Atlantic Reclamation Conference, Wolfville, NS

Enhancement of a Degraded Urban Wetland in Yarmouth, NS

Broad Brook Wetland Park

1. Setting goals
2. Confirming goals
3. Lessons learned

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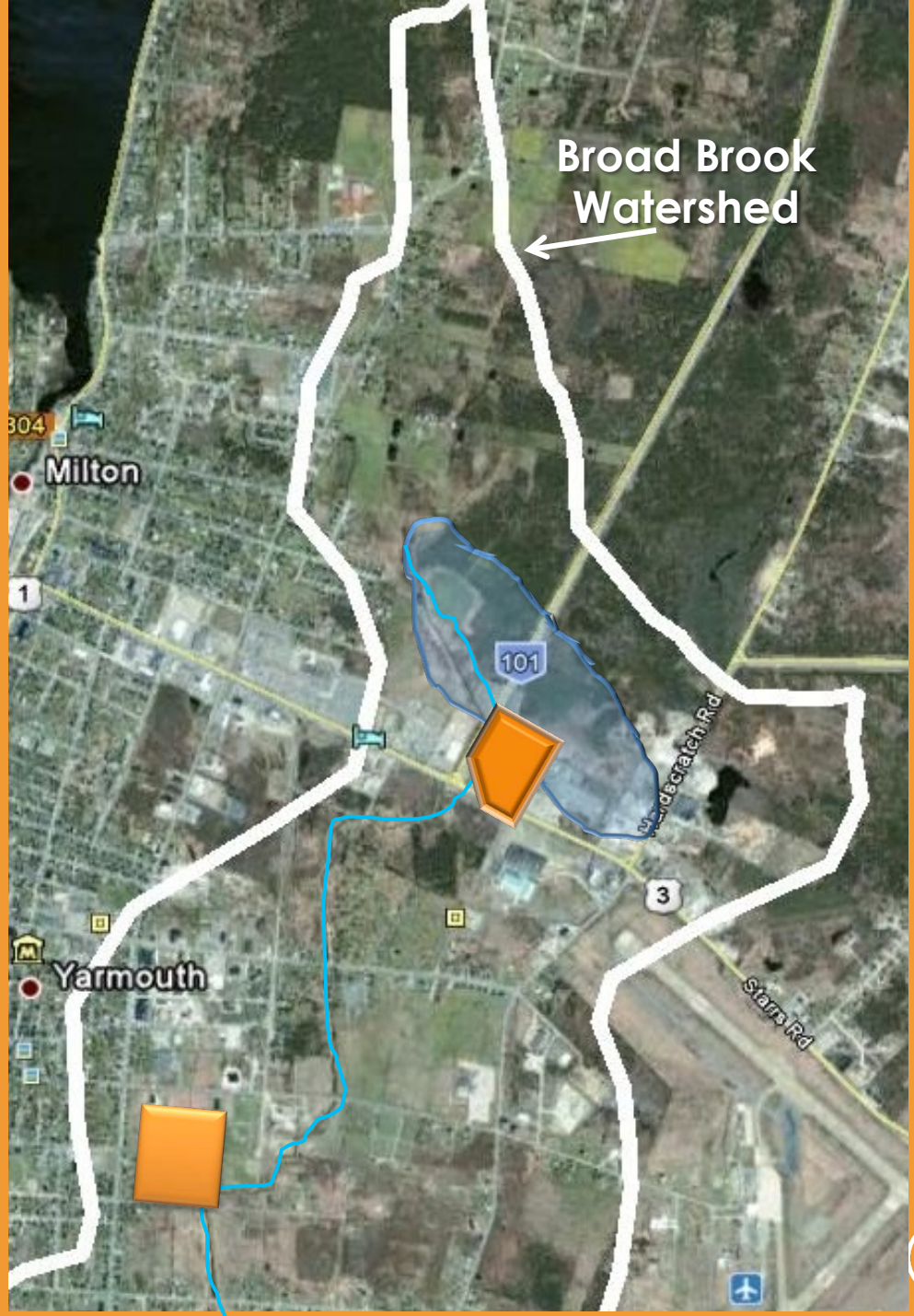

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Looking North From Southeast Street

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Identification of Goals: Process

1. Identify Causes and Character of Degradation

- Site history
- Site character
  - Hydrology
  - Soils
  - Ecology

2. Identify Existing Value

- Consider desires of stakeholders in this

3. Develop Plan With Goals to Address Both

- for feasibility and budgeting
- for approval by NSE
- for Town Council approval

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Site History

Air photos & Anecdotes

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Agriculture
Disturbance
Drainage

1945

Agriculture
Disturbance
Drainage

Infilling

1958

Agriculture
Disturbance
Drainage

Infilling

1967

Agriculture
Disturbance
Drainage

Infilling

Stormwater
Urbanization

1970

Agriculture
Disturbance
Drainage

Infilling

Stormwater
Urbanization

1995

Agriculture
Disturbance
Drainage

Infilling

Stormwater
Urbanization

2000

Agriculture
Disturbance
Drainage

Infilling

Stormwater
Urbanization

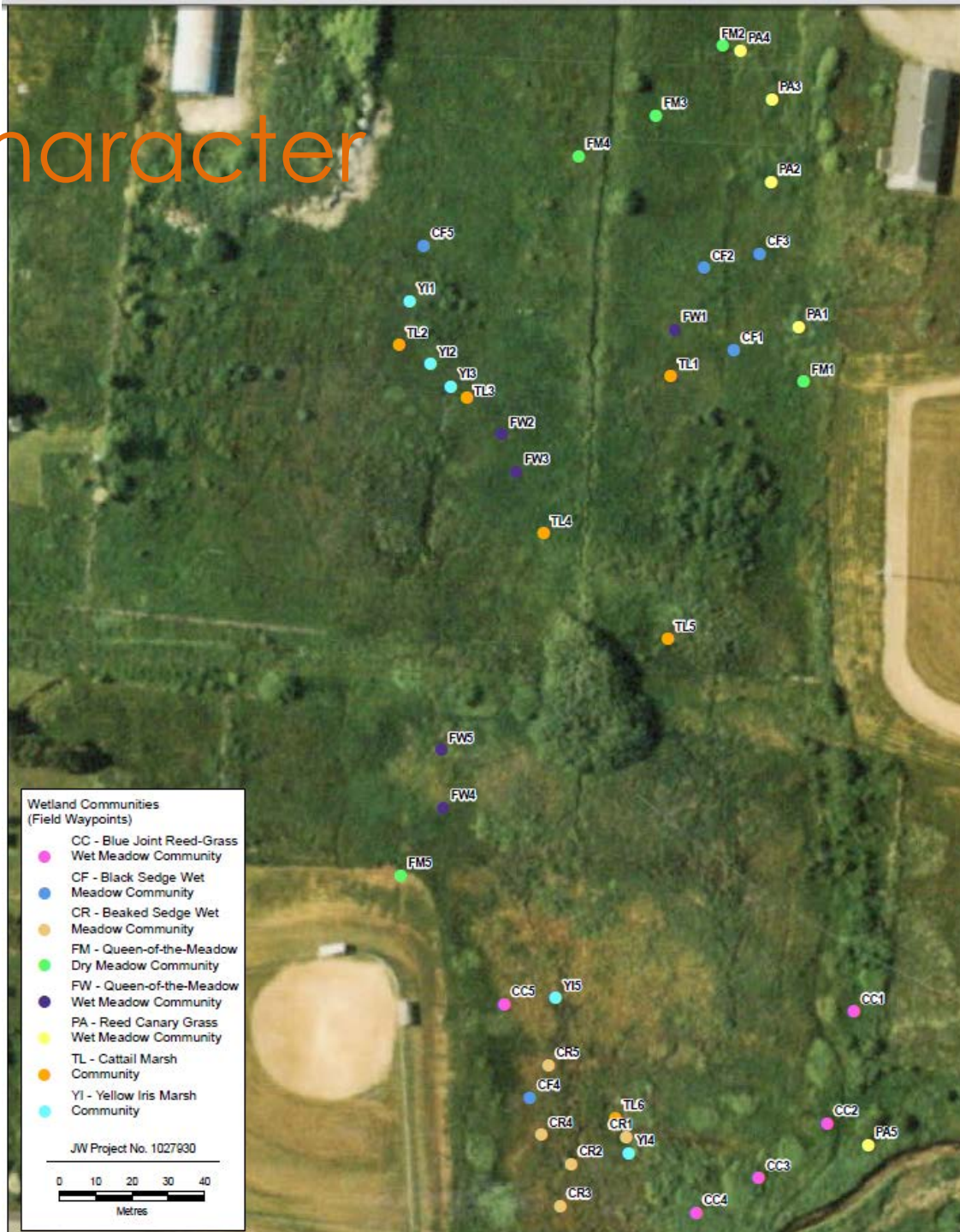
2009


Jacques Whitford

Ecological Character

Eight wetland communities identified, two thicket communities

- Cattail Marsh
- Yellow Iris Marsh
- Black Sedge Wet Meadow
- Beaked Sedge Meadow
- Blue-Joint Reedgrass Wet Meadow
- Queen-of-the-Meadow Dry Meadow and Wet Meadow
- Reed Canary Grass Wet Meadow
- Alder Thicket
- Willow Thicket



Ecological Character

Highly disturbed; >50% non-native/non-wetland species

- queen-of-the-meadow (*Filipendula ulmaria*)
- yellow iris (*Iris pseudacorus)*
- Kentucky bluegrass (*Poa pratensis)*
- Reed canary grass (*Phalaris arundinacea)* and other grasses…
- Tufted vetch (*Vicia cracca)*

Identified desirable communities, evaluated soil and hydro indicators

Identified preliminary restoration goals

- based on desirable community structure within or between the ten identified communities

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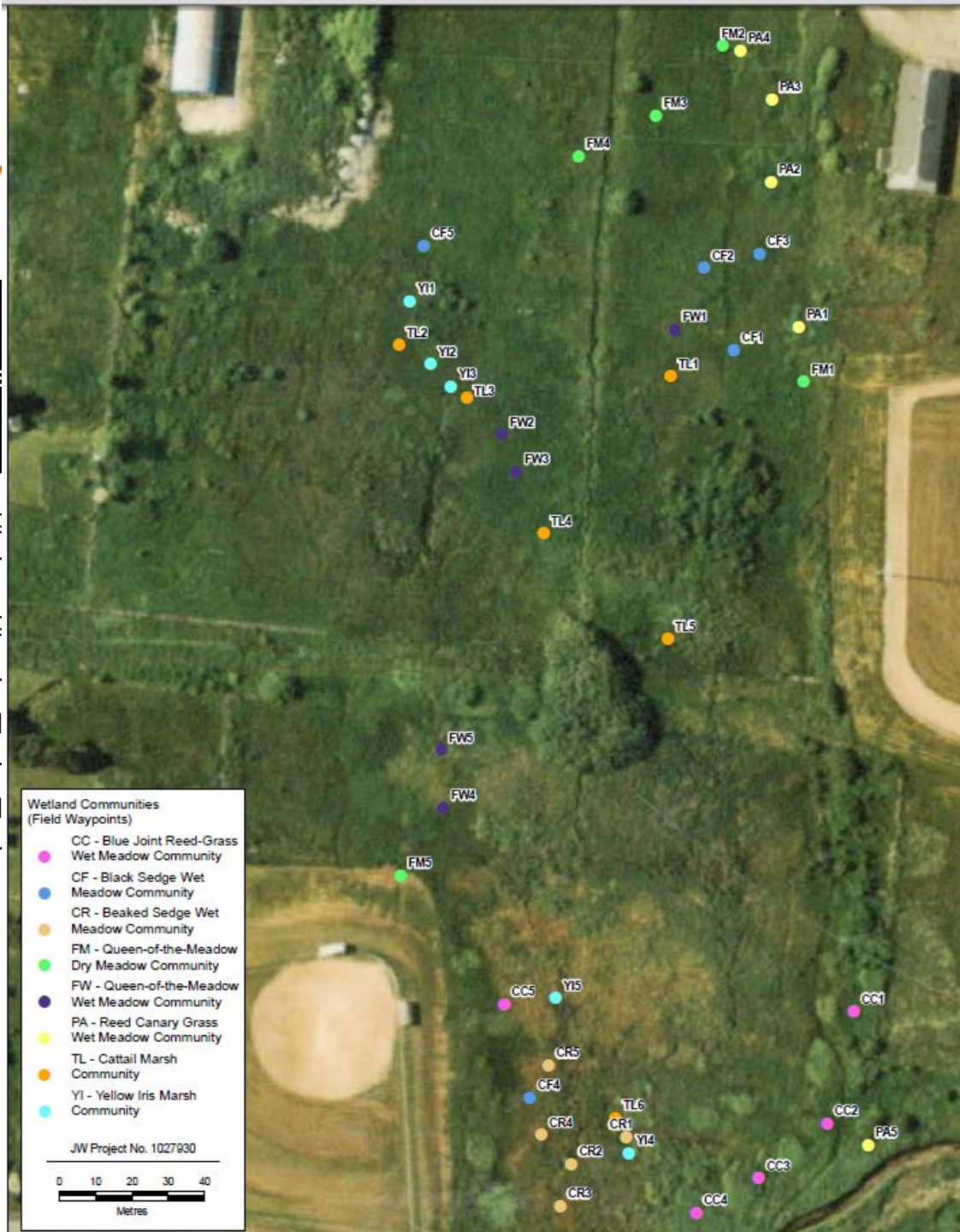
Undist

- 0.1 – 0.7 m m
  - (10 – 40
- 0.04 – 0.1 m
  - Confini
- Underlain by
  - extrem
  - High k

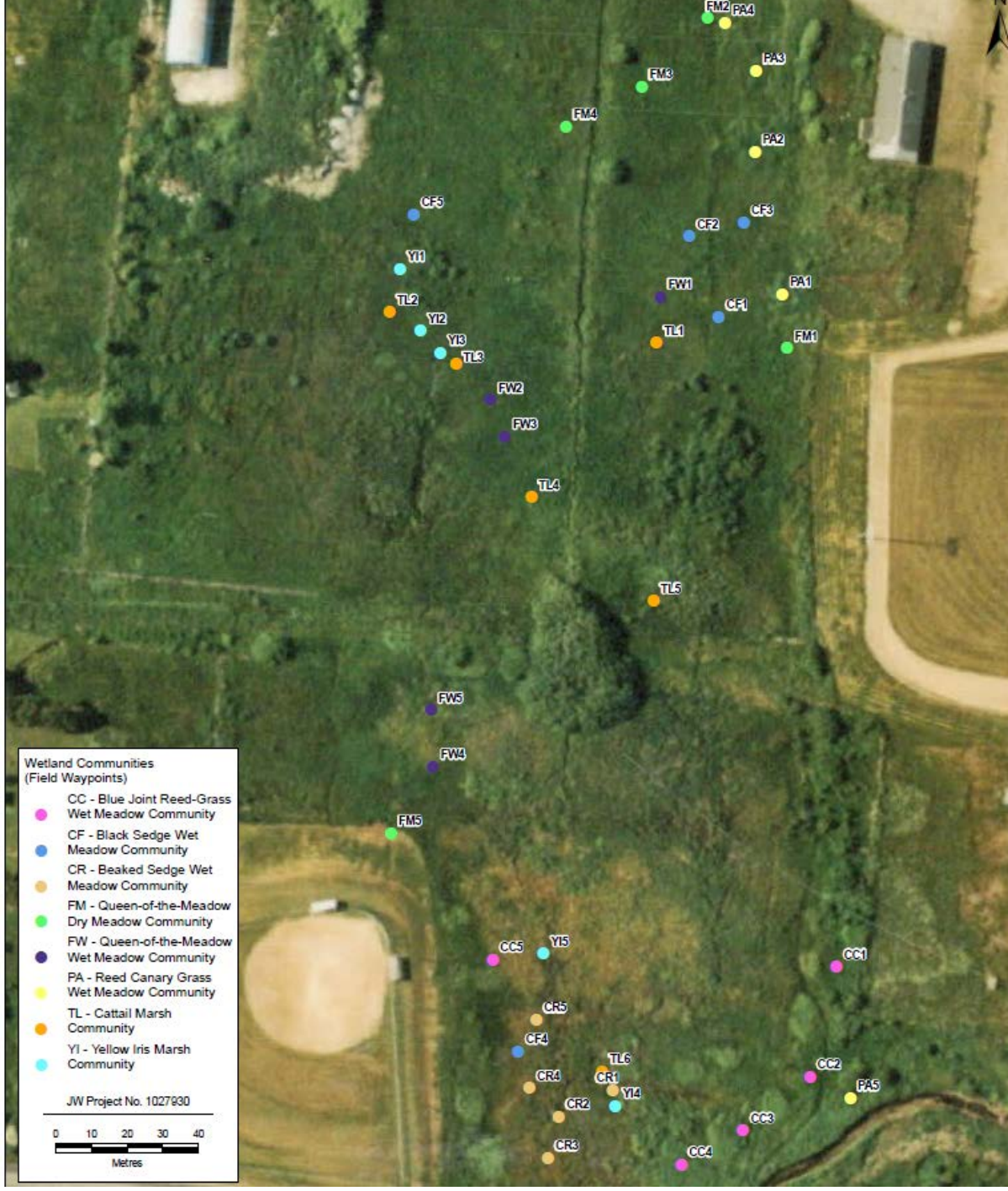
Summary of Con

Community Name	E
Beaked Sedge Meadow	Scatterin
Blue-Joint Reedgrass Wet Meadow	Scatterin
Alder Thicket	Song bird
Willow Thicket	Song bird



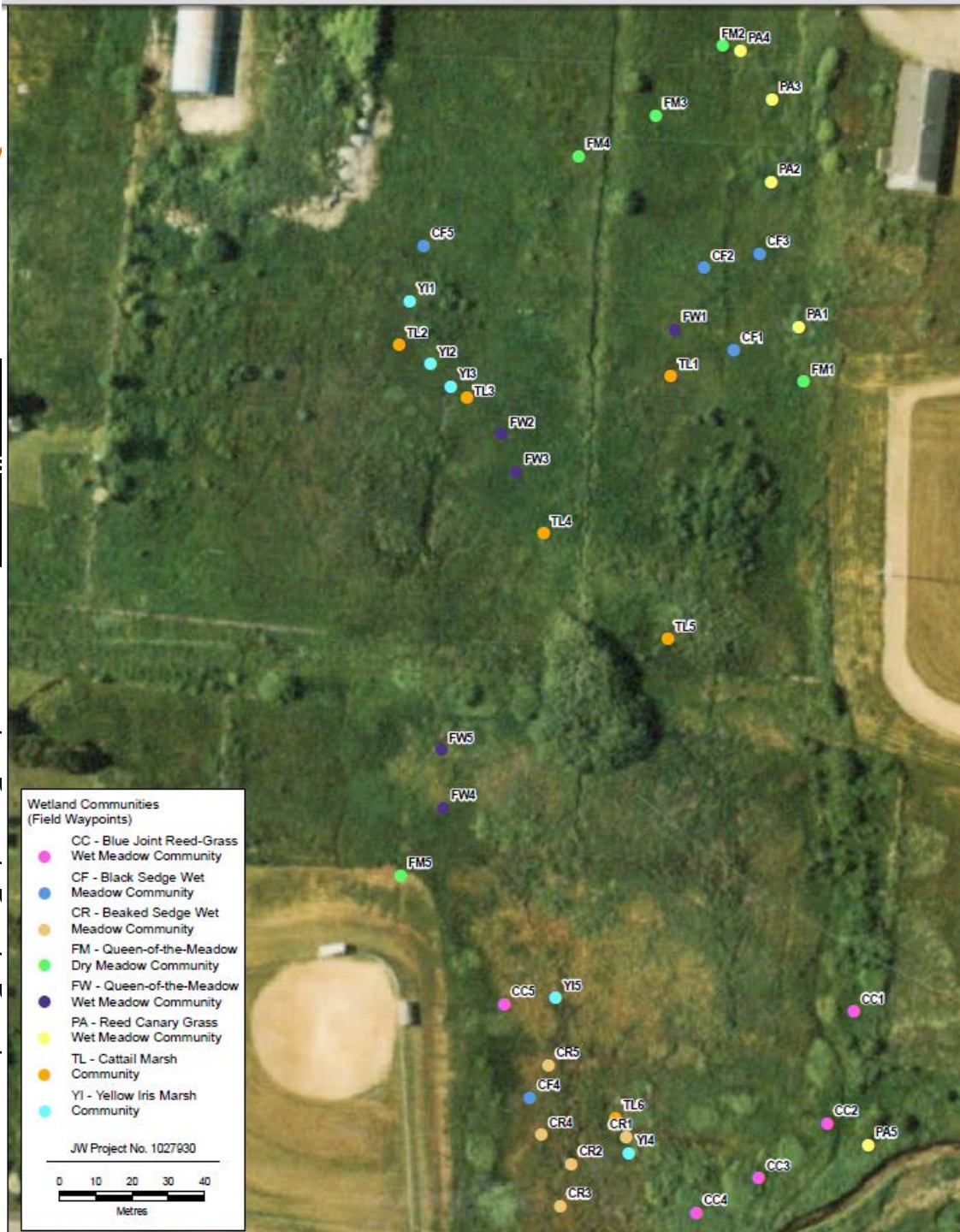
Summary of Co

Community Name	Ecology
Cattail Marsh	High occurre of exotics.
Black Sedge Wet Meadow	High occurre of exotics.



Summary of Com

Community Name	E
Yellow Iris Marsh	Yellow iris
Queen-of-the-Meadow Dry Meadow	High occu exotics.
Queen-of-the-Meadow Wet Meadow	High occu exotics.
Reed Canary Grass Wet Meadow	High occu exotics.



Compensation Plan

Identify causes of degradation

Propose measures to reverse degradation

Enhance existing value

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Causes of Degradation

History of Agriculture

- Drainage enhancement
- Disturbance ecology and species introductions

Urbanized watershed

- Flashy stormwater inputs
- Changes to local groundwater recharge

Ongoing dredging of western channel

- Ongoing local disturbance
- "Pulling the plug" from the bathtub

Existing Values

- Flooding issues
- Existing use

Stormwater Management

- Willow Flycatcher
- Northern Cardinal

Songbirds in the thickets

- Black Duck
- Canada Goose

Fly-over waterfowl

- Urban wetland
- Within an existing recreational area
- New highschool construction on adjacent property

Education and recreation

Compensation Goals: Priorities

NSE / DNR's	• Functional enhancement (not restoration) • Improve "health" and "quality" • Enhance existing value (e.g. open water for waterfowl)
Town of Yarmouth	• Educational / infrastructure enhancement • Active transportation; link high school with residential • Stormwater issues / ditch maintenance
TREPA	• Educational / infrastructure enhancement • Watershed health
Wal-Mart	• Environment • Public Relations • Costs

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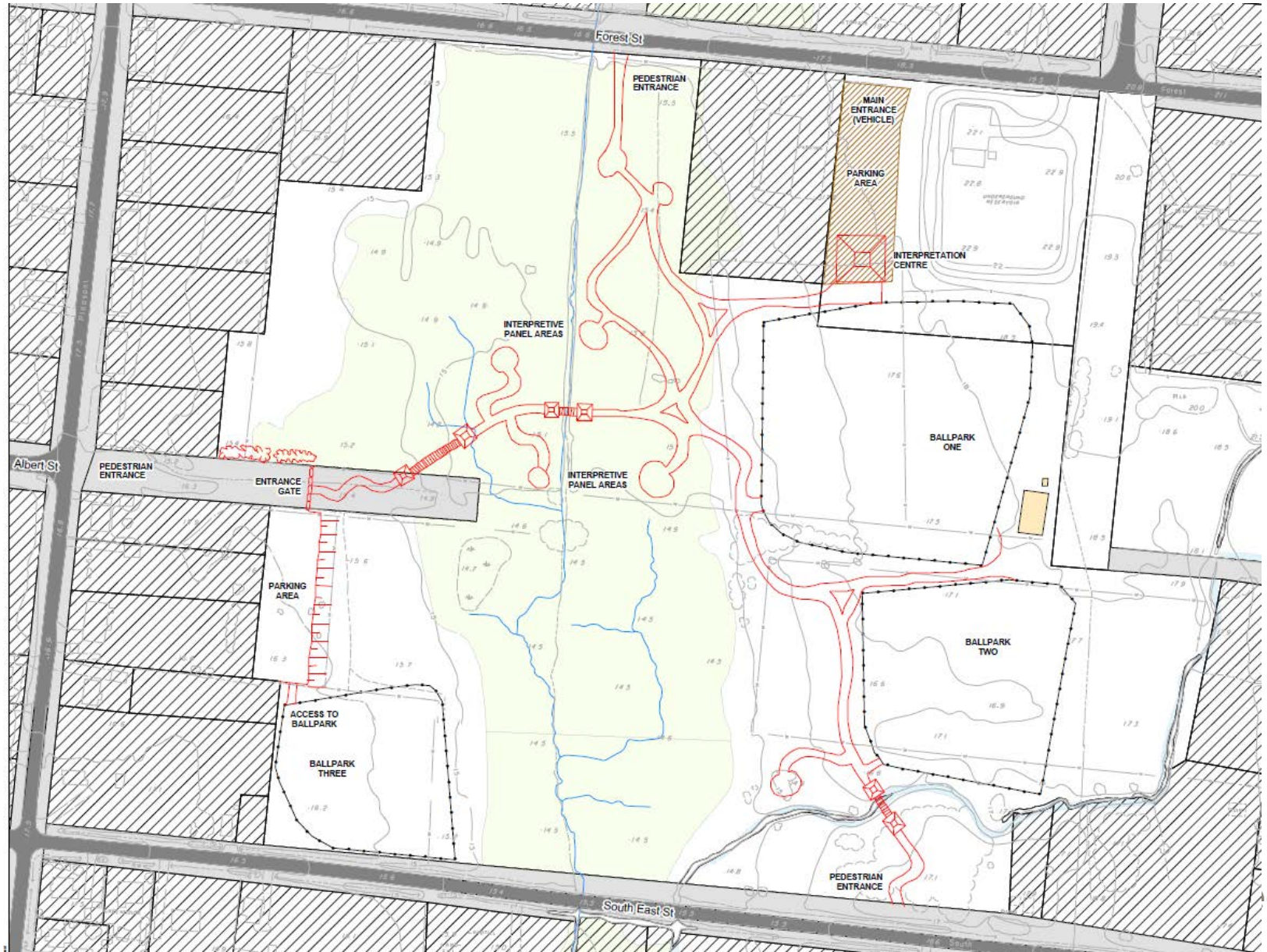
Town of Yarmouth's "Ask"



Compensation Goals

Reduction of non-native, non-wetland species through hydrological modifications, planting and mechanical removal

- Confirmed through repetition of baseline vegetation plots

Provide suitable habitat for waterfowl through plantings and open water creation

- Post Const. habitat suitability assessment
- Indirect evidence of use of ponds by waterfowl, chance sightings during monitoring events, reported sightings by park users

Provide additional songbird habitat through shrub planting

- Chance sightings during monitoring events, reported sightings by park users

Provide trail system to link into Town's active commuting network

Provide opportunities for wetland education by the installation of interpretive signs


WESTERN ENHANCEMENT AREA
NORTH POND
WEST POND
BOTTOM OF POND EL=13.6
SOUTH POND
SOUTHERN ENHANCEMENT AREA
INTERPRETIVE AREA
EXISTING PUBLIC ACCESS AREA
BLEND TRAIL TO EXISTING GROUND ELEVATION
BERM WITH TRAIL TOP EL. 15.7m (SEE DETAIL)
BERM WITH TRAIL (SEE DETAIL)
PROPOSED WATERWAY
INVERT OF WATER WAY =14.6m
SILT FENCE
250mm HDPE CORRUGATED CULVERT
PROPOSED STONE DUST TRAIL
8m LONG CULVERT EXTENSION
EX. 900mmø CULVERT INV=14.37
SOUTH EAST STREET
BROAD BROOK
GEND
EXISTING GROUND CONTOUR (m)


Forest St
Forest St
Clements Ave
Pleasant St
Broad Brook
Wetland Park
Google says it's a place!!
Google
Imagery ©2014 DigitalGlobe, Map data ©2014 Google
Terms
Privacy
Report a pr

Results

Confirming we're on track to achieving our goals

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Provide trail system to link into Town's active commuting network

Provide suitable habitat for waterfowl through plantings and open water creation

Waterfowl Habitat Assessment
- needs additional planting ✓

Provide opportunities for wetland education by the installation of interpretive signs ✓

Reduction of non-native, non-wetland species through hydrological modifications

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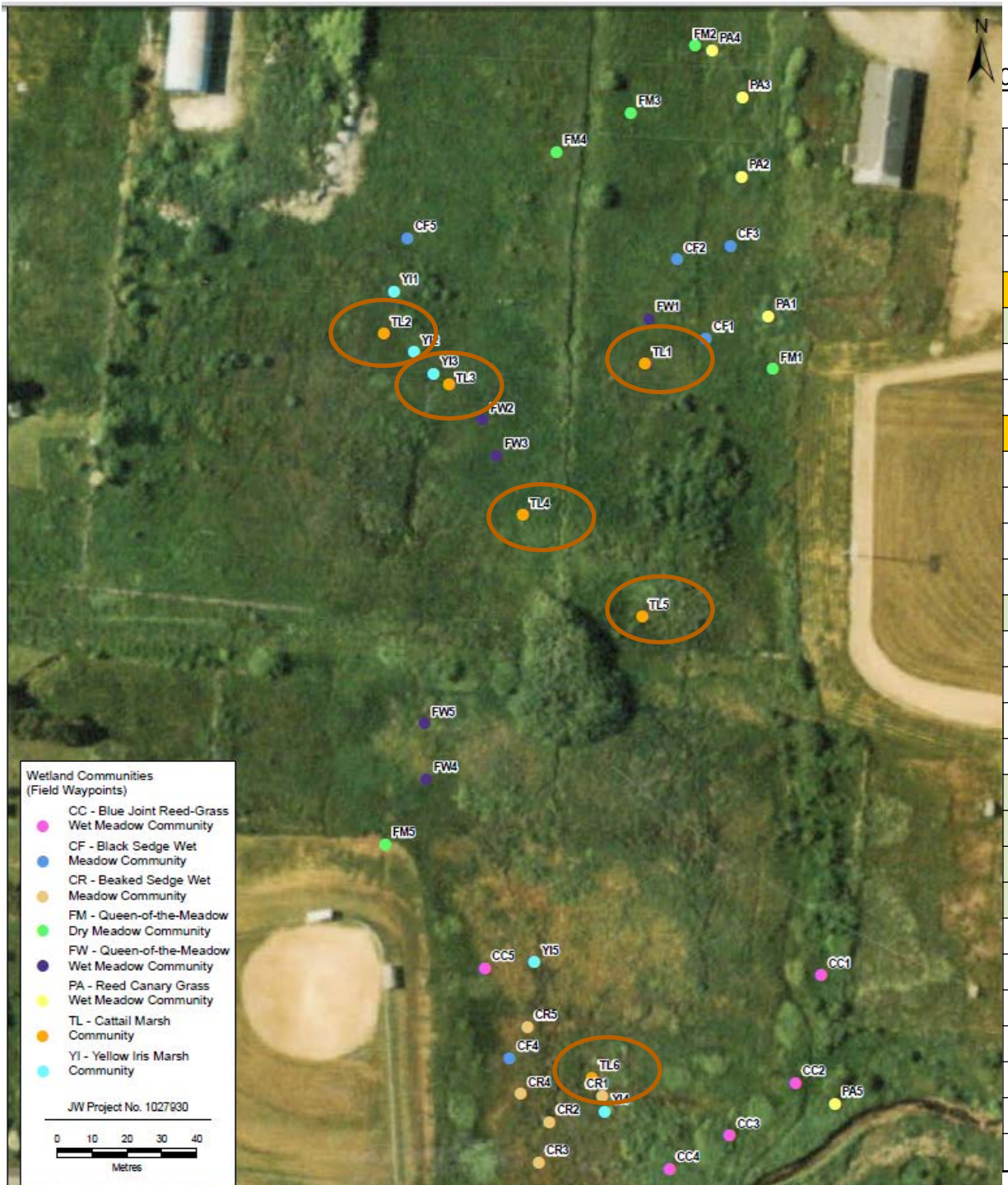
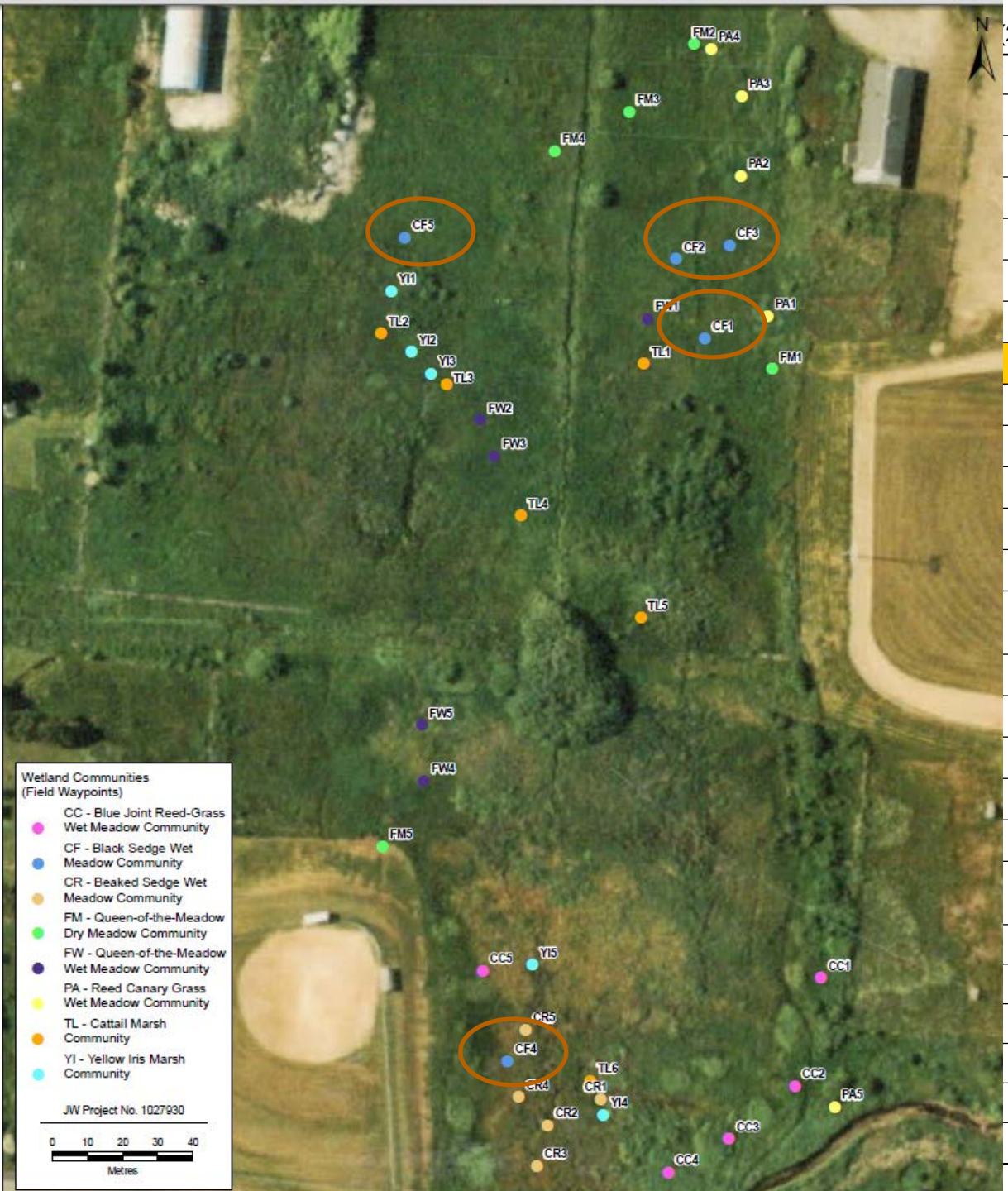


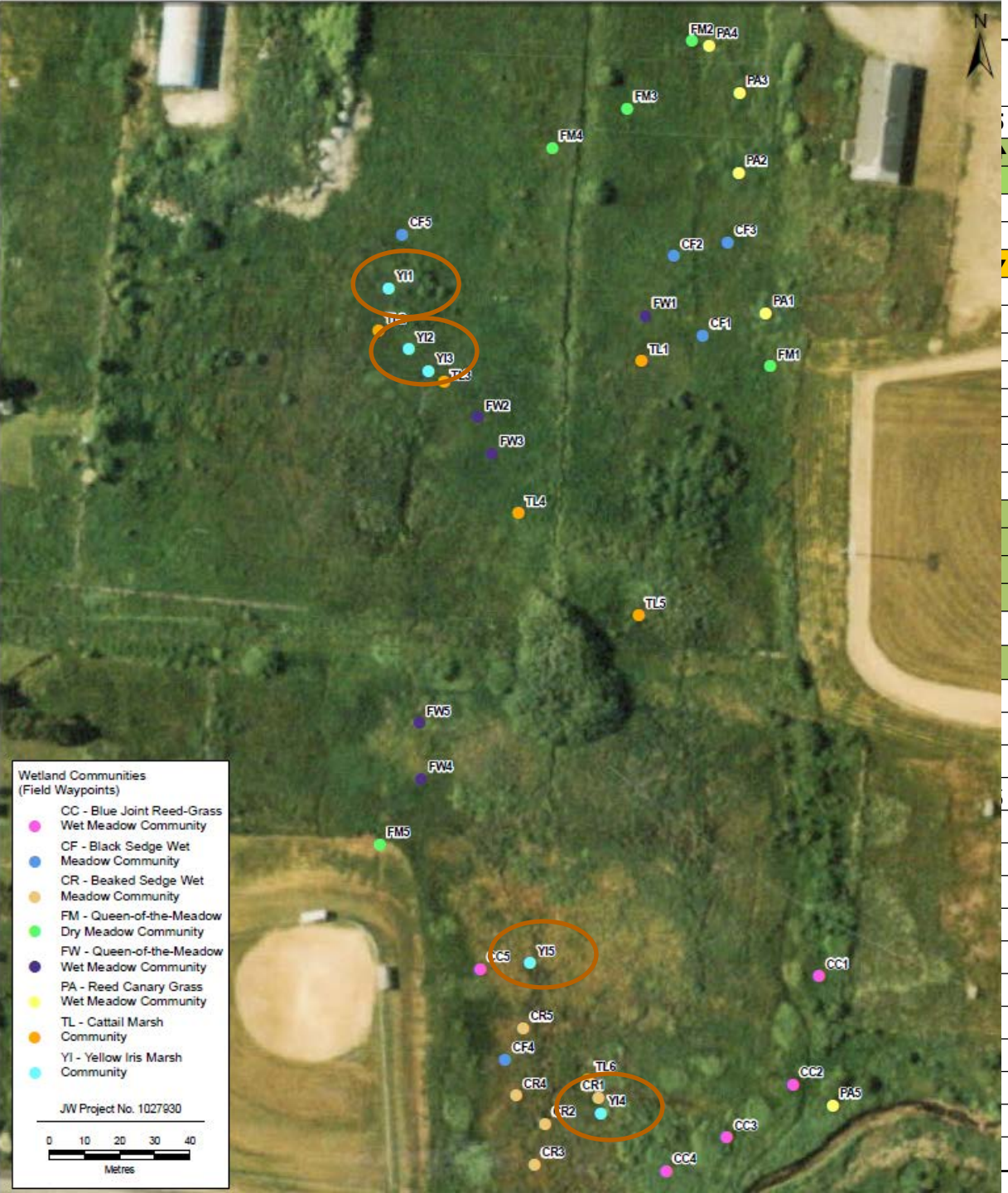
007, 2013 and 2014).

2013 Cover (%)					2014 Cover (%)					
TL2	TL3	TL4	TL5	TL6	TL1	TL2	TL3	TL4	TL5	TL6
0	0	0	0	0	0	0	0	0	0	0
0	0	2	0	2	0	0	0	2	0	1
20	30	30	25	0	50	40	60	60	8	0
0	0	0	0	0	0	0	0	0	0	0
0.5	0	1	3	15	0	0	0	0.5	4	15
0	0	0	1	0	0	0	0	0	5	0
0	0	0	0	0	0	0	0	0	0	0
0.5	0	0	0	25	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0.5	0	0	0	5	0
0	0	1	0	0	0	0	0	5	0	0
0	0	0	2	1	0.5	0	0	0	3	0
0	0	0	0	25	0	0	0	0	0	25
0	0	0	2	0	0	0	0	0	6	0
0	0	0	1	0	8	0	0	0	20	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	2	0.5	0	0	0	1	3
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	2	0	0	0	0	0	1
0	0	0	0	0.5	0	0	0	0	0	0.5
-	-	-	-	-	0	0.5	0.5	0.5	0	0
-	-	-	-	-	0	0	0	0	2	0.5
-	-	-	-	-	0	0	0	0	0	0.5
-	-	-	-	-	0	0	0	0	0	0.5
-	-	-	-	-	0	0	0	0	0	0.5

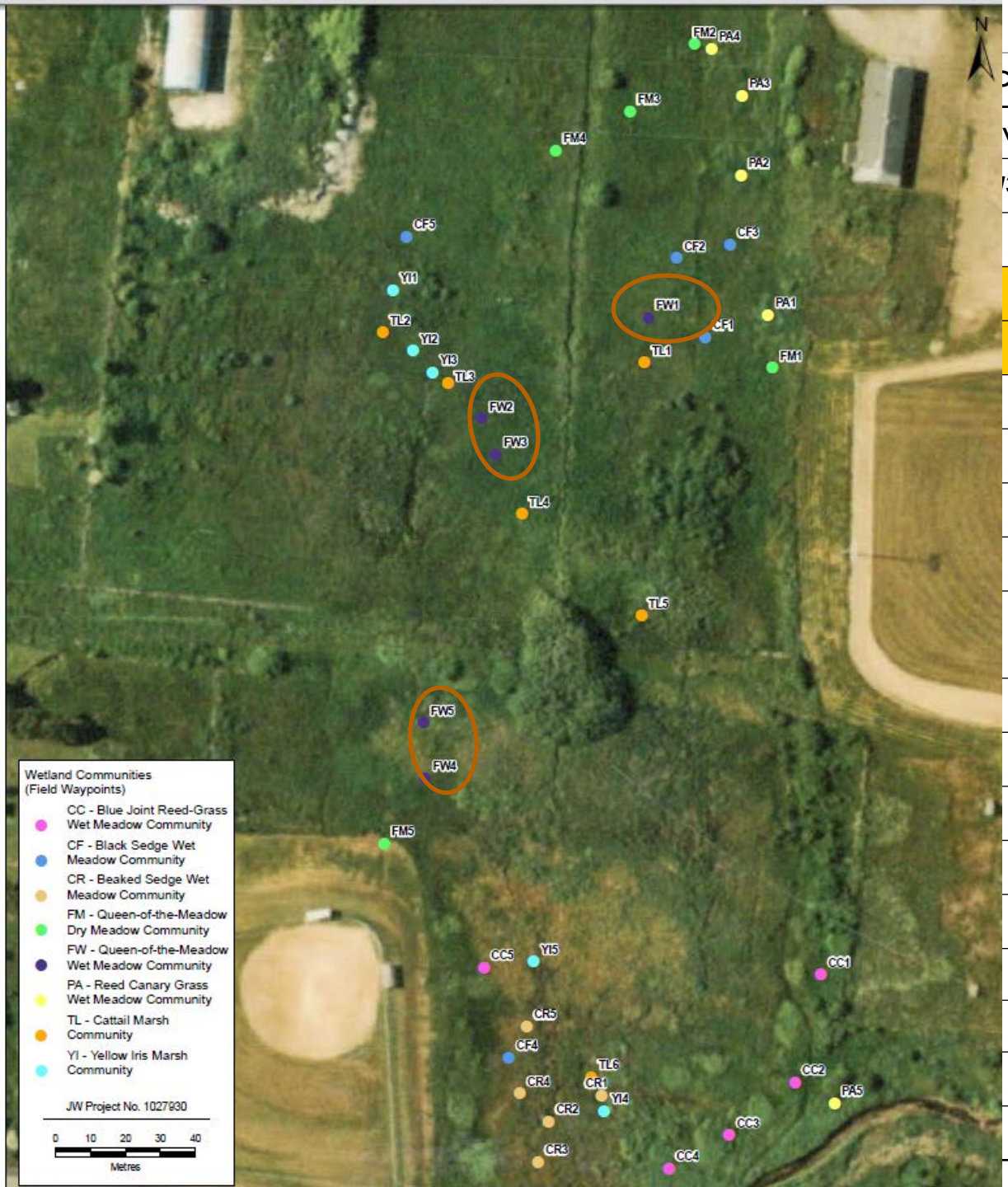


(2007, 2013 and 2014).

2013 Cover (%)				2014 Cover (%)				
CF2	CF3	CF4	CF5	CF1	CF2	CF3	CF4	CF5
2	2	4	0	1	2	0.5	5	0
0	0	5	0	20	0	0	5	0
0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0
50	80	80	2	60	80	80	80	6
50	5	0	0	10	50	3	0	0
0	0	0	0	0	0	1	0	0
0	0	0.5	0	0.5	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0.5	0	0	0	0
0	1	0	0	0	0	1	0	0
0	15	0	0	0	0	6	0.5	0
0.5	2	0	0	0	0	0.5	0	0
0	0	3	0	0	0	0	0	0
0	0	4	0	0	0	0	3	0
0	0	2	0	0	0	0	1	0
1	0	1	0	2	3	0	0.5	0
0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0
0	0	5	0	0	0	0	3	0
0	0	0	0	1	0	0	0	0
-	-	-	-	2	0	0	0	0
-	-	-	-	0	0	0	0.5	0
-	-	-	-	0	0	0	0.5	0



	2013 Cover (%)					2014 Cover (%)				
	YI1	YI2	YI3	YI4	YI5	YI1	YI2	YI3	YI4	YI5
	0.5	0	0	12	10	0	0	0	10	5
	0	0	0	0	0	0	0	0	0	0
	1	1	0	0	0	1	1	0	0	0
	0	0	0	0	5	0	0	0	0	2
	12	40	20	60	30	10	20	20	50	30
	0	0	0	0	1	0	0	0	0	1
	0	0	0	1	10	0	0	0	1	10
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.5	1	0	0	0	0.5	2
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	1	2	0	0	0	0.5	2
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0.5	0	0	0	0	0.5	0
	0	0	0	0.5	2	0	0	0	0.5	3
	0	0	0	0	0	0	0	0	0.5	0
	0	0	0	0.5	10	0	0	0	0.5	10
	0	0	0	0.5	0	0	0	0	0	0
	0	0	0	0	5	0	0	0	0	0
	0	0	0	0	0.5	0	0	0	0	1
	0	0	0	0	1	0	0	0	0	1
	0	0	0	0.5	2	0	0	0	0.5	2
	0	0	0	15	1	0	0	0	30	2
	0	0	0	0	15	0	0	0	0	15
	0	0	0	1	0	0	0	0	1	0
	0	0	0	0.5	0	0	0	0	0.5	0
	15	1	15	0	0	40	20	20	0	0
	-	-	-	-	-	0.5	0.5	0.5	0	0
	-	-	-	-	-	0	0	0	0	1
	-	-	-	-	-	0	0	0	0	3
	-	-	-	-	-	0	0	0	0	0.5
	-	-	-	-	-	0	0	0	0	0.5
	-	-	-	-	-	0	0	0	0.5	0



Community (2007, 2013 and 2014).

ver (%)			2014 Cover (%)				
/3	FW4	FW5	FW1	FW2	FW3	FW4	FW5
	0.5	0	0	0	0	0.5	0
	1	0	0	0	0	1	0
	85	95	85	0	0	90	95
	0	0	0.5	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0.5	0	0	0	0	1	0
	8	2	0	0	0	6	5
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0.5	0	0	0	0	0.5	0
	4	12	0	60	50	4	3
	0	0	0	0.5	0	0	0
	1	7	0	0	0	0	0
	-	-	0.5	0	0	0	0

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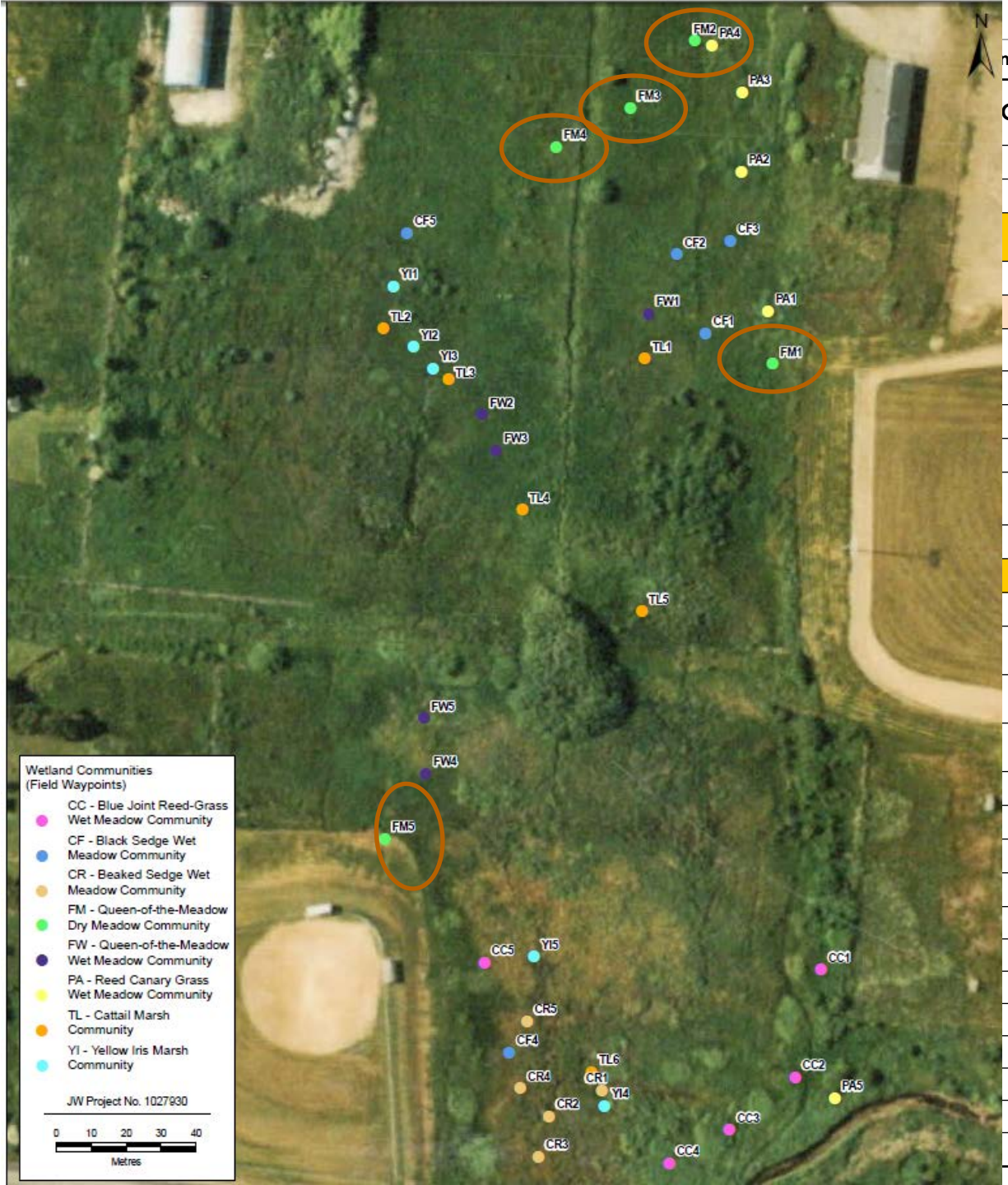
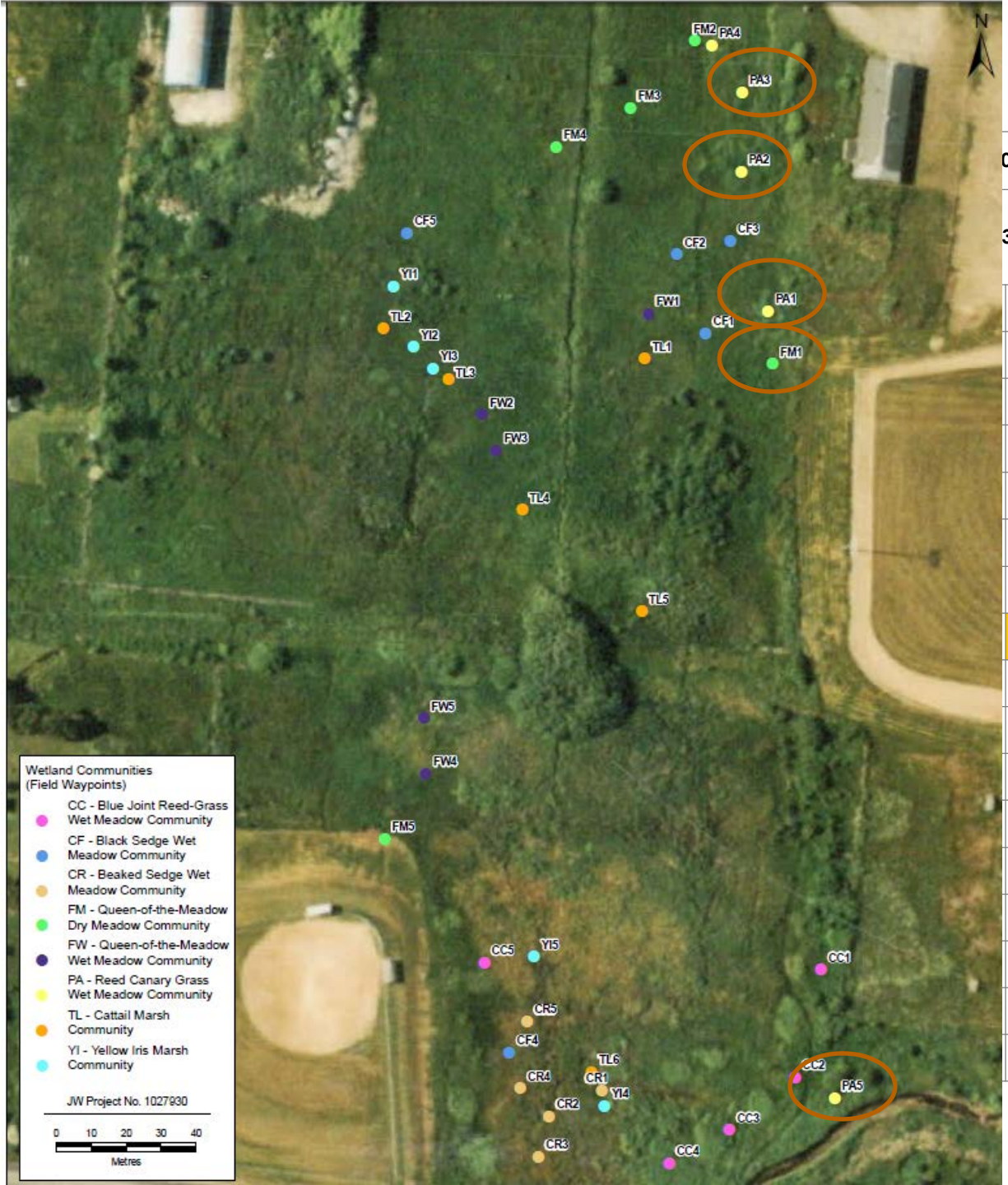


nd 2014).

Cover (%)			2014 Cover (%)				
FM3	FM4	FM5[1]	FM1	FM2	FM3	FM4	FM5
0	0	0	1	0	0	0	0
0	0	0	0	0.5	0	0	0
0	0	1	2	0	0	0	1
90	90	85	85	85	85	90	90
0	0	0	1	0	0	0	5
0	0	15	0	0.5	0	0	15
0	0	0	0	0.5	0	0	0
0	10	0	10	3	0.5	10	0
0	0	0	2	2	0	0	0
0	0	1	0	2	2	0	1
0.5	0	0	0	3	0	0	0
0	3	0	0	0	0	4	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0.5
0	0	0.5	0	0	0	0	0.5
0	0	0	0	0	0	0	0
0	3	0	0	0	0	0	0
0	2	0	0	0	0	2	0
0	0	0.5	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0.5	0	0	0	0	0.5
0	0	2	0	0	0	0	0
-	-	-	0	4	0	0	0
-	-	-	0	0	0	0	1



07, 2013 and 2014).

3 Cover (%)			2014 Cover (%)				
PA3	PA4	PA5	PA1	PA2	PA3	PA4	PA5
0	0	7	5	0	0	0	2
0	0	3	10	0	0	0	0
0	0	0	2	0	0	0	0
35	80	90	60	85	35	70	80
2	1	0	2	0.5	2	2	0
0	0	0	4	0	0	0	0
1	8	0	1	2	1	12	0
10	5	0	4	0.5	15	5	0
30	0	5	0	5	30	0	5
0	0	0	0.5	0	0	0	0
0	3	0	20	0	0.5	2	0
0	1	3	0	0	0	10	20
0	0.5	0	0	0	0	2	0
30	5	0	0	0	40	5	0
0	0	0	2	3	0	0	0
-	-	-	0	0	0	3	0

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Two Year Monitoring Summary

- Communities in the north achieving objectives generally
  - Reduction in upland and invasive
  - Increase in desirable diversity not really happening
- Invasives continue to spread in south
  - Yellow Iris

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Reduction of non-native, non-wetland species through planting and mechanical removal

Provide additional songbird habitat through shrub planting

Check back on this in 2015

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Questions?

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