STREAM RESILIENCY & SUSTAINABILITY REVIEW (SRSR) TOOL

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Program Manager

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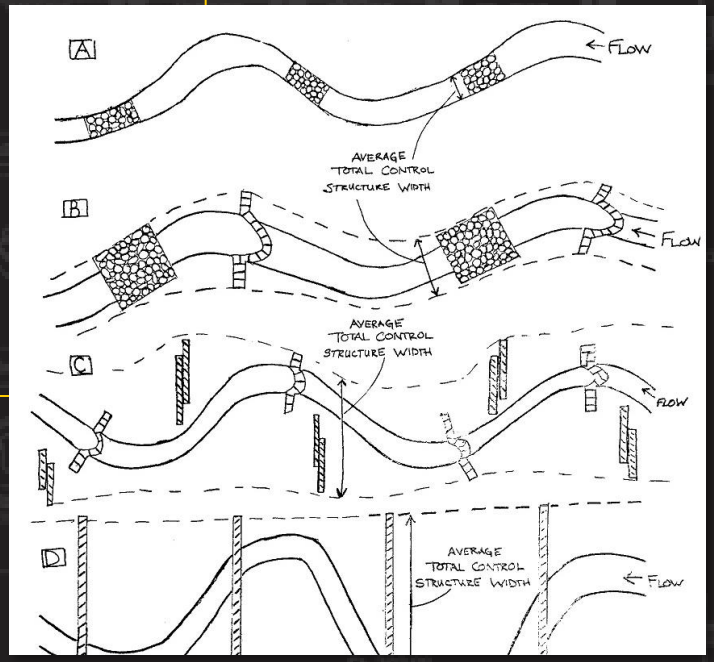
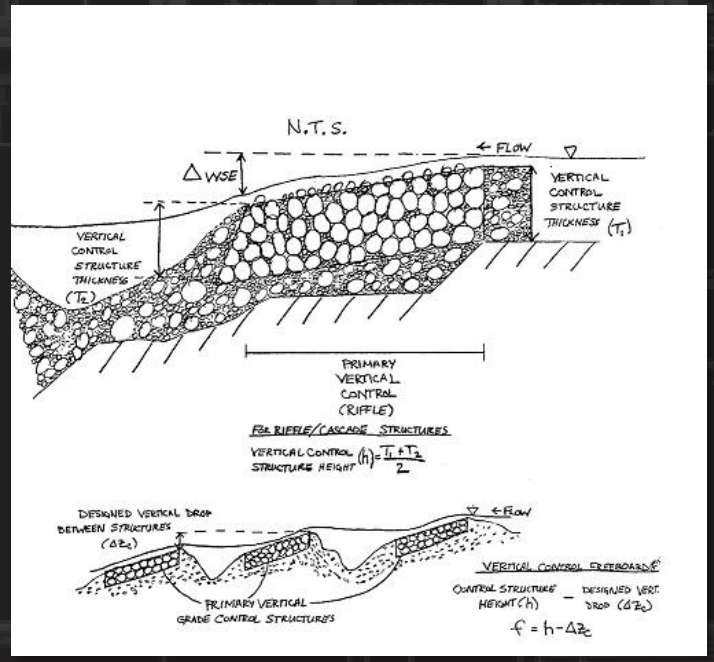
REACH IDENTIFIER	S01 R1						
TOTAL REACH LENGTH	1868		DISCHARGE INFORMATION (cfs)				
	S01 R2		Q2	Q10	Q25	Q50	Q100
	S01 R3		44	122	177	224	27
Also representative for reaches:			ARMORING INFORMATION, D50				
			FLOODPLAIN	RIFFLE	FINAL, DEGRADATI		
			0	2.2	Vertical		

PROPOSED REACH INPUT		Mitigation Plan Table/Page Reference	Notes
storation Type	RVW		
sgen Valley Type	VIII		
sgen Stream Type	C	Design Plans - Sheet 4	
ainage Area (mi^2)	0.23	Design Plans - Sheet 4	
sign discharge used for resiliency calculations (cfs)	22	Design Plans - Sheet 4	*Discharge value used for design calculations
lley slope	1.90%	Design Plans - Sheet 4	
lley Length (ft)	1698	Design Plans - Sheet 4	
annel Length (ft)	1868	Design Plans - Sheet 4	
mary Vertical Control type	Log Vane	Design Plans - Sheet 6-8	
odprone Width (ft)	70	Design Plans - Sheet 4	
lley Bottom Width (ft)	70	Design Plans - Sheet 4	*Width of valley bottom, toe to toe
0-yr discharge innundation width (ft)	70	Design Plans - Sheet 4	*Valley bottom width innundated during 100-yr event
nkfull Channel Width (ft)	9.3	Design Plans - Sheet 4	
annel Top Width (ft)	9.3	Design Plans - Sheet 4	*Top width of channel at floodplain
ean Channel Depth at Riffle Crest (ft)	0.687	Design Plans - Sheet 4	
nkfull Depth at Riffle Crest (ft)	0.893	Design Plans - Sheet 4	
pth at Riffle Crest measured from top of bank (ft)	0.893	Design Plans - Sheet 4	

User Input | Evolution & Ref. Conditions | Performance Standards | Restoration Type explanation





PROBLEM & NEED

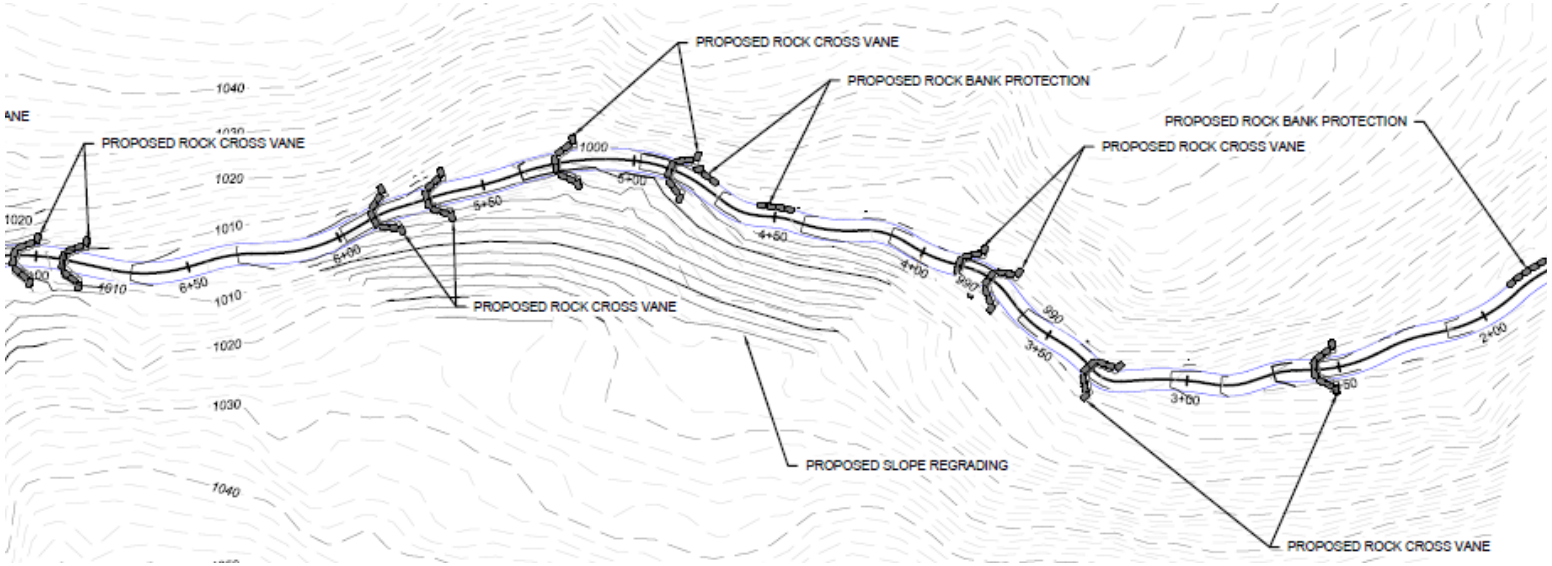
Stream restoration traditionally focused on local stability

Worked within confines of existing planform

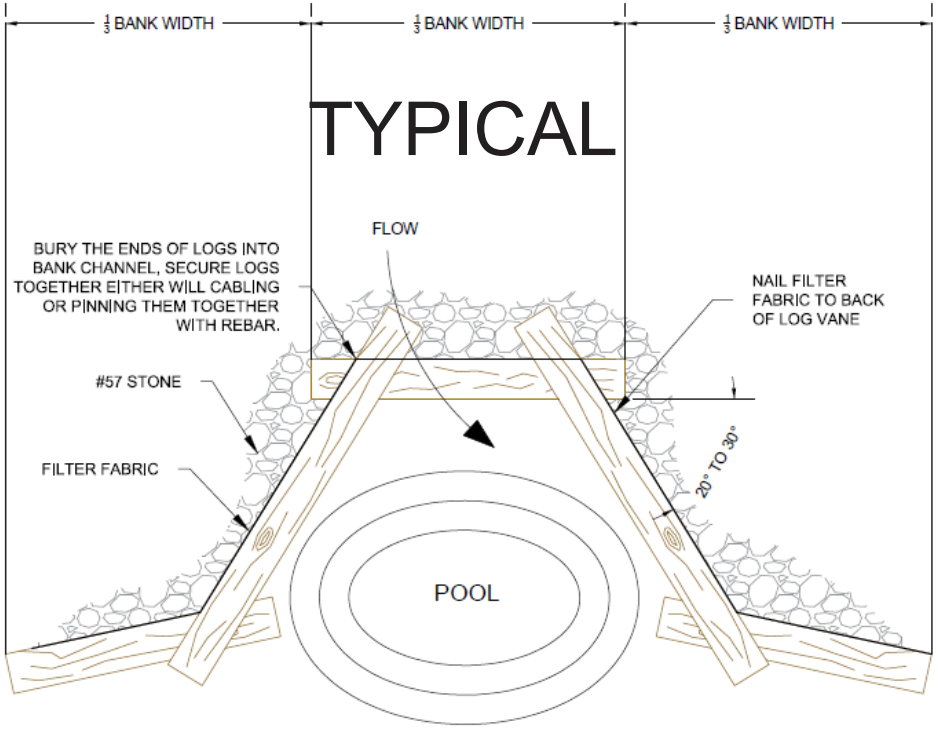
Functional/Conditional assessments traditionally focused on components important to stream function e.g. bank erosion, vegetation, macroinvertebrates, etc.

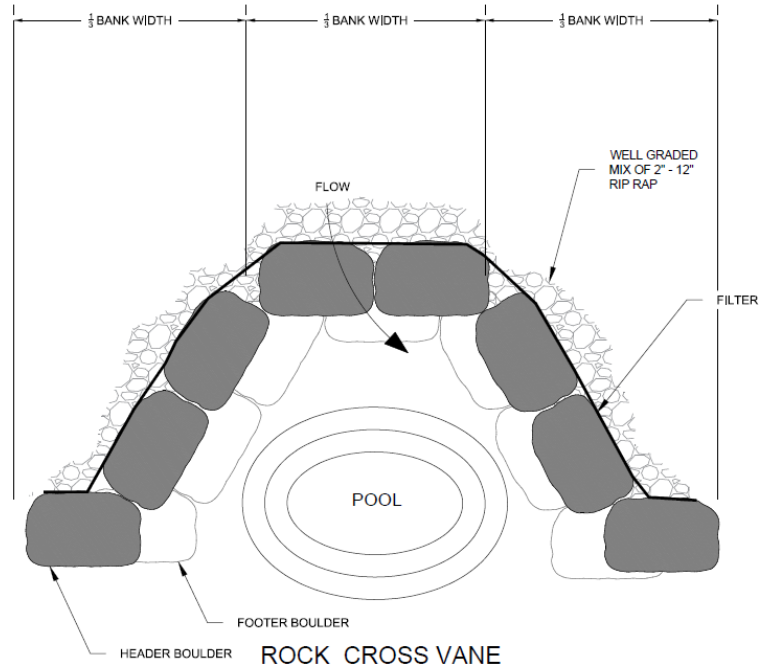
- Soil & groundwater profiles not considered
- Stream & floodplain systems not assessed wholistically

PLAN VIEW

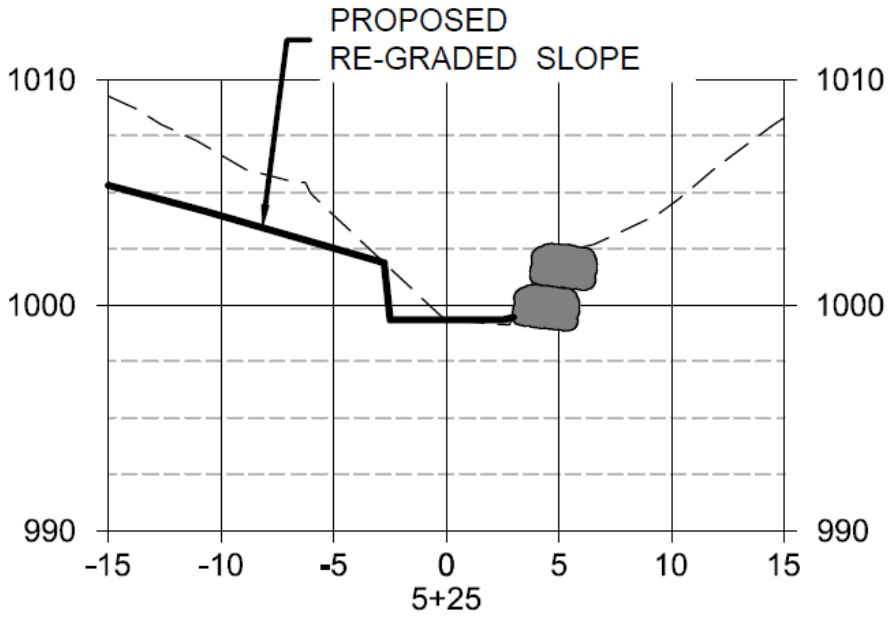


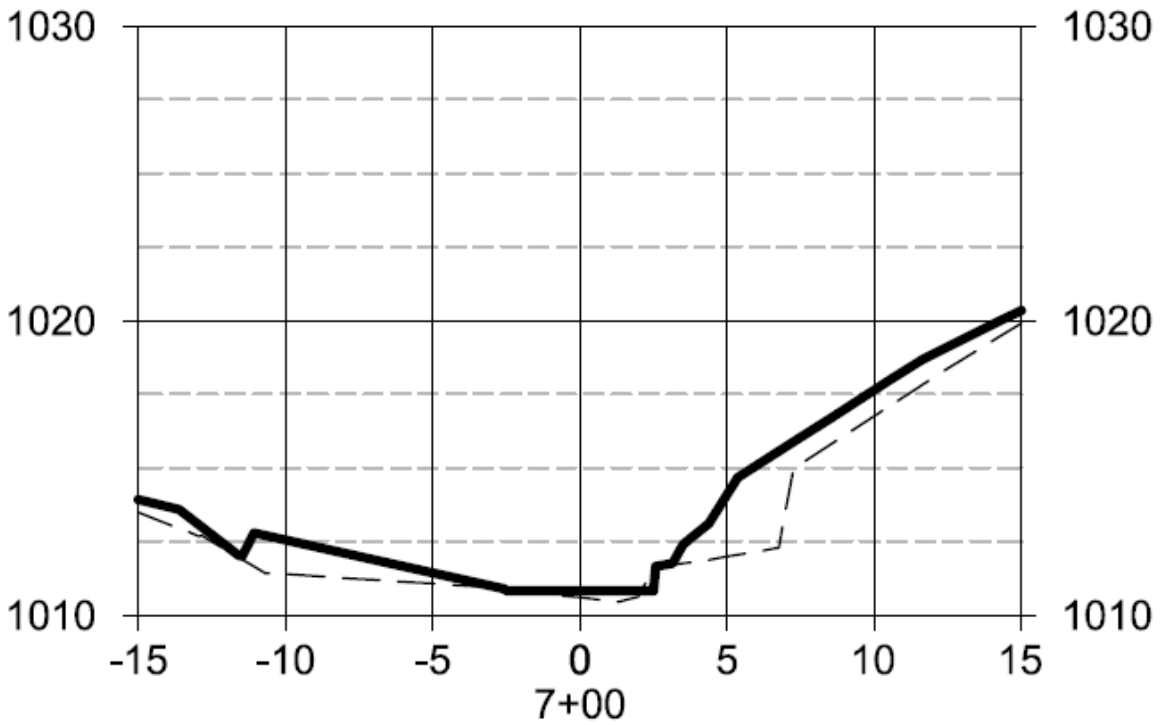
TYPICAL

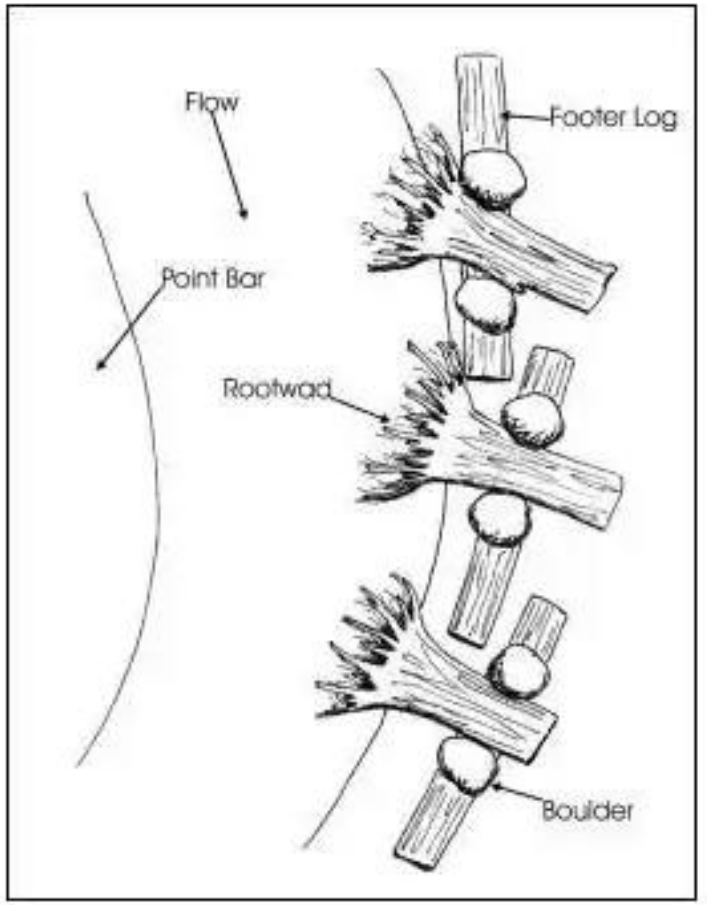




ROCK CROSS VANE


PROPOSED
RE-GRADED SLOPE
1010
1000
990
-15
-10
-5
0
5
10
15
5+25


1030
1020
1010
-15
-10
-5
0
5
10
15
7+00


Flow
Footer Log
Point Bar
Rootwad
Boulder


MAP
08/01/24
16:13:59
LOG
00
+01.0°
-33.1°
-35
-30
+05
SHOW EXTRAS...
015° N15E 0267mils TRUE
ZERO
A-B
CAL
N
030
COLOR
0.5 X
S


00
+05
+04.3°
-43.0°
-45
-40
SHOW EXTRAS...
177° S03E 3147mils TRUE
ZERO
A-B
CAL
150
S
COLOR
0.5 X
S

APPLICATION

*Resiliency: projects should **maintain functions and services** following disturbance (drought, flood)

*Long-term sustainability: projects should be **self-sustaining** in the long-term

BASELINE

POST-CONSTRUCTION

RESTORING TO PRE-DISTURBANCE CONDTION?

- Vertical stability across floodplain and valley
- Laterally dynamic
- Robust vegetative controls
- Low banks / Low shear stress

POST-CONSTRUCTION

YEAR 8 POST-CONSTRUCTION

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SRSR DELIVERABLES

SRSR Design Companion & User Manual

Microsoft Excel-based Design Companion Tool: Use by Designer to input data in fixed format. User Manual includes instructions to designer.

Automatic transfer of data from Design Companion to SRSR Workbook.

Generates performance standards and criteria for designer to integrate into Project MP.

Performance standards & criteria are based on set restoration types (based on designer supplied information).

SRSR Workbook

Microsoft Excel Tool:
1. Defines/identifies restoration type(s).

2. Generates Risk Matrix (measures riskiness of design for landscape setting)

3. Identifies channel evolution state to assess long-term sustainability.

4. Generates suite of ecological performance standards and criteria for use in evaluating resiliency/sustainability and compliance.

SRSR Users Manual

Step-by-step walkthrough of SRSR workbook components

Explanation of, and reasoning behind, computations and cell shading for end-user reference.

Technical Memorandum

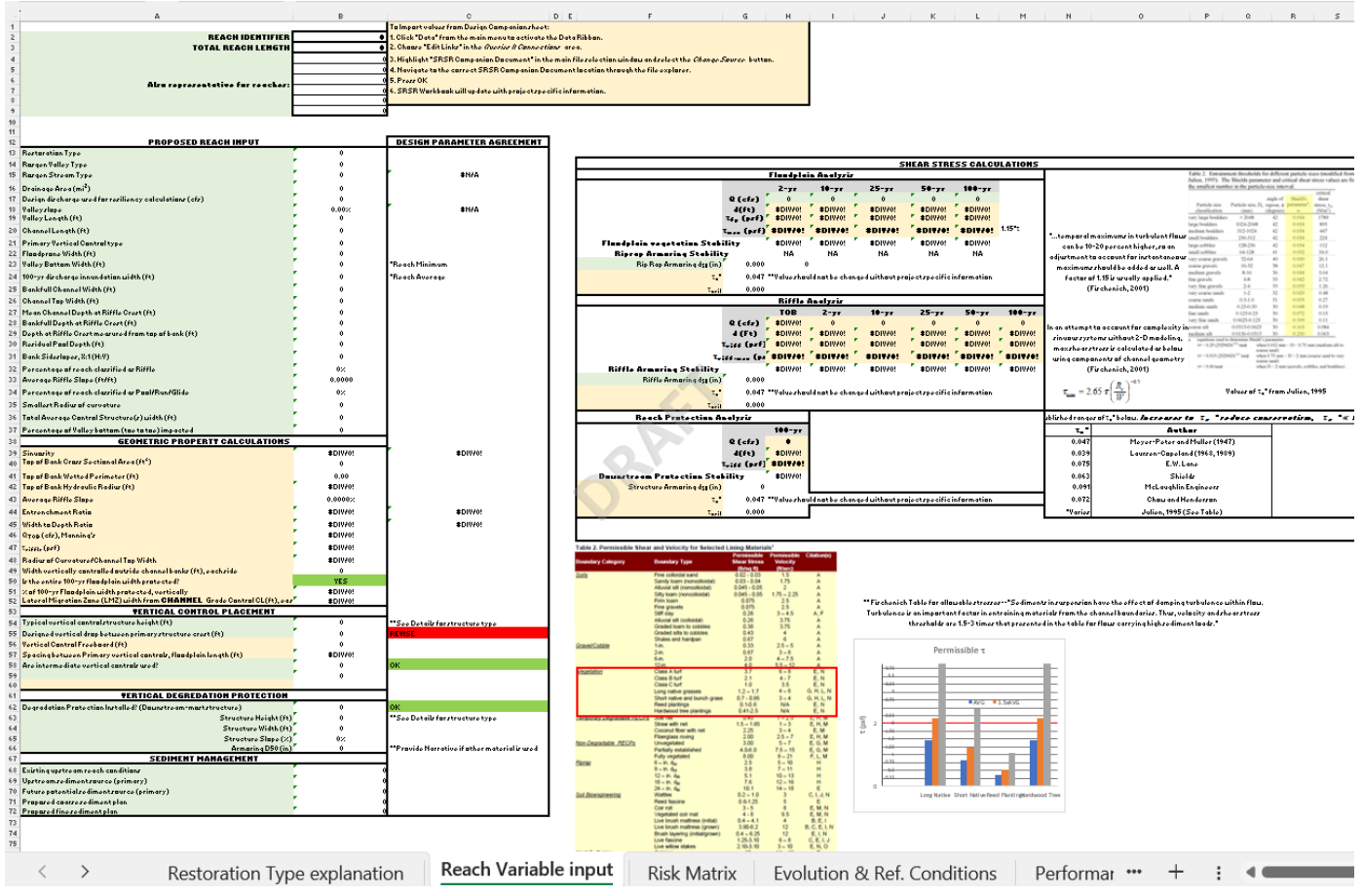
Description of need

Outline of basic use and function of the SRSR workbook

Justification for future need/expansion

SRSR DESIGN COMPANION & WORKBOOK

- SRSR Workbook provides a suite of design evaluation tools and stream ecological performance standards to assess project resiliency and sustainability.
- SRSR does not dictate a specific design philosophy or methodology, but helps user spot check designer-entered data, interpret the output, and make risk-based decisions regarding the potential resiliency and sustainability of stream mitigation proposals.
- Can be applied to a variety of design approaches: stratified by "restoration type" (e.g. design approach), stream classification and valley/landscape setting.
- Can be used with existing stream assessment/crediting protocols & checklists.
- Developed regionally for stream projects implemented in the eastern USA (hydrology and vegetation).



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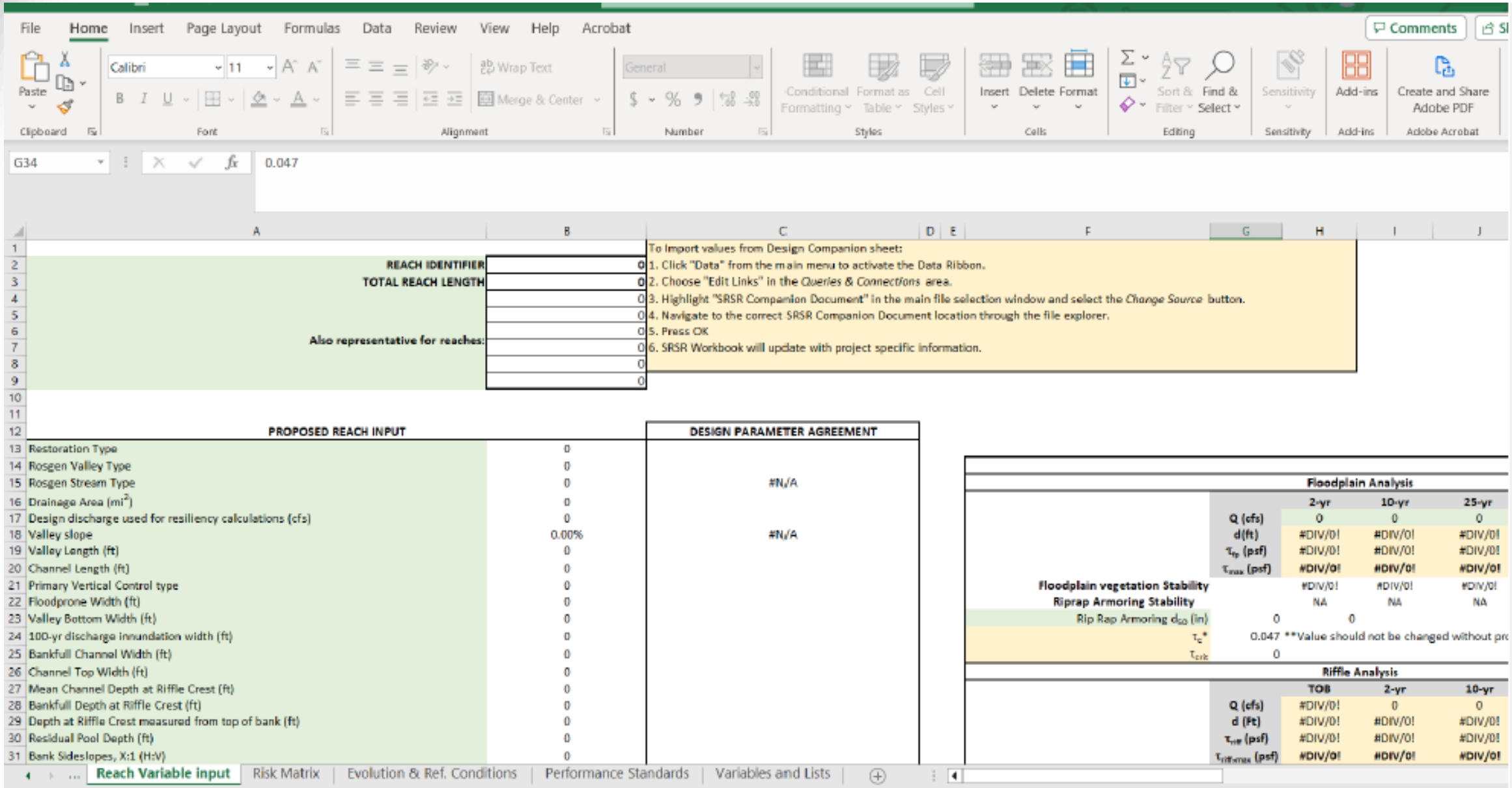
SRSR WORKBOOK



File Home Insert Page Layout Formulas Data Review View Help Acrobat

Comments

Paste | Calibri | 11 | Wrap Text | General | Conditional Formatting | Format as Table | Cell Styles | Insert | Delete | Format | Sort & Filter | Find & Select | Sensitivity | Add-ins | Create and Share Adobe PDF

Clipboard | Font | Alignment | Number | Styles | Cells | Editing | Sensitivity | Add-ins | Adobe Acrobat

G34 | 0.047

	A	B	C
1			To Import values from Design Companion sheet:
2	**REACH IDENTIFIER**	0	1. Click "Data" from the main menu to activate the Data Ribbon.
3	**TOTAL REACH LENGTH**	0	2. Choose "Edit Links" in the *Queries & Connections* area.
4		0	3. Highlight "SRSR Companion Document" in the main file selection window and select the *Change Source* button.
5		0	4. Navigate to the correct SRSR Companion Document location through the file explorer.
6		0	5. Press OK
7	**Also representative for reaches:**	0	6. SRSR Workbook will update with project specific information.
8		0	
9		0	
10			
11			

12	PROPOSED REACH INPUT		DESIGN PARAMETER AGREEMENT
13	Restoration Type	0	
14	Rosgen Valley Type	0	
15	Rosgen Stream Type	0	#N/A
16	Drainage Area (mi^2)	0	
17	Design discharge used for resiliency calculations (cfs)	0	
18	Valley slope	0.00%	#N/A
19	Valley Length (ft)	0	
20	Channel Length (ft)	0	
21	Primary Vertical Control type	0	
22	Floodprone Width (ft)	0	
23	Valley Bottom Width (ft)	0	
24	100-yr discharge innundation width (ft)	0	
25	Bankfull Channel Width (ft)	0	
26	Channel Top Width (ft)	0	
27	Mean Channel Depth at Riffle Crest (ft)	0	
28	Bankfull Depth at Riffle Crest (ft)	0	
29	Depth at Riffle Crest measured from top of bank (ft)	0	
30	Residual Pool Depth (ft)	0	
31	Bank Sideslopes, X:1 (H:V)	0	

Floodplain Analysis		2-yr	10-yr	25-yr
	Q (cfs)	0	0	0
	d (ft)	#DIV/0!	#DIV/0!	#DIV/0!
	τ_{fp} (psf)	#DIV/0!	#DIV/0!	#DIV/0!
	τ_{max} (psf)	#DIV/0!	#DIV/0!	#DIV/0!
Floodplain vegetation Stability		#DIV/0!	#DIV/0!	#DIV/0!
Riprap Armoring Stability		NA	NA	NA
Rip Rap Armoring d_{50} (in)	0	0		
τ_c*	0.047	**Value should not be changed without pr		
τ_{crit}	0			

Riffle Analysis		TOB	2-yr	10-yr
	Q (cfs)	#DIV/0!	0	0
	d (Ft)	#DIV/0!	#DIV/0!	#DIV/0!
	τ_{rif} (psf)	#DIV/0!	#DIV/0!	#DIV/0!
	$\tau_{riffcrest}$ (psf)	#DIV/0!	#DIV/0!	#DIV/0!

Reach Variable Input | Risk Matrix | Evolution & Ref. Conditions | Performance Standards | Variables and Lists

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INTERPRETING OUTPUT

	PROPOSED REACH INPUT		DESIGN PARAMETER AGREEMENT
13	Restoration Type	IS	
14	Rosgen Valley Type	VI	
15	Rosgen Stream Type	E	JUSTIFY STREAM TYPE
16	Drainage Area (mi^2)	0.5	
17	Design discharge used for resiliency calculations (cfs)	300	
18	Valley slope	1.80%	OK
19	Valley Length (ft)	1000	
20	Channel Length (ft)	1300	
21	Primary Vertical Control type	Bed Armoring	
22	Floodprone Width (ft)	50	
23	Valley Bottom Width (ft)	50	
24	100-yr discharge innundation width (ft)	50	
25	Bankfull Channel Width (ft)	8	
26	Channel Top Width (ft)	8	
27	Mean Channel Depth at Riffle Crest (ft)	2	
28	Bankfull Depth at Riffle Crest (ft)	3	
29	Depth at Riffle Crest measured from top of bank (ft)	3.5	
30	Residual Pool Depth (ft)	3.5	
31	Bank Sideslopes, X:1(H:V)	2	
32	Percentage of reach classified as Riffle	60%	
33	Average Riffle Slope (ft/ft)	0.0230	
34	Percentage of reach classified as Pool/Run/Glide	40%	
35	Smallest Radius of curvature	40	
36	Total Control Structure(s) width (ft)	33	
37	Percentage of Valley bottom (toe to toe) impacted	15	
38	**GEOMETRIC PROPERTY CALCULATIONS**		
39	Sinuosity	1.3	JUSTIFY STREAM TYPE
40	Top of Bank Cross Sectional Area (ft^2)	3.5	
41	Top of Bank Wetted Perimeter (ft)	9.65	
42	Top of Bank Hydraulic Radius (ft)	0.36	
43	Average Riffle Slope	2.3000%	
44	Entrenchment Ratio	6.25	OK
45	Width to Depth Ratio	4.00	OK
46	Q_{TOB} (cfs), Manning's	8.89	
47	τ_{riffle} (psf)	0.520	
48	Radius of Curvature/Channel Top Width	5.00	
49	Width vertically controlled outside channel banks (ft), each side	12.5	
50	Is the entire 100-yr floodplain width protected?	NO	
51	% of 100-yr Floodplain width protected, vertically	66%	
52	Lateral Migration Zone (LMZ) width from **CHANNEL** Grade Control CL(ft), ea sid	9.375	

- classifies the stream design based on five design approaches (“restoration types”)
- screens the mitigation design for “risk level” that could influence ecological success and sustainability, based on the project’s design approach, stream performance standards and criteria
- populates a suite of ecological performance standards and criteria, tailored for the project mitigation design approach, that can be used to assess ecological project performance (e.g., compliance)

RESTORATION TYPES

In-situ: placement of in-channel structures without change to planform

In-situ, aggrading: placement of in-channel structures without change to planform, to promote aggradation

Relocation-Corridor: changing planform and profile through in-channel structures and floodplain grading

Relocation-Valley Wide: changing planform, profile, reestablishing grade control. Channel planform, bed, and banks clearly defined. <50% of valley bottom disturbed through restoration activities

Valley Bottom Restoration: changing planform, profile, establishing valley-spanning grade control. Channel planform, bed, and banks may not be clearly defined or visually distinguishable in either design or at completion of construction. >50% of valley bottom disturbed through restoration activities

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RISK MATRIX

RISK LEVEL	Sinuosity	$\frac{Radius\ of\ Curvature}{Channel\ Top\ Width}$	Vertical Grade Control Change in Elevation	Floodplain width protection	Downstream control effective distance (# of structures)	Existing Sediment load in	Potential Sediment Load in	Coarse Sediment Plan	Valley Slope	Design Flood used for stability calculations	% of Valley Bottom disturbed: Tree canopy removal and disruption of soil horizons
Low							None-Stable, Impounded		1.80%		
Low-Medium		5.00									
Medium			0.75		6.67	Eroding Banks		Reach Storage			60.00
Medium-High	1.50			50%						Q25	
High											

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ECOLOGICAL PERFORMANCE STANDARDS

	Metric	y1	y2	y3	y4	y5	y6	y7	Application	Flow Regime		
HYDROLOGY	OHWM	Present and continuous	Present and continuous	Present and continuous	Present and continuous	Present and continuous	Present and continuous	Present and continuous	All	P	I	E
	Flow Classification	≥Existing Conditions	≥Existing Conditions	≥Existing Conditions	≥Existing Conditions	≥Existing Conditions	≥Existing Conditions	≥Existing Conditions	All	P	I	E
	Baseflow Duration, Vertical Grade Control Resiliency-Piping	Water surface>Controlling elevation of structure during periods of active baseflow	Water surface>Controlling elevation of structure during periods of active baseflow	Water surface>Controlling elevation of structure during periods of active baseflow	Water surface>Controlling elevation of structure during periods of active baseflow	Water surface>Controlling elevation of structure during periods of active baseflow	Water surface>Controlling elevation of structure during periods of active baseflow	Water surface>Controlling elevation of structure during periods of active baseflow	All	P	I	
HYDRAULICS	Floodplain Resiliency	Absence of features formed through erosion, <20% bare earth	Absence of features formed through erosion, <15% bare earth	Absence of features formed through erosion, <10% bare earth	Absence of features formed through erosion, <5% bare earth	Absence of features formed through erosion, <5% bare earth	Absence of features formed through erosion, <5% bare earth	Absence of features formed through erosion, <5% bare earth	All	P	I	E
	RESIDUAL Pool Depth	<20% decrease from AB	<20% decrease from AB	<20% decrease from AB	<20% decrease from AB	<20% decrease from AB	<20% decrease from AB	<20% decrease from AB	IS	P	I	
	RESIDUAL Pool Depth	NA	Y2 Pool Depths	<20% decrease from Y2	<20% decrease from Y2	<20% decrease from Y2	<20% decrease from Y2	<20% decrease from Y2	IS-A, RC, RVW, VBR	P	I	
PHOLOGY	Rosgen Channel Type	Mit. Plan Approved	Mit. Plan Approved	Mit. Plan Approved	Mit. Plan Approved	Mit. Plan Approved	Mit. Plan Approved	Mit. Plan Approved	All	P	I	E
	BEHI	LOW	LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	VERY LOW	All			
	Vertical Stability	Δ WSE over PRIMARY grade control structure< 0.75xDesign Freeboard + Designed vertical drop.	Δ WSE over PRIMARY grade control structure< 0.75xDesign Freeboard + Designed vertical drop.	Δ WSE over PRIMARY grade control structure< 0.75xDesign Freeboard + Designed vertical drop.	Δ WSE over PRIMARY grade control structure< 0.75xDesign Freeboard + Designed vertical drop.	Δ WSE over PRIMARY grade control structure< 0.75xDesign Freeboard + Designed vertical drop.	Δ WSE over PRIMARY grade control structure< 0.75xDesign Freeboard + Designed vertical drop.	Δ WSE over PRIMARY grade control structure< 0.75xDesign Freeboard + Designed vertical drop.	All	P	I	E
	Lateral Stability	<10% change in channel TOB length from AB, within LMZ limits	<10% change in channel TOB length from AB, within LMZ limits	<5% change in channel TOB length from Y2, within LMZ limits	<5% change in channel TOB length from Y2, within LMZ limits	<5% change in channel TOB length from Y2, within LMZ limits	<5% change in channel TOB length from Y2, within LMZ limits	<5% change in channel TOB length from Y2, within LMZ limits	IS, IS-A	P	I	E

LOW RISK

- Vertical stability across floodplain and valley
- Appropriate spacing between primary vertical control structures
- Low shear stress (1-D boundary calculations up to 100yr RI)
  - v.2: low flow velocity on floodplain vs low shear stress on floodplain
- Low flow velocities on floodplain
- Appropriate plan form for valley type/landscape

PROJECT TEAM

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