

Habitat Reconstruction & Replacement Overview



- Hudson River provides diverse habitats
 - Plants, plankton, aquatic invertebrates, fish, amphibians, reptiles, birds and mammals
 - Animals living in wetlands, floodplains and upland communities are also dependent on the river

Habitat Reconstruction & Replacement Overview



- A habitat replacement program is being implemented:
- To mitigate for impacts to habitats from the remedial activity (dredging)
 - To reconstruct, replace, and/or stabilize
 - Shoreline (SHO)
 - Riverine Fringing Wetland (RFW)
 - Submerged & Floating Aquatic Vegetation (SAV/FAV)
 - Unconsolidated River Bottom (UCB)

Habitat Reconstruction Update

CAG Meeting October 30, 2014



Hudson River
PCBs SUPERFUND SITE

Reconstruction by River Section

River Section 1 (Thompson Island Pool)

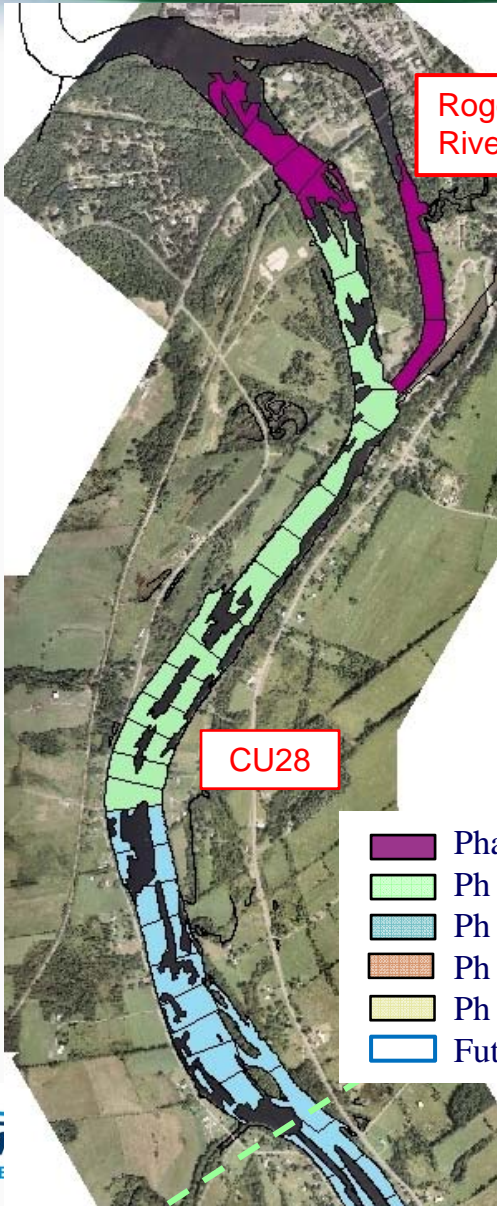


CU's 2-8
Planted
2010-2011

CU's 9,
10, 19
Planted
2012

CU's
20-27
Planted
2013

CU's
28-49
Planted
2014

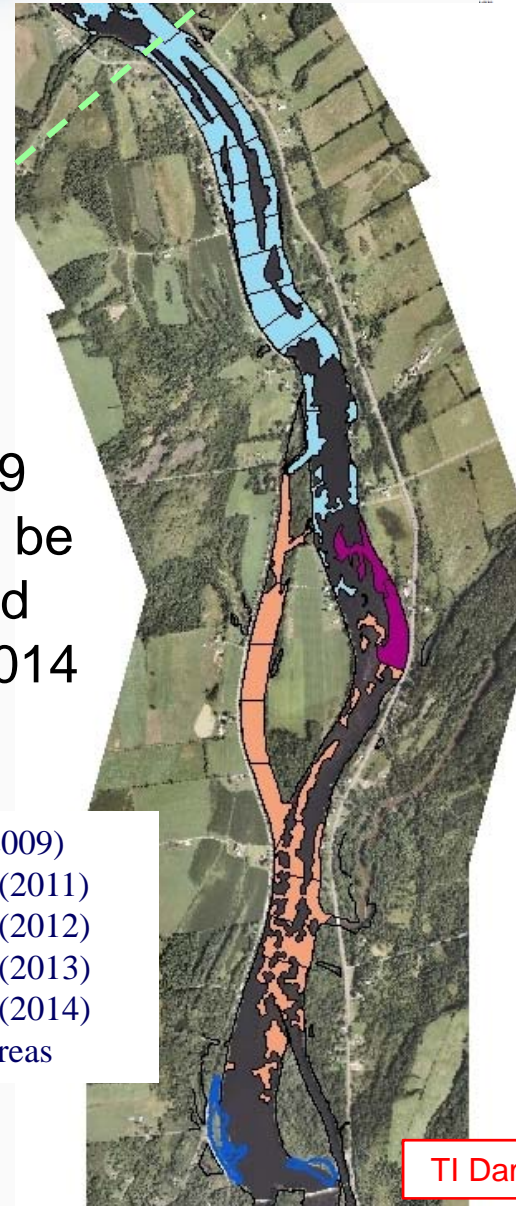


Roger's Island
River Mile 194

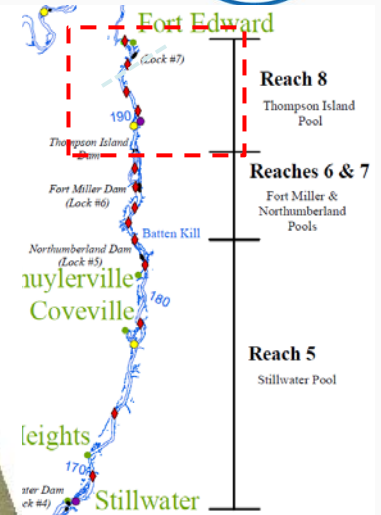
CU28

- Phase 1 CU Boundaries (2009)
- Ph 2 Yr 1 CU Boundaries (2011)
- Ph 2 Yr 2 CU Boundaries (2012)
- Ph 2 Yr 3 CU Boundaries (2013)
- Ph 2 Yr 4 CU Boundaries (2014)
- Future (2015) Dredging Areas

CU's 28-79
Proposed to be
Seeded and
Planted in 2014



TI Dam RM 188.5



CU's 17, 18
Established
As SAV NR
in 2010

CU's
50-52
Planted
2013

CU's
53-59
Planted
2014



Orthoimagery From Habitat
Delineation Report (QEA 2008)

Reconstruction by River Section

River Section 2 (Northumberland Pool)



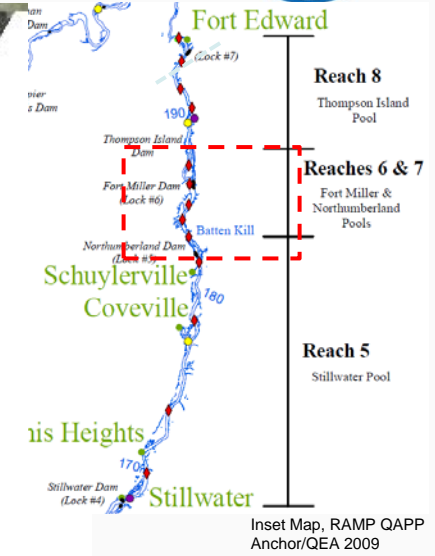
TI Dam RM 188.5

CU's 61-66 (Reach 7) Dredging In 2014 and 2015. Planting TDB

CU's 67-71 Planted 2014

CU's 72-79 and CU 84 Planted 2014

- Phase 1 CU Boundaries (2009)
- Ph 2 Yr 1 CU Boundaries (2011)
- Ph 2 Yr 2 CU Boundaries (2012)
- Ph 2 Yr 3 CU Boundaries (2013)
- Ph 2 Yr 4 CU Boundaries (2014)
- Future (2015) Dredging Areas



Northumberland Dam RM 183.2

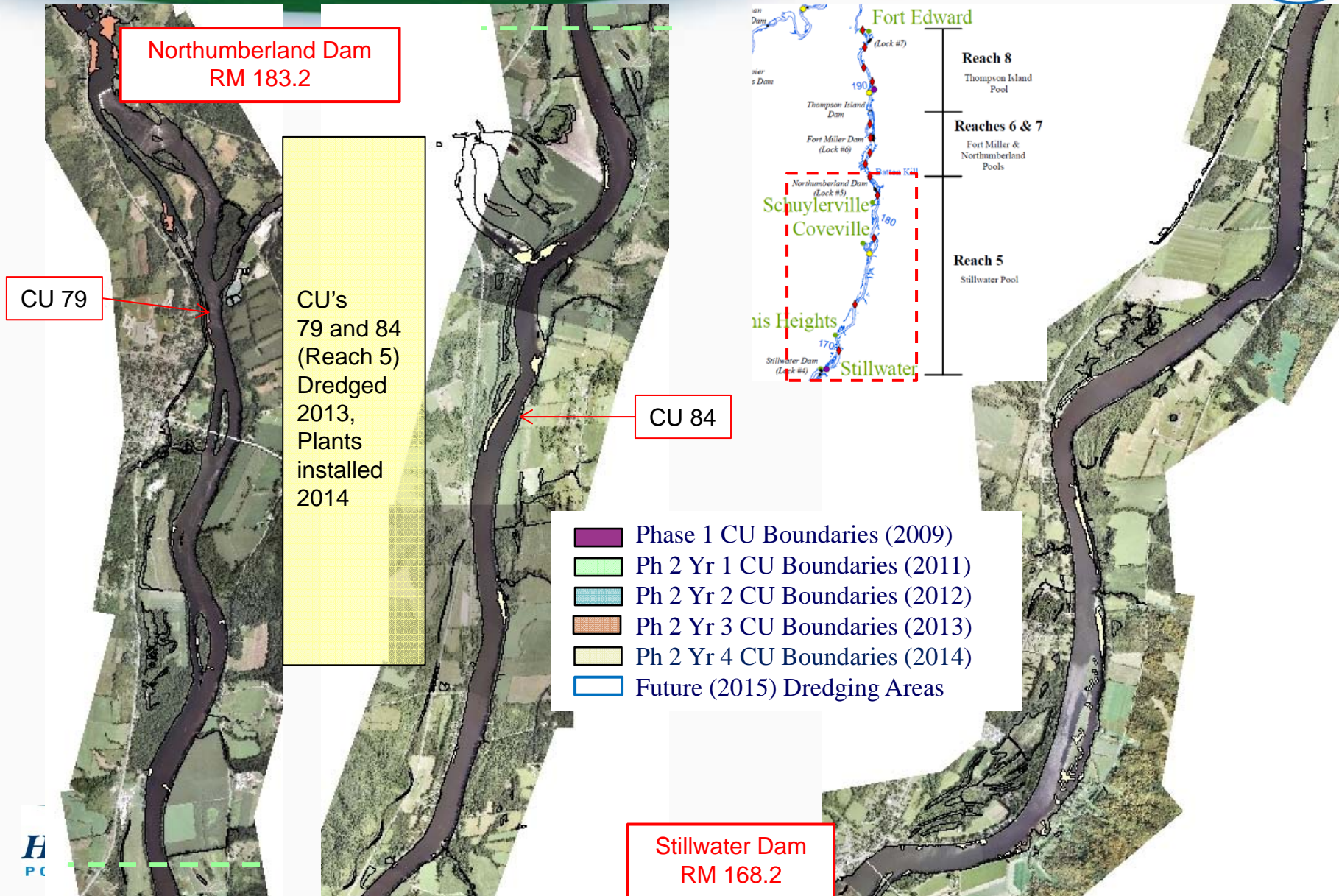
CU79



Orthoimagery From Habitat Delineation Report (QEA 2008)

Reconstruction by River Section

River Section 3 (Southern Pools)



Overall Presentation Format



- Habitats and Characterization
- Reconstruction Approach & Sequence
- Reconstruction Progress to Date
- Habitat Monitoring Approach
 - Monitoring results to date

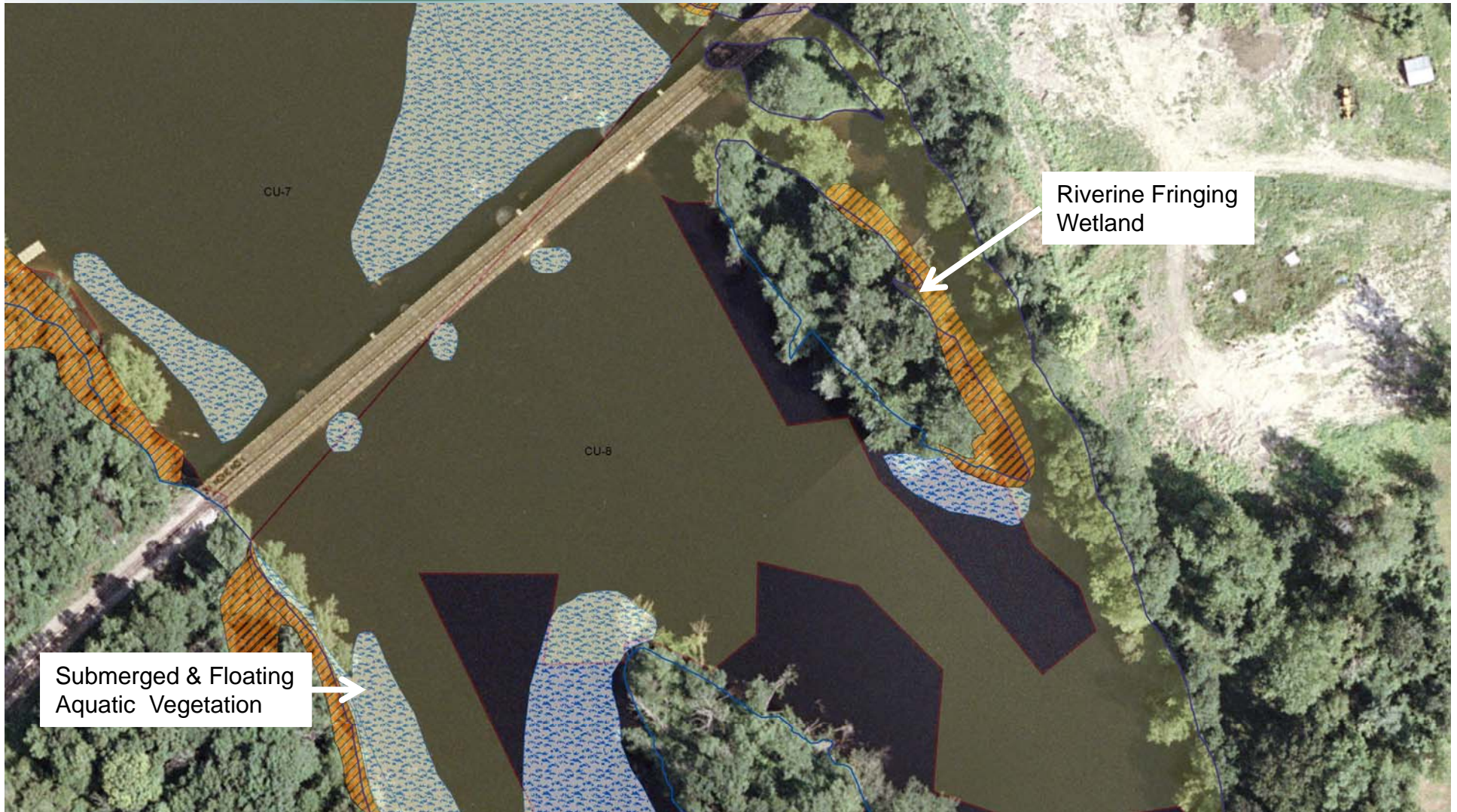
Overall Presentation Format



- Habitats and Characterization
- Reconstruction Approach & Sequence
- Reconstruction Progress to Date
- Habitat Monitoring Approach
 - Monitoring results to date
 - Results to date are mixed for some habitats, however
 - Overall results are encouraging for all habitats

Habitats and Characterization

Pre-Dredge Habitats

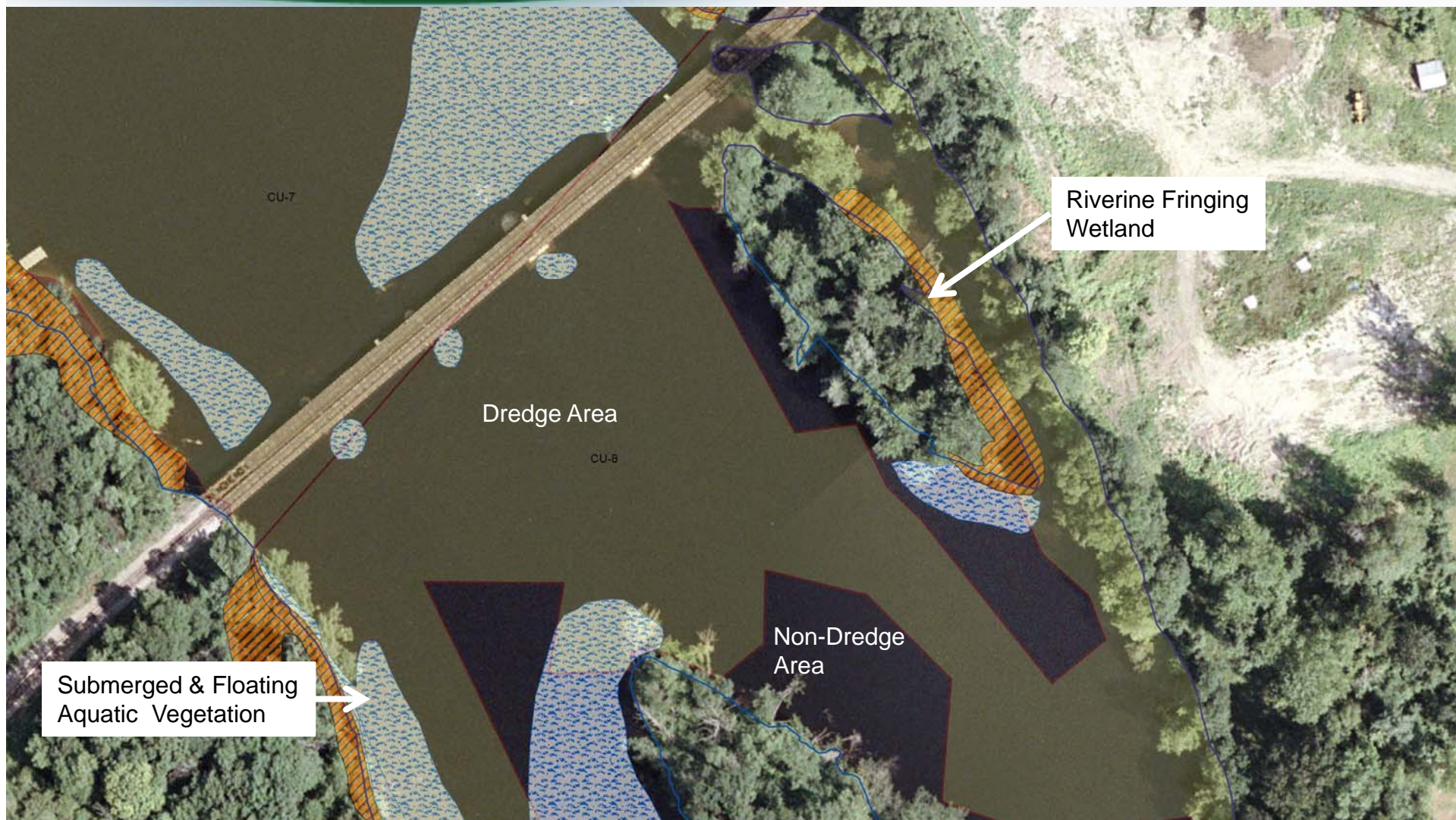


Submerged & Floating Aquatic Vegetation

Riverine Fringing Wetland

Habitats and Characterization

Pre-Dredge Habitats & Dredge Areas



Riverine Fringing Wetland

Submerged & Floating Aquatic Vegetation

Dredge Area

Non-Dredge Area

CU-7

CU-8

Habitats and Characterization



Shoreline (SHO)

Riverine Fringing Wetland (RFW)



Non-dredge shoreline near CU08

Typical RFW Zone A, Reference WET-03R

Habitat data collection & characterization described in Habitat Delineation Report and Phase 1 and Phase 2 Habitat Assessment Reports

Habitats and Characterization



Submerged Aquatic (SAV) Bed



Reference SAV area near CU80

Unconsolidated Sediment (UCB)



Sediments near CU56

Habitat data collection & characterization described in Habitat Delineation Report and Phase 1 and Phase 2 Habitat Assessment Reports

Reconstruction Approach

Components



- Planting with natural recolonization
- Dredging & planting plans approved after a thorough design review
- Includes consultation with federal and state agencies
- Local/regional plant materials & nursery support
- Oversight of dredging and reconstruction

Reconstruction Approach

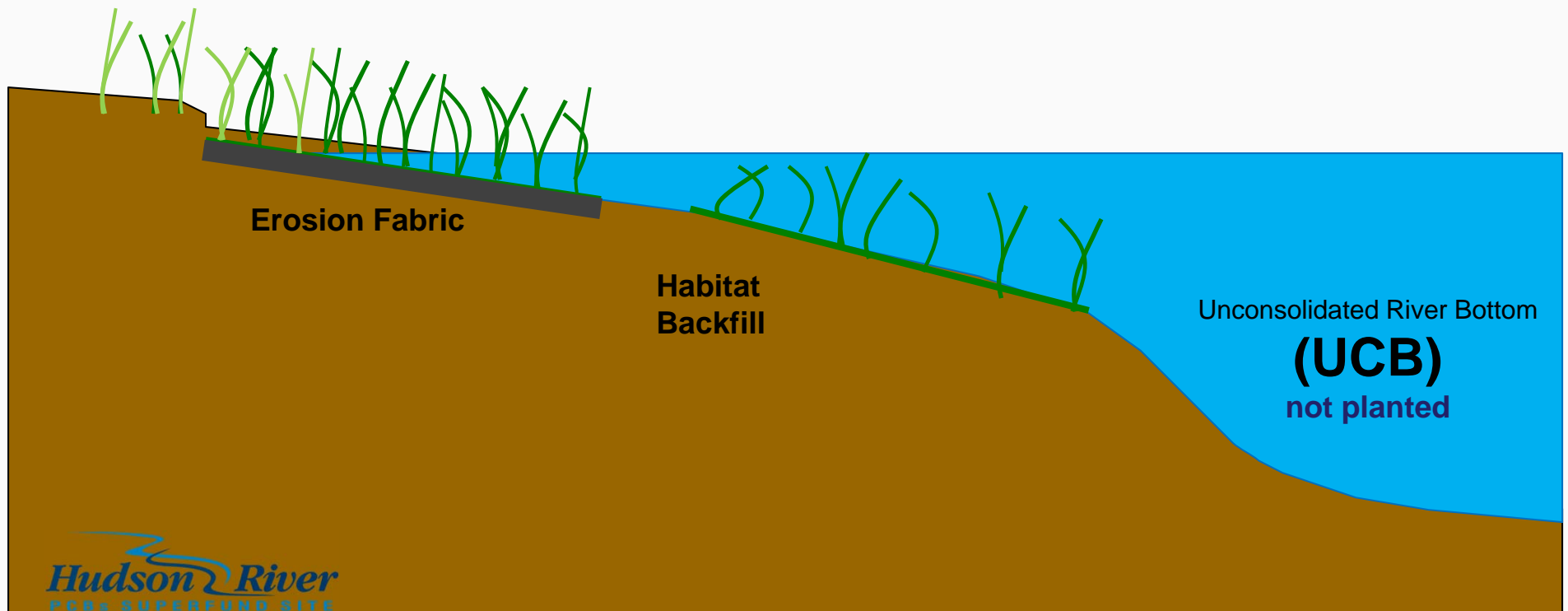
Planting with Natural Recolonization



Upland
(undisturbed)

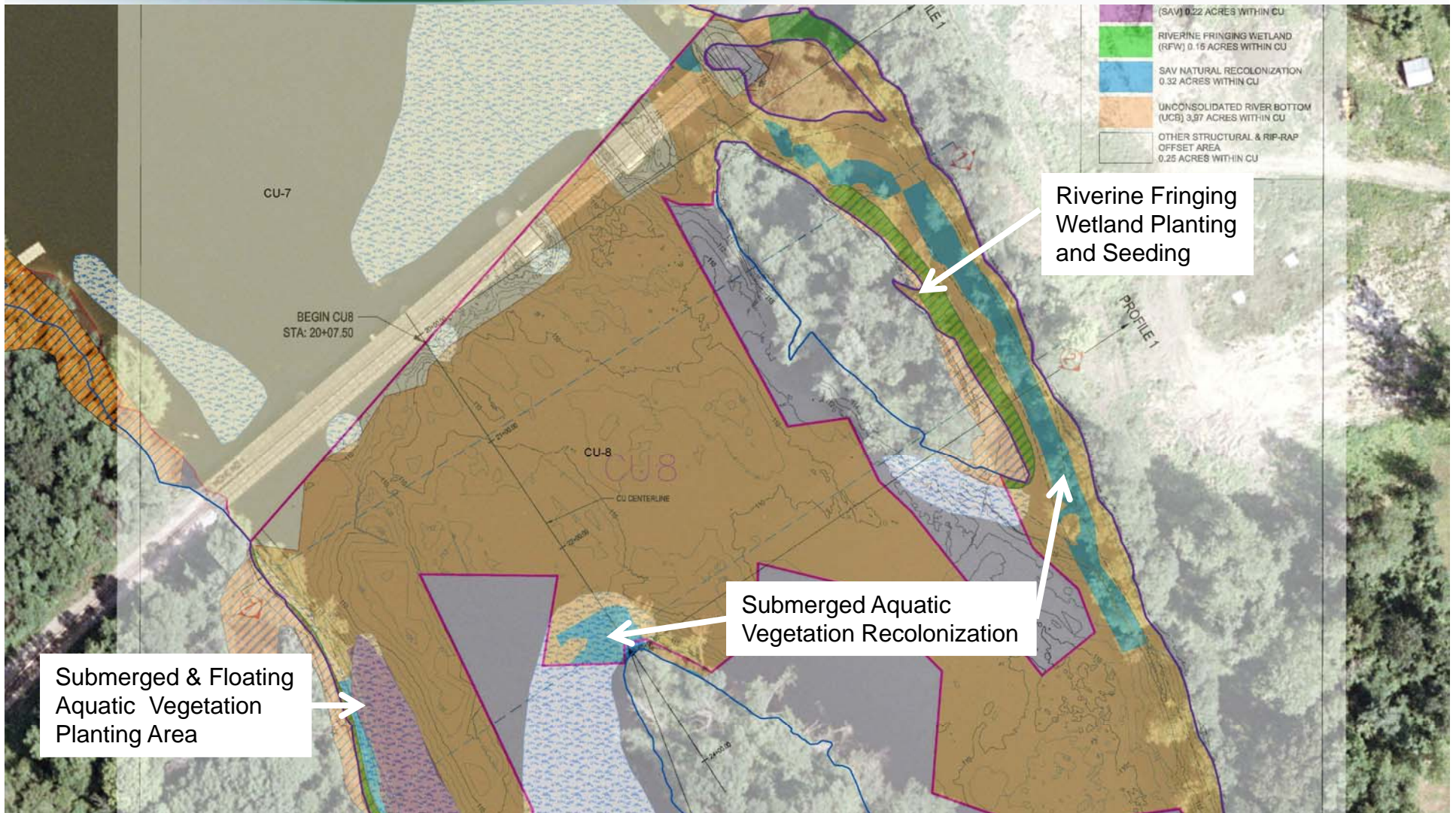
Riverine Fringing Wetland
(RFW)

Sub Aquatic Vegetation
Floating Aquatic Vegetation
(SAV and FAV)



Habitats and Characterization

Habitat Reconstruction Planting Plan



Reconstruction Approach

Reconstruction Sequence



1. Dredging and Backfilling (prior to planting)
 - Rebuild habitat to similar configuration (depth)
 - Includes stabilization and initial seeding
2. Pre-planting backfill survey (year of planting)
 - Elevation and water depth checks
 - Adjust areas as needed through review process
3. PLANT and SEED!
4. Planting review and approval
5. Monitoring and maintenance

Reconstruction Approach

Construction Sequence



Dredging/Backfilling

Erosion control fabric/berms
Initial RFW Zone A seeding



Pre-Planting Construction



Reconstruction Approach

Construction Sequence



Dredging/Backfilling

Erosion control fabric/berms

Initial RFW Zone A seeding

Pre-Planting Construction

Pre-Planting Survey

Planting & Seeding

Maintenance & Monitoring

Herbivory monitoring & controls

Re-planting (if needed)

Invasive plants monitoring & control

Year of Planting



Habitat Reconstruction Sequence

Wetlands Seeding 2013-2014



RFW Zone A Seeding CU52

RFW Zone B Seeding CU69



Habitat Reconstruction Sequence

Wetlands Planting 2014



RFW Zone B Planting CU76



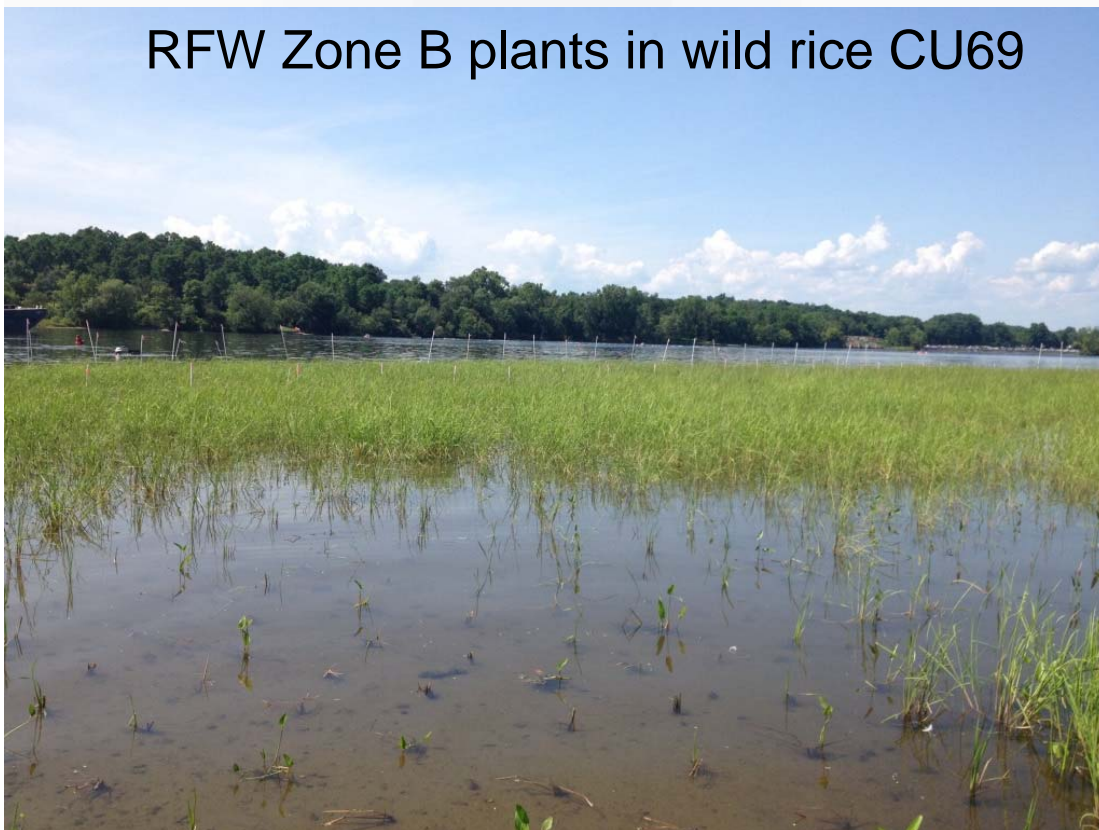
RFW Zone B Planting CU70

Habitat Reconstruction Sequence

Wetlands Planting 2014



RFW Zone B plants in wild rice CU69



RFW Zone A Planting CU35



Habitat Reconstruction Sequence

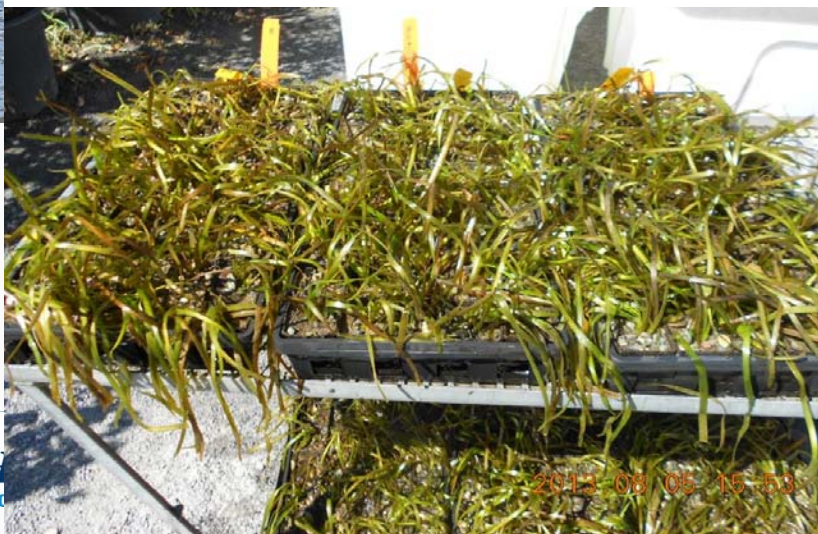
SAV Planting 2013-2014



SAV plant delivery and dive support vessels



American wild celery plants in flats



Diver & diver tender installing plants

Reconstruction Progress to Date

Acres Planted per Year



Year	CU's	Habitat	Acres*
2011	2, 3, 4, 5, 6, 7, 8, 17, and 18	RFW	0.40
		SAV/FAV Planting	6.68
		SAV NR	3.37
2012	9, 10, and 19	RFW	0.41
		SAV/FAV Planting	3.05
		SAV NR	0.79
2013	20 through 27; 50, 51, and 52	RFW	none
		SAV/FAV Planting	7.34
		SAV NR	0.84

Approx. 7.1 acres total installed

Approx. 3.5 acres total installed

Approx. 7.3 acres total installed

* 2013 NR is to date but does not reflect all NR for CU's 50-52. CU Cert Form 3 review pending in some areas

Reconstruction Progress to Date

Acres Planted per Year



Year	CU's	Habitat	Acres*
2014 RS 1	28 through 49; 53-58	RFW (inc. CU 50-52)	4.50
		SAV/FAV Planting	9.23
		SAV NR	TBD
2014 RS 2 & 3	CUs 67 through 79, and CU84	RFW	8.67
		SAV/FAV Planting	8.72
		SAV NR	TBD

*Approx. 31 acres
SAV/FAV + RFW
Installed in 2014!*

* Estimated from design. CU Cert Form 3 review pending on some areas
Note that CUs 79 and 84 are in Reach 5 (Stillwater pool).

Habitat reconstruction in CUs located in Reaches 5 through 1 is anticipated in 2015.

Habitat Monitoring Approach

Wetlands (RFW)



CU 19 RFW Zone A
Wool grass & bulrush
communities planted 2012

Habitat Monitoring Results

Wetlands



CU08 RFW Zone A
Dredged 2009
Seeded 2010



CU68 RFW Zone B
Dredged 2013
Seeded 2013
Planted 2014

Habitat Monitoring Approach

Wetlands



CU09 RFW Zone B
Dredged 2011
Planted & Seeded 2012



CU08 RFW Area
Dredged 2009
Planted 2010
Replanted 2014

Habitat Monitoring Approach

SAV Means Underwater...



Habitat Monitoring Approach

SAV means Underwater...



Wild celery “mother and Daughter” plants

Underwater video camera mounted on water sampler

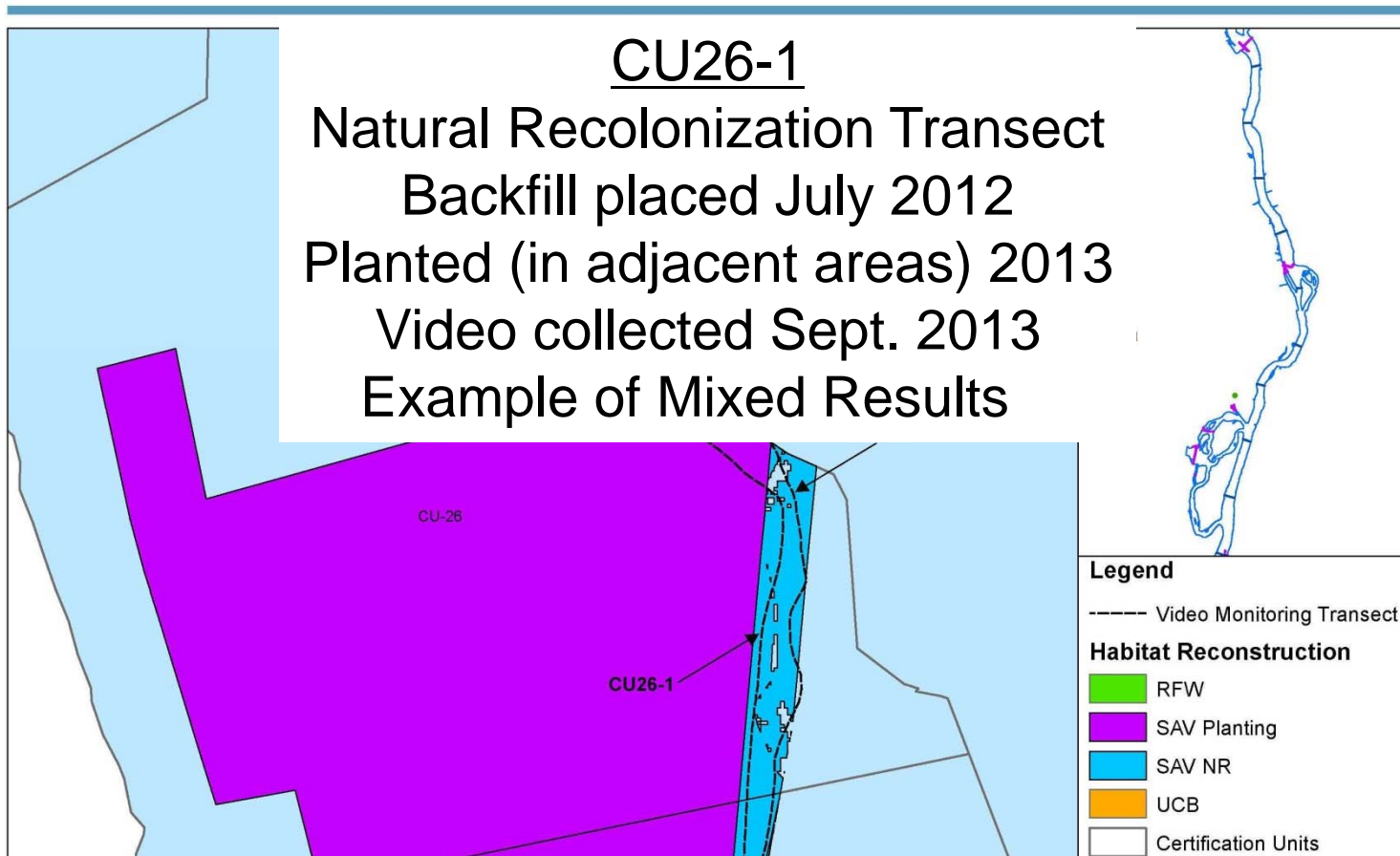


Habitat Reconstruction Monitoring

SAV Monitoring Images 2013-2014




CU26-1.mpg



Habitat Reconstruction Monitoring

SAV Monitoring Images 2013-2014



CU21-1

Natural Recolonization Transect

Backfill placed November 2011

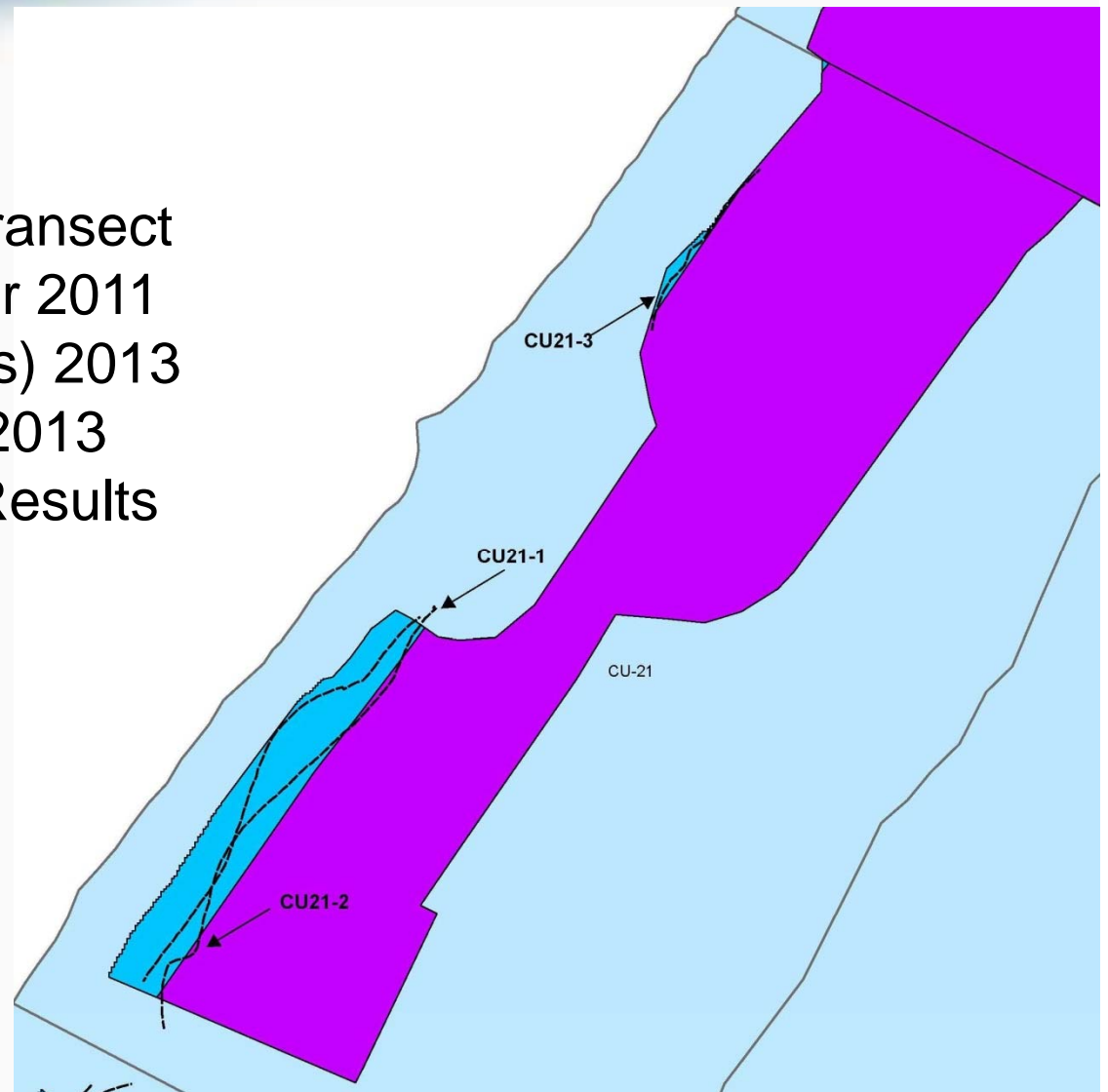
Planted (in adjacent areas) 2013

Video collected Sept. 2013

Example of Encouraging Results



CU21-1.mpg



Habitat Reconstruction Update

Summary



- **Benchmark monitoring results to date are encouraging**
Its been shown that planting can be done successfully
- **Even though some areas are in year 4 of benchmark phase...**
...Its still early in the monitoring process....and...
- **2014 data is pending (lots of it)**
- **Need to keep monitoring and considering potential response actions for areas that present good potential returns....**

Habitat Reconstruction Update

Summary



- **Benchmark monitoring results to date are encouraging**
Its been shown that planting can be done successfully
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...Its still early in the monitoring process....and...
- **2014 data is pending (lots of it)**
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Reminder...plants will grow wherever they want!

Habitat Reconstruction Update

Comments or Questions?



SAV and RFW Planting Units Installed to Date and in 2014

Year	Fringing Wetland	Submerged & Floating Aquatic	Yearly Total
2010 & 2011	2,479	68,573	71,052
2012	3,157	31,910	35,067
2013	0	99,843	99,843
2014	127,928	193,619	321,547
Habitat Total	133,564	393,945	527,509

Approximately 95% of the RFW and 42% of the SAV installed to date was installed in 2014. More planting and monitoring is scheduled for 2015

Habitat Reconstruction Update

Comments and Questions?



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