

Assessing Stream Functions for Watershed Management in Oregon



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How is aquatic resource mitigation currently handled in Oregon?

- U.S. Army Corps and Oregon Department of State Lands collaboratively, but independently, administer a permit process to protect, conserve & provide for the best use of Oregon's aquatic resources
- Mitigation is currently acreage-based; not relying on function assessments and not taking a watershed approach
- No function assessment methods are currently recognized for streams.
- Mitigation for non-wetland waters is inconsistent

Joint Permit Application

This is a joint application, and must be sent to both agencies, who administer separate permit programs. Alternate forms of permit applications may be acceptable; contact the Corps and DSL for more information.

Date Stamp: _____

	U.S. Army Corps of Engineers Portland District		Oregon Department of State Lands
Corps Action ID Number		DSL Number	
(1) APPLICANT AND LANDOWNER CONTACT INFORMATION			
	Applicant	Property Owner (if different)	Authorized Agent (if applicable) <input type="checkbox"/> Consultant <input type="checkbox"/> Contractor
Contact Name			
Business Name			
Mailing Address 1			
Mailing Address 2			
City, State, Zip			
Business Phone			
Cell Phone			
Fax			
Email			
(2) PROJECT INFORMATION			
A. Provide the project location.			
Project Name	Tax Lot #	Latitude & Longitude*	
Project Address / Location	City (nearest)	County	
Township	Range	Section	Quarter/Quarter
Brief Directions to the Site			

EPA, Corps, DSL have shared goals for improving the regulatory programs & mitigation outcomes

How are the agencies improving the mitigation program?

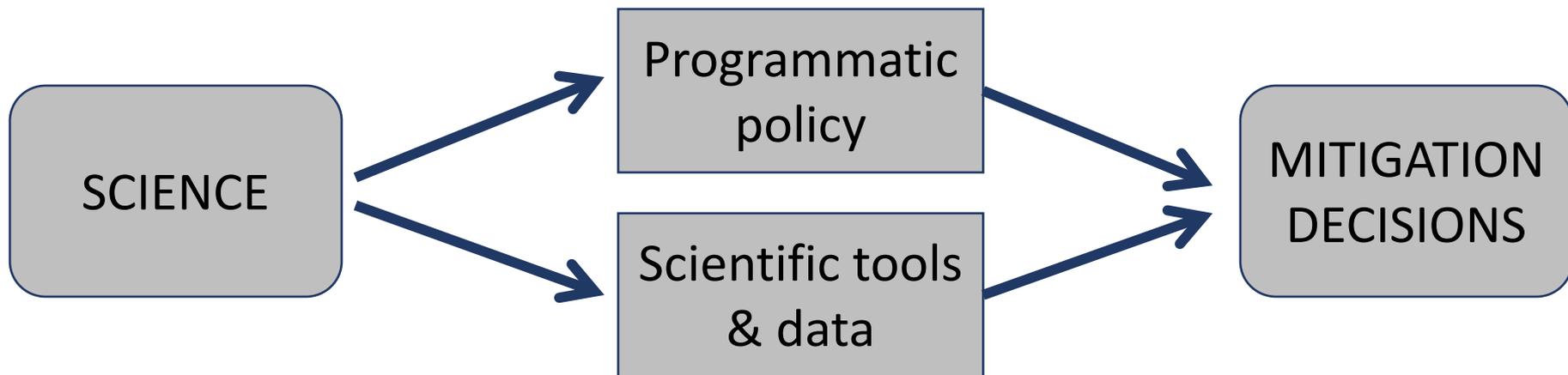
Implement a **function-based, watershed approach** to aquatic resource mitigation in order to:

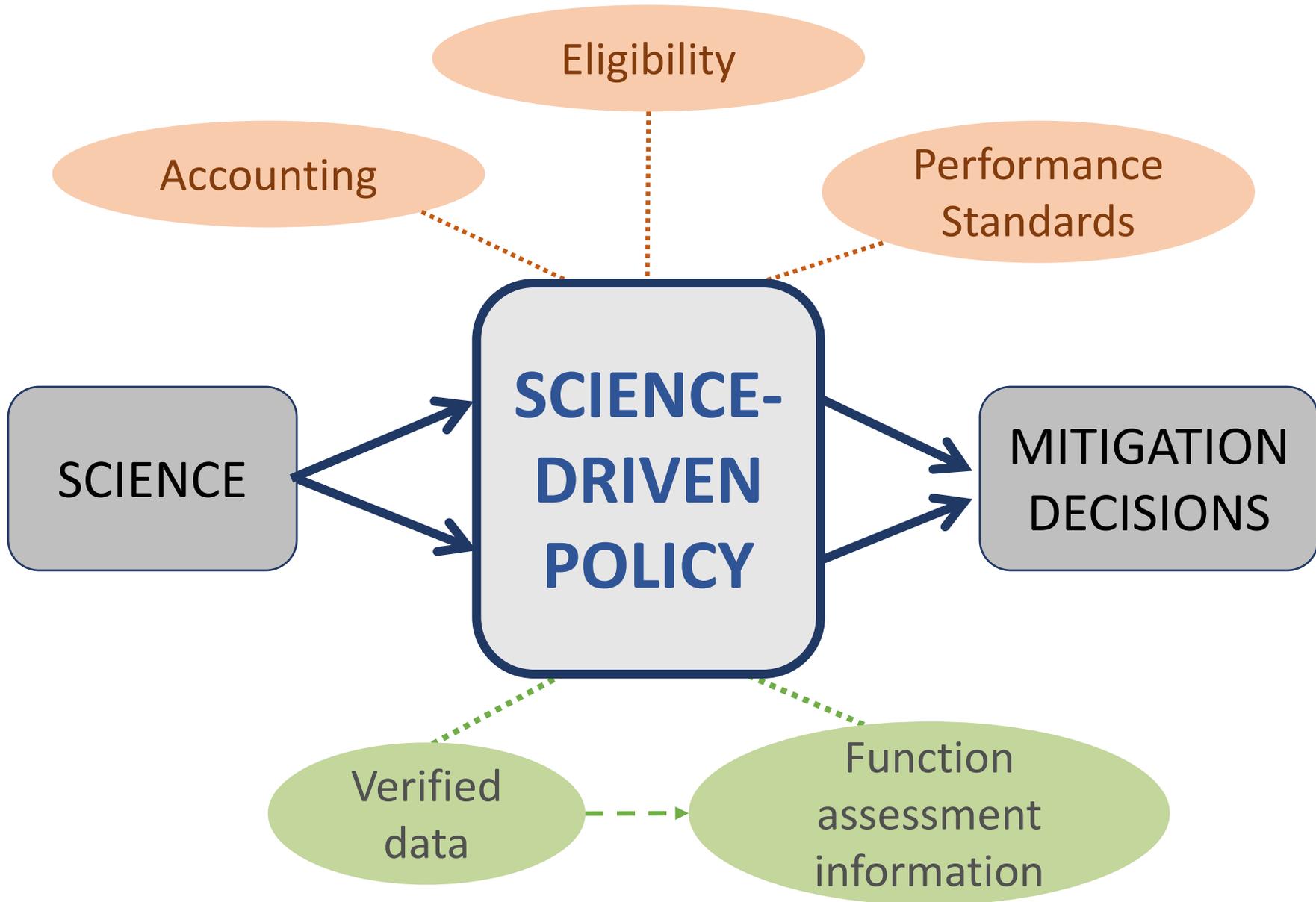
- Operate in alignment with the 2008 Federal Rule
- Improve success of compensatory mitigation projects
- Ensure the replacement of lost ecological functions and services
- Consider local watershed needs and priorities
- Broaden the spatial and temporal scope of mitigation decision-making
- Increase interagency consistency and transparency in mitigation decision-making

How will assessing stream functions help us with watershed management?

“**Watershed approach** means an analytical process for making compensatory mitigation decisions that support the sustainability or improvement of aquatic resources in a watershed. Involves consideration of watershed needs, and how locations and types of compensatory mitigation projects address those needs.”

– 2008 Federal Rule definition

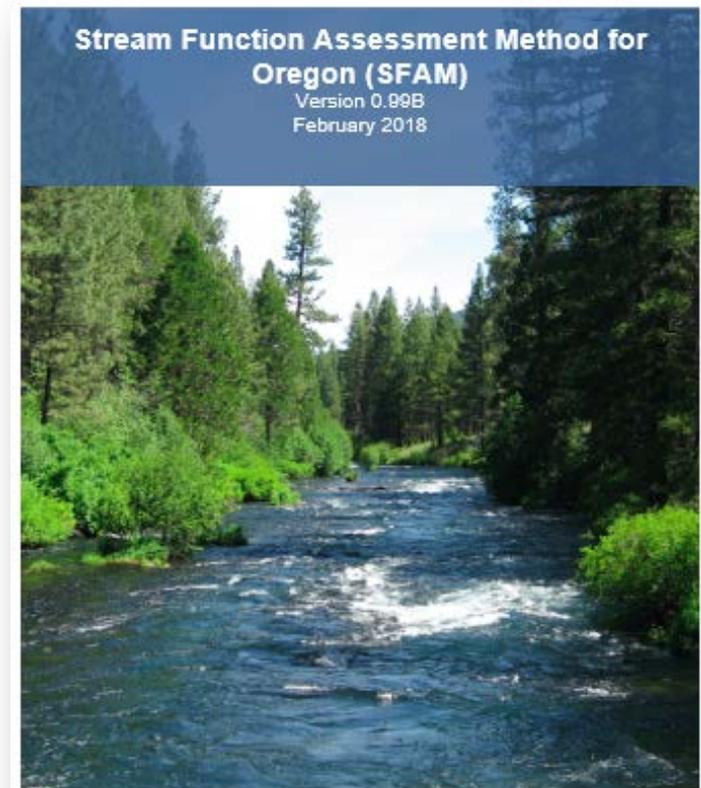




What are the objectives of SFAM?

- ✓ *science-based*
- ✓ *rapid*
- ✓ *applicable statewide*
- ✓ *function-based*
- ✓ *repeatable*

- Designed and field tested to:
 - quantify functions and values
 - reflect landscape and watershed processes
 - apply to $\geq 80\%$ of the permits we receive
- Applicable for non-regulatory purposes: assessment, restoration planning, project monitoring



SFAM is under final review and will be publicly-released in June 2018

Defining stream functions & values

Function = *the processes that create and support a stream ecosystem*

Value = *the ecological and societal benefits that riverine systems provide*

- 11 functions were selected to represent the majority of stream and riparian processes necessary to sustain healthy stream ecosystems
- Each function has an associated value
- Functions are categorized within 4 functional groups

Function Group	Specific Functions/Values
Hydrologic	Surface Water Storage Sub/Surface Transfer Flow Variation
Geomorphic	Sediment Continuity Substrate Mobility
Biologic	Maintain Biodiversity Create and Maintain Habitat Sustain Trophic Structure
Water Quality	Nutrient Cycling Chemical Regulation Thermal Regulation

Measuring stream values

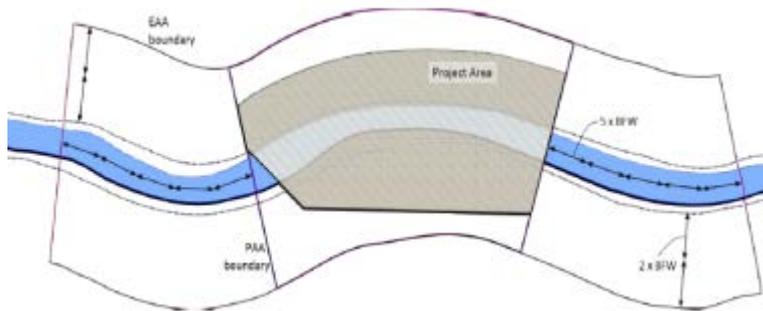
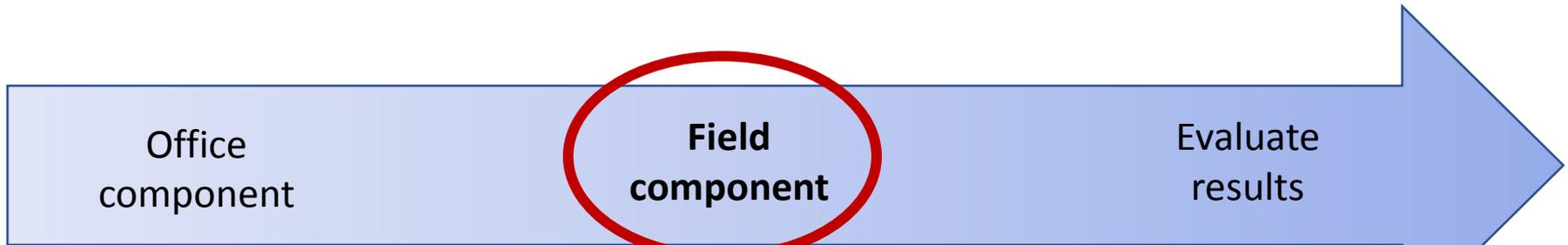
- Values are assessed by evaluating the landscape context of a site (i.e. what is happening upstream & downstream, and on the landscape)
- **16 value measures** determine the opportunity to provide a particular function and the local significance of that function



VALUE MEASURES:

- Rare Species
- Water quality impairments
- Protected areas
- Impervious area
- Riparian area
- Riparian continuity
- Downstream infrastructure
- Zoning
- Downstream flooding
- Impoundments
- Fish passage barriers
- Water source
- Land cover
- Watershed position
- Flow restoration needs
- Unique habitat features

Conducting an SFAM assessment



Lay out assessment areas

Complete 16 *function* measures



FILL IN THE YELLOW BOXES. Most questions below require a numerical input. When possible, please select answer from the drop-down menus instead of typing in the answer.

Measure	Function Groups	Measure Abbreviation	Qualifiers	Data Entry	Measure Score
F1 Natural Cover	What is the percent natural cover above the stream within the PAA? Measure the percentage of cover above the stream, including both overstory and understory vegetation and overhanging banks, by averaging spherical densiometer measurements taken at each transect within the PAA. Functions informed: Sub/Surface Transfer, Nutrient Cycling, Thermal Regulation				
	Biology, Water Quality	Cover		Enter a percentage: (round to nearest whole number)	
F2 Invasive Vegetation	What is the percent cover of invasive vegetation within the PAA? Consider the Oregon Department of Agriculture Noxious Weed list and other sources of information, such as Oregon (MAP) Invasives and (Natural) list. Functions informed: Maintain Biodiversity, Sustain Trophic Structure				
	Biology	Inv/Veg		Enter a percentage: (round to nearest whole number)	
F3 Native Woody Vegetation	What is the percent cover of native woody vegetation within the PAA? Functions informed: Maintain Biodiversity, Create & Maintain Habitat				
	Biology	Woody/Veg		Enter a percentage: (round to nearest whole number)	
F4 Large Trees	What is the percent cover of large trees [dbh>20in] within the PAA? Functions informed: Maintain Biodiversity, Create & Maintain Habitat				
	Biology	LaTree		Enter a percentage:	

Measuring stream functions

- Functions are difficult to directly measure within regulatory parameters, must be quantified using measures
- **16 measures** evaluate specific features characteristic of, or inherent to, the function and may indicate the extent to which a particular function is active

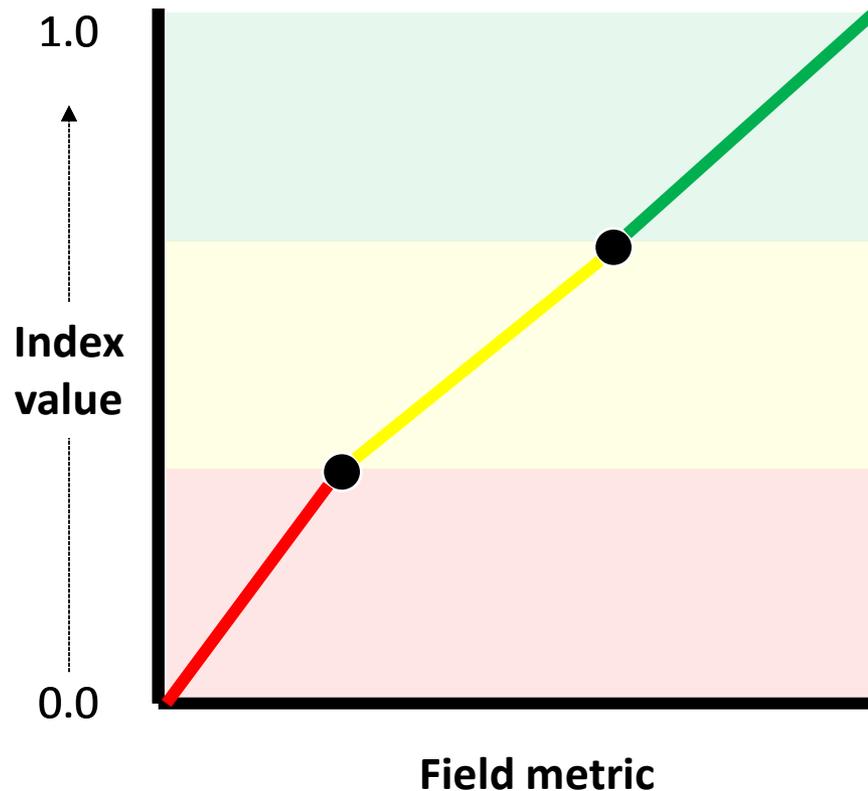
FUNCTION MEASURES:

- Natural cover
- Floodplain exclusion
- Wood
- Incision
- Embeddedness
- Overbank flow
- Wetland vegetation
- Plant composition (x3)
- Riparian buffer width
- Channel bed variability
- Lateral Migration
- Bank Erosion
- Bank Armoring
- Side Channels



How are function measures scored?

Performance indices were developed to translate measures' metrics (percentages, absolute values, ratios, etc.) into meaningful index values (scale of 0.0 – 1.0)



1. Set a standard index scale (give ecological meaning to the scores).
2. Look to literature and data to determine the metric values that correspond with the set thresholds.
3. Draw linear models between thresholds.

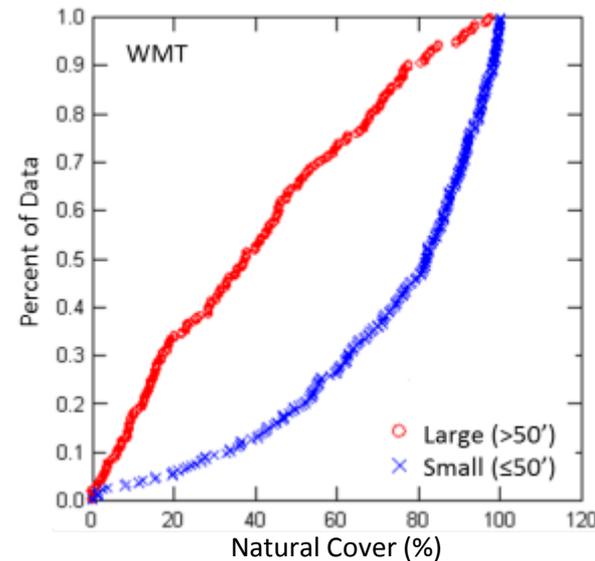
How are function measures scored?

Performance indices were developed to translate measures' metrics (percentages, absolute values, ratios, etc.) into meaningful index values (scale of 0.0 -1.0)

- We identified factors upon which a measure may need to be stratified. The purpose of stratification is to account for context and adjust performance expectations accordingly.

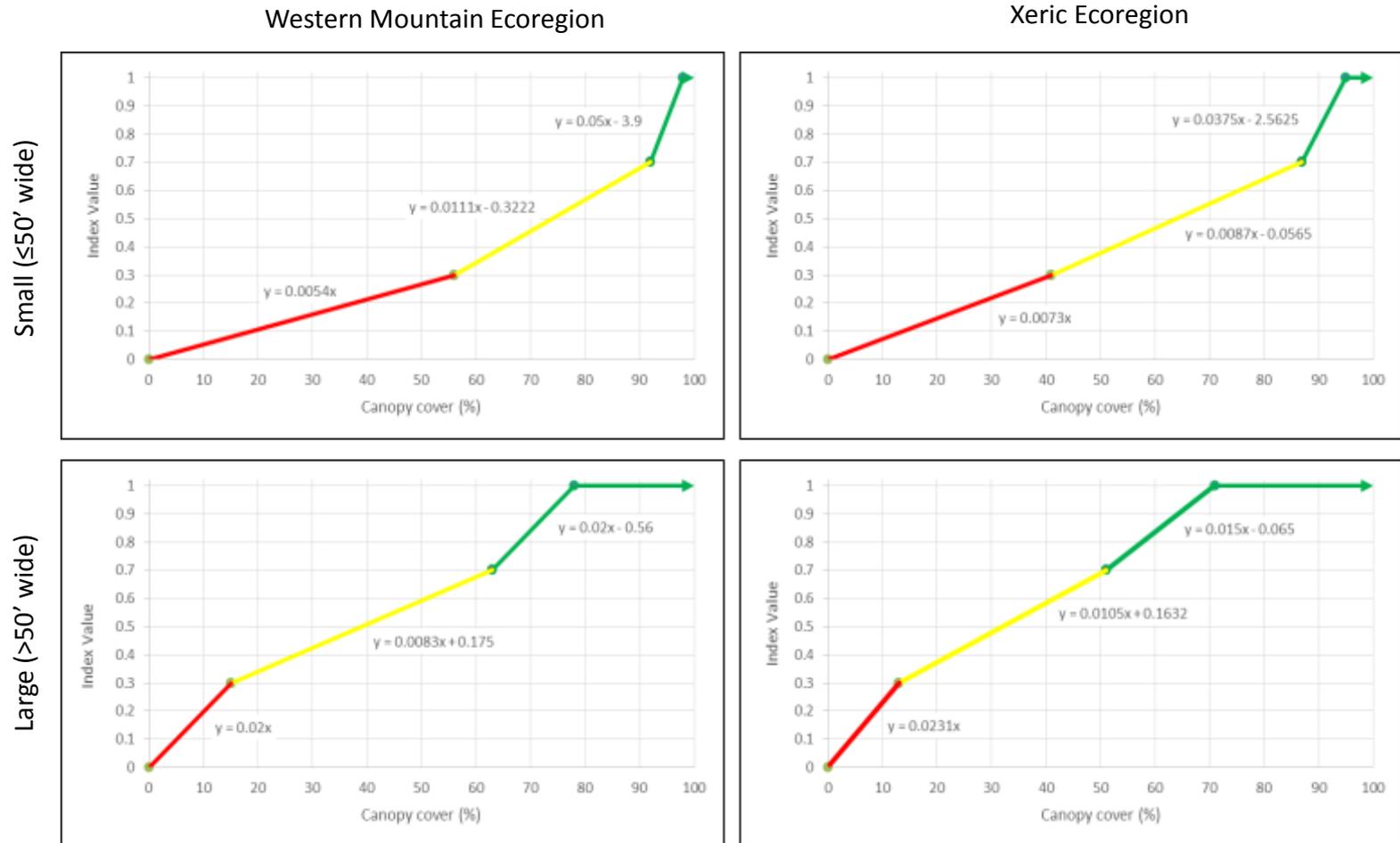
Example: Natural Cover →

A comparison of canopy cover data from both small and large streams presents evidence to support stratification of performance expectations based on size



Example: Natural Cover

What is the percent natural cover above the stream within the Proximal Assessment Area (PAA)?



Ecological function

Surface water storage

(ability to regulate discharge, replenish soil moisture, create low velocity habitat & refugia)

Function measures

- ✓ Quantifiable
- ✓ Rapid
- ✓ Repeatable
- ✓ Sensitive

side channels present?



variable channel bed?



incised channel?

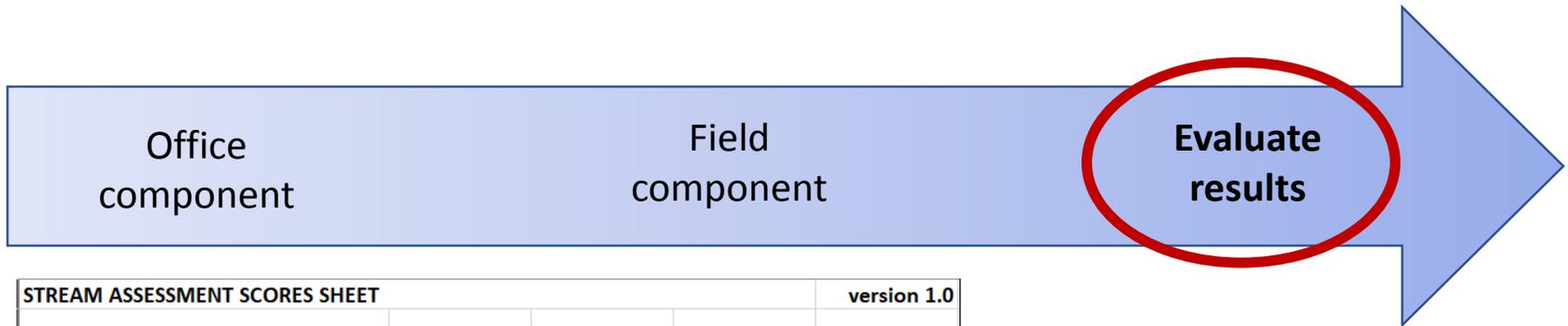


wood in stream?

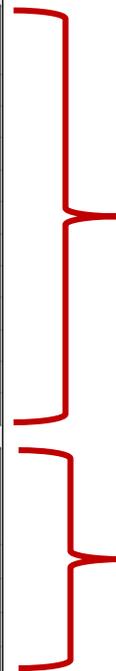


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Conducting an SFAM assessment



STREAM ASSESSMENT SCORES SHEET				version 1.0
Project Area Name:				
Investigator Name:				
Date of Field Assessment:				
Latitude (decimal degrees):		Longitude (decimal degrees):		
SPECIFIC FUNCTIONS	Function Score	Function Rating	Value Score	Value Rating
Surface Water Storage (SWS)				
Sub/Surface Water Transfer (SST)				
Flow Variation (FV)				
Sediment Continuity (SC)				
Sediment Mobility (SM)				
Maintain Biodiversity (MB)				
Create and Maintain Habitat (CMH)				
Sustain Trophic Structure (STS)				
Nutrient Cycling (NC)				
Chemical Regulation (CR)				
Thermal Regulation (TR)				
GROUPED FUNCTIONS	Function Group Score	Function Group Rating	Value Group Score	Value Group Rating
Hydrologic Function (SWS, SST, FV)				
Geomorphic Function (SC, SM)				
Biologic Function (MB, CMH, STS)				
Water Quality Function (NC, CR, TR)				

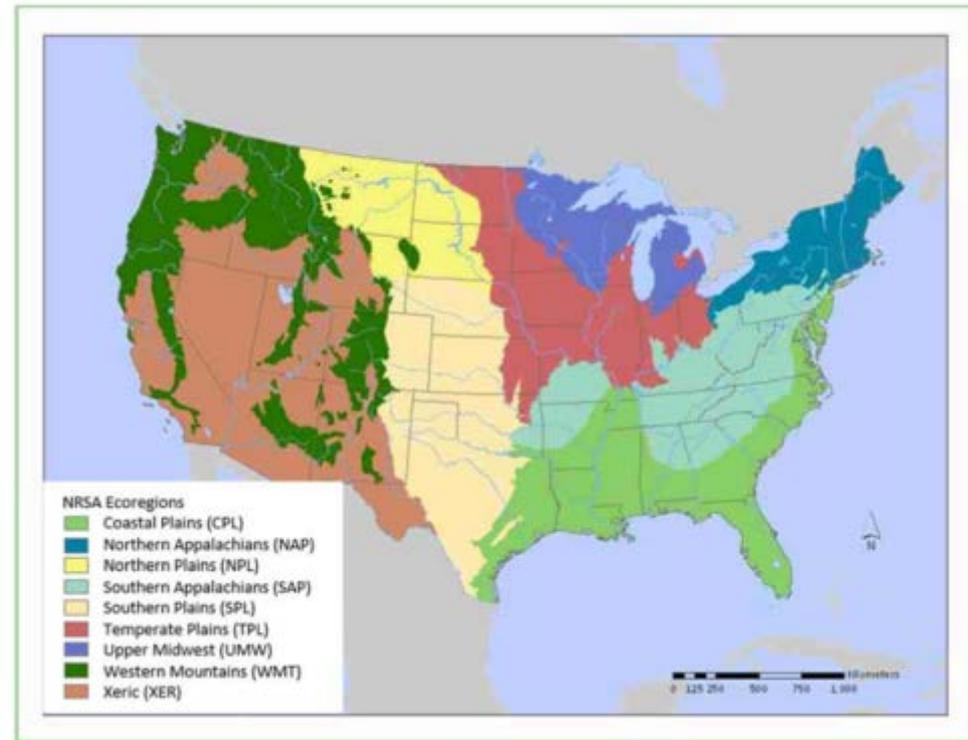


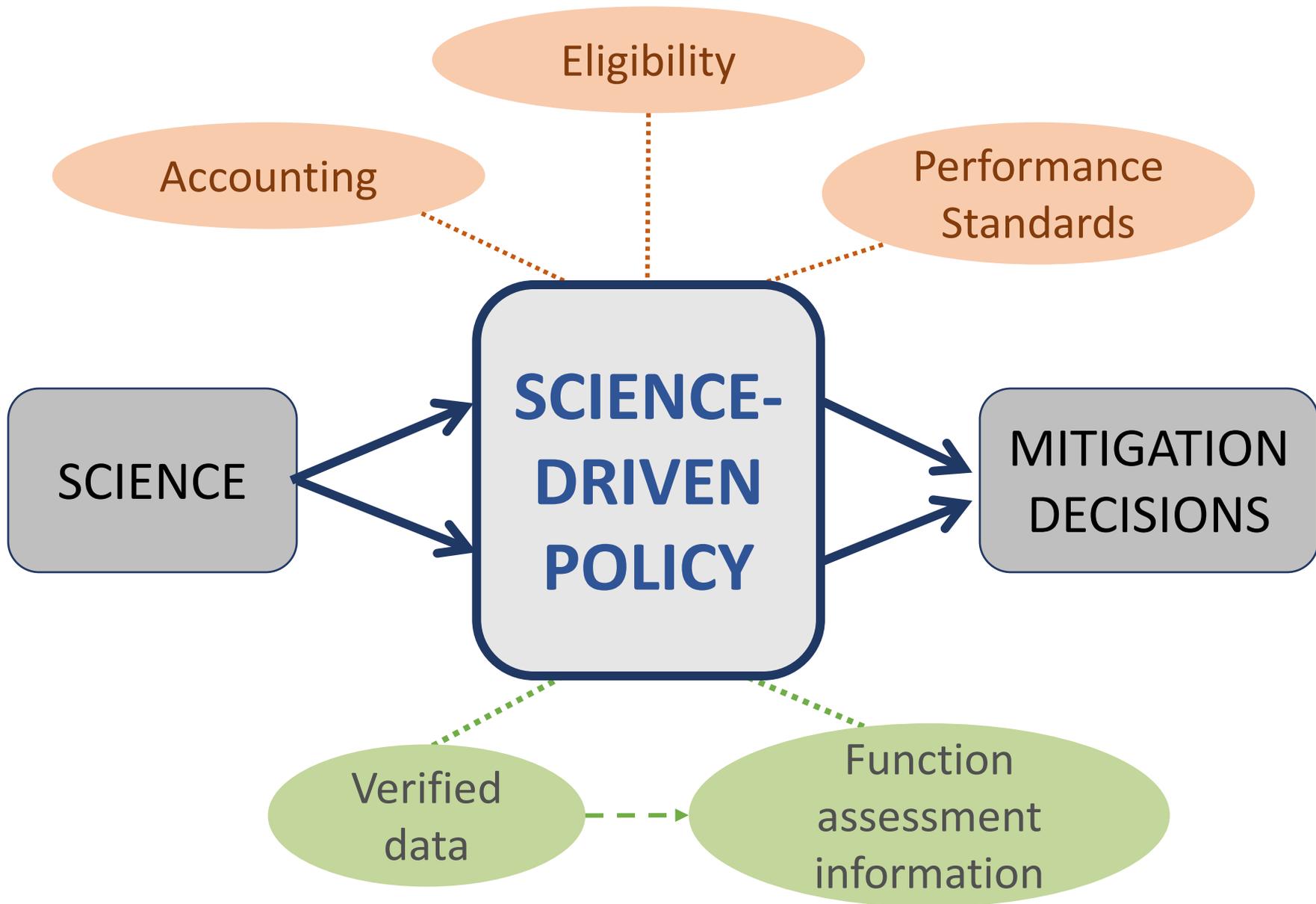
Each specific function is assigned a numerical score and a rating for both function and value

Groups are represented by the highest-functioning, highest-valued function in each thematic category.

Can SFAM be applied outside of Oregon?

- Performance indices for function measures were developed using regional studies and data from the Pacific Northwest:
 - Indices developed based on literature rely on studies from throughout the PNW
 - Indices developed using NARS data include data from Western Mountains and Xeric ecoregions
- Some data layers used to respond to value measures are statewide (vs. national), but equivalent datasets could be referenced in other states/regions





Minimum criteria for site eligibility

Does the proposed mitigation site provide an ecological match to the impact site?

Sets minimum standards for mitigation site approval:

- Same habitat class, and
- Replacement of primary functions and values (group-level)

OR

- Mitigation site is a unique, at-risk, or difficult to replace aquatic resources

Function-informed accounting protocols

How much mitigation is required to fully offset the impacts?

Minimum requirements ensure replacement through base ratios based on activity type, or by function-weighted area

Adjustments ($\geq 0\%$)

- Encourage a high degree of function and value replacement
- Account for temporal loss of function
- Account for long-term sustainability

Site-specific performance standards

Which observable or measurable physical, chemical, and/or biological attributes will be monitored?

Site-specific and based on predicted changes in specific measures

- Reflect site limitations due to landscape characteristics and watershed conditions
- Linked to state and watershed-level data and priorities

A stream function assessment method improves watershed management by:

- Acknowledging the suite of functions and values provided by streams
- Recognizing locally significant functions and values
- Ensuring a minimum level of function/value replacement while encouraging full replacement
- Providing consistent, science-based information that leads to a more consistent mitigation program
- Improving mitigation performance standards and tracking of outcomes

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