Performance Standards, Monitoring Requirements, and Credit Release

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Interagency Review Team (IRT) Course
June 2019

Session Topics

- Performance Measures
  - Types of performance measures
  - Enforceable performance standards
  - Case study, examples, lessons learned
- Monitoring
  - Requirements, Parameters, Time Period
  - Examples
- Credit Release Schedules
  - CA BEI Template

Mitigation Performance Measures

- Administrative Measures
- Ecological Performance Standards
  - Observable
  - Measureable
  - Achievable
- Adaptive Management

DRAFT MITIGATION PLAN

Dairyland Stream Mitigation Site
RES Cape Fear 02 Umbrella Bank
Orange County, North Carolina

Cape Fear River Basin
HUC 03030002

Prepared for:

res

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an entity of Resource Environmental Solutions
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Prepared by:

WK DICKSON
community infrastructure consultants

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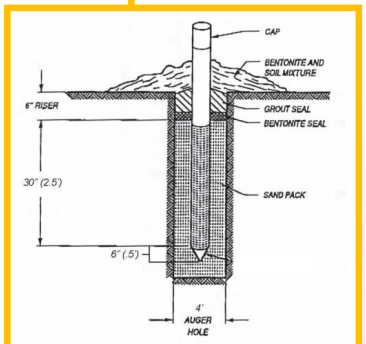
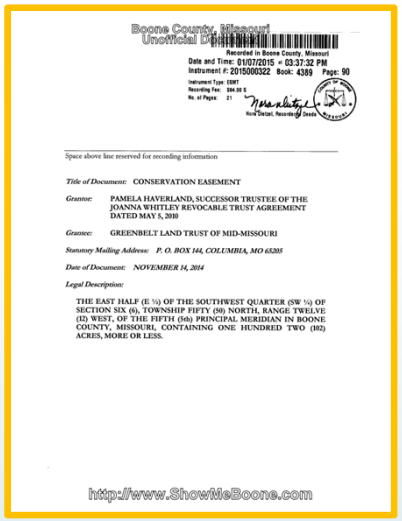
April 2017



Administrative Measures



Boone County, Missouri
Unofficial Document
Recorded in Boone County, Missouri
Date and Time: 01/07/2015 ▪ 03:37:32 PM
Instrument #: 2015000322 Book: 4389 Page: 90
Instrument Type: ESMT
Recording Fee: $94.00
No. of Pages: 21
Space above line reserved for recording information

Title of Document: CONSERVATION EASEMENT

Grantor: PAMELA HAVERLAND, SUCCESSOR TRUSTEE OF THE JOANNA WHITLEY REVOCABLE TRUST AGREEMENT DATED MAY 5, 2010

Grantee: GREENBELT LAND TRUST OF MID-MISSOURI

Grantees Mailing Address: *P. O. BOX 144, COLUMBIA, MO 65205*

Date of Document: *NOVEMBER 14, 2014*

Legal Description:

THE EAST HALF (E ½) OF THE SOUTHWEST QUARTER (SW ¼) OF SECTION SIX (6), TOWNSHIP FIFTY (50) NORTH, RANGE TWELVE (12) WEST, OF THE FIFTH (5th) PRINCIPAL MERIDIAN IN BOONE COUNTY, MISSOURI, CONTAINING ONE HUNDRED TWO (102) ACRES, MORE OR LESS.

http://www.ShowMeBoone.com

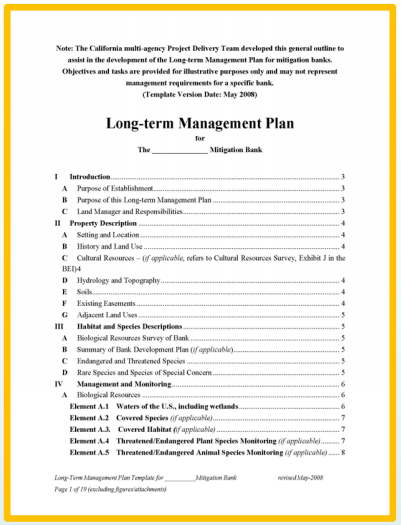
Site Protection

332.7 (a), 332.8(m) & (t)

PERFORMANCE BOND

Financial Assurances

332.8(m)



Note: The California multi-agency Project Delivery Team developed this general outline to assist in the development of the Long-term Management Plan for mitigation banks. Objectives and tasks are provided for illustrative purposes only and may not represent management requirements for a specific bank.
(Template Version Date: May 2008)

Long-term Management Plan
for
The _____ Mitigation Bank

Long Term Management

332.8(u)

Construction Work Plan

332.4 (c)(7) & 332.8(m)

Monitoring

332.6, 332.8(q)(2)

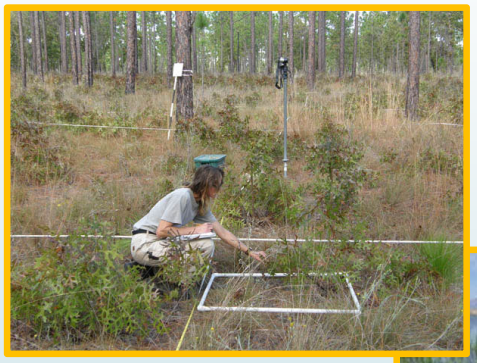
Maintenance

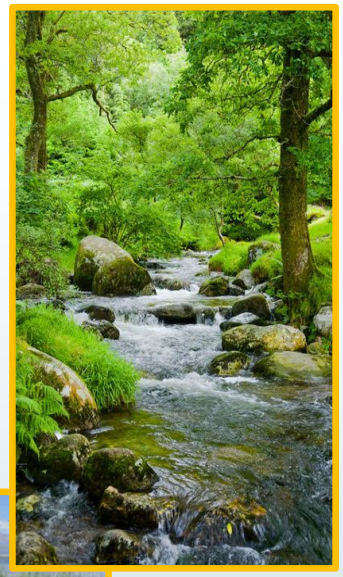
332.4(c)(8)

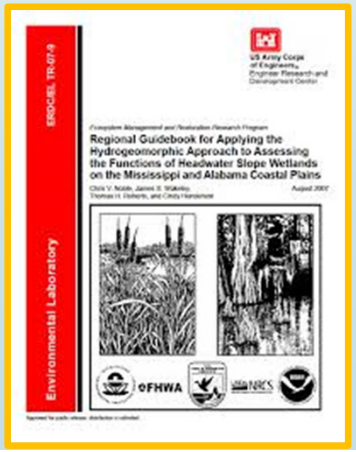
Ecological Performance Standards

(33 CFR 332.5)

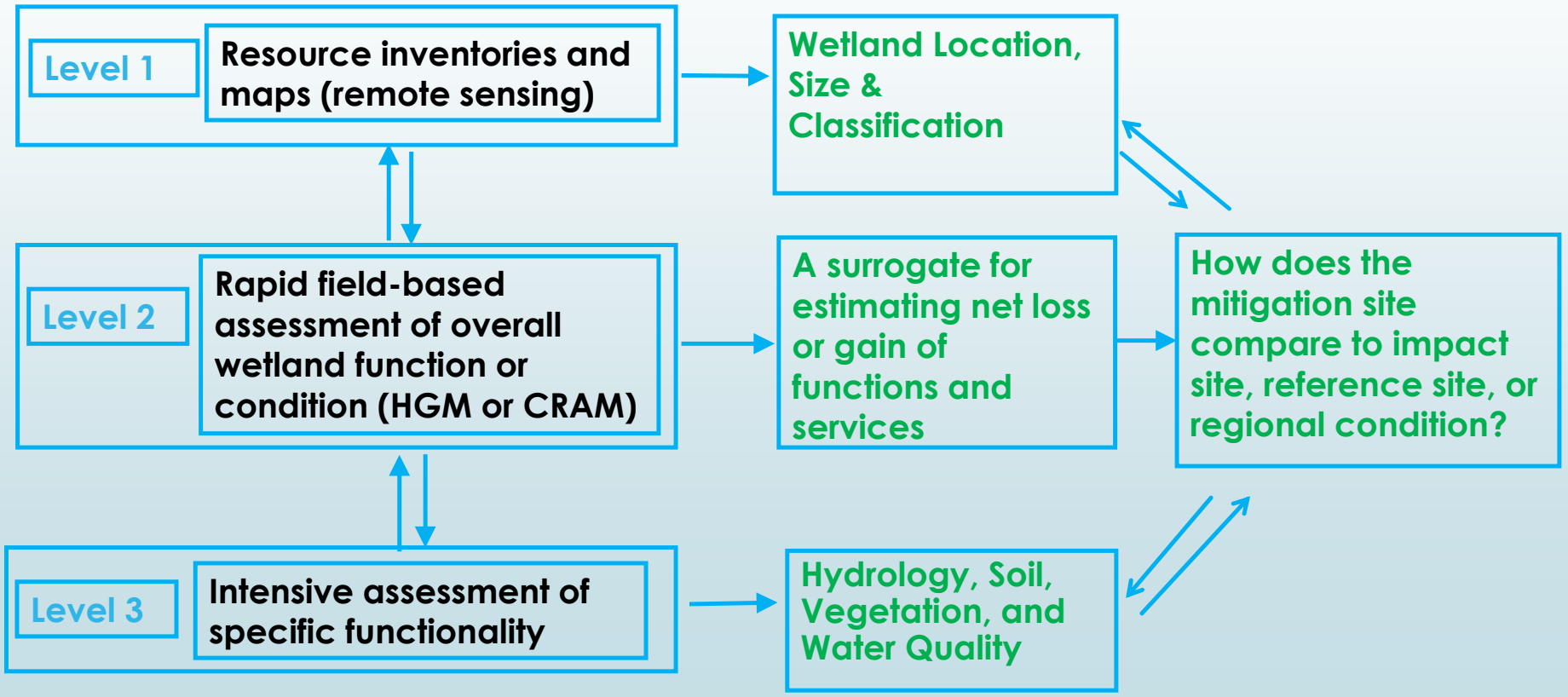
- Based on attributes that are objective and verifiable
- Based on best available science assessed in a practicable manner
- Based on variables or measures of functional capacity
- **Suggestion:** Utilize a suite of performance standards that require different levels of monitoring (ex: application of the EPA Level 1, 2, 3 Framework)



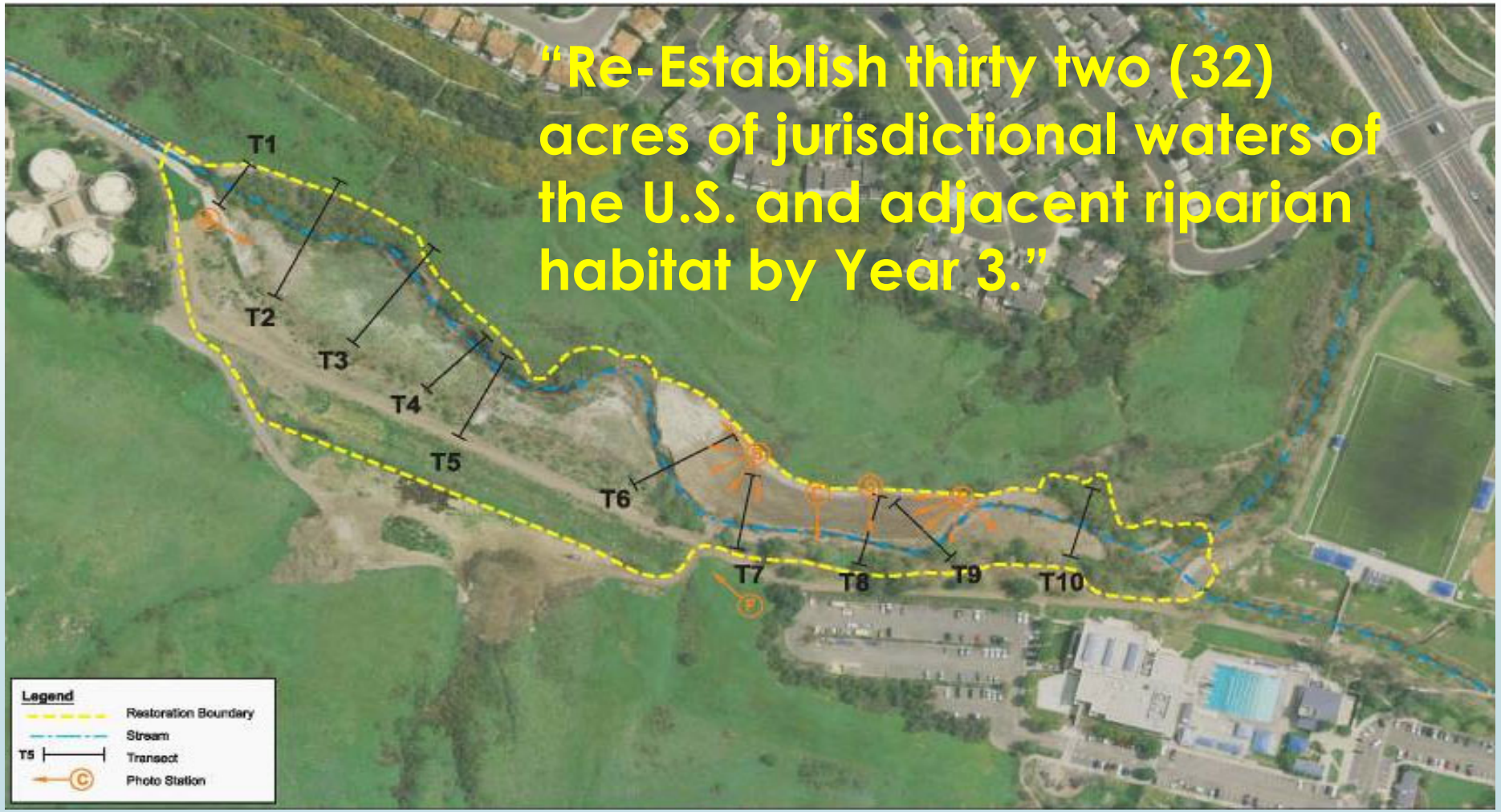




Ecological Performance Standards & EPA 3-Level Approach to Monitoring

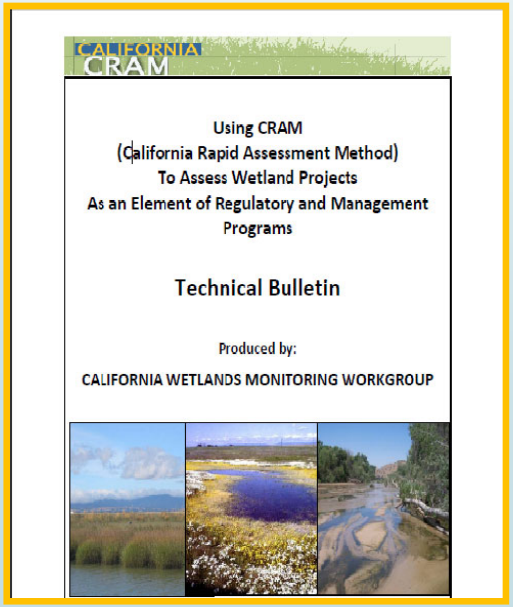


Level 1: Landscape Level Performance Standard



Level 2: Rapid Assessment Performance Standard

"The wetland restoration site must meet or exceed the CRAM target scores for individual metrics by Year 3 and Year 5 as provided in Table 3."



CRAM Metrics

Table 3
CRAM DATA SUMMARY

CRAM Attributes	METRICS		BASELINE SCORES			TARGET SCORES	
			Impact Site/ Pre-Rest[1]	Post-Rest[2] (Baseline)	Reference Site	Year 3	Year 5
Buffer and Landscape Context	Landscape Connectivity		12		3	12	12
	Buffer Sub-metrics:						
	- Percent of Assessment Area with		3		12	12	12
	- Average Buffer Width		3		3	3	3
	- Buffer Condition		3		9	9	12
	Attribute Score (Raw/Final)		**15/63**		**10/42**	**19/79**	**20/83**
Hydrology	Water Source		6		6	6	6
	Hydroperiod or Channel Stability		12		9	9	12
	Hydrologic Connectivity		9		12	9	12
	Attribute Score (Raw/Final)		**27/75**		**27/75**	**27/75**	**30/83**
Structure	Physical	Structural Patch Richness	9		9	9	9
		Topographic Complexity	3		6	6	6
	Attribute Score (Raw/Final)		**12/50**		**15/63**	**15/63**	**15/63**
	Biotic	Plant Community Sub-metrics:					
		- Number of Plant Layers	9		9	6	9
		- Number of Co-dominant Species	3		6	3	6
		- Percent Invasion	3		3	12	12
		Horizontal Interspersion and Zonation	6		6	6	6
		Vertical Biotic Structure	3		9	3	9
	Attribute Score (Raw/Final)		**14/39**		**21/58**	**16/44**	**24/67**
		Overall AA Score	**57**		**60**	**65**	**74**

Level 3: Ecological Performance Standards

PHYSICAL (Hydrology/Soils)

BIOLOGICAL

CHEMICAL

Developing Enforceable Performance Standards

Goals

Statement of intended outcome

What will the mitigation project accomplish?

Objectives

Features critical to desired outcome

What functions/services will get us there?

Performance Standards

Demonstrate how each objective will be achieved:

Attribute, Level, Time Period

Monitoring:

Evaluate Performance

Adaptive Management:

Flexibility

Enforceable Performance Standards

- Can the responsible party be forced to comply?
- Is it likely to be upheld in court?
- Are the performance standards:
  - SIMPLE?
  - UNAMBIGUOUS?
  - MEASURABLE?
    - Quantitative
    - Qualitative

Enforceable Performance Standard?

"Restored channel demonstrates stable **dimension**, **pattern**, and **profile**, while neither aggrading or degrading."

Level 3 Example:
SPD Uniform Performance Standards

What?

- Standard performance criteria language, not targets
- PM determines which is appropriate, documents in worksheet, includes in permit/mitigation plan.

Benefits

- Better predictability for regulated community.
- Increased ability of regulatory agencies to ensure compliance.
- Better gauge of long-term ecological viability of mitigation sites.
- Improved comparison between mitigation sites.
- Incorporation of reference sites.
- Incorporation of functional/condition assessments.

SPD Uniform Performance Standards

Types of aquatic resources addressed:

- Riverine
- Tidal wetlands
- Slope wetlands
- Depressional wetlands
- Buffer habitat

Functional Categories:

- Physical
- Hydrologic
- Faunal-Diversity Index
- Flora
- Water quality (ecological)

SPD Example Worksheet

Attachment 12505.2 SPD uniform performance standards worksheet

1	Date: 5/31/12 DA no.: 2012-00xxx Project manager: Oski Bear	Mitigation site name: Northern CA Bank Cowardin type/HGM: palustrine, emergent, seasonally flooded/ depressional Habitat type: depressional wetland Site coordinates: Center/1st endpoint: Lat: 38°08'01" N Lon: 121°53'07" W 2nd endpoint (if linear) Lat: Lon:	Reference site name: Reference B Site coordinates: Center/1st endpoint: Lat: 38°16'26" N Lon: 121°46'15" W 2nd endpoint (if linear) Lat: Lon:
2	Mitigation objective(s) to improve: [X] habitat conservation/biodiversity; [ ] water storage/flow attenuation; [ ] water quality; [ ] target population of special status biota; [ ] specific aquatic resource function(s); [ ] other:		
3	Mitigation type (select one): [X] re-establishment; [ ] establishment; [ ] rehabilitation; [ ] enhancement		
	If enhancement, indicate function(s) to be increased: function 1: function 2 (if applicable): function 3 (if applicable):		
4	Primary type(s) of site treatment: [X] introduction of plant materials; [ ] invasive species control; [X] hydrological manipulation; [X] topographic/substrate manipulation		
5	Aquatic resource type (select one): [ ] riverine; [X] depressional wetland; [ ] tidal wetland; [ ] slope wetland; [ ] other:		
6	Performance standard categories (select all that apply): [X] physical; [X] hydrologic; [ ] fauna; [X] flora; [ ] water quality (ecological)		
7	Using selections from 2-6 above, insert applicable performance standards and targets from 12505.1-SPD Table of Uniform Performance Standards for Compensatory Mitigation Requirements into worksheet rows below. Add or remove rows for any category, as needed.		

Number/Categories:	Performance Standards:	Targets ("R" indicates reference):				
Physical-1	The permittee shall ensure the mitigation site provides diverse physical features or surfaces contributing to depressional wetland habitat function. Specifically: a. By year 2, the site must contain 25% or more of the number of structural patch types found at the selected reference site. b. By year 3, the site must contain 50% or more of the number of structural patch types found at the selected reference site. c. By year 4, the site must contain 75% or more of the number of structural patch types found at the selected reference site. d. By year 5, the site must contain 90% or more of the number of structural patch types found at the selected reference site.	Year 1: N/A	Year 2: 25%	Year 3: 50%	Year 4: 75%	Year 5: 90%
Physical -2	N/A					
Physical -3	N/A					

Level 3 Example: SPD Hydrology* Stream Surface Hydrology

The stream shall exhibit main channel geometry such that overbank flooding occurs or water can access high flow channels in the active floodplain at least one in years 1-3.

ATTRIBUTE MEASURED:
Overbank/high flow channel flooding

LEVEL THAT CONSTITUTES SUCCESS:
Visual evidence of over bank flooding

TIME PERIOD TO ACHIEVE SUCCESS:
During years 1-3

South Pacific Division Uniform Performance Standards

Level 3 Example: St. Paul District Hydrology* Floodplain Wetlands

Hydrology shall consist of a water table 12"or less to inundation up to 6", for a minimum of 28 consecutive days, OR two periods of 14 or more consecutive days, during the growing season under normal and wetter than normal hydrological conditions.

ATTRIBUTE MEASURED:
Hydrology Shallow Groundwater Water Level

LEVEL THAT CONSTITUTES SUCCESS:
Depth of 12" below ground surface or 6" above surface

TIME PERIOD TO ACHIEVE SUCCESS:
Minimum of 28 consecutive days OR two periods of 14 or more consecutive days

* St. Paul District

Lessons Learned – St. Paul District Target Hydrology?

"The goal is not to establish the ***minimum*** wetland hydrology; rather, it is to establish the ***optimum*** hydrology for targeted wetland plant communities and associated functions and services."

PAST SUCCESS = FAILURE:
Inundation and/or water table <12" below surface for 14 consecutive days during the growing season in most years.

Why?: Hydrology monitoring proved that sponsors over excavated to ensure hydrology.

How?: Adjust hydrology PSs (frequency, depth and duration) based on wetland plant community and reference data.

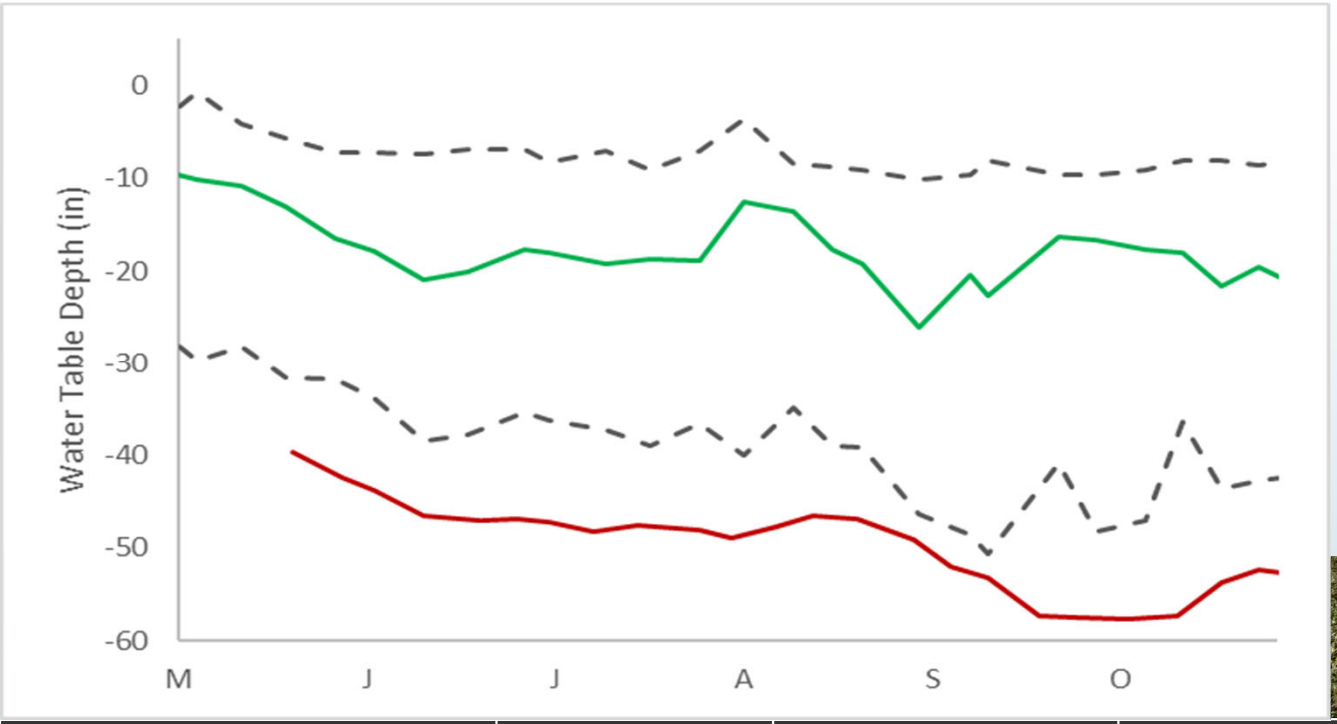
Revising Hydrology Performance Standards

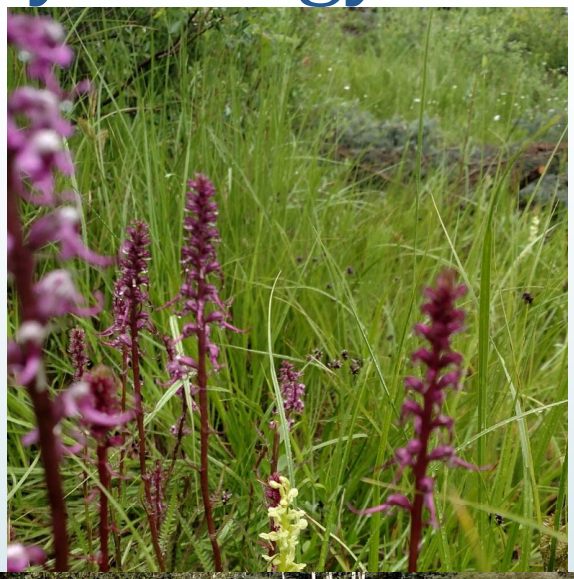
Academic literature:

- Example: Cattail and wet meadows in the Great Plains
  (Boers et al. 2007)
- Flooding worse than drying
- Flooding for more than
  5 weeks = cattail invasion

J. Sueltenfuss, CO State Univ. 2016

Restored Meadows (Colorado) - Hydrology





	# Species	Sedge Cover	Willow Cover
Reference	20	8	60
Perf. Stand. met	17	30	25
Perf. Stand. *NOT* met	6	0	2

Level 3 Examples: Wetland Soils*

a. Soil pH will be within target range of 6.2 – 6.8
(Norfolk District)

b. Soil has documented evidence of redoximorphic features developing by the third year after construction.
(New England District)

c. For coarse textured (sandy) surface soils, positive indicators of hydric soil formation must be demonstrated within 6 inches of the soil surface.
(Norfolk District)

ATTRIBUTE MEASURED:

a. Soil pH
b. Redoximorphic features
c. Hydric soil formation

LEVEL THAT CONSTITUTES SUCCESS:

a. Range of 6.2-6.8
b. Evidence of development.
c. Positive indicators within 6” of surface

TIME PERIOD TO ACHIEVE SUCCESS:

a. Closeout
b. Year 3 post-construction
c. Closeout

Level 3 Example: Norfolk District Vegetation*

Until canopy coverage exceeds 30%, average height of all woody stems (tree) must increase by an average of at least 10%/year by Y5 and Y10

OR

Y5 & Y10 reports shall document that all vegetation is healthy and thriving and average tree height is 5 feet or >.

ATTRIBUTE MEASURED:

Height of vegetation (trees)

LEVEL THAT CONSTITUTES SUCCESS:

a. Average height increase of minimum 10%/year over baseline OR

b. All vegetation is healthy, thriving, and average tree height is at least 5 feet.

TIME PERIOD TO ACHIEVE SUCCESS:

Canopy coverage exceeds 30%
OR Year 5 and Year 10

* Norfolk District

Performance Standards: Vegetation*

Percent absolute cover (for combined strata) of native, wetland species (OBL/FACW) shall be >75% of reference by year 5.

ATTRIBUTE MEASURED:

Absolute cover of native wetland species

LEVEL THAT CONSTITUTES SUCCESS:

Absolute cover >75%

TIME PERIOD TO ACHIEVE SUCCESS:

By Year 5

South Pacific Division Uniform Performance Standards

Performance Standards: Vegetation*

Average vernal pool endemic species richness in restored pools will be within one standard deviation of the average vernal pool endemic specie richness of the reference pools in year 5

ATTRIBUTE MEASURED:

Endemic vernal pool species richness

LEVEL THAT CONSTITUTES SUCCESS:

Within 1 standard deviation of reference

TIME PERIOD TO ACHIEVE SUCCESS:

Year 5

South Pacific Division Uniform Performance Standards

Performance Standards: Species Giant Garter Snake

Open Water Habitat: <50% absolute vegetation cover in Year 4

Marsh Habitat: 75% absolute vegetation cover in Year 4

ATTRIBUTE MEASURED:
Absolute vegetation cover

LEVEL THAT CONSTITUTES SUCCESS:

<50% cover for open water habitat
75% cover for marsh habitat

TIME PERIOD TO ACHIEVE SUCCESS:

Year 4

Species Performance Standards: Vernal Pool Invertebrates

Documented presence of *Branchinecta lynchi* within the Sample Pools every year from year first demonstrated through Year 5 OR
10% of all created pools have documented presence in Year 5.

ATTRIBUTE MEASURED:
Presence of *Branchinecta lynchi*

LEVEL THAT CONSTITUTES SUCCESS:

Annual presence in sampled pools OR
Presence in 10% of all pools

TIME PERIOD TO ACHIEVE SUCCESS:

Year 5

Performance Standards

Mitigation Plan:

Static water table at or within 12” of soil surface for 25% of the growing season (76 days). Duration of surface ponding (>2”) not to exceed 10% (30 days)

Adaptive Management:

Static water table at or within 12” of soil surface for 25% of the growing season (76 days). All wells must show a daily tidal signature for the entire growing season. Periods of failed tidal signatures outside of normal precipitation must not exceed 14 consecutive days.

Enforceable Performance Standards: Stream Stability

Example 1:
Stability assessment will be based on BPJ.

Example 2:
Cross section data within range for appropriate Rosgen stream type. Instability indicators include vertically incising stream bed or eroding channel banks. Movements towards stability include decrease in W/D ratio and increase in pool depth.

Example 3:
Riffle cross sections should be stable and show with little change in Bankfull Area, Max Depth Ratio, and W/D ratio.

Example 4:
- Bank Height Ratio = 1.0 to 1.2
- Entrenchment Ratio: > 2.4
- Streambank Erosion ≤ 10%
- Pool Spacing Ratio = 4-5
- % Riffle = 50-60

Enforceable Performance Standards: Wetland Hydrology

Example 1:
Visual/monitored hydrology show positive correlation w/target hydrology

Example 2:
Saturation or inundation for 12.5% of growing season & >50% dominant FAC or greater

Example 3:
Degree, duration, and periodicity of flooding comparable to reference site

Example 4:
Water table 12 inches or <, to inundation <=6 inches, for minimum 28 consecutive days, OR 2 periods of >=14 consecutive days.

Inundation >6 " shall not occur except following 10-yr, 24-hour or > precipitation events. Duration of inundation > 6" shall be < 14 consecutive days.

Monitoring Requirements

(33 CFR 332.6)

Monitoring Requirements

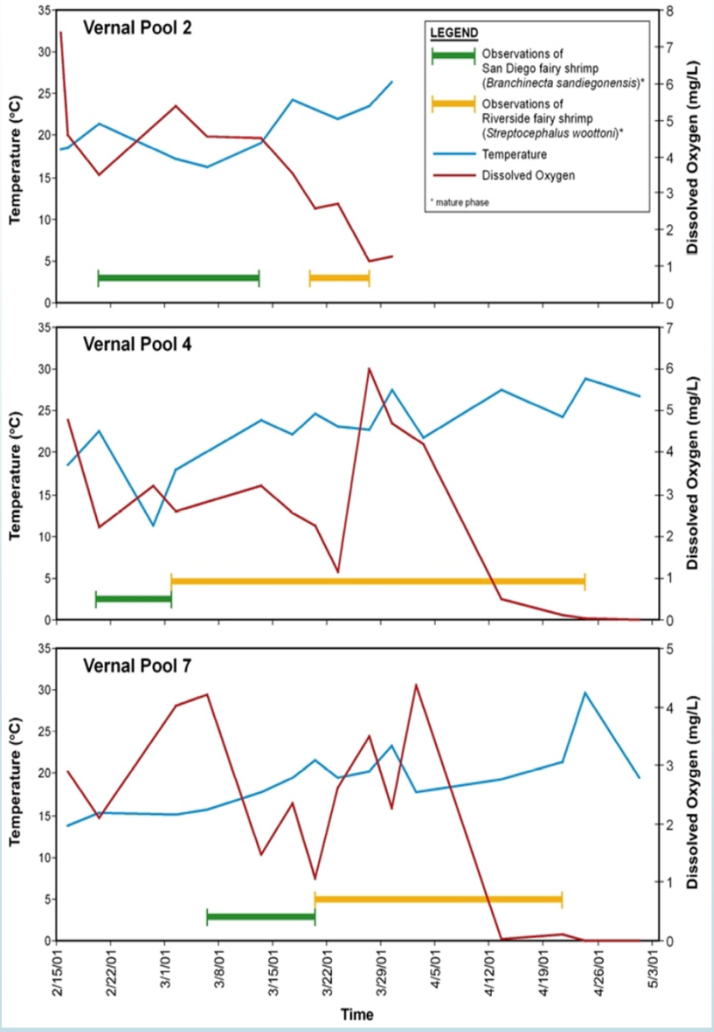
(33 CFR 332.6)

- To determine if the mitigation project is meeting performance standards and achieving objectives

- MBI or ILF Site-Specific Mitigation Plan:
  - Parameters to be monitored
  - Length of monitoring period
  - Parties responsible
  - Monitoring report content and frequency

Monitoring Requirements, cont.

- Monitoring period
  - Until success criteria are met or 5 years, *whichever is longer*
  - Must be extended for slow developing resource types
- Develop a comprehensive monitoring program
  - Hydrology, Soils, Vegetation and Condition/Function
  - EPA Level 1, 2, 3 Wetland Monitoring Framework



Monitoring Program Periods

- Baseline
  - Prior to construction
  - Inform site design and/or to develop performance standards
- Interim
  - From construction until success criteria met
  - Used to evaluate performance and credit release
  - Can be extended if PS not met
- Long Term
  - After site deemed successful and credits released
  - Informs management actions

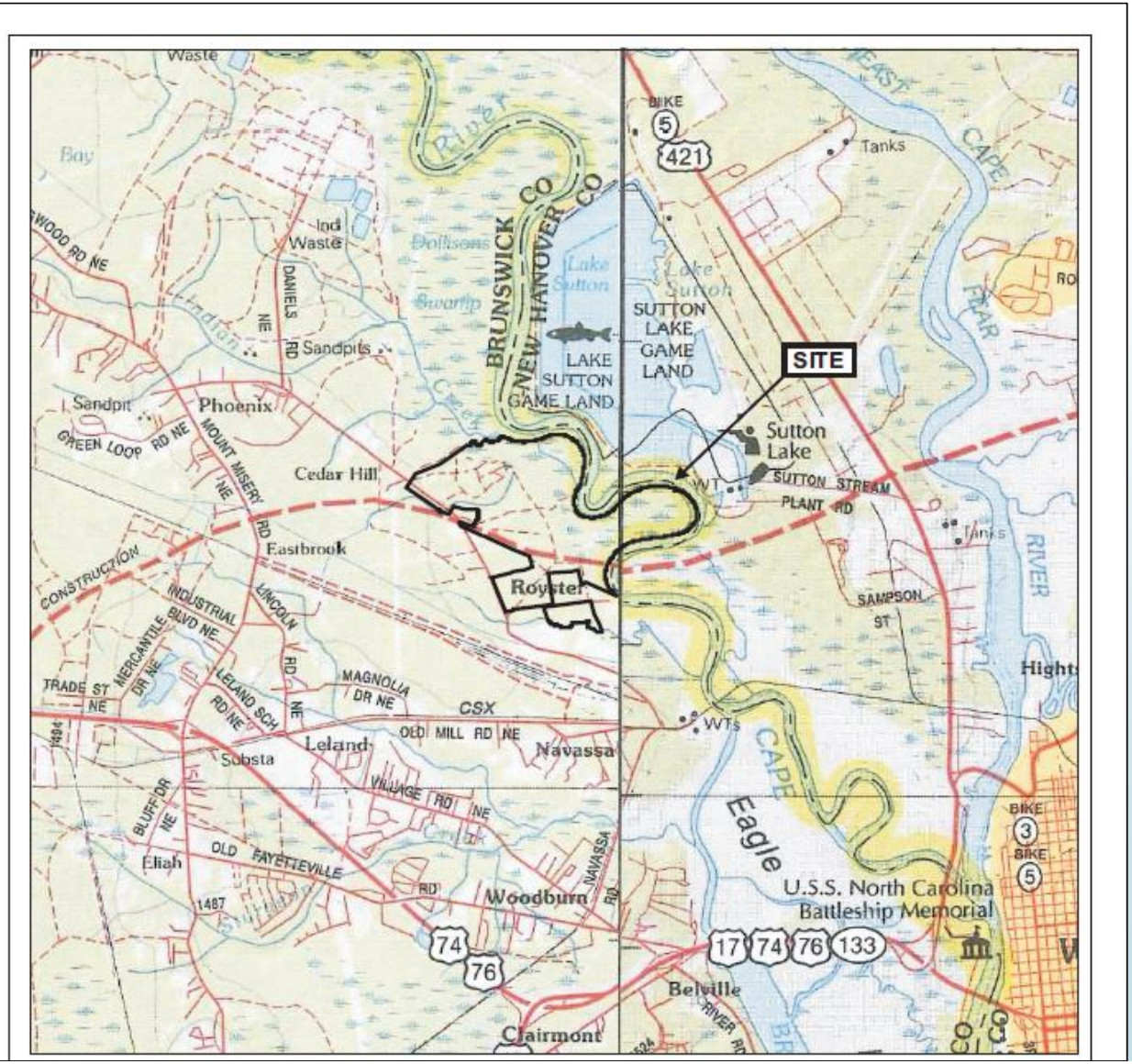
Monitoring Program:
Link to objectives and performance

Qualitative:

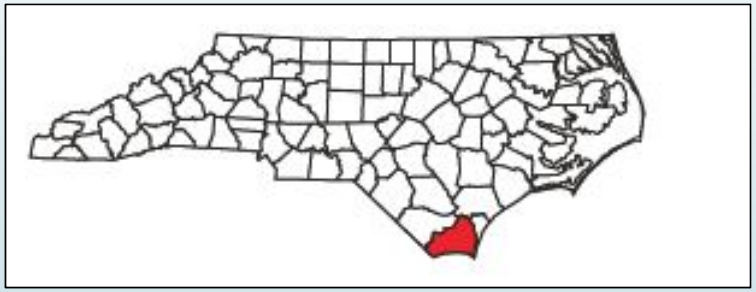
- Photo monitoring
- Wetland hydrology observation
- Vegetation community
  - % cover estimates
  - % dominants estimates
  - nuisance species mgmt.
- Wildlife utilization
- Biological integrity assessment

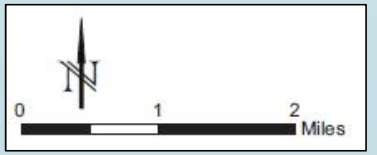
Quantitative:

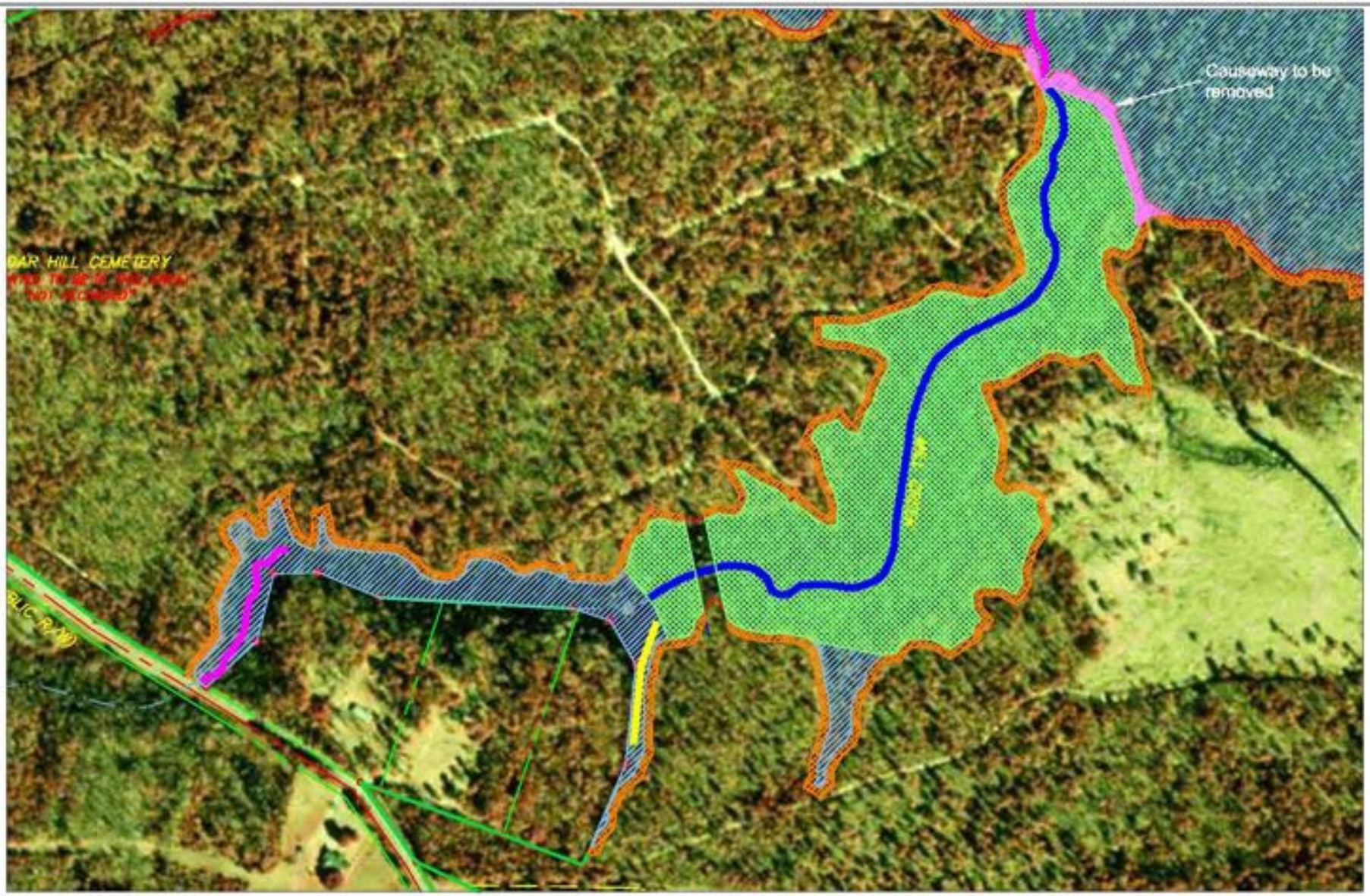
- Hydrologic
  - Gauges/piezometers
- Vegetation
  - % cover and composition
  - Stem counts
- Water Quality
  - PH, salinity, DO
- Functional/Conditional assessments
- Species presence



Lower Cape Fear Umbrella Mitigation Bank
(Sneeden Tract)
Brunswick County






Causeway to be removed
DAR HILL CEMETERY

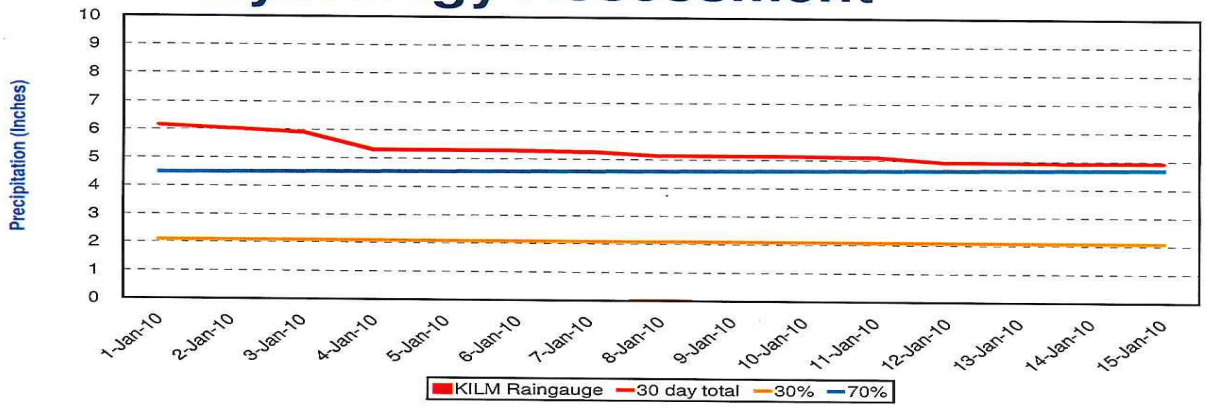
Pre-Construction: Roadbed Removal

Hydrology Assessment

January 2010

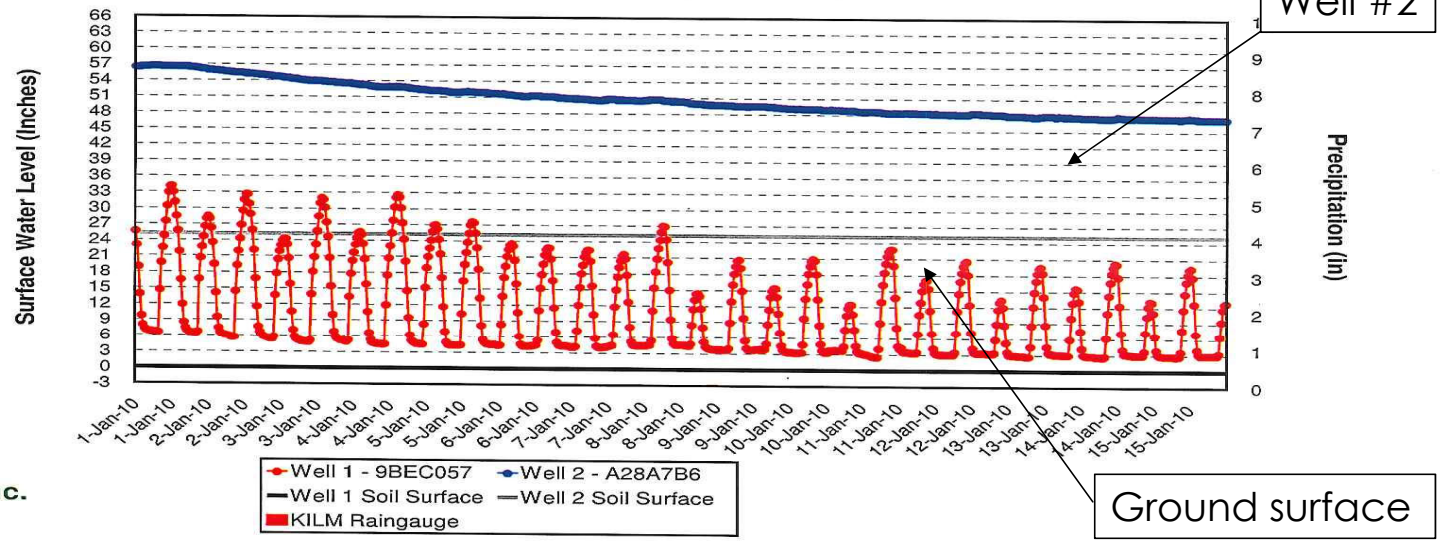
Precipitation data obtained from: Wilmington International Airport (KILM) (www.nc-climate.ncsu.edu)

30% & 70% precipitation data obtained from WETS Station : WILMINGTON WSO AP, NC9457 1979-2008 (ftp://ftp.wcc.nrcs.usda.gov)



Monitoring Well Record

- LCF Umbrella Mitigation
- Brunswick County, NC
- 01-09-117
- Wells 1 & 2
- Ecotone - WM 40
- January 1, 2010 -
- January 15, 2010
- One reading per half hour



Land Management Group, Inc.
www.lmgroup.net

2 Months Post-Construction

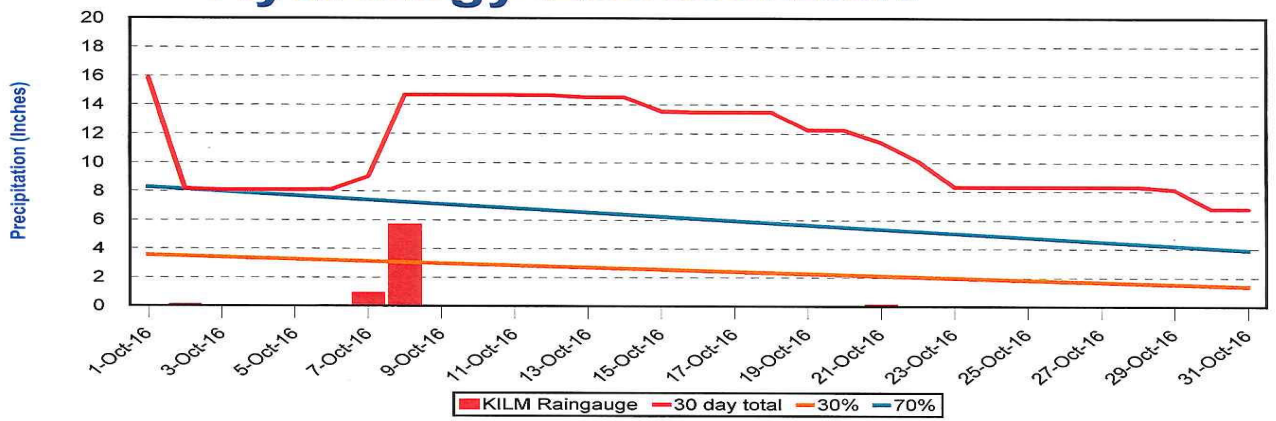
Hydrology Assessment

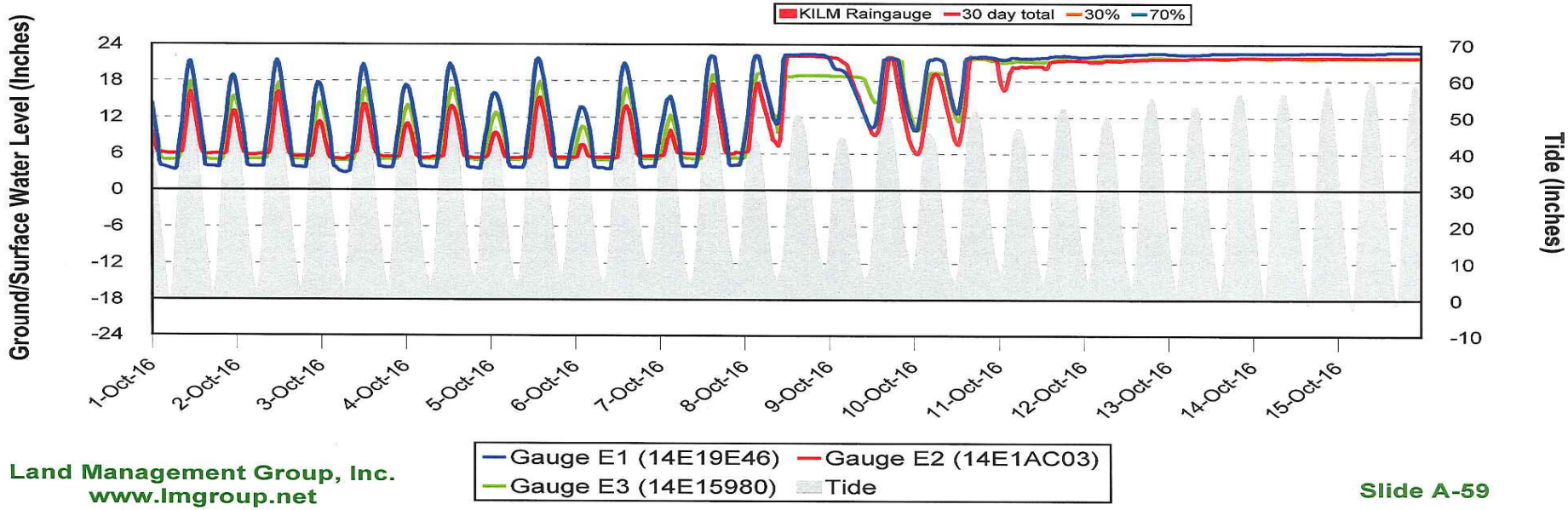
October 2016

Precipitation data obtained from Wilmington International Airport - KILM (www.nc-climate.ncsu.edu)

30% & 70% precipitation data obtained from Wilmington International Airport - KILM 1971-2000 (wcc.nrcs.usda.gov)

- Lower Cape Fear Umbrella Mitigation Bank (Sneeden Tract)
- Brunswick County, NC
- 01-13-038A
- Enhancement Gauges 1, 2 & 3
- Ecotone WM 40
- October 1, 2016 to Oct 15, 2016
- Readings recorded every ½ hour



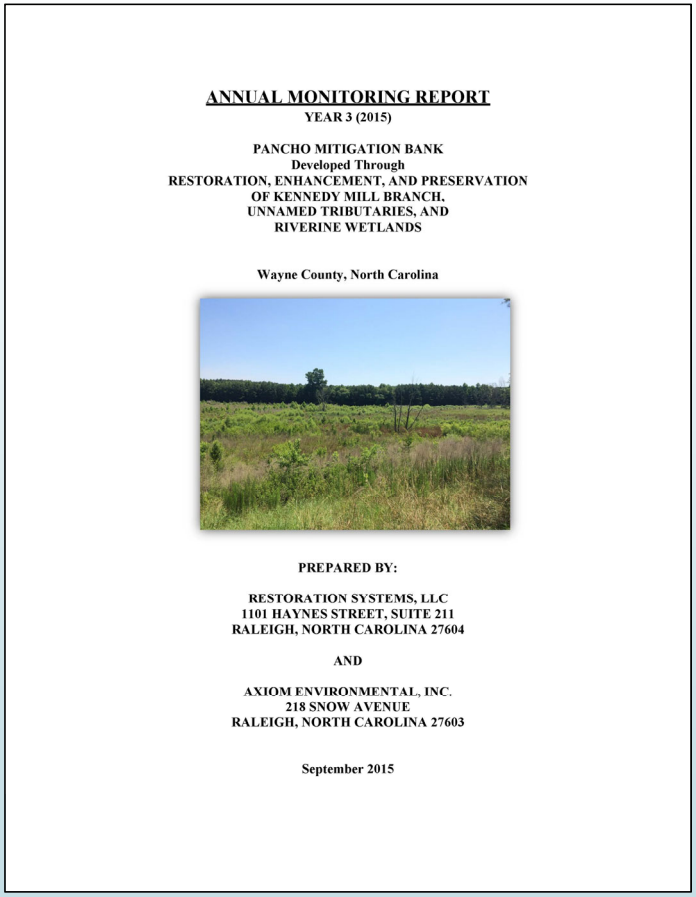


Pre-Construction

Year 3 Post-Construction

Monitoring Report
(RGL 08-03)

- Narrative
  - Overview (1 page)
  - Requirements (1 page)
  - Summary Data (4 pages)
  - Map/Plan (max 1 page)
  - Conclusion (1 page)
- Supporting Data
  - As-builts
  - Maps
  - Photographs
  - Assessment Results
    - raw data and interpretation



ANNUAL MONITORING REPORT
YEAR 3 (2015)

PANCHO MITIGATION BANK
Developed Through
RESTORATION, ENHANCEMENT, AND PRESERVATION
OF KENNEDY MILL BRANCH,
UNNAMED TRIBUTARIES, AND
RIVERINE WETLANDS

Wayne County, North Carolina

PREPARED BY:

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Stream Restoration Monitoring Requirements*

Pre-Construction:

- WQ: DO, Temperature, Conductivity, pH - STATE CERTIFIED LAB
- Benthic: Should follow standard protocols – STATE CERTIFIED LAB

Post-Construction:

- As-built survey: Cross-sections/profile
  - Permanent locations
  - Installed at frequency of 1 per 20 bkfl widths
  - 50% pools & 50% riffles
  - Profile for length of restored channel
- Crest gauges installed at mitigation and reference sites
- Vegetation Plots: Boundaries staked and marked.
  - Plots represent 2% of planted area
  - Planting should occur 11/15 – 3/15.
  - All stems (plots)tagged, numbered, and species noted.

*Charleston District

Stream Restoration Monitoring Requirements*

Annual Monitoring:

- Cross-section and profile data.
  - ALL data collected must be included in a chart.
- Include woody debris count (per 300 ft)
  - Document debris jams.
- Crest gauge data and photographs of bkfl evidence.
- Water Quality: 4X per year - certified lab not required
- Benthic: 1X per year– certified lab is required
- Vegetation data collected between 7/1 and leaf drop.
  - Count, height, root collar diameter, & lateral growth.
  - % cover invasive species.

*Charleston District

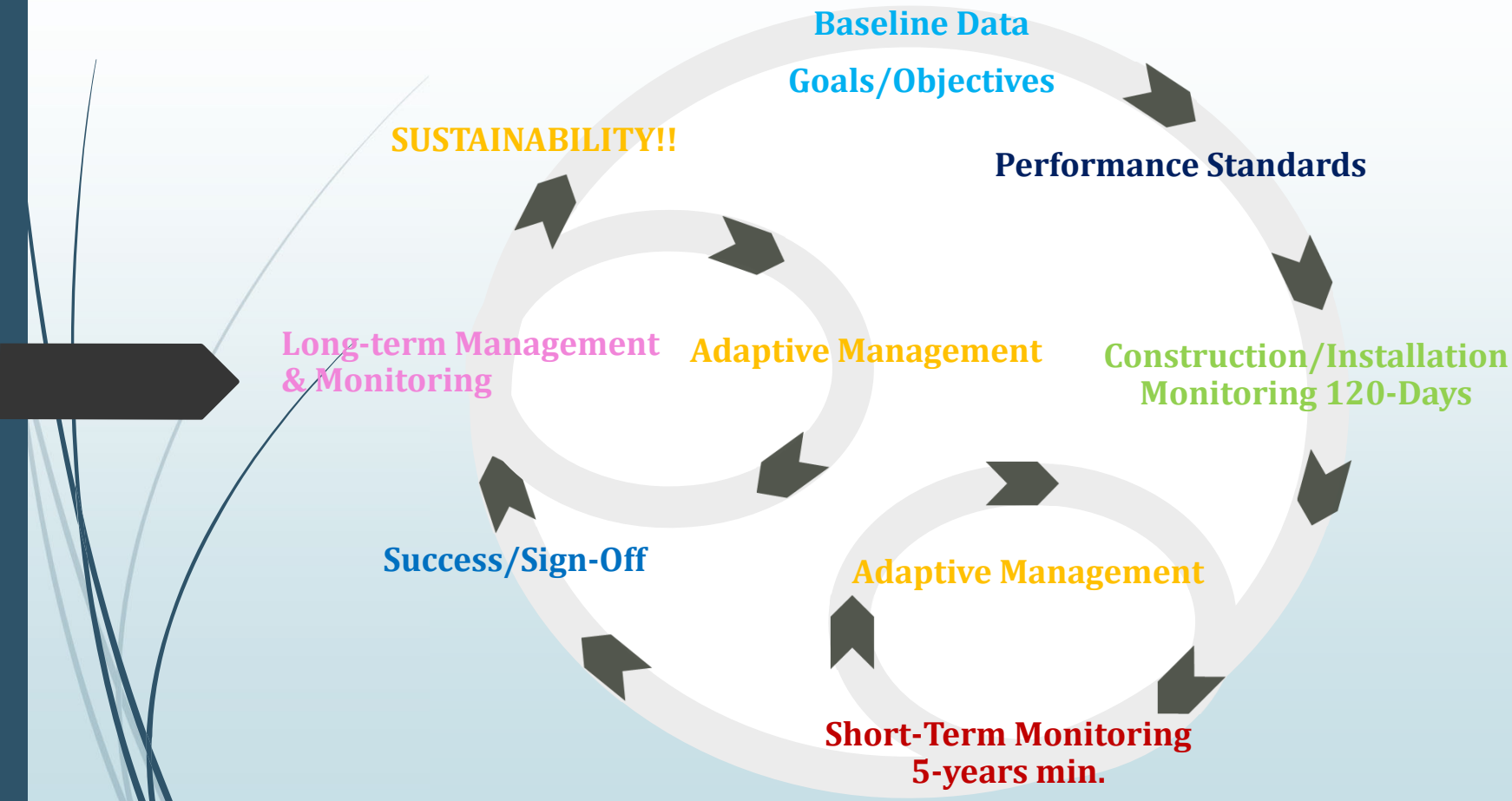
Adaptive Management Measures

- Why?
  - Resources can be complex and dynamic
  - Limited ability to predict response
  - Sustainable mitigation
- How?
  - Plan
  - Assess/Monitor
  - Adapt

Adaptive Management

- Corps, in consultation with the IRT, determines whether performance standards met
- Corps determines if adaptive management is needed or required.
- Instrument should identify process for approving Adaptive Management Plan
- The Sponsor is responsible for implementing an Adaptive Management Plan approved by the Corps (33CFR 332.4(c)(12) and 33 CFR332.7(c)).

Monitoring Program Feedback Loop(s)



Ex: Convert freshwater impoundments to tidal marsh

Objectives	Performance Standards	Monitoring	Adaptive Management
Re-establish 78 acres tidal marsh: Breaching existing dikes to restore natural hydrologic regime and surface elevations; Plant native vegetation	**Y1:** 80% planting survival **Y3:**Average stem density, by species, is ≥ 75 % avg reference. **Y5:** 2 years since last invasive treatment & <5% invasives Site elevations = reference. 100% of low marsh flooded by semi-diurnal tide. Flow rates (ebb and flood – m3/s) in breach within 75% of reference marsh rates.	Annual: Measure of live, standing dead, & shoot densities in veg plot transects across entire site Reference/mitigation site elevation surveys. Invasive species survey. Representative # continuous water level recorders.	Adjust elevations due to reworking of sediments. Chemical removal may be necessary to control invasive species.

Boarshead Ranch Mitigation Bank*

GOALS and OBJECTIVES

- Restore natural hydrologic regime to proposed habitats:
  - *Removal of berms and portions of the elevated farm road network,
  - *Installation of culverts and low water crossings
- Enhance the existing natural wetland and upland communities:
  - *Remove barriers and re-establish historic hydro-periods
  - *Promote growth and recruitment of desirable species
  - *Clear, grub, grade and replant target upland vegetation
  - *Herbicide, prescribed fire, and disking to prepare/maintain uplands
- Restore historically altered agricultural areas:
  - *Re-introduce historical hydro-periods,
  - *Grade to appropriate elevations, where necessary
  - *Plan appropriate species
- Create additional forested and herbaceous wetlands:
  - *Grade to elevation of existing wetlands
  - *Planting appropriate species for the target communities

*Jacksonville District

Performance Standards
(restoration, creation, enhancement, preservation)

Quantitative standards established:

- %cover of target vegetation in each stratum (canopy, shrub and groundcover)
- maximum cover by exotic and undesirable species.
- hydrologic parameters (water depth and hydro period) will be measured and compared to appropriate hydrologic standards for the target wetland types.

Qualitative standards established:

- meets wetland definition
- evidence of groundcover reproduction
- evidence of tree recruitment/seed tree production
- evidence of completed burn
- evidence of wildlife utilization

HERBACEOUS WETLANDS						
OBJECTIVES	CRITERIA	Restore/Create		Enhancement		
		Interim	Final	Base	Interim	Final
Restore natural hydrologic regime	# days/YR water present at surface	> 180	> 180	>90	> 180	> 180
Appropriate Target Communities	# of desirable groundcover spp.	>6	>=14	12	>=12	>=14
	% cover of desirable groundcover species	>60%	>85%	55%	>60%	>85%
	% coverage trees	<15%	<10%	<15%	<15%	<10%
	% cover desirable shrubs	<20%	<10%	<30%	<20%	<10%
	% cover exotic spp./ac.	<5%	<1%	8%	<5%	<1%
	% cover nuisance spp./ac.	<10%	<5%	16%	<10%	<5%
	evidence of groundcover reproduction	Yes	Yes	Yes	Yes	Yes
	evidence of wildlife utilization	Yes	Yes	Yes	Yes	Yes
	meets wetland definition	Yes	Yes	Yes	Yes	Yes

Boarshead Ranch Monitoring:
Baseline, Interim, Long-Term

Quantitative (annual)

- Hydrology
  - Gauges & piezometers
  - Monthly for baseline and interim, annually for long-term
- Wetland Vegetation
  - % cover and composition of groundcover, shrub, and sub-canopy
  - Stem counts
- Upland Vegetation
  - % cover

Qualitative (annual)

- Overall hydrologic assessment
- Estimate % cover and dominate spp. in each community
- Presence and control of nuisance spp.
- Wildlife utilization
- General biological integrity of each community
- Photo monitoring

Boarshead Ranch Monitoring:
Quantitative Monitoring

- For each parameter to be monitored, the plan provided:
  - Method, number of samples, data analysis
- Hydrology
  - Number and locations of gauges and piezometers
- Vegetation
  - Transect locations
  - Define groundcover, shrub, and sub-canopy layers
  - Method for assessing each layer (line-intercept, quadrat)
  - Data analysis- coverage statistics to be calculated

Credit Release Schedules

33 CFR 332.8 (o)(8)

Credit Release Schedules

- Release tied to performance-based milestones
- Reserves a significant share of credits until full achievement of performance measures
- The schedule can take into account:
  - Method of mitigation (restoration, preservation...)
  - Likelihood of success
- Schedule provided in:
  - Mitigation Bank Instrument
  - ILF and Umbrella Bank site-specific Mitigation Plan

Initial Release

- Contingent upon:
  - Instrument or mitigation plan approval
  - Site is secured
  - Appropriate financial assurances executed
  - **Other requirements as deemed necessary**

Wilmington District Stream Restoration and Enhancement Credit Release Schedule			
Year	Performance Based Milestone	Interim	Total
1	MBI/Mitigation plan approval, Easement recorded Financial assurances executed, 404 permit authorization	15%	15%
2	Construction and planting complete	15%	30%
3	Vegetation trending toward final success Stable stream with BHR < 1.2 ER > 2.2	10%	40%
4	Vegetation trending toward final success Stable stream with BHR < 1.2 ER > 2.2	10%	50%
5	Minimum 320 stems/ac Stable stream with BHR < 1.2 ER > 2.2	10%	60%
6/8	Visual documentation of stream stability. Vegetation trending toward final success	5%	65%
7	Minimum 260 stems/ac Stable stream with BHR < 1.2 ER > 2.2	10%	75%
9	Min 210 stems per acre and average 10 feet No single species comprises > 50% All streams must document sufficient flow to maintain OHWM Stable stream with BHR < 1.2 ER > 2.2	15%	90%
10	** Additional 10% upon documentation of 4 bkfl events in 4 separate years	10%	100%

Mobile District Bottomland Hardwood Wetlands Credit Release Schedule			
Release	Performance Based Milestone	Interim	Total
Y1	MBI/Plan approval Easement recorded Financial assurance executed	20%	20%
Y2	Construction complete Attainment of target hydrology Target Forest Type (TFT) approval	15%	35%
Y3	Min 1 YR post tree planting. Minimum 10-15 species per acre. Minimum 400 trees/acre	15%	50%
Y4	Min 2 YR post tree planting, Target trees show positive growth in trunk diameter and height	15%	65%
Y5	Min 3 YR post tree planting Shrub/herbaceous layer planted Target trees show positive growth in trunk diameter and height	15%	80%
Y11	Min 9 years of positive tree growth Hydrology shows positive correlation w/target hydrology. Minimum 10 tree species/acre and min 200-300 stems/acre 7-10' average tree height 50% coverage herbaceous and shrub species. <1% cover invasive species.	20%	100%

CA Instrument Template Release Schedule

Credit Release Schedule for Preservation

Release	Performance Based Milestone	Interim	Total
1	BEI approval Easement recorded Endowment Agreement	15%	15%
2	30% endowment principal funded	15%	30%
3	55% endowment principal funded	25%	55%
4	70% endowment principal funded	15%	70%
5	100% endowment principal funded	30%	100%

Credit Release Schedule for Establishment/Enhancement/Rehabilitation

Release	Performance Based Milestone	Interim	Total
1	BEI approval Easement recorded Financial Assurance Executed Endowment Agreement	15%	15%
2	Construction Complete 30% endowment principal funded	25%	40%
3	Year 2 Performance Stds Achieved 55% endowment principal funded	15%	55%
4	Year 3 Performance Std. Achieved 70% endowment principal funded	15%	70%
5	Year 4 Performance Stds Achieved 100% endowment principal funded	15%	85%
6	Year 5 Performance Stds Achieved Verified JD	15%	100%

Regional Guidance Letter 19-01
Alternative Credit Release Schedule

- Initial credit release
- One post-construction interim credit release
  - Construction of mitigation bank is completed
  - Sponsor submits first monitoring report, which may include as-built plans
  - Consultation with Interagency Review Team
  - District engineer determines whether mitigation bank successfully constructed
- Final credit release
  - Achievement of ecological performance standards
  - Financial assurances released to sponsor

Summary

- Use multiple performance standards and intensities.
- Clearly define reference and targets.
- Identify attribute measured, level that constitutes success, and time period to achieve success.
- Plan for ongoing adaptive management.
- Monitoring program should provide adequate data to demonstrate the project is meeting performance.
- Credit release must be tied to performance.
- LTM funding should be included as a performance milestone for credit release.

Performance Standards: Wetland Re-establishment*

Hydrology:
Degree, duration, and periodicity of flooding is comparable to the reference site(15-25 %)

ATTRIBUTE MEASURED:
Hydrology: flooding

LEVEL THAT CONSTITUTES SUCCESS:
Degree, duration, periodicity is within 15-25% of reference site

TIME PERIOD TO ACHIEVE SUCCESS:
Closeout

* Charleston District

Re-establishment: Hardwood Swamps, Shrub-Carrs and Alder Thickets*

(Mineral Soils)

Hydrology shall consist of a water table 12"or less to inundation up to 6", for a minimum of 28 consecutive days, OR two periods of 14 or more consecutive days, during the growing season under normal and wetter than normal hydrological conditions.

ATTRIBUTE MEASURED: Hydrology
Water Level

LEVEL THAT CONSTITUTES SUCCESS:
Depth of 12" below ground surface or 6" above surface

TIME PERIOD TO ACHIEVE SUCCESS:
Minimum of 28 consecutive days OR two periods of 14 or more consecutive days during the growing season

* St. Paul District

Re-establishment: Hardwood Swamps, Shrub-Carrs and Alder Thickets*

(Mineral Soils)

Hydrology: Inundation greater than 6 inches in depth shall not occur except following 10-year, 24-hour or greater precipitation events. Duration of inundation greater than 6 inches shall be less than 14 consecutive days.

ATTRIBUTE MEASURED: Hydrology
Inundation

LEVEL THAT CONSTITUTES SUCCESS:
Depth of greater than 6" above ground surface

TIME PERIOD TO ACHIEVE SUCCESS:
Less than 14 days following 10Y/24h or greater precipitation event.

* St. Paul District

Performance Standards: Wetland Re-establishment*

Hydrology:
Degree, duration, and periodicity of flooding is comparable to the reference site(15-25 %)

ATTRIBUTE MEASURED:
Hydrology: flooding

LEVEL THAT CONSTITUTES SUCCESS:
Degree, duration, periodicity is within 15-25% of reference site

TIME PERIOD TO ACHIEVE SUCCESS:
Closeout

* Charleston District

Performance Standards: Wetland Re-establishment*

Vegetation:
Minimum 70% survival of planted tree species

Consistent increase:
Height
Lateral growth,
Root collar diameter

ATTRIBUTE MEASURED:
a. Planted tree species
b. Species height, lateral growth, and root collar diameter

LEVEL THAT CONSTITUTES SUCCESS:
a. Minimum 70% survival
b. Consistent increase

TIME PERIOD TO ACHIEVE SUCCESS:
Closeout

* Charleston District