Roaring **Fire** on the Prairie
Can leaves affect natural fire cycles?

**Target Grade Levels:** 9-12  
**Subject Areas:** Biology / Physics / Environmental Science  
**Time Required:** Five-50 minute class periods  
**ISU Partner:** Dr. Rhea Waldman

**Lesson Objectives:**
1. Identify questions that guide scientific inquiry  
2. Design and conduct scientific investigations  
3. Use technology and mathematics to improve investigations and communications  
4. Formulate and revise scientific explanations and models using logic and evidence.

**Materials Required:**
- Plexiglass sheets (Can substitute w/ cardboard)  
- Plexiglass cutting tool  
- Fan  
- Screens (Can substitute w/ straws)  
- Duct Tape  
- Tape measures  
- Native leaves from various tree species

**Lesson Summary**
Fires once roared across native mid-western U.S. prairies every one to five years. These cyclical fires served to prevent the invasion of forests into the grasslands.

However, prairies did have a few native tree species. These native trees have evolved thicker bark to provide a greater tolerance to the cyclical fires.

This lesson gives students the opportunity to develop hypotheses about the possible role of leaf flight in fire promotion. Do the leaves of native species fly further and promote fire? Does sending leaves further provide a competitive advantage to the tree by helping burn out other tree species?

With an ISU aerodynamicist, the students build wind tunnels and develop procedures to test native tree leaf dispersal vs. the most common non-native trees in the area while also employing aerodynamic principals.

This relatively simple procedure produces large sets of data that lend themselves to graphical interpretation using Excel or other graphing tools. The final graphical data will likely be a surprise to students and they will then have to reformulate their original ideas using the data in which they gathered.
Lesson Plans

1. Use the Lesson summary from the previous page to guide an engagement conversation.

2. Students visit the website: http://www.inhf.org/learn.cfm to learn about native species in their local area.

3. Groups write down questions and hypotheses based on the reading and design a procedure for testing their hypothesis.

4. Identify and gather leaves.

5. With the guidance of aerodynamicist (who will help explain laminar flow, boundary layers, and other aerodynamic principles to consider) students construct their wind tunnels.

6. After a tutorial on the graphing software (if needed) students collect their data and troubleshoot their experimental methodology. Teacher should pose control & design questions.

7. Using the graphing software students compile and organize their data into graphs for data analysis.

8. Students write a conclusion revising or confirming their initial hypothesis.

Differentiation

It is useful to have advanced students explore the relationship between distance travelled and leaf loading (mass/ surface area).

A simple extension for students who struggle with graphing is to have them mass the leaves and graph the distance vs. mass to see if there is a relationship.

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Teaching Tips

Students can present their results in many ways including lab reports, poster sessions, or presentations.

It may be helpful to have students discuss the advantages/disadvantages of different types of graphs ex: box and whisker plots vs. scatter plots vs. bar graphs etc.

The lesson can be adapted to focus on your specific Physics, Biology, or Environmental Science concepts.