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AARON J. ENRIQUEZ

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EDUCATION

University of Wyoming	***Laramie, WY***
PhD, Economics	May 2021
MS, Economics, Environment and Natural Resources	Aug 2017
BS, Biology, Honors Program, *summa cum laude*	May 2015
BS, Economics, *summa cum laude*	May 2015

DISSERTATION

Title: Bioeconomic analysis and nonmarket valuation of grizzly bears in the Greater Yellowstone Ecosystem
Committee: David Finnoff (chair), Stephen Newbold (co-chair), Jason Shogren, David Aadland, and Carlos Martínez del Rio (external department member)
Fields: Environmental and natural resource economics, nonmarket valuation, applied microeconomics
Themes:

- Examine **human-ecosystem interactions**, with a specific focus on the relationship between humans and grizzly bears in the Greater Yellowstone Ecosystem.
- Analyze **decision making by resource managers**. A representative wildlife agency determines management of grizzly bears over time by simultaneously accounting for ecological and human realities. Optimal management can simultaneously improve ecological outcomes (e.g., reduce grizzly bear mortality) and human outcomes (e.g., reduce grizzly bear-human conflicts).
- Explore the **tradeoffs** from multi-use species that cause both benefits and damages to people in society. Benefits include existence value, sighting value, and consumptive use value while damages include property damages, human injuries, and livestock depredations.
- Model ecological population dynamics by accounting for **feedback loops** between wildlife and humans. Human-caused grizzly bear mortalities are estimated as a function of grizzly bear population size, expansion of grizzly bear occupied range, climate, and resource quality.
- Use a combined revealed and stated preference **nonmarket valuation** survey to quantify locals' and non-locals' **use and nonuse values**, including values for grizzly bear sightings and conservation.

PUBLICATIONS

Enriquez, AJ and DC Finnoff. (2021). Managing mortality of multi-use megafauna. *Journal of Environmental Economics and Management*, https://doi.org/10.1016/j.jeem.2021.102441.

Abstract: Greater Yellowstone Ecosystem grizzly bears are a high-profile multi-use species currently

protected under the Endangered Species Act. As their population has grown over time, counts of grizzly bear-human conflicts and grizzly bear mortalities have increased. A bioeconomic model is constructed in which a representative wildlife agency maximizes social net benefits from grizzly bears by deciding whether to enact direct population control. A linear optimal control specification is used to reflect the realities of negotiated and rigid active management programs. Stock-dependent benefits and damages adjust along the recovery path, which tracks the natural capital value of a live grizzly bear in the wild (i.e., the in situ marginal net benefits) as the population size changes. Benchmark results indicate that the grizzly bear population has exceeded the size at which protections ought to have been removed. The natural capital value may actually be negative for an interval of time, during which it is optimal for society to continue conserving the species by developing a buffer. The results of the analysis are sensitive to key ecological and economic parameters, especially on the benefits side.

WORKING PAPERS

Enriquez, AJ, BT Gilbert, and LH Thunström. The pain of paying with other people's money. Invited for revision and resubmission at *Review of Behavioral Economics*.

Abstract: Spending decisions are at the heart of consumer research, and factors that impact spending have been studied for many decades. So far, research has focused on spending decisions based on own money. However, people often spend money earned by someone else (e.g., partners spend each other's earned money, government officials spend tax-payer money, employees spend employer money, people in need spend social benefits). We take a first step towards understanding how spending depends on who earned the money. We focus on the shortest social distance between consumer and earner – intra household spending – and survey 166 couples on how pain of paying from a fixed purchase is affected by who earned the money. Pain of paying is a proxy for the opportunity cost of consumption and regulates consumer spending; the higher the pain, the lower the spending. We find that people feel *higher* pain of paying when spending money earned by their partner, compared to when earned by self, suggesting they might be more frugal with money earned by others. Further, their pain of paying increases if they believe their partner will be unhappy with their purchases. Their ability to accurately predict the partner's feelings about the purchase increases with partner similarity in spendthriftiness.

Richardson, LA and **AJ Enriquez**. The economic value of wildlife tourism and implications of marginal population changes. Under review at *Environmental and Resource Economics*.

Abstract: Wildlife tourism is a highly demanded recreation activity in parks and protected areas globally, yet economic benefit measures are lacking. Estimates of the effect of small-scale losses of wildlife on viewing values are virtually non-existent, leading to a dearth of information crucial for answering key wildlife policy and management questions (e.g., appropriate compensation for incidents of human-caused wildlife mortality). We estimate a travel cost model of bear viewing trips in Yellowstone National Park and demonstrate how the resulting consumer surplus estimate can be incorporated into a model of visitor sightings as a function of wildlife population size to evaluate the effect of marginal population changes on sighting value. Results indicate aggregate values of $6 and $7 million annually for viewing grizzly bears and black bears, respectively. The corresponding marginal values are around $38,000 and $12,000 per single grizzly bear and black bear. Our approach and general findings have significant relevance for incidents of poaching, wildlife-vehicle collisions, and other policy applications in which there is a need to determine how marginal changes in a species' population size affects the economic benefits associated with wildlife resources.

Bagdonas, DA, **AJ Enriquez**, KA Coddington, DC Finnoff, JF McLaughlin, MD Bazilian, EH Phillips, and TL McCling. Rare earth element resource evaluation of coal byproducts: A case

study from the Powder River Basin, Wyoming. Under review at *Renewable and Sustainable Energy Reviews*.

Abstract: Domestic rare earth element sources and production are limited in the United States and currently rely on final processing overseas. Increasing demand and resource security has led to significant investigation into domestic rare earth element resources. Much of the existing research focuses on unconventional potential ore stocks, including coal and coal byproducts. This investigation focuses on coal byproducts generated as ash from coal-burning power stations. Wyoming's Powder River Basin hosts the largest U.S. coal stocks for energy production, providing approximately 40% of all thermal coal mined in the country. In Section I, we study Powder River Basin coal byproducts for rare earth element concentrations and compare the data to current alternative resource knowledge. We find that the coal byproducts are consistently high enough in rare earth element concentration (above the current Department of Energy 300 ppm cutoff grade) to warrant consideration as a promising potential resource. Rare earth element behavior within the host coal seams is also considered in an effort to better understand resource prospecting and ore body description. In Section II, we evaluate the economic feasibility of rare earth extraction from coal byproducts using net present value analysis and the rare earth concentrations data from Section I. We calculate the break-even ash-to-oxide output and input unit costs for four coal stations in the Powder River Basin. All stations have break-even unit costs that are higher than the mine-to-oxide operating cost reported for a traditional rare earth element mine. This is a promising result, especially given that it is more costly to refine rare earths from mined material than from ash. The results are highly sensitive to rare earth prices: given low long-term prices, none of the stations can feasibly break even. In Section III, we summarize federal policy considerations in rare earth element resource development. Recent policy developments, which have focused on rare earth element-specific funding legislation, paired with the results from Sections I and II, suggest a robust opportunity for development of Wyoming-based coal byproducts as a partial solution to current domestic rare earth element shortfalls and strategic needs.

Marchal, AJ, **AJ Enriquez**, MD Ehmke, and CA Camargo, Jr. Free riding toward personal protection: Relating parental cooperation behavior to vaccine hesitancy. In preparation for submission.

Abstract: Small urban clusters and rural communities, which have historically had low vaccination rates, are especially vulnerable to healthcare system overloads. We conducted a study in which parents from these locations participated in a voluntary contribution mechanism experiment and then answered survey questions about influenza vaccinations. We observe whether parents' cooperative actions in the experiment (i.e., contributions to a shared group account) relate to their flu vaccination decisions for themselves and their children. We classify different player-types based on parents' propensities to cooperate and react to their partners' actions, including "free riders" (keep the majority of tokens), "contributors" (contribute the majority of tokens), and "responders" (adjust contributions based on partners' actions). We also control for the intensity of reciprocation among all players. We find that free riders and parents who tend to reciprocate are most likely to vaccinate, which is a departure from previous literature. The findings shed light on the behavioral motives behind people's vaccination decisions. Policies that amplify free riding and reciprocation may increase vaccination rates, which would be critical for mitigating the damaging effects of COVID-19 and other preventable diseases.

WORK EXPERIENCE (RESEARCH)

Department of Economics, University of Alaska Anchorage — ***Anchorage, AK***

Post Doctoral Fellow — July 2021 – Present

– *Supervisor*: Dr. Kevin Berry, Associate Professor, Department of Econ., University of Alaska Anchorage
– *Projects:*
  – Marine arctic resilience, adaptations and transformations (NSF grant)
  – Eco-social interactions influencing human exposure to ticks and the Lyme disease agent in anthropogenic landscapes (NSF grant)

Social Science Program, National Park Service ***Remote***

Research Assistant (funded for two tasks) Dec 2020 – July 2021

– *Supervisor*: Dr. Leslie Richardson, Economist, Social Science Program, National Park Service
– *Tasks:*
  – Task 1: Develop R code to calculate national park visitors' travel distances and times from their home zip codes to national parks of interest (following the nearest roads).
  – Task 2: Develop a model that relates wildlife population sizes to visitor sightings and wildlife viewing values to demonstrate how such values might be expected to change with small changes in a species' population.

Department of Economics, University of Wyoming ***Laramie, WY***

Graduate Research Assistant Aug 2020 – May 2021

– *Supervisor*: Dr. David Finnoff, Professor, Department of Economics, University of Wyoming
– *Project*: Valuing grizzly bear conservation and viewing in the Greater Yellowstone Ecosystem (research enhancement grant, Biodiversity Institute, University of Wyoming)

Graduate Research Assistant Jan 2018 - July 2020

– *Supervisor*: Dr. Rob Godby, Associate Professor, Department of Economics, University of Wyoming
– *Project*: Preferences for wind energy in Wyoming (energy graduate assistantship)

Graduate Research Assistant Aug 2015 - Dec 2017

– *Supervisor*: Dr. David Finnoff, Professor, Department of Economics, University of Wyoming
– *Projects*:
  – Economic feasibility of rare earth extraction from coal ash (Rare Earth Fund, School of Energy Resources, University of Wyoming)
  – Risks of animal and plant infectious diseases through trade (NSF grant)
  – Undergraduate advisor for economics capstone projects

Haub School of Environment & Natural Resources, U. of Wyo. ***Laramie, WY***

Research Aide June - Aug 2017

– *Supervisor*: Dr. Jo Albers
– *Project*: Small scale aquaculture as a livelihood alternative with marine conservation benefits in coastal communities in Chile (EfD grant)
– *Highlights*:
  – Obtained fieldwork experience in Southern Chile (April 2018). Participated in stakeholder interviews (conducted in Spanish). Stakeholders included artisanal fishers, members of fisher organizations, and government employees.

Wyoming EPSCoR Program, University of Wyoming ***Laramie, WY***

Undergraduate Research Fellow June - Aug 2013

– *Supervisor*: Dr. Stephen Herbert, Professor, Department of Plant Sciences, University of Wyoming
– *Project*: Scoring algae for algaecide resistance and first steps toward engineering hydrogen peroxide resistance in the green alga *Chlamydomonas* (Wyoming EPSCoR grant, NSF)

WORK EXPERIENCE (NON-RESEARCH)

Department of Physics & Astronomy, University of Wyoming ***Laramie, WY***

Camp Counselor June 2015

– *Supervisor*: Chip Kobulnicky, Professor, Department of Physics & Astronomy, University of Wyoming
– *Camp*: ExxonMobil Bernard Harris Summer Science Camp

United States Forest Service ***Cody, WY***

Forestry Aid (General), Forestry Tech (General) July - Aug 2011, May - Aug 2012

– *Supervisor:* Nicholas Janota
– *Series/Grade*: GS-0462-2/1
– *Organization*: Rocky Mountain Region, Region 2, Shoshone National Forest
– *Type of Appointment*: Student Temporary Experience Program
– *Role*: Wildland Fire Initial Attack Dispatcher
– *Address*: Cody Interagency Dispatch Center, 2501 Wright Bros Drive, Cody WY 82414

PRESENTATIONS

BIOECON XXII Annual Conference (Jackson, WY) September 2021

– *Presenter:* "The economic value of wildlife tourism and implications of marginal population changes"

UW-CSU Graduate Student Symposium (Laramie, WY) April 2019

– *Presenter:* "Bioeconomic grizzly bear management"

International Institute of Fisheries Economics & Trade Conference (Seattle, WA) July 2018

– *Presenter:* "From the shore or from the water? Enforcement of resource rights under discrete enforcement technologies"

Geological Society of America Annual Meeting (Denver, CO) Sept 2016

– *Presenter:* "Economic feasibility of rare earth element extraction from Wyoming coal ash/char"

GRANTS

University of Wyoming

2020 Research Enhancement Grant, *Biodiversity Institute* Spring 2020

Project: Valuing grizzly bear conservation and viewing in the Greater Yellowstone Ecosystem
Authors: Aaron Enriquez (PI), David Finnoff (faculty advisor)
Amount: $9,023

Student Research & Creative Activities Grant, Spring 2019

Haub School of Environment & Natural Resources

Project: Economic valuation of grizzly bears
Authors: Aaron Enriquez (PI), Stephen Newbold, and David Finnoff
Amount: $1,000

Dick and Lynne Cheney Study-Abroad Grant Fall 2016

Destination: Tenerife, Spain (for a graduate course on international environmental assessment)
Amount: $600

IN-PROGRESS SURVEYS

Project: Nonmarket valuation of grizzly bears in the Greater Yellowstone Ecosystem
Researchers: Aaron Enriquez, Stephen Newbold, and David Finnoff

Goals:
- Use stated preference components (choice experiments) to estimate people's willingness to pay for changes in the following grizzly bear-related attributes: chance of seeing a grizzly bear, risk of being injured by a grizzly bear, number of grizzly bear-human conflicts, and grizzly bear extinction probability
- Use a revealed preference component to estimate people's aggregate demand for recreational trips to the area as a function of trip cost, grizzly bear-related attributes, and other key control variables
- Compare average willingness to pay between locals and non-locals

Completed Work:
- Obtained Institutional Review Board approval
- Pretested the survey by running five focus group sessions and a one-on-one interview
- Secured funding for an expected sample size of 2,500 respondents
- Communicated with and sought feedback from grizzly bear experts in three agencies
- Finalized the experimental design and conducted power analysis and simulations in R
- Programmed and administered the survey in Qualtrics
- Analyzed the data

Project: Preferences for wind energy in Wyoming
Researchers: Aaron Enriquez and Rob Godby

Goals:
- Elicit Wyoming residents' attitudes about competing energy sources, including fossil fuels and renewable energy
- Determine what drives Wyoming residents' preferences for (or against) wind energy
- Use a set of economic experiments in which respondents assign credits to signal how important they find various impacts from potential future wind energy developments. The impacts span the following categories: economic considerations, electricity generation, effects on wildlife, effects on climate and environment, and physical characteristics, location, and viewshed

Completed Work:
- Obtained Institutional Review Board approval
- Pretested the survey by running four focus group sessions
- Secured funding for an expected sample size of 800 respondents
- Programmed and administered the survey in Qualtrics

COURSES TAUGHT *(evaluations available on website)*

Department of Economics, University of Wyoming

Instructor of Record, Principles of Microeconomics (online) — Summer 2019
- *Class size*: 41 students
- *Instructor quality*: 4.35/5 (response rate: 58.5%)

Instructor of Record, Principles of Microeconomics (on-campus) — Fall 2018
- *Class size*: 123 students
- *Instructor quality*: 4.52/5 (response rate: 74.8%, department mean: 3.95/5)

Haub School of Environment & Natural Resources, U. of Wyoming

Instructor of Record, Mini Microeconomics (online) — J-Term 2019
- *Description*: Introductory economics course for non-economics majors interested in environmental and natural resource applications
- *Class size*: 6 students
- *Instructor quality*: 4.67/5 (50% response rate)

Instructor of Record, Mini Microeconomics (online) — J-Term 2018
- *Class size*: 19 students
- *Instructor quality*: 4.09/5 (57.9% response rate)

OTHER TEACHING EXPERIENCE

Department of Economics, University of Wyoming

Online Course Mentor, Principles of Microeconomics — Fall 2019

Guest Lecturer, Math Economics — Fall 2017

Undergraduate Advisor for Capstone Projects, History of Economic Thought — Spring 2017

Guest Lecturer, Natural Resource Economics — Fall 2016

Department of Molecular Biology, University of Wyoming

Teaching Assistant, Medical Microbiology Lab — Spring 2014

TECHNICAL SKILLS

Programming: R
Statistical/Mathematical Software: Mathematica, MATLAB, Stata
GIS: QGIS, ArcGIS Pro
Survey: Qualtrics
Others: LaTeX, Microsoft Office (Word, PowerPoint, and Excel)

RELEVANT TRAINING

Virtual Winter School: Survey Design and Experimental Methods in Applied and Agricultural Economics

Host: Arizona State University, USA
Dates: May 18-22, 2020 (*first online portion*); January 6-10, 2021 (*second online portion*)

Highlights: Selected as the EXECON Winter School Scholar: full tuition scholarship ($1,950) from the Experimental Economics Section of the Agricultural and Applied Economics Association.

Foundations of GIST Course

Host: University of Wyoming, USA
Dates: Fall 2020
Highlights: 3-credit online graduate course that provides "an introduction to geographic information systems and spatial analysis for graduate students, with a focus on the integration of common GIS software (ArcPro) and open source tools (R)"

AWARDS

University of Wyoming

Attilio & Hedy Bedont Outstanding Graduate Student Award, *College of Business*	April 2020 & April 2018
Best Graduate Student Teaching Award, *Department of Economics*	April 2019
Top 20 Outstanding Grad, *College of Arts & Sciences*	May 2015
John S. Bugas Theory Award – Microeconomics, *Department of Economics & Finance*	April 2015
M. Clare Mundell Outstanding Senior Award, *College of Business*	April 2015
Dean's Award to Outstanding Seniors, *College of Business*	April 2015

SCHOLARSHIPS

Experimental Economics Section, Agricultural & Applied Economics Association

EXECON Winter School Scholar — Spring 2020
Amount: $1,950

University of Wyoming

Carlton R. Barkhurst Dissertation Fellowship — Spring 2021
Amount: $9,351

John Tschirhart Graduate Scholarship in Bioeconomics — Spring 2020
Amount: $9,600

Rocky Mountain Power Grad. Scholarship in Regulatory Economics — Fall 2019
Amount: $1,500

Rocky Mountain Power Grad. Scholarship in Regulatory Economics — Spring 2017
Amount: $2,000

Rocky Mountain Power Grad. Scholarship in Regulatory Economics — Fall 2015 - Spring 2016
Amount: $2,000

Trustees' Scholars Award — Fall 2011 - Spring 2015
Amount: Full-ride scholarship covering tuition, fees, and room

and board for 8 semesters of undergraduate study

SERVICE & LEADERSHIP

Journal Reviewer, *Forest Science*	2020
Crisis Counselor, *Crisis Text Line*	Oct 2017 - Aug 2019
34 hours of training, 200 hours of service	
Volunteer U-16 Coed Soccer Coach, *Laramie Soccer Association*	April - May 2015
Captain, *Men's Club Soccer, University of Wyoming*	Fall 2018
Treasurer, *The National Society of Collegiate Scholars, U. of WY*	2014 - 2015
President and Player-Coach, *Men's Club Soccer, U. of WY*	2014 - 2015

MEMBERSHIP

American Economic Association	Sep 2019 - Present
Association of Environmental and Resource Economists	July 2018 - Present
The Honor Society of Phi Beta Kappa	2015 - Present

LANGUAGES

Swiss-German (native), English (fluent), Spanish (intermediate)

REFERENCES

Dr. David Finnoff (Phd committee chair)
Professor, Department of Economics
University of Wyoming
Phone: 307-766-5773
Email: finnoff@uwyo.edu

Dr. Stephen Newbold (PhD committee co-chair)
Assistant Professor, Department of Economics
University of Wyoming
Phone: 307-766-4004
Email: snewbold@uwyo.edu

Dr. Kevin Berry (postdoc supervisor)
Associate Professor, Department of Economics
University of Alaska Anchorage
Phone: 907-786-1753
Email: kberry13@alaska.edu

Dr. Leslie Richardson (research task supervisor)
Economist, Social Science Program
National Park Service
Phone: 970-267-7313
Email: leslie_a_richardson@nps.gov