

Course Description

This course is a survey of data analysis skills and statistical methods essential for careers in biology. This course takes a holistic approach to the data analysis workflow using the open-source software R, including: data management, exploratory analyses, modeling, and reproducible science practices. Statistical topics covered may include generalized linear models, mixed effects models, nonlinear models, and ordination. Students apply techniques learned in class to real biological datasets as a course project.



College of Science & Mathematics

BIOL 7410: Applied Biological Data Analysis

Course Section: 01 (83184)

Fall Semester 2026 Syllabus

Instructor Information

Nicholas Green

Email: ngreen62@kennesaw.edu

Office Location: SC 331

Office Phone: 470-578-6546

Office Hours: TBD

Preferred Method of Communication: Email

Course Information

Total Credit Hours: 3

Laboratory / Experiential Field Hours: 0

Course Meeting Information

Course Meeting Time: MWF 09:10 AM - 10:05 AM

Course Meeting Location: SC 212
Course Meeting Modality: In person

Course Materials

There are no required textbooks for this course.

This course requires access to a laptop or computer capable of running R version 4.5 or greater. If you do not have access to one, the instructor can provide you with one.

- There are no course materials required for this course.

Course Learning Outcomes

- Engage with current biology literature to explain the role of statistics in the biological sciences and the ways in which analytical results are communicated.
- Engage in research using modern statistical methods to investigate biological questions.
- Manipulate, summarize, display, and analyze data using the open-source environment and language R.
- Use probability distributions to model and think about biological phenomena.
- Translate biological hypotheses and ideas into statistical models and vice versa.
- Conduct exploratory data analyses in support of scientific investigations, particularly to detect and diagnose common problems with biological datasets.
- Communicate data and analytical results to audiences who may or may not have statistical backgrounds.

Teaching Methods

This course will use the following teaching methods:

- Capstone Courses and Projects
- Collaborative Assignments and Projects

- Hand-on Learning Experiences / Laboratory Experiments

Course Requirements and Assignments

- Students should have access to a computer or laptop capable of running R version ≥ 4.5 . A 64-bit system is highly recommended.
 - If you cannot secure access to a computer or install R, you can either (1) use the [Posit Cloud](#) service free tier; or (2) discuss options with Dr. Green.
- Students will need to install the following software before the first day of class:
 - R version 4.5 or later. Select a mirror [here](#) and follow the onscreen instructions.
 - RStudio Desktop ([latest version](#)). Install this only **after** installing the latest version of R.

Evaluation and Grading Information

- Final letter grades are based on performance on exams, homework assignments, and the course project.
- Final course grades will be based on the traditional 10% grading scheme ($\geq 90\%$ = A, 80 – 89% = B, etc.), with percentages rounded to the nearest integer. Per KSU policy there are no +/- grades.

Grade calculation:

Components of the course grade

Item	% of grade	Description
Pre-assessment	0%	This is an ungraded, mandatory assignment designed to measure students' knowledge and skills at the beginning of the semester. Students must complete the pre-assessment in order to be eligible for passing grade in the course.

Item	% of grade	Description
Homework	20%	Periodic homework assignments (approximately biweekly) are used to assess student comprehension and to provide opportunity for practicing key concepts and procedures. Homework is graded on a completion basis. Collaboration between students is <i>allowed and encouraged</i> .
Midterm and Final Exams	15% each	These exams are used to evaluate student understanding and progress at the middle and end of the semester. Exams are take-home, open book, and open note. Collaboration between students is <i>not permitted</i> .
Course project	50%	The most important assignment of the course is a project where students must apply one or more of the statistical methods learned in class to a research question and dataset of their own choosing. A detailed assignment guide with project requirements and grading rubric will be provided early in the semester.

Course Calendar

Tentative schedule

Tentative schedule		
Week	Dates	Topic
1	Aug 24, 26, 28	Syllabus; Intro to R

Week	Dates	Topic
2	Aug 31, Sept 2, 4	Advanced R
3	Sept 7, 9, 11	Mon: Labor Day; Wed-Fri: Basic statistics review
4	Sept 14, 16, 18	Basic statistics review
5	Sept 21, 23, 25	Data summarization
6	Sept 28, 30, Oct 2	Exploratory data analysis
7	Oct 5, 7, 9	Probability distributions
8	Oct 12, 14, 16	Generalized linear models 1: continuous and count models
9	Oct 19, 21, 23	Generalized linear models 2: binomial and proportional models
10	Oct 26, 28, 30	Nonlinear models
11	Nov 2, 4, 6	Mixed effects models
12	Nov 9, 11, 13	Multivariate analysis 1
13	Nov 16, 18, 20	Multivariate analysis 2
14	Nov 23, 25, 27	Thanksgiving break!
15	Nov 30, Dec 2, 4	Presentations
16	Dec 7, Dec 9	Mon: Wrap up; Wed: Final Exam 8:00 - 10:00 am

Final exam: Wednesday December 9, 8:00 - 10:00 am.

Course Policies

Attendance Policy:

- Attendance is not required but is highly encouraged. Success in this course is strongly correlated with regular attendance. This means that “excused absences” apply to assignment deadlines rather than routine class meetings.
- If an illness or other issue will prevent you from meeting an assignment or exam deadline, please contact me as soon as possible ahead of time so we can make alternative arrangements.

Missed exams and assignments

- Assignments and exams must be turned in on time to be eligible for full credit. Late assignments and exams will be accepted but with a score penalty: 20% for

up to 24 hours late; 40% for up to 48 hours late, and so on. The late penalty is waived if you miss the deadline for an excused reason (e.g., death or serious illness in the family, jury duty, or other situations at the instructor's discretion).

Other course policies

- **Collegial and respectful behavior towards all people is expected at all times.** This does not mean you cannot express your opinions; it means you must be respectful of other people.

General

- In this class, you are welcome to use generative “artificial intelligence” (hereafter “AI”) tools for any purpose other than taking exams. Generative AI is here to stay, so it is incumbent on all of us to learn to use it responsibly. **Here's the important thing to remember: AI should be a supplement to your knowledge and skills, not a replacement for knowledge and skills.**

- You should note that all AI generative tools tend to make up incorrect facts and fake citations, code generation models sometimes to produce inaccurate outputs, and image/art generation tools can produce copied work or offensive products. You will be responsible for any inaccurate, biased, offensive, or otherwise unethical content you submit regardless of how it was created.

- If you use an AI tool on an assignment or exam, you must explicitly describe its contribution in your submission. This includes a PDF of the entire transcript, including prompts and outputs. **The use of an AI tool without acknowledgement is cheating and constitutes a violation of the KSU Code of Academic Integrity.**

Special concerns for this course

- The application of statistical methods in biological investigations can be highly nuanced and context-specific, and AI may not understand every situation accurately. Never accept an AI's output at face value, and check what it says against other sources or knowledgeable colleagues.

- Do NOT ask any AI to provide you with data (i.e., actual numbers) for your course project. There is a high probability that it will simply fabricate data. If you need data for your course project, you should either (1) ask your PI for dataset they are willing to share; or (2) ask Dr. Green for a dataset.
- If you use AI to help you generate R code, run and check the code yourself to verify that (1) the code works; and (2) your instructions were followed accurately. Just as a human colleague could misunderstand your instructions and write unhelpful code, so could an AI.

Modified Operations Policy:

Kennesaw State University is committed to remaining open and continuing full operations, including class schedules, whenever possible. The Office of the President, in consultation with the KSU Office of Emergency Management and other officials, will determine when an emergency impacts KSU's normal operations. When the University is closed due to an emergency, all classes will be canceled, and non-essential personnel will not be expected to work.

When the University shifts to modified operations, Cabinet members, in consultation with the Office of the President or designee and the Office of Emergency Management, will be responsible for determining appropriate operational continuity for their divisions. This may include remote work. During modified operations, each faculty member will be responsible for instructional continuity for their classes. To ensure instructional continuity, all Academic Colleges and Departments are expected to maintain and regularly update instructional continuity plans. All syllabi should also include an instructional continuity plan statement specific to that course.

During a weather event or other emergency, those commuting to campus should exercise their best judgment when determining travel options. If the University remains open and an employee elects not to report to work, the employee will be required to use their accrued vacation time.

The University will announce campus closures and delayed schedules in several

ways. The cell phone number on file with the university will automatically receive KSU Alerts, so make sure your information in OwlExpress is accurate at all times. An email will also be sent to your university account.

In addition, announcements will be made by a notice on the Kennesaw State University home page.

Kennesaw State University (KSU) may decide to close campuses, operate on a delayed schedule, or transition to remote instruction for inclement weather or in case of emergency.

The University will announce campus closures, delayed schedules, or remote instruction through KSU Alerts sent to your cell number on file and to your university email account. In addition, announcements will be posted on KSU's home page: www.kennesaw.edu.

Our class continuity plan includes:

- Communication: Please check D2L Brightspace or e-mail for necessary instructions.
- Virtual Classes: If in-person classes are not possible, we may transition to virtual classes using MS Teams.
- Assignments and Assessments: Deadlines for assignments and assessments may be adjusted to accommodate the emergency situation.

We understand that emergencies create unique challenges. If you need additional support during an emergency, reach out via Brightspace or e-mail. The university also offers resources such as counseling and academic support, which can be accessed remotely.

Institutional Policies

Academic Integrity Statement:

Every KSU student is responsible for upholding the provisions of the [Student Code of Conduct](#), as published in the Undergraduate and Graduate Catalogs. Section 5c of the Student Code of Conduct addresses the university's policy on academic honesty, including provisions regarding plagiarism and cheating,

unauthorized access to university materials, misrepresentation/falsification of university records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the Department of Student Conduct and Academic Integrity (SCAI), which includes either an “informal” resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct’s minimum one semester suspension requirement.

KSU Disruption of Campus Life policy:

All students are responsible for knowing the information, policies and procedures outlined in the Kennesaw State University Codes of Conduct. [Student Conduct and Academic Integrity \(SCAI\)](#) includes: the general Student Code of Conduct, the Residential Code of Conduct, and the Code of Academic Integrity.

KSU Web Accessibility:

Federal law Section 508 Subsection 1194.22 of the Rehabilitation Act and the Board of Regents (BOR) of the University System of Georgia (USG) Web Accessibility Guidelines require that all web content meet the federal government’s accessibility guidelines. As such, KSU complies with USG guidelines.

University accessibility assistance is provided by several offices as noted below. Staff in these offices work to accommodate requests for access or assistance with access as soon as possible in order to either accommodate the request or identify an effective alternative for the requester.

Request for Office Contact Number Contact Email

- Student Support Services Student Disability Services 470-578-2666 sds@kennesaw.edu
- Student Technology Assistance [Student Technology Assistance](#)
- University Information Technology Services 470-578-6999 service@kennesaw.edu
- Third Party Technology Assistance University Information Technology

Services 470-578-6999 service@kennesaw.edu

KSU Reasonable Accommodations:

Students with qualifying disabilities under the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act who require “reasonable accommodation(s)” to complete the course may request those from Office of Student Disability Services. Students requiring such accommodations are required to work with the University’s Office of Student Disability Services rather than engaging in this discussion with individual faculty members or academic departments. If, after reviewing the course syllabus, a student anticipates or should have anticipated a need for accommodation, he or she must submit documentation requesting an accommodation and permitting time for a determination prior to submitting assignments or taking course quizzes or exams. Students may not request retroactive accommodation for needs that were or should have been foreseeable. Students should contact the office as soon as possible in the term for which they are seeking accommodations. Student Disability Services is located in Kennesaw Hall, Room 1205 on the Kennesaw campus and Building A in Suite 160G on the Marietta campus. Please visit the [Student Disability Services \(SDS\) website](#) for more information, or call the office at 470-578-2666 (Kennesaw campus) or 470-578-7361 (Marietta campus).

KSU Enrollment Management/Course Attendance:

Students are solely responsible for managing their enrollment status in a class; nonattendance does not constitute a withdrawal.

Copyright Law:

It is the responsibility of KSU faculty and students to respect the rights of copyright holders and complying with copyright law. The University System of Georgia recognizes that the exclusive rights of copyright holders are balanced by limitations on those rights under federal copyright law, including the right to make a fair use of copyrighted materials and the right to perform or display works in the course of face-to-face teaching activities.

The University System of Georgia facilitates compliance with copyright law and, where appropriate, the exercise in good faith of full fair use rights by faculty and staff in teaching, research, and service activities. The University System of Georgia ensure compliance with copyright law in the following ways.

1. The USG informs and educates students, faculty, and staff about copyright law, including the limited exclusive rights of copyright holders as set forth in 17 U.S.C. § 106, the application of the four fair use factors in 17 U.S.C. § 107, and other copyright exceptions.
2. The USG develops and makes available tools and resources for faculty and staff to assist in determining copyright status and ownership and determining whether use of a work in a specific situation would be a fair use and, therefore, not an infringement under copyright law;
3. The USG facilitates use of materials currently licensed by the University System of Georgia and provides information on licensing of third-party materials by the University System; and
4. The USG identifies individuals at the University System and member institutions who can counsel faculty and staff regarding application of copyright law.

Protecting Students' Privacy (FERPA):

Students have certain rights to privacy. These rights are mandated by federal policy. [The Student Handbook](#) contains information regarding Rights Pertaining to Student Records, and FERPA specific details are available on the [KSU FERPA website](#).

A key requirement of the formal evaluation process is the protection of individual privacy rights concerning educational grading. The University's online learning system and email system is designed to prevent unauthorized individuals from gaining access to sensitive information or information protected by federal or state law. Consequently, faculty and students are strongly encouraged to only communicate regarding course matters through the University's designated technology learning system.

Information should not be made public in any way in which a student's grades, social security number, or other personal information may be identified. Grade information may be shared with members of the KSU community who also have a legitimate educational interest in student success (e.g. academic advisors or

members of the Behavioral Response Team). Faculty may be asked to provide early alert information if there is a concern that a student is at risk, academically or otherwise.

KSU Sexual Misconduct:

In accordance with federal and state law including, Title IX of the Education Amendments of 1972 (“Title IX”) and Title VII of the Civil Rights Act of 1964 (Title VII), the University System of Georgia (USG), including Kennesaw State University, prohibits discrimination on the basis of sex in any of its education programs or activities or in employment. The USG is committed to ensuring the highest ethical conduct of the members of its community by promoting a safe learning and working environment. To that end, Kennesaw State University follows USG Board of Regents Policy Manual, Section 6.7. [Visit Title IX](#).

Withdrawal from Classes:

A student who officially withdraws from a course by the end of the last day to withdraw without academic penalty will receive a grade of “W” and receive no credit.

A student will receive a refund only when the student withdraws from ALL courses for the applicable semester and only by the schedule outlined in the University refund policy found in the Tuition, Expenses, & Financial Aid section of the undergraduate and graduate university catalogs.

Students should be aware that a reduction in their hours might result in the loss of full-time student status and thus affect their financial aid, scholarships, athletic and ticket eligibility, University housing accommodations, use of University resources and access to University facilities, visa for international students, and Veterans Educational Benefits. Students should contact the appropriate office and their academic advisor with questions about the impact of their withdrawal from a course before initiating a withdrawal. Veterans and dependents of veterans who receive educational benefits must notify the Veterans Education Benefits Area in the Office of the Registrar of any course load reductions.

Hardship Withdrawals

If a student experiences significant personal hardship (e.g., medical or family emergency, prolonged illness), the Dean of Students can approve a hardship withdrawal from all courses in the term for which the student is currently registered. In the case of an approved hardship withdrawal from all courses, the Registrar will assign grades of “W” for those classes. The deadline for final approval of a hardship withdrawal by the Dean of Students is the last day of class for which the hardship withdrawal is sought. If the hardship withdrawal process is not complete by the last day of class for which the hardship withdrawal is sought, a student must appeal for a retroactive hardship withdrawal from the Academic Standing Committee.

Appeals for retroactive hardship withdrawals must be directed to the Academic Standing Committee. Retroactive hardship withdrawals are rarely granted if it has been more than one year since the last day of class for which the withdrawal is sought. Extraordinary justification must be shown. In the case of approved retroactive hardship withdrawals, the Registrar will assign a grade of “W.”

University Initiated Withdrawals

If a student is suspended by the Office of Student Conduct following a violation of the University’s Code of Conduct not related to academic dishonesty, the Office of Student Conduct may facilitate a University-initiated withdrawal from courses for which a student is registered for the term. The Registrar will assign grades of “W” for those classes.

Military Withdrawals

A student will receive a “WM” symbol for all courses and a full refund of tuition and mandatory fees and a pro rata refund of other fees for military and other service, as defined by [BOR Policy Manual, Section 7.3.5.3](#). To request a military withdrawal, the student must submit a copy of official orders to the Office of the Registrar.

Academic Feedback:

Institutional Chief Academic Officers will encourage faculty to clarify for students, at the beginning of each course, the basis on which grades will be determined and to provide timely academic feedback as the course progresses ([BOR Academic and Student Handbook Policy 2.18](#))

Netiquette: Communication Courtesy:

All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. See [Email Best Practices](#) for additional guidance.

Course Delivery:

KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction. Please refer to the Instructional Continuity statement included in each course syllabus for specific plans.

University Sponsored Academic Resources

Academic resources supporting KSU's current graduate students can be found here: <https://www.kennesaw.edu/graduate/current-students/index.php>

Additional academic resources include

- [Disability Resources](#)

Technology Resources

For issues with technical difficulties, please contact the Student Help Desk:

[Submit a Request for Help](#)

Email: service@kennesaw.edu

Call: 470-578-6999

[New Students Technology Services](#)- Steps that will help you meet the technological requirements of the University.

Any request for make-ups due to technical issues **MUST** be accompanied by the ticket number received from UITs when the problem was reported to them. The ticket number will document the time and date of the problem. You **MUST** e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

Student Support and Wellness Resources

YOU MATTER at KSU, and your well-being is a priority to us. College is exciting, but it can cause students to experience stress and feel overwhelmed. Through counseling, health education, addiction and recovery support, fitness and recreation activities, and access to basic needs, Wellbeing@KSU is here to help you do well and be well.

- [Department of Career Planning & Development](#)
- [Student Health Clinic](#)
- [Military and Veteran Services](#)

Faculty Profile (USG CV Requirement):

Directory Information

Email: ngreen62@kennesaw.edu

Phone: 470-578-6546

Office: SC 331

Degrees Earned

BS in Biology, University of Louisville

PhD in Biology, Baylor University

Teaching Interests

My teaching is concentrated in two areas: vertebrate biology, and biological data analysis. One of my primary goals for all of my courses is to improve the quantitative and statistical reasoning skills of students. This often means introducing students to state-of-the-art methods in data collection and analysis, often far beyond what most biology majors might otherwise encounter in their undergraduate careers.

Research Interests

The [Green Quantitative Ecology Lab \(QuantEco\)](#) uses advanced mathematical and statistical tools to investigate relationships between living organisms and their environment. Most of our research focuses on understanding how human activities, like urbanization and climate change, affect fish and wildlife across all levels of biological organization.

While our research is often at the cutting-edge of quantitative methods, we are grounded in a rigorous tradition of field ecology and mammalogy. Our work takes us all over Georgia, from the northern Ridge and Valley to the barrier islands of the coast. To complement our computational and field work, we use a wide variety of lab methods like DNA extraction, ELISA, necropsy, craniometry, and microscopy gather the data we need from the samples we collect.

Some of our current projects are listed below and described in more detail on our [lab website](#). If you are interested in participating, please email Dr. Green (ngreen62@kennesaw.edu).

- Spatial ecology of small mammals in urbanizing environments
- Effects of climate change and urbanization on the Etowah watershed
- Osmoregulation in American Alligators
- Effects of climate change on marine food webs

Recent Scholarship

Where to find lab research

[Lab website](#)

[Google Scholar profile](#)

[ORCID profile](#)

Publications since joining KSU

Wildhaber ML, Albers JL, Green NS. 2025. Understanding predator-prey-competitor dynamics between Lower Missouri River *Macrhybopsis* and *Scaphirhynchus* using a combined population—bioenergetics model. *Ecological Modelling* 504: 111097. DOI: <https://doi.org/10.1016/j.ecolmodel.2025.111097>.

Anderson C, Weand M, Alexander H, Bretfeld M, Green NS. 2025. Variations in stand structure, composition, and fuelbeds drive prescribed fire behavior during mountain longleaf pine restoration. *Forest Ecology and Management* 575: 122372. DOI: <https://doi.org/10.1016/j.foreco.2024.122372>;

Hooper MJ, Struckhoff MA, Isanhart JP, Albers JL, Grabner KW, Green NS, Kunz BK, McDonald MV, West BM. 2024. Studies to assess natural resource recovery and evaluate monitoring methods for restored bottomland hardwood forests. *Integrated Environmental Assessment and Management*. DOI: <https://doi.org/10.1002/ieam.4996>;

West BM, Wildhaber ML, Green NS, Isanhart JP, McDonald MV, Hooper MJ. 2024. Survey effort and targeted landbird community metrics at Indiana lowland forest restoration sites. Integrated Environmental Assessment and Management. DOI: <https://doi.org/10.1002/ieam.4992>.

Wildhaber ML, West BM, Bennett KR, May JH, Albers JL, Green NS. 2024. Sicklefins Chub (*Macrhybopsis meeki*) and Sturgeon Chub (*M. gelida*) temporal and spatial patterns from extant population monitoring and habitat data spanning 23 years. Fishes 9: 43. DOI: <https://doi.org/10.3390/fishes9020043>.

Albers J, Wildhaber M, Green N, Struckhoff M, Hooper M. 2023. Visitor use and activities detected using trail cameras at forest restoration sites. Ecological Restoration 41: 199-212. DOI: <https://doi.org/10.3368/er.41.4.199>.

Green NS, Wildhaber ML, Albers JL. 2022. Interaction between transect design and animal distribution in distance sampling of deer. Wildlife Society Bulletin 46: e1368. DOI: <https://doi.org/10.1002/wsb.1368>.

Green NS, Li S, Maul JD, Overmyer J. 2022. Natural and anthropogenic factors and their interactions drive stream community integrity in a North American river basin at a large spatial scale. Science of the Total Environment 835, 155344. DOI: <https://doi.org/10.1016/j.scitotenv.2022.155344>.

Preston TM, Wildhaber ML, Green NS, Albers JL, Debenedetto GP. 2021. Enumerating white-tailed deer using unmanned aerial vehicles. Wildlife Society Bulletin 45: 97-108. DOI: <https://doi.org/10.1002/wsb.1149>

Green NS, Wildhaber ML, Albers JL. 2021. Effectiveness of a distance sampling from roads program for white-tailed deer in the National Capital Region Parks. Natural Resource Report NPS/NCR/NRR—2021/2224. U.S. National Park Service, Fort Collins, Colorado. DOI: <https://doi.org/10.36967/nrr-2284469>.

Green NS, Wildhaber ML, Albers JL, Pettit TW, Hooper MH. 2020. Efficient mammal biodiversity surveys for ecological restoration monitoring. Integrated Environmental Assessment and Management. DOI: <https://doi.org/10.1002/ieam.4324>.