

RHODE ISLAND
REGULATORY WETLAND PILOT DEMONSTRATION GRANT
PROTECTING VERNAL POOLS: MAPPING & LINKAGES TO STATE
AND LOCAL REGULATIONS

Expanded Work Plan for EPA QAPP Review

March 2008

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1. INTRODUCTION

In recent years there has been increasing interest in isolated wetlands, which often provide important hydrological, biological, and ecosystem functions that are increasingly at risk from urbanization and human disturbance. Vernal pools are a type of isolated wetland in New England that are of conservation concern because of their importance as critical habitat for a variety of vertebrates and invertebrates. Vernal pools are especially vulnerable to human disturbance. The same characteristics that make vernal pools valuable breeding sites for certain species increases the possibility of disturbance or destruction. These valuable wetlands are increasing at-risk as a result of their small size, isolated nature, and seasonal drying, which may make them difficult to identify at certain times of the year.

Identification and documentation of viable vernal pools is a critical first step in developing appropriate resource management and protection protocol. This project will build on prior work including the mapping of 1,400 potential vernal pools in southern Rhode Island by The Nature Conservancy (TNC 2003) and the University of Rhode Island (URI), and the recent work undertaken in the Queen's River Watershed (Mitchell et al. 2007). RIDEM will initially focus the project in southern Rhode Island where the map of *potential* vernal pools has already been generated. While this map has value, further field verification is needed in order to produce a map of confirmed vernal pools. The need for improved maps to support decision-making is evident in the recent work completed in the Queen's River Watershed. Using the existing map of potential pools, URI found that after field inspections of 135 potential vernal pools mapped, 95 were confirmed and 40, or about 29%, were found to be non-existent or not viable as vernal pools. This degree of uncertainty in the existence of a pool limits the application of the map conservation agencies and decision-makers.

The project consists of consolidating all prior mapping and field investigations of vernal pools in the Wood-Pawcatuck Watershed into one single GIS coverage. Pools which have already been assessed in the field (see Appendix 1a) will be labeled as previously confirmed and their status will be updated to either "positive confirmation" or "negative confirmation". A subset of study sites will be selected from the remaining unconfirmed or "potential pools" and field assessment will be conducted this spring in order to continue to update the status of pools in the watershed coverage. Pools will be confirmed based on indicators of ecological functionality which can be observed in the field.

2. KEY OBJECTIVES, OUTCOMES, AND PRODUCTS

Objectives – The overall objective of this project is to field verify and map sites which have been previously identified as potential vernal pools. The project will produce an updated GIS layer for the Wood-Pawcatuck Watershed showing the location and status of both confirmed and potential vernal pools. This geo-referenced information will be transferred to other interested parties and will also provide a baseline from which to evaluate whether local and state decision-making with respect to land development improve protection of these vulnerable

wetlands; e.g. upland buffer remains intact. Proper identification of viable vernal pools is essential to fostering effective protection of sufficient upland buffer to preserve their value as amphibian and reptile habitat.

In order to accomplish the overall objective this project will:

- Consolidate existing information about vernal pool status in the Wood-Pawcatuck watershed, into one dataset including creating unique identifiers for each pool.
- Prioritize potential vernal pool sites for field assessment from the subset of unconfirmed potential pools.
- Use data collected during site visits to update the status of unconfirmed potential pools.

Outcomes

The outcome will be an improved mapping coverage for vernal pools for a portion of the state that is intended to facilitate protection of these vulnerable wetlands.

Products – The major products will include

- An updated GIS database of vernal pools in the Wood-Pawcatuck Watershed, including data on attributes such as the type and level of field assessment conducted and unique identifiers for each pool in the watershed.
- A final report summarizing the results of the field assessment, including the updated status of vernal pools in the watershed and the overall effectiveness of the rapid assessment methodology, lessons learned and recommendations.

3. PROJECT TASKS AND ENVIRONMENTAL OUTCOMES

This project will involve the use of new and existing data obtained in the field and through GIS analyses. Prioritization of sites for inspection will focus on potential pools with likely conservation value by analyzing landscape characteristics such as surrounding land use and forest cover. Positive confirmation will be based primarily on the presence of obligate vernal pool species and negative confirmation will be based primarily on the evidence of a sustainable fish population. Supplementary observational data relating to pool and landscape characteristics and presence of potential stressors will also be gathered as possible within the time constraints of the field season for the purposes of descriptive reporting. Pools status will be updated in the GIS data layer and results will be shared with interested parties.

The basic tasks to be performed by RIDEM and NEIWPC are as follows, in rough chronological order

- Acquire TNC dataset of potential pools and all additional datasets of vernal pool location/status in the Wood-Pawcatuck watershed.

- Meet with members of the scientific community who have conducted prior field research on vernal pools to determine the location and status of pools which have been previously assessed in the field.
- Resolve conflicts in feature identification by creating a Unique ID for each pool in the watershed.
- Determine criteria for defining a pool as “confirmed or unconfirmed.”
- Determine criteria for defining a confirmed pool as “positive” or “negative”.
- Update status of all pools confirmed in the field by previous studies to either “positive” or “negative”. (See Appendix 1a.)
- Develop a strategy for selecting unconfirmed pools for field assessment.
- Conduct landscape level analysis for all unconfirmed pools to prioritize pools for field assessment. The analysis includes measurements of forest cover and developed land within buffers surrounding each pool. (See Appendix 1b.)
- Refine site selection by prioritizing pools on private (unprotected) land and those pools which are isolated from wetland complexes. Pools more readily accessible due to proximity to roads/trails and clusters of pools will receive higher priority due to time constraints of the field season. (See Appendix 2.)
- Extract plat/lot information for each pool from municipal assessors’ maps and generate a list of landowners who may need to be contacted for site access permission. (See Appendix 3.)
- Develop protocol for collaboration with the Wood-Pawcatuck Watershed Association (WPWA) for their use of volunteers to assist the WPWA with field inspections. (See Appendix 4.)
- Prepare field inspection protocol and field data sheet to be used by all field personnel including mandatory data collection for verification according to this project and supplemental optional data collection for general information purposes. (See Appendix 5.)
- Recruit and train project staff from DEM Office of Water Resources, Office of Compliance and Inspection and other professional agencies for vernal pool assessment data collection
- RIDEM staff performs field inspections using “knock on door” approach and the RIDEM Administrative Inspection Guidelines for Warrantless Inspections.
- Record required data (presence of egg masses and indicator species) in all study pools as well as other supplementary observational data for site characterization during the spring of 2008.

- Determine updated status of study pools based on presence/absence of indicator species and update the status in GIS data layer.
- Produce final GIS product and metadata.
- Produce final project report.

4. TRANSFER OF PROJECT RESULTS

NEIWPC environmental analyst at RIDEM will summarize project results in reports and mapping products that will be made available on the web. Agencies and organizations that are likely to find these results especially useful include: DEM Wetland Programs, DEM Planning and Development Land Acquisition Program, DEM Division of Fish and Wildlife, DEM Division of Forest Environment, US Fish and Wildlife Service, Natural Resource Conservation Service, RI Chapter of The Nature Conservancy, Audubon Society of RI, RI Natural History Survey, Wood-Pawcatuck Watershed Association, South County Conservancy, municipal land trusts, and local conservation organizations throughout the watershed.

5. PROJECT EVALUATION

The project will produce an updated GIS coverage of potential and confirmed vernal pools throughout the Wood-Pawcatuck Watershed. Proposed performance measures for this project include:

- Number of pools visited in the field by RIDEM and NEIWPC (effectiveness of access).
- Number of pools classified as confirmed via field assessment by RIDEM and NEIWPC (effectiveness of field methods).
- Acres of open space acquired over time within specified buffer distances of confirmed pools.

6. TIMELINE

The project described was initiated in June 2007 and the methods described herein will take approximately one year to complete. Refer to tasks above for the estimated schedule of work.

- *July-August:* Data acquisition, ID conflict resolution, determination of confirmation criteria, status update for previously confirmed pools.
- *September-October:* Development of strategy for site prioritization, initial buffer analysis.
- *November-December:* Site selection and prioritization, WPWA collaboration protocol, development of field data collection methodology.
- *January-February:* Plat/lot and landowner information, development of field protocol and data sheet, train WPWA in field protocol and data sheet.

- *March-April:* Field data collection.
- *May-June:* Data entry and analysis, determine updated pool status, production of final GIS product and report.

Work may continue into Year 3 regarding verification and confirmation of vernal pools.

7. ROLES AND RESPONSIBILITIES/DISTRIBUTION LIST

DEM Office of Water Resources will be the lead agency on this project. RIDEM will collaborate with NEIWPCC, which will provide technical staff support to develop and implement the project with DEM field biologists.

- Susan Kiernan, RIDEM – responsible for contract and grant management and project oversight.
- Carol Murphy, RIDEM – responsible for project oversight, supervision of NEIWPCC staff, and general project direction.
- Erica Sachs, NEIWPCC – responsible for project development and implementation including office and field data collection, GIS analysis and product production, and report writing.
- Kerry Strout, NEIWPCC – coordinates with RIDEM for NEIWPCC contract support.
- Matt Schweisberg, EPA – project manager, primary EPA contact.
- Peter Holmes, EPA – RI state wetland program coordinator.
- Steve DiMattei, EPA – reviews QAPP to ensure compliance with EPA requirements.
- Thomas Getz, RIDEM – reviews QAPP to ensure compliance with RIDEM requirements.

8. DOCUMENTS AND RECORDS

Report format/information.

The format for all data reporting packages will be consistent with the requirements and procedures used for data validation and data assessment described in this QAPP.

Document/record control.

The recording media for the project will be both paper and electronic, with photographs (Digital Photograph Record Collection and Storage SOP, SOP-OD-QM-4) also to be used. The project will implement proper document control procedures for both, consistent with RIDEM's Quality Management Plan. For instance, hand-recorded data records will be taken with indelible ink, and changes to such data records will be made by drawing a single line through the error with an initial by the responsible person. The Project Manager will have ultimate responsibility for any and all changes to records and documents. Similar controls will be put in place for electronic records.

The RIDEM Quality Assurance Manager shall retain all updated versions of the QAPP and be responsible for distribution of the current version of the QAPP. The RIDEM Quality Assurance Manager and the RIDEM Project Manager will approve annual updates. The Project Manager shall retain copies of all management reports, memoranda, and all correspondence between the Rhode Island Department of Environmental Management and all project personnel identified in section 7.

Other records/documents.

Other records and documents that will be produced or adapted in conjunction with this project include:

- Flowchart depicted site selection and confirmation process
- Wood-Pawcatuck vernal pool field data form (4 pp.)
- Instructions for filling out the data form (7 pp.)
- Field Instructions including Field checklist and Tips for visits, etc.
- Outreach materials, including brochures, etc.
- Excel spreadsheet of parcel data and property owner records and contact information (where available) for vernal pool sites
- QAPP
- Quarterly and annual progress reports to EPA
- Maps (both for use in the field and final map product)
- Updated GIS shapefile (and metadata) of potential and confirmed vernal pools in the Wood-Pawcatuck watershed
- Project final report (to include discussion of QA issues encountered, and how they were resolved)

Storage of project information.

Files, paper and electronic records, and other media such as photographs will be maintained in the DEM Office of Water Resources for a minimum of three (3) years after the completion of the grant (June 30, 2009). After 2012, some records may be moved to the DEM Records Archives for storage. As it is anticipated that the confirmation of vernal pools will continue after the grant is completed, the time frames stated are the minimum and probably will be exceeded as the information will be needed for the ongoing program.

Backup of electronic files.

Electronic files will be maintained on the DEM network server, as well as periodically backed up locally by the project manager on CD's or zip disks. Also, as a normal procedure, files on the network server are backed up by the DEM MIS staff at the server location.

9. VERIFICATION AND VALIDATION REQUIREMENTS

Both the Project Manager and the QA Officer will review all data collected during this study to determine if the data meets QAPP Objectives. Decisions to qualify or reject data will be made by the Project Manager and QA Officer. All data collected will be included in the Final Report. To ensure correct interpretation of the data, all problems encountered in the field will be included in an Appendix to the report and discussed in the general text of the report. Problems will also be documented on each field data form.

10. VERIFICATION AND VALIDATION PROCEDURES

All data collected during each study will be included in the appendix of the Final Data Report. Once the data has been collected, it will be entered into Microsoft Excel files and the GIS shapefile will be updated. The Project manager will proofread the data entry for errors. Errors will be corrected. Outliers and inconsistencies will be flagged for further review with the QA Officer. The decision to discard data will be made by the Project Manager and QA Officer. Problems will be discussed in the Final Report.

11. LITERATURE CITED

- Mitchell, J.C. 2005. Using plants as indicators of hydroperiod class and amphibian habitat suitability in Rhode Island seasonal ponds. M.S. Thesis. University of Rhode Island, Kingston, RI.
- Skidds, D.E. 2003. Predictors of hydroperiod in southern Rhode Island seasonal ponds. M.S. Thesis. University of Rhode Island, Kingston, RI.
- Egan, R.S. 2001. Within-pond and landscape-level factors influencing the breeding effort of *Rana sylvatica* and *Ambystoma maculatum*. M.S. Thesis. University of Massachusetts, Amherst, MA.
- Mitchell, J.C., F.C. Golet, D.E. Skidds, and P.W.C. Paton. 2007. Prioritizing Non-regulatory Protection of Vernal Pools in the Queen's River Watershed, Rhode Island. University of Rhode Island, Kingston, RI.
- The Nature Conservancy – Rhode Island Chapter. 2003. Unpublished data.
- Raithell, C. – Principal Wildlife Biologist. R.I. Dept. of Environmental Management – Division of Fish and Wildlife. Unpublished data.

Appendix 1a

Compile Existing Data

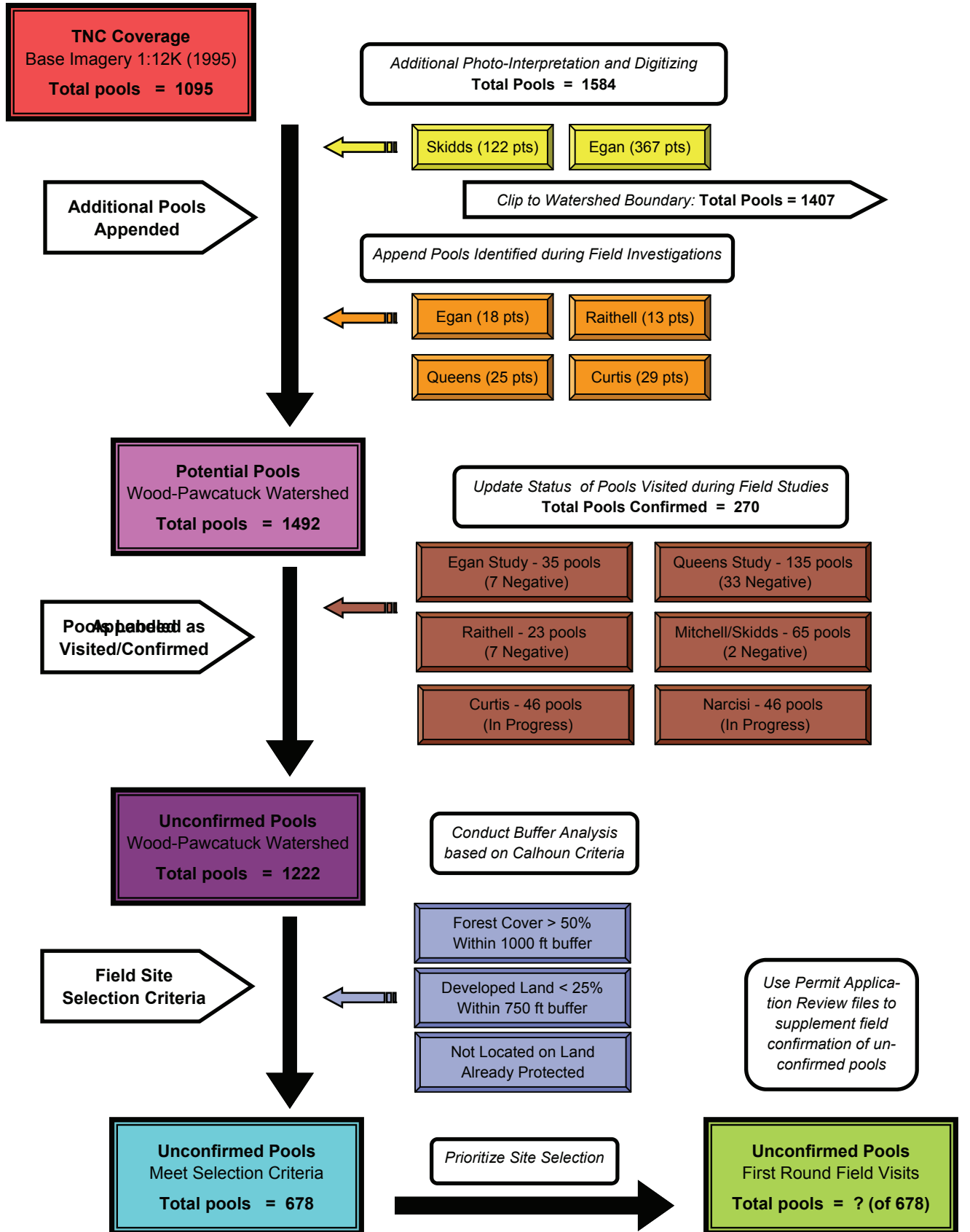
- Obtained potential vernal pool (VP) GIS coverage for Wood-Pawcatuck watershed (WPW) from The Nature Conservancy – Rhode Island Chapter (TNC), appended updates digitized by Dennis Skidds (NPS) and Scott Egan (ENSR) and clipped to watershed boundary (1407 potential VPs).
- Updated ID #'s for consistency with recent investigations.
- Obtained data from previous field investigations in the WPW (Egan 2001; Skidds 2003; Mitchell 2005, Mitchell et al. 2007).
- Determined criteria for determining pool status as “confirmed-positive” and “confirmed-negative”.
- Appended additional pools identified and updated coverage to reflect status of sites already visited/confirmed in the field (270 of 1492).
- Contacted Chris Raithell (DEM Fish and Wildlife), Peter Paton (URI), and Frank Golet (URI) to determine need to verbally confirm status of pools visited but not recorded in any investigation.
- Met with Chris Raithell to confirm applicability of GIS database (Raithell Unpublished data) created from field notes and digitize pools visited but unrecorded.
- Contacted Andy Lipsky (NRCS) re: potential pools confirmed by NRCS.
- Contacted Janice Stone to acquire original data used in creation of the TNC coverage and ranking system.
- Obtained data being used in current field investigations by Mike Narcisi (URI) and Annie Curtis (URI) to begin incorporating into VP Dataset.

Appendix 1b

Flowchart: Site Selection and Confirmation Process

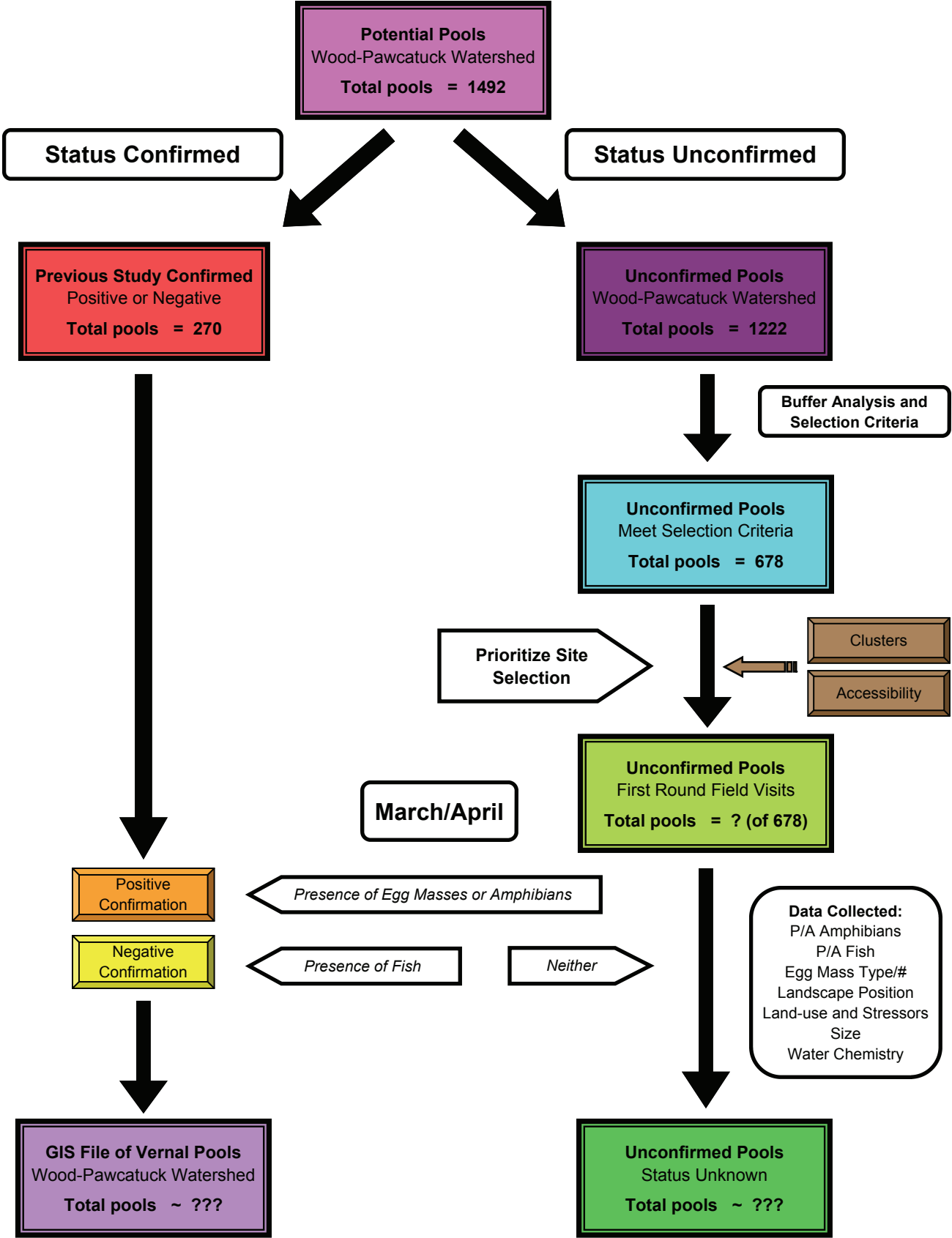
See attached

Vernal Pool Assessment Site Selection Process



Vernal Pool Assessment Confirmation Process

Part 2



Appendix 2a

Site Selection for Field Inspection

- Determined degree of buffer analysis and layers necessary for next level GIS investigation to determine specific sites to visit for inspection.
- Ran coarse level buffer analysis to determine % forest cover and % developed land. Established estimated number of site inspections needed for un-inspected pools – sites with > 50% forest cover within 1000 ft and < 25% developed land within 750 ft given priority for field assessment.
- Conducted buffer analysis using updated 2003 Rhode Island LULC Data to determine percent forest cover (LULC classes 300, 400) within 1000 feet and percent developed land (LULC classes 100, except 115 and 163, and 740, 750) within 750 feet of potential pools (see Metadata).
- Used current DEM conservation land shapefile to target sites located on unprotected land (all land not acquired by fee or conservation easement (see Metadata).
- Began process of selecting specific sites for assessment and investigating ownership. Conducted secondary GIS analysis to locate clusters of pools and proximity to roads.

Appendix 2b

Sites selected breakdown by town (#s)

See attached

Appendix 2c

Map of Watershed and Towns (data available)

See attached

Appendix 2b

Results of GIS Analysis (Totals Pools by Category)

November 30th 2007

Town Name	# Pools	Confirmed POS	Confirmed NEG	Confirmed NONE	Visit NONE	< 25% Developed w/in 750 ft	> 50% Forest Cover w/in 1000ft	Protected NONE	Include in Study
Charlestown	171	18	3	150	151	150	168	114	83
Coventry	4	0	0	4	4	4	4	1	1
Exeter	298	81	28	189	183	269	279	223	114
Hopkinton	226	18	3	205	205	176	189	200	134
N.Kingstown	10	0	0	10	10	6	6	10	5
Richmond	347	43	5	299	282	298	318	284	191
S.Kingstown	172	33	8	131	126	135	140	128	63
W.Greenwich	85	22	3	60	60	85	80	51	33
Westerly	179	3	2	174	156	101	109	150	54
Total	1492	218	52	1222	1177	1224	1293	1161	678

Town Name	Road Distance <100 ft	Road Distance ≥ 100 ft	Road Distance ≥ 200 ft	Road Distance ≥ 500 ft	Road Distance ≥ 750 ft	Road Distance ≥ 1000 ft	Clusters of 3+ pools w/in 500ft
Charlestown	7	22	45	37	18	42	11
Coventry	0	0	0	0	1	3	0
Exeter	27	26	75	35	48	87	16
Hopkinton	8	35	85	29	18	51	17
N.Kingstown	0	3	1	2	3	1	0
Richmond	30	35	97	64	47	74	55
S.Kingstown	10	20	44	22	17	59	20
W.Greenwich	4	8	15	18	7	33	2
Westerly	5	29	69	29	19	28	30
Total	91	178	431	236	178	378	151

Include in Study

- 1) No Confirmation or Visit
- 2) < 25% Developed Land w/in 750ft
- 3) > 50% Forest Cover w/in 1000ft
- 4) Not on already protected land

Confirmation/Visit (Based on Previous Studies)

- 1) POS = evidence of/suitability for pond-breeding amphibians
- 2) NEG = unsuitable/evidence of permanent fish population

Developed/Forest Cover (2003 R.I. LULC Data)

- 1) Developed = All 100 Codes, 740 (Mines, Gravel Pits) & 750 (Transitional)
Codes not included: 115 (Resident > 2 acre) & 163 (Cemetery)
- 2) Forest Cover = 300 (Brushland) and all 400 Codes (Forest)

Protected (DEM Data - StaCons/LocCons shapefiles)

- 1) Protected = Fee Title (State, Local, or Conservation Organization) or Conservation Easement
- 2) NONE = All other conservation land (Conservation Intent, etc.) and private land

Road Distance and Clusters (Measured for Access Prioritization)

NOTE: Not intended to be used for conservation priority

Appendix 2c

Towns in the Wood-Pawcatuck Watershed

Legend

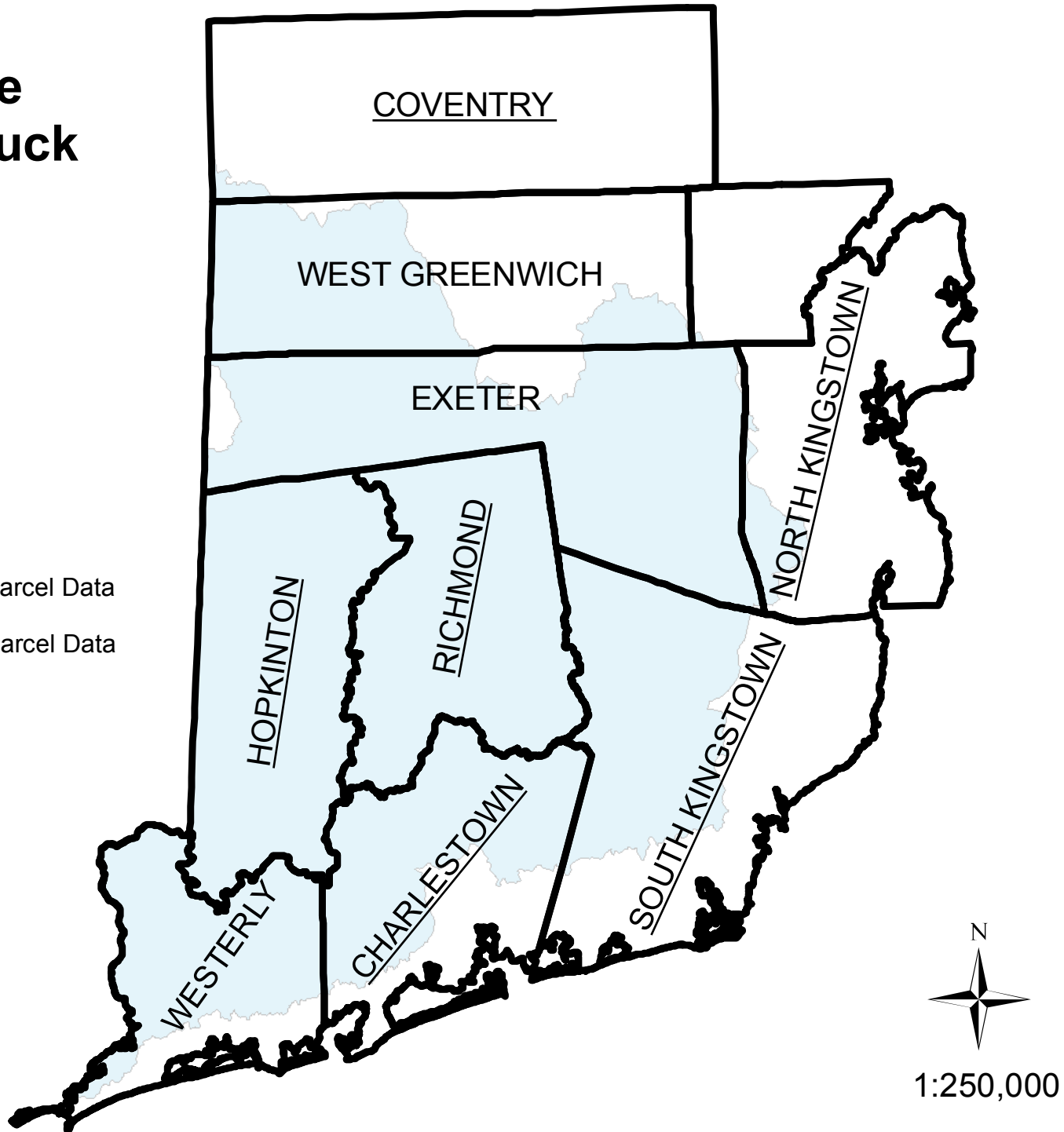


Watershed Basin

Town Name - Digital Parcel Data Available



Town Name - Digital Parcel Data NOT Available



Appendix 3

Determine Ownership

- Began investigating use of permit application files for confirmation of pools in TNC coverage to reduce number of field inspections necessary.
- Communicated with permitting staff on efficient method for on-going reporting of presence of vernal pools on permit application sites. Created internal reporting form and distributed to wetlands permit and OCI staff.
- Compiled plat/lot information for pools prioritized for inspection, from digital parcel data where available (Towns of Coventry, North Kingstown, Hopkinton, Richmond, Charlestown, South Kingstown).
- Used ArcGIS 9.2 to georeference scanned assessor's maps for the Towns of West Greenwich, Exeter, and Westerly. Compiled plat/lot information for pools from the georeferenced maps.
- Plat/Lot #'s for Coventry, North Kingstown, Richmond and South Kingstown sent to Denise Poyer (WPWA) to generate list of landowners.
- Plat/Lot #'s for Charlestown, West Greenwich, Exeter and Westerly sent to Brian Balukonis, RIDEM to generate list of landowners.
- Assign vernal pool sites to WPWA based on willingness to participate in the study.

Appendix 4

Coordination with Watershed Association

The Wood-Pawcatuck Watershed Association and their volunteers will assist project personnel in field data collection. Volunteer recruitment and training will be coordinated and implemented by the Wood-Pawcatuck Watershed Association (WPWA). The WPWA professional staff has agreed to assume a high level of participation.

Denise Poyer, Program Director, of the WPWA will maintain a list of all active volunteers, along with their telephone numbers and e-mail addresses. The WPWA will be responsible for securing access permission from landowners prior to any field visit by volunteers. RIDEM will provide data sheets, field protocol and training to the WPWA and volunteer training will be supervised by Denise Poyer. RIDEM will also provide the WPWA a map of each vernal pool to be inspected, as well as the name of the landowner. Volunteers will be asked to forward their field data sheets to the WPWA within 1 week of data collection.

Appendix 5a
Field Data sheet

See attached

Appendix 5b
Data Sheet Instructions

See attached

Field Data	WOOD-PAWCATUCK VERNAL POOLS	Site ID:	Date: (mm/dd/yyyy)	Status: (LEAVE BLANK)
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REQUIRED	Town:	Place Name:	Arrival Time: (HH:MM) <input type="checkbox"/> AM <input type="checkbox"/> PM
	Observer Name:	Landowner Name:	Departure Time: (HH:MM) <input type="checkbox"/> AM <input type="checkbox"/> PM
	Contact Info:	GPS POSITION RECORDED: <input type="checkbox"/> Yes <input type="checkbox"/> No	MAP ATTACHED: <input type="checkbox"/> Yes <input type="checkbox"/> No
	Directions to Site:	Training Session Date: <i>Please fill out Section 7 if either of these boxes are marked YES</i>	

REQUIRED	Information in Shaded Boxes is key assessment data <i>Please provide as much additional information as time allows Indicate all species observed (check unidentified if uncertain)</i>		Photos Included <input type="checkbox"/> Yes <input type="checkbox"/> No <i>Photos are required for species identification Please follow protocol and attach list in Section 9</i>																																												
2. Observation of Indicator Species	PRESENCE OF AMPHIBIANS <input type="checkbox"/> Yes <input type="checkbox"/> No	<table border="1"> <tr> <td>Adults</td> <td>Juveniles</td> <td>Adults</td> <td>Juveniles</td> </tr> <tr> <td>Wood Frog</td> <td></td> <td>Spotted Salamander</td> <td></td> </tr> <tr> <td>Green Frog</td> <td></td> <td>Marbled Salamander</td> <td></td> </tr> <tr> <td>Spring Peeper</td> <td></td> <td>Four Toed Salamander</td> <td></td> </tr> <tr> <td>Gray Tree-Frog</td> <td></td> <td>Red-Spotted Newt</td> <td></td> </tr> <tr> <td>Pickerel Frog</td> <td></td> <td>Unidentified:</td> <td></td> </tr> <tr> <td>Northern Leopard Frog</td> <td></td> <td>Frog/Toad</td> <td></td> </tr> <tr> <td>American Bullfrog</td> <td></td> <td>Salamander</td> <td></td> </tr> <tr> <td>Eastern Spadefoot Toad</td> <td></td> <td colspan="2"> Did you see Tadpoles? <input type="checkbox"/> Yes <input type="checkbox"/> No Were any longer than 2"? <input type="checkbox"/> Yes <input type="checkbox"/> No </td> </tr> <tr> <td>American Toad</td> <td></td> <td colspan="2"></td> </tr> <tr> <td>Fowlers Toad</td> <td></td> <td colspan="2"></td> </tr> </table>	Adults	Juveniles	Adults	Juveniles	Wood Frog		Spotted Salamander		Green Frog		Marbled Salamander		Spring Peeper		Four Toed Salamander		Gray Tree-Frog		Red-Spotted Newt		Pickerel Frog		Unidentified:		Northern Leopard Frog		Frog/Toad		American Bullfrog		Salamander		Eastern Spadefoot Toad		Did you see Tadpoles? <input type="checkbox"/> Yes <input type="checkbox"/> No Were any longer than 2"? <input type="checkbox"/> Yes <input type="checkbox"/> No		American Toad				Fowlers Toad				
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American Bullfrog		Salamander																																													
Eastern Spadefoot Toad		Did you see Tadpoles? <input type="checkbox"/> Yes <input type="checkbox"/> No Were any longer than 2"? <input type="checkbox"/> Yes <input type="checkbox"/> No																																													
American Toad																																															
Fowlers Toad																																															
EGG MASSES OBSERVED <input type="checkbox"/> Yes <input type="checkbox"/> No	<i>Indicate below if certain of species</i>		Estimated Counted																																												
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	<input type="checkbox"/> Spotted Salamander	How many?	<input type="checkbox"/> <input type="checkbox"/>																																												
	<input type="checkbox"/> Other: _____	How many?	<input type="checkbox"/> <input type="checkbox"/>																																												
OTHER WILDLIFE OBSERVED	<input type="checkbox"/> Turtles	<input type="checkbox"/> Fingernail Clams	<input type="checkbox"/> Dragonfly nymph																																												
FAIRY SHRIMP <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Snakes	<input type="checkbox"/> Amphibious Snails	<input type="checkbox"/> Damselfly nymph																																												
	<input type="checkbox"/> Leeches	<input type="checkbox"/> Caddisfly Larvae	<input type="checkbox"/> Whirlagig beetle																																												
	<input type="checkbox"/> Other: _____		<input type="checkbox"/> Water scorpion																																												
			<input type="checkbox"/> Predaceous diving beetle																																												
FISH OBSERVED <input type="checkbox"/> Yes <input type="checkbox"/> No	How many? <input type="checkbox"/> 1-5 <input type="checkbox"/> 6-10 <input type="checkbox"/> 11-20 <input type="checkbox"/> 21-50 <input type="checkbox"/> 50+	Species Identified: <input type="checkbox"/> Yes <input type="checkbox"/> No	List: _____																																												

3. Landscape Characteristics	SUPPLEMENTARY	<input type="checkbox"/> Man-Made	<input type="checkbox"/> Natural Depression	Presence of Inlet/Outlet?	Is Water Flowing?
	POOL TYPE (select one)	<input type="checkbox"/> Excavated Pit/Ditch	<input type="checkbox"/> Upland Forest Depression	Yes No	Yes No
	SURROUNDING HABITAT (check all that apply)	<input type="checkbox"/> Impoundment	<input type="checkbox"/> Non-Forested Depression	Inlet <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
	<input type="checkbox"/> Quarry	<input type="checkbox"/> Wetland Forest Depression	Outlet <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	
	<input type="checkbox"/> Drainage System	<input type="checkbox"/> Marsh Pool <input type="checkbox"/> Bog Pool			
	<input type="checkbox"/> Forested Wetland	<input type="checkbox"/> Open Wetland	<input type="checkbox"/> Forested Upland	<input type="checkbox"/> Field/Grassland	<input type="checkbox"/> Residential
	<input type="checkbox"/> Deciduous	<input type="checkbox"/> Emergent	<input type="checkbox"/> Deciduous	<input type="checkbox"/> Commercial	<input type="checkbox"/> Highway/Road
	<input type="checkbox"/> Coniferous	<input type="checkbox"/> Scrub-Shrub	<input type="checkbox"/> Coniferous		
	<input type="checkbox"/> Mixed		<input type="checkbox"/> Mixed		

4. Weather	SUPPLEMENTARY	<input type="checkbox"/> Sunny	<input type="checkbox"/> Rain Heavy	<input type="checkbox"/> Rain Light	<input type="checkbox"/> Rain Intermittent
	Current Weather Conditions	<input type="checkbox"/> Partly Sunny	<input type="checkbox"/> Snow Heavy	<input type="checkbox"/> Snow Light	<input type="checkbox"/> Snow Intermittent
		<input type="checkbox"/> Cloudy	<input type="checkbox"/> Other: _____		
	Air Temperature: _____	<input type="checkbox"/> °C <input type="checkbox"/> °F	Days since last Rain/Snow event (if known): _____		

This protocol was developed by the New England Interstate Water Pollution Control Commission (NEIWPCC) and the R.I. Department of Environmental Management (DEM) with funding provided by the Environmental Protection Agency (EPA) Wetlands Pilot Demonstration Grant.

Field Data	WOOD-PAWCATUCK VERNAL POOLS	Site ID:	Date: (mm/dd/yyyy)	Status: (LEAVE BLANK)
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SUPPLEMENTARY *Check all stressors types/subtypes observed: Indicate proximity to pool where appropriate*

5. Pool Habitat Stressors	HYDROLOGY STRESSORS														
	<input type="checkbox"/> Partial/Complete Drainage <input type="checkbox"/> Ditching in pool <input type="checkbox"/> Ditching near pool <input type="checkbox"/> Impoundment <input type="checkbox"/> Culvert restricted/blocked <input type="checkbox"/> Dam <input type="checkbox"/> Beavers	<input type="checkbox"/> Filling <input type="checkbox"/> Complete <input type="checkbox"/> Partial <input type="checkbox"/> Sedimentation <input type="checkbox"/> Siltation in pool <input type="checkbox"/> Sand/Gravel in pool <input type="checkbox"/> Sand/Gravel near pool	<input type="checkbox"/> Excavation (removal of soil) <input type="checkbox"/> Other <input type="checkbox"/> Storm drainage system in pool <input type="checkbox"/> Storm drainage system near pool <input type="checkbox"/> Riprap in/near pool <input type="checkbox"/> Stream channelization <input type="checkbox"/> _____												
	PLANT COMMUNITY STRESSORS														
	<input type="checkbox"/> Removal of Vegetation <input type="checkbox"/> from pool <input type="checkbox"/> from surrounding upland <input type="checkbox"/> Presence of Invasives <input type="checkbox"/> Phragmites <input type="checkbox"/> Purple Loosestrife <input type="checkbox"/> Other: _____	<input type="checkbox"/> Cutting <input type="checkbox"/> Stumps	<input type="checkbox"/> Grazing <input type="checkbox"/> Burning	<input type="checkbox"/> Mowing <input type="checkbox"/> Forest Harvesting											
HABITAT STRESSORS															
<input type="checkbox"/> Dumping <input type="checkbox"/> Old Tires <input type="checkbox"/> Demolition Debris	<input type="checkbox"/> Abandoned Vehicles <input type="checkbox"/> Discarded Appliances <input type="checkbox"/> Other: _____	<input type="checkbox"/> Grass Clippings/Leaves <input type="checkbox"/> Tree Stumps	<input type="checkbox"/> Cans/Bottles <input type="checkbox"/> Trash												
<input type="checkbox"/> Roads nearby <input type="checkbox"/> Traffic noise audible from pool <input type="checkbox"/> Trails nearby <input type="checkbox"/> Railroad nearby <input type="checkbox"/> House(s) nearby	<input type="checkbox"/> Visible from pool <input type="checkbox"/> Visible from pool <input type="checkbox"/> Visible from pool <input type="checkbox"/> Visible from pool	Road Type Nearby: <input type="checkbox"/> 4-lane paved <input type="checkbox"/> 2-lane paved <input type="checkbox"/> Dirt road	Distance to Nearest: <table border="1"> <tr> <td></td> <td>Estimated</td> <td>Measured</td> </tr> <tr> <td>Road _____ ft</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Lawn _____ ft</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Building _____ ft</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>		Estimated	Measured	Road _____ ft	<input type="checkbox"/>	<input type="checkbox"/>	Lawn _____ ft	<input type="checkbox"/>	<input type="checkbox"/>	Building _____ ft	<input type="checkbox"/>	<input type="checkbox"/>
	Estimated	Measured													
Road _____ ft	<input type="checkbox"/>	<input type="checkbox"/>													
Lawn _____ ft	<input type="checkbox"/>	<input type="checkbox"/>													
Building _____ ft	<input type="checkbox"/>	<input type="checkbox"/>													

6. Pool Characteristics	OPTIONAL	DIMENSIONS Depth: _____ ft. <input type="checkbox"/> Estimated <input type="checkbox"/> Measured Width: _____ ft. <input type="checkbox"/> <input type="checkbox"/> Length: _____ ft. <input type="checkbox"/> <input type="checkbox"/> Perimeter: _____ ft. <input type="checkbox"/> <input type="checkbox"/>	Pace Distance: _____ Width: _____ paces Length: _____ paces Perimeter: _____ paces	Approximate Maximum Pool Depth <input type="checkbox"/> Ankle-deep <input type="checkbox"/> Hip-deep <input type="checkbox"/> Shin-deep <input type="checkbox"/> Chest-deep <input type="checkbox"/> Knee-deep <input type="checkbox"/> Deeper																									
	SUBSTRATE <input type="checkbox"/> Firm <input type="checkbox"/> Mucky Dominant Substrate: (select one) <input type="checkbox"/> Peat <input type="checkbox"/> Bedrock <input type="checkbox"/> Gravel <input type="checkbox"/> Leaf Litter <input type="checkbox"/> Cobbles <input type="checkbox"/> Sand <input type="checkbox"/> Other: _____ <input type="checkbox"/> Mud	VEGETATION IN POOL Trees: _____ % Shrubs: _____ % Emergent: _____ % Floating: _____ %	Canopy Cover: _____ % <input type="checkbox"/> Open <input type="checkbox"/> Closed Dead Trees: <input type="checkbox"/> Yes <input type="checkbox"/> No Sphagnum: <input type="checkbox"/> Yes <input type="checkbox"/> No																										
	WATER QUALITY <input type="checkbox"/> Clear <input type="checkbox"/> Oily <input type="checkbox"/> Tea-Colored <input type="checkbox"/> Algae Green <input type="checkbox"/> Other: _____	Water Level: <input type="checkbox"/> Full <input type="checkbox"/> More than 50% <input type="checkbox"/> Less than 50% <input type="checkbox"/> Dry	Measurements <table border="1"> <tr> <td></td> <td>1</td> <td>2</td> <td>3</td> <td>Avg</td> </tr> <tr> <td>Water Temp</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td></td> <td colspan="4" style="text-align: center;"><input type="checkbox"/> °C <input type="checkbox"/> °F</td> </tr> <tr> <td>pH</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Spec. Cond.</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </table>		1	2	3	Avg	Water Temp	_____	_____	_____	_____		<input type="checkbox"/> °C <input type="checkbox"/> °F				pH	_____	_____	_____	_____	Spec. Cond.	_____	_____	_____	_____	
		1	2	3	Avg																								
Water Temp	_____	_____	_____	_____																									
	<input type="checkbox"/> °C <input type="checkbox"/> °F																												
pH	_____	_____	_____	_____																									
Spec. Cond.	_____	_____	_____	_____																									

7. Mapping Information	OPTIONAL	<input type="checkbox"/> USGS Topo Map Quad Name: _____ <input type="checkbox"/> Road Map <input type="checkbox"/> Sketch <input type="checkbox"/> Other: _____
	Map Attached: <input type="checkbox"/> Yes <input type="checkbox"/> No	GPS position recorded: <input type="checkbox"/> Yes <input type="checkbox"/> No
	Check one: <input type="checkbox"/> The above GPS point is at the center of the pool. <input type="checkbox"/> The center of the pool is approximately _____ ft. in the compass direction of _____ degrees from the above GPS point.	Brand and Model of GPS unit: _____

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8. Pool Diagram	OPTIONAL	Indicate the following features on your sketch:		
	<input type="checkbox"/> North Heading <input type="checkbox"/> Location of Water Chemistry Measurement(s) <input type="checkbox"/> Location of Depth Measurement(s) <input type="checkbox"/> Location of GPS position	<input type="checkbox"/> Roads/Houses <input type="checkbox"/> Vegetation Zones <input type="checkbox"/> Pool Habitat Stressors <input type="checkbox"/> Surrounding Land Use Zones	<input type="checkbox"/> Location of Inlet/Outlet <input type="checkbox"/> Attachment Points <input type="checkbox"/> Egg Masses	

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Field Data	WOOD-PAWCATUCK VERNAL POOLS	Site ID:	Date: (mm/dd/yyyy)	Status: (LEAVE BLANK)
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9. List of Photos	REQUIRED IF PHOTOS ARE INCLUDED

Notes:

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Filling Out the Data Sheet – Wood-Pawcatuck Vernal Pool Project

The goal of the 2008 field season is to assess the status of as many previously unconfirmed potential vernal pools as possible. The data collection process includes two levels of data: 1) Key data for rapid assessment of site status (sections 1 and 2); and 2) Supplementary information (sections 3-9).

It is critical that time spent at a site prioritizes the collection of data requested in sections 1 and 2. Data collection requested in sections 3-9 should be considered secondary and limited to time allotted per site. Section 8 (Pool Diagram) and Section 9 (List of Photos) are also considered secondary but may be included even if sections 3-7 are not completed.

- **IMPORTANT: Site ID and Date should be filled out on the top of all 4 pages of the data sheet. Make sure to record the date on which the site was visited.**
- **DO NOT write in the box marked Status (shaded box)**

Section 1: Pool Location- REQUIRED

- The boxes labeled Town, Observer Name, Contact Info, and Training date can be filled out in advance of the arrival at the site.
- Include the site name if one exists and the name of the landowner.
- Fill out the approximate time of arrival and departure at the site.
- If feasible include brief written directions to the site or attach a map if available.
- If a map is attached or a GPS position is recorded, check the appropriate boxes and then fill out section 7.
- **Please make sure to include your name and contact information in case we need clarification about data collected.**

Section 2: Observation of Indicator Species- REQUIRED

- **IMPORTANT: All five shaded boxes MUST be checked Yes or No. This is the key information by which we will determine site status.**

Presence of Amphibians

- If amphibians are observed, check Yes in the Presence of Amphibians box. Information about specific species observed is considered supplementary and may be provided if available but is not critical.
- If species identification information (field guide or other key) is available, the number of specimens observed can be recorded in the appropriate species box. The four obligate vernal pool species are indicated in bold for reference.
- If no identification information is available, the observer can indicate the number of specimens observed in the boxes labeled *Unidentified Frog/Toad* and *Unidentified Salamander*.

- Tadpoles are difficult to identify to the species level, so it is only necessary to check the boxes indicating whether any were observed and if any were larger than two inches long.

Photos Included

- In order to confirm species identification of amphibians, egg masses or other wildlife observed photos are required. Please check either Yes or No in the Photos Included box. Photos may be included even if species identification is not available during the site visit and should just be labeled as Unknown.
- If the Photos Included box is checked Yes, **follow the instructions for photos** and include **a record of photos taken in chronological order** (Section 9).
- Photos documenting surrounding habitat, pool stressors and other noteworthy features can also be included.

Egg Masses Observed

- If egg masses are observed, check Yes in the Egg Masses Observed box. Information about specific species observed is considered supplementary and may be provided if available but is not critical.
- Make sure to indicate if of egg masses numbers were estimated or counted.
- If egg masses are cannot be positively identified as wood frog or spotted salamander, check the box marked Other and fill in the name of the species if known or write *Unknown* if not sure.

Other Wildlife Observed

- Check any boxes for other forms of wildlife observed. If an unlisted species is observed, check the box marked other and fill in the name of the species if known or write *Unknown* if not sure.
- If fairy shrimp are observed, check Yes in the Fairy Shrimp box. Fairy shrimp are considered an obligate vernal pool species and are important for assessment of vernal pool status

Fish Observed

- If fish are observed in the pool, check Yes in the Fish Observed box.
- Please indicate approximately how many fish were seen in the pool by checking the appropriate box. Fish are a predator of amphibian larvae and the presence or absence of a permanent fish population is an important factor in determining pool status.
- Information about specific species observed is considered supplementary and may be provided if available but is not critical.

Section 3: Landscape Characteristics – Supplementary Information

- **IMPORTANT: Sections 3-5 are considered supplementary information and should be completed as time allows, but are not critical for confirmation of pool status.**

Pool Type

- Check the box indicating if the pool appears to **Man-Made** or **Natural** (bold print). The subcategory boxes beneath each type can be checked if appropriate.
- Please indicate whether there is evidence of an **Inlet** or an **Outlet** from the pool. Early spring is the wettest time of the year so any channel running to or from the pool is likely to have water in it at this time of year if ever. Please check whether either the inlet or out let currently has **Water Flowing** in it, by checking the box marked yes or no. The location of any inlet of outlet should be noted on the diagram in Section 8.

Surrounding Habitat

- Indicate the habitat types surrounding the pool by checking all boxes which apply: **Forested Wetland, Open Wetland, Forested Upland, Field/Grassland, Residential, Commercial, and/or Highway/Road.**
- If the type of forested wetland (deciduous, coniferous, or mixed), open wetland (emergent or scrub-shrub), or forested upland (deciduous, coniferous, or mixed) can be identified, please check the appropriate subcategory box(es).
- Detailed information about relative percentage and location of surrounding habitat types is best communicated with a sketch of the pool. Section 8 includes instructions for sketching and details to be included.

Section 4: Weather – Supplementary Information

- **IMPORTANT: Sections 3-5 are considered supplementary information and should be completed as time allows, but are not critical for confirmation of pool status.**

Current Weather Conditions

- Check the appropriate boxes describing the sky conditions during the site visit and type of precipitation if applicable.
- Record the air temperature (indicate ° C or ° F) if measured.
- If the number of days since the last rain or snow event is known please fill in the box. It is especially important to note if the site visit is immediately following a precipitation event.

Section 5: Pool Habitat Stressors – Supplementary Information

- **IMPORTANT: Sections 3-5 are considered supplementary information and should be completed as time allows, but are not critical for confirmation of pool status.**
- **Please check all stressor types and subtypes observed. Be sure to indicate whether the stressor was observed in OR near the pool where appropriate.**

Hydrology Stressors

- Check the applicable boxes indicating the presence of any of the following hydrology stressors: **Partial/Complete Drainage, Impoundment, Filling, Sedimentation,** and/or **Excavation.**
- Where appropriate, check the descriptive subtypes and information about location of the stressor. If uncertain about subtypes, these boxes can be left blank.

Plant Community Stressors

- If there is evidence that **Removal of Vegetation** has occurred, check the box. Check additional boxes describing the location and evidence of vegetation removal (Cutting, Stumps, Grazing, Burning, Mowing, Forest Harvesting).
- If **Invasive Species** are present, check the box. Please indicate whether *Phragmites* or Purple Loosestrife are present, if identified. If other invasives are present, check “other” and write in the name of the species or *unknown* if the species was not identified. If unfamiliar with invasive plant species, do not fill out this section.

Habitat Stressors

- If there is evidence of **Dumping**, check the box and check any additional boxes describing the type of dumping found near the site.
- Check the applicable boxes if other habitat stressors are nearby (**Roads, Trails, Railroads,** and/or **Houses**). If these features are close enough to be visible from the pool, check the appropriate box.
- For **Roads**, also indicate whether traffic noise is audible from the pool and what type of road is nearby (Dirt road, 2-lane paved, 4-lane paved).

Distance to Nearest...

- Where appropriate, estimate or measure the distances to the nearest **Road, Lawn,** or **Building.** Do not approach any building or lawn for which you do not have access permission

Section 6: Pool Characteristics – Optional Information

- **IMPORTANT: Sections 6-9 are considered optional information and should be completed as time allows.**

Pool Dimensions

- If time allows, measurements may be taken for pool **Depth, Width, Length** and **Perimeter**. Please indicate whether dimensions are estimated or measured.
- When measuring depth, be aware that pools may be very deep in early spring and care should be taken when wading into the pool. If the water level is too deep to measure safely, an estimate can be made in the **Approximate Maximum Pool Depth**. The most valuable measurement is from the deepest part of the pool, but that may be difficult to determine. Please indicate on your diagram in Section 8, where depth measurements were taken.
- If pool width, length and perimeter are measured using **Paces**, please fill in the boxes indicating your pace distance and how many paces you counted. Then fill in the boxes calculating the number of feet measured.

Dominant Substrate

- When wading into the pool, pay attention to the substrate beneath your feet. Indicate whether the bottom is **Firm** or **Mucky** (your feet sink in and movement is challenging). A mucky substrate may be evidence that the pool does not dry out and remains wet throughout the year.
- If possible indicate whether the dominate pool substrate is Peat, Leaf Litter, Bedrock, Cobbles, Gravel, Sand, Mud or Other.

Vegetation in Pool

- Estimate percent trees, shrubs, emergent and floating vegetation in and around the pool if possible. Vegetation zones can be indicated on your diagram in Section 8.
- It will probably be difficult to estimate the percent **Canopy Cover** before spring leaf-out, but fill in the box if possible. If it is not possible to determine a percentage, check the box indicating whether the canopy is **Open** or **Closed** (imagine the trees with leaves).
- Note whether there are any **Dead Trees** in the pool and check the box yes or no. Dead trees may indicate that the hydrology of the pool has been altered recently and has become too wet for trees to survive.
- Note whether there is any **Sphagnum** (peat moss) in the pool under the surface of the water. Peat moss locations must dry out at some point and may indicate the seasonal nature of the pool.

Water Quality/Water Level

- Water Quality: check the box describing the color of the pool (Clear, Oily, Tea-colored, Algae green or Other).
- Water Level: if possible, compare the water level to the maximum line of flooding (look for staining on tree trunks surrounding the pool) and indicate whether the pool is Full, More than 50% full, Less than 50% full, or Dry.

Measurements

- Water chemistry measurements (**Water Temperature, pH and Specific Conductivity**) should be taken at least 2 meters from the pool edge and at least 6 inches below the surface (if possible). Make sure to take and record three different measurements and then calculate the average. Make sure to indicate whether temperature is recorded in Celsius or Fahrenheit.

Section 7: Mapping Information – Optional Information

- **IMPORTANT: Section 7 is considered optional information and should be completed as time allows, but is not critical for confirmation of pool status. However, if you checked Yes for GPS position recorded and/or Map attached in Section 1, please complete the information in Section 7.**

Map Attached

- If you have attached a map, check Yes in the shaded box.
- Check the boxes which type(s) of the maps you have included (USGS Topographic Map, Road Map, Sketch, or Other).
- If attaching a USGS Topo Map, write the Quadrangle name in the appropriate box.

GPS Position Recorded

- If a GPS position was recorded, check Yes in the shaded box.
- Record the latitude and longitude information in Degrees and Minutes. Include Minutes to the hundredth of a minute (2 decimal places). Do not use Seconds.
- **IMPORTANT: You must indicate the brand and model of the GPS unit that was used. The accuracy of a GPS position cannot be determined without this information.**
- Check whether the position was recorded at the center of the pool. If the position was not recorded at the center, check the second box and record the approximate number of feet to the center and the compass direction of the center from where the GPS point was taken. This point should also be noted on your diagram in Section 8.

Section 8: Pool Diagram – Optional Information

- **IMPORTANT: Section 8 is considered optional information and should be completed as time allows, but is not critical for confirmation of pool status.**
- Use the axes to show length/width relationship. Make sure to include an arrow for the north heading.
- Indicate the location of any measurements you took – water chemistry, depth, GPS position.
- Use the sketch to provide detailed information about the location of roads, houses, environmental stressors and surrounding land use and vegetation zones.
- If egg masses were observed, indicate the location of egg masses and any attachment points.

Section 9: List of Photos – Optional Information

- **IMPORTANT: Section 9 is considered optional information and should be completed as time allows, but is not critical for confirmation of pool status. However, if you have taken any photos for documentation, a chronological list must be included.**
- For each photo, indicate the time, location if possible and subject matter. Be as specific/detailed as appropriate.
- Refer to the tip sheet for tips on photographing amphibians.
- Refer to the DEM Digital Photograph Record Collection and Storage SOP (SOP-OD-QM-4) for photography. Instructions on providing digital copies will be provided along with your site assignments.
- Notes: Any additional notes or observations should be included here. Feel free to attach additional pages if necessary, making sure to note the Site ID# and Date at the top of each page.

Instructions for Photographs (DEM Digital Photograph Record Collection and Storage SOP: SOP-OD-QM-4)

5.1. CAMERA AND FIELD NOTES

5.1.1. Verify that the date and time on the camera is accurate.

5.1.2. Activate the visible date and time option such that the recorded image will be imprinted with the date and time of the photo.

5.1.3. Select appropriate resolution quality. The higher the resolution the fewer the images that can be recorded for a given media.

5.1.4. Descriptive documentation should be recorded in sequentially numbered field notes immediately after the images are collected for specific photograph detail recall.