

Arch 464
 ECS
 Spring 2008

Name _____

Quiz #4

"Prairie Song, Classroom Buzz"

Read and look at everything before you write!

For this problem you are the acoustics consultant who is advising architect Frank Harmon and the operators of the Prairie Ridge Ecostation for Wildlife & Learning on suitable room configurations and architectural interventions for their rustic classroom. The room is a simple trapezoidal prism, enclosed with wooden surfaces on three sides and screened on the other three. It provides shelter, shade, and ventilation while overlooking the woods and prairie.



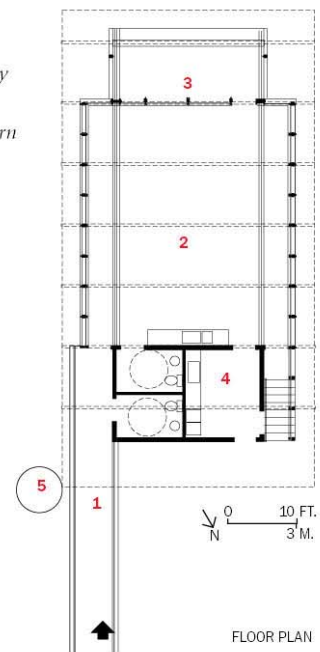
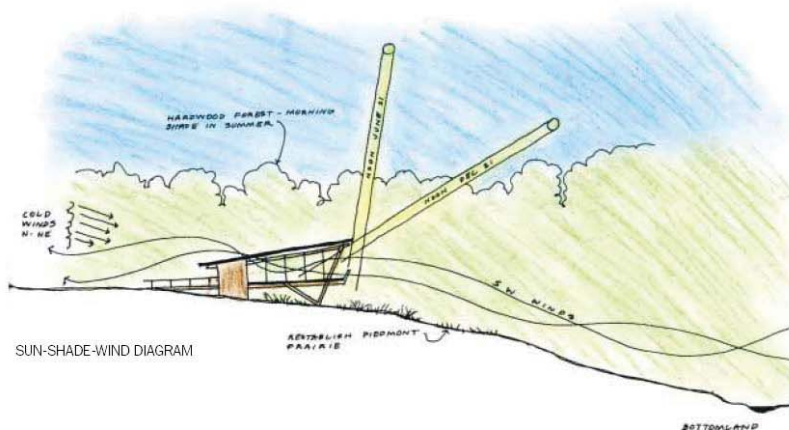
The Ecostation, viewed from the northwest, perched above the prairie, is accessible by a bridge that passes alongside its rainwater cistern. The deck on the south side has a commanding view, spoiled only by a nearby interstate highway.

The building is honest and direct in its use of ecologically sensitive materials and it's integration with the landscape. You'll want to make sure this directness is not obscured by overwrought "fix-ups."

The classroom opens onto an open-air deck (above). To Harmon's delight, the deep eaves have already provided a

welcome niche for a phoebe nest. His team calibrated the overhang for seasonal sun angles (below).

1. Entry bridge
2. Classroom
3. Viewing balcony
4. Office
5. Rainwater cistern



PRAIRIE RIDGE ECOSTATION FOR WILDLIFE & LEARNING

Raleigh, North Carolina

Frank Harmon Architect designs a tree-houselike observation perch for students of the natural world.

By Sarah Amelar

"Spending my childhood along a stream at the edge of a city shaped my life," says architect Frank Harmon, FAIA, of his boyhood in North Carolina. "In those early years, I collected more than 1,000 bird nests," he recalls. "If I hadn't become an architect, I would surely have become a naturalist."

So when the Museum of Natural Sciences, in Raleigh, North Carolina, approached him to create a place where students of all ages could immerse themselves in the natural realm and learn about sustainable living, the fit felt unusually right.

Program

The client initially asked Harmon to help envision an off-site learning center and write a federal grant proposal to finance it. Later, with funds in hand, the museum engaged him to design the 1,400-square-foot "Outdoor Classroom" for its newly founded Prairie Ridge Ecostation for Wildlife & Learning—a 38-acre field site, 1.5 miles from the museum's main building, in downtown Raleigh.

The brief was relatively simple, calling for a screened-in observation deck/classroom with prime views of the site, a small director's office, and restrooms. (For a later phase, Harmon's firm has designed, but not yet built, a sod-roofed dormitory, where students from across the state will be able to stay overnight.)

Since 2004, Prairie Ridge has become a nature preserve, gradually bringing back purple martins, cater-

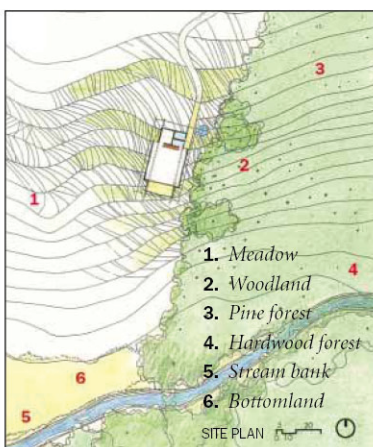
pillars and butterflies, soaring hawks and vultures, thickets of beauty berries, and trails that engulf visitors amid tall, wind-blown grasses. But the site didn't always look this way.

Until a few years ago, this state-owned land—which, surprisingly, abuts a National Guard headquarters and interstate highway—provided cow pastures for North Carolina University's agriculture school. The museum also had a foothold here: a repository, built in the 1990s to house a preserved specimen of every type of insect and animal found in North Carolina.

As encroaching roads prompted the teaching farm to relocate, the surrounding state acreage eventually became poised, parcel by parcel, for private development. Before it was too late, the museum's leaders stepped in to reclaim a swath of North Carolina's long-lost prairies.

Solution

Though the region's densely forested, rolling hills may seem the antithesis of a prairie, Native American tribes and bison once roamed a savannah here. To restore the Piedmont Prairie, ecostation director Mary Ann Brittain has engaged volunteers to uproot nonindigenous plants and replace them with native species, reintroduc-



ing certain flowers, for example, to attract the insects favored by particular birds—all conscious measures to restore and enrich the biodiversity.

As Harmon realized, his building needed to be a teaching tool: a structure that would not only respond to this landscape, but also embody lessons about sustainability. Siting, orientation, forms, materials, and construction methods were all essential considerations. He positioned the Outdoor Classroom on a gentle slope

to yield a range of views: bottomland, pine forest, meadow, hardwood forest, woodland fringe, and stream bank. As Brittain points out, "Edge conditions are the most biologically rich."

Perched like a tree house, the \$300,000 structure sits lightly on the terrain, letting the land flow beneath it. Balanced visually, the roof's upward pitch mirrors the hill's downward slope. Much of the building rests on three triangular heavy-timber frames on a concrete pad.

The structural lumber, indigenous southern yellow pine, is parallel strand, a composite (made of scrap pieces) favored for its strength, rot-resistance, and renewable attributes, diminishing the impact on old-growth forests. All siding and interior panels are of Atlantic white cedar from the Carolina swamps. With this entire wood-frame building dimensioned to reduce waste, the roof's plywood sheets, for instance, required no cutting. And to avoid erosion, the team disturbed as little earth as possible.

Screened in on three sides, the classroom catches southwesterly breezes all year. Its deep south-facing overhang maximizes sun exposure in winter and shade in summer.

Nearly everything about this rustic, unpretentious building appears in full view—joints, lumber members, and for the bathroom, a cistern with a pipe from the roof gutter—all forming part of the overall composition. Soon, photovoltaic panels, set in a field, will take Prairie Ridge off the grid.

Commentary

Just as the new building will season over time, gradually turning silvery gray, the whole ecostation basks in a constant state of flux. The interstate still appears in the vistas from this bucolic perch, but sycamore trees will eventually form a visual buffer. The Outdoor Classroom provides a remarkably comfortable space, like a ship's deck projecting into the landscape. "One of my missions," says Harmon, "is to get people out of their air-conditioned cocoons." As Prairie Ridge's immediate popularity suggests, he has already helped draw people out to peer into cocoons in the wild. ■

Analysis

3 points

1. **Estimate** the reverberation time (T_r) of the classroom, given that for the wooden north wall, ceiling, and floor absorptency = 0.20; and for the three screened wall's absorptency = 0.99. The classroom is 30' x 36'; has a 9' x 30' north wall and a 15' x 30' south wall. **Comment** on the relative deadness or liveliness of the room and its acoustically suitable activities.



Extra Credit. **Identify** the site-scale acoustic problem and suggest an aesthetically pleasing way to solve it.

1 point

Improvements

3 points

2. What is the **acoustic goal** for the room set-up shown below? Suggest **two** different activities that are compatible with both the room set-up and its acoustic quality. Fully **explain** each of your suggestions. Use sketches and diagrams to make your intentions clear. **Identify** where the best seat (acoustically) in the classroom is for these activities and **tell why**.



Improvements

4 points

3. What is the **acoustic goal** for the room set-up shown below? Suggest **two** different activities that are compatible with both the room set-up and its acoustic quality. Fully **explain** each of your suggestions. Use sketches and diagrams to make your intentions clear. **Identify** where the best and worst seats (acoustically) in the classroom are for these activities and **tell why**. If you had one 10' x 20' acoustically reflective panel to place in the room, **where would you place it and why?**

