## PROTOCOL TITLE:

*Consumption and conservation in the commons: Natural resources as a common pool and a public good.*

## PRINCIPAL INVESTIGATOR:

[redacted]

*Department: Department of Economics*

[redacted]

## VERSION NUMBER/DATE:

*Include the version number and date of this protocol.*

## REVISION HISTORY

| Revision # | Version Date | Summary of Changes | Consent Change? |
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## 1.0 Study Summary

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|---|---|
| **Study Title** | Consumption and preservation in the commons: Natural resources as a common pool and a public good. |
| **Study Design** | |
| **Primary Objective** | The purpose of this experiment is to evaluate resource efficiency when a group's use of a resource may be a public good as well as rival in consumption. |
| **Secondary Objective(s)** | Determine theoretical policy to mitigate efficiency loss in this experimental setting. |
| **Research Intervention(s)** | Computerized decision-making experiment. |
| **Study Population** | Florida State University students. |
| **Sample Size** | 100 |
| **Study Duration for individual participants** | 75 minutes |
| **Study Specific Abbreviations/ Definitions** | |

## 2.0 Objectives*

*2.1 This study simulates a natural resource with two properties, a common pool (CPR) and a public good (PG), in order to understand how individuals choose to permanently extract the resource, or how they choose to invest in the PG towards the whole group's benefit.*

*2.2 The main hypotheses of the paper are:*

*(1) In the baseline game, with no externalities, the common pool aspect of the resource will be over-extracted while the public good will go underfunded, based on theoretical predictions.*
*(2) With externalities that spillover from the CPR and PG aspects, the common pool aspect will be further over extracted, however donations to the PG will likewise increase.*
*(3) If a lottery is imposed to distribute licenses to consume from the common pool to reduce overconsumption, both the common pool aspect and the PG aspect will be under-utilized, and there will be an overall increase in efficiency.*

## 3.0 Background*

*3.1 Much of the natural resource literature in economics has viewed the markets that form around natural resources as either common pool resources, where group consumption is rivalrous, or as a public good that is non-rivalrous, however not both simultaneously. In the field, the markets and institutions that form around natural resources are far more nuanced, often having both aspects. This line of research was motivated by a presentation given by Dr. Chelsea Crandall, from the Florida Department of Fish and Wildlife (F&W), at Florida State University. In this presentation she described how the roll of resource agencies, such as the F&W, was to balance the demands of groups that both wish to consume a natural resource (i.e. fishers, hunters, trappers, etc.) and those that wish to conserve the same resources (conservationists, nature spotters, wildlife enthusiasts). This balancing act between consumption and conservation, and the institutions that form around these opposing interactions have yet to be observed in the experimental economics literature.*

*For an illustrative example, consider the history of Yellowstone National Park. The wildlife of Yellowstone has historically been hunted for sport and subsistence, while conservation of the park has been used to benefit the public. While the wildlife of the park is primarily a common pool resource that is rivalrous in consumption, the ecosystem of the park as a whole is a public good where all may receive the benefits of conservation efforts. With respect to externalities, overhunting of wolves and coyotes in Yellowstone in the early 20$^{th}$ century lead to widespread degradation of the national*

*park. The reintroduction of wolves to Yellowstone, on the other hand, served to not only benefit conservation, but the hunters as well. This historical anecdote illustrates how a natural resource may have both common pool and public good aspects, as well as how the over-use of either of these aspects may positively or negatively benefit the other. The dynamics of such an environment has yet to be explored in the economics literature.*

*3.2 This experiment is still in the design stages, and no sessions have been run to collect preliminary data at this time.*

*3.3 Ostrom, Gardner, and Walker (1992) motivates the common pool research of my experimental design. In this article, the authors construct a common pool resource game in which resource stakeholders face an environment where they may overconsume and reduce the value of a resource, but may also construct covenants, or group dynamics to mitigate resource decay. I employ an identical common pool resource account in my experimental design.*

*Isaac, Norton, and Pevnitskaya (2019) motivates the public good and resource externalities of my experimental design. In this article the authors introduce a public good that is non-rivalrous to all stakeholders, however to some stakeholders the public good is a "public-bad" that reduces their welfare when produced. In my experimental design, I employ a similar linear public good and introduce an externality that reduces the value of the public good when the common pool is over extracted from. If there is sufficient over-extraction of the common pool, such an externality can induce the public good aspect to become a similar "public bad.".*

*The policy design of instituting a lottery for common pool consumption licenses is motivated by two sources. First and foremost is the Florida F&W license policy used primarily for susceptible game populations, such as alligator, dove, or antlerless deer hunts. For such game that have sensitive populations to overhunting, the state distributes hunting licenses by a lottery to prevent too many resource stakeholders from hunting. From the economics literature, this policy treatment is most closely related to the work of Kidwai and de Oliveira (2019). In this paper, the authors construct a common pool resource game in which the size of groups extracting from the same common pool is randomly determined. Their findings strongly suggest group-size uncertainty, or randomly adjusting the number of resource stakeholders, significantly improves resource consumption (disincentivizes over-consumption) and leads to an overall improvement in resource productivity.*

## 4.0 Study Endpoints*

*4.1 The primary study endpoint is at the completion of the data collection process. To the extent that subsequent treatments or sessions are required (for example, based on requests of journal editors), the protocol will be revised to reflect the need to collect additional data.*

## 5.0 Study Intervention

*5.1 Participants will make decisions on a lab computer in a strategic decision-making setting. The interventions, or treatments, vary by the conditions or information available to the subjects at the time they make their decisions.*

## 6.0 Procedures Involved*

*6.1 Describe and explain the study design.*

*6.2 Description of procedures is provided above.*

*6.3 There is no direct interaction between subjects throughout the experiment and all decisions are fully private, therefore there is no way participants may identify who is in their group, or what their decisions are.*

*6.4 Data collected will only include the decisions made by the subjects in the experimental game.*

*6.5 N/A*

## 7.0 Data and Specimen Banking*

*7.1 All data will be de-identified immediately after the session ends and all subjects have been paid. The de-identified data on decisions from the experiment will be stored securely on the XS/FS server and on Thomas Frye's desktop computer.*

## 8.0 Sharing of Results with Subjects*

*8.1 No results will be shared with any subjects.*

## 9.0 Study Timelines*

*9.1 The following timeline summarizes the schedule and anticipated progress for this project. In each experimental session, subject participation will last for up to 75 minutes. After the session is completed, there is no subsequent interaction with the subject. I anticipate the sessions will be completed between the Spring and Fall semesters of 2022.*

*See the timetable provide below:*

| Date | Activity |
|---|---|
| March-May 2022 | 1st round of data collection |
| August-November 2022 | 2nd round of data collection |
| December, 2022 | Prepare Draft |
| January - February, 2023 | Revise Draft |
| February - May, 2023 | Prepare for initial submission |

## 10.0 Subject Population*

*10.1 Florida State University students over the age of 18.*

*10.2 Outside of the requirement that participants be students at FSU, no subject populations will be specifically targeted or excluded from participating.*

*10.3 All are excluded (adults unable to consent, individuals who are not yet adults, pregnant women, prisoners).*

## 11.0 Vulnerable Populations*

*This research will not include any vulnerable populations. There are also no known risks to participation in the computerized experiments.*

## 12.0 Local Number of Subjects

*12.1 100 (5 sessions each with 20 subjects).*

## 13.0 Recruitment Methods

*13.1 Subjects will be drawn from an FSU student volunteer database operated by the Experimental Social Science Research Cluster (XS/FS). A computer routine (part of the recruitment software, ORSEE) uses a random process to send out e-mail announcements, and sign-ups occur as voluntary responses to those announcements. The e-mail announcements are sent approximately 48 hours before the experimental session is scheduled.*

*13.2 Subjects are all students at FSU who have volunteered to join the database.*

*13.3 Subjects are only required to be FSU students in order to join the database. There are no methods used to specifically identify potential subjects.*

*13.4 There are no specific materials used to recruit subjects other than the email that invites them to sign up to participate in an experiment. Students are introduced to the possibility of signing up for the volunteer database when information is provided to large undergraduate courses in various disciplines. These are not courses*

*taught by the research staff and faculty who use the XS/FS laboratory.*

*13.5 Following the standard XS/FS Laboratory guidelines, subjects receive a payment just for showing up ($5 for sessions lasting 45min or less, $7 for sessions that last between 45min and 90min, and $10 for sessions that last between 90min and 2 hours). In addition, subjects who participate in the experiment after showing up have the opportunity to make additional earnings through their decisions (average earnings are typically between $15 and $20 for a 45-90min experiment, including the show-up fee). To ensure that we get enough participants for each session, we recruit more than are needed. As a result, at the beginning of each session, some participants are randomly selected and "bumped" from the session. They receive the show-up fee and leave the lab before the experiment begins. Those who participate in the actual session are paid the show-up fee and any additional earnings at the end of the session.*

## 14.0 Withdrawal of Subjects*

*14.1 Investigator discretion (for example, if a subject is behaving in a disruptive manner, they may be asked to leave the session and will be paid their show-up fee).*

*14.2 If a subject chooses to withdraw during the session, they may still receive the show-up fee. In some circumstances, their withdrawal may prevent continued collection of data as decisions are made interactively within groups of fixed size. In these cases, every attempt will be made to complete the session, but otherwise the session will be ended at the most natural stopping point and subjects will be paid their accrued earnings.*

## 15.0 Risks to Subjects*

*15.1 There are no physical, psychological, social, or legal risks beyond the most minimal risks associated with everyday activity. In terms of economic or financial risks, subjects are guaranteed to earn at least the minimum show-up fee for participating. Thus, there are no reasonably foreseeable risks related to the subjects' participation in the experiment.*

*15.2 N/A*

*15.3 N/A*

*15.4 N/A*

## 16.0 Potential Benefits to Subjects*

*16.1 There are no direct benefits to subjects from participating.*

## 17.0 Data Management* and Confidentiality

*17.1 The analysis plan will include both non-parametric methods for comparing the observed behavior across treatments at an aggregated level. To facilitate this estimation, I will seek a large number of observations.*

*17.2 Data will be de-identified immediately after the session is completed and stored electronically. Access to the de-identified data will be restricted to the research staff listed on the protocol form. However, it is standard for journals in economics to require authors to upload (de-identified) raw data to facilitate replication or cross checking.*

*17.3 N/A*

*17.4 No identifying information will be included in the data. De-identified data will be stored electronically on the secure XS/FS server and the PI's secure hard drive. There is no anticipated expiration of the data storage period. The PI will have access to the de-identified data. As noted above, the de-identified raw data may be made available for purposes of replication once the research is published.*

## 18.0 Provisions to Monitor the Data to Ensure the Safety of Subjects*

*This section is required when research involves more than Minimal Risk to subjects.*

*18.1 N/A*

## 19.0 Provisions to Protect the Privacy Interests of Subjects

*19.1 N/A*

## 20.0 Compensation for Research-Related Injury

*20.1 N/A*

## 21.0 Economic Burden to Subjects

*21.1 N/A*

## 22.0 Consent Process

*22.1 I believe this research will be determined to be EXEMPT as it falls under category 45 CFR 46.101(b)(2). Thus, rather than a consent form, we will provide subjects with an Information Sheet.*

## 23.0 Process to Document Consent in Writing

*23.1 N/A (see 22.0).*

*23.2 N/A*

*23.3 N/A*

## 24.0 Setting

*24.1 All in person interactions will take place in the XS/FS computer laboratory. The XS/FS lab protocols for in person computer lab experiments involve repeating to subjects the FSU policy on recommended actions during the COVID 19 pandemic. This includes reminding subjects that masks and vaccinations are strongly recommended, and that subjects that are experiencing any symptoms or been in contact with anyone showing symptoms should not participate. Additionally, the XS/FS computer lab contains 26 computer monitors. To facilitate proper distancing throughout the experiment, we will run at half capacity, with only 12 subjects per session being placed in every other computer station. Furthermore, subjects are welcomed and seated into the computer laboratory one at a time, to minimize contact and maintain proper distancing.*

## 25.0 Resources Available

*25.1 The XS/FS Cluster maintains a database with approximately 2000 volunteer subjects from which the subjects for this study will be recruited. The XS/FS virtual lab is the primary resource that facilitates the research.*