



Assessing Impacts and Benefits of Riparian Zones with the Riparian Ecological Function Index (REFI)



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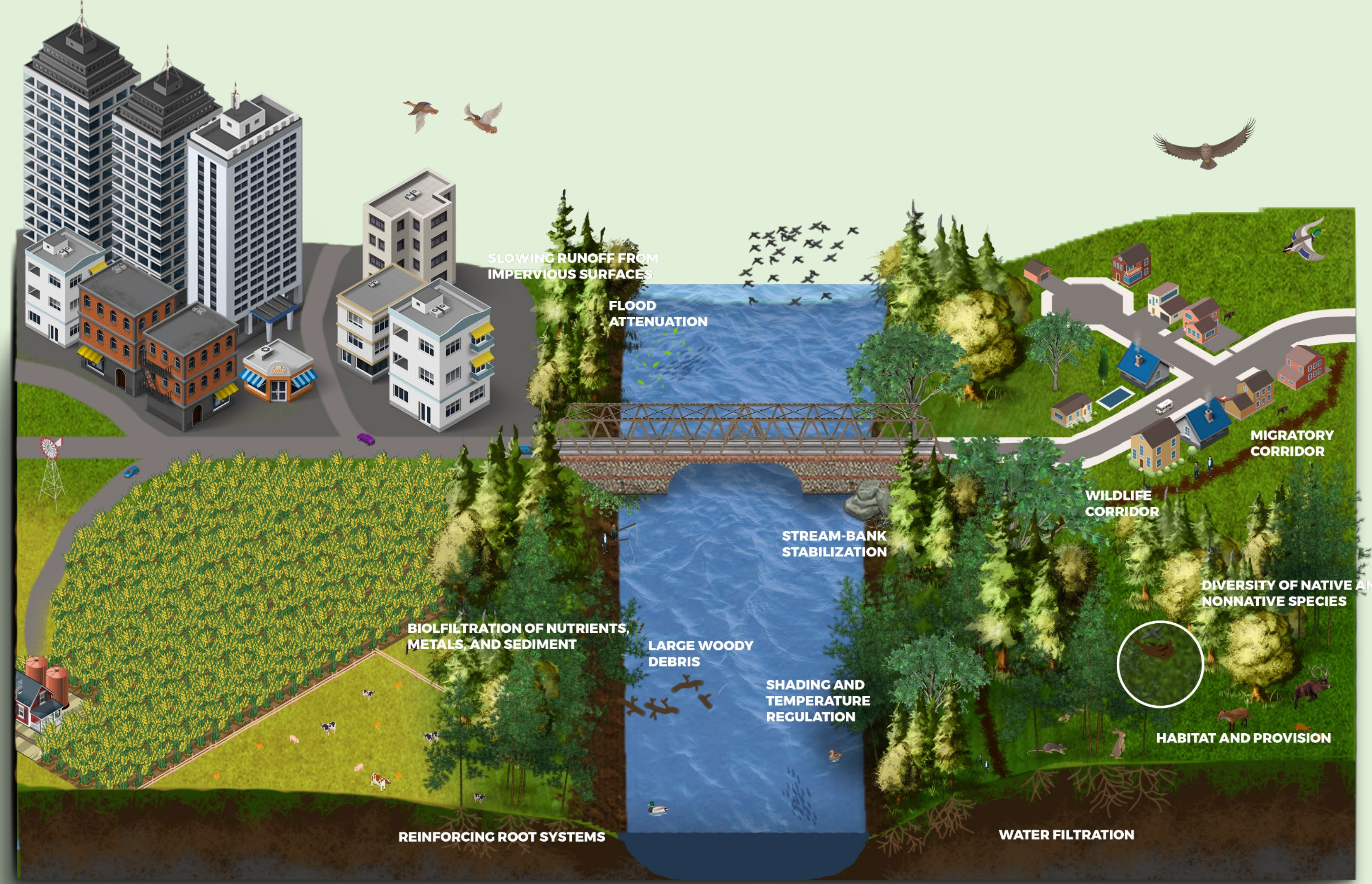
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MANAGEMENT OF RIPARIAN ZONES

The Need for Riparian Restoration

- Riparian zones are the transitional areas between terrestrial and aquatic ecosystems that are located adjacent to a freshwater system (i.e., rivers, lakes, streams, reservoirs, wetlands).
- Support diverse flora and fauna, retaining pollutants (i.e., sediments, nutrients, pesticides, herbicides) to prevent them from entering freshwater systems, attenuating floods, stabilizing streambanks to prevent erosion, and providing shade and temperature regulation for adjacent water bodies.
- Human disturbances can reduce system performance and associated ecosystem services.
- USACE practitioners need tools for assessing impacts and benefits of riparian management actions:
 - Immediate screening needs for project application
 - Large-scale, interagency adoption of modeling approaches
 - Multi-taxa field evaluation of models



REFI: FUNCTION AND FRAMEWORK

What is REFI?

REFI is rapid screening tool to assess the riparian condition, which could include monitoring, impact assessment, or benefit quantification.

Possible uses for REFI include planning studies (e.g., ecosystem restoration) and/or environmental impact Studies / environmental damage assessments

Model Framework

REFI includes multiple levels of analysis that group related riparian functions that are transferrable across regions.

- Outcomes:** Large scale ecological functions of the riparian zone
- Categories:** Groups of Variables by similar discipline or scientific topic
- Variables:** Represent functional condition
- Indicators:** Field data metrics describing riparian zone conditions and observations

Processes that occur within the stream adjacent to the riparian zone

Instream Functions

Quality of habitats supporting diverse flora and fauna

REFI

Unique and Important Habitats

Ecological Connectivity

Spatial and ecological connection between natural environments

COMPLETING A REFI ASSESSMENT

Step 1: Desktop Geospatial Assessment (recommended, but not required)

- GIS Analysis: create base-maps for field work and metrics
- Map Riparian Zone Extent

Step 2: Rapid Field Assessment

- In the field: complete qualitative and quantitative scoring on field assessment worksheet(s)
- Complete Microsoft Excel Worksheet to roll-up reach score into condition indices

Indicators: "Build the case" for the variable score by recording your logic Likert scale (sentiment) scores

Variable: Judgment-based numerical score (0-15) of functional statement

Indicator Scoring	
Strongly Agree (SA)	15
Agree (A)	14
Neutral (N)	13
Disagree (D)	12
Strongly Disagree (SD)	11
Not Applicable (NA)	10

Variable Scoring	
15	Functioning
14	
13	
12	Functioning At-Risk
11	
10	
9	Non-Functioning
8	
7	
6	Non-Functioning
5	
4	
3	Non-Functioning
2	
1	Non-Functioning

Variable	Indicators	Score
Hydrologic Connection <i>RZ is hydrologically connected and provides flood storage, which reduces channel erosion and provides aquatic refugia in the floodplain</i> Score: ____	Floodplain Connectivity ^{CHA} : Stormflows have the ability to access and spread out into the floodplain consistent with the natural geomorphic condition (e.g. limited channel incision).	
	Floodplain Roughness ^{RIP} : Hydraulic roughness slows floodplain velocities consistent with expectations for the stream valley and landscape. Features indicative of these processes include vegetation density and presence of large wood.	
	Flood Storage ^{RIP} : Floodplain topography and features slow or store water consistent with expectations for the stream valley and landscape. Features indicative of this outcome include floodplain wetlands and topographic depressions.	
	In-stream Hydrology ^{CHA} : Flow controls (e.g., dams) in the watershed or stream do not constrain the hydrologic connection between the stream and riparian zone.	
	Other Indicators:	

Instream Functions Outcome

Hydrologic Connection Variable



Indicators?



Indicators?

Let's try it out!

Unique and Important Habitats Outcome

Plant Community Variable

Hydrologic Connection <i>RZ is hydrologically connected and provides flood storage, which reduces channel erosion and provides aquatic refugia in the floodplain</i> Score: <u>5</u>	Floodplain Connectivity ^{CHA} : Stormflows have the ability to access and spread out into the floodplain consistent with the natural geomorphic condition (e.g. limited channel incision).	SD
	Floodplain Roughness ^{RIP} : Hydraulic roughness slows floodplain velocities consistent with expectations for the stream valley and landscape. Features indicative of these processes include vegetation density and presence of large wood.	A
	Flood Storage ^{RIP} : Floodplain topography and features slow or store water consistent with expectations for the stream valley and landscape. Features indicative of this outcome include floodplain wetlands and topographic depressions.	A
	In-stream Hydrology ^{CHA} : Flow controls (e.g., dams) in the watershed or stream do not constrain the hydrologic connection between the stream and riparian zone.	NA
	Other Indicators: <i>Concrete channel decreases frequency of riparian flooding</i>	