WILD 571 – Estimating Demographic Parameters from Marked Animals
Autumn Semester 2020
Instructor: Dr. Paul M. Lukacs

Required Readings (read before class each day)
- Gentle Introduction to Mark – online, chapters noted in brackets below []
- http://www.phidot.org/software/mark/docs/book/
- Bayesian Population Analysis Using WinBUGS (Kery and Schaub 2012) chapters noted in curly braces below {}
- Primary literature as assigned

Class meeting times:
Lectures will be pre-recorded and posted to Moodle at least 1 day prior to class sessions. Class sessions will focus on questions/answer and exercises. All class sessions will be synchronously presented on Zoom.
TR 9:30-10:50 JRH 205, R 12-1:50 JRH 204

Class Zoom link: https://umontana.zoom.us/my/paul.lukacs

August	20	Introduction, Sampling
	25	Maximum Likelihood Estimation [Ch. 1], Burnham et al. (1987), p. 2-25.
	27	Live-resight models (Cormack-Jolly-Seber) [chp 1,2,3]
	Lab	Sampling, optimization and likelihood
September	1	Live-resight models (Cormack-Jolly-Seber) Lebreton et al. (1992)
	3	Live-resight models (Cormack-Jolly-Seber) Lebreton et al. (1992)
	Lab	European dippers, sage grouse
	8	Bayesian Inference / Fitting models with MCMC {Ch. 1, 2, 3}
	10	Bayesian Inference / Occupancy models {Ch. 13}
	Lab	MCMC in R and JAGS
	15	Bayesian Inference / CJS {Ch. 7}
	17	Data storage, formatting and manipulation (link to RStudio Webinar)
	Lab	MCMC in R and JAGS, Markdown
	22	Bayesian Inference / Model diagnostics
	24	**Exam 1**
	Lab	Analysis review
	29	Bayesian Inference / Occupancy models {Ch. 13}

October	1	Incorporating Scientific Questions / Including Covariates [Ch. 6]
	Lab	Hen clams, covariates
	6	Model selection
	8	Closed-population models [Ch. 14] {Ch. 6} Otis et al. (1978)
	Lab	Hares, Taxicabs
	13	Inference to unmarked populations Moeller et al. (2018)
	15	Inference to unmarked populations
	Lab	Example in R
	20	Spatial capture-recapture
	22	Spatial capture-recapture
	Lab	**Exam 2**
	27	Robust design models [Ch. 15] Kendall et al. (1997)
	29	Multi-State Models as a Unifying Theory of Mark-Recapture. [Ch. 10], {Ch. 9}, Lebreton & Pradel (2002), Dhondt (2002)
	Lab	Random effects in JAGS
November	3	**Election day – no class**
	5	Movement and State Change. Doligez et al. (2002)
	Lab	Review
	10	Modeling transitions, what are the limits to complexity?
	12	Hazard rate / Cox models / Known fate
	Lab	Spawning suckers
	17	**Student presentations**
	19	**Student presentations**
	24	**Student presentations**

Grading: All exams will be take-home exams.   Exams will be handed out at the end of class on a Thursday and will be due the following Tuesday at the beginning of class. Students are to work independently on exams and may not discuss the exams with anyone else. Email the completed exam (html, Rmd, word, and any other code) to Paul.Lukacs@umontana.edu prior to the deadline.

Final Presentation: Each student must analyze a capture-recapture data set of their choice (to be approved by the instructor). Students then must present

their analysis and results as an oral scientific presentation. All analyses should be original. More details on the depth and structure of the analyses will be given in class. To be fair to all presenters and to maximize learning, students must attend all presentations. Ten points will be deducted for each presentation missed without an approved absence.

A short (5-10 minute) quiz will be given prior to the start of class every Tuesday. Quizzes are intended to keep students focused on technical analysis details. Quizzes will be posted to Moodle on Mondays and email to paul.lukacs@umontana.edu prior to the start of class (9:30) on Tuesdays.

Computer lab exercises will not be graded. Students are encouraged to work together on the labs. If you do not understand a lab, please ask for help because the concepts will likely be on an exam.

Exam 1	25%
Exam 2	25%
Presentation	25%
Quizzes	25%

PLAGARISM:
Plagiarism will not be tolerated and will result in failing the course.

DROP DATES:

After registering and through the **first seven (7) instructional days of the semester**, students may use Cyberbear add courses or change sections and credits; through the **first fifteen (15) instructional days of the semester**, students may use Cyberbear to drop courses. Fees are reassessed on the sixteenth day of the term. Added courses and credits may result in additional fees. For courses dropped by the fifteenth instructional day, no fees are charged and courses are not recorded. (For deadlines and refund policy for withdrawal from all courses, see the Withdrawal sections of this catalog.)

An instructor may specify that drop/add is not allowed on the internet. A drop/add form is used to make changes in these courses, if approved by the instructor.

After adding a course, the credit/no credit grading option or auditor status may be elected on the internet or on a form available at the Registration Counter in Griz Central in the Lommasson Center. These options are not allowed for some courses as identified in the Class Schedule. Change of grading option to audit is not allowed after the 15 instructional day.

Beginning the sixteenth (16) instructional day of the semester through the forty-fifth (45) instructional day, students use paper forms to drop, add and make changes of section, grading option, or credit. The drop/add form must be signed by the instructor of the course and the student's advisor. The signed drop/add form must be returned to the Registration Counter (or the Registrar's Office at Missoula College) no later than the **forty-fifth** instructional day. A $10.00 processing fee is charged for each

drop/add form. Added courses and credits may result in additional fees. There are no refunds or reductions of fees for courses dropped and grades of W (withdrew) are recorded.

Beginning the forty-sixth (46) instructional day of the semester through the last day of instruction before scheduled final examinations, students must petition to drop. The petition form must be signed by the instructor of the course and the student's advisor and, the dean of the student's major. A $10.00 processing fee is charged for each petition. There are no refunds or reductions of fees for courses dropped, and the instructor assigns a grade of WP (withdrew/passing) if the student's course work has been passing or a WF (withdrew/failing) if the course work has been failing. These grades do not affect grade averages but they are recorded on students' transcripts.

Documented justification is required for dropping courses by petition. Some examples of documented circumstances that may merit approval are: accident or illness, family emergency, or other circumstances beyond the student's control.

The opportunity to drop a course for the current term for such a course ends on the last day of instruction before scheduled final exams. Dropping a course taken in a previous term or altering grading option or audit status for such a course is not allowed. The only exceptions are for students who have received a grade of NF (never attended).