



**BAYOU PRESERVATION**  
ASSOCIATION

STREAM  
CORRIDOR  
RESTORATION  
PRINCIPLES AND  
CHECKLIST

2022

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# Executive Summary

Bayou Preservation Association's Stream Corridor Restoration Checklist highlights four key areas important to thorough and successful project planning and implementation in the stream corridor.

## **Incorporating Outreach for Successful Stream Corridor Restoration**

Houston is the most diverse city in the U.S. In such a large city, with a large diversity of languages, cultures, and backgrounds, it is crucial projects that will impact these various communities make every effort to reach out to, educate, and receive feedback from the communities served and affected by the region's many stream corridor projects.

## **Applying a Comprehensive Approach to Preserve, Improve, and Restore Stream Corridors**

As the Bayou City, Houston has seen an evolution of the region's relationship with its many bayous throughout its history: from traditional, hard-structure engineering to restoration and buybacks, to nature-based solutions and green infrastructure. All the various tools available to environmental managers have roles to play, but we strongly encourage project planners and engineers to consider their projects from every angle and to engineer with nature, rather than fight it, whenever possible.

## **Using Best Practices to Support Form, Functions, and Values**

It is also important to make sure that project planners, engineers, and managers are making use of the current suite of best practices in stream corridor restoration and design. We also encourage the use of the most recent and accurate data, setting appropriate goals and measures of success, and frequently revisiting and adjusting methodologies as needed to achieve these goals.

## **Planning for Sustainability and Resilience in Future Benefits, Impacts, and Needs**

Projects all have a lifespan that will far outlive its installation and will have varying degrees of maintenance required to keep it functional. We also know the needs of the future will likely differ from the needs of today. We strongly encourage project plans that keep this in mind, designing projects that will require minimal maintenance and will not encumber the potential future needs of the community. We hope this will result in projects that are economically sustainable and achieve results with minimal impacts and intrusions on the stream corridor.

This checklist is intended to be used by project planners, managers, environmental practitioners, and contractors when engaging in environmental projects taking place or impacting the riparian corridor. This checklist is not intended to be an all-inclusive list or workbook to be completed, but rather as guidelines to be frequently revisited at each stage of the project process. These topics should be frequently reviewed to ensure they have been considered, addressed, or mitigated at each step to ensure the best outcomes for the environment, as well as everyone involved and impacted by the project.

# Stream Corridor Restoration Principles

The stream corridors and watersheds of our region are vital resources, forming the foundation for our rich natural history. Yet they have been significantly altered by human activity, stressing the capacity of the streams to achieve a generally stable condition, one that can provide the multiple benefits of a healthily functioning corridor, with its wealth of recreational opportunities, mitigation of flood risk, and protection of water quality.

The Bayou Preservation Association seeks and supports nature-based solutions – working with, not against, nature – to restore the physical, chemical, and biological processes of stream corridor ecosystems. The following guiding principles of stream corridor restoration are fundamental, overarching prerequisites for successful restoration. They will promote a sustainable and resilient landscape to support Houston’s unique cultural and biological diversity. Whenever willing partnerships make it possible, we will prioritize restoration initiatives in areas that have been overlooked and that are located in underserved communities.

**Principle 1. Incorporating Outreach for Successful Stream Corridor Restoration.** Successful stream restoration starts with community support; it is essential that the community must understand, care about, and help protect their streams. Community engagement from the beginning and throughout the restoration effort is essential. Successful engagement will: consider effective methods of outreach, include early and frequent notifications, and provide for meaningful community input. The content of community communications will utilize common terminology and describe the “why” of restoration, more than the specific methods, all with the goal of cultivating ownership and appreciation for our bayous and the ecosystem services they provide.

**Principle 2. Applying a Comprehensive Approach to Preserve, Improve, and Restore Stream Corridors.** Stream corridors should be managed comprehensively, i.e., by watershed & floodplain, not just by political or agency boundaries. The entire stream must be considered, including riparian, aquatic, and benthic resources as well as the channel-floodway-floodplain relationships. Furthermore, restoration, enhancement, and improvement of streams should aim to optimize their natural functions and values. Improving the health of the region’s streams and bayous should strive to keep what is good in the stream as well as preserve floodplains. The future health of our stream corridors demands that we avoid or reduce negative outcomes, ensure future adjacent activities (e.g., over development of trails) do not degrade waterways, and require no net loss of riparian function. This is ideally accomplished with a multi disciplinary approach to project design.

**Principle 3. Using Best Practices to Support Stream Form, Functions, and Values.** Clearly stated restoration goals with measurable objectives will guide restoration design to accommodate the water and sediment that the stream will carry. Design will incorporate attention to the form of the stream channel's shape (river morphology), specifically its cross-sectional dimensions (from bank to bank), its meander pattern (when viewed from above), and its upstream-downstream changes in elevation (profile). Best practices to achieve successful stream corridor restoration start with a thorough evaluation of the stream and its current setting in the landscape. This evaluation includes a baseline assessment of physical, hydrological, and biological conditions, a review of historical conditions, characterization of the watershed, and identification of suitable stream segments, for use as references (morphology templates). Understanding and following these natural, stable channel design principles will encourage best practices that promote additive stream functions, such as aquatic habitat, riparian habitat, flood mitigation, water quality, among other functions. Additionally, the use of regionally native, diverse vegetation will support ecological diversity.

**Principle 4. Planning for Sustainability and Resilience in Future Benefits, Impacts, and Needs.** Successful stream restoration projects not only embrace a comprehensive approach using best design practices, but are also tied to the three interconnected components of sustainable development – the ecologic-economic-social triangle. Addressing sustainability and resiliency requires consideration of both short- and long-term benefits and costs. For stream corridors, this entails, for example, supporting water quality and flood reduction targets, accounting for changes in rainfall/climate, considering future needs of the region, and embracing adaptive management. Adherence to these four principles for preserving, enhancing, and restoring our stream corridors will help meet the needs of our city and region – both now and into the future – while creating places where people are able to live, work, and play, with all the natural assets these corridors provide.

**STREAM CORRIDOR RESTORATION CHECKLIST**  
*Checklist of Tasks to Consider in Implementation of the Principles*

<b>1. Incorporating Outreach for Successful Stream Corridor Restoration.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources</i>
	<p>1. Are you involving communications expertise in your project planning and implementation – either in-house or paid or volunteer consultants?</p> <p>And are you integrating regular communications with project leaders and the community?</p> <p><i>Consider: What are you doing to integrate outreach between communications and project staff?</i></p>	EPA Public Participation Guide
	<p>2. Are you evaluating multiple outreach/engagement methods – public meetings, mass or social media, website, one-on-one meetings – and addressing different languages and different learning styles, as appropriate?</p> <p><i>Consider: What were the key results of your evaluation? What methods did you select to use and why?</i></p>	USDA Stream Corridor Restoration pages 4-12 to 4-14
	<p>3. Are you identifying phases of outreach and setting a timeline for outreach? For transparency, are you keeping the community informed with early and frequent notifications throughout the project?</p> <p><i>Consider: Describe the outreach phases you are using and how the notification frequency was established. What mechanism are you providing for transparency and avoiding surprises to the public along the way.</i></p>	USDA Stream Corridor Restoration pages 4-13 to 4-14

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<b>1. Incorporating Outreach for Successful Stream Corridor Restoration.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources</i>
	<p>4. Are you identifying your audiences in terms of level of awareness, goals for the project, and language considerations? Are you using common terminology that is easily understood by those you hope to reach in the outreach/engagement that you are developing?</p> <p><i>Consider: How are you developing the basis for identifying these characteristics of the audiences? And what methods are you using to communicate with different audiences? How are you identifying what "common terminology" is?</i></p>	<p>International Association for Public Participation (IAP2) The P2 Pillars</p> <p>USDA Guidance for Stream Restoration page 100</p>
	<p>5. Are you considering a broad group of potential audiences, developing a demographic breakdown of the audiences, and making sure that diversity, equity and inclusion (DEI) are incorporated into plans for the audiences?</p> <p><i>Consider: In consideration of the demographics of the audience, how are you incorporating DEI into project planning?</i></p>	<p>Bayou Preservation Association Diversity, Equity and Inclusion Statement</p>
	<p>6. Before project design, are you planning a community engagement event for public input, and including a pre-project field tour for those interested?</p> <p><i>Consider: Describe the elements of your pre-design community event and/or field tour.</i></p>	

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<b>1. Incorporating Outreach for Successful Stream Corridor Restoration.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources</i>
	<p>7. Are you preparing a brief summary of the what and why of the project, with emphasis on the project's importance? And are you considering how you will disseminate the summary?</p> <p><i>Consider: How are you determining critical topics/elements to incorporate in the project summary? What are the key benefits for the project? How will you disseminate the summary?</i></p>	
	<p>8. Are you planning an approach for how to provide opportunities for community input and for making timely responses to that input?</p> <p>Are you planning your outreach to develop greater engagement with the community?</p> <p><i>Consider: What specific outreach measures are you incorporating, with the aim of cultivating ownership and appreciation for bayous? Describe how they are designed to address and respond to community concerns?</i></p>	



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<b>2. Applying a Comprehensive Approach to Preserve, Improve, and Restore Stream Corridors.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>1. Are you providing a multi-disciplinary approach to your project, involving experts in various areas (such as experts on vegetation, paddling and other recreation, urban planning, human health, ecology, soils, hydrology, etc.)?</p> <p><i>Consider: Which disciplines are covered in your approach? Why these, and why not others?</i></p>	<p>USDA Guidance for Stream Restoration pages 3, 4</p> <p>USDA Stream Corridor Restoration pages 4-3 to 4-5</p> <p>NSCD Guidance Manual for HCFC D Page 3-2</p>
	<p>2. Are you considering, and does your project support, healthy riparian, aquatic, and benthic resources? Have you balanced these considerations with public access and use?</p> <p><i>Consider: Provide an example of supporting each of these stream resources: riparian, aquatic, and benthic.</i></p>	<p>USDA Guidance for Stream Restoration pages 24, 60</p> <p>USDA Stream Corridor Restoration pages 7-82 to 7-83</p> <p>Remarkable Riparian Field Guide page 30</p> <p>NSCD Guidance Manual for HCFC D pages 2-12 to 2-14</p>

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*Checklist of Tasks to Consider in Implementation of the Principles*

<b>2. Applying a Comprehensive Approach to Preserve, Improve, and Restore Stream Corridors.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>3. Are you considering planned/expected future conditions, e.g., trails, planned paddling access uses, other access, development, flood mitigation, park development, water quality?</p> <p><i>Consider: Which future conditions did you consider, and how?</i></p>	<p style="text-align: center;">USDA Stream Corridor Restoration pages 3-21 to 3-26</p> <p style="text-align: center;">NSCD Guidance Manual for HCFCFCD pages 6-2 to 6-3 &amp; 6-11</p>
	<p>Are you identifying regional planning efforts that encourage preservation of the bayou corridor?</p> <p><i>Consider: How is the project connected to other efforts, especially habitat corridors?</i></p>	<p style="text-align: center;">USDA Guidance for Stream Restoration page 4</p>
	<p>5. Are you developing a floodplain preservation plan?</p> <p><i>Consider: What are the key elements of your floodplain preservation plan?</i></p>	<p style="text-align: center;">USDA Guidance for Stream Restoration page 4</p>

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<b>2. Applying a Comprehensive Approach to Preserve, Improve, and Restore Stream Corridors.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>6. Are you preserving or optimizing the natural functions and values of the stream in your project? Are you balancing impacts on natural functions and values on both sides of the stream, and upstream/downstream?</p> <p><i>Consider: How have you incorporated preservation or optimization of natural stream functions and values?</i></p> <p><i>Describe an example of balancing impacts on stream functions and values, such as maintaining a wildlife corridor, or balancing aggradation and erosion upstream and downstream.</i></p>	<p>Remarkable Riparian Field Guide Page 30</p> <p>NSCD Guidance Manual for HCFCD pages 2-12 to 2-14</p> <p>Bayou Planting Guide</p>
	<p>7. If the site will be used for flood control purposes (for example, channel conveyance or adjacent detention), are you preserving the stream corridor in a manner that will allow it to continue to function in a natural and sustainable way? If not, can you restore and enhance the stream corridor functions as part of the flood control improvement project?</p> <p><i>Consider: How did you determine that appropriate balance and planning to accomplish the balance?</i></p> <p><i>How much of the stream corridor is being preserved? How and why?</i></p>	<p>USDA Guidance for Stream Restoration pages 33-50</p> <p>USDA Stream Corridor Restoration pages 2-1 to 2-15</p> <p>NSCD Guidance Manual for HCFCD page 7-2</p>

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2. Applying a Comprehensive Approach to Preserve, Improve, and Restore Stream Corridors.		
Y or N	Questions	Resources Needed
	<p>8. Are you avoiding degradation of the stream and avoiding or reducing other negative outcomes, including no net loss of riparian function?</p> <p><i>Consider: What specific steps are you incorporating to avoid these negative impacts?</i></p>	<p>USDA Stream Corridor Restoration page 5-19</p>
	<p>9. Do you have a plan for mitigating unexpected damages? (Example: A project contractor removed more vegetation than they should have, requiring extensive restoration of the area.)</p> <p><i>Consider: What steps are you taking to avoid and mitigate for unexpected damages?</i></p>	<p>USDA Stream Corridor Restoration page 14-23</p> <p>NSCD Guidance Manual for HCFCD page 13-8 &amp; 14-5 to 14-6</p>
	<p>10. Are you providing proper coordination and oversight to ensure that this comprehensive approach principle is followed?</p> <p>Are you considering who else will be involved in the care and oversight of this project and how to get them engaged (e.g., watershed/floodplain managers, community organizers, stakeholders, etc.)?</p> <p><i>Consider: What steps are you taking to ensure the proper coordination and oversight of the comprehensive approach? What entities and/or personnel will be involved and how will you engage them?</i></p>	<p>HCFCD Streambank Stabilization Handbook pages 40-43</p> <p>NSCD Guidance Manual for HCFCD page 3-7</p>

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<b>3. Using Best Practices to Support Stream Form, Functions, and Values.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>1. Before you start the project, are you developing a baseline assessment of the physical, hydrological, geomorphological, and biological conditions, including a review of historical conditions, characterization of the watershed, and identification of suitable stream segments for your project?</p> <p><i>Consider: Provide a summary of the physical, hydrological, geomorphological, and biological conditions, including historical conditions, characterization of the watershed, and identification of suitable stream segment for your project.</i></p>	<p>USDA Guidance for Stream Restoration pages 14-23</p> <p>USDA Stream Corridor Restoration pages 2-1 to 2-86</p> <p>NSCD Guidance Manual for HCFCD pages 5-1 to 5-28</p>
	<p>2. Are you reviewing the Natural Stable Channel Design Guidelines developed by HCFCD and following their recommendations?</p> <p>Are you using regional curves – dimensionless ratios from the HCFCD Guidelines – to establish the channel dimension, pattern, and profile? →</p> <p><i>Consider: Describe how the HCFCD’s guidelines document was applied.</i></p>	<p>HCFCD Regional Curve for Natural Stable Channel Design Memorandum Pages 3-5</p> <p>NSCD Guidance Manual for HCFCD pages 7-1 to 7-19 &amp; Appendix D</p>
	<p>3. Are you using the stream function pyramid to identify project goals and objectives?</p> <p><i>Consider: Identify and explain your project goals and objectives and how they relate to the stream function pyramid.</i></p>	<p>Natural Channel Design Review Checklist page E1-E4</p> <p>NSCD Guidance Manual for HCFCD page 2-14</p>

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<b>3. Using Best Practices to Support Stream Form, Functions, and Values.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>4. Are you defining appropriate metrics/success criteria for the project?</p> <p><i>Consider: Give examples of your metrics/success criteria.</i></p>	<p>USDA Guidance for Stream Restoration pages 83</p> <p>USDA Stream Corridor Restoration pages 6-22 to 6-41</p> <p>HCFCFCD Streambank Stabilization Handbook pages 40-43</p> <p>NSCD Guidance Manual for HCFCFCD page 4-6</p>
	<p>5. Are you identifying reference reaches and reviewing relevant reference reach data?</p> <p><i>Consider: How is it informing your design?</i></p>	<p>USDA Guidance for Stream Restoration pages 13, 34, 39</p> <p>USDA Stream Corridor Restoration pages 8-33</p> <p>NSCD Guidance Manual for HCFCFCD page 5-23</p>

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<b>3. Using Best Practices to Support Stream Form, Functions, and Values.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>6. Are you using the most up-to-date rainfall data (Atlas 14 as of June 30, 2021) in helping to define your project?</p> <p><i>Consider: Provide a description of your application of the Atlas 14 data.</i></p>	<p>HCFCFCD Interim PCPM, Memorandum page 2</p> <p>RRDI in Harris County, pages 1, 6-8</p>
	<p>7. Are you considering the presence and future management of exotic (non-native), invasive plant species?</p> <p><i>Consider: How will you address these exotic, invasive species?</i></p>	<p>USDA Stream Corridor Restoration pages 9-10</p> <p>The Quiet Invasion</p> <p>NSCD Guidance Manual for HCFCFCD pages 14-7 &amp; 15-14</p>
	<p>8. Are you providing proper coordination and oversight to ensure that stream form, function, and values principles are followed?</p> <p><i>Consider: What steps are you taking to ensure proper coordination and oversight?</i></p>	<p>HCFCFCD Streambank Stabilization Handbook pages 41-43</p> <p>NSCD Guidance Manual for HCFCFCD page 3-7</p>

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<b>4. Planning for Sustainability and Resilience in Future Benefits, Impacts, and Needs.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>1. Are you identifying a plan for sustainability and future maintenance of the project, and how the project can be maintained over its lifetime?</p> <p>Does the sustainability plan include adaptive management, and, in particular, impacts from future and upstream development that is not currently anticipated?</p> <p><i>Consider: Describe the key features of the sustainability plan and who will be responsible for future project maintenance. What future actions have you considered and how will you address their potential impacts?</i></p>	<p>USDA Stream Corridor Restoration pages 9-26 to 9-46</p> <p>NSCD Guidance Manual for HCFCD page 14-1 to 14-8</p>
	<p>2. Are you also identifying attributes of resilience in your project planning, along with monitoring methods, partnerships, and funding to implement.</p> <p><i>Consider: Describe your resilience plan for these attributes and elements.</i></p>	<p>USDA Guidance for Stream Restoration page 83</p> <p>USDA Stream Corridor Restoration pages 6-22 to 6-41, 9-29 to 9-38</p>
	<p>3. Are you considering future regional needs, in terms of sustainability?</p> <p><i>Consider: Identify the regional future needs for sustainability and how they have been considered in this project.</i></p>	<p>Resilient Houston pages 96-103</p>



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<b>4. Planning for Sustainability and Resilience in Future Benefits, Impacts, and Needs.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>4. Are you identifying the short- and long-term costs and benefits?</p> <p><i>Consider: What are the relative short and long-term cost and benefits of your project?</i></p>	<p>Climate Impact Assessment for the City of Houston</p> <p>Resilient Houston</p>
	<p>5. Are you assessing the Triple Bottom Line - ecological, economic, and social benefits?</p> <p><i>Consider: What are the results of your assessment of the Triple Bottom Line for your project?</i></p>	
	<p>6. Are you taking into account the changes in rainfall and climate?</p> <p><i>Consider: Describe the application of changes in rainfall and climate in your sustainability plan.</i></p>	<p>Climate Impact Assessment for the City of Houston pages 37-46</p>
	<p>7. Does your project commit to, or have a goal to, improve water quality and reduce flooding?</p> <p><i>Consider: What are the water quality and flood reduction targets for the project area and how does your project support them?</i></p>	<p>USDA Conservation Buffers Pages 15-42</p> <p>NSCD Guidance Manual for HCFCD pages 2-14, 8-1 &amp; 15-13</p>

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<b>4. Planning for Sustainability and Resilience in Future Benefits, Impacts, and Needs.</b>		
<i>Y or N</i>	<i>Questions</i>	<i>Resources Needed</i>
	<p>8. Are you considering how to influence planning and regional policy in support of project sustainability?</p> <p><i>Consider: What avenues have you considered for influencing planning and policy for sustainability?</i></p>	<p>USDA Stream Corridor Restoration page 4-3 to 4-13</p>
	<p>9. Are you considering how to involve developers, who may be doing these sorts of projects, in supporting sustainability goals?</p> <p><i>Consider: What avenues have you considered for reaching developers in support of project sustainability?</i></p>	<p>AIA Framework for Design Excellence pages 1-4</p>
	<p>10. Are you providing proper coordination and oversight to ensure that this sustainability principle is followed?</p> <p><i>Consider: What steps are you taking to ensure the proper coordination and oversight?</i></p>	<p>AIA Framework for Design Excellence pages 1-4</p>

# STREAM CORRIDOR RESTORATION CHECKLIST

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### Resources

AIA Framework for Design Excellence

[https://content.aia.org/sites/default/files/2020-08/Framework\\_for\\_design\\_excellence\\_v3.pdf](https://content.aia.org/sites/default/files/2020-08/Framework_for_design_excellence_v3.pdf)

Bayou Planting Guide

[https://www.bayoupreservation.org/BPASite/media/BPA/Education/Resources/BayouPlantingGuide\\_2014.pdf](https://www.bayoupreservation.org/BPASite/media/BPA/Education/Resources/BayouPlantingGuide_2014.pdf)

Bayou Preservation Association Diversity, Equity and Inclusion Statement

[https://www.bayoupreservation.org/BPASite/media/BPA/BayouPreservationDEI-Statement\\_Adopted202009.pdf](https://www.bayoupreservation.org/BPASite/media/BPA/BayouPreservationDEI-Statement_Adopted202009.pdf)

Climate Impact Assessment for the City of Houston

<https://www.houstontx.gov/mayor/Climate-Impact-Assessment-2020-August.pdf>

Harris County Flood Control District (HCFCD) Interim Policy, Criteria, and Procedure Manual (PCPM), July 2019

<https://www.hcfcd.org/Resources/Technical-Manuals/2019-Atlas-14-Policy-Criteria-and-Procedures-Manual-PCPM?folderId=16290&view=gridview&pageSize=10>

IAP2 Federation – The P2 Pillars

[https://cdn.ymaws.com/sites/iap2.site-ym.com/resource/resmgr/files/IAP2\\_Federation\\_-\\_P2\\_Pillars.pdf](https://cdn.ymaws.com/sites/iap2.site-ym.com/resource/resmgr/files/IAP2_Federation_-_P2_Pillars.pdf)

Natural Channel Design Review Checklist

[https://www.epa.gov/sites/default/files/2015-07/documents/ncd\\_review\\_checklist.pdf](https://www.epa.gov/sites/default/files/2015-07/documents/ncd_review_checklist.pdf)

Natural Stable Channel Design (NSCD) Guidance Manual for Harris County Flood Control District (HCFCD)

Recommendation for Rainfall Depths and Intensities (RRDI) in Harris County (Revised 05/31/2019)

[https://acehouston.org/wp-content/uploads/2017/10/1a-Rainfall-Totals\\_revised-2019-05-31.pdf](https://acehouston.org/wp-content/uploads/2017/10/1a-Rainfall-Totals_revised-2019-05-31.pdf)

Regional Curve for Natural Stable Channel Design

<https://www.hcfcd.org/Resources/Technical-Manuals/Natural-Stable-Channel-Design?folderId=15981&view=gridview&pageSize=10>

Resilient Houston

<https://www.houstontx.gov/mayor/Resilient-Houston-20200518-single-page.pdf>

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Streambank Stabilization Handbook: A Guide for Harris County Landowners

[https://www.hcfd.org/Portals/62/Downloads/Streambank%20Stabilization%20Handbook/Streambank StabilizationHandbook SingleSML.pdf?ver=IF25qIvsw8BHiY1FwG9xYA%3d%3d&timestamp=1644239118839](https://www.hcfd.org/Portals/62/Downloads/Streambank%20Stabilization%20Handbook/Streambank%20StabilizationHandbook%20SingleSML.pdf?ver=IF25qIvsw8BHiY1FwG9xYA%3d%3d&timestamp=1644239118839)

USDA Conservation Buffers

[https://www.fs.usda.gov/nac/buffers/docs/conservation\\_buffers.pdf](https://www.fs.usda.gov/nac/buffers/docs/conservation_buffers.pdf)

USDA Guidance for Stream Restoration

<https://www.fs.fed.us/biology/nsaec/assets/yochumusfs-nsaec-tn102-4guidancestreamrestoration.pdf>

USDA Stream Corridor Restoration

[https://www.nrcs.usda.gov/InteFrnet/FSE\\_DOCUMENTS/stelprdb1044574.pdf](https://www.nrcs.usda.gov/InteFrnet/FSE_DOCUMENTS/stelprdb1044574.pdf)

## GLOSSARY

<i>Term</i>	<i>Definition</i>	<i>Source</i>
Adaptive Management	Involves adjusting management direction as new information becomes available. It requires willingness to experiment scientifically and prudently, and to accept occasional failures.	8 (pg 6-37)
Aquatic Resources	Include wetlands, streams, lakes, rivers, springs, seeps, ponds, and groundwater.	14
Atlas 14	Atlas 14 is an updated analysis of rainfall within the state which significantly revised rainfall depths for various durations and frequencies in Harris County.	5
Benthic Conditions	Conditions of the Benthic Zone. The benthic zone is the ecological region at the lowest level of a body of water. It starts at the shoreline and continues down until it reaches the floor, encompassing the sediment surface and subsurface layers. Although this zone may appear barren, it plays a vital role in the health of aquatic ecosystems	20
Biological Conditions	The taxonomic composition, richness, and functional organization of an assemblage of aquatic organisms at a site or within a water body.	21
Channel Dimension	Refers to the shape of a channel looking at a section cut across the channel.	11 (pg 11)
Channel Pattern	Refers to the back-and-forth meander of a channel, as viewed from above. Pattern is qualitatively described as straight, meandering or braided (multi-channel).	11 (pg 10)
Channel Profile	The shape of the bed as viewed from the side. Most natural streams have sequences of riffles and pools that maintain channel slope and stability.	11 (pg 11)
Climate	The long-term weather average observed within a geographic region	23
Development	Any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations, or storage of equipment or materials.	22
Ecology	The study of the interrelationships of living organisms to one another and to their surroundings.	2, 3, 4
Exotic (non-native) Plant Species (need to reconsider use)	Species of trees, bushes, and flowering or non-flowering plants that are cultivated in regions outside of their native range.	10 (pg 5)
Flood Control	The construction or rehabilitation of structural mitigation or anything that retains, diverts, redirects, impedes, or otherwise modifies the flow of water.	6
Flood Mitigation	The implementation of actions, including both structural and nonstructural solutions, to reduce flood risk to protect against the loss of life and property.	6
Geomorphological	A branch of both physiography and geology that deals with the form of the earth, the general configuration of its surface, and the changes that take place due to erosion of the primary elements and the buildup of erosional debris.	2, 3, 4
Historical Conditions	Conditions under which natural streams originally formed.	(11 pg 17)
Hydrograph	A curve showing stream discharge over time.	2, 3, 4
Hydrology	The scientific study of the water of the earth, its occurrence, circulation and distribution, its chemical and physical properties, and its interaction with its environment, including its relationship to living things.	2, 3, 4
Invasive Plant Species (need to reconsider use)	Hardiness and an ability to reproduce and spread can lead some exotic plants to be characterized as invasive. When established in natural habitats, invasive plants can out-compete native plant species and decrease the amount of available habitat for wildlife that depend on native plants for nesting and feeding.	10 (pg 5)
Land Uses	The purpose for which land is or may be used	24
Mitigating Damages	Compensatory mitigation is required to replace the loss of wetland and aquatic resource functions in the watershed. Compensatory mitigation refers to the restoration, establishment, enhancement, or in certain circumstances preservation of wetlands, streams or other aquatic resources for the purpose of offsetting unavoidable adverse impacts.	14
Monitoring Plan	A plan to evaluate whether management actions for restoration were conducted as planned, or to determine whether the management actions are having the desired habitat response	19

## GLOSSARY

<b>Term</b>	<b>Definition</b>	<b>Source</b>
Paddling Access	The place on the shore of a lake or river where you put in or take out	18
Project Design	A project design is a strategic organization of ideas, materials and processes for the purpose of achieving a goal	17
Rainfall	The amount of precipitation measured by the depth	25 (pg 2)
Reference Reach	sites believed to be indicative of the natural potential of the stream corridor	8 (pg 4-20)
Regional Curve	A regression of the relations among drainage area, selected cross-sectional parameters and streamflow.	2
Riparian	Located on the banks of a stream or other body of water.	2, 3, 4
Riparian Corridor	Includes lands defined by the lateral extent of a stream meanders necessary to maintain a stable stream dimension, pattern, profile, and sediment regime. For instance, in stable pool-riffle streams, riparian corridors may be as wide as 10-12 times the channel bankfull width. In addition the riparian corridor typically corresponds to the land area surrounding and including the stream that supports (or could support if unimpacted) a distinct ecosystem, generally with abundant and diverse plant and animal communities (as compared with upland communities.	2
Riparian Function	The various roles riparian areas play in the local ecology, including: protecting aquatic ecosystems by removing sediments from surface runoff, decreasing flooding, maintaining appropriate water conditions for aquatic life, and providing organic material vital for productivity and structure of aquatic ecosystems. They also provide excellent wildlife habitat, offering not only a water source, but food and shelter, as well.	16
Stakeholders	individual or group that has an interest in any decision or activity of an organization	15
Stream Corridor	A stream corridor is an ecosystem that usually consists of three major elements: Stream channel, Floodplain, and Transitional upland fringe Together, they function as dynamic and valued crossroads in the landscape.	7
Stream Function Pyramid	an approach that organizes stream functions in a pyramid form to illustrate that goal setting, stream assessment methodologies and stream restoration must address functions in a specific order...with parameters that are commonly used in the fields of hydrology, hydraulics, geomorphology, physiochemistry, and biology.	9 (pg E1)
Stream Segment	a relatively homogenous section of stream contained <u>within a reach</u> that has the same reference stream characteristics but is distinct from other segments in the reach in one or more of the following parameters: degree of floodplain encroachment, presence/absence of grade controls, bankfull channel dimensions (Width/Depth ratio, entrenchment), channel sinuosity and slope, riparian buffer and corridor conditions, abundance of springs/seeps/adjacent wetlands/ stormwater inputs, and degree of channel alterations.	2
Sustainability	The degree to which the restored stream can be expected to continue to maintain its restored (but dynamic) condition.	8 (pg 5-14)
Triple Bottom Line	The Triple Bottom Line (TBL) is an accounting framework that incorporates three dimensions of performance: social, environmental and financial. This differs from traditional reporting frameworks as it includes ecological (or environmental) and social measures that can be difficult to assign appropriate means of measurement. The TBL dimensions are also commonly called the three Ps: people, planet and profits.	13
Watershed	An area of land whose total surface drainage flows to a single point in a stream.	2, 3, 4
Wildlife Corridors	A wildlife corridor is defined as a linear landscape feature that allows animal movement between two patches of habitat or between habitat and geographically discrete resources such as water. Connections between extensive areas of open space are integral to maintaining regional biological diversity and population viability.	12

## GLOSSARY

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