

Grizzlies Healthy Planet Initiative (GHPI)

Biodiversity Subcommittee Report

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INTRODUCTION

The Biodiversity Subcommittee is one of four subcommittees in the Environmental Operations working group of the Grizzlies Healthy Planet Initiative. Our charge is to assess and recommend ways to improve biodiversity on OU's campus. Specifically, we seek to: (1) document existing biodiversity on campus, identify high-value wildlife habitats, and assess impacts of current OU policies and practices; (2) assess importance of campus biodiversity for advancing OU's education, research, and sustainability goals; (3) recommend actions and policy changes to help protect, expand, and enhance biodiversity on campus; and (4) encourage development of a campus community that values biodiversity.

To assess existing biodiversity and wildlife habitats on campus, we compiled a wildlife species list based on data gathered by OU faculty and students in the course of educational and research activities. We made use of the National Land Cover Database and other sources to quantify and map land cover types on OU's campus. To assess the value of biodiversity for educational, research, and recreational activities, and to review existing OU policies and practices related to land use and grounds maintenance, we interviewed faculty, students, and staff and recruited subcommittee members who were directly involved with these activities.

To formulate recommendations for preserving, expanding, and enhancing biodiversity on OU's campus in the future, we recruited subcommittee members with expertise in ecology, environmental science, conservation biology, and land management. We will make use of the best available scholarship from these fields.

PURPOSE

Oakland University's campus supports a diverse array of wildlife species and ecosystems, which provide essential services to our community and support the university's research and teaching missions. Unlike many of our peer institutions, OU's campus includes extensive tracts of natural land cover with diverse wildlife habitats. To achieve the sustainability goals of the GHPI, it is essential that we recognize the importance of biodiversity to our campus community, and that we ensure the continued preservation, enhancement, and expansion of biodiversity on OU's campus.

ASSESSMENT

Biodiversity and Wildlife Habitats on OU's Campus

- More than 500 wild animal, plant, and fungi species have been observed on OU's campus, including 180 insects, 143 bird, 15 mammal, 22 fish, 11 reptile & amphibian, 143 herbaceous plant, and 58 trees & shrub species (Appendix 1). The majority of these species were observed by faculty and students on the OU

Biological Preserve or Student Organic Farm, including species of conservation concern in MI such as Blanding's turtles, chorus frogs, red-shouldered hawks, common nighthawks, flying squirrels, and bald eagles (Appendix 1, Fig. 1).

- OU's campus includes a diverse array of wildlife habitats, with 34% of campus comprised of undeveloped land cover including 405 acres of deciduous forest, 193 acres of woody wetlands, 5 acres of shrubland and mixed forest, and 28 acres of meadows and emergent herbaceous wetlands (Fig. 1, 2). Much of OU's campus area consists of vegetation types identified as high priority for conservation by the Michigan Natural Features Inventory, including Oak Opening, Oak-Pine Barrens, and Inland Wet Prairie vegetation types (Fig. 3). High-value areas for biodiversity on campus include the OU Biological Preserve, the OU Student Organic Farm, several remaining tracts of uncut primary forest that remain outside of the preserve, and over a dozen naturally occurring wetlands that serve as amphibian breeding habitats (Appendix 1; Fig. 2, 3).
- OU's campus also includes approximately 1400 acres of developed land where the primary ground cover is manicured lawn and intentionally planted trees and shrubs. Campus trees include a mix of ornamental species and species native to Michigan. Many of the plantings over the past decade were supported by the Campus Beautification Fund, which was created to incentivize tree plantings on campus. Developed areas include ~46 acres of buildings, ~268 acres of sports turf, ~6930 parking spaces in 26 lots, ~5 miles of road, and ~15 miles of sidewalk. There are also two 18-hole golf courses and a driving range (Fig. 4, 4), and extensive gardens surrounding the historic Meadowbrook Hall.

Biodiversity Contributions to OU's Mission (Education, Research, and Operations)

- The diverse vegetation and wildlife present on our campus provide tangible support for OU's teaching, research, and service missions, particularly in the biological and environmental sciences. Over 20 courses and over 60 published research articles have relied on the Biological Preserve or Student Organic Farm as living laboratories (Fig. 1; Appendix 2, 3). Campus biodiversity also enriches OU's ties with local community organizations. The Clinton River Watershed Council (CRWC) has maintained a citizen science monitoring site for >10 years in the Biological Preserve, providing volunteer opportunities for students and collecting valuable data.
- Natural areas on campus, and trails running through them, serve students and faculty by providing recreational opportunities (1, 4). Multiple student and faculty groups rely on campus biodiversity to support their activities, including the Ecology Club, the Leaders for Environmental Awareness & Protection (LEAP), the Growing Grizzlies, the Pollinator Conservation Organization, and the Campus Alliance for Sustainability and the Environment (CASE-OU).
- Natural ecosystems on campus provide important ecosystem services that help to support university operations, including stormwater mitigation, air & water filtration, noise reduction, and microclimate cooling.
- Biodiversity also provides intangible benefits, allowing us to provide a healthy environment for our students and faculty that is conducive to learning and scholarship.

History of Land Use on OU's Campus

- Prior to Oakland University's founding, the Dodge Estate lands that would become our campus included a patchwork of wildlife habitats typical of an agricultural landscape, including pasture lands, agricultural fields, and patches of deciduous forest and woody wetlands. The property also included developed land associated with Meadowbrook Hall and associated private golf course, which was expanded into the Katke-Cousins Golf Course in the 1970's (Fig. 5, 6).
- Through the 1980's and 1990's, many of the agricultural fields and pasture lands outside main campus gradually transitioned to woody wetlands, mixed woodlands, and deciduous forest through the natural process of ecological succession (Fig. 2–6).

- In the 1990's, parts of the southern campus were developed into the R & S Sharf Golf Course (Fig. 4). In 2000, the Faculty Senate proposed creating a Biological Preserve, resulting in informal protections for much of the remaining undeveloped land in support of educational, research, and recreational activities by students, faculty and staff (Fig. 1, 5).

Current Land Management Policies & Practices

- Facilities is currently responsible for all land management decisions and actions, which are implemented by groundskeepers working for Buildings & Grounds. This includes maintaining lawns, gardens, and trees throughout main campus, the athletic fields, and along campus roads. It also includes maintaining the area surrounding the Student Organic Farm and Biological Research Station in East Campus, and all management practices in the Biological Preserve. Broad policy decisions and long-term planning for managing OU's lands are largely guided by availability of funding for projects and reference to the Campus Master Plan.
- Groundskeepers maintain training and certifications related to land management at OU. In particular, they must maintain Commercial Pesticide Applicator certifications for chemical management of turfgrass, right-of-way, and ornamental plants. Groundskeepers are required to follow state & federal regulations for chemical applications. No off-label use of pesticides or fertilizers is allowed. OU sponsors training opportunities that count as course credits toward recertification requirements, in partnership with Oakland Community College, MI State University, the International Society of Arboriculture, and the MI Nursing and Landscape Association.
- Groundskeepers work with construction crews to ensure replacement of trees damaged or destroyed during projects. The Campus Beautification Fund has also supported planting hundreds of new trees and shrubs throughout the main campus. Some plantings have been of native tree species, but most have been ornamentals. Decisions about selecting tree, shrub, or herbaceous plant species have been based primarily on aesthetics and management costs. As part of the Tree Campus USA initiative, new policies are being drafted to provide guidelines for planting and replacing trees on main campus.
- Groundskeepers are encouraged to allow plant growth on the borders of wetlands and lakes, such as Bear Lake. However, this is an informal policy, and lake banks are sometimes mowed in response to complaints about aesthetics. So far as we were able to determine, there are no formal policy documents to guide everyday decision-making regarding the width of buffer zones around wetlands and lakes, when or where woody debris should be removed from natural wetlands or streams, how and when to manage invasive species, where or how to maintain trails, or which areas of campus should be mowed regularly. These decisions appear to be made based on past practices, responses to specific complaints, or feedback from administrators.
- The primary point of contact between Facilities and OU students or faculty is the Campus Development and Environment Committee (CDEC). Decisions about land management practices are sometimes changed in response to faculty or student feedback, as with the recent recommendation not to go forward with a plan to modify the Meadowbrook Marsh wetland. However, on other occasions large-scale management decisions proceeded without significant communication with faculty or student stakeholders, as with the 2018 Galloway Creek project which was opposed by local faculty members with expertise in stream ecology. This was in part because CDEC lacked faculty members with ecology or environmental science expertise in the academic year when the proposal was reviewed. To help improve communications about these types of projects, the Faculty Senate recently modified the CDEC charge and composition to include issues related to campus sustainability, and to ensure participation by at least one faculty member with expertise in ecology or environmental science. Academic Affairs is also currently working to pilot a new model that will directly involve relevant faculty and staff in decision-making affecting research and teaching operations at the East Campus Field Site. These changes should help to improve communications between Facilities and the faculty and students who have the greatest interest and expertise in preserving and enhancing biodiversity on OU's campus.

RECOMMENDATIONS

Key questions to address

- What can we do to better protect or enhance campus biodiversity in high-value wildlife habitats, such as the Biological Preserve and existing tracts of forest or wet meadows?
- What are ways we might change our approaches to campus planning, to help expand wildlife habitats into highly-managed areas of campus? (“Re-Wilding OU” initiative)
- What can we do to better control invasive plants in natural and managed parts of campus?
- What can we do to better protect wetlands and streams from stormwater discharge and chemical runoff?
- What can we do to increase faculty and student involvement in decisions about land & water management that affect biodiversity?
- What resources would we need to implement each recommendation?
- What time frame might be reasonable to implement each recommendation?

Summary of recommended actions (Tables 1 & 2)

We recommend that the university take the twenty-two specific actions to preserve and enhance biodiversity on OU’s campus, listed in Tables 1 and 2. These recommendations include four proposed changes to organizational leadership, seven proposed changes to university policies, and eleven proposals to take direct action (Tables 1 & 2). Within each category (leadership, policies, and direct actions), we listed actions in order of priority, timeline, and projected cost.

Recommended changes to organizational leadership

Recommended changes to organizational leadership include: (1) create a standing Biodiversity Subcommittee of CDEC, (2) establish a process for reviewing habitat-restoration proposals from faculty and student groups, (3) appoint committees and/or faculty directors and advisory boards to oversee management of the Biological Preserve and East Campus Field Station, and (4) hire a Sustainability Officer to coordinate sustainability initiatives. All of these are high priority actions that should be implemented within the next year or two, since these changes will help to facilitate many of the recommended direct actions listed in Table 2. Except for hiring a Sustainability Officer, these actions will require no more than minimal financial investments by the university.

Hiring a Sustainability Officer is high priority because most if not all of the recommended actions will require coordinated efforts by multiple groups of faculty, students, staff, and administrators. Many of the proposed direct actions may be difficult to implement without this type of coordination (Table 2), which is why we recommend creating this position within the next 1-2 years.

Establishing a process to review habitat-restoration proposals is especially urgent, as demonstrated by recent difficulties with the review and implementation of a proposal to create a new pollinator garden on OU’s main campus. This proposal was submitted to CDEC and received broad support from its committee members, but missing or vague details subsequently resulted in problems for the faculty and staff charged with implementing the proposal. Creating a clearly defined process for the review and implementation of landscaping proposals will help to ensure that all necessary information is provided and that key stakeholders are included in the decision-making process.

Recommended changes to university policies

Recommended policy changes include: (1) identifying currently-mowed areas that could be allowed to revert to natural landscapes, (2) developing a written policy document for groundskeepers and their supervisors to encourage practices that preserve and enhance wildlife habitat, (3) promote groundskeeper training opportunities aimed at reducing use of chemical pesticides and fertilizers on campus, (4) develop groundskeeper training opportunities to learn more about landscaping practices to preserve and enhance wildlife habitat, (5) investigate and implement alternative options to reduce the use of salt for de-icing roads, (6) implement

bioswales as a preferred method for stormwater management in future construction projects, and (7) adjust the Campus Master Plan to increase prioritization of wildlife habitat in future construction. The first two recommendations, which are high priority and low cost, should be implemented within the next 1-2 years. Changes to groundskeeper training and road salt use, which are medium priority and relatively low cost, should be implemented within the next 5 years. Changing our construction practices and the Campus Master Plan are long term goals that may incur significant costs, but that could result in substantial long-term benefits to biodiversity on OU's campus.

Recommended direct actions to preserve and enhance biodiversity on OU's campus

We identified eleven direct actions that should be implemented within the next five years, none of which should incur more than moderate costs to the university. The highest priority and lowest cost proposals are to: (1) reconfigure the Campus Beautification Fund into a repository for donations from community members interested in supporting native plantings on campus, (2) apply for external funds to support land management and conservation efforts on campus, and (3) encourage faculty to incorporate invasive plant management and ecological restoration efforts into academic courses. These actions should be implemented within the next 1–2 years.

Another high priority action that should be implemented within the next 1-2 years, but which will require a modest financial investment, is to conduct a professional assessment of wildlife habitats on OU's campus and generate a detailed habitat inventory map. We recommend contracting with an outside organization, such as the Michigan Natural Features Inventory (MNFI), to assist with this assessment. This is a high priority action because having a detailed habitat inventory map of OU's campus will provide important baseline information that will facilitate many of our other recommendations, such as seeking external funding for restoration projects, identifying high-value habitats where new construction should be avoided, developing a Wildlife Habitat Management Plan for OU's campus, establishing legal protection for the Biological Preserve, and supporting outdoor research and teaching activities on OU's campus.

Multiple proposed direct actions focus on increasing the visibility and usage of the Biological Preserve by establishing legal protections, developing a system of clearly marked trails, increasing its online presence, and erecting educational signs and outdoor kiosks. These actions will help to educate the OU community about the extent and diversity of wildlife habitat on OU's campus, and they will facilitate increased use of the Biological Preserve by students and faculty for outdoor research projects, outdoor activities for courses in ecology and environmental science, and recreational activities for students and faculty.

To help engage the entire Oakland University community in OU's efforts to preserve and enhance wildlife habitats on campus, **we propose a “Re-Wilding OU” initiative to promote efforts to preserve and enhance wildlife habitat on campus.** This initiative should ideally be organized by the new Sustainability Officer and involve coordinated action by Facilities, Advancement, CDEC, University Communications & Marketing (UCM), academic departments (e.g., Biological Sciences, Chemistry, Communication), and groups of interested students and faculty (e.g., Campus Alliance for Sustainability and the Environment). This initiative would increase the visibility of restoration efforts on campus by creating and posting informational signs, creating and maintaining an online presence via OU's website and social media, organizing events to support and promote the effort (e.g., volunteer days), and raising funds to support native plantings and restoration projects on campus.

Table 1. Recommendations 1–11: changes to organizational leadership and university policies to facilitate approval of proposals and encourage decisions to protect and enhance biodiversity on OU's campus. For each action, we indicate its priority level, time frame to start (Short: 1–2 yrs; Long: 5–10 yrs), estimated cost per year (Medium: > \$5000; High: > \$50,000), and individuals or groups responsible for taking action.

Category	Action	Priority	Time frame	Cost	Responsibility
Leadership	1. Create a standing Biodiversity Subcommittee of the Campus Development & Environment Committee (CDEC), focused on maintaining and enhancing biodiversity on campus. This subcommittee should have a composition similar to the current Campus Tree Advisory Ad Hoc Committee, and its charge could include responsibilities currently held by this ad hoc committee. This subcommittee could also serve as a first point of contact for student or faculty proposals aimed at preserving biodiversity on campus.	High	Short †	None	CDEC to create; Provost to appoint members
	2. Establish a clear process for reviewing proposals by faculty and/or students to conduct landscaping projects on main campus. Guidelines for proposal preparation should be drafted to clarify: (1) who should proposers contact first to discuss details? (2) where should proposals be submitted (e.g., CDEC)? (3) which administrators would need to sign off on the proposal and in what order? which details must be included for full proposal review by CDEC (e.g., location, site layout, timing, funding and/or labor, long-term maintenance plan, contact info for responsible party)?	High	Short †	None	Biodiversity Subcommittee of CDEC (new), Facilities
	3. Appoint committees (and/or faculty directors plus advisory councils) to oversee management of the Biological Preserve and the East Campus Field Station, with responsibility to coordinate use by students & faculty, work with Facilities to make decisions about land use and management, coordinate applications for outside funding to support academic activities, and protect biodiversity in these high-value wildlife habitats.	High	Short * †	Low	Provost; CAS Deans Office
	4. Recruit a Sustainability Officer to coordinate sustainability initiatives on campus and initiate/coordinate grant proposals related to sustainable campus development.	High	Short †	High	President; Provost
Policies	5. Identify low-use or low-visibility mowed areas that could be allowed to revert to natural landscapes via ecological succession. Reallocate funds from mowing to other types of landscape management, such as invasive species control.	High	Short * †	None	Facilities; Stakeholders
	6. Develop a written policy document to guide decision-making by groundskeepers and their supervisors, which should include: (1) prioritizing natural landscapes instead of using lawn as our "default" ground cover; (2) prioritizing native plant species when making landscaping decisions throughout main campus and the golf course; (3) developing and protecting riparian buffer zones around wetlands including streams, lakes, ponds, and marshland.	High	Short	None	Facilities; CDEC
	7. Promote training opportunities for groundskeepers aimed at reducing use of chemical fertilizers and pesticides on campus.	Medium	Medium †	Low	Facilities
	8. Partner with organizations like MI Green Industry Association and the MI Botanical Society to expand groundskeeper access to training opportunities focused on preserving and enhancing wildlife habitat.	Medium	Medium †	Low	Facilities
	9. Investigate and implement alternative options to reduce the use of salt for de-icing roads.	Medium	Medium †	Medium	Facilities
	10. Implement bioswales as a preferred method for stormwater management in future construction projects.	Medium	Long †	Low or Medium	Facilities, CDEC
	11. Re-visit the Campus Master Plan and adjust plans to increase prioritization of wildlife habitat in future construction, based on recently slowed growth in student enrollments and recent acquisitions of off-campus buildings.	Medium	Long	Medium	President; Provost; Facilities; CDEC

* Action has already been initiated; † Ongoing effort once started; CDEC = Campus Development & Environment Committee; MSU = Michigan State University

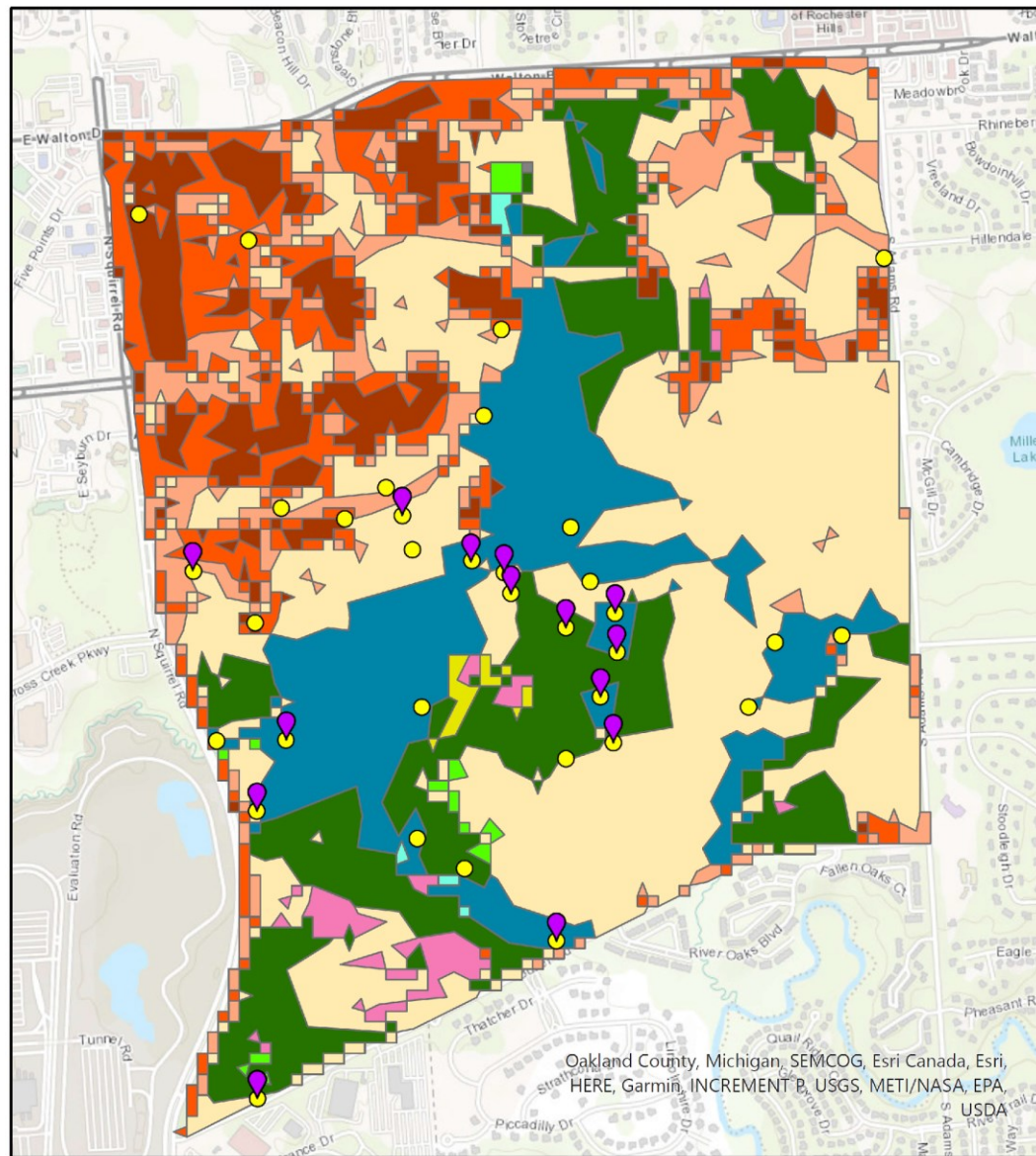
Table 2. Recommendations 12–22: direct actions to protect and enhance biodiversity on OU's campus. For each action, we indicate its priority level, time frame to start (Short: 1–2 yrs; Long: 5–10 yrs), estimated cost per year (Medium: > \$5000; High: > \$50,000), and individuals or groups responsible for taking action.

Action	Priority	Time frame	Cost	Responsibility
12. Reconfigure the Campus Beautification Fund into a repository for donations from community members interested in supporting plantings of native trees and shrubs on campus. Consider changes to the name or description of this fund to communicate a commitment to native plantings. Partner with Advancement and Communications & Marketing to raise funds and elevate the visibility of this initiative.	High	Short	None	Advancement; Facilities; UCM
13. Apply for external funds to support land management and conservation efforts, including invasive plant removal, ecological restoration, and controlled burns. Develop partnerships with local groups such as the Oakland County Sustainability Office and the Clinton River Watershed Council (CRWC) to write grant proposals and implement projects. Potential grants are available through the Fish and Wildlife Service Partners Program, the Competitive State Wildlife Grant (C-SWG) Program, the National Fish and Wildlife Foundation, the National Oceanic and Atmospheric Administration, and the Great Lakes Restoration Initiative.	High	Short †	Low	Sustainability officer (new); Facilities; Student & faculty groups
14. Incorporate invasive plant management and ecological restoration efforts into academic courses, to create service-learning opportunities for students.	High	Short †	Low	Faculty instructors; Biological Preserve Committee; Facilities
15. Contract with the U.S. Fish & Wildlife, Michigan Natural Features Inventory (MNFI, a nonprofit extension of Michigan State University), or similar organization to conduct a professional assessment of wildlife habitats on OU's campus and generate a detailed habitat inventory map. The 2017 MNFI assessment (Fig. 3) was based largely on pre-settlement vegetation types and is therefore multiple decades out of date. Obtaining an updated habitat inventory will be valuable for future conservation planning.	High	Short	Medium	Sustainability officer (new); Biodiversity Subcommittee (new)
16. Partner with local organizations (e.g., Feral Flora, Plantwise, Natural Community Services, MSU Landscape Services) to design and install wildlife friendly alternatives to traditional landscaping.	Medium	Short †	Medium	Sustainability officer (new); Biodiversity Subcommittee (new); Facilities
17. Increase legal protection for the Biological Preserve by establishing a conservation easement and/or by establishing an officially recognized Arboretum on all or part of the Preserve.	Medium	Medium	None	OU Legal; Biological Preserve Committee; CDEC
18. Organize a "Re-Wilding OU" initiative, with a primary goal of converting highly-managed (e.g., mowed) land into wildlife habitat. Partner with Advancement and Communications & Marketing to raise funds and elevate the visibility of this initiative.	Medium	Medium †	Low	Sustainability officer, Facilities, UCM, Biodiversity subcommittee (new), Academic departments, Student & faculty groups
19. Recruit and organize student groups to help establish, map, and maintain a system of clearly marked trails throughout the Biological Preserve.	Medium	Medium †	Low	Biological Preserve committee (new)
20. Work with the Partners for Fish and Wildlife program (U.S. Fish & Wildlife Service) to obtain assistance for planning, implementing, and funding habitat management and restoration, including identification of new local partners.	Medium	Medium †	Low or Medium	Sustainability officer (new); Facilities
21. Increase visibility of Biological Preserve by increasing its online presence, and/or by erecting educational signs and outdoor kiosks.	Medium	Medium †	Medium	Biological Preserve committee (new)
22. Develop and implement a Wildlife Habitat Management Plan for the OU campus. This should be done in consultation with a professional organization (e.g., Michigan Natural Features Inventory, Plantwise LLC, MSU Landscape Services, Cardno, Natural Community Services).	Medium	Medium	Medium	Sustainability officer (new); Standing Biodiversity Subcommittee (new)

† Ongoing effort once started; ; CDEC = Campus Development & Environment Committee; MSU = Michigan State University; UCM = University Communications & Marketing



Figure 1. Photos of OU biodiversity and activities involving the OU Biological Preserve. From top left: white tailed deer (Dr. Sandra Troxell-Smith); short-tailed shrew (Troxell-Smith); Blanding's turtle (Megan Jamison); monarch butterfly caterpillar (Dr. Mary Jamieson); eastern bumble bee (Jamieson); students collecting tree data (Dr. Keith Berven); students sampling Galloway Creek (OU Ecology Club); Dr. Scott Tieg identifying aquatic invertebrates (OU Ecology Club); 2021 controlled burn (Dr. Tieg).



Land Cover

- Deciduous Forest
- Developed, High Intensity
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, Open Space

- Emergent Herbaceous Wetlands
- Hay/Pasture
- Herbaceous
- Mixed Forest
- Shrub/Scrub
- Woody Wetlands

- Amphibian Breeding Habitat (confirmed)
- Open-Water Wetland (marshes & ponds)

Figure 2. Map of habitat types on the Oakland University campus, based on the 2016 National Land Cover Database. Also highlighted are high-value wetland habitats, including many with documented use by breeding amphibians.

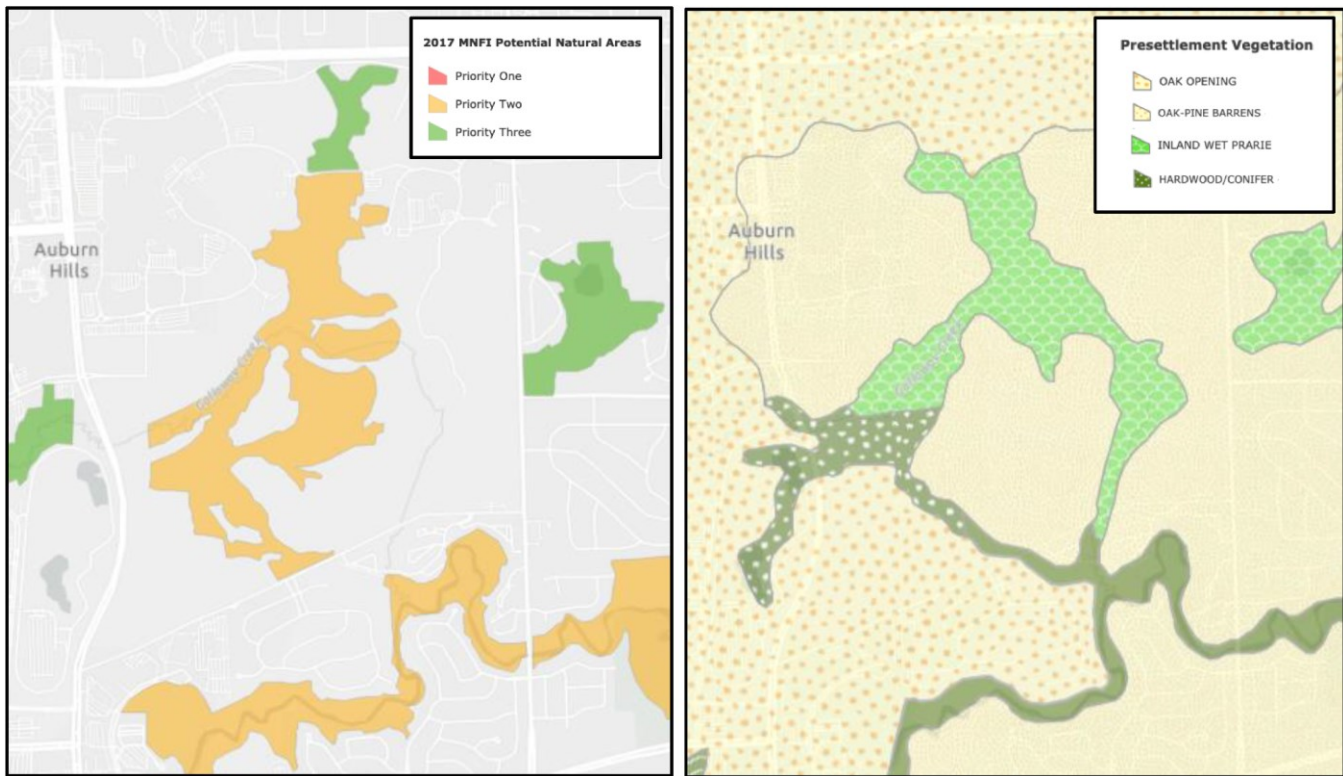


Figure 3. Michigan Natural Features Inventory (MNFI) map (2017) of high priority natural areas (left). The 2017 MNFI assessment was based in part on available data for pre-settlement vegetation types, as shown in the associated map (right). The Oak Opening natural communities is an imperiled habitat based on global conservation rankings (NatureServe G1 status). Oak-Pine Barrens and Inland Wet Prairies are both globally vulnerable natural communities (NatureServe G3 conservation status).

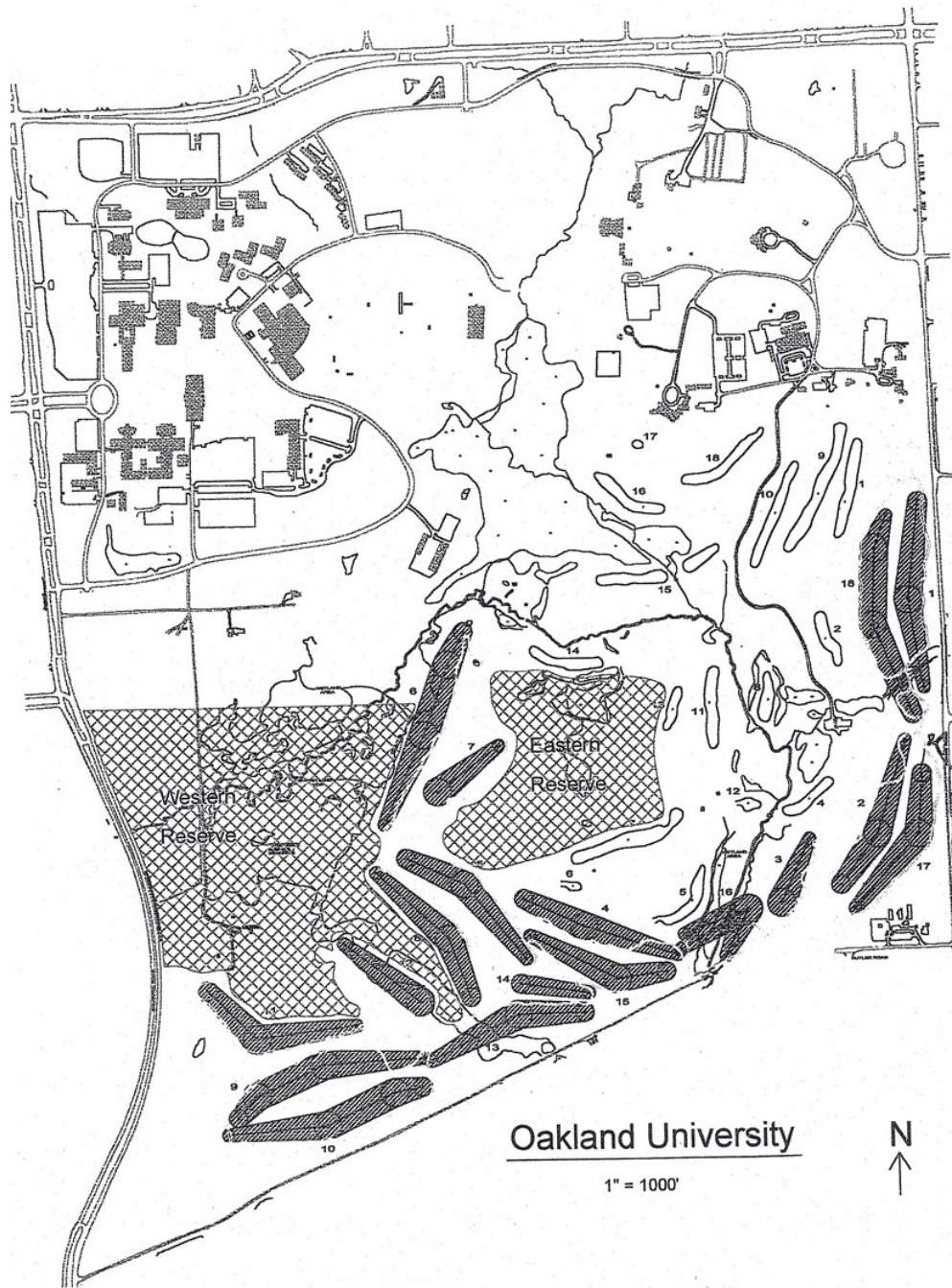


Figure 4. Map of the Oakland University campus from the 2000 memo of the Campus Development and Environment Committee to the OU Senate, delineating the boundaries of the Eastern and Western parts of the OU Biological Preserve. Also highlighted are numbered positions of golf course holes. Approximate locations of Katke-Cousins holes are indicated by open (white) shapes with free-drawn borders, and R & S Sharf holes are indicated by shaded polygons.

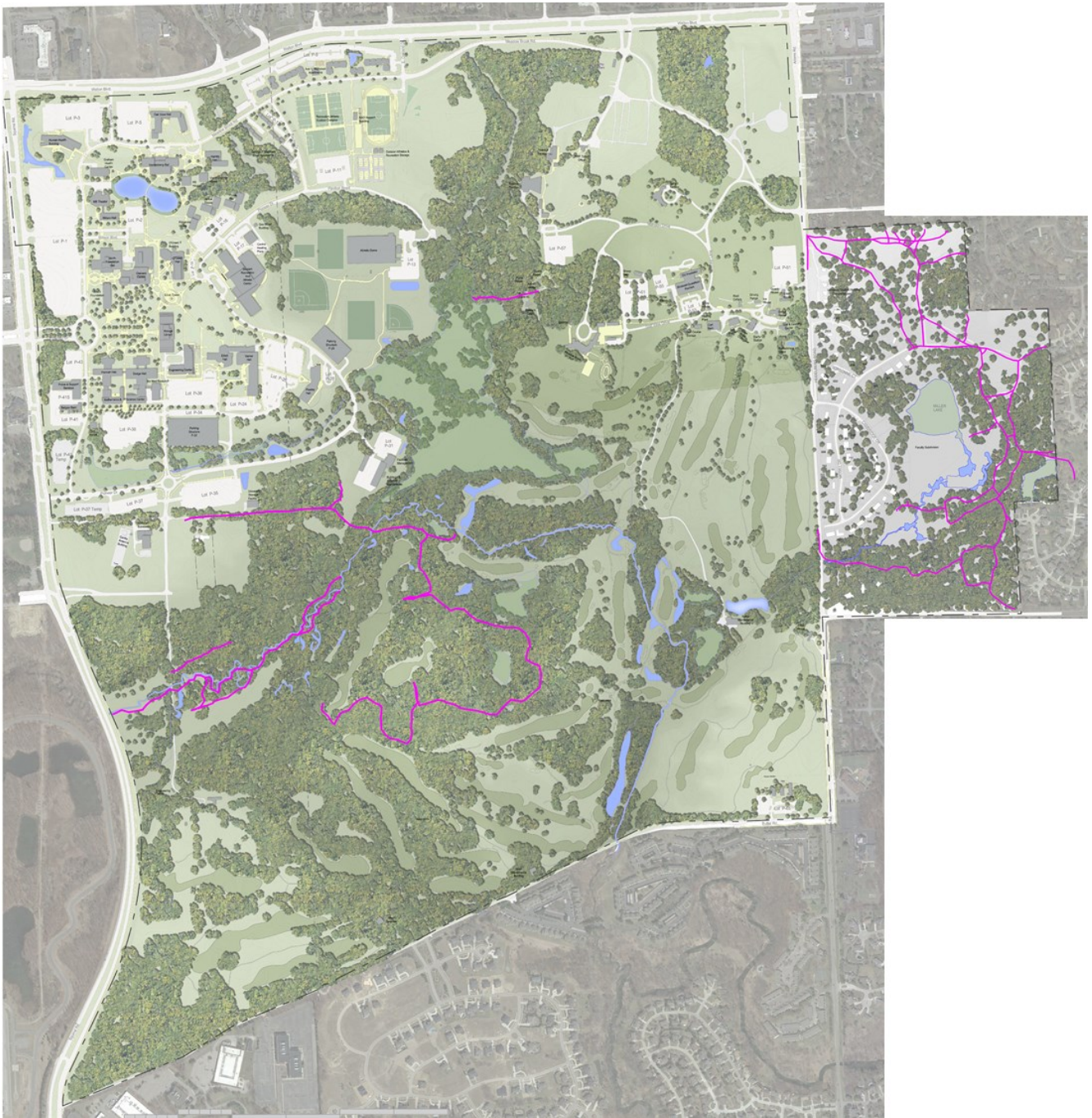


Figure 5. Map of Oakland University and the adjoining faculty subdivision, highlighting networks of existing trails through the OU Biological Preserve and the faculty subdivision (magenta lines). The positions and shapes of golf course holes are also highlighted in green. Map provided by Facilities.



Figure 6. Historic aerial imagery of Oakland University's campus in 1985 and 1999, for comparison with Figures 2 & 3. Notable changes in land cover include development of the second golf course in the 1999 map, and natural succession from pastureland to deciduous forest and woody woodlands in the Western Biological Preserve and in patches between golf holes in south campus. Images acquired using Google Earth.

Appendix 1. List of 595 confirmed wild animal, plant, and fungi species observed on Oakland University's campus, highlighting the diversity of wildlife present. This list is not a comprehensive survey of biodiversity on campus, since it only includes species observed during the course of research or teaching activities conducted by OU faculty and students. Superscript numbers highlight the many species observed on OU's Biological Preserve (1) or at the Student Organic Farm (2).

VERTEBRATE ANIMALS:

Amphibians (7):

Ambystoma laterale; Blue-spotted salamander²
Anaxyrus americanus; American toad^{1,2}
Hyla versicolor; Gray treefrog¹
Lithobates clamitans; Green frog¹
Lithobates sylvaticus; Wood frog¹
Pseudacris crucifer; Spring peeper¹
Pseudacris triseriata; Western chorus frog¹

Birds (143):

Accipiter cooperii; Cooper's hawk¹
Accipiter striatus; Sharp-shinned hawk¹
Actitis macularia; Spotted sandpiper¹
Agelaius phoeniceus; Red-winged blackbird¹
Aix sponsa; Wood duck¹
Ammospiza leconteii; LeConte's sparrow¹
Anas platyrhynchos; Mallard duck¹
Archilochus colubris; Ruby-throated hummingbird¹
Ardea alba; Great egret¹
Ardea herodias; Great blue heron¹
Baeolophus bicolor; Tufted titmouse¹
Bombycilla cedrorum; Cedar waxwing¹
Branta canadensis; Canada goose¹
Bubo virginianus; Great horned owl¹
Buteo jamaicensis; Red-tailed hawk¹
Buteo lineatus; Red-shouldered hawk¹
Buteo platypterus; Broad-winged hawk¹
Butorides virescens; Green heron¹
Cardellina canadensis; Canada warbler¹
Cardellina pusilla; Wilson's warbler¹
Cardinalis cardinalis; Northern cardinal¹
Cathartes aura; Turkey vulture¹
Catharus fuscescens; Veery¹
Catharus guttatus; Hermit thrush¹
Catharus minimus; Gray-cheeked thrush¹
Catharus ustulatus; Swainson's thrush¹
Certhia americana; Brown creeper¹
Chaetura pelagica; Chimney swift¹
Charadrius vociferus; Killdeer¹
Chordeiles minor; Common nighthawk¹
Cistothorus palustris; Marsh wren¹
Colaptes auratus; Northern flicker¹
Columba livia; Rock pigeon¹
Contopus cooperi; Olive-sided flycatcher¹
Contopus virens; Eastern wood-pewee¹

Corthylio calendula; Ruby-crowned kinglet¹
Corvus brachyrhynchos; American crow¹
Cyanocitta cristata; Bluejay¹
Cygnus olor; Mute swan¹
Dolichonyx oryzivorus; Bobolink¹
Dryobates pubescens; Downy woodpecker¹
Dumetella carolinensis; Gray catbird¹
Empidonax minimus; Least flycatcher¹
Empidonax traillii; Willow flycatcher¹
Eremophila alpestris; Horned lark¹
Euphagus carolinus; Rusty blackbird¹
Falco columbarius; Merlin¹
Fulica americana; American coot¹
Gallinago delicata; Wilson's snipe¹
Gavia immer; Common loon¹
Geothlypis trichas; Common yellowthroat¹
Grus canadensis; Sandhill crane¹
Haemorhous mexicanus; House finch¹
Haemorhous purpureus; Purple finch¹
Haliaeetus leucocephalus; Bald eagle¹
Hirundo rustica; Barn swallow¹
Hylocichla mustelina; Wood thrush¹
Icterus galbula; Baltimore oriole¹
Icterus spurius; Orchard oriole¹
Junco hyemalis; Dark-eyed junco¹
Larus delawarensis; Ring-billed gull¹
Larus smithsonianus; Herring gull¹
Leiothlypis celata; Orange-crowned warbler¹
Leiothlypis peregrina; Tennessee warbler¹
Leiothlypis ruficapilla; Nashville warbler¹
Leuconotopicus villosus; Hairy woodpecker¹
Megaceryle alcyon; Belted kingfisher¹
Megascops asio; Eastern screech owl¹
Melanerpes carolinus; Red-bellied woodpecker¹
Melanerpes erythrocephalus; Red-headed woodpecker¹
Meleagris gallopavo; Wild turkey¹
Melospiza georgiana; Swamp sparrow¹
Melospiza lincolni; Lincoln's sparrow¹
Melospiza melodia; Song sparrow¹
Mniotilta varia; Black-and-white warbler¹
Molothrus ater; Brown-headed cowbird¹
Myiarchus crinitus; Great crested flycatcher¹
Nannopterum auritum; Double-crested cormorant¹
Oporornis agilis; Connecticut warbler¹
Pandion haliaetus; Osprey¹
Parkesia motacilla; Louisiana waterthrush¹
Parkesia noveboracensis; Northern waterthrush¹
Passer domesticus; House sparrow^{1,2}

Passerculus sandwichensis; Savannah sparrow¹
Passerella arborea; American tree sparrow¹
Passerella iliaca; Fox sparrow¹
Passerina cyanea; Indigo bunting¹
Pheucticus ludovicianus; Rose-breasted grosbeak¹
Pipilo erythrophthalmus; Eastern towhee¹
Piranga olivacea; Scarlet tanager¹
Plectrophenax nivalis; Snow bunting¹
Poecile atricapillus; Black-capped chickadee¹
Poliophtila caerulea; Blue-gray gnatcatcher¹
Pooecetes gramineus; Vesper sparrow¹
Quiscalus quiscula; Common grackle¹
Regulus satrapa; Golden-crowned kinglet¹
Sayornis phoebe; Eastern phoebe¹
Scolopax minor; American woodcock¹
Seiurus aurocapilla; Ovenbird¹
Setophaga americana; Northern parula¹
Setophaga caerulescens; Black-throated blue warbler¹
Setophaga castanea; Bay-breasted warbler¹
Setophaga coronata; Yellow-rumped warbler¹
Setophaga fusca; Blackburnian warbler¹
Setophaga magnolia; Magnolia warbler¹
Setophaga palmarum; Palm warbler¹
Setophaga pensylvanica; Chestnut-sided warbler¹
Setophaga petechia; Yellow warbler¹
Setophaga pinus; Pine warbler¹
Setophaga ruticilla; American redstart¹
Setophaga striata; Blackpoll warbler¹
Setophaga tigrina; Cape may warbler¹
Setophaga virens; Black-throated green warbler¹
Sialia sialis; Eastern bluebird¹
Sitta canadensis; Red-breasted nuthatch¹
Sitta carolinensis; White-breasted nuthatch¹
Spatula discors; Blue-winged teal¹
Sphyrapicus varius; Yellow-bellied sapsucker¹
Spinus pinus; Pine siskin¹
Spinus tristis; American goldfinch¹
Spizella pallida; Clay-colored sparrow¹
Spizella passerina; Chipping sparrow¹
Spizella pusilla; Field sparrow¹
Stelgidopteryx serripennis; North rough-winged swallow¹
Sturnella magna; Eastern meadowlark¹
Sturnus vulgaris; European starling¹
Tachycineta bicolor; Tree swallow¹
Thryothorus ludovicianus; Carolina wren¹
Toxostoma rufum; Brown thrasher¹
Tringa solitaria; Solitary sandpiper¹
Troglodytes aedon; House wren¹
Troglodytes hiemalis; Winter wren¹
Turdus migratorius; American robin^{1,2}
Tyrannus tyrannus; Eastern kingbird¹
Vermivora cyanoptera; Blue-winged warbler¹
Vireo flavifrons; Yellow-throated vireo¹
Vireo gilvus; Warbling vireo¹
Vireo olivaceus; Red-eyed vireo¹

Vireo philadelphicus; Philadelphia vireo¹
Vireo solitarius; Blue-headed vireo¹
Zenaida macroura; Mourning dove¹
Zonotrichia albicollis; White-throated sparrow¹
Zonotrichia leucophrys; White-crowned sparrow¹

Fish (22):

Ameiurus melas; Black bullhead catfish¹
Campostoma anomalum; Central stoneroller¹
Catostomus commersonii; White sucker¹
Culaea inconstans; Brook stickleback¹
Cyprinus carpio; Common carp¹
Esox lucius; Northern pike¹
Etheostoma caeruleum; Rainbow darter¹
Etheostoma nigrum; Johnny darter¹
Hypentelium nigricans; Northern hogsucker¹
Lepomis cyanellus; Green sunfish¹
Lepomis macrochirus; Bluegill sunfish¹
Luxilus cornutus; Common shiner¹
Micropterus salmoides; Largemouth bass¹
Noturus flavus; Stonecat catfish¹
Oncorhynchus mykiss; Rainbow trout¹
Percina caprodes; Common logperch¹
Pimephales notatus; Bluntnose minnow¹
Pimephales promelas; Fathead minnow¹
Rhinichthys atratulus; Eastern blacknose dace¹
Salmo trutta; Brown trout¹
Semotilus atromaculatus; Common creek chub¹
Umbra limi; Central mudminnow¹

Mammals (15):

Blarina brevicauda; Northern short-tailed shrew¹
Canis latrans; Coyote¹
Didelphis virginiana; Opossum¹
Glaucomys volan; Southern flying squirrel¹
Marmota monax; Groundhog¹
Mephitis mephitis; Striped skunk¹
Neogale vison; Mink¹
Odocoileus virginianus; White-tailed deer¹
Ondatra zibethicus; Muskrat¹
Procyon lotor; Common raccoon¹
Sciurus carolinensis; Eastern gray squirrel¹
Sciurus niger; Fox Squirrel¹
Sylvilagus floridanus; Eastern cottontail rabbit^{1,2}
Tamias striatus; Eastern chipmunk^{1,2}
Tamiasciurus hudsonicus; American red squirrel¹

Reptiles (4):

Chelydra serpentina; Snapping turtle¹
Emydoidea blandingii; Blanding's turtle¹
Storeria occipitomaculata; Red-bellied snake¹
Thamnophis sirtalis; Common garter snake¹

INVERTEBRATE ANIMALS:

Crustaceans (3):

Armadillidium; Pillbugs

Decapoda; Crayfish¹

Isopoda; Sowbug¹

Insects (180):

Acrididae; Short-horned grasshoppers¹

Aeshnidae; Darner dragonfly¹

Agapostemon sericeus; Silky Striped Sweat Bee²

Anasa tristis; Squash bug²

Anatrytone logan; Delaware Skipper²

Andrena alleghaniensis; Allegheny Mining Bee²

Andrena crataegi; Hawthorn Mining Bee²

Andrena cressonii; Cresson's Mining Bee²

Andrena hirticincta; Hairy-banded Mining Bee²

Andrena miserabilis; Miserable Mining Bee²

Andrena nasonii; Nason's Mining Bee²

Andrena vicina; Neighborly Mining Bee¹

Ancyloxypha numitor; Least Skipper^{1,2}

Apis mellifera; Honey bee^{1,2}

Athericidae; Water snipe fly¹

Augochlora pura; Pure green sweat bee^{1,2}

Augochlorella aurata; Golden Sweat Bee^{1,2}

Augochloropsis fulgida; Green Metallic Bee²

Bicyrtes quadrifasciatus;

Bombus auricomus; Black-and-gold bumble bee²

Bombus bimaculatus; Two-spotted bumble bee²

Bombus citrinus; Lemon cuckoo bumble bee²

Bombus griseocollis; Brown-belted bumble bee²

Bombus impatiens; Eastern bumble bee^{1,2}

Bombylius major; Greater bee fly²

Burnsius communis; Common checkered skipper²

Callibaetis picta; Small minnow mayfly¹

Calopterygidae; Broad winged damselfly¹

Calopteryx maculata; Ebony jewelwing¹

Celastrina ladon; Spring azure¹

Ceratina calcarata; Wide-legged little carpenter bee²

Ceratina dupla; Common eastern little carpenter bee²

Ceratina mikmaqi; Mikmaq little carpenter bee²

Ceratina strenua; White-striped little carpenter bee²

Cercyonis pegala; Common wood-nymph¹

Chironomidae; Midge¹

Chrysochus auratus; Dogbane leaf beetle²

Ciseps fulvicollis; Yellow-collared scape moth¹

Coelioxys alternata; Alternate cuckoo leafcutter bee²

Coenonympha tullia; Ringlet²

Colletes latitarsis; Ground-cherry plasterer bee²

Coenagrionidae; Narrow winged damselfly¹

Coenonympha californica; Common ringlet¹

Colias eurytheme; Orange sulphur

Colias philodice; Clouded sulphur²

Colias sp.; Clouded yellows¹

Corixidae; Water boatman¹

Cosmopepla lintneriana; Twice-stabbed stink bug

Ctenucha virginica; Virginia ctenucha moth¹

Cupido comyntas; Eastern tailed blue²

Curculionidae; Weevils¹

Danaus plexippus; Monarch butterfly^{1,2}

Dryopidae; Long toed water beetles¹

Elmidae; Riffle beetles¹

Enodia anthedon;

Epargyreus clarus; Silver-spotted skipper²

Erynnis; Duskywings¹

Erythemis simplicicollis; Eastern pondhawk¹

Euodynerus; Potter wasp¹

Euphydryas phaeton; Baltimore checkerspot¹

Euphyes conspicua; Black dash²

Galgula partita; Wedgling moth

Gerridae; Water striders¹

Gomphidae; Club tailed dragonfly¹

Halictus; Furrow bees²

Harmonia axyridis; Multicolored Asian lady beetle²

Halictus confusus; Confused sweat bee²

Halictus ligatus; Ligated gregarious sweat bee²

Halictus rubicundus; Polymorphic sweat bee²

Hemaris diffinis; Snowberry clearwing²

Herminiinae; Litter moths¹

Hesperiidae; Skippers^{1,2}

Hoplitis pilosifrons; Hairy-faced summer mason bee²

Hoplitis producta; Prolonged summer mason bee²

Hoplitis truncata; Square-tail mason bee²

Hydrophilidae; Water scavenger beetles¹

Hydropsychidae; Net-spinning caddisfly¹

Hylaeus hyalinatus; Hyaline yellow-faced bee²

Hylaeus modestus; Modest yellow-faced bee²

Hylaeus sparsus; Carrot yellow-faced bee²

Junonia coenia; Common buckeye

Lampyridae; Firefly beetles¹

Lasioglossum anomalum; Anomalous sweat bee²

Lasioglossum bruneri; Bruner's sweat bee²

Lasioglossum succinipenne; Amber-winged sweat bee²

Lasioglossum coriaceum; Leathery sweat bee²

Lasioglossum cressonii; Cresson's sweat bee²

Lasioglossum elissiae; Ellis's sweat bee²

Lasioglossum ephialtum; Nightmare sweat bee²

Lasioglossum foxii; Fox's sweat bee²

Lasioglossum hitchensi; Hitchens's sweat bee²

Lasioglossum illinoense; Horseshoe sweat bee²

Lasioglossum imitatum; Bristle sweat bee²

Lasioglossum leucocomum; White-haired golden sweat bee²

Lasioglossum leucozonium; White-banded sweat bee²

Lasioglossum lineatum; Lineolated sweat bee²

Lasioglossum near ephialtum;

Lasioglossum near laevisimum; Very smooth sweat bee²

Lasioglossum pectorale; Dull-breasted sweat bee²

Lasioglossum pilosum; Hairy sweat bee²

Lasioglossum smilacinae; Mayflower sweat bee²
Lasioglossum admirandum; Admirable sweat bee²
Lasioglossum paradmirandum; Stunning sweat bee²
Lasioglossum timothyi; Timothy's sweat bee²
Lasioglossum versans; Friendless sweat bee²
Lasioglossum versatum; Experienced sweat bee²
Lasioglossum vierecki; Viereck's sweat bee²
Leptoceridae; Long-horned caddisfly¹
Lethe eurydice; Smoky-eyed brown butterfly¹
Libellula luctuosa; Widow skimmer¹
Libellula pulchella; Twelve-spotted skimmer
Libellulidae; Skimmer dragonfly¹
Limenitis archippus; Viceroy^{1,2}
Limenitis arthemis; Red-spotted purple butterfly
Lomographa sp.; Moth genus¹
Lon hobomok; Hobomok skipper¹
Lophocampa caryae; Hickory tussock moth
Lycaena phlaeas; American copper²
Lygaeus turcicus; False milkweed bug²
Meconema thalassinum; Drumming katydid
Megachile exilis; a leafcutter bee²
Megachile mendica; Beggar leafcutter bee²
Megachile texana; Texas leafcutter bee²
Megisto cymela; Little wood satyr¹
Melissodes agilis; Agile long-horned bee²
Melissodes bimaculatus; Two-spotted long-horned bee²
Melissodes illatus; Valiant long-horned bee²
Melissodes subillatus; Vigorous long-horned bee²
Melissodes wheeleri; Callirhoe bee²

Myrmeleontinae; Ant lions
Nomada armatella; Armed cuckoo nomad bee²
Nomada articulata; Articulated cuckoo nomad bee²
Nomada pygmaea; Pygmy cuckoo nomad bee²
Nepidae; Water Scorpion
Nomada; Nomad bees²
Nymphalis antiopa; Mourning cloak¹
Odontocorynus salebrosus; Weevil species¹
Osmia atriventris; Maine blueberry bee²
Osmia conjuncta; Eastern snail shell mason bee²
Osmia distincta; Distinct mason bee²
Osmia pumila; Dwarf mason bee²
Osmia taurus; a mason bee²
Ophion sp.; Ichneumon wasp
Papilio cresphontes; Eastern giant swallowtail²
Papilio glaucus; Eastern tiger swallowtail
Papilio polyxenes; Black swallowtail^{1,2}
Papilio troilus; Spicebush swallowtail
Peponapis pruinosa; Squash bee²
Perdita octomaculata; Eight-spotted miner bee²
Phyciodes tharos; Pearl crescent¹
Pieris rapae; Cabbage white butterfly^{1,2}
Plathemis lydia; Common whitetail¹
Poanes massasoit; Mulberry wing²
Poanes viator; Broad-winged skipper²

Polistes dominula; European paper wasp^{1,2}
Polistes fuscatus; Dark paper wasp^{1,2}
Polistes peckius; Peck's skipper²
Polygonia comma; Eastern comma¹
Pompeius verna;
Prochoerodes lineola; Maple spanworm moth
Psychomorpha epimenis; Grapevine epimenis moth¹
Pyrrharctia isabella; Isabella tiger moth²
Rhaphidophoridae; Camel crickets
Satyrium acadica; Acadian hairstreak¹
Satyrodes eurydice; Marsh eyed brown²
Scarabaeidae; Scarabs¹
Simulida; Black fly¹
Sphaerophoria; Globetails¹
Speyeria cybele; Great spangled fritillary²
Sphecodes johnsonii; Johnson's cuckoo sweat bee²
Sphex ichneumoneus; Great golden digger wasp^{1,2}
Strangalia luteicornis; Flower longhorn beetle¹
Sympetrum; Meadowhawks¹
Syrphini; Hoverflies¹
Thymelicus lineola; European skipper^{1,2}
Veliidae; Small water striders¹
Vanessa atalanta; Red admiral²
Xanthotype; Crocus geometer moths¹
Xylocopa virginica; Eastern carpenter bee^{1,2}

Millipedes (1):

Cylindroiulus; Millipede

Snails (2):

Bithyniidae; Mud snail¹
Helisoma spp; Rams horn snail¹

Spiders (3):

Hentzia palmarum; Common hentz jumping spider²
Mecaphesa sp.; Crab spider
Phidippus audax; Bold jumping spider²

Worms (2):

Lumbricus terrestris; Common earthworm
Oligochaeta; Freshwater oligochaete¹

PLANTS & FUNGI:

Fungi (12):

Agaricus; Field and button mushrooms
Antrodia; Antrodia mushroom
Apiosporina morbosa; Black knot
Calvatia gigantea; Giant puffball
Cerioporus sp.; Dryad's saddle¹
Coprinus comatus; Shaggy mane¹
Hydnoporia olivacea; Brown-toothed crust fungus
Lepiota; Lepiota mushroom²

Marasmius oreades; Fairy ring marasmius²
Phallus rugulosus; Wrinkly stinkhorn²
Stereum; Hairy curtain crust fungus
Trametes gibbosa; Lumpy bracket¹

Herbaceous plants (143):

Achillea millefolium; Common yarrow^{1,2}
Ageratina altissima; White snakeroot¹
Agrimonia parviflora; Small-flowered agrimony¹
Alliaria petiolata; Garlic mustard¹,
Allium vineale; Wild garlic
Ambrosia artemisiifolia; Common ragweed
Apocynum cannabinum; Hemp dogbane¹
Aquilegia canadensis; Red columbine²
Arctium; Burdocks
Asclepias incarnata; Swamp milkweed^{1,2}
Asclepias syriaca; Common milkweed^{1,2}
Asclepias tuberosa; Butterfly milkweed^{1,2}
Berberis thunbergii; Japanese barberry
Berteroa incana; Hoary alyssum²
Bryopsida; Mosses
Calystegia; False bindweeds
Cerastium; Mouse-ear chickweeds
Cerastium fontanum; Mouse-eared chickweed¹
Cichorium intybus; Chicory^{1,2}
Cirsium arvense; Creeping thistle^{1,2}
Cirsium discolor; Field thistle¹
Cirsium vulgare; Bull thistle^{1,2}
Colchicum; Naked ladies
Convallaria majalis; European lily of the valley
Convolvuleae; Morning glory family
Coreopsis lanceolata; Sand coreopsis²
Cyperus; Flat sedges
Daucus carota; Queen Anne's lace^{1,2}
Dianthus armeria; Deptford pink¹
Dicranum scoparium; Broom moss¹
Dipsacus fullonum; Wild teasel
Echinacea pallida; Pale purple coneflower²
Echinacea powwow; Coneflower powwow²
Echinacea purpurea; Purple coneflower²
Elymus spp.; Wild ryes and wheat grasses¹
Epilobium coloratum; Purpleleaf willowherb¹
Equisetum arvense; Field horsetail¹
Erechtites hieraciifolius; Fireweed
Erigeron annuus; Daisy fleabane²
Erigeron strigosus; Daisy fleabane¹ *Eupatorium*
perfoliatum; Common boneset¹
Euphorbia corollata; Flowering spurge
Euthamia graminifolia; Flat-topped goldenrod¹
Eutrochium maculatum; Spotted Joe-Pye weed^{1,2}
Galium mollugo; Hedge bedstraw¹
Geranium maculatum; Wild geranium¹
Geranium sanguineum; Bloody crane's-bill
Glechoma hederacea; Ground ivy

Helenium autumnale; Common sneezeweed²
Helianthus annuus; Common sunflower
Helianthus divaricatus; Woodland sunflower¹
Heliopsis helianthoides; False sunflower²
Hemerocallis fulva; Orange day-lily
Hieracium lachenalii; Common hawkweed¹
Hieracium spp.; Hawkweeds
Houttuynia cordata; Chameleon plant
Hypericum perforatum; St. John's-wort¹
Hypericum prolificum; Shrubby St. John's-wort¹
Impatiens capensis; Common jewelweed¹
Iris versicolor; Northern blue flag¹
Lamiaceae; Mint family
Leonurus cardiaca; Motherwort²
Leucanthemum vulgare; Ox-eye daisy^{1,2}
Liatris aspera; Rough blazing star²
Liatris cylindracea; Cylindrical blazing star
Liatris spicata; Dense blazing star¹
Lotus corniculatus; Bird's-foot trefoil¹
Lupinus perennis; Sundial lupine²
Lythrum; Loosestrife
Medicago lupulina; Black medic^{1,2}
Mimulus ringens; Allegheny monkeyflower¹
Monarda fistulosa; Bee balm^{1,2}
Monotropa uniflora; Ghost pipes¹

Oenothera biennis; Evening primrose^{1,2}
Onoclea sensibilis; Sensitive fern¹
Oxalis corniculata; Creeping woodsorrel
Oxalis dillenii; Slender yellow woodsorrel¹
Oxalis stricta; Upright yellow woodsorrel¹
Packera; Ragwort¹
Penstemon digitalis; Foxglove beardtongue¹,
Penstemon hirsutus; Hairy beardtongue^{1,2}
Persicaria maculosa; Lady's thumb
Phlox pilosa; Prairie phlox²
Phragmites australis; European reed
Physalis virginiana; Ground cherry²
Physostegia virginiana; Obedient plant²
Plantago lanceolata; Ribwort plantain^{1,2}
Plantago major; Greater plantain^{1,2}
Podophyllum peltatum; Mayapple
Potentilla recta; Sulphur cinquefoil¹
Potentilla simplex; Common cinquefoil^{1,2}
Prunella vulgaris; Common selfheal^{1,2}
Pseudognaphalium obtusifolium; Sweet everlasting²
Pycnanthemum virginianum; Virginia mountain mint^{1,2}
Ranunculus; Buttercups¹
Ranunculus acris; Common buttercup¹
Ratibida pinnata; Gray-headed coneflower²
Rosa multiflora; Multiflora rose¹
Rudbeckia hirta; Black-eyed Susan^{1,2}
Rudbeckia lacinated; Cutleaf-coneflower²
Rumex crispus; Curly dock
Salvia nemorosa; Woodland sage²

Sanguinaria canadensis; Bloodroot¹
Scilla; Wood hyacinth
Securigera varia; Purple crownvetch¹
Silene latifolia; White campion²
Silphium terebinthinaceum; Prairie dock²
Sisyrinchium angustifolium; Blue-eyed grass¹
Solanum carolinense; Carolina horsenettle
Solanum emulans; Eastern black nightshade²
Solidago canadensis; Canada goldenrod^{1,2}
Solidago gigantea; Giant goldenrod¹
Solidago juncea; Early goldenrod¹
Solidago rigida; Stiff goldenrod²
Solidago rugosa; Wrinkle-leaved goldenrod¹
Symphyotrichum; American asters²
Symphyotrichum laeve; Smooth blue aster^{1,2}
Symphyotrichum lanceolatum; Panicle aster
Symphyotrichum lateriflorum; Calico aster^{1,2}
Symphyotrichum novae-angliae; New England aster^{1,2}
Symplocarpus foetidus; Eastern skunk cabbage¹
Taraxacum erythrospermum; Red-seeded dandelion
Taraxacum officinale; Common dandelion^{1,2}
Tradescantia ohiensis; Ohio spiderwort²
Trifolium hybridum; Alsike clover¹
Trifolium pratense; Red clover^{1,2}
Trifolium repens; White clover^{1,2}
Tussilago farfara; Colt's-foot¹
Typha; Cattails
Verbascum thapsus; Great mullein
Verbena hastata; Blue vervain¹
Verbena urticifolia; White vervain¹
Veronia missurica; Ironweed²
Veronicastrum virginicum; Culver's root²
Vicia tetrasperma; Smooth tare¹
Viola sp.; Violets
Zizia aurea; Golden alexander^{1,2}

Trees & Shrubs (58):

Acer negundo; Box elder¹
Acer platanoides; Norway maple
Acer rubrum; Red maple¹
Acer saccharinum; Silver maple¹
Acer saccharum; Sugar maple¹
Amelanchier sp.; Serviceberry¹
Betula alleghaniensis; Yellow birch
Carpinus caroliniana; American hornbeam¹
Carya cordiformis; Bitternut hickory¹
Carya glabra; Pignut hickory¹
Carya ovata; Shagbark hickory
Catalpa speciosa; Northern catalpa
Celtis occidentalis; Common hackberry
Cornus drummondii; Roughleaf dogwood
Cornus racemosa; Gray dogwood
Cotoneaster; Cotoneasters
Crataegus laevigata; Midland hawthorn¹
Cupressus; Cypress

Elaeagnus umbellata; Autumn olive¹
Fagus grandifolia; American beech¹
Forsythia intermedia; Forsythia
Fraxinus americana; White ash¹
Fraxinus pennsylvanica; Green ash¹
Gleditsia triacanthos; Honey locust
Hamamelis sp.; Witch hazel¹
Juglandaceae; Walnut
Juniperus; Juniper
Ligustrum obtusifolium; Border privet
Ligustrum sinense; Chinese privet
Ligustrum vulgare; Common Privet
Lonicera; Honeysuckles
Magnolia soulangeana; Saucer magnolia
Malus sp.; Crab apple¹
Ostrya virginiana; Hop hornbeam¹
Picea abies; Norway spruce
Pinaceae; Pine
Pinus strobus; Eastern white pine¹
Podocarpus macrophyllus; Buddhist pine
Populus deltoides; Cottonwood¹
Populus grandidentata; Big-tooth aspen¹
Prunus serotina; Black cherry¹
Prunus virginiana; Chokecherry¹
Pyrus calleryana; Callery pear
Quercus alba; White oak¹
Quercus bicolor; Swamp white oak
Quercus macrocarpa; Bur oak¹
Quercus rubra; Northern red oak¹
Quercus velutina; Black oak¹
Rhamnus cathartica; Common buckthorn¹
Rosa blanda; Smooth rose
Rosa multiflora; Multiflora rose
Rubus occidentalis; Black raspberry
Sassafras albidum; Sassafras¹
Symphoricarpos orbiculatus; Coralberry
Tilia americana; American basswood¹
Ulmus americana; American elm¹
Ulmus rubra; Slippery elm¹
Viburnum sieboldii; Siebold's viburnum¹

Appendix 2. Courses that rely on the biodiversity and natural areas of OU's campus.

- BIO 1201 – Biology laboratory
- BIO 3312 – Field botany
- BIO 3330 – Ecology
- BIO 3332 – Field biology
- BIO 3351 – Animal behavior lab
- BIO 3360 – Organic farming
- BIO 3361 – Applied organic farming
- BIO 3362 – Permaculture
- BIO 3363 – Permaculture lab
- BIO 4310 – Conservation biology
- BIO 4321 – Medical parasitology lab
- BIO 4336 – Population and Community Biology
- BIO 4381 – Ecological problem solving lab
- BIO 4350 – Topics in behavioral biology
- BIO 4970 – Scientific Inquiry and Communication
- BIO 4995 – Independent research
- CHM 4100 – Environmental Chemistry
- CHM 4130 – Environmental Aquatic Chemistry
- CHM 4996 – Independent Research
- ENV 3080 – Introduction to Environmental Science
- ENV 3700 – Principles of Soil Science
- ENV 3750 – Introduction to Apiculture and Sustainability
- ENV 4800 – Biogeochemical cycling
- ENV 4850 – Environmental Fate and Transport
- ENV 4950 – Environmental Science Internship

Appendix 3. Publications by OU researchers and students* involving natural areas on OU's campus.

1. *Scherr, K.D., and Jamieson, M.A. 2021. Abiotic and biotic drivers of strawberry productivity across a rural-urban gradient. In press: Basic and Applied Ecology
2. Boyero, L., M.O. Gessner, R.G. Pearson, E. Chauvet, J. Pérez, J., S.D. Tiegs, A.M. Tonin, F. Correa-Araneda¹⁰, N. López-Rojo and M.A.S. Graça. 2021. Global Patterns of Plant Litter Decomposition in Streams. In: Boyero L., Swan C. and C. Canhoto (Eds.), Leaf Litter Breakdown in Freshwater Ecosystems
3. Ferreira, V., Eloegi, A, Tiegs, S.D., von Schiller, D., and R. Young. 2020. Organic-Matter Decomposition and Ecosystem Metabolism as Tools to Assess the Functional Integrity of Streams and Rivers – a Systematic Review. Water 12: 3523.
4. *Parkinson, E., *Lawson, J. and S.D. Tiegs. (2020). Artificial Light at Night at the Terrestrial-Aquatic Interface: Effects on Predators and Fluxes of Insect Prey. PLOS1
5. *Wilson, C.J., and Jamieson, M.A. 2019. The effects of urbanization on bee communities depends on floral resource availability and bee functional traits. PLOS ONE 14 (12), e0225852-e0225852.
6. Fitch, G., *Wilson, C.J., Glaum, P., Vaidya, C., Simao, and Jamieson, M.A. 2019. Does urbanization favour exotic bee species? Implications for the conservation of native bees in cities. Biology Letters 15: 20190574.
7. Jamieson, M.A., Carper, A.L., *Wilson, C.J., Scott, V.L., and Gibbs, J. 2019. Geographic bias in bee community research limits understanding of species distribution and response to anthropogenic disturbance. Frontiers in Ecology and Evolution 7: 194.
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