UNIVERSITY OF WISCONSIN–RIVER FALLS FACULTY AND STAFF HOMEOWNER PERCEPTIONS OF ENERGY AND WATER CONSERVING MEASURES

by

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Abstract

The purpose of this study is to gather perceptions for University of Wisconsin-River Falls (UWRF) faculty and staff who are homeowners on their decisions to conserve energy and water. Sustainability is a high priority in UWRF's strategic plan. It is important to understand how a campus culture that supports sustainability can impact its workers perceptions of sustainability and their implementation of sustainable practices in their home. Energy and water are areas of focus for this study. Energy is important due to its impact on personal finances as costs rise, and accounts for a large percentage of an individual's ecologic footprint. Meanwhile, fresh water is a focus because it is a critical limited resource that is under increasing strain from population and consumption growth. Both are areas of focus for the City of River Falls in its municipal efforts toward conservation.

For this study, an online survey was administered to UWRF faculty and staff which generated 113 responses. Questions for the survey were adapted from content and cues from multiple peer reviewed research studies and other resources referenced in this paper, census data, content found on governmental web sites like the Environmental Protection Agency, Energy Information Administration and Energy Star. Final survey questions were chosen which would serve as indicators for whether UWRF Faculty and Staff follow the below eight concepts derived from the decision sciences when they make decisions to conserve energy and water.

Based on the eight decision science concepts, the results for this study indicate: 1) Information overload – responses do not strongly support or counter the concept that information overload is a major factor in participants' decision to conserve energy and water; 2) Aversion to loss v.s. attraction to gain – responses to some questions supported this concept, and responses to other questions countered this concept that individuals are more averse to loss than they are attracted to gain when making decisions to conserve energy and water; 3) Delayed v.s. immediate benefits and threats –

responses supported this concept that participant decisions to conserve energy and water were swayed more by immediate benefits and threats more than by delayed benefits and threats; 4) Finite pool of worry – responses to some questions supported and other questions countered the concept that participants stopped worrying about threats in the future due to more immediate threats; 5) Single action bias – responses countered this concept and showed that although participants believed they and others performed few actions to conserve energy and water, most participants had in fact performed numerous actions; 6) Confirmation bias – some responses supported and some responses countered the concept that participant actions to conserve energy and water follow their biases regarding energy and water conservation; 7) Uncertainty – responses were inconclusive whether participant actions supported or countered the concept that uncertainty is a major factor in their decisions to conserve energy and water; 8) Collective measures and norming – responses supported the concept that individuals were more likely to conserve energy and water if it was seen as collective action, meanwhile social norming was not seen as a motivator for participants.

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INTRODUCTION

The purpose of this study is to gather perceptions for UWRF faculty and staff who are homeowners on their decisions to conserve energy and water. Sustainability is a high priority in UWRF's strategic plan. It is important to understand how a campus culture that supports sustainability can impact its workers perceptions of sustainability and their implementation of sustainable practices in their home. Energy and water are areas of focus for this study. Energy is important due to its impact on personal finances as costs rise, and accounts for a large percentage of an individual's ecologic footprint. Meanwhile, fresh water is a focus because it is a critical limited resource that is under increasing strain from population and consumption growth. Both are areas of focus for the City of River Falls in its municipal efforts toward conservation.

BACKGROUND

What is Sustainability?

Sustainability is most commonly referred to as meeting "the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 43). This definition of sustainability has been around since the 1980s but is taking on greater significance as human population and resource use are increasing at a rate that is putting a strain on natural systems and resources.

Cornerstones of Sustainability

The following three concepts form the three "cornerstones" of sustainable living. When implemented effectively, they form a balance between economy, ecology and society which stimulates - rather than degrades - economies, social systems and the natural world.

1. Economic Vitality: Activities that create personal and societal economic wellbeing that can be sustained long-term.

2. Ecologic Integrity: Activities that minimize negative environmental impacts, and seek to restore rather than degrade environmental systems that support human, animal and plant life.

3. Social Rights, Responsibilities and Equity: Activities that are sensitive to and have a positive impact on others, their health, their way of life, their culture, their economies, their ecologic systems, and their political processes.

Figure 1 Cornerstones of Sustainability

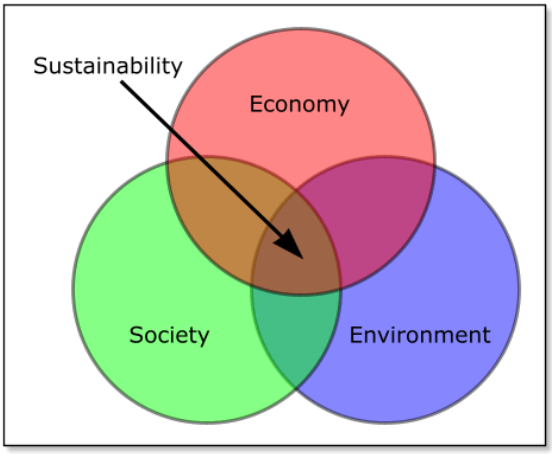

Figure 1. Economy, society and the environment form what are considered the three cornerstones of sustainability.

The Big-Picture Problem

Illustrated in Figure 2 below, as per capita standards of living continue to rise in developing countries, human demand for natural resources is quickly outpacing the natural world's capacity to regenerate and sustain those demands. Political, financial, agricultural, industrial, trade and consumer systems are structured to encourage consumption and waste ("cradle to grave") rather than conservation ("cradle to cradle"). The end results are seen in the form of higher prices for goods and services, increasing levels of pollution in air and fresh water, human health issues, rapid change in climate systems, and strain on natural systems that sustain wildlife species and human life. Some international and national measures are being taken to address these concerns, with varying degrees of success.

Figure 2 The Funnel Concept

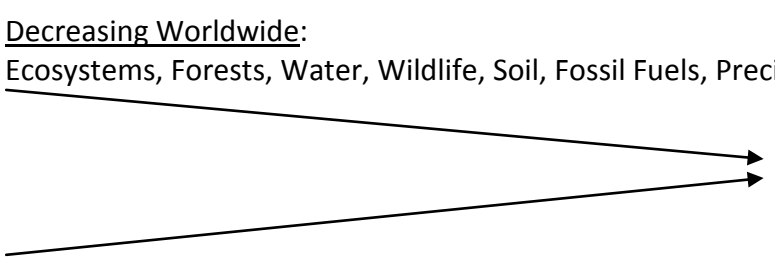

Figure 2. The funnel concept states that natural resources are in decline while the demand for those resources is increasing due to growth in population and consumption. Adapted from "Figure 1.1: The Funnel of Converging Trends" by S. James and T. Lahti, 2004, *The Natural Step for Communities,* p. 6. Copyright 2004 by New Society Publishers.

What Can Be Done?

Every human activity has an impact on the natural world, and on the ability of future generations to provide for themselves. When individuals have access to useful information on how their daily activities can negatively impact the natural world, and when presented with viable options for alleviating that impact, they are empowered to make meaningful lifestyle changes. They can respond by being stewards and choosing to preserve and enhance our Earth's natural resources, which in turn will sustain and be appreciated by themselves and future generations. By making such choices, individuals improve their own quality of life by improving their financial bottom-line, by protecting human health and social systems, and preserving the natural resources they enjoy.

Focusing On the Homeowner

Sustainable change is a "bottom-up" process that requires the engagement of multiple players at all levels of citizenry, business and government. Meanwhile the values, habits and buying activities of homeowners and consumers affect all sectors of local, state, national and world economies by

driving the harvest of raw materials, manufacture of goods, distribution of goods and services, and provision of education and public services.

For this study, homeowners were targeted for a number of reasons, which include:

- Homeowners are the lowest common denominator stakeholders in a community who have a full range of options for directly implementing and affecting sustainable change through home upgrades and behavior changes (in contrast, renters are limited in their ability to implement household upgrades).
- A high percentage of faculty and staff at the University of Wisconsin-River Falls (UWRF) are homeowners in River Falls and the surrounding area.
- River Falls electrical, water and wastewater services are managed by a municipally-owned utilities – River Falls Municipal Utilities (RFMU). RFMU will be provided with results from this study, which may assist them in targeting their programming and marketing efforts toward their homeowner customers. RFMU targets homeowners for its electrical and water conservation programming, and hosts an engaged energy and water conservation subcommittee represented by all sectors of the community. RFMU employs a Conservation Coordinator who advocates for community energy and water conservation, and the Utility has earned national recognition for customer participation in its Renewable Energy Block Program. In its efforts toward conservation, the City of River Falls has been recognized with the designation as an EPA Green Community. RFMU will be provided with results from this study, which may assist them in targeting their programming and marketing efforts toward their homeowner customers.

Focusing on Homeowner Energy Use

As shown in Figure 3, for the average American, home energy use is their most resource intensive activity. According to the U.S. Energy Information Administration, emissions (sulfur, nitrogen, heavy metals, carbon dioxide/monoxide, and particulate matter) from the burning of fossil fuels are harmful to the health of plants, animals and humans, cause acid rain, and produce greenhouse gasses which are major contributors to climate change (United States Energy Information Administration).

Figure 4 illustrates nine key areas where homeowners consume energy. Space heating and cooling, and water heating, account for 72% of the typical home's energy use. In Wisconsin's climate zone, space heating would comprise a larger portion of this pie chart and space cooling would be smaller.

Figure 3 Homeowner Energy Use

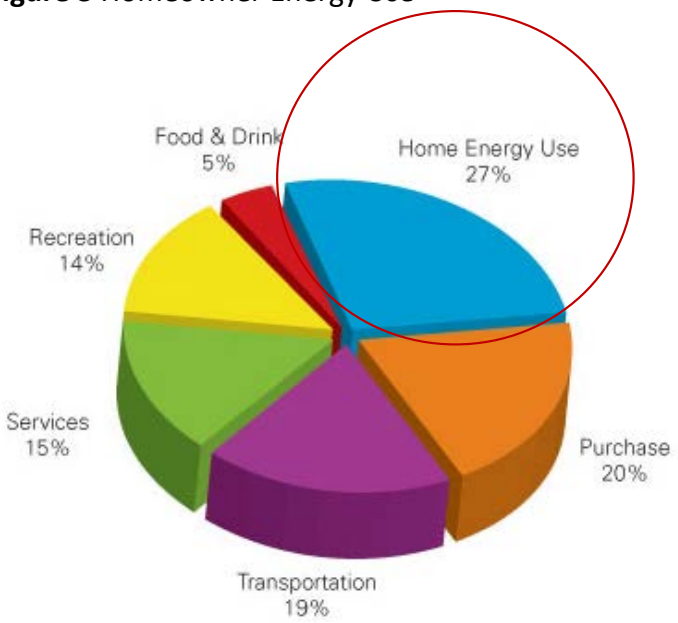

Figure 3. Home energy consumes the largest portion of energy use among all homeowner activities. Adapted from Energy Star http://www.energystar.gov/index.cfm?c=windows_doors.pr_benefits

Figure 4 How We Use Energy in Our Homes

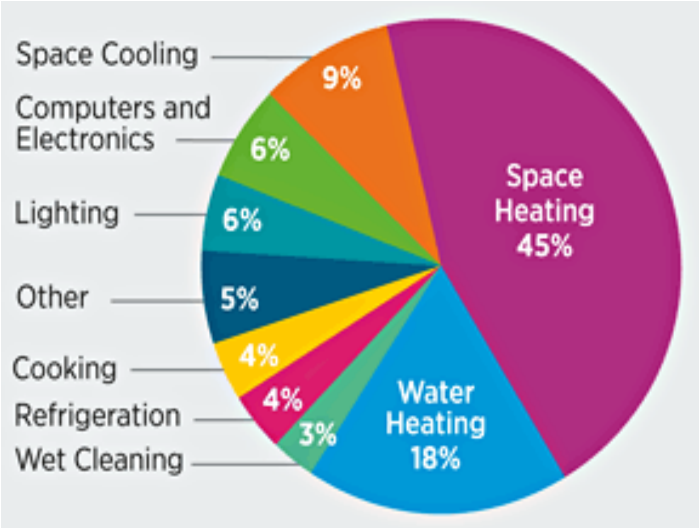

Figure 4. Categories for energy use in the typical U.S. home. "Residential Primary Energy Consumption, by Year and Fuel Type," by D&R International, Ltd., 2011, *2010 Buildings Energy Data Book*, p. 2-1. Released March 2011 by the U.S. Department of Energy.

Focusing on Homeowner Water Use

Residents living in Wisconsin and Minnesota are privileged to have access to an abundance of freshwater lakes and streams, and to be adjacent to three of the four largest freshwater lakes in the world (Lakes Superior, Huron and Michigan). This fresh water abundance can skew residents' perception of the broader reality - that fresh water is in short supply in numerous parts of the US and world where fresh water shortages are causing severe strain. According to US EPA, "Managing the supply and availability of water is one of the most critical natural resource issues facing the United States and the world" (US EPA WaterSense). It is anticipated that within a few decades more than half of the world's people will live with severe water scarcity, which will inevitably draw political attention to water-rich regions of the world like the Great Lakes. The Great Lakes has already been subject to numerous unsuccessful fresh water diversion plans to other states and regions.

Locally the city of River Falls had experienced a severe water shortage of its own during the summer of 2007, prompting its City Council to implement an ordinance for odd/even lawn watering days, which is still in effect today.

According to the US EPA WaterSense, "homes use more than half of publicly supplied water in the United States, which is significantly more than is used by either business or industry" (US Environmental Protection Agency WaterSense).

The Residential End Uses of Water report provided by the American Water Works Association documented nine key areas where water is used in the home, and the percentage of home water use each comprise: the toilet 28%, clothes washer 24%, shower 18% and faucet 16% account for 86% of homeowner water use (AWWA, 1999).

Energy and Water Use – A Broader Picture

Energy and water use involves much more than the energy we consume and the water we drink and use directly. For example, a broader picture of the energy and water we use includes the goods and services we consume, like the energy and water used to run factories and produce goods, and the energy and water used to raise animals and grow crops. From this perspective, we can begin to see that our total energy and water needs and impact amount to much more than the water we use directly. Measuring the total environmental footprint of the study population is beyond the scope of this study.

LITERATURE REVIEW

There are three primary approaches to measuring the buying trends of individuals who make ethical choices while purchasing or making ethical lifestyle choices. 1) The most popular approach, which happens to be the most relevant to the business sector, focuses on consumer behavior at the moment of purchase and determining the factors that drive their final decision toward or away from ethical purchases. 2) The second approach is from a psychological perspective and focuses on individuals' choice to make ethical purchases or behavior changes in reaction to perceived threats – the level of uncertainty regarding perceived threats is seen as the primary determinant in an individual's decision making process. 3) The third approach is the approach used in this study and is rooted in the Decision Sciences – an area of study which uses concepts from a combination of psychology and economics to deduce the mental processes that shape choices, behaviors and attitudes. This approach attempts to make sense of why individuals often behave unexpectedly while making simple choices.

Two articles rooted in the Decision Sciences were the inspiration for this study, a Newsweek article titled "Brain Freeze" and a New York Times article titled "Why the Brain Isn't Green." Findings highlighted in those two articles form the basis for this study. Peer reviewed research which supports those two articles' findings are referenced below.

"Brain Freeze" elaborates on an area of research in the decision sciences that explores how information overload causes individuals to be mentally paralyzed and incapable of making good decisions or taking positive action. The article, in large part, is based on findings from experts in the decision sciences.

Concept 1: Information Overload and Decision Making: In summary, "Brain Freeze" concludes that when faced with too much information or too many options, individuals either make poor

decisions that they regret, or they decide to take no action at all. This article raises the question of whether UWRF faculty and staff, and River Falls community members, are having similar difficulties with decisions to conserve energy and water due to information overload (Begley, 2011).

The second article titled "Why Isn't the Brain Green?" uses insights from the decision sciences to specifically examine environmental decision making. The article reports on research from the Center for Research on Environmental Decisions (CRED) at Columbia University, funded by the National Science Foundation. The Center's primary objective is to study "how perceptions of risk and uncertainty shape our responses to climate change and other weather phenomena" (Gertner, 2009).

This article distills a number of key CRED research findings, explained below, and further explained in CRED's published guide "The Psychology of Climate Change Communication: A guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public."

Concept 2: Aversion to Loss Versus Attraction to Gains: According to CRED, individuals are more averse to losses than they are interested in gains. Therefore, individuals who are affected by environmental pressures (like extreme heat or drought) are more likely to be motivated to take energy and water conserving measures to alleviate loss rather than to reap potential benefits (i.e. cost savings). Individuals who have experienced a "Pearl Harbor Moment" have experienced an extreme loss event that noticeably affects their wellbeing and can spark individuals and groups to action (Gertner, 2009). The trend of being more averse to losses than attracted to gains is seen across financial, environmental and health benefits and threats (Hardisty and Weber, 2009).

Concept 3: Delayed Versus Immediate Benefits and Threats: Individuals undervalue delayed benefits regardless of the scope of the impact of their actions i.e. ("saving the planet") and are more likely to take measures that have immediate benefits. In the same way, individuals will put less stock

in threats perceived to be far into the future, like the long-term effects of climate change, and pay more attention to immediate threats, like soaring prices of gas and goods (Gertner, 2009). While making decisions, individuals are more concerned about short to medium term gains versus losses rather than the domain (environmental, financial, health) for those gains and losses (Hardisty and Weber, 2009).

Concept 4: Finite Pool of Worry: Individuals have a "finite pool of worry" and are unable to sustain their sense of urgency and action on a topic like climate change that has consequences relatively indirect and far in the future, while more immediate concerns i.e. (soaring healthcare costs, loss of job) take precedence. As a result, actions are taken which have immediacy, are governed by emotion, and have short-term benefits (Gertner, 2009). As described by CRED in their guide, Individuals can only worry about a certain number of things at one time, which occupies their thoughts and lessens their level of concern over future worries. Also, individuals become desensitized to repeated messages of extreme threats (Center for Research on Environmental Decisions, 2009).

Concept 5: Single Action Bias: When exhibiting this bias, individuals tend to take a single or small number of minor action steps to alleviate a future threat, which in turn decreases their level of worry regarding that threat and subsequently decreases the individual's motivation to take additional action (Gertner, 2009). Individuals and institutions may feel that by recycling or changing light bulbs, they are already doing enough (Center for Research on Environmental Decisions, 2009).

Concept 6: Confirmation Bias: Individuals focus on reading and absorbing information that supports their mental model of how the world works, and resist information that requires them to change their mental model or behaviors (Center for Research on Environmental Decisions, 2009).

Concept 7: Uncertainty's Role: Uncertainty plays a major role in decision making, as uncertainty over the future benefits of taking action to conserve, and how far into future a threat is

perceived to be, may cause inaction (Gertner, 2009). Additionally, when there is uncertainty that a resource is depleting, then individuals will not change behavior toward conserving (Joireman, Posey, Truelove and Parks, 2009)

Concept 8: Collective Measures and Norming: Participation increases when people collectively collaborate on a goal, and dramatically increases the likelihood of self sacrifice. Additionally, individuals working in a group are much more likely to take actions that have delayed benefits (Gertner, 2009). Specifically, social norming is extremely effective in eliciting collective conservation-related behavior (Griskevicius, Cialdini and Goldstein, 2008).

METHODS / IMPLEMENTATION

Survey Participants

Upon formal request through the UWRF Institutional Review Board (IRB) process, a complete list of 902 UWRF faculty and staff were provided by the UWRF Institutional Research Office as potential survey takers for this study, comprising all UWRF faculty and staff. A narrowed list of 841 faculty and staff were invited via email at their work email address to participate in this survey online. Criteria used to narrow the list was home address – if a faculty's or staff's address was not a home address, but was an apartment or post office box address, then that individual was removed from the invitation list.

Of the 841 invited faculty and staff, 113 completed the survey in full and indicated that they were homeowners, and 13 said that they did not own the home where they reside, so they did not complete the survey. Therefore, 13.6% of UWRF faculty and staff completed the survey, which is a relatively low response rate. This sample size results in a confidence interval of approximately 8.5%, which suggests that although the data is beneficial, it may not be representative of the UWRF faculty and staff population. For the whole sample group of 841 faculty and staff invited to take the survey, 41% live in the City of River Falls. Meanwhile, for the 113 who completed the survey, 34.5% live in the City of River Falls - this was a similar percentage of River Falls residents as the sample group.

Procedures

Survey Development For Community Program: The questions for the survey used in this study were originally developed to be included as part of the application process for participants chosen to compete in a year-long community-wide River Falls energy and water conservation contest called "The Biggest User" to see which of fifteen households could conserve the most energy and water

over that year. That contest was to be co-administered by me (Matt Fitzgerald) and Daniel Shaw, an associate. The contest included home assessment, community education, contestant write-ups, and home upgrade/behavior change components. Survey questions were adapted to compliment the contest by gathering baseline perceptions, motivators and barriers to contestants' conservation of energy and water. River Falls Municipal Utilities staff reviewed and provided feedback on the survey questions, and three families pilot tested the survey and provided feedback. The survey and informed consent form were submitted to and approved by the UWRF Institutional Review Board (IRB). A Mayoral write-up on the contest was released on the front page of the River Falls Community Newsletter in October, 2011, and the contest received a favorable recommendation after review by a Utility Commission subcommittee. Unfortunately, in November funding for the contest was voted-down by the River Falls Utility Commission on a vote of 4-3.

Survey Questions: Survey questions were developed in a hybrid fashion, adapted from content and cues from multiple research studies and resources referenced in this paper, census data, content found on governmental web sites like the Environmental Protection Agency, Energy Information Administration and Energy Star. Also, survey beta testers at the River Falls Municipal Utilities and pre-test homeowners provided feedback on survey questions, which caused those questions to be modified.

Survey Retooling for Administering to UWRF Faculty/Staff: Although the community-wide Biggest User contest was not funded, the survey questions were still relevant to UWRF faculty and staff, and to RFMU. The survey was retooled to be administered to UWRF faculty and staff. As mentioned, the original survey questions had been adapted from multiple sources – those original questions were modified very little for use in the final study. The process for administering the survey

was overhauled completely. The survey was redeveloped to be taken online, and the final survey questions are included in Appendix B.

Survey Introduction and Consent Form: The online survey for this study was introduced with a title and filtering question, asking individuals if they were homeowners. Included at the beginning of the survey was an informed consent form requiring the survey taker to agree to its terms before starting the survey.

Survey IRB Approval: The redeveloped survey and consent form were submitted to the IRB and received approval for administering to human participants, and was assigned final IRB Protocol #H2012-W049. Included with that paperwork submission for IRB approval was a description of the formal process for obtaining a list of faculty and staff participants, described in the "Survey Participants" section above.

Survey Mass Email Invitation: A mass email was submitted to 841 UWRF faculty and staff to their work email address inviting homeowners to participate in the online survey, with a description of the survey and direct link to the survey from within the email. Included in the email was reference to the survey being IRB approved. Also in that email was a material inducement – mention of a drawing that would be held for survey takers which would award six participants $25.00 Falcon Dollars deposited to their university ID to be used anywhere on-campus. This email is viewable as Appendix A in this study.

Taking the Survey: An email invitation was sent on Monday, April 23, 2012 to potential participants, and survey takers were asked to complete the survey within four days – by Friday of that same week. When a survey taker clicked on the link in that email, they were brought to the survey introduction page – a page asking a simple filtering question "Do you own the home that you live in?" For participants who answered "No", they were directed to a page that explained they must own the

home where they reside to complete the survey, and they were provided with the option of giving a brief comment and/or receiving a copy of the study's final research paper.

For participants who indicated "Yes" that they owned the home where they reside, they were brought to the Informed Consent Form page, which required their agreement to terms of taking the survey. After agreeing to the terms of the Consent Form, they were brought to the survey questions.

Once survey participants completed their survey, they were brought to a final survey page asking first for their email address, if they were interested in entering a survey drawing for a chance to win one of six awarded $25.00 falcon dollars. Next, they were asked if they wished to receive a copy of the final paper for this study once that paper was complete.

Participant Drawing, Announcing Winners: On the Saturday during the week the survey was administered, an informal drawing was held for the 90 survey participants who had completed the survey. Identical sized sheets of paper containing the email addresses of the 90 participants were folded once and added to a box, stirred, then randomly drawn. Six winners had $25.00 Falcon Dollars added to their University ID card using the online UWRF Falcon Dollar purchase tool for making purchases on-campus. All entrants were emailed with the winning names.

Requests For Copy of Research Paper: Upon completion and final review of this research paper, all participants who requested to receive a copy of this study will receive access to a copy of this paper. Sixty participants indicated they wished to receive a copy of the final paper.

Data Analysis: For data analysis, frequencies and degrees were primarily used in a Likert-like manner during table design while developing survey questions, in an effort to streamline data analysis upon conclusion of survey administration. Use of means analysis was kept to a minimum.

RESULTS

Below are participant responses to each of the nineteen questions posed in the online survey. Each question contains a table with aggregated responses and a description of results.

First survey question: this question asked when participants' homes were built. As shown in Table 1, 45% of participants responded that they currently reside in homes built before 1976, while 26% said that they live in homes built after 1995.

Table 1
Year Subject's Home Was Built

Answer	Response	%
Before 1950	29	26%
1951 – 1975	21	18%
1976 – 1994	34	30%
1995 – 2012	29	26%
Total	113	100%

Second survey question: this question asked for the square footage of participant homes. As shown in Table 2 below, 43% of survey participants reside in a home between 2,000 and 3,000 square feet, while 7% of participants live in homes larger than 3,000 square feet.

Table 2
Square Footage of Subject's Home

Answer	Response	%
Less than 1,000	2	2%
1,000 - 2,000	54	48%
2,000 - 3,000	49	43%
3,000 - 4,000	6	5%
4,000 +	2	2%
Total	113	100%

Third survey question: this question asked if participants lived within the City of River Falls. According to participant responses shown in Table 3 below, 35% of participants live within the city of River Falls, WI.

Table 3

Subject Residency Within the City of River Falls, WI

Answer	Response	%
Yes	39	35%
No	74	65%
Total	113	100%

Fourth survey question: this question asked for participants to choose a phrase that best described the level of lifestyle changes they had already made to conserve energy and water. According to participant responses shown in Table 4, focusing on results for scale, 52% of participants said they had made one or a small number of lifestyle changes to conserve energy and water, while 57% said they had made numerous changes – these percentages are closely matched, therefore they do not indicate a preference toward making either a small or large number of lifestyle changes to conserve energy and water.

Meanwhile, focusing on degree, 67% of participants perceived they had performed minor lifestyle changes while 42% perceived they had made major lifestyle changes – these percentages were different enough to indicate that the changes which participants perceived as minor changes to lifestyle were somewhat preferable to major changes.

Table 4
Lifestyle Changes That Conserve Energy and Water

Answer	Response	%
No energy or water conserving lifestyle changes have been made at this time	4	4%
Made one or a small number of MINOR changes to our household's lifestyle	22	19%
Made numerous MINOR changes to our household's lifestyle	45	40%
Made one or a small number of MAJOR changes to our household's lifestyle	30	27%
Made numerous MAJOR changes to our household's lifestyle	12	11%
Total	113	100%

Fifth survey question: this question asked for participants to choose a phrase that best described the home upgrades to their home that they had already made to conserve energy and water. According to participant responses shown in Table 5, focusing on results for scale, 60% of participants said they had made one or a small number of home upgrades to conserve energy and water, while 33% said they had made numerous upgrades – these percentages had enough difference to indicate that participants preferred performing one or a small number of home upgrades over performing numerous home upgrades.

Meanwhile, focusing on degree, 50% of participants said they had performed minor home upgrades while 43% said they had made major home upgrades – these percentages may not be different enough to indicate that there is a strong preference between minor and major home upgrades.

Table 5
Home Upgrades That Conserve Energy and Water

Answer	Response	%
No energy or water conserving home upgrades have been made at this time	7	6%
Made one or a small number of MINOR upgrades to our house	34	30%
Made numerous MINOR upgrades to our house	23	20%
Made one or a small number of MAJOR upgrades to our house	34	30%
Made numerous MAJOR upgrades to our house	15	13%
Total	113	100%

Sixth survey question: this question asked participants to rate their household's level of knowledge regarding conserving energy. Table 6 shows that 63% of participants perceived their household's level of knowledge regarding conserving energy is intermediate. Meanwhile, a 19% of participants said that their knowledge was at a beginner level while 18% indicated that they had advanced knowledge.

Table 6
Subject's Household Level of Knowledge On the Topic of Energy

Answer	Response	%
Beginner	22	19%
Intermediate	71	63%
Advanced	20	18%
Total	113	100%

Seventh survey question: this question asked participants to rate the impact they perceived certain home energy upgrades would have on their energy savings. Based on responses shown in Table 7, the aggregate data shows a pattern that as a whole, the group of participants thought the order from highest to lowest impact for energy upgrades would be in the following order: heating system, water heater, air conditioner, appliances, lighting, and electronics. This order perfectly matches the Department of Energy pie chart shown in Figure 4 of this study regarding where the typical household uses the most energy, from highest to lowest.

Table 7
Subject's Perceived Impact of Making Home Energy Upgrades

Question	High Impact	Minimal Impact	Low Impact	Do Not Own	Responses
Heating System	45	14	2	0	61
Air conditioner	39	11	9	13	72
Water heater	42	16	11	1	70
Lighting	25	34	16	0	75
Appliances (kitchen or laundry)	35	25	11	1	72
Electronics (computer, entertainment system, etc…)	13	37	33	3	86
Other energy consuming Item	7	10	12	12	41

Table 8 below shows results from a fill-in field for additional energy-related items participants had included which they may be considering. A broad range of consumer items are listed.

Table 8
Other Energy Consuming Items Provided by Participants

Other energy consuming items
Electric fence charger
Hybrid car & just one car
New windows
Pool pump/heater
Solar hot water heater
TV
Water Softener
Windows
Wood burning fireplace (change to insert)

Eighth survey question: this question asked participants to rate their household's level of knowledge regarding conserving water. Table 9 shows that 57% of participants perceived their household's level of knowledge about water conservation to be intermediate. Meanwhile, 21% perceived they had beginner knowledge, while 22% indicated that they had advanced knowledge.

Table 9
Subject's Household Level of Knowledge on the Topic of Water

Answer	Response	%
Beginner	24	21%
Intermediate	64	57%
Advanced	25	22%
Total	113	100%

Ninth survey question: this question asked participants to rate the impact they perceived certain home upgrades would have on their water savings. Based on responses shown in Table 10, the data shows a pattern that in aggregate, the group of participants thought the order from highest to lowest impact for water upgrades would be in the following order: Clothes washer, Toilets, Repair

water leaks, Showerhead, Dishwasher, Faucets. This order is considerably different from the AWWA's report referenced in this study on Page 6, which is the following: toilet, clothes washer, shower, faucet, leaks.

Table 10
Participant's Perceived Impact of Making Home Water Upgrades

Question	High Impact	Minimal Impact	Low Impact	Do Not Own	Responses
Showerhead	36	26	10	3	75
Faucets	21	43	17	3	84
Clothes washer	41	12	5	2	60
Toilets	41	20	8	0	69
Repair water leaks	40	12	13	5	70
Dishwasher	23	20	16	15	74
Lawn irrigation	19	7	6	62	94
Pool/whirlpool	8	5	3	84	100
Other water consuming Item [a]	3	6	3	25	37

[a] Two responses were written-in by two participants, both with a value of "Water Softener"

Tenth survey question: this question poses a list of motivators that could influence participants' ability or desire to conserve energy and water, and asks participants to rate the degree of motivation provided by each. Those motivators are individually listed in Table 11 below and can be broken into one of three categories – financial, social or environmental. When the twelve motivators in Table 11 are distributed into these three categories, patterns appear, which are illustrated further below in Table 12.

Table 11
Importance of Factors That Motivate Household Members to Conserve Energy and Water

Question	Very Important	Important	Moderately Important	Of Little Importance	Unimportant	Responses
Saving money	68	32	10	1	2	113
Friends, family and others are conserving	11	20	23	41	16	111
Reducing air pollution, water pollution and emissions	47	40	20	4	1	112
Increasing value and performance of the home	44	50	14	4	0	112
Reducing the loss of natural resources from my consumption	55	37	13	5	2	112
Improving comfort and air quality in my home	48	45	15	4	1	113
Reducing the loss of species from extinction	37	38	23	8	5	111
Minimizing health impacts that my consumption may have on others	46	36	19	8	2	111
Protecting my children and/or future generations	64	28	10	4	4	110
Instilling a conservation ethic for my children and/or future generations	62	31	12	3	2	110
Faith-based reasons	14	22	11	25	34	106
Other reason 1	3	1	1	0	9	14

Table 12 illustrates that, on average, 82% of participants felt that financial motivators to conserve energy and water were at least "Important." In contrast, an average of 69% of participants responded that some social motivators were important and 25% said they were unimportant. More than 75% of participants responded that all environmental motivators were important.

Table 12
Financial, Social, and Environmental Categories for Motivators

Motivators	Responded Important/ Very Important			Responded of Little Importance/Unimportant		
	Mean	Min	Max	Mean	Min	Max
Financial [a]	82%	79.9%	82.6%	4%	2.6%	3.6%
Environmental [b]	75.8%	67.6%	82.1%	7.5%	4.5%	11.7%
Social [c]	60.9%	28.2%	84.5%	25.4%	4.5%	55.7%

[a]Includes aggregated responses to questions 1,4,6 from table 11
[b]Includes aggregated responses to questions 3,5,7 from table 11
[c]Includes aggregated responses to questions 2,8,9,10,11 from table 11

Shown in Table 13 below, write-in fields were available at the end of the question for participants to add to the list of reasons that motivate them to conserve energy and water. Five responses were added to these fields which could all be categorized under the three financial, social or environmental categories.

Table 13
Other Motivators for Conserving Energy and Water, Provided by Participants

Other reason 1
Fun being clever
I enjoy the challenge
I just hate wasting things
Right thing to do
To serve as an example to others

Eleventh survey question: this question poses a list of barriers that could limit participants' ability or desire to conserve energy and water, and asks them to rate the degree to which those barriers have limited them. Specific barriers are individually listed in Table 14 below and can be broken into one of three categories – constraints (financial/time), uncertainty, and information overload. When the twelve barriers in Table 14 are distributed into these three categories, patterns appear, which are illustrated further below in Table 15.

Table 14
Degree of Impact that Barriers Have Had on Household's Conservation of Energy and Water

Question	Very Much	Quite a Bit	Some	Very Little	None	Responses
Financial constraints	36	24	30	16	6	112
Time constraints	13	30	41	20	8	112
Uncertainty regarding Benefits	7	16	33	31	24	111
Uncertainty over length of stay in home	6	10	24	32	40	112
Confusion over information related to conservation measures	3	9	33	34	34	113
Level of difficulty in researching and implementing changes	5	13	35	32	27	112
Other reason 1	3	0	1	0	8	12
Other reason 2	0	0	2	0	6	8

Table 15 below illustrates that 50% of participants responded that financial and time barriers were at least "Important" factors in limiting their conservation of energy and water – and 22% rated these constraints unimportant. Also, 57% of participants responded that uncertainty was unimportant as a barrier – while only 17% rated uncertainty as an important barrier. More than 56%

of participants responded that information overload was unimportant as a barrier, while over 13% rated information overload as an important barrier.

Table 15
Constraints, Uncertainty and Information Overload

Barriers	Responded Important/ Very Important			Responded of Little Importance/Unimportant		
	Mean	Min	Max	Mean	Min	Max
Constraints (Financial/Time)[a]	50%	38.4%	53.6%	22.3%	19.6%	25%
Uncertainty [b]	17%	14.3%	20.7%	57%	49.5%	64.3%
Information Overload [c]	13.3%	10.6%	16.1%	56.4%	52.7%	60.2%

[a]Includes aggregated responses to questions 1, 2 from table 14
[b]Includes aggregated responses to questions 3, 4 from table 14
[c]Includes aggregated responses to questions 5, 6 from table 14

Two fill-in fields were available at the end of the question for participants to write-in additional barriers that have limited their conservation of energy and water. Those reasons are shown in Table 16 and fit into the above categories of constraints, uncertainty and information overload.

Table 16
Other Barriers to Conserving Energy and Water, Provided by Participants

Other reasons
Age of home – retrofitting
Appliances were new when bought the house 18 years ago
Federal & State Tax Credits & Incentives that keep changing in the middle of the year
Health - need certain temps to maintain health
Not going to replace some items until they break
Twin home & association rules

Twelfth survey question: this question lists factors that could potentially negatively impact participants' lifestyles, and they were asked to rate how severely each factor has impacted their lifestyle. Shown in Table 17 below, the following percentage of participants responded that they felt at least some loss from increased cost of goods and services (vehicle fuel prices 81.4%, groceries and goods 80.5%, home fuel prices 69%, utility costs 66%). Participants responded that higher cost of groceries and consumer products were factors that impacted them most. Few participants (18%) responded that unpredictable or extreme weather impacted them quite a bit or very much, which 25% responded that unpredictable or extreme weather had no impact on their lifestyle.

Table 17
Degree Household's Lifestyle Has Been Impacted by Specific Factors

Question	Very Much	Quite a Bit	Some	Very Little	None	Responses
Increased vehicle fuel Prices	27	21	44	18	3	113
Increased home fuel cost (gas, propane, oil)	23	17	38	28	7	113
Increased utility costs (electric/sewer/water)	17	18	39	32	6	112
Increased cost of groceries and store goods	30	33	28	20	2	113
Unpredictable or extreme Weather	8	10	33	36	25	112
Other	3	1	0	1	7	12

One write-in field was available for participants to add to the list of factors that have impacted their lifestyles. Political issues were primary concerns in the list of responses, shown in Table 18 below.

Table 18
Other Factors Provided By Participants

Other
Cable/internet
Governor Walker's policies
Impending retirement
Politics
Walkers bill

Thirteenth survey question: this question lists potential home upgrade items, then asks participants to rate how likely it is that they would upgrade that item in their home during the next year. Shown in Table 19 below, as a mean, over 35% of participants indicated that they had already upgraded the items listed. Items that were upgraded most included heating systems and clothes washers, while the least upgraded items were electronics.

As a mean, 16.4% of participants who hadn't already upgraded an item responded that they were likely to make the listed upgrade over the next year, and over twice as many participants (38.5%) responded that they were unlikely to make the listed upgrades during the next year.

Of the participants who responded that they were likely to upgrade items over the next year, they indicated that they were most likely to perform upgrades that were in the lower to middle price for items on the list, like lighting and appliances, and they indicated that they were least likely to perform the highest cost upgrade items on the list, like a home heating system.

Table 19
Likelihood Participants Will Make Energy or Water Conserving Home Upgrades During the Next Year

Question	Very Likely	Slightly Likely	Uncertain	Slightly Unlikely	Very Unlikely	Already Upgraded	Responses
ENERGY Heating system	4	5	9	5	38	52	113
Air conditioner	4	7	8	6	48	35	108
Water heater	8	11	14	10	31	37	111
Lighting	10	18	12	11	24	34	109
Appliances (kitchen or laundry)	8	12	12	13	27	39	111
Electronics (computer, TV, stereo, etc…)	10	12	11	11	41	26	111
Other (energy)	1	0	2	1	4	4	12
WATER							
Showerhead(s)	8	14	12	12	25	41	112
Clothes washer	3	12	9	8	25	54	111
Toilet(s)	3	15	7	8	41	38	112
Other (water)	0	2	0	1	6	5	14

Two write-in fields were available for participants to include additional home upgrades that they sought to perform, shown in Table 20. Relatively high cost items were added to this list, like solar photovoltaic and solar thermal units, and either they had already made those upgrades, or the likelihood that they would make those upgrades over the next year were low.

Table 20
Other Energy and Water Home Upgrades Provided by Participants

Other (energy)	Other (water)
Money	Remodel shower
Photovoltaic Panel Additions	Solar Hot Water Install
Solar array	Water softener
Solar electric fencer	
Programmable thermostat	

Fourteenth survey question: this question asks participants to clarify their responses to question thirteen by indicating why they may have been unlikely to perform certain upgrades during the next year. As shown in Table 21 below, for responses to question 13 regarding items that participants said they were "Unlikely" or "Very Unlikely" to upgrade over the next year, 84% of participants answered that they were unlikely to upgrade because their current model was functioning. Meanwhile, 31% of participants said that the upgrade was too costly. And, 16% of participants selected "Other Reasons" then wrote-in responses which are listed in Table 22.

Table 21
Participants' Reason for Unlikelihood of Making Home Upgrades

Answer	Response	%
Too costly	28	31%
Current model is functioning	75	84%
Other reason	14	16%

Write-in responses shown in Table 22 below were primarily the following: they did not believe there were benefits to performing the upgrades, they were abstaining from upgrades because they expect to move, and a combination of cost-related reasons. One participant responded that they had a poor impression of the performance of higher efficiency items.

Table 22
Other Reason Provided by Participants for Their Unlikelihood of Making Home Upgrades

Other reason
Don't believe in it
Don't have A/C
Don't have air conditioner
Don't like the function of some of the high efficiency toilets, shower heads, and the slow brightening of some fluorescent bulbs
Electric heat, no air conditioner
Less than 10 year old
May be moving
Moving
Not sold on cost/benefit or necessity
Old house not likely to easily afford installing central air, especially since heating is by baseboards so there is no duct system
Rarely use AC, Water heater works off boiler
Retrofitting - finding good companies
We would like a more efficient refrigerator but that would need remodeling of the entire kitchen.

Fifteenth survey question: this question lists specific home upgrades, then asks participants to determine how long a return on investment (ROI) timeframe they are willing to accept for each upgrade. As shown in Table 23, for lower-cost upgrades (lighting, showerheads and toilets) participants either sought under a 5-year return on investment, or thought that a quick ROI was not important for those items. Meanwhile, for higher-cost upgrades (heating system, refrigerator and clothes washers) participants were slightly more tolerant of 5-7 year return on investment and were slightly less likely to say that ROI was not important.

It is important to note that in the energy industry, the term “return on investment” when applied to product efficiencies refers to the increased cost for upgrading to a more efficient item i.e. (Energy Star versus purchasing a standard efficiency item), and how long it will take to see a payback

from those added initial costs through cost savings. Nevertheless, due to inconsistencies in survey responses to this question, it was determined that ROI is an ambiguous term that each participant may have interpreted differently depending upon the item purchased or the nature of the purchase. For the purpose of this study, due to these inconsistencies, results from this question were eliminated from the Discussions/Summaries/Conclusions section of the study. This question was originally designed to address "Concept 3: Delayed versus immediate benefits and threats." Further study with drill-down questions would be helpful to determine how participants define the term "return on investment."

Table 23
Length of Time Participants Will Tolerate Return on Investment from Specific Upgrades

Question	Less Than 5 Years	5 - 7 Years	More Than 7 Years	Not Important
Heating system	36.0%	30.6%	14.4%	18.9%
Lighting	52.7%	16.4%	5.5%	25.5%
Refrigerator	44.1%	27.0%	10.8%	18.0%
Showerhead(s)	51.8%	13.4%	3.6%	31.3%
Clothes washer	42.7%	29.1%	6.4%	21.8%
Toilet(s)	49.5%	20.2%	5.5%	24.8%

Sixteenth survey question: this question provides a list of behaviors that conserve energy and water, and asks participants to rate the likelihood that they would implement each behavior. From responses shown in Table 24 below, an almost identical numerical order emerged from largest to smallest where behaviors that a high percentage of participants were already performing were also the behaviors that a high percentage of other participants thought they would be most likely to perform. The behaviors that the fewest participants were already performing were also behaviors that the fewest other participants thought they would be least likely to perform.

The behaviors that participants said they were most likely to implement and had few participants who said they were unlikely to implement include: turn off lights when not in use, set thermostat to 78 degrees, and set hot water heater to 120 degrees. Meanwhile, for the behaviors that participants said they were least likely to implement, almost an equivalent number of participants responded that they were likely to implement those behaviors, which include: dry clothes on clothes line, and wash clothes and dishes before 7 a.m. and after 7 p.m.

Table 24
Likelihood Participants Will Perform Conserving Behaviors

Question	Very Likely	Slightly Likely	Uncertain	Slightly Unlikely	Very Unlikely	Already Performing	Responses
Turn off lights when not in use	32	2	0	0	2	77	113
Set thermostat to 68 deg in winter, 78 deg in summer	27	7	1	2	8	68	113
Set hot water heater to 120 degrees	27	10	9	3	4	59	112
Fill dishwasher more and hand wash less	25	7	1	4	11	62	110
Wash clothes or dishes before 7 a.m. or after 7 p.m.	15	25	3	12	25	32	112
Dry clothes on clothes line	11	15	3	11	43	30	113
Use a fan rather than air conditioning	17	21	7	9	25	34	113

Seventeenth survey question: this question asks how much participants think the typical household in their community is doing to conserve energy and water. As shown on Table 25, 64% of participants perceived that members in their community were doing some to conserve energy and water, and 24% perceived very little was being done. And 12% of participants perceived community members were doing “quite a bit” or “very much,” and no participants perceived that community members were doing nothing.

Table25
Participants' Perception of How Much a Typical Household in their Community Conserves Energy and Water

Answer	Response	%
Very Much	1	1%
Quite a Bit	12	11%
Some	72	64%
Very Little	27	24%
None	0	0%
Total	112	100%

Eighteenth survey question: this question asks participants how concerned they are that current human consumption rates of energy and water may have a negative impact on future generations. According to results in Table 26, 71% of participants responded with a high degree of concern that human consumption rates of energy and water may have a negative impact on future generations, and 95% reported at least some concern. Meanwhile 6% of participants responded that they had very little or no concern.

Table 26
Subject Degree of Concern That Human Consumption Rates of Energy and Water Will Negatively Affect Future Generations

Answer	Response	%
Very Much	46	41%
Quite a Bit	34	30%
Some	27	24%
Very Little	4	4%
None	2	2%
Total	113	100%

Nineteenth survey question: this question asks participants to order a list of household activities from ones that have the most to ones that have the least ecologic impact. According to responses shown in Table 27 below, participants collectively ordered household activities from most to least ecologic impact in the following order.

1. Your home's energy use
2. Your household's food and diet
3. Your household's buying and waste
4. Your household's driving and flying

Table 27
Participants' Perceived Order of Household Activities, From Most Ecologic Impact to Least

#	Answer	1	2	3	4	Responses
1	Your household's food and diet	9	13	37	47	106
2	Your household's buying and waste	27	24	32	23	106
3	Your household's driving and flying	27	37	16	26	106
4	Your home's energy use	43	32	21	10	106
	Total	106	106	106	106	-

DISCUSSION/SUMMARY/CONCLUSIONS

Survey Questions - Participant Profiles

The first three survey questions for this study were intended to gather profile information on survey participants. Below is an explanation of the nature and purpose for those questions.

The **1st survey question** asked when participants' homes were built, and was intended to make assumptions about the general efficiency of a participant's home, based on building standards during the era their home was built. The specific year groupings were based on when home construction or energy/water consuming household standards experienced significant efficiency increases due to legislation or home construction changes. For example, homes built before 1995 missed the EPA's first introduction of a host of new Energy Star specifications for home appliances and products in 1995, including heating and cooling. Homes built before 1976 were built prior to the Energy Conservation and Production Act of 1976 (ECPA), which established performance standards for all new residential and commercial buildings. And homes built prior to 1951 generally had lower insulation levels.

According to survey responses, half of survey participants currently reside in homes older than 1976. Those homes would likely be ideal candidates for efficiency upgrades to their home's envelope, like insulation, windows and air sealing. Additionally, participants with homes built between 1976 and 1995 would benefit most from upgrades to their appliances and air sealing. Homes newer than 1995 that have energy and water consuming appliances and items older than ten to fifteen years old may benefit most by upgrading those products to Energy Star ones, like hot water heaters, refrigerators, clothes washers and home electronics.

Using the SPSS Crosstab Lambda tool, a cross-calculation was made between the year participants' homes were built and the column in question 13 which allows participants to indicate whether they had "Already Performed [energy and water] Upgrades." There was not a significant relationship between the two, as the significance had a value greater than .05 (significant would be less than .05), indicating that the age of a participant's home did not significantly impact their decision to perform the energy or water conserving upgrades that they have already performed. This means that individuals were not necessarily only replacing items simply because they were broken or severely outdated. Further study with drill-down questions would clarify this statistic.

Second survey question: this question asked for the square footage of participant homes. As mentioned, 43% of survey participants reside in a home between 2,000 and 3,000 square feet, and 7% of participants live in homes larger than 3,000 square feet. These results are important because the size of a home has a direct correlation to how much energy it uses.

The median size of the single family home built in the 1960s and earlier was 1,500 square feet. According to the US Census web site (United States Census, 2011), in 2010 the average US home was 2,392 square feet. Therefore, roughly 43% of participants for this study live in an average size home. Median home sizes and amenities have increased considerably for new homes built since the 1960s. Therefore, although construction practices and efficiencies improve the consumption of energy and water in modern homes, those improvements are often negated by the increased size of the home (United States Census, June 2011).

Space heating and cooling systems account for 54% of the average U.S. home's total energy consumption (see Figure 4). Since larger homes require more energy to heat and cool, larger homes have a greater opportunity to benefit from home improvements that increase the efficiency of their space heating and cooling, like sealing air leaks, improving insulation, replacing drafty or single-pane windows, and upgrading home heating and cooling systems if they are older than 10-15 years old (Energy Star, n.d.). Since 50% of participant in this study reside in homes larger than 2,000 square feet, we can assume that those homeowners may benefit from these types of home upgrades. Receiving a home energy audit is often helpful in identifying the optimal improvements that would increase a home's performance.

Third survey question: this question asked if participants lived within the City of River Falls, WI. Results show that 35% of participants live within the city of River Falls. This question was included in the study so that City of River Falls resident responses could be separated from those not living in River Falls for providing results specifically for RFMU, who targets conservation programming and messages to its City of River Falls customers.

Eight Decision Sciences Concepts

The eight decision science concepts addressed by the remaining sixteen questions in this survey include the below. How each concept is supported or countered by data gathered from this survey is explained further in this section.

- Concept 1: Information overload
- Concept 2: Aversion to loss v.s. attraction to gain
- Concept 3: Delayed v.s. immediate benefits and threats
- Concept 4: Finite pool of worry
- Concept 5: Single action bias
- Concept 6: Confirmation bias
- Concept 7: Uncertainty
- Concept 8: Collective measures and norming

Concept 1: Information overload

Explanation

Faced with too much information, individuals make poor decisions that they regret, or they take no action at all.

Prediction

Participants will perceive that information overload will play an important role in participants' willingness to take action to conserve energy and water.

Conclusion

The data from survey questions was not solid enough to strongly support or counter the prediction for concept 1. The **11th survey question** asked participants if the following reasons

limited their ability or desire to conserve energy and water: “Confusion over information related to conservation measures,” and “Level of difficulty in researching and implementing changes.” According to responses, participants did not perceive that information overload was an important factor limiting them from taking energy or water conserving measures in their home.

According to data in Table 12 for question 11, 13.3% of participants responded that information overload was an important factor limiting them from to conserving energy and water. Meanwhile, 56.4% of participants responded that information overload was not an important barrier for them. Given the complexity of this concept, further study with additional drill-down questions would assist in adding validity to this concept’s prediction. Cross-tab questions targeted toward vetting whether participant actions support their perception would add credibility.

Concept 2: Aversion to loss versus attraction to gain

Explanation

Individuals are more averse to loss than they are attracted to gain.

Prediction

Participants in this study will not consider their lifestyles noticeably affected by environmental pressures, nor will they be motivated to perform upgrades and lifestyle changes because of a feeling of threat from those pressures. While there have been recent unusual or severe weather events that have impacted them, like unusually mild winters, severe rain events, and effects from drought, none have likely been sufficiently severe prior to their taking the survey to be considered "Pearl Harbor Moments". Meanwhile market impacts from current economic volatility would be considered a financial threat and motivating factor for study participants, prompting them to consider taking conservation measures for cost saving reasons to alleviate that financial threat. Financial, environmental and health losses versus benefits will show a similar trend of individuals being more averse to loss than attracted to gains.

Conclusions

Responses to the **4th, 5th and 14th survey questions** showed support for this prediction. The **10th survey question** does not support this prediction. Below is an explanation for each.

The **4th and 5th survey questions** asked participants to describe their household's lifestyle and home upgrade measures to date toward conserving energy and water. Participant responses showed that they perceived they had made a small number of minor lifestyle and home upgrade changes.

Regarding the **4th survey question**, lifestyle changes are often associated with a feeling of loss long-term, since discomfort and inconvenience is often the byproduct of a lifestyle change. The more change-demanding a lifestyle change is, the greater discomfort is created.

Regarding the **5th survey question**, counter to a lifestyle change's association with loss, home upgrades are often associated with gains, as standard of living is often improved with home upgrades through cost savings and improved comfort. Although there is an immediate one-time financial loss to perform a home upgrade, often as the cost for a home upgrade increases, the impact on personal comfort also increases proportionately.

Looking more closely at response data from these questions, aggregated in Table 28 below, participants' perceptions show that they are more averse to the losses associated with home upgrades (financial losses), as 27% more participants responded that they had made one or a small number of home upgrades than those who responded they had made numerous home upgrades. Meanwhile participants showed that they are more averse to the losses associated with lifestyle changes (discomfort and inconvenience), as 21% more participants responded that they had implemented minor lifestyle changes than those who responded that they had made major lifestyle changes.

Table 28
Aggregated data from Table 4 and Table 5

	One or a small number	Numerous	Minor	Major
Lifestyle Changes	46%	51%	**59%**	**38%**
Home Upgrades	**60%**	**33%**	50%	43%

The **14th survey question** asks why participants may be unwilling to upgrade certain energy or water items. Responses support the prediction for concept 2 that individuals are

more averse to loss than attracted to gain. For 84% of respondents, the reason that they are most unlikely to purchase a new model is because their current model is functioning, while 31% responded that upgrades were too costly. Write-in responses included: a financial risk in upgrading if they perceive a home move is in their near future, and retrofitting inconvenience and cost.

Responses to the **10th survey question**, which asks how important financial, social or environmental motivators are in motivating them to conserve, do not support the prediction for concept 2 that individuals are more averse to loss than attracted to gain. Data shows that 75% of participants responded that environmental factors related to loss were important or very important in motivating them to conserve. This shows a strong aversion to loss. Nevertheless, 82% of participants responded that financial motivators associated with gain were important or very important. This shows a stronger attraction to gain than aversion to loss. Follow-up drill-down questions that uncover whether financial motivators were for either benefit reasons or for loss aversion reasons would clarify whether the 10th survey question supports or contradicts the prediction for concept 2.

Concept 3: Delayed versus immediate benefits and threats

Explanation

Individuals value immediate benefits more than delayed benefits. Individuals put more stock in immediate threats than future threats. Individuals are more concerned about the benefits or threats than the domain (financial, social, environmental) of the benefit or threat.

Predictions

Participants will be inclined toward upgrades that have a quick return on investment. Participants will be more concerned about short-term and immediate threats than long-term threats.

Conclusions

The **12th survey question** supports the prediction for concept 3. The **12th survey question** lists factors that could potentially negatively impact participants' lifestyles, and they were asked to rate how severely each factor has impacted their lifestyle. Results supported the prediction that individuals would be more concerned about immediate versus long-term threats. Participants responded that they had more concern over immediate threats that are perceived to affect their daily lives, like increased cost of goods and services, rather than longer-term or sporadic threats like extreme weather events. The following percentage of participants responded that they felt at least some impact from increased cost of goods and services (vehicle fuel prices 81.4%, groceries and goods 80.5%, home fuel prices 69%, utility costs 66%). Fewer participants experienced some impact from unpredictable/extreme weather (45%). Not long after this survey was administered, Wisconsin had a record-breaking drought summer, which would have likely altered participant responses to this question.

For write-in participant responses to this question, Wisconsin's recent political issues were the primary concern. This is predictable considering the impact that recent actions by Governor Walker's administration have had on state employees, which has impacted workers' healthcare costs, retirement benefits, and their ability to pursue collective bargaining through worker unions. Passion has been high on this topic among Wisconsin state workers. These responses show concern for immediate threats.

Concept 4: Finite Pool of Worry

Explanation

Individuals can only worry about a finite number of concerns at one time, and find it difficult to sustain a long-term sense of worry about a topic because more immediate worries take precedent.

Prediction:

Participants will have a finite pool of worry, therefore individuals who become aware of energy and water resource issues will generally lose a sense of urgency regarding those issues because ramifications are considered far in the future, meanwhile they will focus much of their actions on conservation efforts that are more immediate and have short-term benefits. Concern will be moderate to low regarding their concern over the impact of their current energy and water consumption rates on future generations.

Conclusions:

The **18th survey question** asks respondents how concerned they are that current human consumption rates of energy and water may have a negative impact on future generations. Responses to this question do not support the part of this concept's prediction that participants have less concern over worries far in the future than those which are immediate. While 71% of participants responded with at least "Quite a bit" of concern, 95% reported at least some concern. Yet this relatively high level of concern does not indicate that participants' concern for this issue carries a lesser or higher degree of worry than issues which are more immediate.

For the **10th survey question**, which asks individuals how important specific factors are in motivating them to conserve energy and water, responses shown in Table 12 illustrate that

participants have a high degree of worry about environmental topics that imply negative impacts in the future. Those environmental topics were rated by 75.8% to be at least "Important."

Using the SPSS Crosstab Lambda tool, a cross-calculation was made between question 18 and question 13 to determine if there is a significant relationship between participants' level of concern for future generations due to the impacts of their consumption, and comparing that concern to the actions that they have already taken to conserve energy and water. The calculation showed that there was not a significant relationship between the two, as the significance between the two had a value greater than .05. Which means that it was not necessarily participants' concern for future generations that drove their rational to take conservation measures. Further study with drill-down questions would clarify and give integrity to this statistic.

The **12th survey question** asked participants to indicate the degree that their lifestyle had been impacted by a list of factors. Responses to this question supported the prediction that participants show a high degree of worry about immediate threats. Responses showed that participants had felt at least "Quite a bit" of impact from increased cost of groceries and goods (47%), increased vehicle fuel prices (42%), increased home fuel prices (35%) increased utility costs (27%) and unpredictable/extreme weather (16%).

On the surface, the data from these separate questions indicate that the opposite of the prediction is true, and participants were more worried about threats in the future and less worried about immediate threats (fewer participants expressed at least "Quite a bit" of concern for immediate threats than those who indicated future threats are at least "Important"). Since

the format and wording for these questions vary considerably, an additional study that would include a narrow set questions comparing participant level of concern over specific immediate threats versus specific future threats would be required to add validity to this conclusion.

Concept 5: Single Action bias

Explanation

Individuals will often only take a single action, or small number of minor actions, which decreases their feeling of worry about a topic, and decreases the likelihood that they will take more action steps

Prediction

Most participants will have either taken one or a small number of minor action steps to conserve energy and water at the time of taking this survey.

Conclusions

The **4th and 5th survey questions** asked participants whether they perceived their household had made one or a small number versus numerous home upgrades or lifestyle changes to conserve energy and water, and whether those changes were minor or major changes. Responses to these questions showed that participants perceived that they had performed one or a small number of minor actions toward conserving energy and water.

Nevertheless, participants' perceptions of their actions to conserve energy and water was not supported by the true actions they reported later in the survey (their actions did not reflect single action bias). For the **13th and 16th survey questions**, when asked how likely it was that they would perform specific home upgrades or lifestyle changes, all participants performed at least one action. Only 5.3% of participants stopped after performing a single conservation measure, and 76% performed more than four. Demonstrating this is a cross-tab between question 6 and questions 13/16 shown in Table 29 below.

Table 29
Self reported level of knowledge compared to number of conservation measures already taken.

Self Reported Level of Knowledge	Total number of Conservation Measures Taken				Number of Home Upgrades Performed				Number of Lifestyle Changes Made			
	0	1	2-3	4+	0	1	2-3	4+	0	1	2-3	4+
Advanced	5.0%	5.0%	15.0%	75.0%	35.0%	5.0%	20.0%	40.0%	20.0%	5.0%	15.0%	60.0%
Intermediate	5.6%	2.8%	11.3%	80.3%	15.5%	14.1%	26.8%	43.7%	23.9%	2.8%	14.1%	59.2%
Beginner	13.6%	13.6%	13.6%	63.6%	18.2%	27.3%	31.8%	22.7%	40.9%	4.5%	18.2%	45.5%

Additionally, responses to questions 13 and 16 showed that participants were as likely to have already performed costly home upgrades as they were to have performed inexpensive ones. This does not support the prediction that participants have a tendency toward single action bias.

The **13th survey question** lists potential home upgrade items, then asks participants to rate how likely it is that they would upgrade that item in their home during the next year. A column is available for participants to indicate that they have already performed the upgrade, if they have done so.

It was anticipated that participants would have already upgraded smaller cost items, or would be likely to do so over the next year. It was also anticipated that most participants had not invested in higher cost upgrades and would forego those upgrades longer than one year in the future. These assumptions proved to be somewhat incorrect, as a high percentage of participants had already upgraded large cost items like heating systems and clothes washers. Yet, the assumption that participants would respond that they were more likely to upgrade lower cost items rather than high cost items over the next year was accurate.

Typically upgrades to higher-cost energy or water consuming products are due to product replacement at the end of a product's useful life. As mentioned previously, using the SPSS Crosstab Lambda tool, a cross-calculation was made between the year participants' homes were built and the column in question 13 which allows participants to indicate whether they had "Already Performed [energy and water] Upgrades." There was not a significant relationship found between the two, which means that individuals were not necessarily only replacing items simply because they had reached the end of their useful life.

In the two write-in fields at the end of this question for participants to include upgrades they may be likely to make, higher cost items were added to this list, like solar photovoltaic and solar thermal units. Either participants had already made those upgrades, or the likelihood that they would make those upgrades over the next year were low.

The 16th survey question provided a list of behaviors that conserve energy and water, and asks participants to rate the likelihood that they would implement each behavior. The goal of this question was to identify which behaviors are considered most acceptable or generate the least resistance in implementing, as well as which behaviors are least acceptable or have the most resistance in implementing. It was anticipated that behaviors which have the highest number of participants already performing them will also be the most acceptable behavior changes and receive the least resistance.

From responses, indeed an almost identical numerical order emerged from largest to smallest in terms of behaviors that a high percentage of participants were already performing and behaviors that non-adopters thought they would likely perform.

Meanwhile, lifestyle changes that were either familiar or required minimal change or discomfort were behaviors that participants indicated they had already performed or were most likely to adopt, which include turning-off lights, changing the settings on a thermostat, setting a hot water heater to a lower temperature, or hand washing dishes less often while using the dishwasher more. Meanwhile, a marked decrease in participants already performing and participants likely to perform behaviors occurred when an adjustment to their personal schedule would be required to perform the measure (wash clothes or dishes at a specified time), when a major change in process or equipment occurred (drying clothes on a clothes line), or when comfort was at stake (using a fan rather than air conditioning). Drying clothes on a clothes line caused the greatest resistance among participants, likely for a variety of reasons ranging from allergies, restrictive covenant, added initial expense, inconvenience, and modesty.

Concept 6: Confirmation Bias

Explanation

Individuals tend to read and absorb information that supports their mental model of how the world works, and resist information that runs counter to that mental model.

Predictions

Participants who perceive they have beginner knowledge about conserving energy and water will not have as strong a mental model about conservation as those who perceive they have intermediate or advanced knowledge. Therefore, those who perceive they have beginner knowledge will show more willingness to make home upgrades or behavior changes that promote conservation of energy and water than those who consider themselves to have intermediate or advanced knowledge. Those with intermediate or advanced knowledge will have either already performed upgrades or made lifestyle changes, or will be unwilling to do so if they have not already performed upgrades or lifestyle changes.

Conclusions

The **6th and 8th survey questions** asked participants to rate their level of knowledge regarding conserving energy and water. Responses supported the confirmation bias concept, as participants who perceived they had advanced knowledge either had already performed numerous conservations measures, or had performed none at all. While those who perceived they had beginner knowledge performed either one/some or none at all.

It was anticipated that most participants would consider themselves to have either beginner or intermediate knowledge of each, which results showed was not true because there were a similar number of participants who responded they had advanced knowledge energy

and water conservation versus beginner knowledge. Participants responded that their level of knowledge for energy/water was: beginner 19%/21%, intermediate 63%/57%, and advanced 18%/22%. Energy and water were posed as separate questions because it was anticipated that participants would respond that they had a much higher level of knowledge for one than the other - these percentages show that was not true.

When cross-comparing question 6 with question 13, which asked how likely it was that participants would perform specific upgrades over the next year, Table 30 below shows results which support the prediction for confirmation bias that individuals who indicate a beginner knowledge will be more likely to show a willingness to perform upgrades, meanwhile individuals who indicate intermediate or advanced knowledge will either have already performed upgrades (if their world view was that conservation is important to them), or will be unwilling to perform conservation measures (if their world view is either that conservation is unimportant to them, or that a particular conservation action carried little importance to them. For example, some participants responded that they had no air conditioner and also responded that they were very unlikely to upgrade by installing one).

Table 30

Self reported knowledge of conserving energy and water compared to willingness to upgrade energy and water items.

Self Reported Knowledge	Response	Heating System	Air Conditioner	Water Heater	Lighting	Appliances	Electronics	Shower head	Clothes Washer	Toilet
Beginner	Already Upgraded	36.4%	27.3%	31.8%	18.2%	18.2%	18.2%	9.1%	45.5%	18.2%
	Very Likely	9.1%	18.2%	4.5%	4.5%	0.0%	9.1%	9.1%	0.0%	0.0%
	Slightly Likely	0.0%	0.0%	4.5%	13.6%	4.5%	13.6%	13.6%	13.6%	9.1%
	Uncertain	18.2%	13.6%	18.2%	18.2%	27.3%	13.6%	18.2%	13.6%	13.6%
	Slightly Unlikely	9.1%	9.1%	22.7%	18.2%	18.2%	9.1%	31.8%	18.2%	18.2%
	Very Unlikely	27.3%	31.8%	18.2%	27.3%	27.3%	36.4%	18.2%	9.1%	40.9%
	No Response	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%
Intermediate	Already Upgraded	46.5%	33.8%	33.8%	32.4%	38.0%	26.8%	40.8%	46.5%	35.2%
	Very Likely	1.4%	0.0%	5.6%	8.5%	8.5%	2.8%	4.2%	4.2%	2.8%
	Slightly Likely	4.2%	4.2%	11.3%	16.9%	11.3%	11.3%	12.7%	9.9%	14.1%
	Uncertain	5.6%	5.6%	11.3%	11.3%	4.2%	9.9%	9.9%	7.0%	5.6%
	Slightly Unlikely	2.8%	5.6%	5.6%	7.0%	11.3%	9.9%	5.6%	4.2%	4.2%
	Very Unlikely	39.4%	46.5%	29.6%	18.3%	25.4%	38.0%	25.4%	25.4%	36.6%
	No Response	0.0%	4.2%	2.8%	5.6%	1.4%	1.4%	1.4%	2.8%	1.4%
Advanced	Already Upgraded	55.0%	25.0%	30.0%	35.0%	40.0%	15.0%	50.0%	55.0%	45.0%
	Very Likely	5.0%	0.0%	15.0%	15.0%	10.0%	30.0%	15.0%	0.0%	5.0%
	Slightly Likely	10.0%	20.0%	10.0%	15.0%	15.0%	5.0%	10.0%	10.0%	15.0%
	Uncertain	5.0%	5.0%	10.0%	0.0%	15.0%	5.0%	5.0%	5.0%	0.0%
	Slightly Unlikely	5.0%	0.0%	5.0%	10.0%	5.0%	10.0%	5.0%	5.0%	5.0%
	Very Unlikely	20.0%	40.0%	30.0%	25.0%	15.0%	30.0%	15.0%	25.0%	30.0%
	No Response	0.0%	10.0%	0.0%	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%

For the **19th survey question**, participants were to put in order four human activities from most to least ecologically impacting. This question was designed to be a simplistic cross-check for question 6 and question 8 to indicate whether a participant's self reported knowledge of conserving energy and water matched reality. For the purpose of this study, correct answers were responses which correctly indicated that home energy use had the most impact (27%,) and that food and drink had the least (5%). Buying and waste (20%) and transportation (19%) were considered too closely matched to rule-out responses as incorrect if their order were transposed by participants (Energy Star).

Responses to question 19 showed that collectively, participants correctly responded to this question. Yet, individually, participants who indicated beginner knowledge were more successful at responding to this question correctly than those who indicated advanced or intermediate knowledge. This implies that participants' self reported knowledge may not necessarily match reality. Further study with additional questions would assist in giving validity to this conclusion.

When using the SPSS Crosstab Lombada tool, a cross calculation was made between question 6 (self reported knowledge of energy) and question 19 (rating the ecologic impact of certain household activities), as shown in Table 31 below. Results showed that 23 got the ranking correct, and of that 13 were intermediate while 3 were beginner and 0 were advanced. Note that because there is a significant relationship (.02) between level of knowledge of energy and water, survey question 6 regarding knowledge of energy was used a benchmark to cross-calculate with what their actual knowledge was.

Table 31
Self reported knowledge of energy and water conservation versus actual

Self Reported Knowledge of Energy & Water Conservation	Correctly responded	Incorrectly responded	Did not respond
Beginner knowledge	5	14	3
Intermediate knowledge	18	51	2
Advanced knowledge	0	18	2
Total	23	83	7

The **7th and 9th survey questions** followed this same pattern, and although results showed that participants were collectively correct in their assessment regarding which energy upgrades would have the most impact, individually the accuracy of participant responses generally did not match their self reported knowledge (participants who indicated beginner, intermediate and advanced knowledge were equally likely to be correct or incorrect in their accuracy). This supported the confirmation bias concept.

Additionally, a fill-in field was provided at the end of the 7th and 9th survey questions which allowed users to type-in a home upgrade that was not be on the list. This additional field was intended to obtain a better understanding of other energy and water saving approaches that participants may consider highly important. Two upgrades listed are notable because they would play a large role in conserving energy and water, which include: reducing their number of vehicles to one vehicle (hybrid vehicle), and upgrading to a solar hot water heater. Vehicles are beyond the scope of this study, but account for 19% of the average person's total energy use for all their activities, as shown on the pie chart in Figure 3 for this study. Water heating accounts for 18% of a typical home's energy use, as shown in Figure 4 for this study.

For the **4th survey question**, when reviewing responses regarding lifestyle changes, as described in the Results section of this study, participants responded that changes they

perceived as minor were preferable to major changes. This supports the part of the confirmation bias which states that individuals are averse to change.

Participants who rated themselves as having intermediate or advanced knowledge of energy and water conservation either performed numerous lifestyle changes, or performed none at all. Meanwhile participants who rated themselves as having beginner knowledge either performed one or a few lifestyle changes or none at all.

Yet, unlike performing home upgrades, participants' willingness to make lifestyle changes did not support confirmation bias, as shown in Table 32 below. Regardless of whether participants indicated they had beginner, intermediate or advanced knowledge of conserving energy and water, most responded that they were either already performing most measures, or were very likely to perform those measures. For three lifestyle changes, there was a noticeable aversion among the three groups for: clothes washing/dish washing before 7 a.m. or after 7 p.m., drying clothes on a clothes line, and using a fan rather than air conditioning. Those lifestyle changes received a disproportionately higher number of responses from participants saying they were "Very Unlikely" to perform those changes.

Table 32

Self reported knowledge of conserving energy and water compared to willingness to make lifestyle changes.

Self Reported Knowledge	Response	Turn off lights	Adjust thermostat	Adjust hot water heater	Dish wash more, hand wash less	Clothes wash/dish wash before 7am, after 7pm	Dry clothes on clothes line	Use fan, not air conditioning
Beginner	Already Performing	54.5%	50.0%	50.0%	45.5%	18.2%	9.1%	9.1%
	Very Likely	36.4%	31.8%	27.3%	31.8%	18.2%	13.6%	22.7%
	Slightly Likely	4.5%	13.6%	13.6%	13.6%	27.3%	18.2%	31.8%
	Uncertain	0.0%	0.0%	9.1%	0.0%	0.0%	4.5%	4.5%
	Slightly Unlikely	0.0%	4.5%	0.0%	0.0%	18.2%	9.1%	9.1%
	Very Unlikely	4.5%	0.0%	0.0%	4.5%	18.2%	45.5%	22.7%
	No Response	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%
Intermediate	Already Performing	70.4%	60.6%	53.5%	54.9%	31.0%	29.6%	36.6%
	Very Likely	26.8%	18.3%	22.5%	19.7%	11.3%	9.9%	15.5%
	Slightly Likely	1.4%	7.0%	7.0%	2.8%	19.7%	9.9%	12.7%
	Uncertain	0.0%	1.4%	9.9%	1.4%	4.2%	2.8%	5.6%
	Slightly Unlikely	0.0%	0.0%	4.2%	4.2%	8.5%	11.3%	5.6%
	Very Unlikely	1.4%	11.3%	2.8%	14.1%	23.9%	36.6%	23.9%
	No Response	0.0%	1.4%	0.0%	2.8%	1.4%	0.0%	0.0%
Advanced	Already Performing	75.0%	70.0%	50.0%	65.0%	30.0%	35.0%	30.0%
	Very Likely	25.0%	30.0%	25.0%	20.0%	15.0%	5.0%	5.0%
	Slightly Likely	0.0%	0.0%	10.0%	10.0%	25.0%	20.0%	25.0%
	Uncertain	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%
	Slightly Unlikely	0.0%	0.0%	0.0%	5.0%	10.0%	5.0%	15.0%
	Very Unlikely	0.0%	0.0%	10.0%	0.0%	20.0%	35.0%	15.0%
	No Response	0.0%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%

Concept 7: Uncertainty

Explanation

Uncertainty plays a major role in hindering individuals' willingness to take action.

Prediction

Uncertainty will play a role in participants' unwillingness to make lifestyle changes or perform home upgrades to conserve energy and water.

Conclusion

The 11th survey question asked participants to indicate the degree to which a list of reasons limited their ability or desire to conserve energy and water. Responses revealed in Table 15 show that participants didn't perceive that uncertainty was an important factor limiting their conservation of energy and water. An additional study with further questions that would cross-check whether participant perception matched reality would assist in adding validity to conclusions for this concept.

Concept 8: Collective Measures and Social Norming

Explanation

When multiple individuals are involved collectively toward a goal, participation greatly increases. Individuals in groups are more likely to be sacrificial. Meanwhile, social norming is an effective way to change behavior.

Predictions

Study participants will be more willing to take conservation measures, and will be more willing to have delayed benefits from taking those measures, if those actions are viewed as being collective. Social norming will be an important factor in participants willingness to take conservation measures.

Conclusions

The first part of the concept 8 states that individuals are more willing to be sacrificial and have delayed benefits from taking conservation measures if those measures are seen as collective actions. This part of concept 8 is supported by responses to the 18th and 10th survey questions.

The 18th survey question asked participants how concerned they are that current human consumption rates of energy and water may have a negative impact on future generations. While 71% of participants responded with a high degree of concern, 95% reported at least some concern. Meanwhile for question 10, shown in Table 11, “protecting my children and/or future generations” and “minimizing the health impact that my consumption may have on

others" were perceived by most participants to be very important or important motivators to conserve.

As previously mentioned in the conclusions for Concept 4, using the SPSS Crosstab Lambda tool, a cross-calculation was made between question 18 and question 13 to determine if there is a significant relationship between participants' level of concern for future generations due to the impacts of their consumption, and comparing that concern to the actions that they have already taken to conserve energy and water. Since there was not a significant relationship between the two, it was not necessarily true that participants' concern for future generations drove their rationale to take conservation measures.

The 17th survey question asked participants how much they think the typical household in their community is doing to conserve energy and water. Responses showed that they perceived community members were doing either "some" or "very little." This suggests that social norming is not an important factor for participants in their decision to take energy and water conservation measures, because participants are in practice performing conservation measures at a greater degree of participation ("some" to "quite a bit") than they think others in their community are doing, as shown in Table 19, Table 24, and most notably in Table 29. If their actions were a result of social norming, then they would be performing measures at a similar degree of participation to what they think others in their community are doing.

Participants perceived that 88% of community members were doing some or very little to conserve energy and water, with most of those doing some. They had also devalued their own conservation efforts and indicated that they thought they performed conservation measures to a similar degree as they predicted individuals in their community were.

Meanwhile, the data gathered from questions 13 and 16 in this survey indicate that most participants in this study are in fact taking numerous low cost and high cost measures and making numerous lifestyle changes to conserve energy and water.

The **10th survey question** poses a list of motivators that could impact participants in their ability or desire to conserve energy and water, and asks participants to rate the degree that those motivators have motivated them to conserve. One item in this question asks how important it is in their decision to conserve if "friends, family and others are conserving." Responses to this part of the question run counter to norming being important factor, as 51.4% of participants perceived this was unimportant in motivating them to conserve.

If participants did not perceive that social norming was an important factor motivating them to conserve energy and water, then what were factors motivating them? For the 10th survey question, illustrated in Table 12, motivators are broken into financial, social and environmental factors.

For financial motivators, according the data in Table 12, 82% of participants responded that all financial motivators to conserve energy and water were at least "Important." These financial motivators either created cost savings, or served as investments.

For social motivators, depending upon the motivator, 69% of participants responded that some social motivators were important (if they were in regard to protecting or enhancing the lives of future generations), while 25% of participants responded that some social motivators were unimportant, or of little motivating importance (if they were in regard to social norming or faith based reasons). Social motivators had the largest mean difference in participant responses.

The motivator that participants clearly opted-out of responding to the most among motivators in all categories was in response to the faith-based motivator, with seven opt-outs. It also received the highest degree of unimportance as a motivator by 55.7% of participants.

For environmental motivators, over 75% of participants responded that all environmental motivators were important motivators. “Reducing loss of species from extinction” was rated as being the least motivating of the three environmental motivators; 67.9% of participants said that it was at least important. Meanwhile, of the three environmental motivators listed, loss of species received the highest degree of unimportance by 13% of participants. Environmental motivators given the highest degree of importance focused on factors that have a direct impact on human welfare.

As an anecdotal observation, participants may have rated specie loss as the lowest of the three environmental motivators because often the human impact from specie loss is not quantified by experts then relayed to citizens. Instead, how specie loss affects creatures and the environment is typically the focus of these messages. Additionally, participants may associate the term “specie loss” with larger creatures like giant pandas, elephants, tigers and rhinoceros, that are at the top of the food chain and play a lesser role in supporting ecosystems, rather than species at the bottom of the food chain that are often overlooked and form the fundamental underpinnings for ecosystems that support all life on earth, like microorganisms, plants, coral and insects i.e. (bees), which are most easily affected by dramatic ecosystem changes. The plight of these endangered species are a more difficult story to tell, and draw a much smaller audience than large mammals, even though their significance to the welfare of human beings cannot be overstated.

REFERENCES

AWWA Research Foundation & American Water Works Association. (1999). *Residential End Uses of Water.* Retrieved from http://www.allianceforwaterefficiency.org/Residential_Shower_Introduction.aspx

Begley, S. (2011, March). Brain Freeze: How the Deluge of Information Paralyzes our Ability to Make Good Decisions. *Newsweek*, 28-33.

Center for Research on Environmental Decisions. (2009). The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides, and the Interested Public. Retrieved from http://www.csc.noaa.gov/digitalcoast/_/pdf/CRED_Psychology_Climate_Change_Communication.pdf

Energy Star. (n.d.). When is it Time to Replace? Retrieved from http://www.energystar.gov/index.cfm?c=heat_cool.pr_checklist_consumers

Environmental Protection Agency WaterSense. (2008, June). *Water Supply and Use in the United States*. Retrieved from http://www.epa.gov/watersense/docs/ws_supply508.pdf

Gertner, J. (2009, April). Why Isn't the Brain Green? *New York Times.* Retrieved from http://www.nytimes.com/2009/04/19/magazine/19Science-t.html?pagewanted=all

Griskevicius, V., Cialdini, R. & Goldstein, N. (June, 2008). Social Norms: An Underestimated and Underemployed Lever for Managing Climate Change. *International Journal of Sustainability Communication, 3*, 5-13.

Hardisty, D. & Weber, E. (2009). Discounting Future Green: Money Versus the Environment. *Journal of Environmental Psychology, 138(3)*, 329–340.

Joireman, J., Posey, D., Truelove & H., Parks, C. (2009). The Environmentalist Who Cried Drought: Reactions to Repeated Warnings About Depleting Resources Under Conditions of Uncertainty. *Journal of Environmental Psychology, 29,* 181-192.

James, S. & Lahti, J. (2004). *The Natural Step for Communities: How Cities and Towns can Change to Sustainable Practices*. Gabriola Island, BC: New Society Publishers.

Sarkar, M. (June, 2011). How American Homes Vary By the Year They Were Built. *US Census Bureau Working Paper 2011-18*. Retrieved from http://www.census.gov/hhes/www/housing/housing_patterns/pdf/Housing%20by%20Year%20Built.pdf

United States Census. (2011). Highlights of Annual 2011 Characteristics of New Housing. Retrieved from http://www.census.gov/construction/chars/highlights.html

United States Energy Information Administration. *Electricity in the U.S.* Retrieved from http://www.eia.gov/kids/energy.cfm?page=electricity_in_the_united_states-basics

World Commission on Environment and Development. (1987). *Our Common Future.* Oxford University Press, 43.

Whitmarsh, L. (2011). Scepticism and Uncertainty About Climate Change: Dimensions, Determinants and Change Over Time. *Global Environmental Change-human And Policy Dimensions, 21(2)*, 690-700.

GLOSSARY OF TERMS

Confirmation Bias: To seek information that supports one's own view of how the world works.

Cradle to cradle: Process that starts with production of goods from recycled materials, those materials are converted into consumer goods, goods are consumed, then waste is re-entered into the process stream as recyclables.

Cradle to grave: Process that starts with raw material being harvested from the earth's raw materials, converted into goods, consumed by individuals, then waste that is generated is disposed of permanently (landfills/incineration)

Ethical Consumption and Behavior: Making choices to consume or behave a certain way for ethical reasons. In this study, those ethical reasons are related to sustainability.

Finite Pool of Worry: Individual are only capable of worrying about a certain number of worries at one time, then when that maximum number of worries is reached, some worries are discarded to focus attention on the most present worries.

Footprint: The amount of environmental impact that an individual's actions have on the natural world.

Pearl Harbor Moment: Extreme man made or natural event that causes individuals to collectively take action toward a common goal.

Return on Investment Timeframe (ROI): Amount of time that is required to earn-back dollars spent through cost savings.

Single action bias: Tendency for individuals to take a single action, or a small number of actions, to alleviate a threat, then take no further action because the perception of threat has been alleviated.

Sustainability: fulfilling the needs of the present without compromising the ability of future generations to meet their own needs.

APPENDIX A

Email Invitation to Survey Takers

From: Matthew Fitzgerald [noreply@qemailserver.com]
Sent: Monday, April 23, 2012 10:31 PM
To: [Email List]
Subject: UWRF Faculty & Staff: Sustainability Home Survey

Dear UWRF Faculty and Staff,

You are invited to participate in a graduate research study on sustainability by completing an online survey meant to gather homeowners' thoughts on conserving energy and water in their home. It would be greatly appreciated if you would be willing to take the survey during the next four days (by Friday, April 27).

This survey should take 15-20 minutes.

Follow this link to the Survey:
http://uwrf.qualtrics.com/SE/?SID=SV_bvfpxWbbda3plju

$25 FALCON DOLLAR DRAWING:
In appreciation for taking the survey, you will have the opportunity at the end of the survey to enter a drawing to be one of six $25.00 Falcon Dollar recipients, to be applied for on-campus dining or other purchases. Winners will be awarded Falcon Dollars and contacted by email this Saturday, April 28th.

IRB APPROVED:
This research project has been approved by the UWRF Institutional Review Board for the Protection of Human Subjects, protocol # H2012-W049.

If you have concerns about how you were treated in this study, please contact: Molly Van Wagner, Interim Director of Grants and Research, 101 North Hall, UWRF, 715/425-3195.

Thank you in advance for your time and consideration.

Matt Fitzgerald
UWRF Graduate Student
Sustainable Community Development Program

Unable to view this survey? Copy and paste the below link into your web browser:
http://uwrf.qualtrics.com/WRQualtricsSurveyEngine/?Q_SS=4ZzV998SYfdc0Ti_bvfpxWbbda3plju&_=1

APPENDIX B
Online Survey

Default Question Block

SURVEY
UWRF Faculty and Staff Perceptions, Motivators and Barriers to Making Purchases and Lifestyle Changes that Conserve Energy and Water

Do you own the home or residence that you live in?

- Yes
- No (renting, or other arrangement)

Subject Consent Form for Participation of Human Subjects in Research

This research project has been approved by the UW-River Falls Institutional Review Board for the Protection of Human Subjects, protocol # H2012-W049.
University of Wisconsin-River Falls

(This survey should take 15-20 minutes to complete)

Project Title:
UWRF Faculty and Staff Perceptions, Motivators and Barriers to Making Purchases and Lifestyle Changes that Conserve Energy and Water

Researcher:
Matthew Fitzgerald, Sustainable Community Development Masters Program, UW-River Falls, 715/425-9466, matthew.j.fitzgerald@uwrf.edu

Description:
The purpose of this study is to help gather perceptions, motivators and barriers for University of Wisconsin-River Falls faculty and staff that impact their willingness to make purchases and lifestyle changes that conserve energy and water. Information gathered from the survey will be shared with River Falls Municipal Utilities in an effort to assist with targeting future energy and water conservation programs to City of River Falls residents.

The results of each individual's participation will be strictly confidential. With the exception of the researchers involved in running this study, nobody will be allowed to see or discuss any of the individual surveys. Responses to survey questions will be combined and reported in group form in a professional presentation or publication.

The risks to you are minimal, and you are free to terminate your participation at any time. A summary report and explanation of the results will be made available to you when the study is completed if you so request.

Authorization:
By selecting "I Agree", I have read the above and understand the nature of this study and agree to participate. I understand that by agreeing to participate in this study I have not waived any legal or human rights. I also understand that I have the **right to refuse to participate** and that **my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice**.

If you have any concerns about your treatment as a participant in this study, please call or write:

Molly Van Wagner
Interim Director of Grants and Research
101 North Hall, UW-River Falls, River Falls, WI 54022 telephone: 715/425-3195

- I Agree
- I Do Not Agree

Your thoughtful responses to the following survey questions are appreciated.
Thank you in advance for your participation and time.

Approximately when was your home built?

- Before 1950
- 1951 - 1975
- 1976 - 1994
- 1995 - 2012

What is the approximate square footage of your home?

- Less than 1,000
- 1,000 - 2,000
- 2,000 - 3,000
- 3,000 - 4,000
- 4,000 +

Do you live within the city of River Falls?

- Yes
- No

LIFESTYLE CHANGES:
From your perspective, which statement below best describes your household's lifestyle changes to date that help to conserve energy and water?

- No energy or water conserving lifestyle changes have been made at this time.
- Made one or a small number of MINOR changes to our household's lifestyle
- Made numerous MINOR changes to our household's lifestyle
- Made one or a small number of MAJOR changes to our household's lifestyle
- Made numerous MAJOR changes to our household's lifestyle

HOME UPGRADES:
From your perspective, which statement below best describes your household's home upgrades to date that help to conserve energy and water?

- No energy or water conserving home upgrades have been made at this time

- Made one or a small number of MINOR upgrades to our house
- Made numerous MINOR upgrades to our house
- Made one or a small number of MAJOR upgrades to our house
- Made numerous MAJOR upgrades to our house

ENERGY:
How would you rate the general level of knowledge for your household on the topic of conserving household energy?

- Beginner
- Intermediate
- Advanced

ENERGY:
If you upgraded the following items in your home to more efficient ones, rate the impact you perceive those upgrades would have on your household's energy savings.

	High Impact	Minimal Impact	Low Impact	Already Highly Efficient	Do Not Own
Heating System					
Air conditioner					
Water heater					
Lighting					
Appliances (kitchen or laundry)					
Electronics (computer, entertainment system, etc…)					
Other energy consuming item					

WATER:
How would you rate the general level of knowledge for your household on the topic of conserving household water?

- Beginner
- Intermediate
- Advanced

WATER:
If you upgraded the following items in your home to more efficient ones, rate the impact you perceive those upgrades would have on your household's water savings.

				Already Highly	

	High Impact	Minimal Impact	Low Impact	Efficient	Do Not Own
Showerhead					
Faucets					
Clothes washer					
Toilets					
Repair water leaks					
Dishwasher					
Lawn irrigation					
Pool/whirlpool					
Other water consuming item					

How important are the following factors in motivating individuals in your household to conserve energy and water?

	Very Important	Important	Moderately Important	Of Little Importance	Unimportant
Saving money					
Friends, family and others are conserving					
Reducing air pollution, water pollution and emissions					
Increasing value and performance of the home					
Reducing the loss of natural resources from my consumption					
Improving comfort and air quality in my home					
Reducing the loss of species from extinction					
Minimizing health impacts that my consumption may have on others					
Protecting my children and/or future generations					
Instilling a conservation ethic for my children and/or future generations					
Faith-based reasons					
Other reason 1					
Other reason 2					

To what degree have the following reasons limited your household's ability or desire to conserve energy and

water?

	Very Much	Quite a Bit	Some	Very Little	None
Financial constraints					
Time constraints					
Uncertainty regarding benefits					
Uncertainty over length of stay in home					
Confusion over information related to conservation measures					
Level of difficulty in researching and implementing changes					
Other reason 1					
Other reason 2					

To what degree has your household's lifestyle been impacted by the following?

	Very Much	Quite a Bit	Some	Very Little	None
Increased vehicle fuel prices					
Increased home fuel cost (gas, propane, oil)					
Increased utility costs (electric/sewer/water)					
Increased cost of groceries and store goods					
Unpredictable or extreme weather					
Other					

How likely is it that you will upgrade each of the following with a more efficient model during the next year?

	Very Likely	Slightly Likely	Uncertain	Slightly Unlikely	Very Unlikely	Already Upgraded
ENERGY Heating system						
Air conditioner						
Water heater						
Lighting						
Appliances (kitchen or laundry)						
Electronics (computer, TV, stereo, etc…)						
Other (energy)						

WATER Showerhead(s)						
Clothes washer						
Toilet(s)						
Other (water)						

If you chose “Unlikely” or “Very Unlikely” above, what are your main reasons for your response?

- [ ] Too costly
- [ ] Current model is functioning
- [ ] Other reason

If your household were to make each of the following upgrades, what is the return on investment time frame you would be willing to accept (time frame that dollars saved pay for the upgrade)?

	Less Than 5 Years	5 - 7 Years	More Than 7 Years	Not Important
Heating system				
Lighting				
Refrigerator				
Showerhead(s)				
Clothes washer				
Toilet(s)				

What is the likelihood that your household would perform the following energy and water conserving measures?

	Very Likely	Slightly Likely	Uncertain	Slightly Unlikely	Very Unlikely	Already Performing
Turn off lights when not in use						
Set thermostat to 68 deg in winter, 78 deg in summer						
Set hot water heater to 120 degrees						
Fill dishwasher more and hand wash less						
Wash clothes or dishes before 7 a.m. or after 7 p.m.						
Dry clothes on clothes line						
Use a fan rather than air conditioning						

How much do you think a typical household in your community is doing to conserve energy and water?

- Very Much
- Quite a Bit
- Some
- Very Little
- None

How concerned are you that current human consumption rates of energy and water may have a negative impact on future generations?

- Very Much
- Quite a Bit
- Some
- Very Little
- None

Drag and drop the below 4 household activities so they are ordered from top-to-bottom, 1 - 4, from greatest ecologic impact to least (1 having the most impact).

Your household's food and diet

Your household's buying and waste

Your household's driving and flying

Your home's energy use

Survey Complete!

Thank you for your time and willingness to to complete this survey!

$25 FALCON DOLLAR DRAWING:

Enter a drawing to win one of six $25 falcon dollar giveaways to use on-campus for dining or other purchases by providing your email address below. Your email address will in no way be linked to your information and will be kept separate from your responses. Winners will be awarded Falcon Dollars and contacted by email this Saturday, April 28th.

RECEIVE A COPY OF THE FINAL RESEARCH PAPER:

Would you like to receive an electronic copy of the graduate research paper that will result from data collected in this survey once it is complete?

- Yes (Note: Please provide your email address above)

No

This survey and study is targeted only to individuals who currently own a home. You have indicated that you do not own a home. Thank you for your time and willingness to take this survey.

RECEIVE FINAL RESEARCH PAPER:

If you are interested in receiving an electronic copy of the graduate research paper that will result from data collected in this survey once it is complete, please provide your email address below.

You have chosen not to take this survey. You are welcomed to make a comment below before leaving this site. Thank you.