As a natural realm, it is not large and its green subjects do not number in the millions. But the 65 acres of special habitat comprising the Kirby Park Natural Area bordering the west bank of the Susquehanna River across from Wilkes-Barre are home to about 130 members of the plant kingdom. A few of the natives are rarely found in urban settings, many others are common, while at least two species – Japanese knotweed and mustard garlic – are aliens that muscled their way in. The natural area is also home to more than 200 species of birds, at least 12 mammals and other creatures such as amphibians, reptiles and insects.

Users of the online plant guide click through a series of choices to identify specimens.

Image Sources: Patricia Merwine • Texas A and M University • USDA PLANTS Database • Wildflowers and Other Natural Wonders of the Southeastern United States.

Over nearly a decade, students have developed an online plant identification guide for Kirby Park

By Bill Wolfson
Species belonging to the plant kingdom in the park have long been of special interest to Kenneth M. Klemow, professor of biology and geoenvironmental science. Since 1998, teams of Wilkes University students under his tutelage have developed two taxonomic keys on the World Wide Web, soon to be downloadable onto hand-held devices. Whether desktop-based or mobile, computer-powered keys can incorporate text, images and “instant search” capabilities not possible in printed, often hefty biological field guides and technical manuals.

When powered by a handheld computer, users can take these large databases of information directly to the specimens they want to identify, speeding up the process and also eliminating any need to disturb rare or endangered species for classification inside a four-walled laboratory.

KEYS AND HOW THEY WORK

Dichotomous keys are usually developed in one of two formats: dichotomous or polyclave. Klemow’s students continue to refine both.

Dichotomous keys (the most common and easiest for most people to use) offer the user successive choices between two contrasting statements called couplets. Using a dichotomous key can be compared to traveling down a road with many side streets: To arrive at the right address, correct choices must be made all along the journey. If, for example, an evergreen is to be correctly identified, one pair of couplets may ask: “Are the needle-like leaves mostly in clusters or are they scattered or alternate?” By choosing the right answers to successive couplets, the specimen is finally identified.

“I’m glad they continue to refine the dichotomous key Web site because for younger students and casual hikers who haven’t mastered their botanical terminology, a graphic interface is more user friendly,” observes Jessica (Kwasny) Guy ’00, now a dentist in Mount Pocono, Pa. Though she majored in biology, Guy learned much about creating frames-based Web pages as she upgraded previous students’ work. “I believe the concept of the dichotomous key paired with today’s programming capabilities and wireless technologies will achieve the goals we dreamed about seven years ago.”

In contrast, polyclave keys allow users to enter the key at any point and choose the most obvious or important characteristics of the specimen to identify – no need to travel the length of the entire road to arrive at the correct destination. This type of key, however, usually requires understanding of biological terminology; for instance, “Are the leaves pinnately or palmately compound?”

“Polyclave keys are often written in a very cryptic manner, which makes them difficult to understand for people who aren’t professional botanists,” Klemow observes. “You really have to learn a whole new vocabulary, which is not a problem if you’re a professional botanist. But most people don’t use words like these and don’t want to learn them.” Klemow stresses, however, that polyclave keys are great learning tools for the biologically tempered among us. And because they tend to be database-oriented, they lend themselves more easily to manipulation and management by computers.

Complicating matters for biologically disinclined souls, both types of traditional keys often lack pictures and illustrations. While the online keys to Kirby Park remain works in progress, the dichotomous version with photographs is largely complete. It can be found on the Web at http://kirbypl.wilkes.edu/.

Ongoing development of the keys for nearly a decade has resulted in rich educational experiences and collaborations between students in the biology and mathematics and computer science departments. “By having a biologist work with a computer science person, the result is a real synthesis of something that neither person can do alone,” Klemow believes. “There’s good educational value to that – interdisciplinary collaborations can yield some very good science.”
OF WIKIS, RIPARIAN ZONES AND IPODS

The Kirby Park keys, because their development is collaborative and ongoing, follow the “wiki” model: a Web site or similar online resource allowing users to add and edit content collectively. A wiki (from wiki wiki, a Hawaiian-language phrase for fast) also can be a form of software that handles complex problems with simple solutions. “We were doing wiki before wiki became fashionable,” Klemow chuckles. “Our students continue to build a tool in a successive way. The result is something that none of the groups could have done alone.” Next steps: versions downloadable to hand-held computers, smart phones and similar hand-held devices.

“Technology is becoming a bigger part of our everyday life,” observes Ryan Stetz, class of ’07. “In a few years, just about everybody is going to have an iPod or PDA device.” Stetz partnered with classmate and fellow biology major Zachary Wilson ’07 to re-program the dichotomous version of the key for hand-holds. “Our project demonstrates where much of science seems to be headed,” Wilson explains. “We’re getting away from the paper-based world and more and more, we’re going electronic.”

The pair also began work on what will become podcasts for Kirby Park and several other natural areas. After downloading onto hand-held devices, commentary will augment what visitors are seeing along nature trails as they hike from station to station. Stetz’s and Wilson’s unfinished work represents a great opportunity for future senior project teams.

“Nine years down the road, I still come back periodically to the Kirby key to see what people have added, what they’ve changed and how they’ve improved it,” says Amie D’Angelo ’98, now teaching physical science in the Hazleton (Pa.) Area School District. The first students to work on the project, D’Angelo teamed with Anastasia (Gurdock) Zabielski. “I feel a great sense of pride to have been a part of it,” D’Angelo reflects. “I look back with deep appreciation for how much Dr. Klemow helped me learn — about plant and tree identification, riparian zones like Kirby Park, how important they are in maintaining the health of our waterways and so much more. I try to pay it forward — to students I teach today.”

WILD, “TAMED,” NOW WILD AGAIN

Riparian zones, or habitats, are the green, vegetated areas found along river and stream banks. Subject to repeated flooding, they are especially worthy of protection and preservation because of the many important functions they perform: purifying water by removing sediments and contaminants, reducing risk of wider flooding, preventing erosion and supporting a diversity of plant and wildlife species, to list just a few. Klemow, current students and
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It’s a LIVING PROJECT, perpetual and COMMUNITY-BASED.

- Jessica (Kwasny) Guy ’00

alumni all note how unusual it is to find such a specialized habitat still existing in the heart of a city. Many riparian zones disappeared long ago, eliminated by factories, mills, mines, urban development, farmland and other human-driven modifications to our ecosystem.

The Kirby family donated the tract to the city in 1927, and it quickly became a popular recreation area. The land was cleared of many native trees and vegetation, and a small zoo, arboretum and a greenhouse dotted an increasingly manicured landscape in the northern section of the park. Gravel was mined in the southern section. Almost all original riparian habitat was destroyed.

Only a decade later, the Army Corps of Engineers constructed the first levee along the too-often flooded Susquehanna River, effectively bisecting Kirby Park. All the land along the river-side of the levee quickly began to revert to what it had been for millennia, a natural riparian forest. Stands of sycamore, black locust and silver maple trees – all common to Pennsylvania’s riparian habitats – form a dense canopy once again, while spring beauty, dutchman’s britches, trillium and other herbaceous plants carpet the forest floor.

Now at age 70, the Kirby Park Natural Area is again approaching maturity. Its location just across the river from the University makes it a convenient and very accessible living laboratory for Klemow, generations of Wilkes biology students yet to follow and anyone else who wants to learn. The taxonomic keys make the learning easier.

**KEYS FOR THE FUTURE**

When the Kirby Park keys are complete, work by Klemow and future students will not end at the park’s borders. He estimates Luzerne County alone is home to more than 2,000 plant species. Plus, many thousands more birds, mammals, amphibians, reptiles, fish, mollusks, insects and spiders offer enough taxonomical work to keep students and others busy for years to come.

Then there’s the rest of the commonwealth. Never short on ideas or enthusiasm, Klemow and former students envision alliances with other educational institutions. “I can already see the network of regional keys all sharing information with a central database,” envisions Guy. “It’s a living project, perpetual and community-based. Anyone – students, environmental club members and even the random person with a camera phone – could e-mail photos and descriptions to the key for review and entry.” It might find use in ecological monitoring, mapping invasive species or charting maturation of forests.

Such a vision might be coordinated by organizations such as the Pennsylvania Biodiversity Partnership, a broad-based, public-private partnership created in 2001 to promote conservation of native species and their habitats. Its formation came as a direct response to a recommendation made by the Pennsylvania 21st Century Environment Commission. Klemow chairs a committee for the organization that focuses on biodiversity informatics – the creation, integration, analysis and understanding of information regarding biological diversity.

“There are a couple of models that I think we could explore to develop sets of statewide taxonomic keys,” he says. “We could carve up the work geographically, county by county perhaps, or we could do it by biological classification: ‘You folks do the trees, we’ll take the shrubs ...’ ”

Collaborative efforts such as those envisioned by the professor and his current and former students would have been difficult if not impossible before the emergence of the Internet and World Wide Web. “When Web browsers developed with their ability to link words to text blocks and provide images, it just hit me that this is something that should be easily doable to help people identify the specimen they are looking at,” Klemow remembers.

Using the power of computational and information technologies to organize, analyze and transmit biological data, the biology professor and his students are finding new ways to easily share information – whether from a city park in Wilkes-Barre or the other side of the planet.