# Using Riffle Bioassessment by Volunteers to Assess the Health of Two Rivers & Engage High School Students in Science
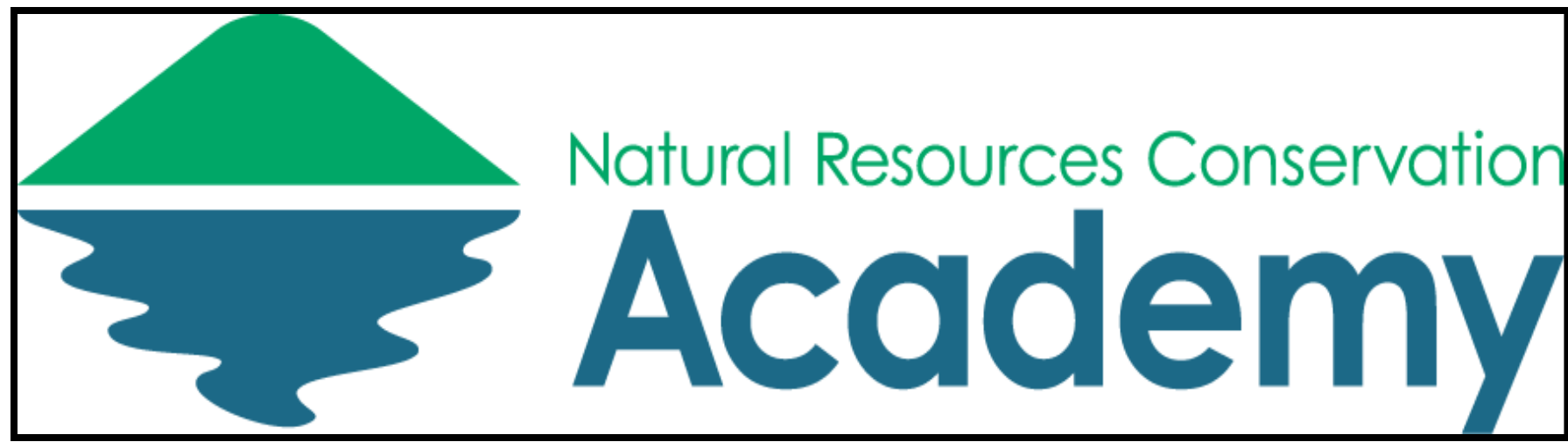
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## ABSTRACT

Nearly half of Connecticut's rivers have been degraded to the point that they currently do not support aquatic life. Monitoring of water quality in rivers and streams is extremely important to ensure the protection of rivers with good water quality.

The Riffle Bioassessment by Volunteers (RBV) program is one method to assess water quality by using benthic macroinvertebrates as bioindicators. RBV is also a great program because it involves citizens, making them aware of the health of nearby rivers. For my project, I used the RBV method to compare the health of sites in two rivers (Salmon and Coginchaug Rivers) and taught my class about the importance of the RBV program and engaged them in data collection.

We found only three of the most pollution sensitive (most wanted) organisms at the Salmon River site, and only two of the most pollution sensitive organisms at the Coginchaug River site. The presence of four or more of these organisms indicates excellent water quality, whereas three or less requires more information before water quality is determined. The low numbers of pollution sensitive species at both sites could be due to the drought conditions and very low water levels.

## INTRODUCTION

Land use of Connecticut watersheds have greatly impacted the water quality of our rivers. Forty-five percent (45%) of assessed river miles do not support aquatic life use, and 29% of assessed river miles did not support recreational use in Connecticut (2014 Integrated Water Quality Report).

The Riffle Bioassessment by Volunteers (RBV) program is a vital method used by the Connecticut Department of Energy and Environmental Protection (CT DEEP) to assess the health of wadeable rivers, streams, and watersheds throughout the state. The RBV program involves surveying streams and rivers to learn about the benthic macroinvertebrate communities present in riffle (rocky) areas. Through this approach, we can assess water quality by documenting the presence of different types of macroinvertebrates in the river, as particular types are more sensitive to pollution than others. The absence of the most sensitive species may tell us that the river is polluted or degraded. Additional reasons that RBV is a very important program is that it involves citizens and gives them a chance to learn about their watersheds, participate in scientific studies, and contribute to state conservation efforts.

The objectives of my project are: 1) to use the RBV method to compare the current health of two sites in two different watersheds and 2) to teach my vocational agricultural (Vo-Ag) classmates about the RBV program and its importance.

## METHODS

### Study Area and Organism

- I used the RBV method to survey macroinvertebrates in riffle environments of two rivers (Fig. 1). RBV equipment and resource materials were borrowed from CT DEEP.
- I conducted RBV at two sites: one in the Coginchaug River in Wadsworth Falls State Park (Fig. 2a), and the other in the Salmon River at the Salmon River State Forest (Fig. 2b)
- All riffle macroinvertebrates (i.e. aquatic invertebrates that can be seen by the naked eye) were surveyed (Fig. 3).
- The surveys were conducted in September and October of 2015.

### Data Collection and Analysis

The RBV method includes the following steps, which I completed at each river site:

1. Delineate the river area to be sampled and identify 6 locations to collect samples.
2. Take pictures of the site.
3. Place the net in the water at location 1, make sure it is flat on the river bottom and nothing can get under the net before collecting your sample.
4. Scrub the rocks in the area in front of the net (18" wide & 14" high).
5. Kick the river bottom in the same area in a zigzag pattern for one minute.
6. Do this once more in location 2, then empty the contents into a large tray.
7. Repeat steps 2-6 (above) at locations 3 and 4, then again in locations 5 and 6.
8. Examine the contents of each tray and sort the macroinvertebrates into like kinds, using an ice cube tray filled with water and placing each kind into a separate section.
9. Identify the organisms using the RBV resource materials provided, and complete the RBV field data sheet (Fig. 3).
10. Prepare a voucher sample to submit to CT DEEP by placing one of each kind of organism identified into a vile with alcohol.
11. Submit the field data sheet and the voucher to CT DEEP.

I then reviewed the verified results provided by CT DEEP and compared the data I collected at the Salmon and Coginchaug Rivers.


Fig 1. (Top) Conducting RBV assessment of the Coginchaug River with my class and community partner. (Bottom) Presenting to my class about the RBV method before going into the field.
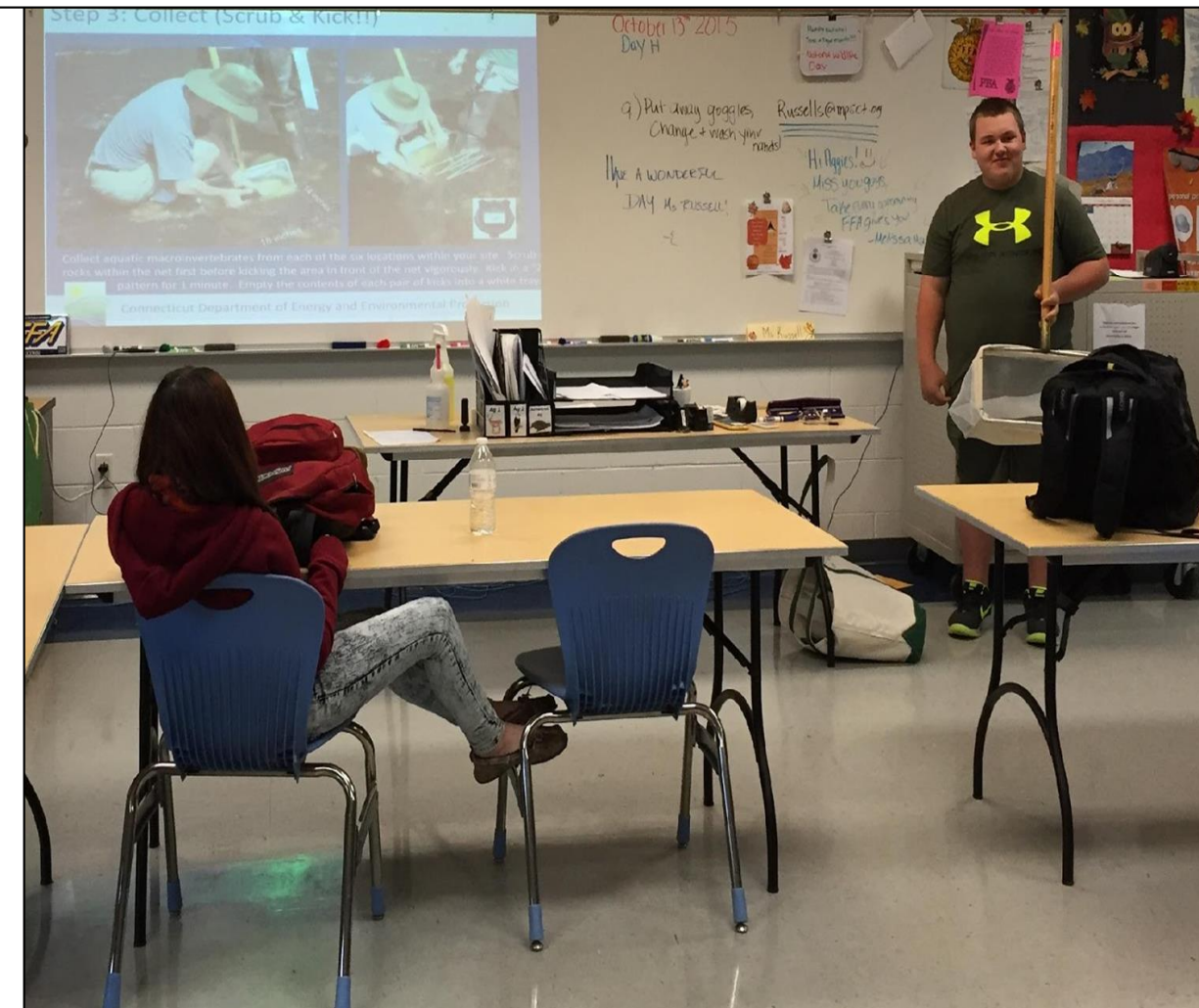
## METHODS CONTINUED

### Engaging My Class

I engaged my high school vocational agriculture class by:

1. Giving them a presentation on the importance of the RBV program and how to carry out the assessment method (Fig. 1).
2. Conducting the RBV as a class at the Coginchaug River (Fig. 1) led by staff from my community partner organization, the Connecticut River Coastal Conservation District.
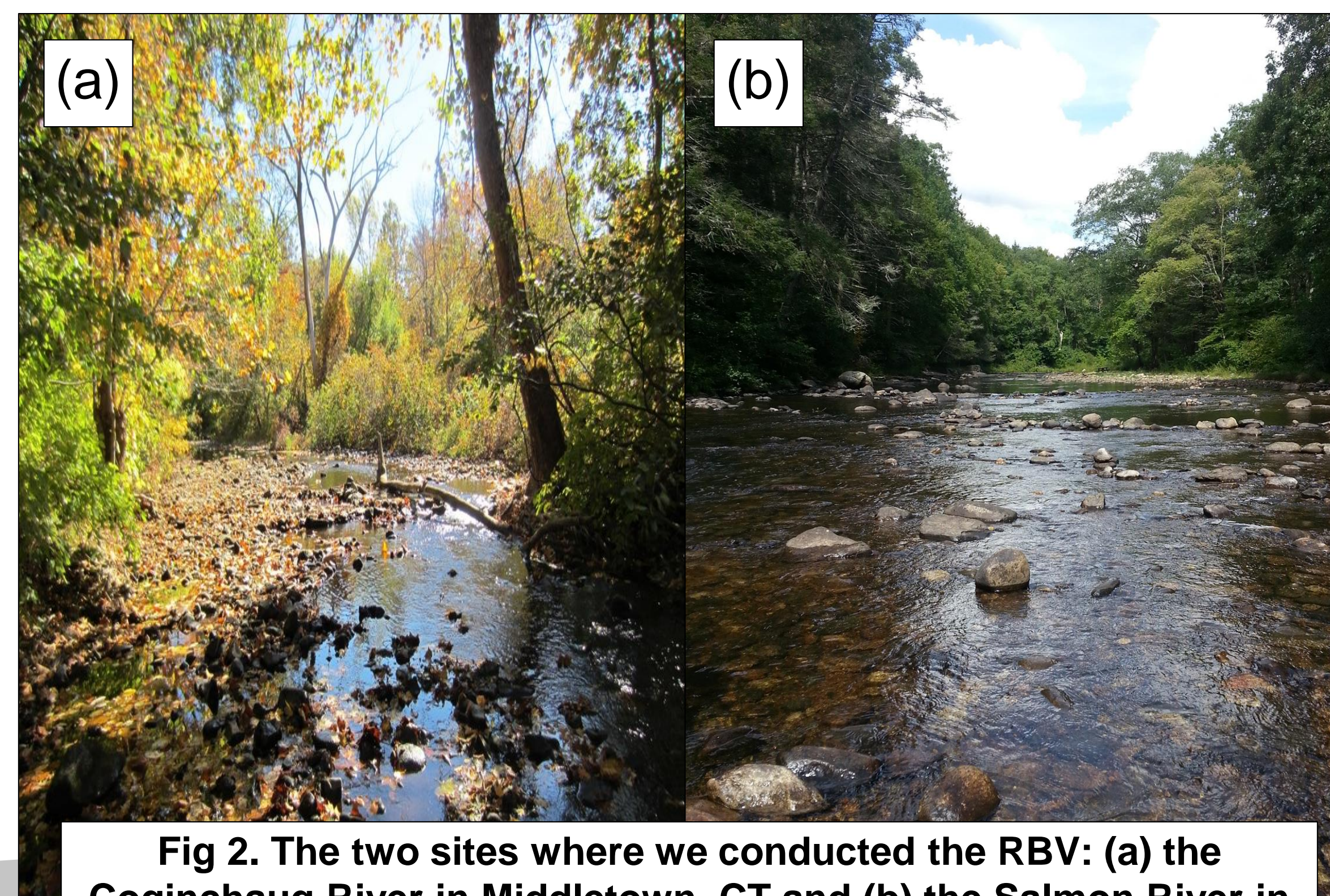

Fig 2. The two sites where we conducted the RBV: (a) the Coginchaug River in Middletown, CT and (b) the Salmon River in Colchester, CT.

## RESULTS

### Salmon River Results

We found three most wanted organisms at the Salmon River site (Table 1): Isonychia (Minnow Mayfly), Perlidae (Common Stonefly), and Brachycentrus (Mid-size Plant Case Building Caddisfly).

### Coginchaug River Results

We found only two most wanted organisms at the Coginchaug River site (Table 2): Perlidae (Common Stonefly) and Rhyacophila (Michelin Man Caddisfly).

| Table 1. Salmon River Results | | | Table 2. Coginchaug River Results | |
|---|---|---|---|---|
| **Macroinvertebrate** | **Value** | | **Macroinvertebrate** | **Value** |
| Isonychia | Most wanted | | Perlidae | Most wanted |
| Perlidae | Most wanted | | Rhyacophila | Most wanted |
| Brachycentrus | Most wanted | | Hydropsychidae | Moderately wanted |
| Hydropsychidae | Moderately wanted | | Philopotamidae | Moderately wanted |
| Stenonema | Moderately wanted | | Psephenus | Moderately wanted |
| Psephenus | Moderately wanted | | Corydalus | Moderately wanted |
| Corydalus | Moderately wanted | | Nigronia | Moderately wanted |
| Nigronia | Moderately wanted | | Amphipoda | Least wanted |
| Gomphidae | Moderately wanted | | Midge | Least wanted |
| Midge | Least wanted | | Leptoceridae | Other |
| Worm | Least wanted | | Hemiptera | Other |
| Elmidae | Other | | Coleoptera | Other |
| Baetidae | Other | | | |
| Atherix | Other | | | |
| Helicopsyche | Other | | | |
| Ephemeridae | Other | | | |
| Hydracarina | Other | | | |
| Empididae | Other | | | |
| Odontoceridae | Other | | | |

| # Most Wanted Types: | Water Quality: |
|---|---|
| 5+ | **EXCEPTIONAL:** *Fully Supporting* Aquatic Life Use Goals |
| 4 | **EXCELLENT:** *Likely Supporting* Aquatic Life Use Goals |
| 0-3 | **NOT DETERMINED:** More Info Needed |


Fig 3. (Left) CT DEEP RBV data interpretation. (Right) RBV field data sheet with three main types of macroinvertebrate indicators.
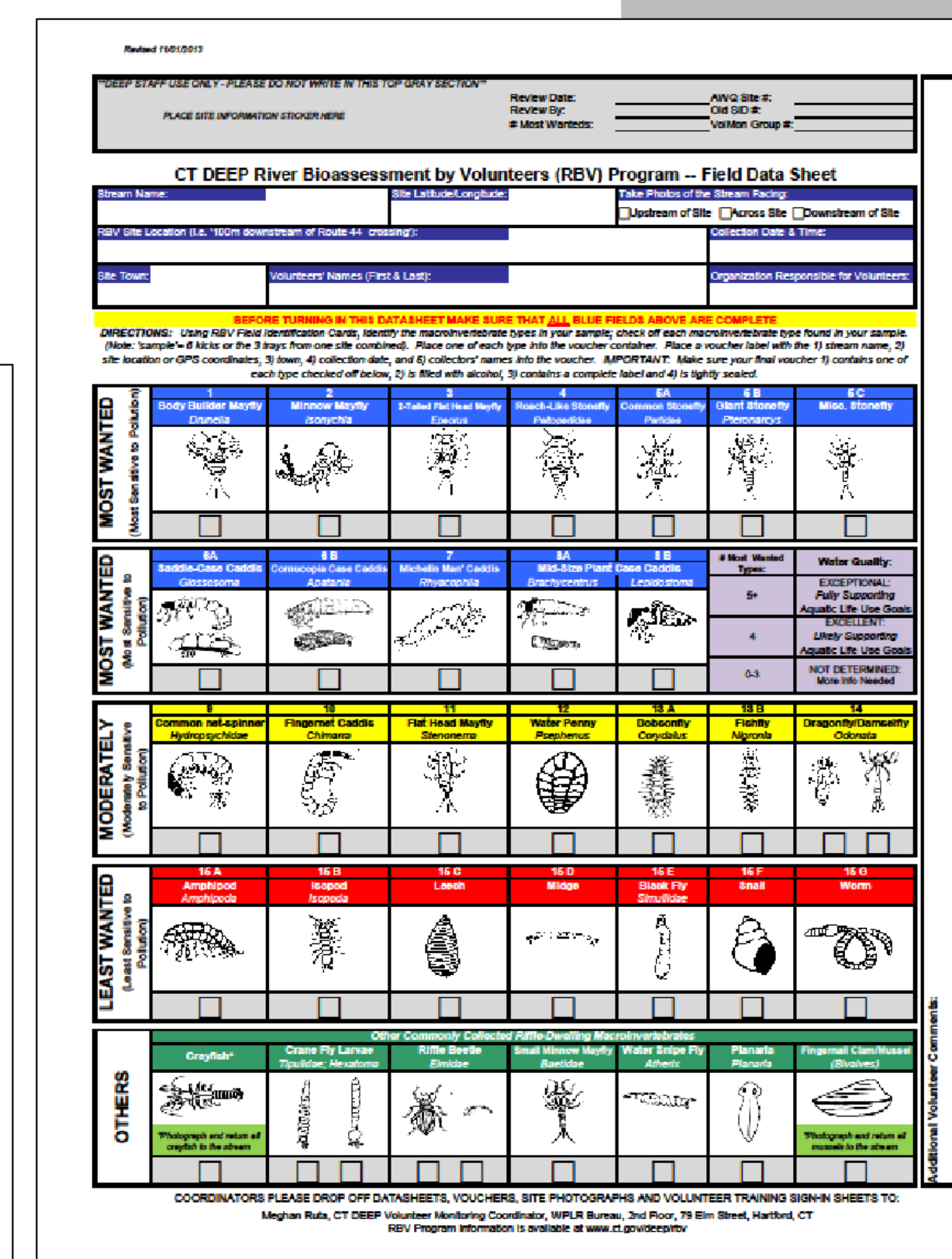
## CONCLUSION

Due to the numbers of most wanted organisms (0-3), more information is needed to make any conclusions about water quality at both of the sites studied (Fig. 3). At the Salmon River, we found only three of the most wanted organisms, but we also observed two types of macroinvertebrates (Helicopsyche and Ephemeridae) that are not often found. At the Coginchaug River, only two of the most wanted organisms were found, and in general there were fewer types of organisms. There was more variety at the Salmon River site, but the low numbers of pollution sensitive species at both sites could be due to the drought conditions and very low water levels, especially at the Coginchaug River site.

## REFERENCES

http://www.ct.gov/deep/lib/deep/water/water_quality_management/305b/2014_iwqr_facts.pdf