Riparian Ecological Function Index (REFI)
Field Worksheet (Version 1.0)

Reach/ID		River Bank	Left / & / Right
Lat/Long		Reach Length (ft)	
Date		Min Buffer Width (ft)	0-30 / 30-100 / 100+
Assessor (s)		Avg Buffer Width (ft)	0-30 / 30-100 / 100+

SCORING INSTRUCTIONS

Variables are judgment-based scores reflecting the condition of the riparian zone relative to this physical or ecological function. **Indicators** record the logic embedded in the variable and can be used to calculate a variable score. Each indicator has a specific context: UPL = Uplands, BAN = Bank area, CHA = Channel, or RZ= riparian zone. Indicators may be omitted by selecting "NA", or indicators may be added under "Other Indicators". A minimum of three indicators is recommended for each variable.

REFI assessment involves two primary steps:

1) Assess **indicators** based on your agreement with their *functional statement* at the site: Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly Disagree (SD), Not Applicable (NA)
2) Score **variable** condition using its *functional statement* and **indicators** based on the following scale: Functioning (15 to 11), Functioning At-Risk (10 to 6), or Non-Functioning (5 to 0).

Variable	Indicators	Score
INSTREAM FUNCTIONS		
Upland Runoff *RZ reduces upland runoff and associated pollution load to the stream and supports interflow processes* Score: ____	**Overland Runoff** [UPL]: Runoff velocities and volumes are reduced by riparian zone roughness (e.g., vegetation, large wood, litterfall) and extent, encouraging infiltration and interflow processes.	
	Bypassing Flows [UPL]: Bypass elements are not present (e.g., pipes, tile drains, ditches) and runoff sources move through the riparian system as overland flow or as interflow.	
	Floodplain Slope [RZ]: Interflow processes (i.e., shallow groundwater flow) are not limited by steep ground slope.	
	Runoff Pollution [UPL]: Potential point/non-point pollutant sources are intercepted and adequately mitigated by the RZ.	
	Notes/Other Indicators:	
Hydrologic Connection *RZ is hydrologically connected to the river, which reduces channel erosion and provides aquatic refugia in the floodplain* Score: ____	**Floodplain Connectivity** [CHA]: Stormflows have the ability to access and spread onto the floodplain consistent with the natural geomorphic condition (e.g. limited channel incision).	
	Floodplain Roughness [RZ]: 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 [RZ]: 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.	
	Upstream Hydrology [CHA]: Flow controls (e.g., dams) in the watershed or stream do not constrain the hydrologic connection between the stream and riparian zone.	
	Notes/Other Indicators:	
Streambank Processes *RZ vegetation and fluvial-geomorphic processes are in sync such that the stream is in dynamic equilibrium.* Score: ____	**Erosion Potential** [BAN]: There is little potential for bank erosion based on protection provided by bank rooting depth, bank cover, or bank slope.	
	Reach Erosion [BAN]: The channel in this reach is not experiencing excessive erosion or deposition.	
	Channel Evolution [CHA]: Stream is relatively stable and not experiencing morphological changes or major shifts that could negatively impact riparian zone structure or function.	
	Sediment Supply [CHA]: There is not excessive sediment supply, from watershed sources or legacy sediment, or sediment imbalance due to instream flow controls that trap sediment.	
	Notes/Other Indicators:	
Energy, Nutrients, and Sediment *RZ provides energy sources to stream, buffers nutrients, and pollutants from runoff and in groundwater.* Score: ____	**Carbon Sources** [CHA]: Riparian zone provides energy sources (e.g. FPOM, CPOM) to stream consistent with River Continuum Concept. Organic matter is from diverse and quality sources (e.g. leaves, branches, large wood).	
	Root Zone [RZ]: Riparian zone rooting depth supports nutrient uptake, cycling, and biogeochemical reactions through deep soil penetration and interaction with groundwater during baseflow and stormflow.	
	Soil Suitability [RZ]: There is no evidence of disturbance or compaction from unnatural processes. Surface layer of soil allows uninhibited plant growth and infiltration.	
	Mobilizing Flows [CHA]: Sediment, wood, and organic material is freely transported to the stream, consistent with expectations for the stream valley and landscape.	
	Notes/Other Indicators:	
Riparian Filtering *RZ removes sediment and other constituents from upland and riverine sources.* Score: ____	**Buffer Width** [RZ]: The vegetated buffer has a width sufficient to support filtering of sediment and nutrients (nitrogen and phosphorous), which typically have thresholds are 560 ft (171 m) and 145 ft (44 m), respectively.	
	Buffer Density [RZ]: The vegetated buffer is dense enough in vegetation to slow overland flow velocity to filter sediment/pollution before reaching the stream.	
	Ground Cover [RZ]: The vegetated buffer floor is covered by vegetation or organic material.	
	Notes/Other Indicators:	

ECOLOGICAL CONNECTIVITY		
Lateral Processes *RZ maintains lateral ecological connectivity between the river, floodplain, and upland in response to human disturbance.* Score: ____	**Adjacent Land Use** [UPL]: The land use adjacent to the RZ causes little to no disturbance to riparian ecological functions. Levels of disturbance can vary depending on the land use type (i.e., natural, rural, suburban, urban).	
	Average Buffer Width [RZ]: The average width of the riparian corridor is not restricted by human development. The riparian vegetation maintains connection to upland ecosystems.	
	Disturbance Distance from Buffer [RZ]: Human activity adjacent to riparian zone exists at a reasonable distance to cause little to no disturbance to riparian function.	
	Notes/Other Indicators:	
Longitudinal Movement and Habitat *RZ maintains longitudinal ecological connectivity within the corridor and supports a diverse habitat mosaic* Score: ____	**Corridor Movement** [RZ]: There is no evidence of development or stressors within the buffer that could affect animal movement. Physical barriers (e.g., fences, roads, bridges, or exceedingly dense walls of foliage) or unnatural modifications to vegetation (e.g., disking, mowing/shredding, logging, cutting, trampling, herbicide treatment, herbivory disease) that are likely to affect dispersal or impede migratory movements or are not present. (Note: consider barriers to flying, crawling, or swimming species).	
	Habitat Interspersion [RZ]: A variety of vegetation appears in "patches" and creates a heterogeneous pattern, or mosaic of habitat along the corridor.	
	Patch Disturbance [RZ]: Relative location and arrangement of habitat patches within the mosaic promotes community linkages and ecological processes. Distance between patches does not impede movement or create isolation between habitats.	
	Notes/Other Indicators:	

UNIQUE AND IMPORTANT HABITATS		
Plant Community *RZ supports diverse flora that supports a variety of ecological functions.* Score: ____	**Riparian Extent** [RZ]: The vegetated buffer width is not constrained and can reach its natural maximum extent.	
	Invasive/Non-Native Species [RZ]: The riparian zone supports primarily native taxa. The presence of invasive species minimally influences riparian quality and ecological functions (i.e., a lack of functional dominance).	
	Native Species Regeneration/Recruitment [RZ]: There is new growth providing evidence of regeneration (i.e., native poles, sapling, seedlings) and recruitment (i.e., established vegetation) that would be expected for the riparian zone.	
	Vegetative Diversity [RZ]: A wide variety of vegetation is present (ground-cover species, grasses, shrubs, and trees) to provide suitable habitat for fauna.	
	Notes/Other Indicators:	
Canopy Habitat *(Forested RZs)* *RZ provides suitable habitat for faunal species (e.g., birds) using the canopy* Score: ____	**Vertical Structural Diversity** [RZ]: There is variability in the height, structure, and fill in vegetation (i.e., no uniform stand height or density) that supports vertical stratification of species.	
	Horizontal Structural Diversity [RZ]: There is variability in tree density, spacing, and canopy cover including some forest gaps.	
	Woody Species Richness [RZ]: There is high variation in the number of different canopy vegetation species represented in the community.	
	Notes/Other Indicators:	
Understory Habitat *(Forested or scrub-shrub RZs)* *RZ has suitable habitat for faunal species (e.g., mammals, birds, herps) in understory layer* Score: ____	**Vegetation Age Diversity** [RZ]: Trees/shrubs vary in age and size. There is evidence of both old and new growth, with trees of various size classes mixed spatially across the landscape.	
	Stem Abundance [RZ]: Frequency of trees, saplings, and shrubs provides sufficient habitat for riparian species.	
	Snag Density [RZ]: Presence of snag(s) and standing deadwood provides potential habitat for various faunal species. There is also a presence of large, live trees for future snag development.	
	Notes/Other Indicators:	
Floor Habitat *RZ provides and supports suitable habitat for various faunal species (i.e., herps and mammals) on the forest floor.* Score: ____	**Detritus Cover** [RZ]: Litter fall buildup of organic ground cover from detritus and woody debris optimizes potential habitat for various faunal species.	
	Herbaceous Cover [RZ]: Presence of emergent vegetation provides a layer of cover and habitat for forest floor. The vegetation is present without dominating organic cover, is spatially intermixed, and is not part of a dense monoculture.	
	Vegetation Supporting Litter Dynamics [RZ:] Presence of contributed vegetation (e.g. large fallen deadwood (*forested*), branches/brush piles (*scrub-shrub*), aquatic/terrestrial rooted plants (*emergent*)) supports ecological functionality within terrestrial riparian zone (i.e., habitat formation, terrestrial food webs, biogeochemical processes).	
	Notes/Other Indicators:	
Stream Habitat *RZ canopy shades stream and regulates water temperatures. RZ shapes in-stream habitat* Score: ____	**Near-Bank Canopy Cover** [CHA]: Canopy cover along the bank effectively regulates temperature by providing shade cover for majority of the stream edge as well as several feet over the stream in many places.	
	Near-Bank Organic Material [CHA]: Riparian zone contributes organic material to stream with visible retention (i.e., packs of leaves, twigs, or woody debris in stream are evident).	
	Instream Coarse Wood [CHA]: Riparian zone contributes large deadwood that supports ecological functionality in the stream (i.e., habitat formation, aquatic food webs, biogeochemical processes).	
	Notes/Other Indicators:	