LESSON GOALS
This investigative study will introduce students to a group of important, but often overlooked organisms in the Wildlife Sanctuary Outdoor Learning Center of the Chattahoochee River Environmental Education Center and school campuses. The campus wildlife included in this group of animals, centipedes, millipedes, and close relatives is very exciting and even sometimes frightening to people. As amazing as any cinema monsters, these “way cool critters” will turn on young minds and launch grand discoveries. Students, through this Field Study can discover the significance of these animals in terms of the overall biodiversity of the habitat.

Students, working in discovery teams will (1) describe the micro-habitat of the study site, (2) observe and record the Myriapods located, (3) collect and identify the Myriapods found, (4) describe the size and diversity of the Myriapod populations within the study site.

Observing small organisms hidden in the litter of the forest floor can present challenges. This field study requires patience, taking risks (lying and kneeling on the forest floor), overcoming fears, and getting your hands dirty. These organisms are little known and therefore, little information exists concerning these organisms for the state of Georgia. Much of the easily obtained information concerns the control of these animals as pests.

MATERIALS
- Field Study journals
- Pencils and sharpener
- Field microscopes, one per team
- Hand lenses, one per student
- Plastic collection containers (large Kroger spice containers)
- Clear plastic snap together observation boxes
- Forceps, one per student
- Ruler, one per team
- Cloth 3 meter measure tape, one per team
- Nylon survey line
- Black permanent markers, on per team
- Golden Guide, Spiders and their Kin, one per team
- Campus Myriapod key, one per team
- Soil moisture gauge, one per team
- Soil and air thermometers, one per team
- Antiseptic wipes and hand sanitizer
- Paper towels
- 18” x 60” Al-u-lite tables, one for every two teams

POSSIBLE STUDENT-DRIVEN QUESTIONS
Introductory:
• What is a centipede and a millipede?
• What is so important about these and the other two Myriapod classes?
• Do we need predators and decomposing plant processors at this level of the habitat?

Investigatory:
• How many different types of Myriapods are in this habitat?
• Does the type of forest floor litter affect diversity and abundance?
• Are both centipedes and millipedes present?
• Which class and which species is most common?
• Does soil moisture or temperature affect the population?

Anticipated student questions:
• Can these creatures hurt me?
• Are Rolly-Polly bugs myriapods?
• How do we choose our study site?

PROCEDURE
Hypothesis:
The litter of the open deciduous forest provides better conditions for Myriapod populations.  
OR
Cooler, moister soils and forest floor litter provides better conditions for Myriapod populations.  
OR
Acceptable levels of food, temperature and moisture for Myriapod populations exist in pine and open deciduous forests.

Procedures:
Students will be placed in two to three person investigation teams. Each team will conduct independent research on Myriapods. The teams will compile the information collected into a report and will present a presentation to the other students. Stress to the students that boring means snoring and encourage very creative presentations using multi-media, song, creative movement, etc. This is to lay a strong foundation of basic understanding of the nature and nomenclature of Myriapods and their role in world ecosystems.

Students may develop a Myriapod key for use with their field investigations.

Next discuss with the students the forest habitats present at the Chattahoochee River Environmental Education Center. Ask them if they would expect to find Myriapods in the forests. Have students respond in their teams after discussing the question with their teammates. Open the discussion to encourage maximum student participation. Explain to the students that in their teams they will conduct a field study investigation of Myriapods in two different forest situations. Discuss poison ivy and other field study safety precautions.

Field Investigations:
1. Gather the students on the lower deck. Provide each student with a Field Journal, a pencil and a hand lens.
2. As a group, walk through the pine forest study area. This site is a young (less than 20 year old) Loblolly Pine forest that was formally an agricultural field, then pasture, and finally an old field
succession site. Trees at the corners of the approximately 30 meter square study area would have been previously prominently marked with flagging tape.

3. Have the students observe the overall characteristics of the area and record this in their journals. Remind students to cooperatively work with their teammates.

4. As a group, walk to the open deciduous forest study area. This site is predominantly broad life trees that are 45 to over 80 years old. This study area has also been marked with flagging tape.

5. Have the student teams observe the overall characteristics of the area and record this in their journals. Next ask the students to record any questions that they could pose concerning Myriapods in these two forest settings. Determine the amount of time to allow for this, tell the students, and call time to keep the investigation on schedule.

6. Assign one half other the class to investigate the pine forest and the other half to investigate the deciduous forest. Encourage the student teams to develop questions as they conduct their field investigations.

7. The team investigation materials have been previously placed on Al-u-lite tables at each area.

8. Explain to the teams that they will use the nylon twine, the tent pegs, the markers, and the measure tape to create quadrants on the forest floor. Each team will further divide the quadrant by placing a section of twine diagonally across the square from each tent peg. Each team will then investigation within their Quadrant from the top of the leaf litter to the soil layer. They are to investigate one triangle in the quadrant at a time. They will work as a team but each team member will independently record observations and data in their journals.

9. Stress to the teams that at the conclusion of the quadrant investigation, the area will be returned to as close to undisturbed as possible. Constantly reinforce principals of good stewardship as well as good scientific investigations. Therefore, have each team place each layer of litter material to the side so that it can be properly replaced.

10. Each team should now begin testing for temperature and soil moisture. Test the soil in each triangle of the quadrant. Test the air temperature in the sun and shade if possible. If the quadrant is on a slope, determine the approximate direction. You could also determine with respect to the slope.

11. The team should carefully describe the forest floor in their quadrant.

12. Next, have the teams begin their Myriapod searches. Each team should remove the litter layer by layer searching for the Myriapods.

13. When organisms are located that may be Myriapods, the students should use their forceps to collect the organism placing it in a plastic container. Reinforce responsible behavior in studying live organisms and stress that all of the organisms will be returned to the quadrant.

14. When all four triangles in the quadrant have been investigated to the soil layer, an option would be to use very small trowels to carefully excavate small areas of soil in the quadrant to a depth of one to three inches to determine if any of the Myriapods are in the soil.

15. Each team will use forceps to carefully collect each organism, taking due care to avoid causing injury or death.

16. Have each team take their collected organisms to their study station at the table. Tables will have been set up with the microscopes and other equipment at each study area to save time and facilitate the field investigations. Tables should be convenient to the quadrants. The equipment for each team should be placed on each end of the tables.

17. The teams will use their identification materials, microscopes, plastic observation boxes, and hand lens to identify the organisms to the extent possible. If a team determines that and organism is not a Myriapod, they could attempt to identify that organism at a later time.

18. All observations and data are to be recorded in full and complete detail in their journals. NOTE: Within the total amount of time available for this portion of the field study, you must divide the time for identification, recording, and then final analysis. You must also ensure that time is available to rehabilitate the quadrants.
19. The students should select one organism at a time. They should sketch the organism and describe the organism while observing the organism with the naked eye, a hand lens, and the microscopes. Each organism should be measured as accurately as possible. An option could be to weigh the combined Myriapods by class from each quadrant and each study area.

20. Organisms will be digitally photographed for each study area.

21. Teams will review their findings, analyze their data, and determine what their data indicates.

22. What questions arise from their findings? Any surprises? Each team should quickly write a brief summary of their data. Do the teams have their own hypothesis? Encourage and facilitate the teams developing their own questions, predictions, hypotheses, and conclusions. Create an atmosphere for creative thinking, active questioning, and challenging earlier predictions.

23. Teams at each study area may now compare and see each other’s collections.

24. Now combine the individual teams into a study area team. Have them review and discuss the sum of all of the data for their area. Allow 15 minutes for this and advise the combined teams that you are keeping time.

25. Bring the teams together on the deck. The teams are to prepare a presentation of their findings and conclusions of no more than ten minutes. Provide markers and flip charts for this presentation.

26. Encourage and facilitate discussion.

27. Pack individual team equipment into large plastic sweater boxes. Pack these into large plastic totes to allow for easy storage and transport to the study areas.

Prediction:
There will be greater diversity and abundance of Myriapods in the litter open deciduous forest floor.

OR

If the floor litter of the open deciduous forest provides better conditions, then a greater diversity and abundance of Myriapods will occur in this habitat.

RESOURCES

- Spiders and their Kin, Golden Guide
- <www.whatsthatbug.com>
- <www.efn.org>
- <www.emporia.edu/ksn>
- Callaway Gardens Crawlosuem
- Fernbank Science Center
- UGA School of Agriculture, Entomology Society

TEACHER NOTES

Extensions:

1. Ask students to write a short story for younger grades using the Myriapods in the Field Study Investigation as the principal characters. Compile the writings into a short story collection to be placed in the Media Center. Have students read their own short stories to the younger students during story time.

2. Students could write the music and lyrics to Myriapod songs. Using digital photographs of the Myriapods observed in their natural macro-habitat of the forest floor, the students could produce a CD of images coordinated with their original music compositions.

3. Divide students into teams of four to five persons. All the persons in each team must have investigated the same study area; either the pine or deciduous forest sites. Instruct the teams to carefully review their field study journals, paying very close attention to all the notes and sketches. They are to share and compare all information in all the journals on their team. Next instruct the
students to develop and design a multi medium “construction” that will serve as a creative educational display depicting the micro-habitat, the Myriapods, and the other observed organisms. Proved the students with the greatest diversity of arts and craft materials possible to afford the students the opportunity to be as creative as possible. After each team has completed their constructed three dimensional displays, place the constructions on exhibit in the Media Center or front lobby of the school.