Liking Lichens
Applying Knowledge of Lichen Ecology to GA’s Performance Standards

Submitted to:
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Executive Summary

The *Liking Lichens* Project is funded by a Teacher Quality Higher Education Program Grant through the U.S. Department of Education’s No Child Left Behind Act and administered by the Adult Education Program at the University of Georgia’s Department of Lifelong Education, Administration, and Policy. The project, an educator enhancement initiative for teachers, had three specific goals in 2011-2012:

To provide teachers with opportunities for hands-on research in ecology in the classroom and in the field

To train teachers to utilize cameras and online databases in their K-12 science courses

To connect teachers with researchers in a large scale ecological monitoring project

The 2011-2012 project began with a 5-day residential summer workshop held at the Charlie Elliott Wildlife Center. The workshop was designed and staffed by a team of experts in lichen study, education, and geography. Attending were 20 Georgia educators—15 public school teachers and 5 other environmental educators. As in three previous years, Cassandra Drennon & Associates conducted a third-party evaluation of the workshop and will also be evaluating three sustained contact weekends which will round out the program between September 2011 and March 2012.

The residential workshop had four learning objectives, contributing to achievement of the overall project goals stated above:

1. Participants will increase knowledge of biota
2. Participants will increase their camera skills
3. Participants will increase their skills using GPS
4. Participants will learn to use life lists in the classroom and for research

The *Liking Lichens* Project achieved all four of its learning objectives for the summer workshop as demonstrated through pre and posttesting, a retrospective pretest, and a focus group interview. Participants’ greatest learning gains appear to be associated with the life lists which they will continue to work on during and between the sustained contact weekends.
Key Findings

About the Workshop Experience:

1. Instructors effectively inspire the participants
2. Teachers were well supported with resources to help them learn the content but additional resources may be needed to meet their instructional needs.
3. Hands-on experiences, particularly in the field, consistently engaged the participants and stimulated their learning.
4. Participants wanted more time to process and apply what they were learning.
5. Teachers believe they learned a lot in the workshop despite some challenges, and most are confident they will be able to use what they learned in the classroom.
6. There were challenges communicating both the content and logistical information.
7. The conference center was an adequate setting for the workshop.
8. Scheduling issues were a source of frustration for most participants.

Key Recommendations

1. Provide participants with actual lesson plans, activities, and other curricular resources that demonstrate how content from the workshop can be incorporated into lessons that conform to the Georgia Performance Standards.
2. Include among the workshop faculty a science coach, master teacher, professional development specialist, or UGA faculty member from curriculum and instruction who can facilitate sessions with the teachers on applying what they are learning to the classroom.
3. Incorporate at least two breakout sessions during the weekdays, not late in the evenings when participants are tired, when teachers can discuss the practical application of the content and develop model lessons.
4. Establish a Wiki or other online environment where teachers can share tools, lesson plans, and tips for teaching about lichens.
5. When participants go out into the field, facilitate their learning by providing a checklist of the lichen species and other biota that they will be identifying.
6. Include at least one former participant on the planning committee for upcoming sustained contact weekends and any future weeklong workshops.
7. Consider cutting back the time spent on lecture each day and delivering lectures in short blocks.
8. Make the objectives for each lecture clear and build in opportunities for participants to demonstrate their understanding of the material.
9. In place of some lectures, facilitate discussions about how the material previously covered is relevant to classroom practice.

10. Incorporate small group work and collaborative learning into the agenda so that the participants remain actively involved most of the time and so they can build their professional relationships with the other teachers.

11. So that participants can spend more time actively learning, consider reducing the overall number of topics addressed.

12. When planning for events at a rural conference center, take a “better safe than sorry” approach and assume you cannot rely on consistent Internet access; have a backup plan in place.

13. Incorporate frequent breaks in the agenda and adhere to the schedule as distributed.

14. Avoid changing the schedule, particularly if changes result in unnecessary down time. If changes become inevitable, clearly communicate them to everyone.
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Introduction

Background

The *Liking Lichens* Project is funded by Georgia’s Teacher Quality Higher Education Program Grant and is administered by the University of Georgia Department of Lifelong Education, Administration, and Policy. The primary goals for Teacher Quality Higher Education Program Grants, which are an outgrowth of the federal No Child Left Behind Act, are 1) to help teachers become current in the content they teach; 2) to help teachers become current in appropriate strategies for teaching their subject; and 3) to help teachers develop the background necessary for incorporating instructional technology into the courses they teach. This is the seventh year that the *Liking Lichens* project has offered Georgia teachers and nature center educators an intensive opportunity to learn lichen identification in the field and the laboratory and to develop ways to apply their learning to the classroom. The specific goals for the *Liking Lichens* project in 2011-2012 are:

- To provide teachers with opportunities for hands-on research in ecology in the classroom and in the field.
- To train teachers to utilize cameras and online databases in their K-12 science courses.
- To connect teachers with researchers in a large scale ecological monitoring project.

A unique feature of this year’s project was the collaboration with Discover Life, an initiative funded in part by the National Science Foundation geared toward educators and scientists. Discover Life aims to provide an open-source Web-based encyclopedia of species. According to the initiative Website, [http://www.discoverlife.org](http://www.discoverlife.org), users of Discover Life can benefit from it in many ways. Teachers and researchers, for example, can:

- **Keep a life list** - Essentially, a life list is an electronic journal of photographic, video, or audio records of natural history. A contributor’s photos become linked to species information and map data.

- **Map species** - Whenever someone enters locality data to one of his or her photos, it will map as a point on the Global Mapper.

- **Monitor species locations** - Someone can enter a species name on the Global Mapper and it will show all the points where Discover Life has records for that species.

- **Identify species** - The site includes IDnature Guides for use in identifying a wide variety of insects, birds, and more.
Liking Lichens began with a 5-day residential workshop held July 17-21, 2011 at the Charlie Elliot Wildlife Center in Mansfield, Georgia. Three one-day follow-up meetings are scheduled to support the educators during the 2011-2012 school year, as teachers incorporate the workshop content into their instruction. These sessions will also serve to build lichen content on the Discover Life website.

The program logic model (Figure 1) depicts the relationship between project goals and the resources, activities, outputs, and outcomes that were designed to achieve them.

A team of expert educators and researchers facilitated the residential workshop which was led by Dr. Robert Hill, of UGA’s Department of Lifelong Education, Administration, and Policy. The team also included Dr. Tommy Jordan, of UGA’s Department of Geography, and Mr. Sean Beeching, an independent consultant to the project, along with Drs. John Pickering and Nancy Lowe of Discover Life. As in previous years, graduate student Wayd Walker served as the Project Administrator.

The project met its quota of 20 participants. Among them, 15 were teachers in K-12 public schools; 4 were environmental educators; and 1 taught on the college level.

Evaluation Design

As in 2006, 2007, and 2009, Cassandra Drennon & Associates provided a third-party evaluation of the Liking Lichens program’s summer workshop at the Charlie Elliott Wildlife Center. (Due to a decrease in funding, no external evaluations were done in 2008 or 2010.) The purpose of evaluation has been to measure both participant learning and satisfaction at...
the workshop and this year the evaluation will also include the sustained contact weekends scheduled for September, 2011 and January and March 2012.

The four learning objectives for the workshop were:

- Participants will increase knowledge of biota.
- Participants will increase their camera skills.
- Participants will increase their skills using GPS.
- Participants will learn to use life lists in the classroom and for research.

To accomplish this evaluation, we collected data in four ways. First, we administered a 31-item pretest, developed by the workshop faculty, to all participants at the outset of the workshop. The test included 24 questions (77%) pertaining to lichens and other biota, 5 questions (16%) pertaining to GPS skills, and 2 questions (6%) pertaining to technical camera skills. Five additional questions, including four questions specific to Discover Life and life lists were not asked because the answers to those questions had inadvertently been included on the participant’s test sheets. We administered the same instrument on the last day of the workshop in the form of a posttest to measure increases in participants’ knowledge. The evaluators scored the tests using an answer key provided by the faculty.

Second, to get another picture of knowledge gains across the four general content areas, we asked participants to self-evaluate their knowledge gains through a retrospective pretest. Research has shown retrospective testing to be as effective as the traditional pretest and posttest to determine the impact of a professional development workshop. When asked in advance of training to assess their knowledge levels of unfamiliar content, participants are not always able to do this accurately. Once they have attended the training, however, they find out what they did or did not know, allowing them to more accurately assess their learning. We asked participants to rate their knowledge level at the end of the workshop on a 5-point scale with 0=No, 1=A Little, 2=Moderate, 3=Quite a Bit, and 4=Extensive. We then asked them to think back and estimate what their knowledge level had been in each area before the workshop. To analyze the results, we compared the groups’ average response in each category before and after.

Third, we administered a survey on the workshop’s final day to measure participant satisfaction. The survey consisted of 23 positive statements about the workshop experience and it asked participants to indicate how strongly they agreed with each, using a 5 point scale: 1 = Strongly Disagree, 2 = Somewhat Disagree, 3 = Neutral, 4 = Somewhat Agree, and 5 = Strongly Agree. The survey was designed to capture participant levels of satisfaction in three areas: The Learning Experience, Communication, and Structure & Organization.

Finally, we conducted a focus group with the participants on the last day of the workshop to gather their perceptions of the program’s strengths and weaknesses. The focus group took approximately 45 minutes. One evaluator from CD&A moderated the discussion using a semi-structured interview guide. A second evaluator created a real-time transcript of the conversation. An audio recording of the discussion was made of the conversation for backup.

Instruments used to collect data are included in the appendices of this report.

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Findings

The *Liking Lichens* Project accomplished all four of its goals for the summer workshop: 1) to increase knowledge of biota; 2) to increase camera skills; 3) to increase GPS skills; and 4) to learn to use life lists in the classroom and for research. The increase in knowledge and skills was demonstrated through the pre/post testing, the retrospective pretest, and the focus group interview. The fourth goal, to learn how to use life lists was introduced to participants at the workshop and will continue with two follow-up meetings during the 2011 - 2012 project period. Although this content was not assessed on the pre/post test, the retrospective pretest indicated that participants’ greatest learning gains were associated with the life lists.

Participants’ feelings about the workshop itself were mixed. While they found the hands-on field experiences highly enjoyable and useful, they found the lectures somewhat disorganized, too long, and too advanced. Their recommendations point to a need for more careful planning of future agendas including less “down time,” more interaction with colleagues, and more time devoted to practical application of the material.

The findings are discussed in detail in the following two sections of this report: Workshop Experiences and Knowledge Gains.

Workshop Experiences

Findings about participants’ workshop experiences are based on the written Participant Evaluation Form and the focus groups. They are organized according to three broad topics: The Learning Experience, Communication, and Structure and Organization. Each of these discussions concludes with a chart showing mean scores for the section of the survey that specifically addressed the topic and recommendations related to the topic that are supported by the data. Table 1 displays the aggregated data for level of agreement (from Strongly Disagree to Strongly Agree), indicated by percentage and number of responses in each category.

We were very much treated as adults, scholars, biologists and colleagues rather than just students.

*Teacher Participant*
<table>
<thead>
<tr>
<th>The Learning Experience</th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
<th>Left blank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Presentations by instructors increased my interest in Georgia’s biota.</td>
<td></td>
<td>7 (37%)</td>
<td>12 (63%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Field experiences with instructors increased my interest in Georgia’s biota.</td>
<td>2 (11%)</td>
<td>17 (89%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Experiences with GPS units increased my interest in using technology in future instruction related to specific plants and animals of Georgia.</td>
<td>3 (16%)</td>
<td>10 (53%)</td>
<td>6 (32%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Experiences with <em>the digital camera and macro lens</em> increased my interest in using technology in future instruction.</td>
<td>2 (11%)</td>
<td>17 (89%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Learning about GIS will be helpful to me.</td>
<td>2 (11%)</td>
<td>1 (5%)</td>
<td>8 (42%)</td>
<td>8 (42%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. The workshop provided ample resources to support my understanding of the content.</td>
<td>2 (11%)</td>
<td>1 (5%)</td>
<td>9 (47%)</td>
<td>7 (37%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. The workshop provided ample resources to assist with my instructional needs.</td>
<td>9 (47%)</td>
<td>6 (32%)</td>
<td>3 (16%)</td>
<td>1 (5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Adequate time was provided during the workshop for us to discuss how the material could be applied.</td>
<td>4 (21%)</td>
<td>7 (37%)</td>
<td>2 (11%)</td>
<td>5 (26%)</td>
<td>1 (5%)</td>
<td></td>
</tr>
<tr>
<td>9. Opportunities to conduct selected plant and animal identifications were adequate.</td>
<td>1 (5%)</td>
<td>4 (21%)</td>
<td>2 (11%)</td>
<td>7 (37%)</td>
<td>5 (26%)</td>
<td></td>
</tr>
<tr>
<td>10. Sufficient time was allocated to learn how to use and apply the GPS unit for exercises during the workshop.</td>
<td>1 (5%)</td>
<td>6 (32%)</td>
<td>4 (21%)</td>
<td>5 (26%)</td>
<td>2 (11%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Communication</td>
<td>Strongly Disagree</td>
<td>Somewhat Disagree</td>
<td>Neutral</td>
<td>Somewhat Agree</td>
<td>Strongly Agree</td>
<td>Left blank</td>
</tr>
<tr>
<td>11. The goal(s) and objective(s) of the workshop were clear to me.</td>
<td>1 (5%)</td>
<td>3 (16%)</td>
<td>10 (53%)</td>
<td>5 (26%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Instructions given prior to any activity were always clear.</td>
<td>5 (26%)</td>
<td>5 (26%)</td>
<td>7 (37%)</td>
<td>2 (11%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Presentations by instructors were pitched at my level (neither too simple nor too advanced).</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
<td>3 (16%)</td>
<td>10 (53%)</td>
<td>4 (21%)</td>
<td></td>
</tr>
<tr>
<td>14. Instructors did a good job explaining difficult material.</td>
<td>3 (16%)</td>
<td>3 (16%)</td>
<td>8 (42%)</td>
<td>5 (26%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. The instructors helped me connect the scientific information with the K-12 classroom or science center work.</td>
<td>6 (32%)</td>
<td>3 (16%)</td>
<td>8 (42%)</td>
<td>2 (11%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. The purposes of the three Sustained Contact Weekends (Sept. 2011, Jan. 2012, and Mar. 2012) are clear.</td>
<td>1 (5%)</td>
<td>5 (26%)</td>
<td>7 (37%)</td>
<td>6 (32%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure and Organization</td>
<td>Strongly Disagree</td>
<td>Somewhat Disagree</td>
<td>Neutral</td>
<td>Somewhat Agree</td>
<td>Strongly Agree</td>
<td>Left blank</td>
</tr>
<tr>
<td>17. The instructional environment was suitable for learning.</td>
<td>2 (11%)</td>
<td>17 (89%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Housing was adequate.</td>
<td>3 (16%)</td>
<td>10 (53%)</td>
<td>6 (32%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Information provided prior to the workshop was clear.</td>
<td>2 (11%)</td>
<td>17 (89%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Information provided prior to the workshop was timely.</td>
<td>2 (11%)</td>
<td>1 (5%)</td>
<td>8 (42%)</td>
<td>8 (42%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Adequate time was provided for the meals and breaks.</td>
<td>2 (11%)</td>
<td>1 (5%)</td>
<td>9 (47%)</td>
<td>7 (37%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. The length of each session was about right.</td>
<td>9 (47%)</td>
<td>6 (32%)</td>
<td>3 (16%)</td>
<td>1 (5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Learning Experience

Finding 1. Instructors effectively inspire the participants. All of the participants agreed either somewhat or strongly that the presentations and field experiences led by the instructors increased their interest in Georgia’s biota as well as in the digital camera as a tool for instruction. With the exception of three individuals who were neutral, the participants also agreed somewhat or strongly that the experiences instructors provided increased their interest in GPS as an instructional tool (Table 1). When asked about the strengths of the project, seven of nineteen teachers present on the last day of the workshop identified the instructors as the primary strength. Specifically, they pointed to the instructors’ knowledge, support, enthusiasm, and dedication.

Finding 2. Teachers were well supported with resources to help them learn the content but additional resources may be needed to meet their instructional needs. The majority of the participants (84%) agreed either somewhat or strongly that there were ample resources at the workshop to support their learning about lichens and other biota—books, handouts, visual aids, and artifacts. Nearly half the group (47%), however, disagreed somewhat that there were ample resources to support their instructional needs. During the focus group, several indicated their agreement with the teacher who wished for more materials that could actually be used in the classroom. For example, teachers want materials such as PowerPoint presentations in an electronic format that they can edit for their own purposes. A teacher suggested the workshop be augmented with a website where teachers can also upload materials to share with one another.

Finding 3. Hands-on experiences, particularly in the field, consistently engaged the participants and stimulated their learning. As in years past, the highlight of the workshop was the field experience. Unanimously, teachers enjoyed the morning small group sessions, led by faculty experts, which took place in the woods surrounding the conference center. In contrast to the afternoon lectures, they described these morning sessions as goal-oriented, hands-on, and engaging. “That’s the way you want your classroom to be,” said one teacher. Field experiences and experiences with the digital cameras were the highest rated learning experiences at the workshop (Figure 2). Some teachers thought that taking worksheets or checklists along in the field would help reinforce their learning. Information was thrown out like, ‘Here is the handout and here is the material.’ My thing is, when would you suggest is the best time that we do this? I’d like them to say, ‘A good time to do this is such and such.’ We only got that kind of direction if we asked for it.

Finding 4. Participants wanted more time to process and apply what they were learning. A substantial majority of the participants (69%) were either neutral or negative about the time that was provided during the workshop to discuss how the material could be applied in their classrooms (approximately 90 minutes around lunch time on the last day of the workshop). Similarly, a majority (58%) was either neutral or negative about the amount of time allocated to learn how to use and apply the GPS unit for exercises during the workshop. One teacher explained that, “There were good ideas but not enough time to discuss more about the issues.” Another person shared, “One thing that really got on my nerves was there was no time to think. No time for reflection. There were handouts to read and no time to even read those.” This comment inspired another participant to add, What is really satisfying about this is getting to become a part of the research community. The pictures we take have potential to be seen all over the world.
Teacher Participant
Several participants also noted that there was not enough time in the schedule to practice identifying species.

**Finding 5. Teachers believe they learned a lot in the workshop despite some challenges, and most are confident they will be able to use what they learned in the classroom.** In the focus groups, we asked teachers the extent to which they were prepared to apply what they had learned in the workshop despite the fact that the workshop did not provide as much support in this area as they would have liked. “A lot!” said one teacher.

*It was great. I think we learned a lot.*

*There were some technical glitches but I really learned a lot.*

*We did a lot of interesting things.*

Teacher Participant

“One teacher said that it would really depend on what you were teaching. She thought GPS would be great for teaching Geography, “wind currents, weather, etc.” Another teacher, who teaches Social Studies added that she will be using the GPS her very first week back at school.

*It has changed my educational philosophy, honestly. The photography was the main thing I took out of this. Using photography was huge. I want to use it to teach all concepts in my classroom. There is power in kids having something they took instead of demonstrating to them. It’s a beautiful thing.*

One member of the focus group took the initiative to ask her peers if they thought the GPS section of the workshop in particular was relevant. One teacher said that it would really depend on what you were teaching. She thought GPS would be great for teaching Geography, “wind currents, weather, etc.” Another teacher, who teaches Social Studies added that she will be using the GPS her very first week back at school.
Recommendations about the Learning Experience

- Provide participants with actual lesson plans, activities, and other grade specific curricular resources that demonstrate how content from the workshop can be incorporated into lessons that conform to the Georgia Performance Standards.

- Include among the workshop faculty a science coach, master teacher, professional development specialist, or UGA faculty member from curriculum and instruction who can facilitate sessions with the teachers on applying what they are learning to the classroom.
• Incorporate at least two breakout sessions during the weekdays, not late in the evenings when participants are tired, when teachers can discuss the practical application of the content and develop model lessons.

• Establish a Wiki or other online environment where teachers can share tools, lesson plans, and tips for teaching about lichens.

• When participants go out into the field, facilitate their learning by providing a checklist of the lichen species and other biota that they will be identifying.

• Include at least one former participant on the planning committee for upcoming sustained contact weekends and future weeklong workshops.

Communication

Finding 6. There were challenges communicating both the content and logistical information. On average, the participants either were neutral or only somewhat in agreement with the six positive statements on the Participant Evaluation Form pertaining to communication (Figure 3). These were the lowest ratings received for communication in the years that CD&A has been collecting such data. Communication problems surfaced in a variety of forms.

Most participants felt that the instructors were pitching the content at a level that was too advanced for them or for their students. As one teacher explained, “My biggest issue was that this was set up as a college level lecture and the teachers were having a difficult time figuring out how to turn it into classroom [practice.]” Another said plainly, it was a little too advanced.” A third teacher added, “They were very supportive of our learning but there was a disconnect with the professors in them and the teachers in us.” Not everyone thought the content was pitched too high, however. One teacher said, “The high level wasn’t an issue; I liked the intro to new fields.”

Another major theme in the feedback from participants was the overuse of lecture. The teachers felt that the instructors relied too heavily on this teaching technique at the expense of providing them hands-on practical experience with the content. They made this point repeatedly. Participants complained that during lectures, “the goal” rarely seemed clear. In contrast, they liked working with the digital cameras because the task was clear and they understand what they were trying to accomplish.

A third communication problem pertained to the schedule. Several participants felt that changes made to the printed schedule were not effectively communicated to the group, and that changes were made too frequently. They say this resulted in confusion and wasted time.
Figure 3. Participant Results: Communication
Statements Ranked by Average Score
N=19

The goal(s) and objective(s) of the workshop were clear to me.
The purposes of the three Sustained Contact Weekends (Sept. 2011, Jan. 2012, and Mar. 2012) are clear.
Instructors did a good job explaining difficult material.
Presentations by instructors were pitched at my level (neither too simple nor too advanced).
The instructors helped me connect the scientific information with the K-12 classroom or science center work.
Instructions given prior to any activity were always clear.

1=Strongly Disagree, 2=Somewhat Disagree, 3=Neutral, 4=Somewhat Agree, 5=Strongly Agree

Recommendations about Communication

- Consider cutting back the time spent on lecture each day and delivering lectures in short blocks.
- Make the objectives for each lecture clear and build in opportunities for participants to demonstrate their understanding the material.
- In place of some lectures, facilitate discussions about how the material previously covered is relevant to classroom practice.
- Incorporate more small group work and collaborative learning into the agenda so that the participants remain actively involved most of the time and so they can build their professional relationships with the other teachers.
- So that participants can spend more time actively learning, consider reducing the overall number of topics addressed.
Structure and Organization

Finding 7. The conference center was an adequate setting for the workshop. Participants either agreed or strongly agreed with all the positive statements on the evaluation form pertaining to the conference setting and logistics. This finding indicates that Charlie Elliott Wildlife Center continues to be an adequate venue for holding the event, at least from the perspective of the teachers. The most significant problem with this facility has been unreliable Internet access. This reality should be taken into account when planning instructional events here.

Finding 8. Scheduling issues were a source of frustration for most participants. Group members felt that the sessions were too long; there were too many arbitrary changes to the schedule; and changes to the schedule were not communicated effectively. Moreover, they felt there was needless “wasted time” or “down time” that could have been put to better use. While an Internet outage severely impacted the instructors from Discover Life, the participants expressed little frustration with this wrinkle. Several expressed aggravation with the fact that the instructors had not anticipated this possibility and come equipped with backup print materials. Similarly, they wished that the instructors had avoided downtime in the agenda all together and adapted to the circumstances.

Recommendations for Structure and Organization

• When planning for events at a rural conference center, take a “better safe than sorry” approach and assume you cannot rely on consistent Internet access; have a backup plan in place.

• Incorporate frequent breaks in the agenda and adhere to the schedule as distributed.

• Avoid changing the schedule, particularly if changes result in unnecessary down time. If changes become inevitable, clearly communicate them to everyone.
Knowledge Gains

To determine knowledge gained during the workshop, participants were tested at the beginning and retested at the end of the week. We measured their knowledge gains according to three of the four learning objectives—that participants would demonstrate their knowledge of 1) lichens and other biota, 2) camera technology, and 3) GPS units. A mistake on the test form rendered questions about the fourth objective pertaining to life lists not usable. Tables 2 through 5 compare the pretest and posttest results overall and for each of these content areas in terms of the average percentage correct. Learning gains were evident in each content area. Overall, the group increased their scores from pretest to posttest by 31 percentage points. The majority of questions focused on lichens and other biota. Knowledge increased in this domain by 31 percentage points as well. Knowledge of the camera and GPS units increased by 44 percentage points and 26 percentage points respectively.

Table 2. Overall Knowledge Gains: Comparison of Pretest and Posttest Results

<table>
<thead>
<tr>
<th></th>
<th>Average % Correct</th>
<th>Minimum % Correct</th>
<th>Maximum % Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE</td>
<td>56%</td>
<td>29%</td>
<td>94%</td>
</tr>
<tr>
<td>POST</td>
<td>87%</td>
<td>65%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 3. Knowledge Gains for Lichens and other Biota: Comparison of Pretest and Posttest Results

<table>
<thead>
<tr>
<th>Lichens and other Biota</th>
<th>Average % Correct</th>
<th>Minimum % Correct</th>
<th>Maximum % Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE</td>
<td>56%</td>
<td>21%</td>
<td>100%</td>
</tr>
<tr>
<td>24 questions</td>
<td>POST</td>
<td>87%</td>
<td>63%</td>
</tr>
</tbody>
</table>

Table 4. Knowledge Gains for Technical Camera Skills: Comparison of Pretest and Posttest Results

<table>
<thead>
<tr>
<th>Technical Camera Skills</th>
<th>Average % Correct</th>
<th>Minimum % Correct</th>
<th>Maximum % Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE</td>
<td>38%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>2 questions</td>
<td>POST</td>
<td>82%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 5. Knowledge Gains for GPS Units: Comparison of Pretest and Posttest Results

<table>
<thead>
<tr>
<th>GPS skills</th>
<th>Average % Correct</th>
<th>Minimum % Correct</th>
<th>Maximum % Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE</td>
<td>61%</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>5 questions</td>
<td>POST</td>
<td>87%</td>
<td>60%</td>
</tr>
</tbody>
</table>
Participants’ subjective assessment of their learning gains, measured by the retrospective pretest, mirrored the learning gains demonstrated through pre and posttesting. Participants perceived their greatest learning gains were associated with the cameras. Learning gains associated with lichens and other biota were slightly more narrow. They perceived the smallest learning gains to be associated with GPS units. Broadly speaking, the participants perceived themselves having little knowledge of these three topics at the outset of the workshop but moderate knowledge by the end. Their knowledge of life lists was not objectively measured through the pre and posttest, but according to the retrospective pretest, the greatest learning gains occurred in this area. Participants perceived that they entered the workshop with little knowledge of this topic but by the end they had quite a bit of knowledge about how to use life lists in the classroom and for research.

![Figure 5. Retrospective Pretest Results](image)

0=None, 1=Little, 2=Moderate, 3=Quite a bit, 4=Extensive

**Final Thoughts**

In the focus group and on the retrospective pre-test, teachers self-reported that they learned a lot during the weeklong workshop. Their perceptions are objectively supported by gains in knowledge demonstrated through the pre and posttest. The question, however, is whether they can apply what they learned to their classrooms. The teachers left feeling that they would indeed be able to use what they learned in the workshop, but they were clear that the workshop fell short of helping them develop specific standards-based activities and lesson plans. The upcoming sustained contact weekends provide an opportunity to fill this critical gap.
Appendices

- Participant Evaluation Form
- Focus Group Interview Guide
- Retrospective Pretest
- Pretest/Posttest
### Participant Evaluation Form

**Liking Lichens (and other Biota): Applying Ecological Knowledge to Georgia’s Performance Standards**  
July 17-20, 2011

Please indicate the extent to which you agree with each of the following statements.

<table>
<thead>
<tr>
<th>The Learning Experience</th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Presentations by instructors increased my interest in Georgia’s biota.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Field experiences with instructors increased my interest in Georgia’s biota.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Experiences with GPS units increased my interest in using technology in future instruction related to specific plants and animals.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Experiences with the digital camera and macro lens increased my interest in using technology in future instruction.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Learning about GIS will be helpful to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. The workshop provided ample resources to support my understanding of the content.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. The workshop provided ample resources to assist with my instructional needs.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Adequate time was provided during the workshop for us to discuss how the material could be applied.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Opportunities to conduct selected plant and animal identifications were adequate.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Sufficient time was allocated to learn how to use and apply the GPS unit for exercises during the workshop.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication</th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. The goal(s) and objective(s) of the workshop were clear to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. Instructions given prior to any activity were always clear.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. Presentations by instructors were pitched at my level (neither too simple nor too advanced).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. Instructors did a good job explaining difficult material.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. The instructors helped me connect the scientific information with the K-12 classroom or science center work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. The purposes of the three Sustained Contact Weekends (Sept. 2011, Jan. 2012, and Mar. 2012) are clear.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structure and Organization</th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Neutral</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. The instructional environment was suitable for learning.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19. Housing was adequate.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20. Information provided prior to the workshop was clear.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21. Information provided prior to the workshop was timely.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22. Adequate time was provided for the meals and breaks.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. The length of each session each day was about right.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Liking Lichens 2011  
Focus Group Questions

CD&A is participating as an external evaluator for this workshop. Our purpose in being here with you today is to gain insights into the experience you’ve had this week and, from that, to learn how to improve the workshop. To guide our report writing, we’ll be reviewing this conversation along with the paper evaluation form you filled out this morning. For the sake of accuracy, we’d like to audiotape our conversation today. Your remarks, however, will be kept confidential (we won’t use any names) and the tapes will be destroyed once we’ve completed the evaluation report. Does anyone have any questions/concerns?

We have just a few questions, and they’re intended to encourage a conversation about your learning experience this week:

1. How has the week been going for you?

2. What was the most engaging moment of the week for you? (At what moment did you feel most involved with what was happening?)

3. What was the most distancing moment of the week for you? (At what moment did you feel least involved with what was happening?)

4. We’d like you to think for a moment about yourself as a learner this week. What could you have done differently that would have improved your learning experience?

   Probes:
   a. Did anything get in the way of your ability to learn?
   b. What could the project staff have done something differently to support your learning?

5. To what extent do you think you’ll be able to transfer what you learned here to your classroom?

6. Is there any way this project could increase your ability to transfer the skills and knowledge you’ve gained to the classroom?
RETROSPECTIVE PRETEST
Please assess, generally, the knowledge and skills you gained during this workshop. You can defer to the workshop agenda and other materials to refresh your memory of what was covered under each topic.

IMPORTANT: Please rate your knowledge and skills AFTER first, and then rate your knowledge and skills BEFORE the workshop, by circling the most appropriate response.

<table>
<thead>
<tr>
<th>AFTER having completed the workshop:</th>
<th>None</th>
<th>Little</th>
<th>Moderate</th>
<th>Quite a bit</th>
<th>Extensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>My knowledge of Lichens and other biota</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>My skills photographing biodiversity</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>My skills using GPS</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>My ability to use life lists in the classroom and research</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BEFORE coming to this workshop:</th>
<th>None</th>
<th>Little</th>
<th>Moderate</th>
<th>Quite a bit</th>
<th>Extensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>My knowledge of Lichens and other biota</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>My skills photographing biodiversity</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>My skills using GPS</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>My ability to use life lists in the classroom and research</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Pre-Course Evaluation - Summer 2011
TEACHER QUALITY WORKSHOP

Liking Lichens (and other Biota): Applying Ecological Knowledge to Georgia's Performance Standards in Science

A. GeoSpatial Information

1. **Why is it increasing important to know the locations of phenomena we observe in nature?**
   a. Geospatial relationships tell us more information about an object than simply whether it exists.
   b. Everything is related and everything occupies a place in space.
   c. By linking a feature to a location, we can begin to understand the deeper relationships of that feature to the natural world it exists in, including soils, water, forest type, pollution, etc.
   d. **All of the above**

2. **What are coordinates?**
   - The term used to describe hand-to-eye relationships, for example, in sports.
   - Numerical values that describe a location relative to a known reference system.
   - Very small parts of a lichen body
   - Angular measures indicating direction as read from a compass

3. **What is the Global Positioning System?**
   - A device to help navigate to an unknown location
   - A device to record the location of a lichen specimen
   - A system of satellites that broadcasts signals continuously to users all over the world
   - The lever on a chair that raises and lowers the seat

4. **What is a Geographic Information System?**
   - A computer program that displays maps on the screen
   - A database of geospatial features that overlay precisely
   - A system of tools that allow us to ask questions about the relationships between phenomena
   - **All of the above**

5. **What is a datum in mapping?**
   - The date a lichen is first created
The date and time that a sample is taken during a field survey
• A way to describe the shape of the earth and provide the foundation for a given coordinate system
• One item of data

B. Lichens

6. • Cladonia cristatella
   • Usnea strigosa
   • Parmotrema perforatum
   • Cladonia subtenuis
   • Flavoparmelia caperata

7. • Cladonia subtenuis
   • Cladonia cristatella
   • Usnea strigosa
   • Parmotrema perforatum
   • Flavoparmelia caperata

8. • Parmotrema perforatum
   • Flavoparmelia caperata
   • Usnea strigosa
   • Cladonia subtenuis
   • Cladonia cristatella

9. • Cladonia cristatella
   • Usnea strigosa
   • Parmotrema perforatum
   • Cladonia subtenuis
   • Flavoparmelia caperata

10. • Cladonia subtenuis
    • Cladonia cristatella
    • Usnea strigosa
    • Parmotrema perforatum
    • Flavoparmelia caperata

C. Natural History & Other Biota

11. Some examples of phenology are:
   a. Blooming times of flowers
   b. Leafing out of trees
   c. Insect emergence times
   d. Diversity of species in an area
12. Lichen species richness decreases with:
   a. Poor air quality
   b. Poor soils
   c. Poor diversity of tree species
   (answer = a)

13. To collect high quality data on species, Discover Life protocols use:
   a. insect pins
   b. herbarium sheets
   c. digital photographs, GPS, and cell phones
   d. written observations
   e. all of the above
   (answer = c)

14. Discover Life's goals are to:
   a. study large scale effects such as climate and pollution on species and their interactions
   b. improve education with hands-on science projects
   c. collect and maintain specimens from all over the continent
   d. maintain a genomics library for over a million species
   e. all of the above
   f. a and b
   (answer = f)

15. Discover Life is building a network of study sites to study:
   a. effectiveness of digital photography for use in science classrooms
   b. spread of diseases transferred by insect vectors
   c. effects of large scale factors such as climate on species and their interactions
   d. all of the above
   (answer = c)

Please refer to the answer sheet at the end of this handout. Your task is to match answer with a Powerpoint slide. Be certain to use the appropriate letter:

16. ___P___
17. ___A___
18. ___G___
19. ___D___
20. ___O___
21. ___H___
22. ___C___
23. ___K___
24. ___I___
25. ___Q___
26. ___N___
27. ___B___
28. ___L___
29. ___S___
30. ___J___
31. ___F___
32. ___M___
33. ___R___
34. ___E___

D. Technical Skills

35. The term "20x optical zoom" means:
- The camera can take photos close to your subject
- The camera can be used like a telescope
- The camera has optical shooting modes, ranging from fully automatic to manual
- The camera has none of the above features

36. Uploading data means....
- The user uses a receiving device to initiate the transfer of data
- Offering any file for downloading or the process of receiving such a file
- Sending data from a remote system such as a server to a local system
- Sending data from a local system to a remote system such as a server
37. Ask a question about GA Biota that is on your mind.
Please Match Each of the Following with a Powerpoint slide. The slides are Numbered 16 – 34 and will be Shown in Numerical Order.

You May Remove this Sheet from the Handout for Easier Access.

A. A “composite”
B. *Aralia spinosa*, Devil’s walking stick, with compound leaf
C. Sphinxid: *Darapsa myron*, Virginia creeper sphinx
D. *Quercus alba*, White oak
E. *Toxicodendron radicans*, Poison Ivy
F. Bees
G. Noctuid: *Harrisimemna trisignata*, Harris’ Three-spot
H. Flies
I. *Plantanus occidentalis*, Sycamore
J. Beetles
K. Saturnid: *Citheronia regalis*, Hickory horned devil, Regal Moth
L. Wasps
M. *Ligustrum sinense*, Privet
N. *Hedera helix*, English Ivy
O. *Euonymus americanus*, Hearts a bustin’
P. Geometrid: *Epimecis hortaria*, Tulip tree beauty
Q. *Cornus florida*, Dogwood
R. *Impatiens capensis*, Jewelweed
S. Moths