally shows good resistance, it may occur on selected trees. Prolonged periods of cool, moist, damp spring weather will increase anthracnose. The best times to control anthracnose are before buds break, at bud break, and when leaves have expanded.

Summer-

Water newly transplanted trees so that they receive one inch of water every 10 days. Water mature trees during drought.

Pests, Diseases, And Cultural Problems:

Pests-

Aphids
Sycamore plant bug
Sycamore tussock moth
scales,
bagworms,
borers

Diseases-

Anthracnose (*Gnomonia veneta*)
leafspots

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds: No pregermination needed, however 60 days at 41° F has proven beneficial.

Cuttings: Softwood cuttings; best to use 8000 ppm IBA.

Additional Sources Of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs*. 1993.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation*. Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs*. Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

Dumbarton Oaks Park

Tree Feature Data: Tulip Poplar - *Liriodendron tulipifera*

Category:	Deciduous tree
Areas:	1-Lover's Lane Entrance/Beech Grove 3-Southside Stream Slope
Feature Name:	*Liriodendron tulipifera* (Tulip poplar)
Source of Identification:	HABS Report on Dumbarton Oaks Park
Field Numbers:	LT-1 (1-Lover's Lane Entrance/Beech Grove) LT-18 (3-Southside Stream Slope) LT-21 (3-Southside Stream Slope)

Historic Significance/Appearance/Intent:

The existing tulip poplar trees reflect the natural vegetation that Beatrix Farrand retained and enhanced in her design for the informal portion of the estate. The tulip poplars found along the Beech Grove, have been estimated to have been on the property since the 1920's, with some smaller plants naturalizing under National Park Service management. Many of the existing trees were used to highlight designed or natural features of the landscape and as sentinel trees along the stream path and waterfalls. They are significant contributing features.

Descriptive Characteristics:

Habit: This is a fast-growing tree which has the potential to grow 15-20 feet in a six year period and can reach heights to over 150' feet; however, in inhabited areas it is usually found to be between 40 to 60 feet high. It usually grows in a pyramidal form in open areas and later developing an oval-rounded form with large sinuous branches constituting the framework. In the wild it is often devoid of branches from 70 to 80 percent of its height with a narrow ovoid canopy.

Leaves: alternate, simple, 3 to 8" across and as long, broad truncate apex with a short acuminate lobe on each side and usually 3-4, acute or short acuminate lobes on each side near the rounded or truncate base, bright green above, paler beneath, petiole beneath.

Bark: Grayish brown, furrowed into close, interlacing rounded ridges which are dark brown to grayish black; crevices.

Buds: Valvate, terminal-1/2" long, greenish to reddish brown , covered with bloom, white dotted, entire bud resembling duck's bill; laterals similar but considerably smaller.

Flowers: Perfect, with 6 greenish-yellow petals in 2 rows, 3 reflexed sepals, interior of the corolla an orangish color; May to early June; solitary; and often born high in the canopy.

Dumbarton Oaks Park

Tree Feature Data: Tulip Poplar - *Liriodendron tulipifera*

Fruit: Cone-like aggregate of samaras, 2-3" long eventually turning brown in October and persisting through winter.

Native Habitat: Massachusetts to Wisconsin, south to Florida and Mississippi. Cultivated 1663 (Dirr, 1990).

Preservation Practices and Work Procedures:

Since the tulip poplar trees are growing naturally in a woodland setting, maintenance practices are recommended for the safety of visitors only and not specifically to maintain specific specimens in perpetuity. The trees should be periodically inspected for their structural integrity. If hazard pruning is necessary, it should be done immediately, regardless of season. However, structural pruning is best done in late winter or early spring before buds enlarge. Cabling is recommended for large specimens only and should be done in winter.

Winter-

Prune out dead, damaged, and diseased wood as needed. Prune to maintain structurally open form to prevent wind-throw in heavy storms.

Raking. Poplars tend to drop a lot of small branches after wind storms.

Inspect/Repair/Install cabling as needed.

Spring-

Soil pH. Poplar trees prefer deep, rich, moist soils (pH 6.5 - 7.1). Collect a soil sample and send it to the Cooperative Extension Service for determination of pH, phosphorus and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition.

Transplant. Spring is the best time to transplant replacement trees.

Inspect trees for any pest problems.

Summer-

Water newly transplanted trees so that they receive one inch of water every 10 days. Water mature trees during drought.

Inspect trees for any pest problems.

Dumbarton Oaks Park

Tree Feature Data: Tulip Poplar - *Liriodendron tulipifera*

Insects, Diseases, and Cultural Problems:

Insects-

Aphids	Poplar Tent Caterpillar	Twig Girdler
Bronze Birch Borer	Poplar Twig Maker	
Eastern Tent Caterpillar	Satin Moth	
Imported Willow Leaf Beetle	Scales	

Diseases-

Armillaria tabescens- root rot	Hypoxylon Canker
Blight	Leaf Blister
Branch Gall	Leaf Rusts
Cytospora Canker	Leaf Spots
Dieback	Poplar Mosaic
Fusarium Canker	Septoria Canker

Cultural Problems-

Frequent leaf and twig drop.
Fast growing and fast declining.
Susceptible to sunscald

Recommended Replacement Method:

- ☐ propagate a genetic clone of the existing plant
- ☐ graft the existing plant onto another rootstock
- ☐ seedling replacement or transplant from the vicinity
- ■ nursery stock or other off-site source
- ☐ different cultivar with similar characteristics
- ☐ substitute species with similar characteristics

Propagation Method:

Seeds:	Should be stratified in bags of peat moss or sand for 60-90 days, at 41°F.
Cuttings:	July collection made with basal cuts 1/2" below node.
Grafting:	Most cultivars are grafted.

Additional Sources of Information:

Cornell University, New York Cooperative Extension. *1993 Pest Management Recommendations for Commercial Production and Maintenance of Trees and Shrubs*. 1996.

Dirr, Michael. *Manual of Woody Landscape Plants*, fourth edition. Atlanta, GA: Stipes Publishing Company. 1990.

Dirr & Heuser. *The Reference Manual for Woody Plant Propagation*. Athens, GA: Varsity Press, Inc. 1987.

Johnson & Lyon. *Insects that Feed on Trees and Shrubs*. Cornell University Press, second edition. 1991.

Sinclair, Lyon, & Johnson. *Diseases of Trees and Shrubs*. Cornell University Press. 1987.

PRESERVATION MAINTENANCE CALENDAR

∗ NPS 10-21A pesticide use requests should be approved prior to the application of any pesticide.

WINTER

Maintenance Procedures

DAMS: Periodically monitor for ice damage.

CIRCULATION: None needed.

FORSYTHIA WALK: None needed.

TREES: Prune out dead, damaged, and diseased wood as needed. Prune to maintain structurally open form to prevent wind-throw in heavy storms.

Raking trees tend to drop a lot of small branches after wind storms. Rake fallen leaves.

Inspect/Repair/Install cabling as needed.

Prepare 10-21A pesticide use requests for quick response to insect/disease outbreaks.

Special Recommendations:

Platanus occidentalis: While pruning, disinfect cutting tools to prevent spread of canker stain disease.

Forsythia suspensa: Prune out dead, damaged, and diseased wood as needed. Structural pruning is best done during the late winter or during spring flowering. Mature shrubs benefit from occasional thinning of older branches. Structural prune to improve light and air circulation.

Robinia pseudoacacia: Inspect for internal decay (fungal conks appear on trunks) and borer damage (hollow wood, bulging bark, sawdust). Remove damaged wood since rotting organisms tend to inhabit borer tunnels and hasten the decline of the tree.

Ulmus americana: Elms pruned during the dormant season are less likely to contract Dutch elm disease.

PRESERVATION MAINTENANCE CALENDAR

SPRING

Maintenance Procedures

DAMS:	Remove debris and repair damage resulting from winter storms.
CIRCULATION:	Remove surface debris.
FORSYTHIA WALK:	Remove surface debris. Reset stones which may have been frost heaved during winter.
TREES:	Check soil pH. Collect a soil sample and send it to the Cooperative Extension Service for determination of pH, and phosphorus and potassium levels. Apply lime and fertilizer as necessary to adjust the soil condition. Transplant. Spring is the best time to transplant replacement trees. Inspect trees for any pest problems.

Special Recommendations:

Forsythia suspensa:	Rejuvenation pruning is essential for maintaining the long term vitality of the shrub. Immediately after flowering, remove 1/3 of the oldest stems each year for three years.
Ulmus americana:	Replace with nursery stock "Washington Elm clone."

PRESERVATION MAINTENANCE CALENDAR

SUMMER

Maintenance Procedures

DAMS: Remove excessive silt deposits. Pull drain plugs to flush out debris and silt accumulations.

CIRCULATION: Inspect surface condition and repair as needed.
Remove vegetation encroaching into trails.

FORSYTHIA WALK: Inspect surface condition.
Remove woody and exotic vegetation as needed.

TREES: Water newly transplanted trees so that they receive one inch of water every 10 days. Water mature trees during drought.

Inspect trees for any pest problems.

Special Recommendations:

Forsythia suspensa: Structural pruning is best completed in late spring or early summer immediately after flowering.

Acer platanoides: Remove volunteer seedlings.

Ulmus americana : Inspect trees for any branch showing signs of Dutch elm disease. Signs include; yellowing, wilting or leaf drop. Prune immediately and send wood sections for disease verification. If tested positive for Dutch elm disease, treat immediately with approved fungicide if showing less than 15% wilt; if more than 15%, remove and dispose of in landfill.

PRESERVATION MAINTENANCE CALENDAR

FALL

Maintenance Procedures

DAMS:	Remove debris which has accumulated behind dams.
CIRCULATION:	Remove debris. Repair damage resulting from summer use.
FORSYTHIA WALK:	Remove debris. Repair damage resulting from summer use. Reset stones which may have been dislodged as a result of summer use.
TREES:	Inspect cables after storms.

Olmsted Center for Landscape Preservation

INSPECTION - SPECIMEN TREES

Category: Areas: Feature Name and Field ID#:	Overall Form	Leaf, Shoots	Branches	Cables	Trunk	Roots, Soil	Flower, Fruit	Pests, Diseases	Tag Present (y/n)	Comment on size, age, condition, field diagnosis and work needed:	Further Diagnosis Needed (y/n)	Work Needed (X) Critical Work (*)	Replace Immed (I) Plan for Repl (P)	Action Completed (date)

Codes: 0= can not assess
1= satisfactory condition
2= fair, needs some work
3= poor, needs work
*= critical condition

Recommended Equipment for Inspection:
- binoculars
- insect jars

Inspected by:

Date:

TRAIL/WALK INSPECTION FORM

TRAIL OR WALK: _____

Beginning Mile or Distance Point: _____ Ending Mile or Distance Point: _____

Inspected by: _____ Date: _____

Dist Pt	Feature[1]	Problem[2]	Resource/Cost Requirements[3]	Rate[4]

1 - Paved tread; Unpaved tread; Sign; Exhibit; Monument or marker; Bridge; Foot log; Suspension bridge; Boardwalk; Water bar; Culvert; Retaining wall; Ditch; Fence or railing; Safety railing; or other appropriate feature.
2 - Edge Failure; Abrupt depression; Surface failure; Crack; Debris; Rut; Washout; Erosion; Damage; Deterioration; Vegetation; Tree; Hazard tree; Slide; Rock fall; Wear; Vandalism; Flood; Natural catastrophe; or other appropriate description.
3 - Estimate crew size, crew days or hours, special equipment needs, quantity of material (explosives, fill, gravel, rails, etc.), cost and/ or contract cost.
4 - Rate 1, 2 or 3 based upon: 1 - routine maintenance, supported by current base funds, is adequate to accomplish work; 2 - cyclic or repair/rehab funding is required to bring to condition 1; 3 - major/special funding is required for major rehab or replacement to bring to condition 1.

Provide an overall **CONDITION ASSESSMENT** for this segment of trail for the following based upon the ratings above in 4:

Paved tread	Unpaved tread	Drainage structures	Signs/monuments/markers	Walls/fences/railing	Bridges	All

Olmsted Center for Landscape Preservation

INSPECTION - FENCES & WALLS

Category: Areas: Feature Name and Field ID#:	Deteriorated	Cracked	Damaged	Leaning	Collapsed	Loose, missing parts	Accumulated debris	Needs refinishing	Other	Comment on condition, field diagnosis and work needed:	Further Diagnosis Needed (y/n)	Work Needed (X) Critical Work (*)	Replace Immed (I) Plan for Repl (P)	Action Completed (date)

Codes:
0= can not assess
1= satisfactory condition
2= fair, needs some work
3= poor, needs work
*= critical condition

Recommended Equipment for Inspection:
- binoculars
- insect jars

Inspected by:

Date:

Olmsted Center for Landscape Preservation

INSPECTION - GARDEN BEDS

Category: Areas: Feature Name and Field ID#:	Weeds	Wilting	Vandalism	Deadheading	Staking	Edging	Divide Perennials	Soil pH, Fertility	Pests, Diseases	Comment on condition, field diagnosis and work needed:	Further Diagnosis Needed (y/n)	Work Needed (X) Critical Work (*)	Replace Immed (I) Plan for Repl (P)	Action Completed (date)

Codes: 0= can not assess
1= satisfactory condition
2= fair, needs some work
3= poor, needs work
*= critical condition

Recommended Equipment for Inspection:
- binoculars
- insect jars

Inspected by:

Date:

Dumbarton Oaks Park

RECORD KEEPING - FEATURE: _____

Record notes on measurements, conditions, work performed, reason for removal, replacement or installation, propagation method and growing location, status of feature, or reference to a related report, etc.

Measurement	Condition/ Problem	Major Work/ Change	Removal	Replacement	Installation	Propagation	Other	Date and Initials

PROJECT AGREEMENT

DEVELOPMENT OF TWO DEMONSTRATION SECTIONS OF THE PRESERVATION MAINTENANCE PLAN FOR DUMBARTON OAKS PARK, ROCK CREEK PARK

PROJECT DESCRIPTION

Rock Creek Park, the National Park Service, National Capital Field Area System Support Office, the Denver Service Center, and the Friends of Montrose and Dumbarton Oaks Parks (Dumbarton Oaks Park Restoration Committee) in association with the Olmsted Center for Landscape Preservation will initiate development of a Landscape Preservation Maintenance Plan for Dumbarton Oaks Park. This project will (1) create the framework for a comprehensive Landscape Preservation Maintenance Plan for Dumbarton Oaks Park, (2) fully develop two prototype sections of this Plan, and (3) implement the preservation maintenance recommendations in these two sections. Completion of this project will fulfill a Challenge Cost-Share Program agreement entered into by the National Park Service (Rock Creek Park) and the Friends of Montrose and Dumbarton Oaks Parks (Dumbarton Oaks Park Restoration Committee), respectively, on June 30 and July 1, 1996.

BACKGROUND AND PURPOSE

Dumbarton Oaks Park is administered by the National Park Service as part of Rock Creek Park. The unit consists of 27 acres and is located off Lover's Lane near 31st and R Streets, N.W. Washington, D.C.

Dumbarton Oaks Park is a designed historic landscape which was originally part of the adjoining Dumbarton Oaks estate which was owned by the Robert Woods Bliss family from 1920 to 1940. They engaged the services of Beatrix Jones Farrand, a landscape architect and one of the founders of the American Society of Landscape Architects, to design the grounds of this estate. The mansion and immediate surroundings were designed as formal gardens around a Georgian mansion. The valley below, now Dumbarton Oaks Park, was designed as a rustic backdrop to the formal gardens. The naturalistic gardens were along a waterway that was enhanced with 16 stone waterfalls, a pond, a stone bridge and other features that wind through the length of the park. In 1940, the Blisses gave their estate and formal gardens to Harvard University and deeded the lower park (Dumbarton Oaks Park) to the National Park Service for the enjoyment of the general public. Dumbarton Oaks Park is the only well-documented landscape in the National Park Service designed by Beatrix Farrand.

Over time, the park was transferred between various jurisdictions of the National Capital Area, as were personnel familiar with the site. Preservation maintenance during this period has been non-existent. Rampant vines and overgrowth ultimately began to take over the carefully designed landscape. Urban development, including a large increase in paved surface on the surrounding properties, adversely affected the drainage system feeding into the stream valley. Huge quantities of silt and uncontrolled waters have severely eroded the streambed, washed away dams and trails, and adversely affected plants. Controlling storm water runoff into the valley continues to be the most critical component in the preservation of this valuable resource.

The integrity of the original designed landscape is in immediate danger of being lost unless emergency stabilization is initiated to preserve what remains. This project will guide the stabilization effort and recommend recurring and cyclic preservation maintenance activities.

Implementation of this Preservation Maintenance Plan will protect extant historic features until a long-term preservation treatment strategy is developed through a Cultural Landscape Report.

PROJECT OBJECTIVES

(1) Create the framework for a comprehensive Landscape Preservation Maintenance Plan that will be developed section by section over time:

- develop a map showing proposed preservation zones (and sub-zones, if appropriate) which will be used as a basis for developing Plan sections
- describe the topics for additional Plan sections (e.g. circulation/paths, woody plant management, exotic plant management, meadow and turf management, woodland area management, architectural elements, etc.)
- recommend priority order for development of Plan sections

(2) Fully develop two prototype sections of this Plan

(a) Stream bank stabilization section
- develop condition assessment form
- conduct condition assessment inspection
- identify stabilization work needed
- define preservation maintenance practices and calendar

(b) Entrance and Forsythia Hill section
- conduct condition assessment
- identify stabilization work needed
- define preservation maintenance practices and calendar

(3) Implement the preservation maintenance recommendations in these two sections:

- demonstrate stabilization techniques
- evaluate effectiveness and implications for future Plan sections

PRODUCTS/ACCOMPLISHMENTS AT THE END OF THIS PROJECT

1. Preservation Maintenance Plan containing:
   - an Operational Preservation Maintenance zone map
   - a comprehensive list of proposed sections in priority order
   - sections completed for two areas, as described above

2. Preservation Maintenance demonstration projects accomplished in two areas of the park

PROJECT TASKS AND SCHEDULE

Phase 1. Project Start-Up August 1996
- Prepare and draft Project Agreement.
- Meet with Advisory Group to discuss project background and objectives. Review draft Project Agreement.
- Agree on two priority areas for preparation of demonstration projects.
- Establish Technical Work Groups. These groups will be responsible for preparation of draft Maintenance Plans and for overseeing the implementation of the plans.

Phase 2. Prepare initial draft demonstration sections of the Preservation Maintenance Guides December 1996 - January 1997
- Technical Work Groups meet and prepare initial draft of the sections.
- Prepare a detailed list of project tasks and schedule for remainder of project, including a preliminary schedule for work projects related to the implementation of the plan.
- Circulate drafts, list and schedule for review by Project Management Team, and subsequently the Advisory Group.
- Park staff in consultation with technical advisors from the SSO and FDO will identify any compliance requirements for implementation of these projects (see Compliance section below).

Phase 3. Prepare final demonstration sections of the Preservation Maintenance Guides February - April 1997
- Circulate final drafts for review by Project Management Team and Advisory Group, with subsequent approval by Superintendent, ROCR.
- Obtain Section 106 Compliance as needed.
- Meet with Project Management Team and Advisory Group to discuss and evaluate the project, implementation schedule for demonstration sections, and development of future sections of the Preservation Maintenance Plan.

Phase 4. Implement Demonstration Plans Spring - Summer 1997

- Coordinate field project teams, supplies, and materials. - Provide field guidance during implementation.

Phase 5. Project evaluation (OCLP participation may be limited due to funding) Fall 1997

- Presentation by Technical Work Groups to Project Advisory Group and Management Team on accomplishments and recommendations for future work.
- Evaluate implementation of projects and revise/expand sections as necessary to provide for maintenance of completed work.
- Obtain Advisory Group concurrence on final prioritized list of future sections, operational preservation maintenance zone maps, future objectives and plans for follow-up work.

ROLES AND RESPONSIBILITIES:

Advisory Group: Sets project objectives, reviews Project Agreement, and establishes Technical Work Groups. Reviews draft demonstration sections of the Maintenance Plan. Evaluates effectiveness of the demonstration sections and makes recommendations to park management on development of additional sections and other related preservation projects.

Project Management Team: Recommends overall project strategy to the Advisory Group and prepares Project Agreement. Reviews draft demonstration sections of the Maintenance Plan. Evaluates project effectiveness and makes recommendations to the Advisory Group for development of additional sections of the Plan and other related preservation projects. Leadership for this team is provided by two project Co-leaders.

Park: Coordinates Project Management Team and Advisory Group Meetings. Provides project administrative support. Coordinates the review of draft demonstration sections of the Maintenance Plan. Identifies and coordinates any necessary compliance (see section below). Finalizes schedule and coordinates field work projects related to implementation. Participates in project evaluation.

Olmsted Center: Prepares draft Project Agreement based on meeting with Advisory Group. Prepares initial draft of demonstration sections of the Maintenance Plan. Incorporates comments and prepares final sections of the Plan based on review.

Technical Work Groups (2): Prepare detailed lists of project tasks and propose project schedules. Inventory and inspect field conditions. Develop draft feature stabilization and maintenance strategies. Coordinate with members of the

Project Management Team to obtain information and ensure project meets objectives. Members provide leadership for overseeing implementation.

COMPLIANCE

Park staff in consultation with technical advisors will determine any compliance requirements (from either the National Environmental Policy Act and National Historic Preservation Act) related to implementation of this project.

FUNDING

Funding available from:

Cost-share Project Fund (FY96)	$7,000
Friends of Dumbarton Oaks Park (FY97)	3,000
Total:	$10,000

Costs for project:

FY96

Olmsted Center staff time:	$6,000
Olmsted Center travel costs:	1,000
Subtotal:	$7,000

FY97

Olmsted Center staff time:	$2,000
Olmsted Center travel costs:	1,000
Subtotal:	$3,000

PROJECT STAFF

This project is a team effort. It will consist of an Advisory Group, a Project Management Group and Technical Work Groups (see attached list) made up of staff from Rock Creek Park, the National Capital Area System Support Office, Denver Service Center, the Olmsted Center for Landscape Preservation, and the Friends of Montrose and Dumbarton Oaks Parks. Project implementation will be done by Friends group volunteers, National Park Service and Dumbarton Oaks Mansion staff of Harvard University and others under the direction of the technical work group members.

Recommended by:

Cynthia Cox — 1/23/97

Cynthia Cox
Chief, Maintenance Division
Rock Creek Park

Regina E Moriarty — 1-23-97

Regina Moriarty — Date
Chief, Resource Management & Visitor Services Division
Rock Creek Park

Concurred by:

William R Shields — 1/23/97

William R. Shields — Date
Superintendent, Rock Creek Park

Nora Mitchell — 1/23/97

Nora Mitchell — Date
Director, Olmsted Center for Landscape Preservation

Attachment to the Project Agreement for Development of Two Demonstration Sections of the Preservation Maintenance Plan for Dumbarton Oaks Park, Rock Creek Park.

Advisory Group
Role: Provides overall project guidance and project evaluation.

William Shields, Superintendent, Rock Creek Park
Adrienne Coleman, Assistant Superintendent, Rock Creek Park
Jim Ingram, Member, Friends of Montrose & Dumbarton Oaks Parks
Brian Stephenson, Member, Friends of Montrose & Dumbarton Oaks
Gay Mackintosh, Dumbarton Oaks, Harvard University
Gary Scott, Chief Historian, National Capital Area
Scott Ahrnsbrak, Maintenance Mechanic Supervisor, Rock Creek Park
Robert Ford, Natural Resource Manager, Rock Creek Park
William Yeaman, Resource Management Specialist, Rock Creek Park
Mike McMahon, Landscape Architect, National Capital Area

Project Management Team
Role: Identifies project tasks and objectives, and participates in project evaluation.

Darwina Neal, Chief Landscape Architect, National Capital Area (Project Leader)
Stephen Strach, Cultural Resource Specialist, Rock Creek Park (Project Co-Leader)
Cynthia Cox, Chief of Maintenance, Rock Creek Park
Regina Moriarty, Chief of Resource Management & Visitor Services, Rock Creek Park
Doug Curtis, Hydrologist, National Capital Area
Rebecca Stevens, Chief Historical Architect, National Capital Area
Maureen Joseph, Landscape Architect, Denver Service Center
Nora Mitchell, Director, Olmsted Center for Landscape Preservation
Charlie Pepper, Horticulturalist, Olmsted Center for Landscape Preservation
Dan Hodgson, Maintenance Mechanic Supervisor, Rock Creek Park

Technical Work Groups (4-5 people per group maximum)
Role: Prepare and implement maintenance plans.

1. Stream Stabilization: Charlie Pepper, Doug Curtis, Dan Hodgson Brian Stephenson, Stephen Strach, Darwina Neal (Jim Ingram)

2. Entrance and Forsythia Hill: Charlie Pepper, Cindy Cox, Dumbarton Oaks Mansion representative, Brian Stephenson, Stephen Strach, Darwina Neal (Jim Ingram)

Recommended by:

Cynthia Cox — 1/23/97

Cynthia Cox
Chief, Maintenance Division
Rock Creek Park

Regina E Moriarty — 1-23-97

Regina Moriarty — Date
Chief, Resource Management & Visitor Services Division
Rock Creek Park

Concurred by:

William R Shields — 1/23/97

William R. Shields — Date
Superintendent, Rock Creek Park

Nora Mitchell — 1/23/97

Nora Mitchell — Date
Director, Olmsted Center for Landscape Preservation

Database Table Structure

Streambank

MNGMTZONE	Management Zone	Numeric	1
ZONENAME	Zone Name	Character	30
SUBZONE	Treatment Module Code	Character	5
SUBZONENAM	Treatment Module Name	Character	30
DAMNUMBER	Dam Number	Numeric	2
DAMNAME	Dam Name	Character	30
BANKEROSIO	Bank Erosion	Character	20
SSDOWNLEFT	Streambank Sideslope Downstream Left of Dam	Numeric	3
SSUPLEFT	Streambank Sideslope Upstream Left of Dam	Numeric	3
SSDOWNRIT	Streambank Sideslope Downstream Right of Dam	Numeric	3
SSUPRIT	Streambank Sideslope Upstream Right of Dam	Numeric	3
CHBEDSCOUR	Channel Bed Scouring	Character	30
SEDTYPDOWN	Sediment Type Downstream	Character	50
SDEPOSDOWN	Sediment Deposit Downstream	Character	30
SEDTYPUP	Sediment Type Upstream	Character	50
SDEPOSUP	Sediment Deposit Upstream	Character	30
BANKVEGLEF	Bank Vegetation Cover Left	Character	30
BANKVEGRIT	Bank Vegetation Cover Right	Character	30
RIPBUFLEFT	Riparian Buffer Type Left	Character	30
RIPBUFRITE	Riparian Buffer Type Right	Character	30
CHANDEBRIS	Stream Channel Debris	Character	30
DAMSTRUCT	Dam Structural Integrity	Character	50
WINGWALEFT	Left Wingwall Condition	Character	50
WINGWALRIT	Right Wingwall Condition	Character	50
WATERFLOW	Water Flow Course	Character	50
DSLODGESTO	Dislodged Stones	Character	20
WORKNEEDED	Emergency Stabilization Work	Character	200
CONDITRANK	Condition Rank	Character	5
REPAIRNEED	Repair Work Needed	Character	200
REHABTREAT	Rehabilitation Work Needed	Character	200
COMMENTS	Comments	Character	UL

Circulation

MNGMTZONE	Management Zone	Numeric	1
ZONENAME	Zone Name	Character	30
SUBZONE	Treatment Module Code	Character	5

SUBZONENAM	Treatment Module Name	Character	30
FEATURE	Feature Type	Character	10
DIST_POINT	Distance Point on Trail	Numeric	5
STEP_NUM	Step Number	Character	5
MATERIAL	Material of Feature	Character	30
CONDITION	Condition of Feature	Character	200
WORKNEEDED	Emergency Stabilization Work	Character	200
REPAIRNEED	Repair Work Needed	Character	200
REHABTREAT	Rehabilitation Work Needed	Character	200
COMMENTS	Comments	Character	UL

Walls

MNGMTZONE	Management Zone	Numeric	1
ZONENAME	Zone Name	Character	30
SUBZONE	Treatment Module Code	Character	5
SUBZONENAM	Treatment Module Name	Character	30
FEATURE	Feature Type	Character	10
LOCATION	Distance Point Along Wall	Character	30
MATERIAL	Material of Feature	Character	30
CONDITION	Summary of Condition	Character	200
WORKNEEDED	Emergency Stabilization Work	Character	200
REPAIRNEED	Repair Work Needed	Character	200
REHABTREAT	Rehabilitation Work Needed	Character	200
COMMENTS	Comments	Character	UL

Trees

MNGMTZONE	Management Zone	Numeric	1
ZONENAME	Zone Name	Character	30
SUBZONE	Treatment Module Code	Character	5
SUBZONENAM	Treatment Module Name	Character	30
LOCATION	Location Within Treatment Module	Character	30
COM_NAME	Common Name	Character	40
SCI_NAME	Scientific Name	Character	50
DBH_IN	Diameter Breast Height Inches	Numeric	5
FORM	Form Condition	Numeric	5
LEAF	Leaf Condition	Numeric	5
BRANCHES	Branch Condition	Numeric	5
CABLES	Cable Condition	Numeric	5
TRUNK	Trunk Condition	Numeric	5
ROOTS	Root Condition	Numeric	5
FLOWER	Flower Condition	Numeric	5
PESTS	Pest Activity	Numeric	5
TAG	Tag Present	Numeric	5
DIAGNOSIS	Further Diagnosis Needed	Numeric	5
REPLACE	Replacement Needed	Numeric	5

CONDITION	Summary of Condition	Character	200
WORKNEEDED	Emergency Stabilization Work	Character	200
COMMENTS	Comments	Character	UL

EASTERN PRODUCTS, INC.

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EcoTak	:	Natural vegetable Bio-Degradable hydrocolloids based products which are the best **NATURAL TACKIFIERS** available.
EcoCoir	:	Natural organic Bio-Degradable Coir Fiber Products such as **COIR GEOFABRICS, COIR NETS**, etc.
EcoMat	:	Natural organic Bio-Degradable **COIR FIBER DOUBLE NETS filled with COIR FIBER.**
EcoFelt	:	Natural organic Bio-Degradable **NEEDLED FELT COIR FIBER NETTING / GEOFABRICS.**
EcoLogs	:	A Natural organic Bio-Degradable **COIR FIBER ROLLED IN SAUSAGE SHAPE**, enveloped in hand knotted coir nets.
EcoBed	:	Natural vegetable Bio-Degradable **COIR FIBER ROLLED IN BED SHAPE**, enveloped in hand knotted coir nets.
EcoJute	:	A Natural organic Bio-Degradable **BURLAP GEOFABRIC** either in Fabric and/or Net form.
EcoPit	:	A **Natural organic Bio-Degradable substitute of PEAT** available in Briquette form Enriched with N.P.K. if required.
Eco-Compost	:	A Natural organic Bio-Degradable **COIR PITH / DUST COMPOST** enriched with Natural Organic Compost - the best Fertilizer available.
EcoStik	:	A Natural organic substitute for **MOSS STICK/PLANT SUPPORT.**
EcoPot	:	A Natural organic **COIR PITH / DUST POT.**
EcoBasket	:	A Natural organic **COIR BASKET.**

EcoTak

Natural Tackifiers / Binders

Introduction:
EcoTak-OP and **EcoTak-SAT** are high quality Natural Tackifiers designed for fiber mulch binding hay/straw tacking and dust control.

Features:
EcoTak-OP and **EcoTak-SAT** have the properties of fast tank dispersion and absorption and retention of moisture. When mixed with water, both turn into a slurry and become viscous. These natural tackifiers act as gelling, hardening and holding agents will not only retain moisture but will also provide a perfectly stable micro climate for **seed germination**.

EcoTak range of tackifiers swell and become sticky in presence of water. When sprayed over the soil surface, the moisture is released from the activated particles and they stick and bind to whatever they come in contact with i.e. seeds, fertilizer or even surface soil. This action helps hold revegetation and erosion control materials in the place during critical germination and young **seedling growth**.

EcoTak-SAT when mixed into **seed-bed** in the **nurseries**, binds the seed-bed together for **easy transplant** of seedlings. It retains enough moisture and humidity to **expedite germination.** It acts as a natural **growth-stimulant**.

EcoTak-OP and **EcoTak-SAT** act as an **"Agricultural Adhesive"**. It forms a **"Protective Blanket"** over seed and soil allowing the penetration of rain and in effect glue seed & hay / straw to the soil surface thus **reducing soil erosion.**

EcoTak-OP and **EcoTak-SAT** can be mixed with water and sprayed over soil using hydroseeder / sprayer to **hold dust.**

Applications:
- **Hydroseeding**
- **Hay/Straw Tacking**
- **Fiber Mulch Binding**
- **Dust Control**
- **Re-vegetation**
- **Seed-bed / Cube Binder**

Advantages:
- **Economical and Efficient Holding Power**: EcoTak holds seed and immediate surrounding soil in place until germination and growth is accomplished. This reduces the impact of rain, wind and displacement of planted material. This also increases water infiltration and **reduces water runoff.**
- **High Viscosity**
- **Hydroseeder Lubricant:** **EcoTak** act as lubricant for many moving parts of hydroseeder / sprayer and also lubricate slurry thereby **reducing the potential for clogging.**
- **Improve slurry flow and suspension:** Slurry reaches further with the same pump force.
- **Fast, easy loading**
- **Reduce moisture loss, fertilizer leaching**
- **Non toxic**, non corrosive all natural powder. Reducing soil erosion and moisture permeation without harm to vegetation or the environment.
- Form a firm, resilient, rewettable membrane
- **Enhance germination**
- **Drift control of spray**
- Cold water soluble

Mixing Instructions:
Add **EcoTak** slowly to the forceful stream of water in the hydroseeder tank. Agitate vigorously with appropriate quantities of fiber mulch, seed and fertilizer.

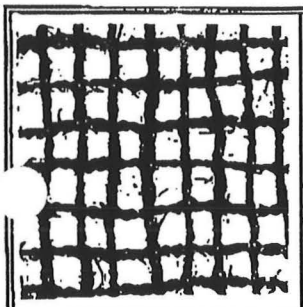
Application Rate:
EcoTak-OP: Average rate:
40 to 50 pounds per acre.

EcoTak-SAT: Average rate:
40 to 120 pounds per acre.

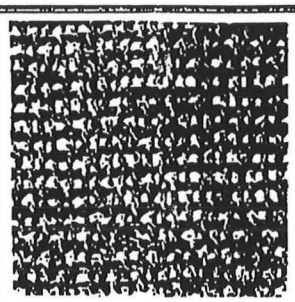
Greater or lesser quantities can be applied based on application, amount of fiber/straw, erosion potential, soil conditions, temperature, humidity and slope.

Warranty:
The Information given here and the recommendations made herein are based on our research and are believed to be accurate. No guarantee of their accuracy is made. in every case we urge and recommend that purchaser before using any product in full scale production make their own tests to determine to their own satisfaction whether the product is of acceptable quality and is suitable for their particular purpose under their own operating conditions. The product discussed herein are sold without any warranty as to merchantability or fitness for a particular purpose or any other warranty, expressed or implied. Nothing that has been mentioned here should be taken as permission, inducement or recommendation to practice any patented invention without a license. No representative of ours has any authority to waive or change the forgoing provision.

Eastern Products, Inc.
1162 Sycamore Lane
Mahwah, NJ 07430
Tel.: 800-934-0809
201-934-5050
Fax.: 201-934-8686



EcoCoir-4000



EcoCoir-7000



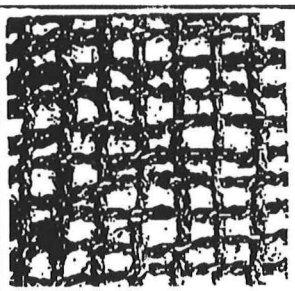
EcoCoir-9000

EPI's EcoCoir

Erosion Control Blankets
100% Natural Coir Geofabrics



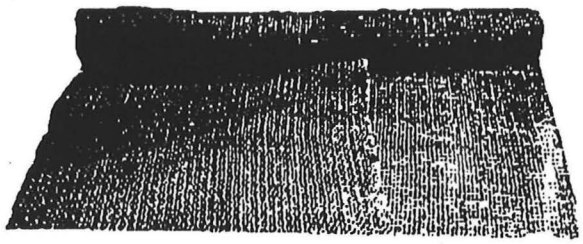
EcoCoir-2000



EcoCoir-12500



EcoCoir-L Loop matting



EcoCoir rolls

EPI's EcoCoir - 100 % Natural Coir (Coconut) Fiber Netting--

- Biodegrade in 4-10 years
- High tensile strength
- Aesthetically pleasing
- Water absorbing
- Resistant to UV rays
- Economical alternative to synthetics

Applications:

- Road embankments
- Soil Erosion Control
- Re-vegetation
- River embankments
- Ski slopes and ski lift tracks
- Hillside slopes
- Soil Bio-engineering
- Re-sedimentation projects
- Landscaping
- Mining and Wastelands
- Golf courses
- Streambank stabilization

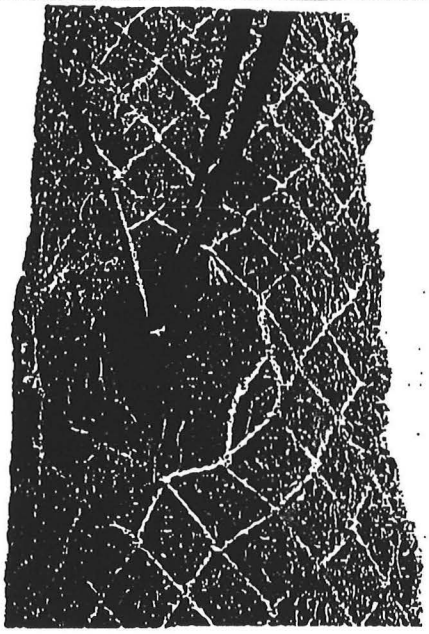
EPI's EcoCoir Coir Geofabrics are made from 100 % Natural Coir Fiber drawn from Coconut Husk. Coir is naturally resistant to mold, rot, and moisture. EPI's EcoCoir are high strength geofabrics and they decompose very slowly. They hold soil in place and prevent erosion from wind and rain. They also promote the growth of new vegetation by absorbing water and retaining the right amount of moisture for re-vegetation.

EcoCoir 4000 is a light weight coir geofabric with open weave construction allowing hydroseeding after installation. EcoCoir 7000 is useful for extreme slopes, and for geogrids. EcoCoir 9000 is high strength Coir geofabric for slopes higher than 1:1. It is also used for streambank erosion control and is an economical substitute for synthetics. EcoCoir is available in variety of width, length, densities, weight, and weave, standard and loop matting.

EcoCoir - Ecologically correct for the Ecosystem.

EASTERN PRODUCTS, INC.

1162 Sycamore Lane, Mahwah, NJ 07430 U.S.A.
Tel: (201) 934-5050 Tel: (800) 934-0809 Fax: (201) 934-8686



EPI's

EcoLogs

100% Natural Coir Fiber Logs



EPI's EcoLogs - 100 % Natural Coir (Coconut) Fiber Logs for--

- Streambank Stabilization
- Channel Stabilization
- Shoreline Stabilization
- River-bank Stabilization
- Wasteland Restoration
- Wildlife Habitat
- Re-vegetation
- Erosion Control

EPI's EcoLogs are 100 % Natural, Bio-degradable, Coconut Fiber Logs in cylindrical shape, covered in Coir Fiber Net for bioengineering solutions for bank erosion problems. EcoLogs last several years providing safe, natural growth medium for plants and act as root support system. It naturally biodegrade and protects the bank until trees and other plant root bindings develop natural protection. EcoLogs provide natural solution which is ecologically safe and aesthetically pleasing.

EcoLogs - Ecologically correct for the Ecosystem.

Specifications:
100% natural, bio-degradable Coir fiber interior, and 100 % Natural, Bio-Degradable Coir netting exterior.
EPI also offers EcoLogs-S, a special Coir Fiber EcoLogs with a wooden core in the center.
Size:

Diameter (in Inches):		8",	12",	16",	20"
Length (in Feet):	4',	8',	12',	16',	20'

Other sizes available upon request.
Weight: 9 Lbs/ Cubic Ft.
EcoLogs being natural product made in cottage industry, about 10% variation in specifications is expected.
Installation:
EcoLogs are installed with 2"x2" wooden stakes. The outer Coir Netting is woven such as to help in installation by tying it up.

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EASTERN PRODUCTS, INC.

1162 SYCAMORE LANE
MAHWAH, N.J. 07430
U.S.A.

TEL: (201) 934-5050
FAX: (201) 934-8686

Description & Uses

Natural organic Hydrocolloid powder EcoTak-OP derived from vegetable seed with 100% active ingredients. It is no toxic or harmful. It is environmentally safe to animal life and plant. MSDS available on request

Application:

Fiber mulch Tackifier:

Under Normal Condition i.e. 50 degrees F and less than 2: 1 slopes use EcoTak-OP at the rate of 40 to 50 Lbs. per acre. Cooler temperature or Steeper slope than 2:1 use EcoTak-OP at the rate of 60 to 80 lbs. per acre.

Straw / Hay Tacking - Mulch / Soil Binder:

Use EcoTak-OP 40 to 50 lbs. of EcoTak with 800 gal. of water as an overspray. For better holding strength and more even application add 150 lbs. of fiber mulch.

Slurry Lubricant:

Use 1 lb. of EcoTak per 100 lbs. of fiber mulch.

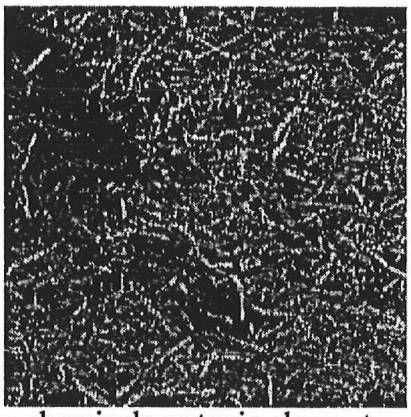
Mixing Procedure:

Fill hydroseeder with water up to the bottom agitator, Engage agitator to max. RPM and slowly add required quantity of EcoTak-OP to the forceful stream of water. After tackifier is mixed with water thoroughly, then add seed, fertilizer and fiber mulch.

EcoFibre
Premium Wood Fiber Mulch

Engineered for Excellence

No other hydroseeding product measures up.

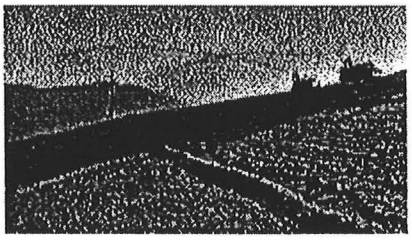


Look closely. There's a big difference between EcoFibre® hydroseeding products and other mulches. It's all our long fibers.

By using only natural wood fiber, our manufacturing process creates fibers to a precise range of lengths. These fibers, when sprayed on a job site, interlock more readily, creating a fiber blanket that allows air and soil to penetrate. Yet they firmly hold the seeds and soil in place through severe weather conditions. EcoFibre® is 100% wood fibre and contains no growth inhibiting chemicals or toxic elements.

With EcoFibre, you'll get it right...the first time.

EcoFibre® products can actually help you to be more productive. Our unique fiber blend mixes easily with seed, water and fertilizer to produce a lump-free homogenous slurry. It flows smoothly through hydroseeding equipment, carries further and covers more evenly due to its long fiber length. You'll be able to finish one job and move on to the next without delay. Plus, you'll have fewer call-backs, because EcoFibre® reduces spotty growth that many "economy" brands cause.

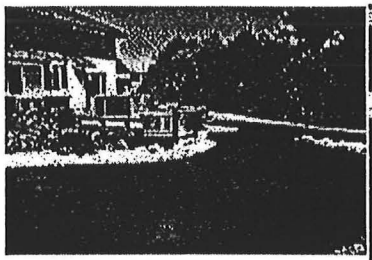


So even though you may pay a little more for EcoFibre®, you'll often find that it pays you back in the long run. In fact, numerous experts emphasize the superior results of wood fiber mulch to cellulose mulch for erosion protection and sustained plant growth. Experts also agree that wood fiber mulch will cover the same area with 20 - 30% less material than cellulose mulches.

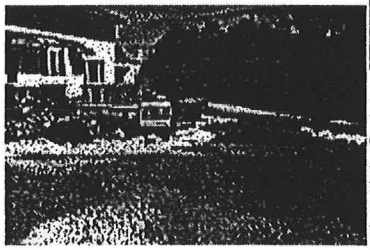
EcoFibre® is colored green to help meter applications evenly, and give the site an attractive, temporary grass-like appearance.

Easy to use. Fewer callbacks. Less material. Professional reputation. Use

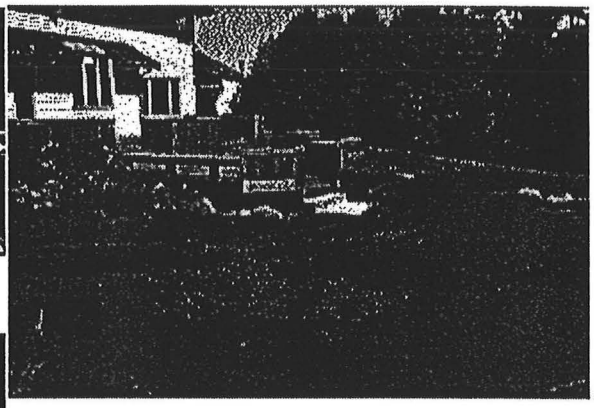
EcoFibre® products for your next job.



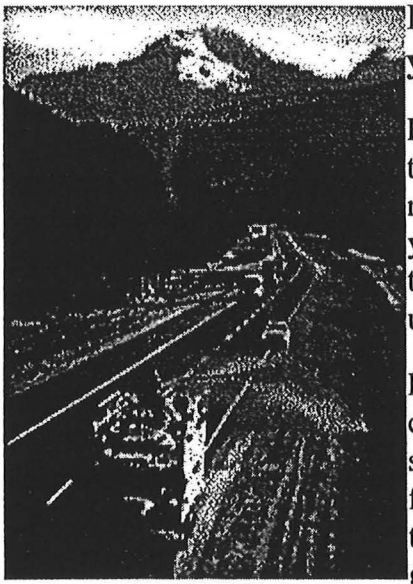
Application



1st Week



EcoFibre® in Action: From application (upper left) through the end of the 3rd week (above). EcoFibre® is engineered to promote quick seed germination, so your customers can have a beautiful lawn quickly. This time lapsed series of photos was taken over a three week period in July in western Washington State. The EcoFibre® mulch rate was 57 lbs./1000 sq. ft. (2500 lbs./acre).



EcoFibre holds the seed. And protects your profits.

EcoFibre® Premium Wood Fiber Mulch could be the most important ingredient in establishing your reputation for high quality hydroseeding. When you spray a jobsite, you're putting everything on the line. You need to know that the mulch you use will do the best job possible.

EcoFibre® is being used regularly on four continents in a variety of climates and has proven superior in all uses. It's superior because it's made from residual virgin wood fibers, and engineered to promote even coverage and quick seed germination. Our exacting manufacturing process produces longer, more consistent fiber lengths with extra holding power to protect seeds, prevent erosion and reduce the risk of clogging. You get more usable fiber and less dust. The high manufacturing temperatures produce a sterilized fiber with no growth inhibiting chemicals.

EcoFibre®, the next generation of Wood Fiber Mulch.

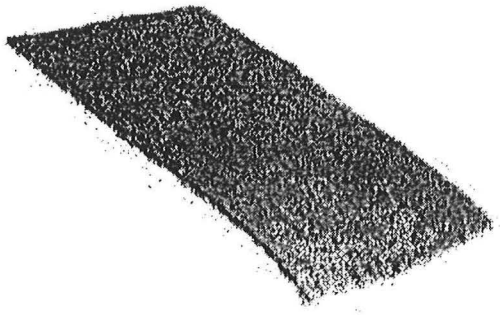
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EcoAegis™ | **EcoFibre®** | EcoFibre®+Tac

EcoAegis
Bonded Fiber Matrix

The Next Generation...

Why just substitute...when you can **upgrade**?

Control Erosion Better...Faster...and Easier...with Less Risk



When your erosion problem demands the soil-holding strength of a mat but your budget calls for the faster speed and lower cost of hydroseeding, choose the smart solution -- **EcoAegis™** bonded fiber matrix.

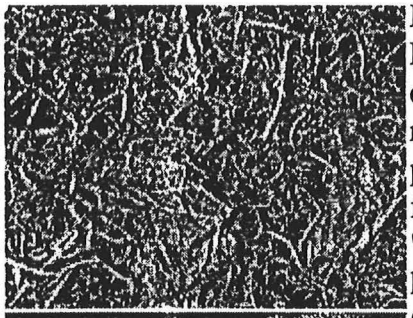
Our blend of refined wood fiber and unique, sophisticated tackifiers, is applied in a one-step hydroseeding process. Once dry, it forms a water-insoluble protective cover that is porous and breathable and secures soil and seed while enhancing establishment of vegitation.

We developed EcoAegis™, named after **Aegis**, the shield that protected the mythological Greek god Zeus, to provide a more versatile, easier-to-use and biodegradable alternative to erosion control mats. EcoAegis™ can be applied with seed and fertilizer using conventional mechanically-agitated hydroseeding equipment. We call this process Hydro-Matting.

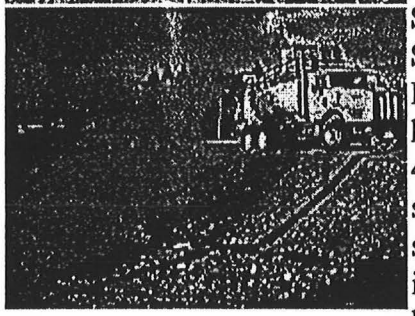
The key to performance of EcoAegis™ is the use of crosslinking agents. The bonding compounds used in the product, polysaccharide polymers, are made of long-chain molecules. Left alone, these molecules move independently of one another. However, the crosslinking agents in EcoAegis™ tie one polymer to another. This linkage allows EcoAegis™ to mix and flow easily when wet and enables it to remain strong and insoluble once dry -- protecting the soil surface from repeated rains and sheet flows.

EcoAegis™ is gentle on the environment, too. Because it is sprayed on, the site remains relatively undisturbed, further reducing risks of erosion. In time, the product decomposes to carbon dioxide, a natural by-product of organic decomposition used by plants for photosynthesis, and water.

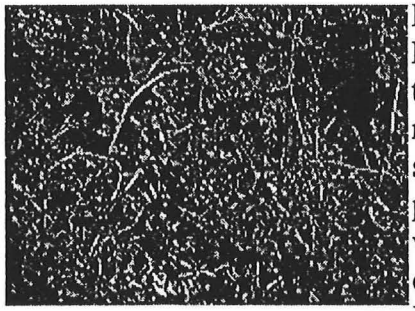
EcoAegis™...The Smart Way to Stabilize Slopes



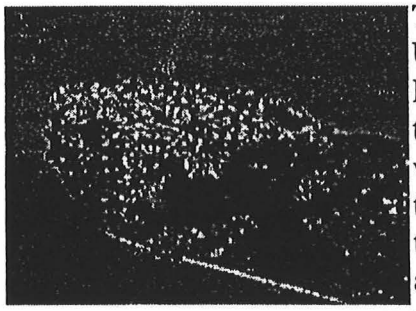
Premium Fibers
EcoAegis™ is made from engineered, thermo-mechanically refined residual wood fibers. This process produces a clean, highly fibrous material of interlocking "fingers" -- the very best fibers for hydromulching.



Stabilizes Steep, Hard-to-reach Slopes
EcoAegis™ is normally applied hydraulically at the rate of 3,000 to 4,000 lbs. per acre. It bonds to most slopes, including near-vertical surfaces. No special operator training is required other than normal hydroseeding procedures. It can also be applied by helicopter to protect inaccessible sites.



Enhances Plant Growth
EcoAegis™ forms a protective cover that absorbs the erosive impact of rain drops and foot traffic to hold soil, seed, and fertilizer firmly in place. The seed is not smothered, which can happen with erosion control mats. In addition, EcoAegis™ retains more than ten times its weight in water and reduces evaporation, creating a microenvironment that helps nurture plant growth.



The Protective Shield
Under normal conditions, EcoAegis™ sets up within 24 hours to form a durable, natural-colored, water-resistant matrix. Depending on topography and application technique, it dries to a thickness of about 1/8 to 1/4 in. (3-6mm). This shield bonds intimately with the soil and conforms to contours to ensure complete protection. It can set up to protect a new seeding even when applied at near-freezing temperatures.

Case Study: Capilano Watershed

Canfor's newest product, **EcoAegis™**, is put to a real-world test at a slide in the Greater Vancouver Regional District watershed.

Independent Tests Demonstrate Value of EcoAegis™

EcoAegis™ reflects extensive research and development and a sound testing program. Our objective was to develop the best *bonded fiber matrix* available. Not one of the many other formulations studied equaled the performance levels acheived by EcoAegis™. It is an effective alternate solution to difficult erosion problems.

EcoAegis™ has performed successfully on sites ranging from near-freezing temperatures in Canada to the heat of an Australian Summer.

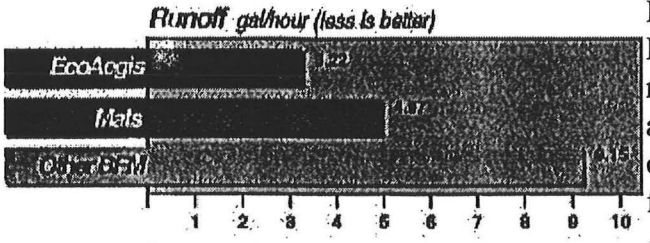
Independent testing by an internationally respected laboratory in the United States confirms the outstanding performance of EcoAegis™. We set the performance benchmark for EcoAegis™ to be equal to or better than the best-performing products published in *Effectiveness of Selected Materials Under Simulated Rain and Sunlight*, Proceedings of Conference XXVI, International Erosion Control Association, Atlanta, GA., February 1995.

As the following results show, the strengths of EcoAegis™ may, indeed, have set a new benchmark of performance for this type of erosion control. The benefits of EcoAegis™ include:

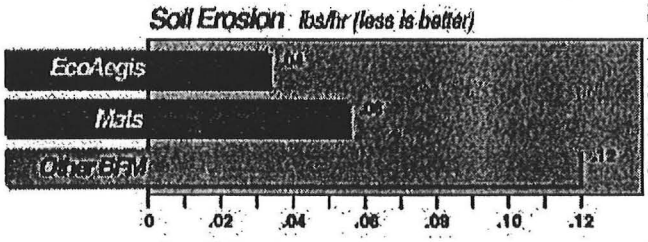
- Less water runoff
- Less seed loss
- Less soil loss
- Generally higher seed germination rates

Better than Erosion Control Mats

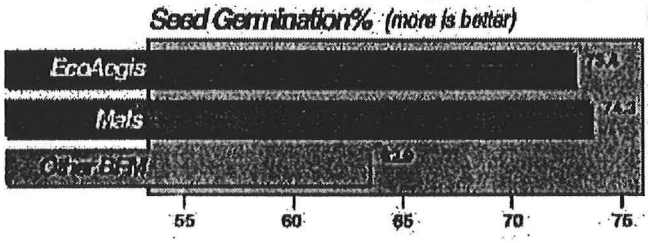
For all tests: Slope = 2.5:1 (H:V); Rainfall = 5 in. per hour; Rainfall duration = 30 minutes



Runoff
EcoAegis™ reduced water runoff 65% compared to another BFM and 35% compared to the average of the four best mats.



Soil Erosion
EcoAegis™ saved 67% more soil than another BFM and 33% more soil than the average of the four best mats.



Seed Germination Rate
Germination rate of seed protected with EcoAegis™ was 17% higher than another BFM and within 1% of the four-mat average.

The tests illustrate the ability of EcoAegis™ to nearly match or exceed performance of erosion control mats in three critical areas.

In each case, EcoAegis™ is compared to the *average* of the four top-performing mats.

Note: The four best mats vary from one category of comparison to another. No one mat was better than EcoAegis™ in all categories, further verifying the overall strengths of EcoAegis™. Tests were conducted scientfically to obtain honest results even though there may be subtle variances from one test to another.

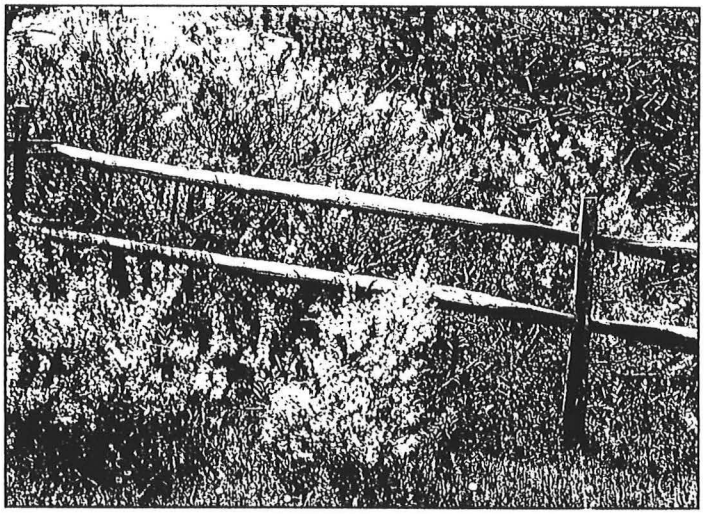
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EcoAegis™ | EcoFibre® | EcoFibre®+Tac

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1996
WHOLESALE CATALOG

PINELANDS NURSERY

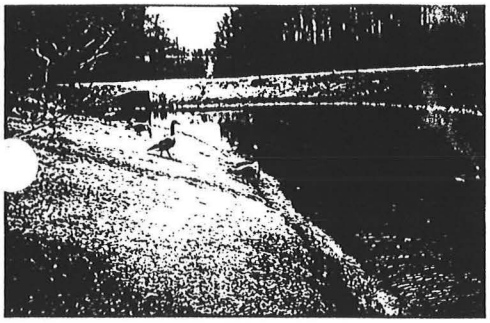
"The Source
for Native Plants and BonTerra
Erosion Control Products"







Protect the Environment - Use only Nursery Propagated Plants



Eroded Pondshore

C2 Blanket Installed



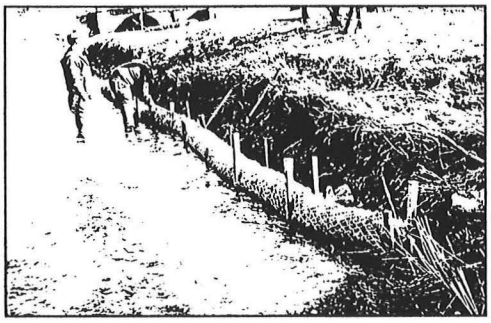


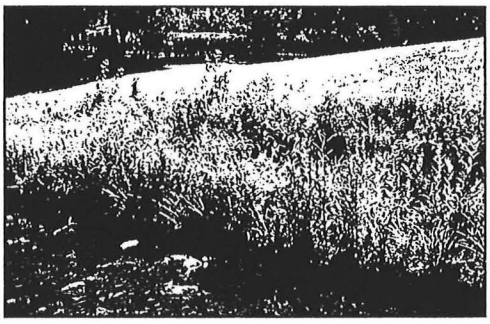
4 Months Later



Eroded Streambank

Bio Logs Installed





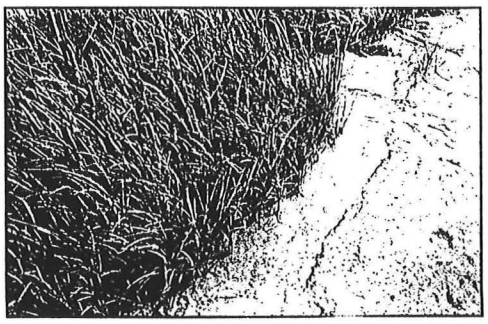
4 Months Later



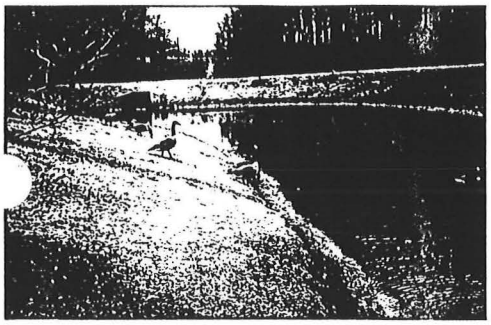
Bog Mat in the Nursery

Installed on bayshore





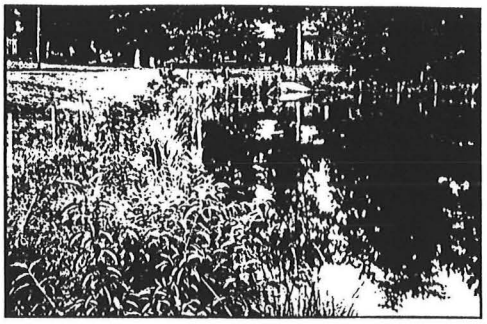
2 Months Later



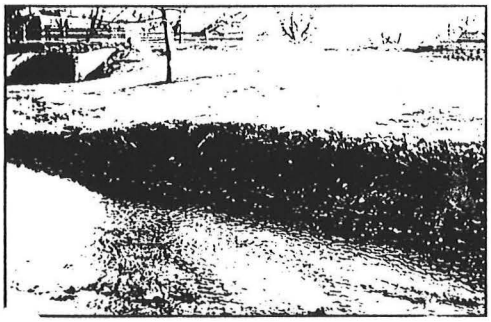
Eroded Pondshore

C2 Blanket Installed



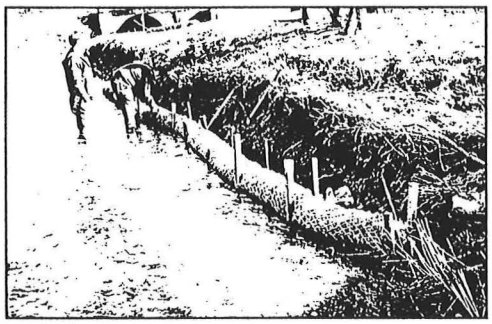


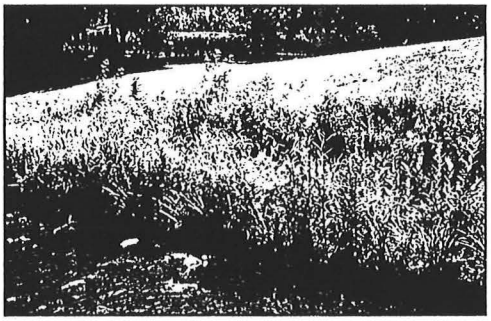
4 Months Later



Eroded Streambank

Bio Logs Installed





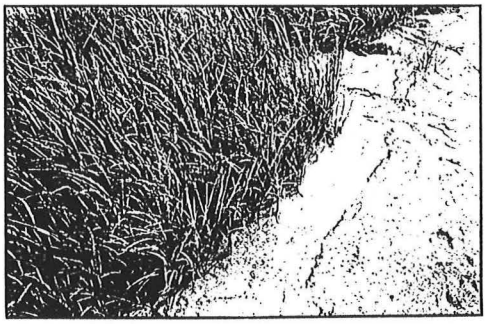
4 Months Later



Bog Mat in the Nursery

Installed on bayshore





2 Months Later

DESIGN CRITERIA TABLE

BESTMANN
GREEN SYSTEMS

7 Mall Street
Salem, MA 01970

TEL: 508/741-1166
FAX: 508/741-3780

© 1993

ITERPRETING THE DESIGN CRITERIA TABLE:

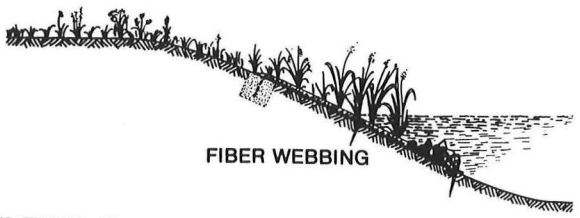
ioengineering can effectively stabilize streambanks and shorelines within a broad range of physical onditions. In many cases, conditions are too stressful for conventional planting techniques or spontaneous atural revegetation, yet do not require hard structural measures. The following table can be used to etermine the specific Bestmann Green Systems materials suitable for cost-effective treatment on a spectrum f hydraulic and morphological conditions.

om the top portion of the table, locate the type and level of stress factors present on the site for proposed oengineering work. The stress levels shown represent maximal values, not average values. The highest ress level indicated is used to determine the materials needed. In general, materials listed in the lower ortion of the table under the same stress level column will provide the necessary protection for the site. If the ghest stress level column for the proposed site has two factors in it, move into the next higher stress level olumn to determine the materials needed. When stress levels are not anticipated within the first two years llowing installation, move into the next lower stress level column to choose materials. The stress tolerance the materials shown below assumes that each material is used alone. When Bestmann Green Systems aterials are used in combination with eachother, or with additional protective structural measures, the range application is increased.

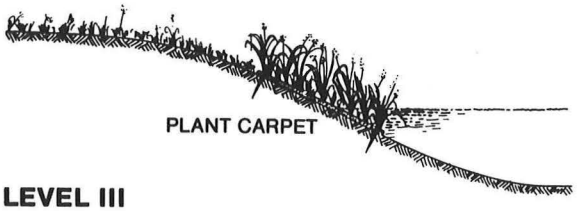
TRESS TYPE	*STRESS LEVELS*				
	1	2	3	4	5
Stream Velocity	<1 ft/sec	<2.5 ft/sec	<5 ft/sec	<8 ft/sec	<12 ft/sec
Wave Height	<6 inches	<1 foot	<20 inches	<2.5 feet	<4 feet
Slop rofile	<1:10	<1:5	<1:3	<1:2	variable
Sun osure	full sun	mostly sun	part sun	part shade	shade
Traffic: Human/Anima	none	slight	moderate	frequent	extreme

estmann Green Systems Materials					
Medium Plant Plugs	X				
Fiber Webbing	X				
Large Plant Plugs	X	X			
Plant Carpets	X	X			
Plant Pallets		X	X		
Fiber Mat		X	X		
Fiber Roll (coir net)		X	X		
Plant Roll		X	X	X	
Brush Carpet		X	X	X	
Fiber Roll (PE net)			X	X	X
Rock Roll				X	X
Plant Revetment				X	X

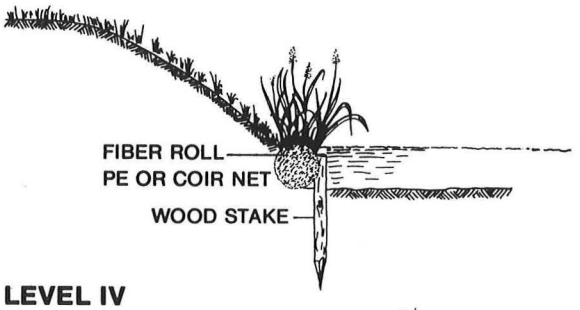
LEVEL I



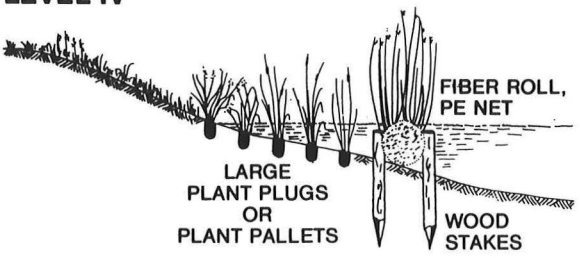
LEVEL II



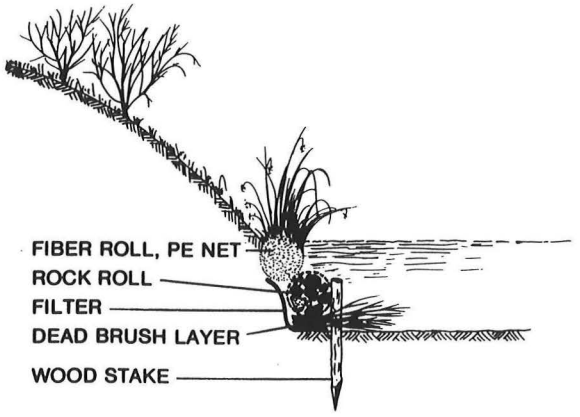
LEVEL III



LEVEL IV



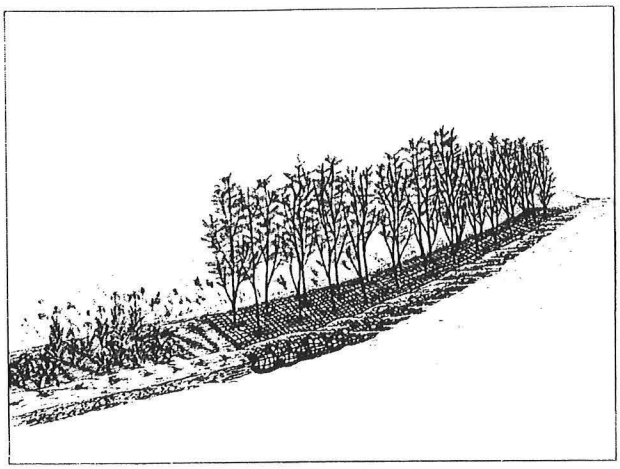
LEVEL V



LIVING SOLUTIONS

EROSION CONTROL WITH HERBACEOUS OR WOODY PLANTS

On many disturbed rivers and streams, strong currents wash away seeds or young plants and prevent the spontaneous emergence of vegetation; special plantings are required. In other cases, a prompt esthetic solution is desired where standard methods are ineffective.

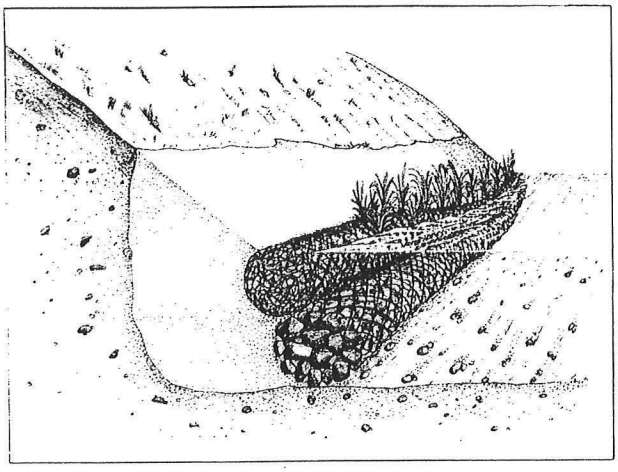


Plant Carpets™ are pre-vegetated biodegradable blankets which collect and hold sediments. Densely planted and thoroughly rooted, they develop into a thriving wetland community. Various species combinations are available, including grasses and sedges, or shrubs.

Fiber Mats™ are immediately effective erosion control modules that lend themselves to planting with woody species.

SECURING AN UNDERCUT BANK

On sites with limited space, stabilizing a steep bank must be accomplished efficiently. The materials chosen must be compact and stable, while offering plants opportunity for continued colonization.

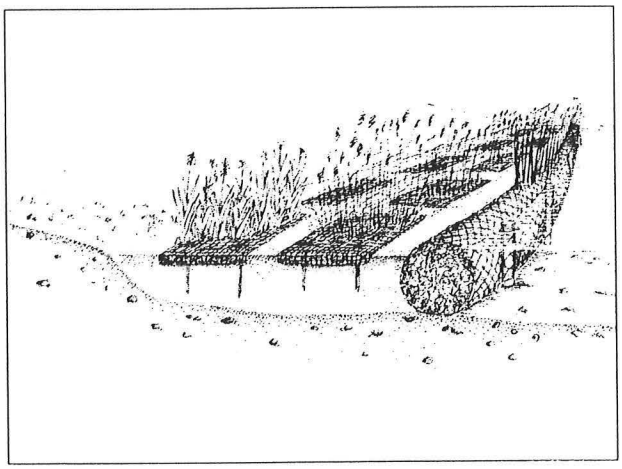


Fiber Rolls™ anchored firmly in the subsoil protect the toe of the slope and retain fill material. Plants are inserted after installation to facilitate handling or rolls can be supplied pre-vegetated.

In cases with deeper undercutting, **Rock Rolls™** offer a stable foundation for other measures.

RESTORATION OF LAKESIDE WETLAND BORDER

High intensity waves (produced by motorboats) and other factors often cause the disappearance of wetland borders. Once established, a belt of wetland plants can withstand reasonable wave impact. Many species are able to dissipate wave energy through leaf and stem elasticity.

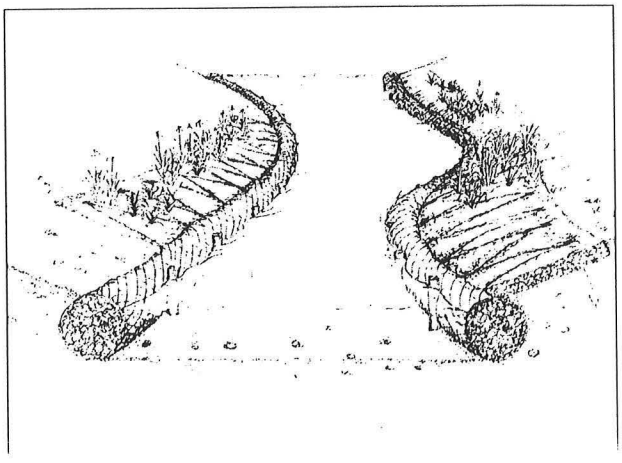


A breakwater of **Fiber Rolls™** calms the water, helps contain the substrate, and supports growth. Nonetheless, only vigorous stands of vegetation are capable of spreading.

Pregrown **Plant Pallets™** endure wave action and protect roots and rhizomes even in exposed sites.

RENATURALIZING AN URBAN STREAM

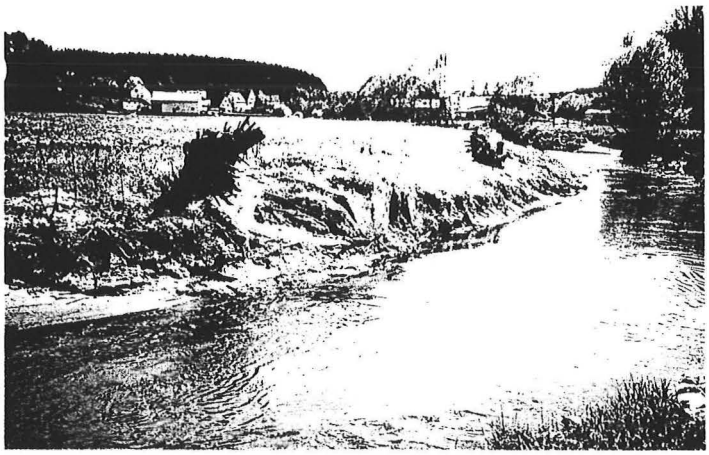
The straightening and concurrent shortening of a channel steepens the stream's gradient. Roof and pavement runoff results in high storm flows. Increased volume and steepness cause erosion and downcutting. Citizens demanded high ecological value within the confined space.



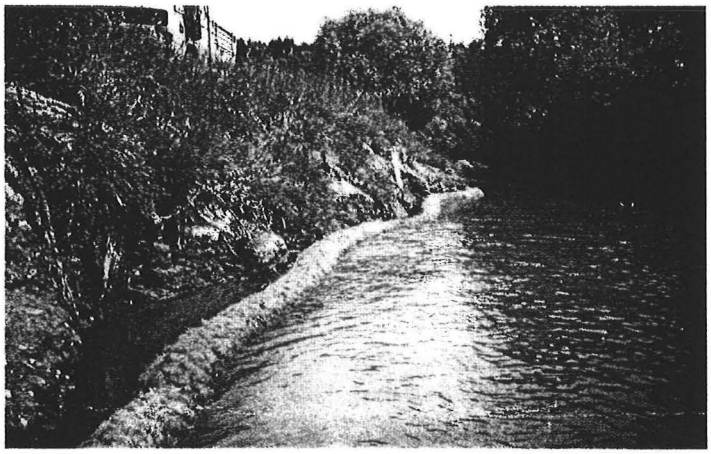
With **Plant Carpets™**, a mature stand of native wetland plants is literally unrolled on site. They require little or no maintenance and do not obstruct the passage of water during flood events.

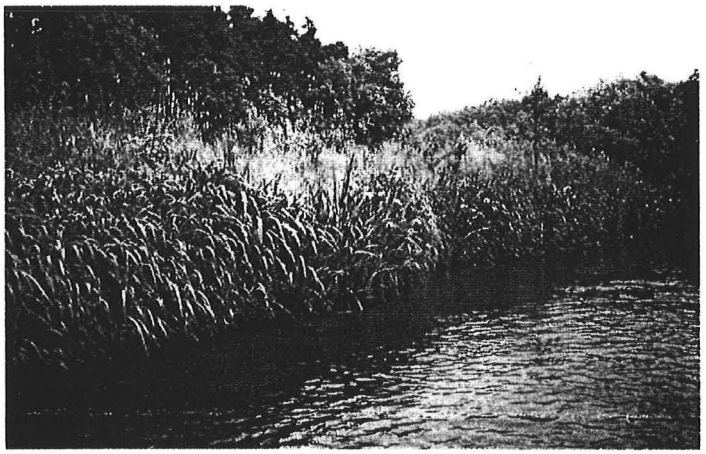
Fiber Rolls™ are flexible, dense, biodegradable construction modules which secure the bank. Vegetation does not wash out during high flows.

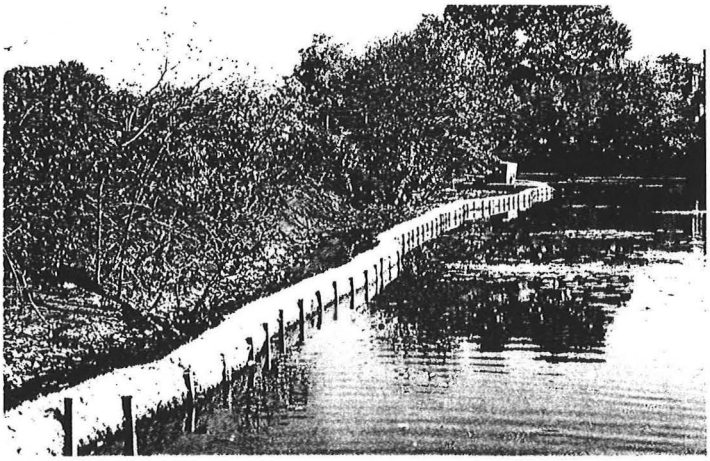
FOR DYNAMIC PROBLEMS









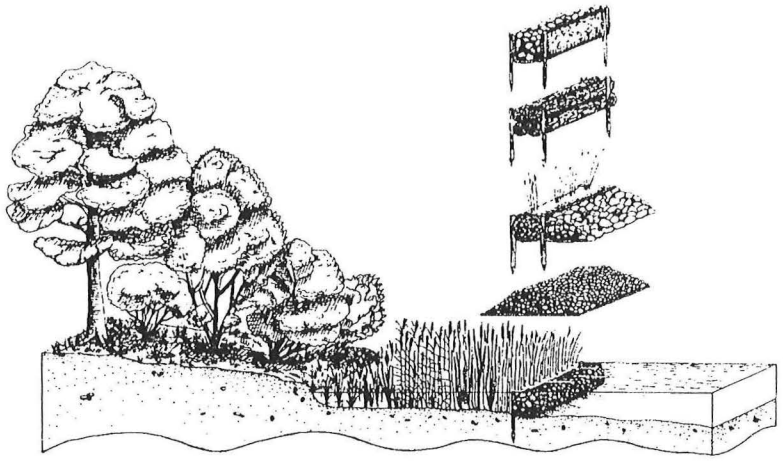




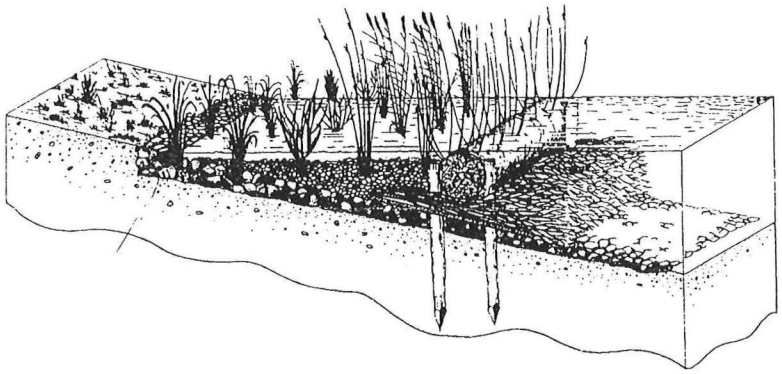




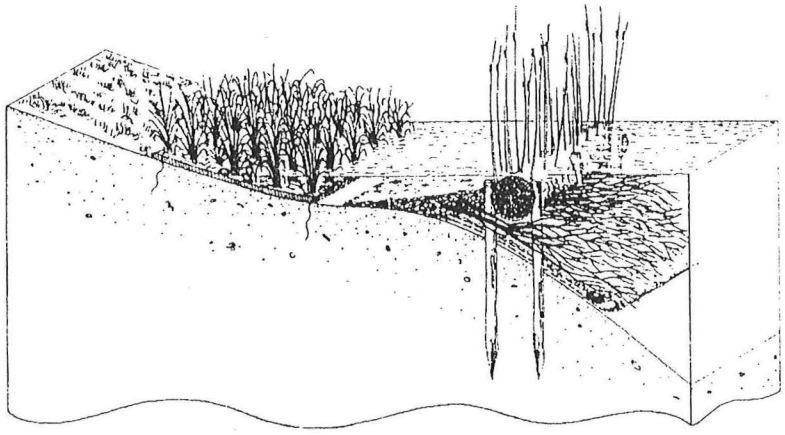
QUALITY PRODUCTS AND SPECIALIZED CONSULTING SERVICES



Bioengineering is a low-tech approach for effective yet sensitive design and construction using natural and living materials. The practice brings together biological, ecological, and engineering concepts to vegetate and stabilize disturbed land. Bestmann Green Systems, Inc. offers innovative techniques and materials for establishing herbaceous vegetation at the water's edge where waves, flow, or tides cause stress. Once established, vegetation becomes self-maintaining. When living plants are impacted by a major force, such as flooding, or conditions are altered by sediment accumulation, plants are capable of regeneration and adaptation.



Bestmann Green Systems bioengineering modules support the growth and development of plants, and physically secure the bank or shoreline. The modules are fabricated from coir, a coconut fiber which is chosen for its high tensile strength, decomposition rate of 7-12 years, and moisture retention properties. As roots mature sufficiently to provide stability, the natural fiber biodegrades. Native plant species are selected for their adaptation to varied physical conditions and many provide excellent food and cover for fish and wildlife. Vegetation becomes the framework for a full wetland community, including important microorganisms. Bestmann Green Systems solutions improve water quality through their ability to control erosion, catch and stabilize sediment, and counteract non-point source pollution and eutrophication. The systems are cost-effective and can be installed virtually year 'round, alone or combined with other methods.



CONTACT US ABOUT YOUR PROJECT OR TO REQUEST DETAILED TECHNICAL INFORMATION

EXPERIENCE:

Bestmann Green Systems products and techniques were developed and introduced to the German market in the 1970's. Since that time, we have accumulated experience in Europe, North America, and Asia with the issues specific to streams, rivers, lakes, detention basins, constructed wetlands, and tidal areas in urban and rural settings alike. On highly varied projects, we have analyzed stress factors, developed solutions, and refined our approach to deliver reliable results.

PERFORMANCE:

Bestmann Green Systems products and techniques are designed to adequately address the hydraulic and biological factors of a site. We have documented the short- and long-term performance under different conditions. Our performance record remains unequalled in the erosion control industry. The systems are highly effective the day they are installed, and they grow better over time.

SERVICE:

We offer prompt well-informed sales support, including free consultation. Additionally, through training and practice in both Germany and the United States, our staff is uniquely qualified to provide a full range of consulting services for bioengineering project design. We are familiar with the variety of technical, ecological, and regulatory requirements in the field of land and water resource management and restoration. We invite collaboration with planners, engineers, and other professionals to best serve our clients.

QUALITY:

The quality of Bestmann Green Systems bioengineering solutions depends on living and structural components. Our rugged coir fiber modules are designed for versatile application, effective installation, and dependable function under a range of hydraulic conditions. Our unique cultivation method and exacting standard for quality ensure our plant materials are vigorous and able to flourish under stressful aquatic conditions.



53 Mason Street, Salem, MA 01970
TEL: 508/741-1166 FAX: 508/741-3780

© 1994 Bestmann Green Systems, Inc.
Some methods and systems described are protected by US Patent Number 5,338,131 dated August 1994.
Additional patents pending.

PRICE LIST July 1993

PLANT PLUGS

Small	$0.70
Medium	1.75
Large	5.90

PLANT CARPETS

per ten square feet	$34.30

PLANT PALLETS

per ten square foot module	$56.70

FIBER ROLLS

quantity:	-300 feet	300-1500 feet	1500+ feet
Small (12")	$10.50/ft	$ 9.30/ft	$ 8.10/ft
Medium (16")	$16.20/ft	$14.40/ft	$12.50/ft
Large (20")	$20.60/ft	$18.20/ft	$15.90/ft

Prices quoted are for polyethylene mesh; please add $0.50 per foot for coir mesh.

FLOATING ISLANDS

Vegetated	$1290.00
Gravel-topped	$1375.00

For materials, dimensions, and species, see specifications.

Please call to verify the FOB point for your order. Shipping and taxes not included.

Full payment due prior to shipping unless approved for different terms.

Prices subject to change without notice unless secured by a 1/3 deposit.

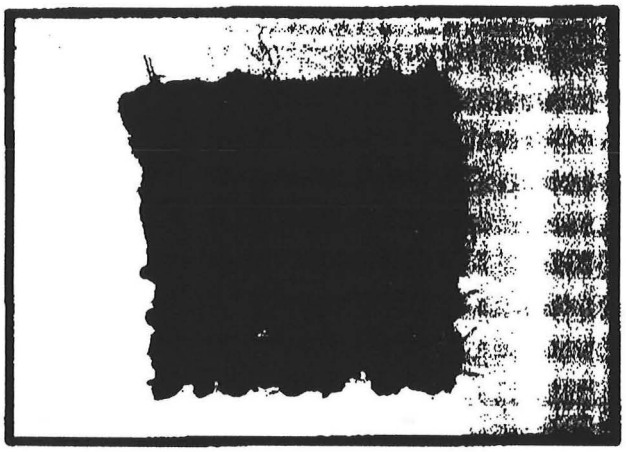
Additional products and accessories available by inquiry.

RoLanka International, Inc.
"Coconut Fiber Specialists"

1-800-760-3215
Tel: (770) 961-0331
Fax: (770) 961-1480
6476 Mill Court, Morrow, GA 30260

BioD-Mesh™

Highly Versatile, Biodegradable, Organic Erosion Control Blanket







***BioD-Mesh** is an economical, 100% natural, organic blanket woven from spun mattress coir yarns. BioD-Mesh is a highly engineered yet biodegradable erosion control blanket. The woven matrix of our blanket prevents the fibers from being washed away when exposed to runoff water. The high wet tensile strength and high limiting shear stress values of the BioD-Mesh guarantee a superior performance above all other types of organic erosion control blankets design to last 2-4 years. BioD-Mesh is environmentally friendly and cost effective. BioD-Mesh blanket is the erosion control product that concerned designers and specifiers have been seeking all these years.*

Specifications

Parameter	BioD-Mesh 60
Weight oz/sy	18
(g/m^2)	(600)
Wet tensile strength	
lbs/feet	340 x 310
(kN/m)	(5.0 x 4.5)
Dry tensile strength	
lbs/feet	525 x 473
(kN/m)	(7.7 x 6.9)
Open area	50 %
Limiting shear stress	
bare soil lbs/ft^2	3.6
(N/m^2)	(176)

The BioD-Mesh 60 blanket is recommended for slopes up to 1:1 and water flows up to 13 fps.

Standard roll size is 6.5' X 180' (2m X 30m). Also available in 3.25' (1m), 9.75' (3m) and 13' (4m) wide rolls.

Available for immediate delivery

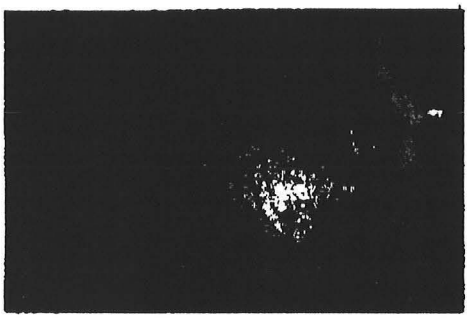
■ Portland, OR ■ Atlanta, GA ■ Ayer, MA ■ Linden, NJ

RoLanka International, Inc.
"Coconut Fiber Specialists"

1 800 760 3215
Tel: 770 961 0331
Fax: 770 961 1480
6476 Mill Court, Morrow, GA 30260

BioD-Roll™

Coir (coconut fiber) roll for streambank and shoreline stabilization





In the past, design engineers used rock riprap and concrete structures to address shoreline and streambank erosion. Often, those structures failed to accomplish the environmental expectations, especially in wetlands. With growing concern over environmental destruction, there is an increasing demand for bioengineering solutions for shoreline and streambank erosion control. As a result, many professional designers are incorporating biological, ecological, and engineering aspects of erosion control into their designs. Bioengineering solutions combine all three aspects to produce living structures capable of handling shoreline and streambank erosion.

Specifications

Outer Net

Standard coir rolls are made of bristle coir twines (2"x2" mesh). The coir twine has minimum strength of 80 lbs (356 N). Synthetic outer nets (2"X2" mesh) are available upon request. The synthetic twine has minimum strength of 200 lbs (890 N).

Inner Core

Compacted with mattress coir and available in two stuffing densities.

9 lbs/ft^3 (144 kg/m^3)
7 lbs/ft^3 (112 kg/m^3)

Standard diameter: 12 inch (30 cm)
Also available in 16 inch (40 cm) and 20 inch (50 cm) diameters.

Standard length: 20 feet (6.1 m)
Five feet (1.52 m) and 10 feet (3.05 m) lengths are also available.

Unit weight depends on the diameter and stuffing density.

	12" (30 cm) dia.	16" (40 cm) dia.	20" (50 cm) dia.
9 lbs/ft^3(144 kg/m^3) density:	7 lbs/ft (10 kg/m)	12.4 lbs/ft (18.1 kg/m)	19.4 lbs/ft (28.3 kg/m)
7 lbs/ft^3(112 kg/m^3) density:	5 lbs/ft (8 kg/m)	8.9 lbs/ft (14.1 kg/m)	13.9 lbs/ft (22.0 kg/m)

Available for immediate delivery

☐ Portland, OR ☐ Atlanta, GA ☐ Linden, NJ

RoLanka International, Inc.
"Coconut Fiber Specialists"

1 800 760 3215
Tel: 770 961 0331
Fax: 770 961 1480
6476 Mill Court, Morrow, GA 30260

Patent Pending Design

BioD-Mat™

Bristle Coir Erosion Control Blanket



High Functional Longevity

High Wet Tensile Strength

Specifications

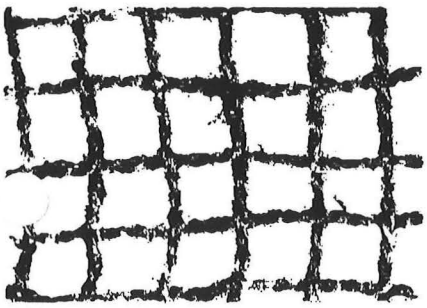
Revised October 1996

Property	Test Method	BioD-Mat 40	BioD-Mat 70	BioD-Mat 90
ight (oz/sq. yd)	ASTM D 3776	13.6	23	29
(grams/sq. m)		460	780	980
Wide width tensile strength	ASTM D 4595			
(lbs/in) MD **Wet condition**		56	124	148
(lbs/in) CD **Wet condition**		54	86	78
Elongation at failure	ASTM D 4595			
(%) MD **Wet condition**		30	42	52
(%) CD **Wet condition**		28	25	24
% Open area	Calculated	65	48	38
Thickness (in)	ASTM D 1777	0.35	0.33	0.35

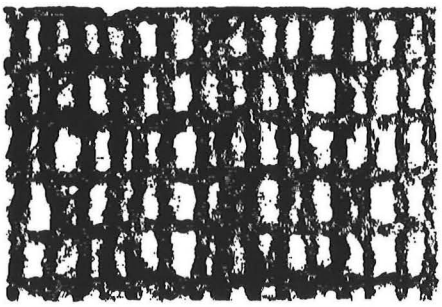
The BioD-Mat 40 blanket is recommended for slopes up to 1:1 and water flows up to 8 fps.
The BioD-Mat 70 blanket is recommended for extreme slopes (> 1:1) and water flows up to 12 fps.
The BioD-Mat 90 blanket is recommended for extreme slopes (> 1:1) and water flows up to 16 fps.

The BioD-Mat blankets are available in 6.5 ft. (2 m) and 9.75 ft. (3 m) widths.
Thirteen feet (4 m) wide blankets will be available on request.

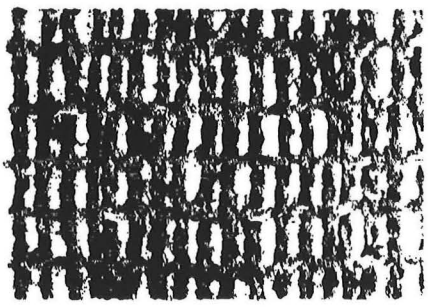
BioD-Mat 40



BioD-Mat 70



BioD-Mat 90



Available for immediate delivery

RoLanka International, Inc.

Coconut Fiber Specialists
6476 Mill Court, Morrow, GA 30260, Tel: (770) 961-0331 Fax: (770) 961-1480

Price List January 1997

(Subject to change without notice)

Product	[1]Price (F.O.B.warehouse)	Product Description
1. BioD-Mesh 60	$ 1.15 / SY	Mattress coir woven blanket. Weight 600 g/m^2. Std. size: 6.5' wide, 166' long.
2. BioD-Mat 40	$ 1.40 / SY	Bristle coir woven blanket. Weight 480 g/m^2. Std. size: 6.5' and 13' wide, 166' long.
3. BioD-Mat 70	$ 2.00 / SY	Bristle coir woven blanket. Weight 780 g/m^2. Std. size: 6.5' and 9.75' wide, 166' long.
4. BioD-Mat 90	$ 2.60 / SY	Bristle coir woven blanket. Weight 980 g/m^2. Std. size: 6.5' wide, 166' long.
5. BioD-Roll 30 (12" dia.)		Cylindrical shaped coir rolls. Available in 7 lbs/ft^3 and 9 lbs/ft^3 densities. Std. length: 20 feet.
Coir twine outer net	$ 6.00' / l. foot	
Synthetic twine outer net	$ 6.35' / l. foot	
6. BioD-Roll 40 (16" dia.)		Cylindrical shaped coir rolls. Available in 7 lbs/ft^3 and 9 lbs/ft^3 densities. Std. length: 10 feet and 20 feet
Coir twine outer net	$ 10.00' / l. foot	
Synthetic twine outer net	$ 10.40' / l. foot	
7. BioD-Roll 50 (20" dia.)		Cylindrical shaped coir rolls. Available in 7 lbs/ft^3 and 9 lbs/ft^3 densities. Std. Length: 10 feet and 20 feet.
Coir twine outer net	$ 16.00' / l. foot	
Synthetic twine outer net	$ 16.45' / l. foot	
8. BioD-Medium Compacted coir dust	$ 1.20 / cubic foot	Compacted (8:1) coir dust bricks. Packed in pallets of 720 ft^3. Each pallet contains 2400 bricks of 1.4 lbs.
	$ 1.10 / cubic foot	Compacted (5:1) coir dust blocks. Packed in pallets of 547 ft^3. Each pallet contains 219 blocks of 10 lbs
9 BioD-Cord Coir twine	$ 0.02 / l. foot	Bristle coir twine. Diameter: 0.35 inch. Strength : 65-90 lbs.
10. BioND-TRM	$ 2.80 / SY	Bristle coir - synthetic net turf reinforcing mat. Weight 1000 g/m^2. Std. size: 6.5' wide, 166' long.
11. BioD-SCF 28	$ 1.00 / SY	Mattress coir pad between two polypropylene nets Weight 280 g/m^2. Std. size: 8' wide, 166' long.

[1]F.O.B. from warehouse in **Atlanta (Georgia), Linden (New Jersey), Portland (Oregon)** or Ayer (Massachusetts). Available for immediate delivery. Shipping charges and taxes, if applicable, are not included.
*Add extra 2% / linear foot for 9 lbs/ft^3 density coir rolls.

WARRANTY

RoLanka International, Inc. guarantees BioD- products to be free from defects in manufacturing. Due to the variables such as weather, soil conditions, type of installation etc., RoLanka International, Inc. cannot guarantee that its products will perform under unlimited conditions. RoLanka International, Inc. will not be liable for any direct, indirect or consequential damages or losses occurred by any failure of our products.