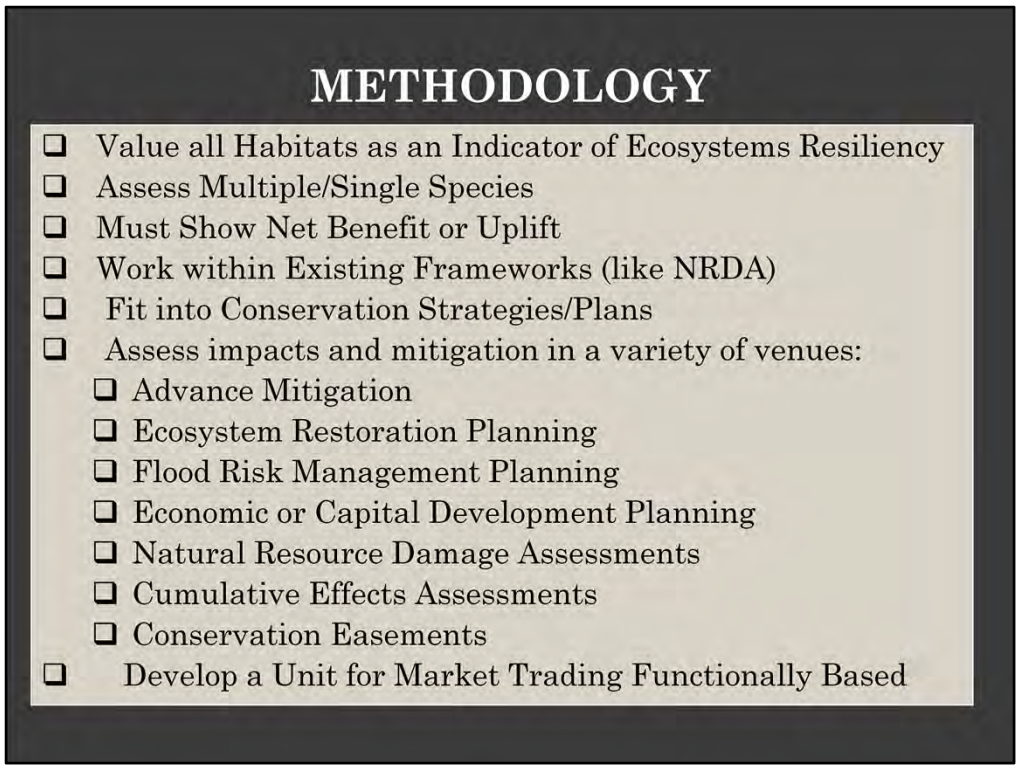
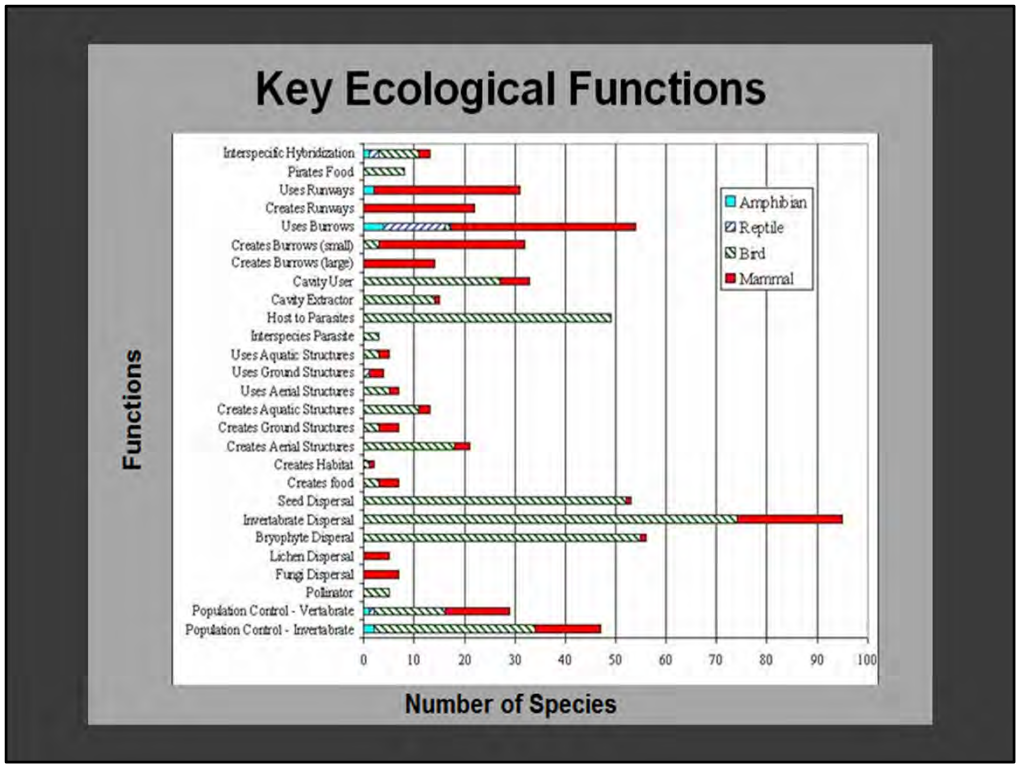
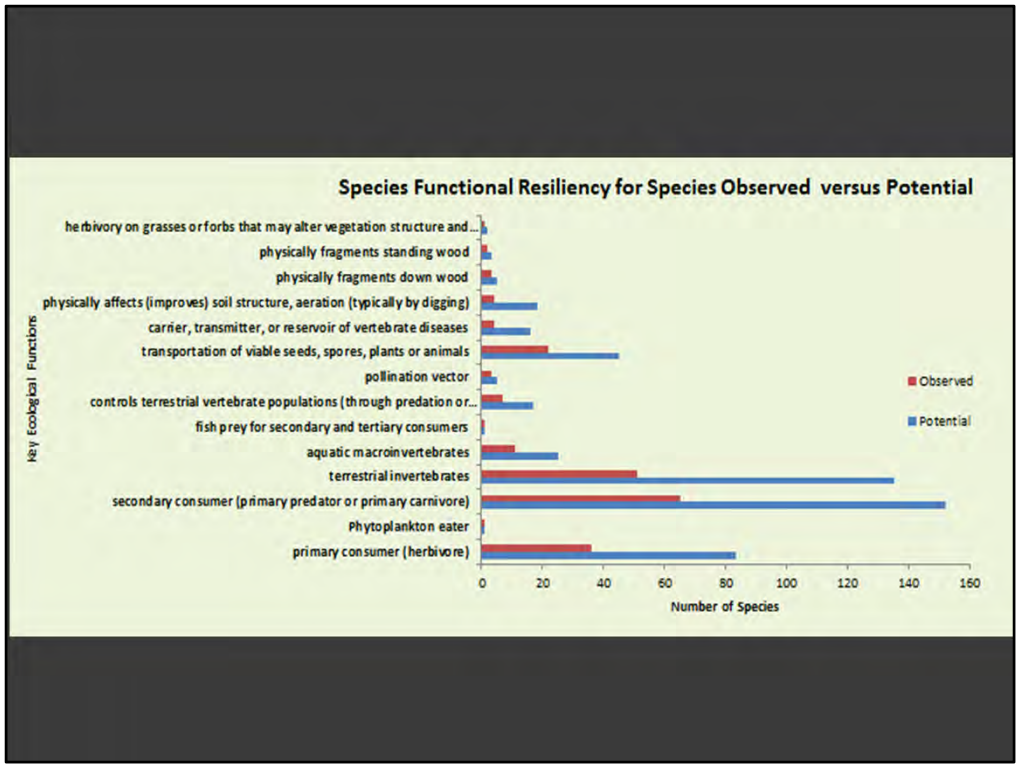
CHAP Overview



These are needs from recent policies and different venues that would use conservation banks. The CHAP unit is the Functional Redundancy Index value. It is very important to note that any method that deals with conservation banking needs to work in a multiple of venues, as CHAP does. CHAP method has been reviewed several times by independent scientific panels with the most recent sponsored by the Corps of Engineers and overseen by the Corps Planning Center of Expertise that followed the National Academy of Sciences review format. The Institute is currently working with the Corps on next steps for implementation.



Functional profiles built for each impact and mitigation site or conservation bank.

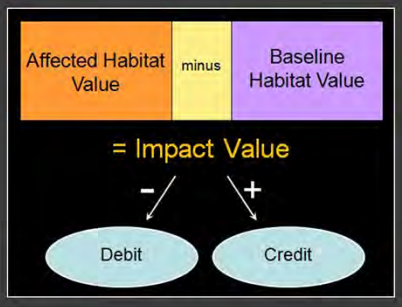


If you have known studies then you can develop an observed versus potential profile to illustrate functional resiliency.

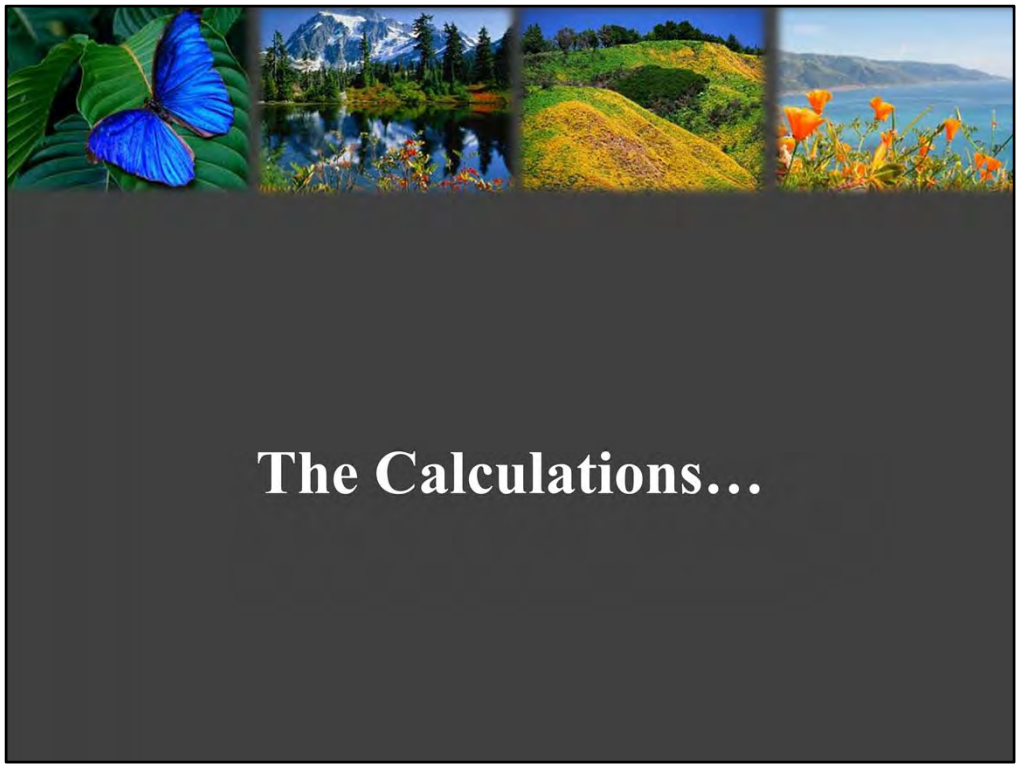
Process Procedures:

A) Form a Habitat Evaluation Team
B) Create a Species List
C) Preliminarily Map the Study Site
D) Conduct Field Inventory
- Wildlife habitat types
- Structural conditions
- Key environmental correlates
- Local condition adjustment factors
- Invasive species cover
- Run Verification Transects

E) Finalize Mapping
F) Run Calculations
G) Produce Report

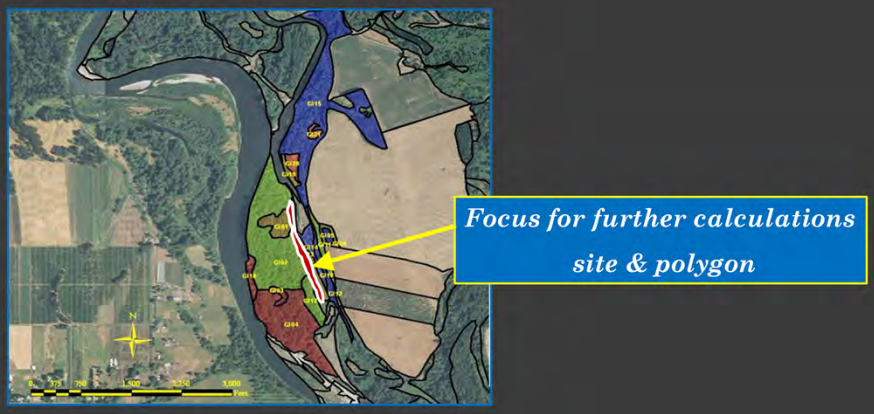


CHAP uses a set of protocols to measure habitat quality by evaluating biodiversity within a habitat type and/or structural condition to determine if activities will create an impact (debit) or enhancement (credit).



Review of Calculations – note in making this determination CHAP uses the best available science. Presidential Memo (Nov 3, 2015) calls for using the appropriate tools to measure, monitor and evaluate. US Fish Wildlife Service Draft Policy calls for using Best Available Science and looking a species functions.

Example:



Information tracked at the site and for each individual polygon .

FUNCTIONAL REDUNDANCY INDEX (FRI)

Valley Foothill Riparian (Species Associated)	**Function 1** Disperses Seeds/Fruits (through ingestion or caching)	**Function 2** Breaks up Down Wood	**Function 3** Primary Burrow Excavator (underground)	**Function 4** Eats Terrestrial Invertebrates
Acorn Woodpecker	1	1	0	1
Black Bear	1	1	1	1
California Newt	0	0	0	1
Yellow Warbler	0	0	0	1

Species-Function Matrix
Site

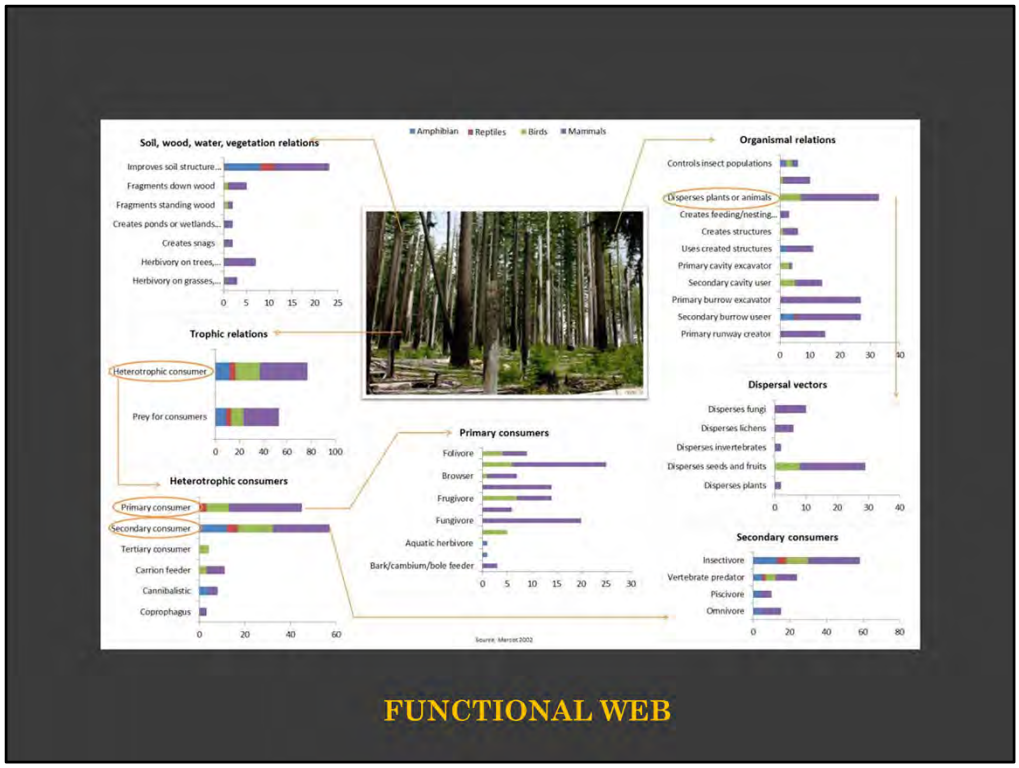
For each habitat type at a site a Functional Redundancy Index (FRI) is calculated. For the first matrix, functional redundancy is defined as the number of species performing the same ecological function in a community. So, for example, for Valley Foothill Riparian habitat in the Santa Ana basin you would take all of the potential species found in that basin that are associated with that habitat type. This species list would then be reviewed to make it appropriate for the site. You would then calculate the FRI based on species and their associated Key Ecological Functions. The value for the given matrix above is calculated by dividing the sum of all of the 1's by the total number of functions. For the subset of species and functions shown here, it would be 9/4 or 2.25.

FUNCTIONAL REDUNDANCY INDEX (FRI)

Valley Foothill Riparian (Polygon #1 KECS)	Function 1 Creates Snags	Function 2 Breaks up Down Wood	Function 3 Primary Excavator	Function 4 Eats Fish	Function 5 Eats Terrestrial Insects
Down Wood	1	1	1	0	1
Snags	1	0	1	0	1
Tree Cavities	1	1	1	0	0
Hollow Living Trees	0	1	0	0	1
In Stream Large Woody Debris	0	0	0	1	1

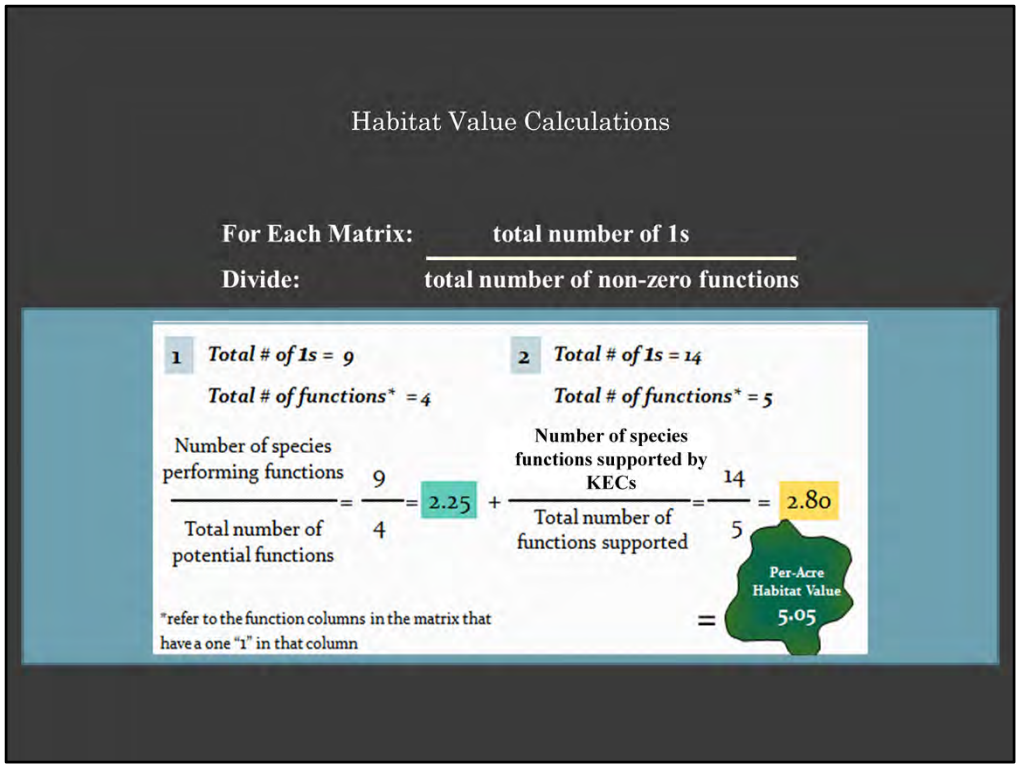
Habitat-Function Matrix
Polygon

For each habitat type at a site a Functional Redundancy Index (FRI) is calculated. Functional redundancy is defined here as the number of species supported by key habitat elements that are found within a polygon. So, for example, field inventory of the polygon that has a Valley Foothill Riparian habitat would have a listed of fine featured habitat elements or Key Environmental Correlates (KECs) associated with it. This matrix would be created for each polygon to depict each KEC supporting which species functions. You would then calculate the FRI based on the KECs and their support for associated Key Ecological Functions. The value for the given habitat matrix is calculated by dividing the sum of all of the 1's by the total number of functions. For the matrix shown here, this subset of KECs within this habitat type would be 14/5 or 2.80.

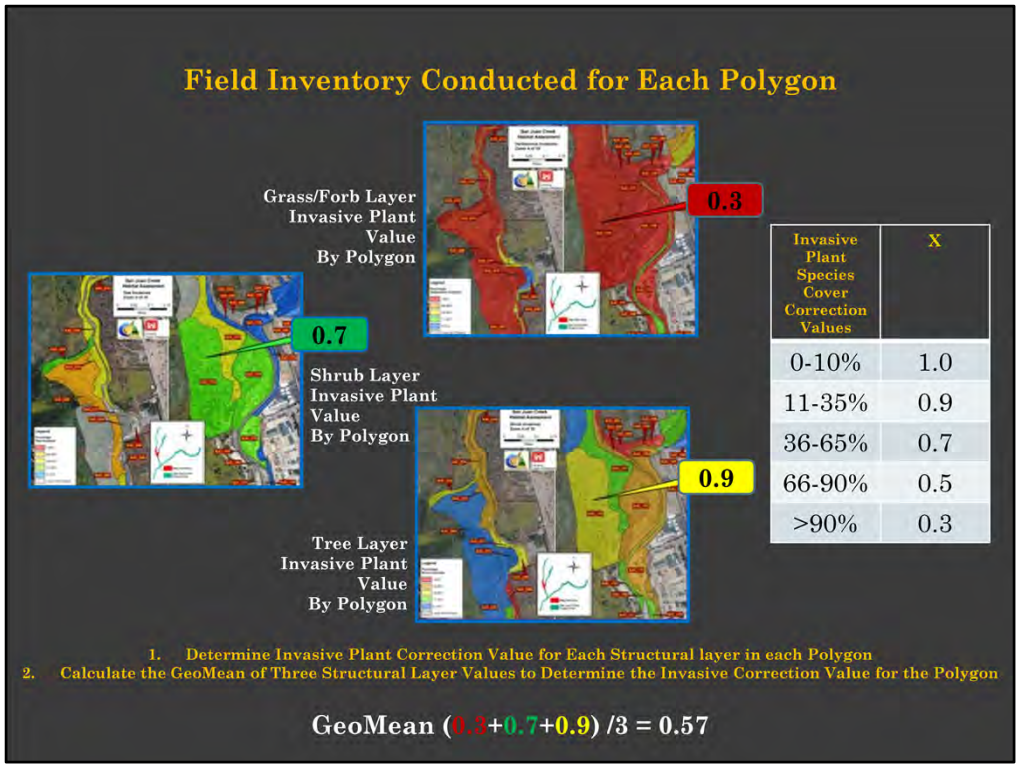


FUNCTIONAL WEB

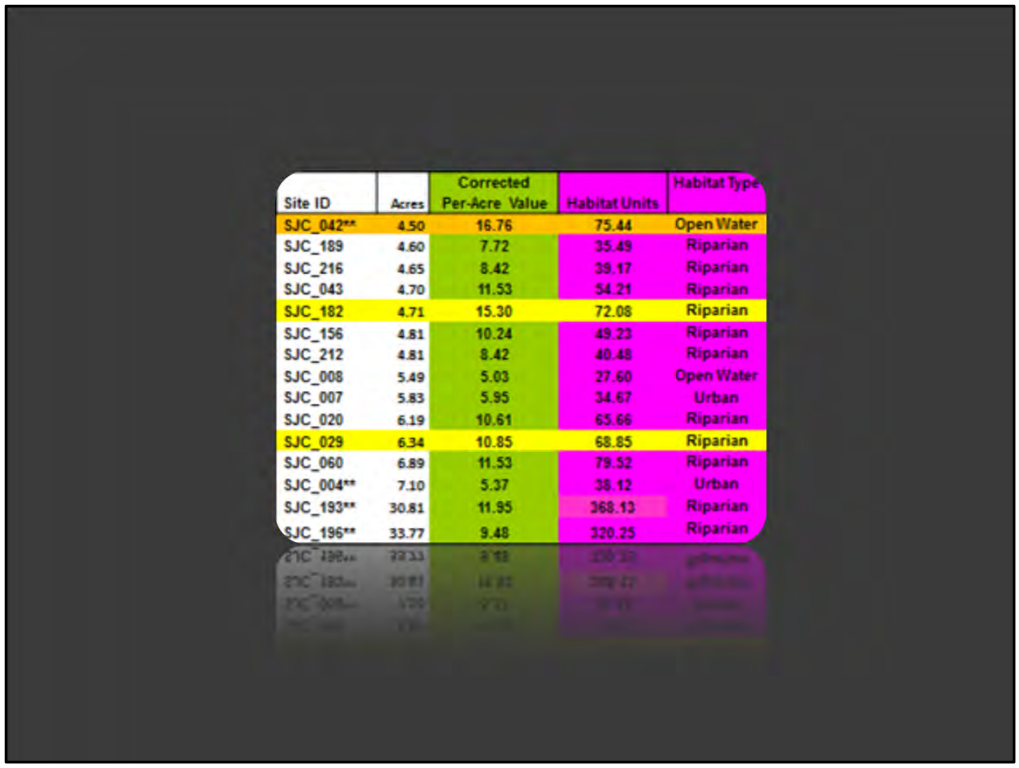
The prior Habitat Matrix is founded on the concept of a Functional Web, which was first reported by the US Forest Service Bruce Marcot in 2002. The functional web concept is defined as the set of all Key Ecological Functions within a community and their connections among species and thence to habitat elements or Key Environmental Correlates. It depicts how habitat elements provide for (support) species and the array of ecological functions performed by those species.



To determine the final value of the polygon(s) the two matrix values are simply added together. This value is a deterministic in that it is a direct output from the species, habitat components and functions and it is an unbiased value.



Discounting can occur as long as it is clearly expressed in the document along with the discount chart. These amounts are determined via consensus.

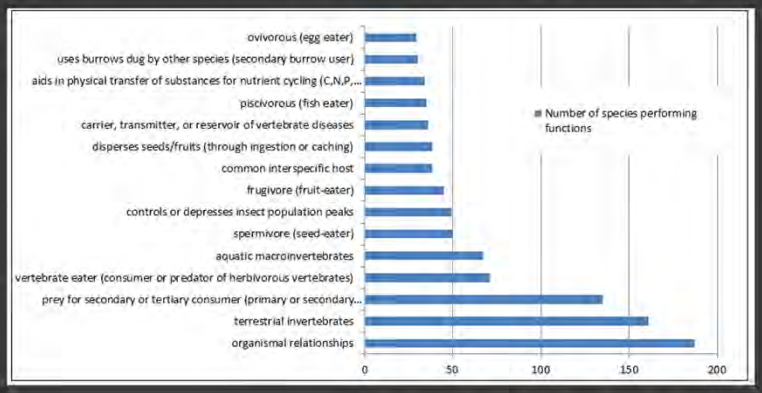


Site ID	Acres	Corrected Per-Acre Value	Habitat Units	Habitat Type
SJC_042**	4.50	16.76	75.44	Open Water
SJC_189	4.60	7.72	35.49	Riparian
SJC_216	4.65	8.42	39.17	Riparian
SJC_043	4.70	11.53	54.21	Riparian
SJC_182	4.71	15.30	72.08	Riparian
SJC_156	4.81	10.24	49.23	Riparian
SJC_212	4.81	8.42	40.48	Riparian
SJC_008	5.49	5.03	27.60	Open Water
SJC_007	5.83	5.95	34.67	Urban
SJC_020	6.19	10.61	65.66	Riparian
SJC_029	6.34	10.85	68.85	Riparian
SJC_060	6.89	11.53	79.52	Riparian
SJC_004**	7.10	5.37	38.12	Urban
SJC_193**	30.81	11.95	368.13	Riparian
SJC_196**	33.77	9.48	320.25	Riparian

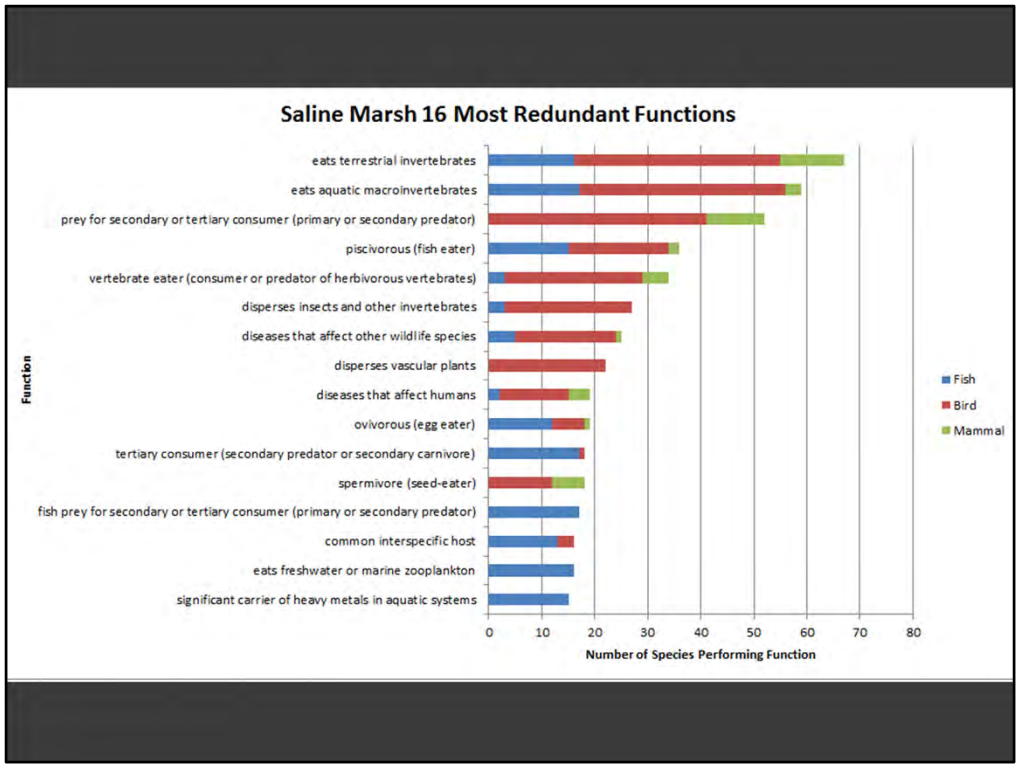
Small areas can have large values.

Mitigation Banks

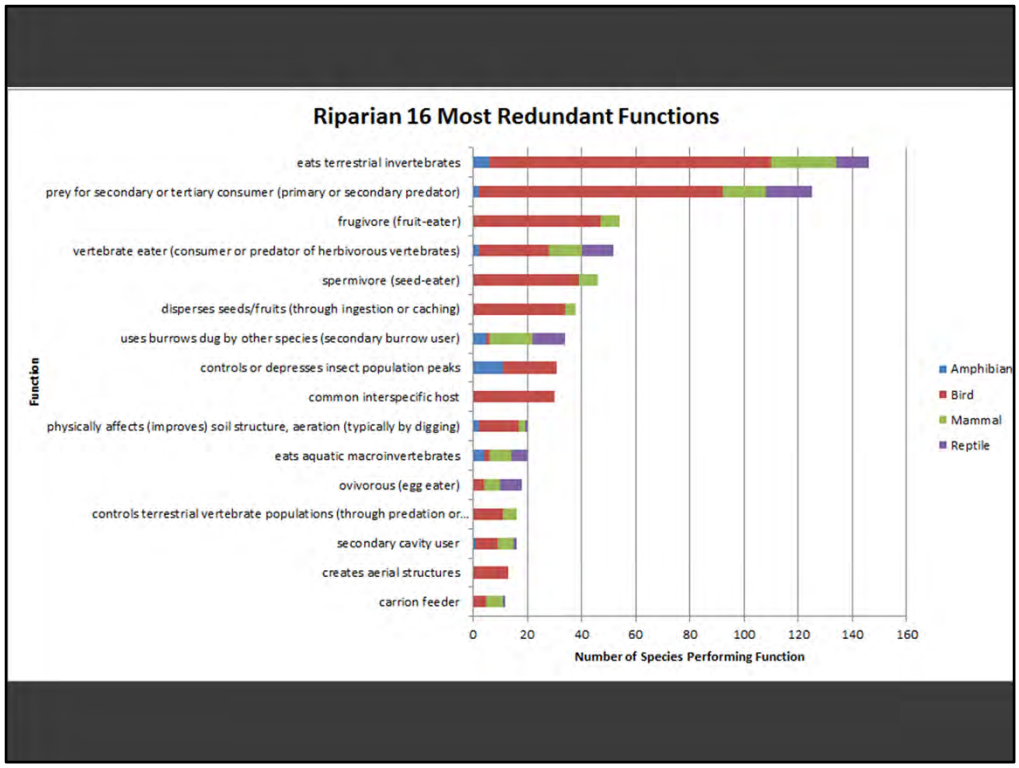
Compare Functional Profiles from Impact to Mitigation Bank or Site



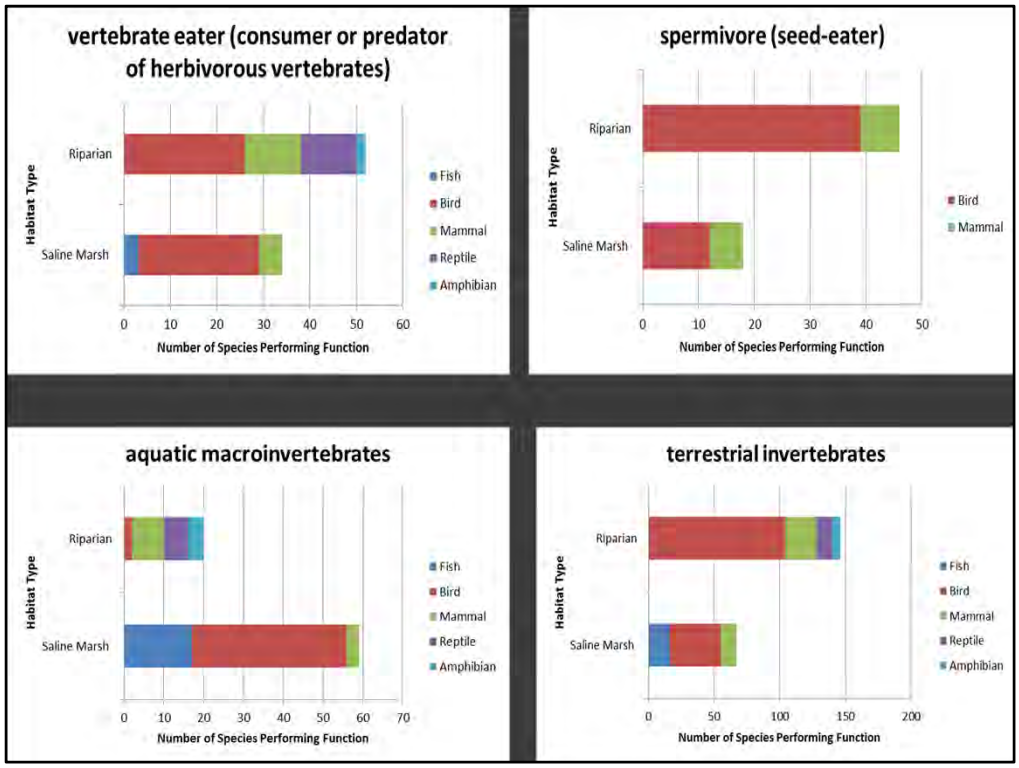
Regarding comparing site impacts to acquiring mitigation from a conservation bank, what are the tradeoffs? We need to be transparent. So above is a hypothetical and partial functional profile of aa conservation bank.



Hypothetically, an impact has occurred to a saline marsh that has the above profile of the 16 most abundant functions (this information is coming from San Francisco Bay South Shoreline study). Note the general animal categories depicted to illustrate what group of species are performing what functions.



Hypothetically, the nearest conservation/mitigation bank has the above profile of the 16 most abundant functions (this information is coming from Aliso Creek). Note the general animal categories depicted to illustrate what group of species are performing what functions. See amphibians and reptiles are added but fish are absent. Based on this, one needs to decide if this is an appropriate bank from which to mitigate. Some tradeoff analysis may need to be done whereby overtime there becomes a need to start and direct that certain kinds of conservation/mitigation banks need to be created because the ones at hand are missing the compensation for key functions.



Compare the two sites, as part of the trade-off analysis, individual functions can be examined and displayed as part of being transparent. Ultimately, the tradeoff between or among sites to conservation/mitigation banks is a policy decision.

This comes from the Presidential Memo (Nov 3, 2015) for Natural Resource Damage Assessments to look at advance restoration and use of conservation banks.

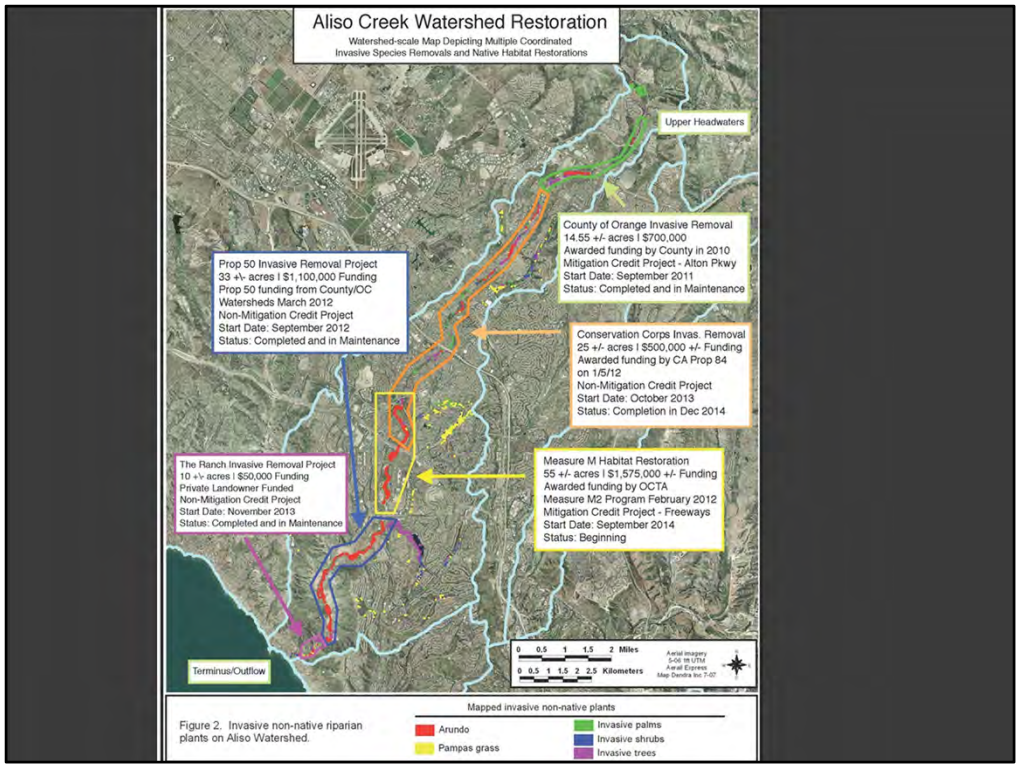
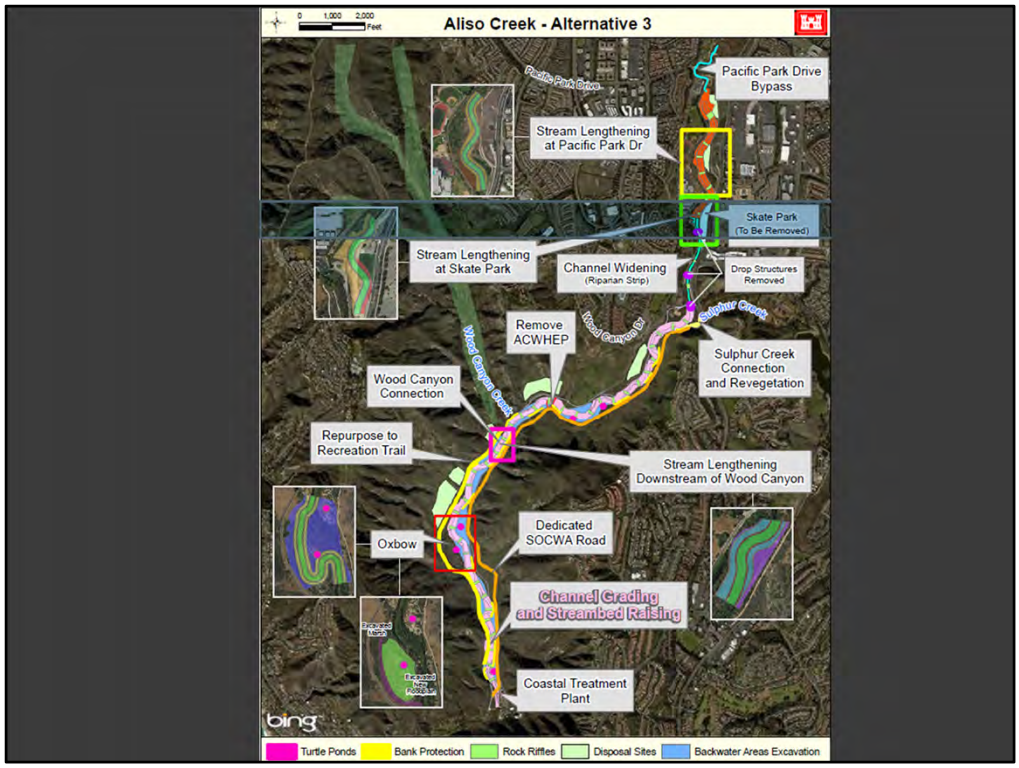


Figure 2. Invasive non-native riparian plants on Aliso Watershed.

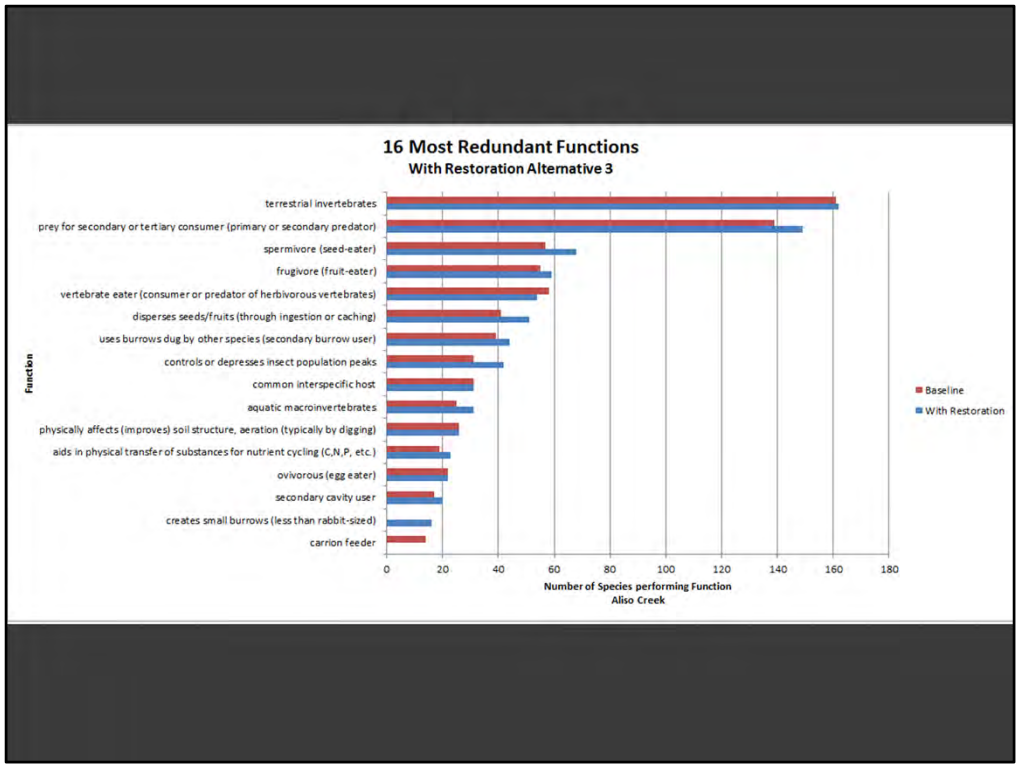
Example of a multiple agency effort to conduct various restoration activities at one site. Any method used to value impacts and mitigation must be able to track multiple activities at a site… like controlling invasive plants as form of mitigation.



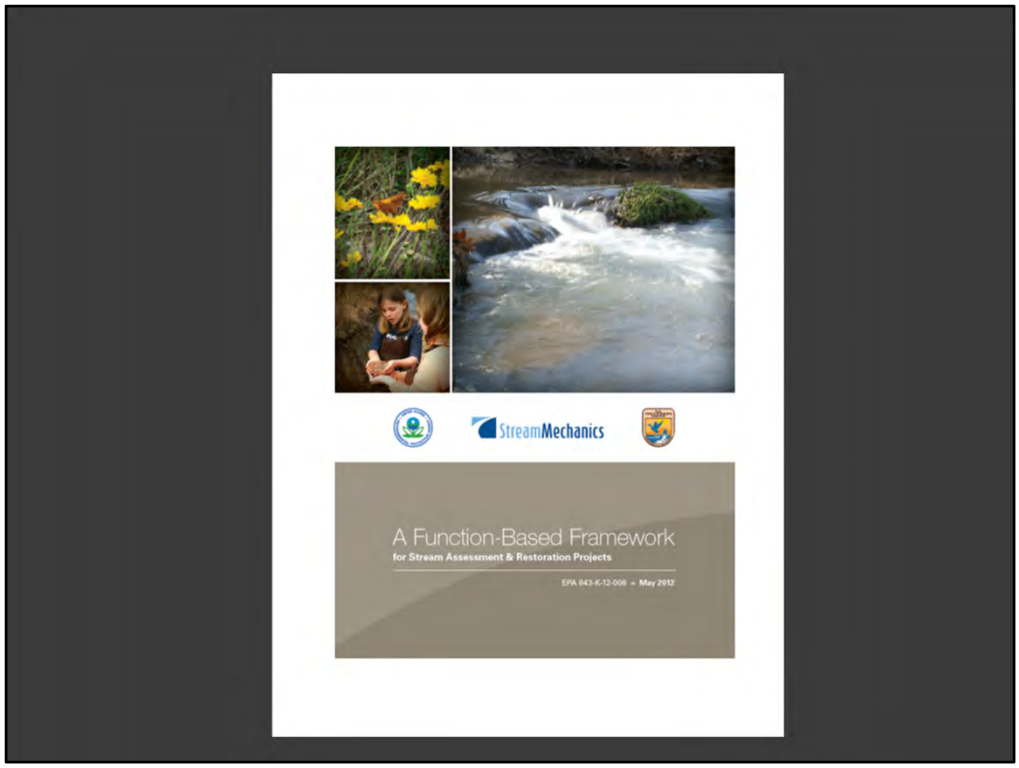
Another example of what a method needs to be able to track. Multiple management activities that are used for ecosystem restoration.

Alternative 3	Acres	Base Year Existing HUs	Year 5 With Project HUs	Year 5 FWOP* HUs	Year 10 With Project HUs	Year 10 FWOP HUs	Year 25 With Project HUs	Year 25 FWOP HUs	Year 50 With Project HUs	Year 50 FWOP HUs
Base Alternative	167.72	2,282.6	3,429.7	2,245.3	3,672.5	2,208.0	4,037.5	2,073.5	4,144.2	1,628.0
Alternative 3 Additional Measures	Values represented for the additional measures assume completion of the base alternative. Habitat Units are in addition to the base alternative. Year 5-50 FWOP HUs are taken from either or a combination of the base year HUs or the future without project HUs depending on their spatial overlap of the base alternative.									
Reconnect Oxbow	14.07	208.9	296.8	190.1	317.5	171.3	360.5	139.1	360.5	107.2
Lower Terrace at Oxbow	11.35	168.5	355.6	153.3	377.8	138.1	412.5	112.2	412.5	86.5
Channel Lengthen Downstream of WC	6.04	132.3	142.3	131.4	151.8	136.9	165.7	152.7	167.9	154.0
Wood Canyon Re-align	7.69	107.2	131.1	107.2	151.5	107.2	160.6	107.2	166.9	86.9
Sulphur Creek Connection	1.75	31.3	78.9	35.3	83.8	40.3	88.5	44.9	89.4	45.8
Widen Channel/Remove Drop Structures	7.38	66.1	223.7	67.9	230.4	69.8	243.1	75.2	244.0	71.3
Widen/Lengthen/Remove Drop Structures	20.65	256.9	507.2	267.2	530.3	277.6	571.9	308.6	575.4	290.8
Pacific Park Drive Bypass Channel	1.01	9.5	137.6	9.9	138.0	10.2	138.9	11.2	138.9	10.3
Pacific Park Drive Bypass Riparian	1.01	9.5	20.4	9.9	22.2	10.2	25.8	11.2	25.9	10.3
Floodplain Extension	21.28	302.8	606.8	294.0	598.0	285.3	577.9	265.1	518.4	205.6
Woody Debris Placement	30.15	494.5	747.3	730.2	758.7	741.6	787.5	770.4	787.5	770.4
Boulder Cluster Placement	30.15	494.5	735.6	730.2	746.9	741.6	775.8	770.4	775.8	770.4
Turtle Pond 5 with Reconnect Oxbow	0.23	2.3	5.3	4.7	5.7	5.3	5.7	5.9	5.7	6.0

Example of outputs from CHAP that are feed into an economic evaluation… any method used needs to be able to be incorporated into an economic evaluation.



Comparison of alternatives to baseline conditions allow functions to be compared for each scenario. Note above, the 16 functions with the highest redundancies show increases with restoration activities with Alternative 3 management actions… Also with this alternative one action (carrion feeder) shows no increase with the alternative while creates small burrows shows and added function over baseline conditions.



Part of ecosystem restoration is to work in areas that are already damaged or impacted that now require remedial action to correct. CHAP incorporates a Hydro-Geomorphic module that is built from "A Function-Based Framework" that was developed by EPA and USFWS. Note: initial concept came from the Corps – ERDAC section.

Example of what current conditions are and gives an idea of what remedial action(s) might be needed.

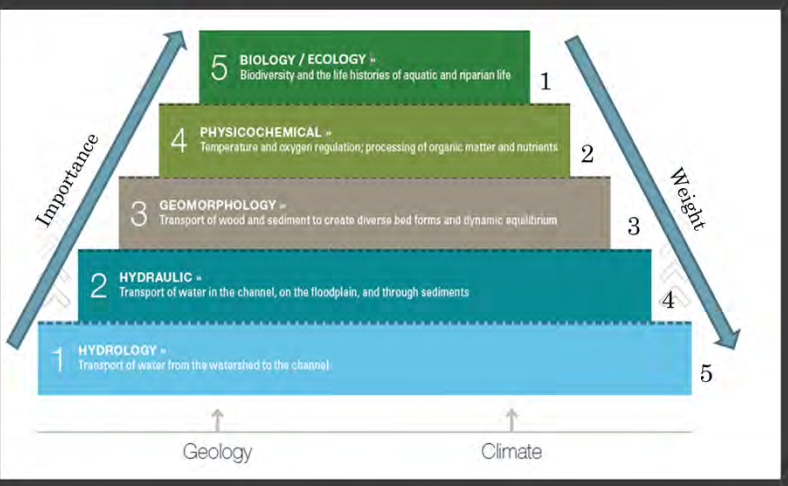
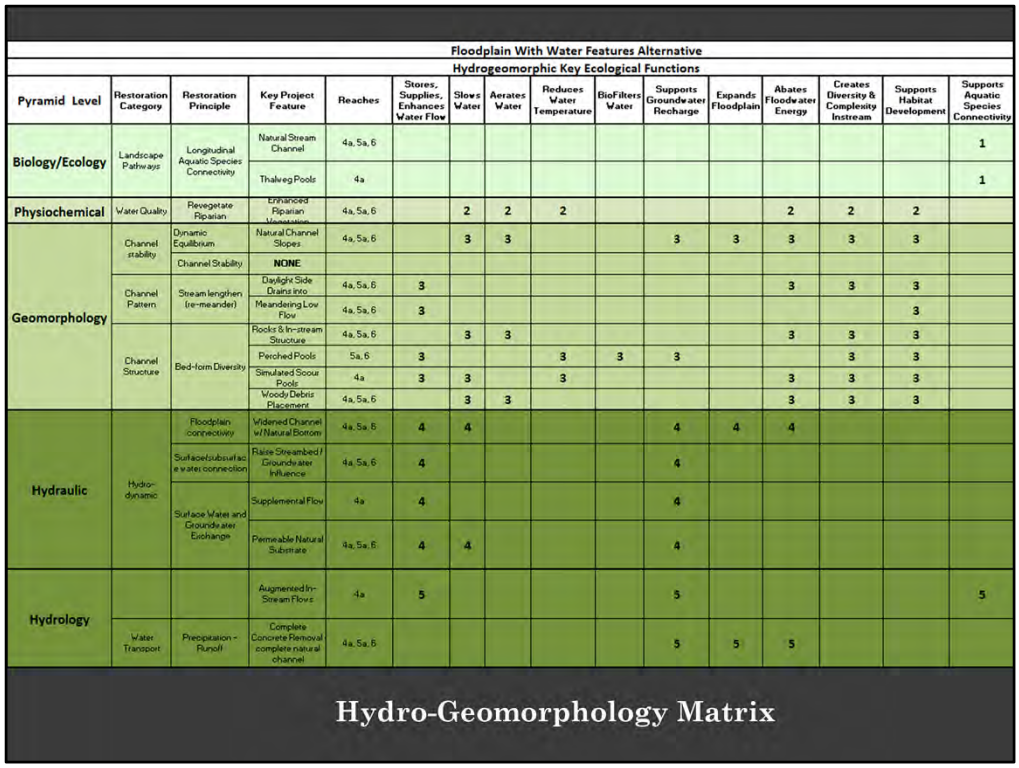


Figure 3. A stream pyramid framework for designing and assessing a functional prescription for ecosystem restoration. [Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC EPA 843-K-12-006].

CHAP HGM module uses a simple weighting structured based off of the above figure cited in the A Functional-Based Framework publication…. That is Hydrology is the prime foundation piece for building a functional stream hence it gets a weight of 5. Hydraulic is next functional piece and it gets a weight of 4, etc.



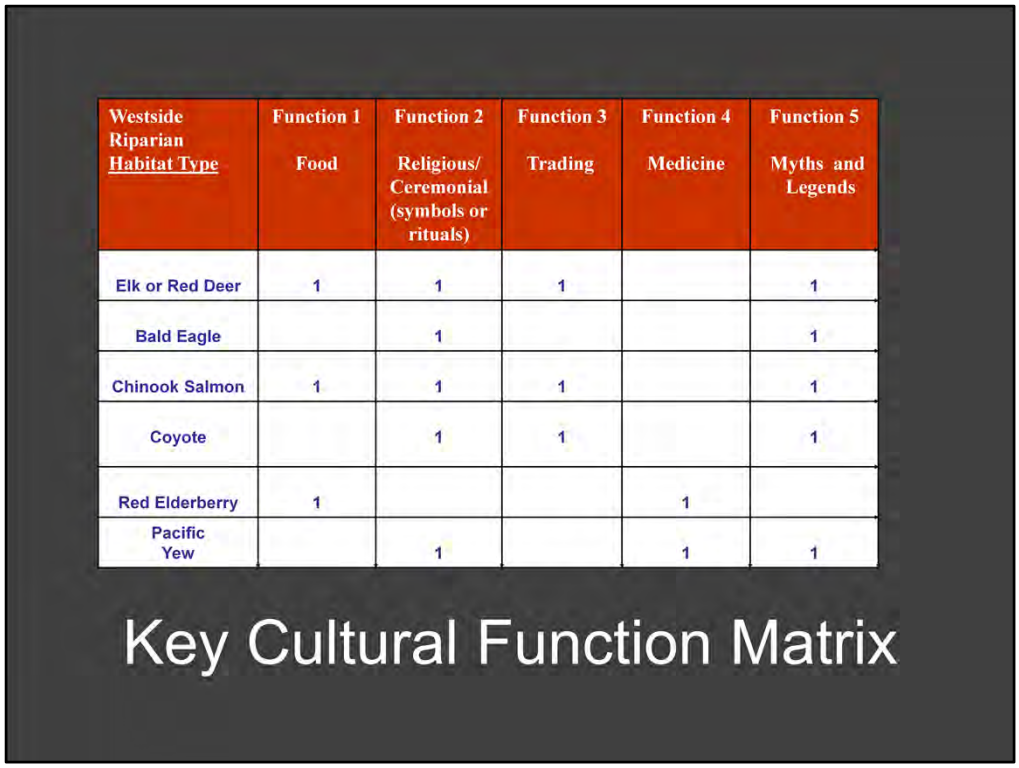
Floodplain With Water Features Alternative

Hydrogeomorphic Key Ecological Functions

Pyramid Level	Restoration Category	Restoration Principle	Key Project Feature	Reaches	Stores, Supplies, Enhances Water Flow	Slows Water	Aerates Water	Reduces Water Temperature	BioFilters Water	Supports Groundwater Recharge	Expands Floodplain	Abates Floodwater Energy	Creates Diversity & Complexity Instream	Supports Habitat Development	Supports Aquatic Species Connectivity
Biology/Ecology	Landscape Pathways	Longitudinal Aquatic Species Connectivity	Natural Stream Channel	4a, 5a, 6											1
			Thalweg Pools	4a											1
Physiochemical	Water Quality	Revegetate Riparian	Enhanced Riparian Vegetation	4a, 5a, 6		2	2	2				2	2	2	
Geomorphology	Channel stability	Dynamic Equilibrium	Natural Channel Slopes	4a, 5a, 6		3	3			3	3	3	3	3	
		Channel Stability	NONE												
	Channel Pattern	Stream lengthen (re-meander)	Daylight Side Drains into	4a, 5a, 6	3							3	3	3	
			Meandering Low Flow	4a, 5a, 6	3									3	
	Channel Structure	Bed-form Diversity	Rocks & In-stream Structure	4a, 5a, 6		3	3					3	3	3	
			Perched Pools	5a, 6	3			3	3	3			3	3	
			Simulated Scour Pools	4a	3	3		3				3	3	3	
			Woody Debris Placement	4a, 5a, 6		3	3					3	3	3	
Hydraulic	Hydro-dynamic	Floodplain connectivity	Widened Channel w/ Natural Bottom	4a, 5a, 6	4	4				4	4	4			
		Surface/subsurface water connection	Raise Streambed / Groundwater Influence	4a, 5a, 6	4					4					
		Surface Water and Groundwater Exchange	Supplemental Flow	4a	4					4					
			Permeable Natural Substrate	4a, 5a, 6	4	4				4					
Hydrology			Augmented In-Stream Flows	4a	5					5					5
	Water Transport	Precipitation - Runoff	Complete Concrete Removal complete natural channel	4a, 5a, 6						5	5	5			

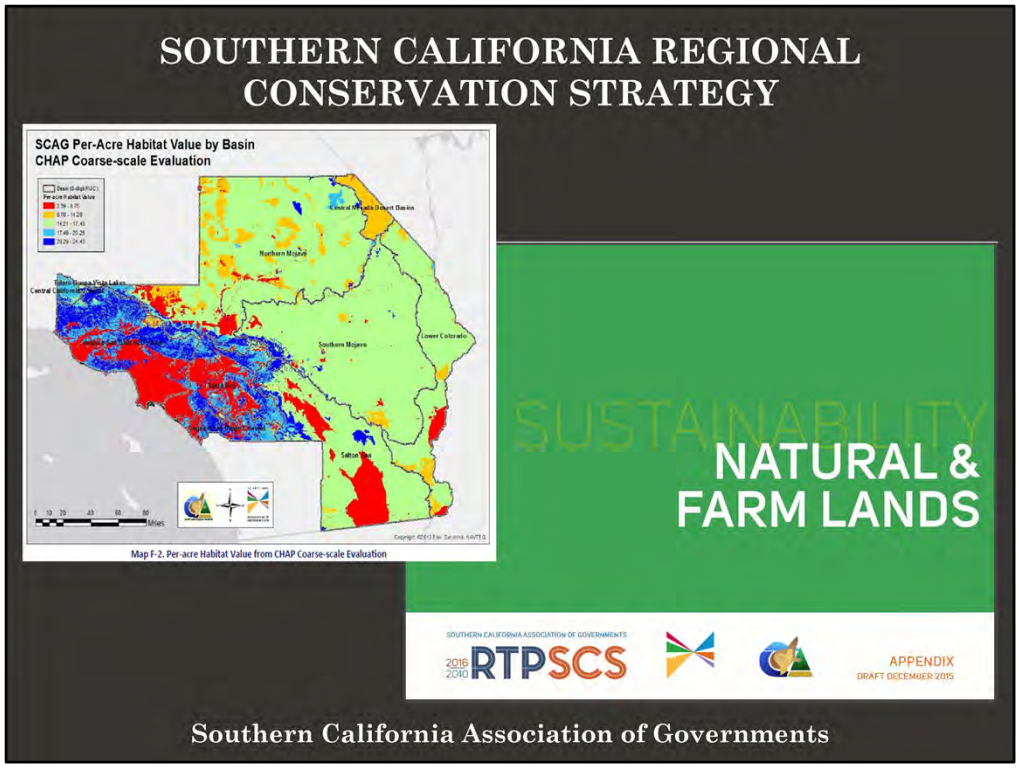
Hydro-Geomorphology Matrix

This is an example of the CHAP HGM Matrix whereby the weights are assigned based on category within the pyramid to the key project feature(s) that would be corrected or enhanced. Again, keep in mind this is all spatially explicit by polygon by reach. This only shows one alternative; other alternatives would have there own matrix. This information is then treated like the species and habitat matrices in that a functional redundancy value is determined



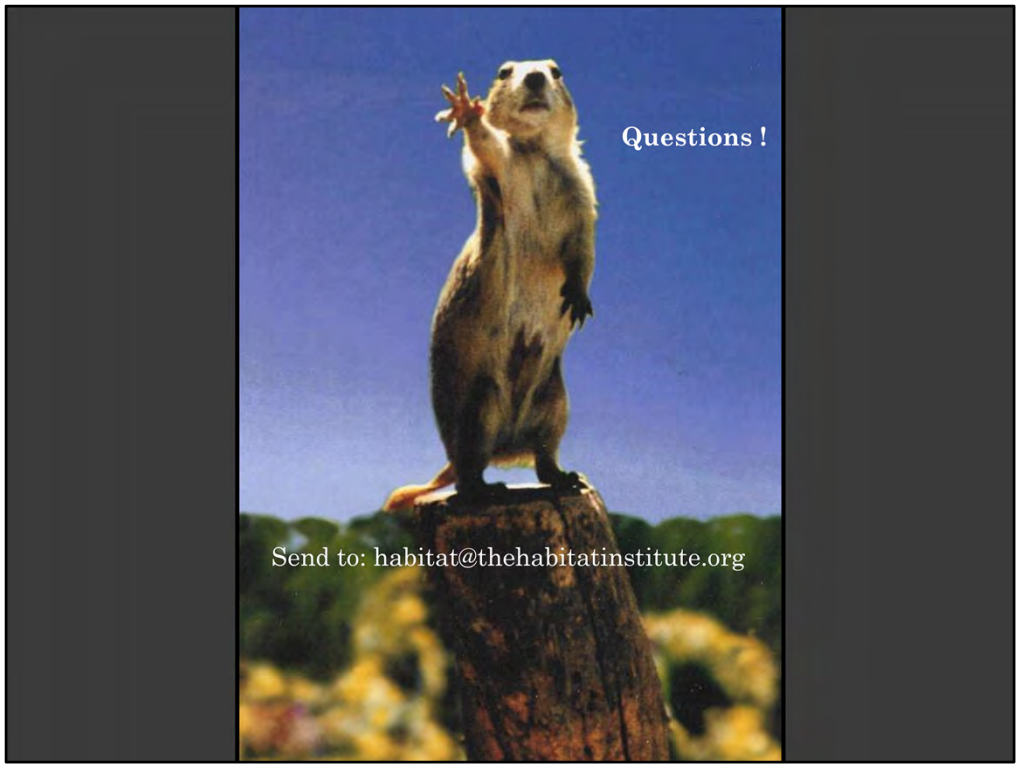
Westside Riparian Habitat Type	Function 1 Food	Function 2 Religious/ Ceremonial (symbols or rituals)	Function 3 Trading	Function 4 Medicine	Function 5 Myths and Legends
Elk or Red Deer	1	1	1		1
Bald Eagle		1			1
Chinook Salmon	1	1	1		1
Coyote		1	1		1
Red Elderberry	1			1	
Pacific Yew		1		1	1

Example that CHAP can include Cultural Function matrix if needed and these values can be added to the appropriate polygons/site.



Southern California Association of Governments (SCAG) releases a report for public comment that supports the application of innovative land conservation tools. Stating the application of, The Habitat Institute's Combined Habitat Assessment Protocols (CHAP) accounting and appraisal tool was applied to measure habitat quality for their Conservation Framework and Assessment Report, and that this report acts as a key step towards a regional conservation program and/or a regional advance mitigation plan. The report can be found at:
http://sustain.scag.ca.gov/Sustainability%20Portal%20Document%20Library/SCAG%20Final%20Conservation%20Framework%20%20Assessment_Feb.pdf

Training staff and others in the Habitat Measurement Techniques & CHAP protocols to obtain consistent results. Like annually training on plant identification, running field inventories, GIS mapping, etc..


Questions !
Send to: habitat@thehabitatinstitute.org