Tips for Forestry event
Science Olympiad Coaches Workshop Hammond, IN
October 2, 2004

Presented by Tom Wellnitz, The Paideia School, Atlanta, Ga
Coach for Div. B and Div. C teams
wellnitz.tom@paideiaschool.org

Organization of material in this packet

1. Overview of the event and steps for quickly getting started in this event.
    (pp2-3)

2. What to expect at an event
    A. The probable (page 3)
    B. The possible (page 4)

3. Training hints (pp. 5-9)

4. Pitfalls (page 10)

5. Going from state to national competition (pp. 11-13)

6. Sample notebook organization pages (pp. 14-16)

7. Spreadsheet on the conifers from the national tree list (pp. 17-18)

8. National tree list with notes of which resources include which trees. (pp19-20)

9. Practice event (includes diagrams so it can be done w/o specimens) (pp 21-)
    For the GA tree list, which is used for the practice exercise, see
        http://www.gsu.edu/~wwwgso/ga_rules.html
(If you use the practice test included here, teams had 3.5 minutes per station.)

Science Olympiad Forestry Event -- Getting started

1. The Forestry event deals with tree identification and questions about the ecology, economic uses, and habitats of trees. Identification is supposed to be based upon the leaves, although other parts can be included as well. Students are expected to answer questions with scientific name -- genus and species.

2. **Get a copy of your state's official list.** Confirm that this is the list that will be used at your tournament. Your job is much easier if these are the only leaves you will see. It should be much shorter than the national list, and if done well, you should be able to find samples of most if not all of the trees to use in practice.

3. **Bring the list to the tournament.** Organize the list so your students can find the names of what they are looking for quickly. The list my team is organized alphabetically by common name. Last year we printed the list onto label paper so students could pull off name without needing time to copy. Check with your tournament official to see if pull off labels will be allowed.

4. **Get the Audubon book for identification but try to avoid using it in the tournament.** Make notebooks. Our notebook is organized by category of leaf: Gotta to know unusual forms, oval leaves, compound leaves, big leaves, oaks, pines, leathery leaves. Notebook includes a large picture of leaf (from Audubon pocket guides or photo). Pictures are 3 x 5 so many can be put in photo holders. Each section has a quick guide to the leaves with diagrams on the pages. The goal for all this is to make as much information available as quickly as possible without needing to leaf through the thin pages and small type of the Audubon guide.

You may want to copy the relevant Audubon pages and include it in your notebook.

Make tabs for the Audubon book so you can quickly find what you need if you do need it. Avoid needing to go the index to find pages. Time often matters in this event.

5. **Divide your resources into two parts so each student can be doing something.** At a minimum you should have two lists of the trees so one person

can be copying the name while the other looks for the answer to a question.

      6. **Use hints at the stations to identify the tree.** Look for seeds, location leaf collected, information or sample of flower.   Sometimes the question being asked about the tree will give away what tree it is.

      7. **Practice before the event.** Students should be familiar with all resources they take in and how to use them to their best advantage.

What to expect at a Forestry event -- The probable

      1. Event rules say that the event should include have a question on identification and a related question about the tree.

      2. Almost universally, this will mean the event will be done as stations; almost nobody will use a wood lot because it is too hard to manage under the time constraints of a tournament. Usually stations are one leaf sample, one question. Some uniform period of time will be allowed at each station.   This means students will be moving often, maybe 20-30 times (or more) in one period. If you have never watched an event done in stations, you will be probably be surprised at how hard it is for students to move between stations. See hints about stations on training page.

      3. Expect somewhere between 20 and 30 tree samples. (A super tournament site with a committed event supervisor might push the number to 50.)

      4. On a good day, many of you will see dried samples of leaves (because most regionals and some state tournaments occur before leaf out in the spring.) On an average day, you will probably see a number of stations where the "leaf sample" is a picture.   The only fresh materials you might see are evergreens.   A really good day, especially late in the spring will have living or recently living specimens.

      5. Leaf samples that you may not be able to identify. Identification of trees by only their leaves can be difficult. You want your students to do the best they can. At least narrow the tree down and then put down some name. The sample may not have been on the list or the supervisor identified it incorrectly.

Guessing shouldn't count against you , and it is better than a blank.

6. Questions about the tree can range from uninspired. -- Is this leaf simple or compound? What type of leaf margin does it have? to simple -- answer is in the commentary of the Audubon book, to more involved -- question may come from another resource book. Some questions will give away the type of tree -- What is special about the General Sherman tree? (largest diameter tree so you know it should be Giant Sequoia.) Usually the question will require the students to write something. Don't expect your team to be able to answer all the questions. There are too many different types of things that can be asked -- physiology, ecology, economic benefits, diseases, botanical vocabulary, and habitat. Questions may not be about the specific tree, but plants or trees in general.

7. Regrettably, you may find the person organizing the event has spent much less time preparing for this than your students have. Many supervisors underestimate how much time it takes to write good, challenging questions. Then, for this event time pressure is intensified because the person has to collect samples. Even if you know where to find the sample of the trees you want to use, many hours can be involved with the collection.

What to expect at a Forestry event -- the possible

Often Science Olympiad events are organized hastily by people who do not understand the education needs of adolescents or who have limited experiences with evaluating the work of a number of talented students in a short period of time. However, I like to push education value in events as much as possible. While this event is a natural history event, there are no reasons higher order skills cannot be included. Here are somethings you might see.

1. Several tree leaf samples per station. When I run events, I try to keep the number of stations to a minimum, often equal to the number of teams per time slot. With fewer stations, you can also include more trees. Each student might work with a different problem. With single stations, too much of the time is spent moving between events. As an event supervisor, I also spend more time monitoring the move when I could be evaluating earlier session work.

Combining several trees at the same station allows some of the questions to be comparison or recognition of similarities or recognizing important differences. Having fewer stations allows more time per station and allows more time to look up information for complicated questions .

2. The types of questions can vary. Instead of only a short answer, fill-question, you might see multiple choice, multiple choice where you pick ALL the correct answers, pick the false statement, comparisons, or rankings.   As a person involved with grading, I don't like fill-in type questions because it opens the range of acceptable answers. I prefer to take the students in some direction for which I know there is only one correct answer. In the rush to evaluate everything before an awards ceremony having to think about whether the answer makes sense even if not what I wanted is difficult.

3. Measurement and calculation can be a part of this event. Students often don't do enough of this, and including these reinforce these skills.

4.   Leaves could be matched with seeds. While the rules infer question should include a leaf that is on the list, there is nothing to say that a seed included at a station could not match the leaf or maybe not even be from the tree list. There is nothing that says that a tree can only show up once. Often students think if they have seen a question about a particular tree, it has to be something different. Which is why this could make a nice question.

5. I personally feel the event supervisors should give half credit if the genus for a leaf is correct and the species name is incorrect.   With some genera, if you have only a leaf, especially only a dried one, you can't make a positive identification.

6. I would include many questions that may not be directly related to the leaf or tree involved. That is, a question like what is the economic value of this tree will be hard to impossible to answer correctly if you don't identify the tree correctly. So you've lost two points. I would like to see about 1/3 of the questions be questions that could be answered regardless of what the tree species is.

Forestry Training and Preparation Hints
Part 1 -- Identification

1. Learning the trees by leaves. This is a key part of the event. Your goal should be to have your students be able to identify by sight for nearly all the trees on your list. This will save valuable time at the event. If a unique identification is not possible by sight, the students should know it is either tree A or B or C.

    A. Work from pictures. Cut apart an Audubon pocket guide and use these as flash cards.
    B. Make flash cards from diagrams. See references for black line drawings.
    C. Look at trees with leaves on them and recently collected samples.
    D. Practice with dried specimens -- often look very different from book pictures.
    E. Practice with silhouettes (put the leaf on a photocopy machine)
    F. Students must know the "gimmes" on your state list: Sassafras, yellow (tulip) poplar, white pine, sweetgum.
    G. Work the hard ones -- perhaps making keys, checklists, comparing pictures. Locate as many samples of these as you can.

2. Learn the features that make samples different. While some trees are unlike any others, many were (possibly deliberately) included on tree lists because of similarities. One problem with using any kind of flash card is that students pick up more information from the image -- orientation of leaf, color, rip on corner of paper, etc. to use in their identifications, and then they have trouble with a new sample.   Students may find it helpful get in the habit of saying what are the features they see that make it, e.g. a white oak, (*Quercus alba*). (For this tree, it might be deep lobes, round lobe tips, uneven size of lobes, no waxy coating on leaf.)

    A. Describe the leaves
    B. Check books to see what are the key identification features
    C. Compare similar leaves and make list of the key differences
    D. Know the ranges you might expect in number of lobes, size, etc.
    E. Mark the differences on diagrams of quick identification features.

3. Decide on what your students will use to remember trees. Organize your notebook in this way, and make lists to reflect this.   Students may gain much from organizing their own notebooks. Some schools even start over with new notebooks each year as a way of reviewing what undoubtedly is lost from months of inattention to details related to this event.

4. Collecting samples.   I keep sections of newspaper and corrugated cardboard in my car.   If I see an interesting specimen, I collect it. Put it between the newspaper, use the corrugated cardboard as a air spacing tool, and put some weight on it. If you know what it is, mark it with as much information as you know when you collect it. Guarantee you will forget what it is by the time it is dried.   For many of you it is already too late because leaves have already started to fall. You should check colleges or other schools to get samples.

A. Mounting -- herbarium paper, lamination, sheet protectors. Lamination is good to keep the sample from damage if used repeatedly. It is bad for some identification features where you need to need to feel leaf (red and white mulberry, American and slippery elm). Leaf node of compound leaves can be hard to get through laminator; I tug the lamination from the back side to help get through the rollers. Sheet protectors may be cheaper and better suited for some samples, especially if using only half sheet of herbarium paper. Sheet protectors allow removal of sample occasionally.

B. Preserving leaves -- Leaves can be soaked in a 2 part water, one part glycerin solution for about one week.   This preserves the flexibility of the leaves and allows them to be handled.

C. Pines -- can be mounted with tape to herbarium paper.

D. Spruces -- I don't have a good answer to these. Maybe store in ziplock bags.

Part 2 -- Preparation for answering the questions

The second part of this event covers a large amount of material. While I don't know this for sure, my feeling is that in a competitive tournament, students' ability to answer these questions eventually determines their success. After all, everyone knows what the identification will involve. The questions about the trees can come from widely different areas and from a number of different resources.

Key ideas
1. Team members need to be familiar with what is in their resources and how to find information quickly.

2. The more time they spend on preparing notebooks and locating the information, the more likely they will remember something and not have to look it up.

3. Making and including lists can make retrieval of information faster. Some list topics include State and Provincial trees, names and symptoms and trees affected by common diseases, superlatives -- biggest, fastest growing, widest distributed -- typical habitat for trees on your state list.

4. Notebook should probably include a glossary, preferably one with pictures. I don't think students need to know all the botanical names for something but having the glossary can come in handy if a question asks about it. I think picture ones are easier to use.

5. As students research trees, they should keep notes of interesting things they learn about the trees. Probably as a first step, this should involve reading all the information in the Audubon guide about the tree. Note: the Audubon pocket guides have somewhat different information than the big book. Depending on student time and interest, they could later organize this information on sheets for each tree in their notebook.

6. Other worthwhile references:
   A. *A Natural History of Trees* (see reference on the annotated national list)

B. References listed by Science Olympiad. I think the Virginia Tech pages are among the most useful, especially the facts sheets (third URL listed here).
http://www.cnr.vt.edu/dendro/wwwmain.html
http://www.cnr.vt.edu/dendro/dendrology/main.htm
http://www.cnr.vt.edu/dendro/dendrology/factsheets.cfm
The "Ask Dr. Dendro" link on one of the pages can be useful when you get stuck.

7. Pictures -- you can probably find many with a Google image search. The problem is whether they show enough detail of leaves to be useful. If you have lots of time and will be going to a tournament where pictures are likely to be used instead of real samples, this might be a good exercise to do because you will see the same pictures likely to be found by your event supervisor.

Part 3 -- Preparing to Compete

Students may need help in making them more effective competitors.   As mentioned earlier, many students find stations confusing. The students aren't used to moving around a room, may not be used to doing things with the limited time of a station, and may not be used to being a room with so many other students.

Station hints:
1. Practice with answering questions in a timed manner. (If you use the practice test included here, teams had 3.5 minutes per station.)

2. Practice moving from station to station. It is amazing to watch how long some students can take moving from table to table. One key thing that helps here is keeping the number of resources involved to a minimum. Students should be able to pick up and go fast. Maybe two resources: a notebook and the Audubon guide. Keep things like rulers, tree lists, attached to the binders.

3. Know the resources and how to use them.   Everything students take in they should know how to use. The more they practice, the less they will have to use any of the resources.

4. Put your school name on everything the students take into the room so when it is left there, you will get it back.

Forestry Event Pitfalls -- Areas of common difficulty

1.   The Audubon guide photographs may not provide enough information to identify clearly a tree.   The photograph may lack crucial size information or a telling detail may not be visible. The guide may only show the main form of the tree. (Example: *Quercus falcata* shows two distinct leaf types and only one is in the book.)

2. Dried leaf samples may look much different from the leaf when it is green and on a tree or as photographed for the guide book.   Dried leaf texture can change greatly from the living leaf. (Good example is tupelo, *Nyssa sylvatica*.)

3.   Young leaves may look different from older leaves of the same season. Same with immature seeds.   Leaves on younger tress may look different from older trees. Young trees often have bigger leaves than older ones, and you may be more likely to see a young leaf sample because it can be collected closer to the ground. Lengths are among the least reliable of criteria

4. Leaves from ornamental trees, trees planted by landscaping companies, or in many housing developments may not be true samples of their species. Many, like maples and birches, are hybrids possessing some traits from two different species. Using them as guide trees may cause problems with identification.

5.   Some trees are very hard to identify only by leaves. This is true for oaks, some hickories, and pines (especially from the national list).

6. Collecting durable samples of pines and spruces can be hard. They almost always should be done fresh, but if they don't grow near you, this can be hard.

7. When collecting samples to use for practice, identification can be hard. Many areas have trees that are similar to trees on the national list. For example, Georgia has at least 22 kinds of oaks and at least 8 hickories; many varieties can be confused with the target trees at first or even second glance. To be a reliable practice tool, you need to make sure it is the tree you really want. Often this

involves using several different keys, and/or having access to flower, seed, or bark. You want to avoid having practice or identification samples that are poor representatives of the species.

8. Compound leaves may have a different number of leaflets than listed in the book.   For example, I collected a butternut (*Juglans cinera*) this summer that has 21 leaflets where Audubon lists it as 11-17 leaflets.

9. Getting samples of trees on your tree list can be hard. Getting samples from the national list can be close to impossible.

Going from the state tournament to the national tournament

Forestry is a different event from many Science Olympiad events because the national event is much different than the state event. There are over 170 species of trees on the national list while most states only include 50-80.   Trees vary significantly from region to region.   As one extreme example, I can collect maybe 60 trees on the national list within 15 miles of where I live in Georgia. A friend of mine lives in Fairbanks, Alaska where she says there are six trees that grow there, and I think one of them is not on the national list.   Few if any students will have an opportunity to see a living or recently living sample of all the trees on the national list. Compare this to the most similar event, Fossils, where everyone uses the same list and you can purchase samples.

This page gives some information that might be helpful to teams going to nationals.

1. I worked with the national event supervisor for Forestry at the 1996 national in Georgia. That year, he had 50 one tree/one question stations, at 45-50 seconds a station. I understand that national 2004 had 30 identifications, 90 seconds a station; ten of the questions were about conifers. (As an aside, the national supervisor grows many conifers in pots, so even though he is coming from Georgia, you might see fresh samples you would only expect to see in other parts of the country.)

2. This makes the national list of 170 plus species to be an absurdly high

number to know if you are only going to see 30-50 of them. It also means that if you qualify for nationals, your forestry students have only a short amount of time to double or triple their tree information and understanding. If you are a team that typically goes to nationals, I would start studying the national list early, making a national notebook and then paring it down to a state level. If your students are like mine it is hard to learn new things in April and May.   In many ways eastern teams have an advantage because the western trees are mostly conifers which share similar appearances and common ways of telling them apart.

       3. The national event typically is done with live or recently alive samples. This might help you to prepare if you think like an event supervisor traveling to nationals. What trees might I be able to find locally in Illinois? What trees can I stick in plastic bags and carry on the plane? (E.g., if Kentucky Coffeetree doesn't grow near the campus, I wouldn't look for it because my specimen of it covers four sheets of herbarium paper.)

       4. The superlative list you made for state trees may not apply to national trees or you need to correct some because the national list trumps your state list.

       5. Getting samples of national trees might be hard. Coaches who typically go to nationals might agree to swap tree samples. You might find herbarium samples at some colleges. You can request friends of yours who live elsewhere to get samples for you.   You can visit every arboretum and plant/ tree nursery you can find. Nurseries are important because some of the trees or hybrids might be planted as ornamentals. At this level, a hybrid is better than nothing. Some tress you can buy on-line as nursery stock if you have more money than you know what to do with. One place I looked was running around $15 a tree.

       Expect some to be almost impossible to find. (Then think like an event supervisor, if you can't get them, do you think he/they will be able to get them on short notice before the event?) If I had a team getting ready for nationals I would put some of these on my list to give limited attention: *Aleurites moluccana, Larix occidentalis, Picea sitchensis, Pinus monticola, Chamaecyparis nootkatensis, Cupressus macrocarpa* (unless you know someone who lives in Monterey, CA), the yuccas (although they do keep well as herbarium samples -- the issue is more their size). By now you should have the idea, I'm not going to keep looking for all the western trees with limited ranges. I'd do the same thing with the limited range trees from the Southeast but since this includes Georgia, some of these

might show up. The major exception to limited range might change for me if we learned this tree had some interesting fact or superlative associated with it. Like *Pinus aristata*, which is the oldest tree. Apparently, while hard to find actually growing, you can get nursery cuttings of them and grow them. The sample may not be from a tree several thousands of year old, but it still is a Bristlecone pine.

6. Beware of the increased confusion factor with trees from the national list. I am not sure at first, second, and third glance how to tell *Quercus velutina, Q. palustris,* and *Q. kelloggii* apart if you only have a leaf. Look for other similar problems: *Platanus* sp and *Catalpa* sp. For conifers, you may find the two spreadsheets in this packet helpful.

7. As a study tool, almost all the national trees are in either the East or West Audubon Pocket guides. You might want to make up a mixed set and use them as flash cards.