

# Paper Reuse Project

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## **Background**

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There is extensive use of paper at Humboldt State University. According to Paul Mann, senior communication officer in the Marketing and Communication Department, H.S.U. computer labs consumed 2,637,137 toner sheets in fall of 2009 (Appendix 2). Once the “pay only what you print” program was set up in fall 2010, paper consumption in computer labs

dropped to 1,900,696 toner sheets. Once again, paper used dropped to 957,543 toner sheets by fall of 2011. These numbers are looking at all labs on campus that are managed by Information Technology Services. Unfortunately these figures do not answer our two main questions of how much paper is being consumed on campus and how much of that is single sided with potential to still be reused. Since these figures only represent prints from labs the overall consumption of paper is not being accounted for because students are not the only entities that use paper on campus. Also just looking at printed paper is difficult because the school computers don't monitor whether a print is single sided or double sided so some of the numbers we needed had to be collected manually. These numbers came from our 1 week study where we collected paper from designated areas to see how much paper was usable single sided and get an idea of how much people were printing single sided instead of double. A survey was also sent out to better understand the paper use behaviors of staff and faculty on campus.

#### **I. Community:**

Not much research has been done previously on the paper waste at Humboldt State except for three projects. All three of these projects look at concerns of what paper consumption is doing to the environment and ways to address them. The first project was conducted by the Purchasing Group Recycled Paper Project in 1999. They chose to look at products that are bought that have harmful effects on the environment and focused on paper. They were concerned with the type of paper that was being used and the harm that this choice created in the environment. Their main goal was to convert the campus's purchasing of paper to 50% or more post consumer waste paper in hopes to reduce harmful impacts to the environment. This project had to understand who had purchasing power on campus, as well as understanding the purchasing policies for the school to ensure that changing to environmentally friendly paper did

not breach any policies. In their study they tested both 50% and 100% PCW (Post Consumer Waste) in offices to see if there were any malfunctions. Since recycled paper consists of old paper broken down, the heat from some printers can cause the PCW paper to warp and cause paper jams when it is printed on twice in a row, as it is when it is printed double sided. These malfunctions are important to identify in the early stages so as to not create further waste and problems through the changeover. The project focused more on the environmental aspect of changing the type of paper used to be more environmentally friendly, than the actual behavior change of getting people to be aware of their printing to develop more appropriate printing habits. Other project succeeding this one focused on behavior and defined what would be considered greater habits.

In 2002 the Student Waste reduction project continued on where the 1999 project left off on education of consumption. This project was conducted by a single student known as Luara Hauser where she estimated that students were roughly consuming over 200 sheets of paper each, per year. The project consisted on an indirect approach to solving the paper waste issue by educating students. They created signs for various labs around campus as a means to encourage double sided printing and discourage against frivolous use. As paper waste continued to be a problem due to the unlimited free printing on campus further measures were thought to be needed. In the following year, 2003, the project group Paperwork, tried to figure out a means to effectively reduce paper waste by putting a cap on printing. Since there was unlimited printing people had no real incentives to conserve paper. The solution was to use computer software that would limit student prints however the software proved too costly. It would have cost each printer \$400 to install. However later HSU enacted a new policy known as pay for print as a means to reduce the university's expenses on paper and encourage less frivolous use.

## II. Projects at other Universities:

The Association for the Advancement of Sustainability in Higher Education (AASHE) provides a forum for Universities to share projects and ideas to help achieve sustainability. They post case studies of programs and policies that have been implemented at various campuses and also provide informational material to help guide universities who are trying to reduce their ecological footprint. After searching their database, it became apparent that the vast majority of paper related projects had to do with switching from virgin paper to PCW paper. One exception was a project at St. Edwards University where they tried to reduce paper consumption, primarily through updating their human resources records to a digital system. This project cost \$22,000 upfront and \$1,000 monthly to maintain so it would not be feasible to find funding for a similar project at HSU within the timeframe for this class. One other AASHE document was particularly relevant to our project and that was "Paper Steps on Campus", a PDF release with tips on improving your school's paper policies. This guide has advice ranging from buying appropriate paper to implementing recycling programs and specific tips to reduce paper consumption such as attaching a signature stamp on all university e-mails reading "Before printing this e-mail, assess if it is really needed". Searching AASHE has given us ideas and a starting point for brainstorming project goals and solutions but it has also shown that reducing paper consumption is a largely untapped area of potential environmental improvements in Universities across the United States.

### HSU Information Technology Services (ITS):

In order to get a better idea of systems currently in place and feasibility of any potential project ideas, we had a meeting with Laurie Takao from the ITS department. She told us that the reason there is no data on single sided printing versus double sided printing is that the printers

are not physically capable of recording that data. This hardware limit is also the reason one double sided page is charged the same amount as two single sided pages in the pay-for-print program. There are few if any printers on the market with sensors that would indicate single sided or double sided printing and most of our campus printers are relatively new and won't be replaced in the near future. Almost all computer lab printers on campus are able to print double sided and the few small pockets of campus without this capability should be upgraded soon. This means that it is possible to institute a campus wide policy to set all computer lab printers to print double sided as a default. This would mean that single sided printing is still possible but only if you intentionally choose that option in the print settings. There have been a few incidents where a technician has accidentally set lab computers to a double sided default, but ITS was informed they are not allowed to change the default without a public announcement of the policy change. ITS would like to make this default change but simply hasn't had the time to come up with the proposal. Takao discussed many ideas for paper waste reduction ranging from investing in software to make online assignments easier to education campaigns about printing options. This meeting made it very apparent that ITS is interested in reducing paper waste and that they are happy to be an ongoing resource throughout this project.

### **III. Legal impacts of paper recycling:**

#### *CA Laws on Recycling:*

CA Integrated Waste Management Act of 1989 (AB 939) established CA Integrated Waste Management Boards which promoted solid waste diversion. Integrated Waste Management Plans became a required document and a 50% waste diversion for each jurisdiction. In Humboldt County seven of the eight jurisdictions met or exceeded the 50% mandate (Humboldt Planning Commission). Another stepping stone in CA legislation is the Recycled

Newsprint Act (AB 1305). This act in 1989 set standards to newsprint consumers to use 25% recycled newsprint in publications and 50% by 2000. Today 50% of newsprint used by printers and publishers in CA must be 40% post consumer paper fiber according to Californians Against Waste.

Even with certain CA regulatory goals established about waste reduction and increase recycled use; there are still large holes to fill. A 2010 study with collaboration between Humboldt Waste Management Authority (HWMA), Trinidad Rancheria, Blue Lake Rancheria, and Humboldt State University (HSU) created a baseline for diversion of waste and identified what materials could be diverted (CASCADIA, 2012). The study looked at 202 waste samples hand- sorted and 88 visual construction/ demolition debris samples. During the study period around 65,597 tons of waste was sorted into 90 types of standard material. Then they were sorted into five recoverability groups; recoverable paper, other recoverable, compostable/ potentially compostable, potentially recoverable and problem materials. The results found that 60% of waste by the commercial sector (looking at Arcata, Blue Lake, Eureka, Ferndale, Rio Dell, Trinidad, and unincorporated areas) is recoverable. This broke down to compostable/ potentially compostable items like food, yard waste and compostable paper made up 37% (6,356 tons) of the waste in that commercial sector. The study then noted recoverable paper (cardboard, "other office paper", newspaper, and "other recyclable paper") makes up 13% or 2,322 tons of disposed waste (CASCADIA, 2012). Breaking down waste by season Arcata's Commercial sector (2011) Recoverable paper was 12.9% with waste composition of 20.5%. Compared to Arcata's winter recoverable paper use when students are back in school to 13.7% and waste composition for paper is 24.7%. Even though these numbers may imply a small increase in paper use during a school year, a reduction in use would still help HSU. In turn, H.S.U could show what Arcata and



Humboldt could do to increase waste diversion efficiency.

#### **IV. Environmental Recycling Impacts:**

The University now uses 100% post-consumer waste paper (pcw) as a result of the efforts of the Purchasing Group Recycled Paper Project in 1999. This switch in paper choice is supposed to cut down impacts made on the environment. According to a web site on one of HSU's servers this choice in paper shows a direct annual savings. These savings include over 1,200 trees, 349,000 gallons of water wasted, 3,000lbs of air pollution, 215 cu. yards of landfill space and 204,000 kilowatt hours of electricity. Now 100% pcw paper as defined in a 1995 research paper by Paper Task Force, states it as, "products or other materials generated by a business or consumer that have served their intended end uses, and that have been recovered or otherwise diverted from the solid waste stream for the purpose of recycling." So in the lifecycle of paper starts at forests, gets manufactured, then sold to people for various uses like notebooks or newspapers and then gets taken to the recovery station where it is recycled and used again.

However, it is important to remember that just because a product is recycled it doesn't mean that it has no external impacts on the environment. It is true that recycling cuts down environmental impacts, but doesn't eliminate them, so irresponsible use of recycled paper can still have substantial impact on the environment. Before getting into detail of what those impacts might be, it is important to understand the recycling process and what goes into it. The information for which the process was reviewed from was done by multiple scientist and engineers who compiled a fact sheet for, The Leading Technical Association for the Worldwide Pulp, Paper and Converting Industry (TAPP) in 2001.

The first step in the paper recycling process is sorting. Much sorting does not have to be done at home anymore because more cities are combining all of their recycling to be sorted by

high level technology that can sort plastic, paper, and glass, so much of that burden is removed from consumers. After all the recycled goods are sorted, the paper gets bundled up and then transported to a paper mill for processing. At this point it is important to remember that not all paper can be recycled; there is some that is considered contaminated so it must be composted, burned for energy, or put in the landfill. At the mill, the paper is stored until needed and separated by paper type, because there is a fine balance between what can be combined for the various classes of recycled paper. When needed the paper is then moved by conveyor to a big vat called a pulper; which contains water and chemicals. This pulper chops the recovered paper into pieces and then heats it to break it down into a mushy mixture called pulp. The mushy mixture is then thrown in a cylinder where it is cleaned of any foreign material that may have gotten mixed in like staples and such. Sometimes the next step is deinking (de-inking) to undergo pulp laundering. This process removes printing ink and sticky glue residue. The pulp is pushed through a huge vat where air and soap like chemicals are injected into the pulp. The sticky residue collects in bubbles and rises up into the air out of the tub. The ink collects into bubbles on the surface of the mixture where it gets removed to reveal clean pulp. Under normal circumstances the next step would be refining, bleaching and color stripping, however 100% pcw paper doesn't undergo a bleaching process to limit the amount of chemicals used in production, although it does undergo refining in order to make the pulp ready for the remaking of the final product. The third from last step in this process is making the sheets of paper. This process uses 99.5% water with .5% being that of chemicals. When the pulp feeds onto the screen and drains from the pulp, the recycled fibers quickly begin to bond where they go through a roller to remove any excesses water. The final process before being packaged and shipped out is the final stage of paper making. This is the heating and ironing of the paper to make it like new

again.

With a better understanding of the process of recycling paper, we can now discuss some of the impacts to the environment that have been identified. These impacts have been identified by a feasibility study on virgin, 30%, and 100% pcw paper in 2008 from the University of British Columbia. This study revealed that 100% pcw paper lifecycle uses a total of 44 million BTU's of energy which is mostly from the heating process of production. Greenhouse gas emissions include 3,582lbs of CO2 equiv. and a water waste of 10,325 gallons. This study concluded with a solid waste of 1,155 pounds. When compared to virgin paper these number showed a significant difference, however just because a number is smaller, it doesn't mean that it can or should be ignored because these processes are still impacting the environment. So it is important to use paper to its maximum use to limit the waste of increased production. It is more important to avoid a problem if it is possible then try to figure out how to fix it later.

### **Goals**

Our goal is to reduce the amount of paper waste on campus by taking steps towards cradle to cradle mentality. This means keeping the paper on campus until the paper has been fully used. By using both sides of the paper and shredding it to make it into new paper, it will reduce the cost of getting new clean paper and reduce the emissions of trucking the recycling and waste. Our other goal is to bring awareness of the paper waste that happens on campus. By bringing the issue of paper waste to the forefront of people's minds, it will make them think about their actions.

### **Objectives**

By spring 2013 we want HSU to have programs set up to begin to reduce paper use by a quarter in one semester. We will do this by having a watermark come up every time someone wants to print. The watermark will state a fact about paper that will make people think about if what they are printing is really worth the paper. This will have to be approved by ITS and will continue until they no longer want to use them.

Our other objective is to divert the paper waste to groups on campus that would put the single sided paper to use. One group on campus we have been in contact with is R.O.S.E and they would be using the single sided paper to make notebooks. These notebooks would then be open for student purchase to help fund other R.O.S.E programs. Another area of campus that would use this paper is the Math Lab. The single sided paper in this case is used as scratch paper for math problems. Once both sides of the paper has been used, C.C.A.T would use the double sided paper to make into new paper. Clearly there is a demand for single sided paper on campus which shows this waste diversion is needed.

### **Alternatives**

#### ***Alter the pay scale for Pay-For-Print***

The current Pay-For-Print system charges the same price for two single sided pages as it does for one double sided page. We would like to change the pay scale so a double-sided page would be cheaper than two single-sided pages. After meeting with ITS staff, we concluded that this is not a feasible alternative. The printers we have on campus do not have the sensors required to differentiate between single and double sided printing and therefore we would not be able to implement a software change that would make this alternative possible.

#### ***Implement an official campus policy in favor of double-sided printing***

Many professors do not accept assignments printed double sided because they consider it unprofessional. We would like to have an official campus policy stating that HSU supports double sided printing and encouraging professors to accept double sided assignments whenever possible. In order to bring this idea to fruition, we would work with Associated Students to pass a resolution.

***Make all computer labs default to double sided printing***

All computers in computer labs on campus are set with single sided printing as the default. If you want to print double sided, you have to go in to the print setup and choose the double sided option. If we changed the default, printing would automatically be double sided. Single sided printing would still be possible but only if the person intentionally chose to print single sided through the print setup options. ITS would like to implement this change. The only reason they have not done it yet is that it requires a formal policy change. The ITS staff member we spoke to said that she would love if we wrote a proposal explaining the policy change and giving supporting information explaining why this change would be beneficial. If we provide ITS with a proposal, they will pursue the policy change and would likely have the defaults set to print double sided within a year.

***Collect single sided paper and redistribute in notebooks***

When people print on one side of a piece of paper and then decide they don't want or need it, they frequently throw it in the recycling bin. If we collect this single sided paper we could use the blank side, reducing our use of fresh unused paper. We would like to try a pilot program to collect this type of paper from offices and computer labs on campus. We would give the paper to people who would use it as scratch paper or for taking notes.

***Collect single sided paper and use for printing on the blank side***

For the same reasons listed in the previous alternative, we would like to reuse single sided paper. One idea was to have designated printers that are loaded with single sided used paper. When someone wants to print flyers or any document that would be acceptable on the backside of used paper, they would be able to use these designated printers. After meeting with ITS, we determined that this is not a feasible alternative. Once a page has been printed on it is not quite as flat as fresh paper and it tends to jam printers when printed on for the second time.

#### ***Give educational presentations***

Some people don't think about the impacts of their paper use choices or don't know how to change the print settings to print double sided. We could give presentations in classes or at stakeholder meetings to encourage waste reducing behaviors like printing double sided or reusing single sided paper as scratch paper. These presentations could raise awareness and teach people how to change printer settings to reduce paper consumption.

### **Implementation Strategies**

We have a two prong approach to implementing a solution to our problem. First, based on our paper study and survey results we will conduct a *pilot program*. The second approach is through *policy* to change behavior. This will entail approaching Information Technology Services (ITS) department with a paper printing proposal. Our strategies are to target reducing and reusing before recycling while showing the environmental and economical benefits.

#### ***Collect single sided paper and redistribute to groups that have a need***

When people print on one side of a piece of paper and then decide they don't want or need it, they frequently throw it in the recycling bin. If we collect this single sided paper we could use the blank side, reducing our use of fresh unused paper. We conducted a pilot program

to collect this type of paper from offices and computer labs on campus. This would mean different bins for clean non- sensitive single sided paper. Then we gave the paper to people who would use it as scratch paper or for taking notes. We have given presentations to the Math Lab, WRRAP/ ROSE, and CCATT. We have support from the Math Lab and ROSE who is willing to collect the paper from the bins in the Library. The Math lab will use the paper for Math tutoring and ROSE hopes to use the paper for notebook workshops. ROSE is looking into setting up a permanent notebook making station in their office. CCATT has taken a passive stance that they will use single sided paper for their own printing needs. Whereas WRRAP as a whole has not given us a firm decision on where they stand. Our strategies are aimed for this project to continue beyond this semester by working with interested parties to divert the waste for projects that in turn reduces paper use.

#### *Changing the computer labs default to double sided printing*

All computers in computer labs on campus are set with single sided printing as the default. If you want to print double sided, you have to go in to the print setup and choose the double sided option. If we changed the default, printing would automatically be double sided. Single sided printing would still be possible but only if the person intentionally chose to print single sided through the print setup options. ITS would like to implement this change. The only reason they have not done it yet is that it requires a formal policy change. The ITS member we spoke to, Laurie Takao, said that she would accept a written proposal explaining the policy change and give supporting information explaining why this change would be beneficial. Our proposal provides ITS with preliminary data that they will pursue the policy change and would likely have the defaults set to print double sided within a year.

#### **D) Study:**

*Purpose:* The study looked at how much usable paper was being put into recycling bins by seeing how much was single sided and double sided paper. Since the University consumes massive amounts of paper on a collective scale, it was important to account for that for this study, which means incorporating not only student labs, but offices and departments as well. By identifying how much single sided, usable paper is being recycled we can better understand how much can be diverted. Diverting paper can potentially save a fresh piece of paper that would have otherwise been used if not for the scratch piece, which is the ultimate purpose of this project.

*Hypothesis:* We looked in various recycling bins to get an idea of what was in them before the start of the study. Based on those scans, we hypothesized that there would be a larger percentage of paper that could still be used and by doing so save resources in the process. From that we determined that there would be enough single sided paper to eventually divert.

*Site:* For purposes of this study our sample sites included Siemens Hall and 2 library computer labs. The labs from the library were labs 121 and 122. Other bins that were in the library were not incorporated into the study so as to maintain an even sample size between students and other members on campus. Siemens Hall collections included 5 faculty offices, 2 departments and the 2 computer labs. The office paper bins that are in the hallway of Siemens Hall on the first and second floor were included as well because many of the offices use them. These sample locations were chosen based on their high levels of use.

*Procedure:* The study was conducted over a one week time frame. At the start of the week, all bins that were to be included in the study were emptied so as to not have anything skew our data. We then collected paper from all of the computer labs in both Siemens Hall and the library every day at 3:30. The faculty and staff offices were collected every few days at the same time as



they didn't accumulate as rapidly. Morgan King from Plant Ops supplied us with bins where we stored our paper from each collection day during that one week.

After all paper was collected, it was sorted into like categories. We came up with some paper definitions and standards for paper so that the sorting process was more accurate (Appendix 3). The paper was sorted into four categories: single sided, double sided, other and trash. Paper in the single sided category is accepted if it is clean, non-ripped/torn paper that is 8 ½" by 11". This includes lightly folded sheets and glossy paper. Double sided is accepted if it has markings on both sides of the paper, 8 ½" by 11", non-ripped/torn, and lightly folded. Other is accepted if it does not fit in the other two categories. Some examples of paper found in this category include binder dividers, magazines, cardboard, paper bags, phonebooks and other items that fit under that. The last category was trash. Pieces that were not identified by the top 3 are considered under this category. Which means, anything with food remnants, candy wrappers, or disposable coffee mugs. When sorting the paper all printed paper and notebook paper was included. However the paper was not separated between the two, so for purposes of this paper, we do not know how much of the printed paper was single sided. We just looked at the amount of usable paper.

A scale was then borrowed from plant ops to weigh the paper. With the trash that was thrown out, the other three categories were left to weigh. Once the paper was weighed, it was converted to sheets per lbs and turned into measurable data that could then be used to compare with our pilot that will be discussed in another section.

***Results:***

Over the course of one week 61.32lbs of paper being recycled. Of those 61.32lbs, 34.1lbs was determined other, 5.6lbs was double sided, and 22.6lbs was single sided paper. Knowing

that there are 5,000 sheets in 10 reams of paper that fit in a box and a box weighs 50lbs we could calculate how many sheets of paper was in fact being thrown out. Given this key we factored that 5.6 of double sided paper equaled 560 sheets and the 22.6lbs of single sided was the equivalent of 2,260 sheets.

Our results show only what we have determined usable paper that is being placed in the bins, so the actual percentage that is usable is projected to be much greater. This is identified to account for anything that may skew our collected data. Knowing this, we have determined that there is a lot of paper that is being wasted through the recycling process as we define wasted paper as paper that has a significant measurable use.

From what we have defined to count, 1,700 more sheets of single sided paper were collected then double. Our hypothesis was true which means that many resources have been wasted through the lack of use of usable paper. This refers to the possible trade of using scratch paper instead of a fresh new piece. Given that paper can only be recycled 5 to 7 times before its quality is too low to reuse, the full use of its life is important and represent the overall purpose of this project. From this determination there is a great need to divert paper to places that could use it. We also discovered during the study that there were places on campus that need usable paper which gave us a starting point for our pilot to take flight.

## **II) Survey**

Very little data exists about HSU's paper consumption. We were not able to find any information whatsoever about how much paper is used in staff and faculty offices. What data does exist about the paper we throw away is lumped into one large 'recycling' category which also includes every other category of recycling including cans and glass so it is essentially useless in answering questions about paper consumption behaviors. Because no data exists, we

decided to find our own data by sending out a survey to offices on campus. The complete survey with survey responses can be found in appendix LETTER.

We hoped to use this survey to estimate how much paper is used on campus but what we got was an idea of just how difficult it is to estimate that number. Each department purchases their own paper and often lumps them into general office supply expenses, keeping no specific record of paper purchases. To complicate matters further, some offices don't purchase their own paper but instead get it from a stockroom that supplies multiple departments. Determining a list of who buys paper and who to send the survey to for the most accurate results is practically impossible. We decided that because compiling a list of paper purchasers was such a monumental task, we would simply send the survey to every office and include questions such as "Who is responsible for ordering paper for your office?" to help us pick out which departments share paper. As it turned out, even finding a list of all departments was a monumental task. After asking around to people in Plant Ops and Human Resources, we found that no master list exists of contact information for departments on campus. There is a list of all departments on campus on the budget website but sometimes single office is listed as multiple departments in this list so it is difficult to determine even how many departments there are. Luckily there is at least a clear list of academic departments. We took these lists and looked up each department's contact information individually. For many of the departments we were unable to find contact information. Ultimately we sent the survey to all of the 38 academic departments and 61 of the estimated 160 non-academic departments.

We chose to separate the Academic offices from the Non-Academic offices in our results because of their different focuses and possible differences in printing behaviors. Academic offices print all the readings, tests, worksheets, and syllabi that professors hand out to students

while non-academic offices primarily printing is centered around business such as hard copies of e-mails or paperwork.

Of the 61 non-academic offices we e-mailed the survey to, 28 responded and of the 38 academic offices we sent it to, 15 responded. 14 of 15 academic offices, or 93% order their own paper while 24 out of 28 non-academic offices do making 86%. This confirmed what we suspected about the complexity of determining how much paper is used on campus. When asked if their department has records of paper use over the last year, in total, academic and non-academic departments had 12 offices say that yes, they did keep records, 13 said they did not, 11 said they had some records but they were incomplete, and 7 participants skipped this question. This shows a fairly even distribution of those who do and do not keep records of paper use. When asked how many reams of paper (1 ream = 500 sheets of paper) were used in a year we got answers ranging from 1 ream to 1889 reams. On average, academic departments used 174 reams and non-academic departments used 157. This shows that academic and non-academic departments use comparable amounts of paper but looking at the individual data (which can be seen in appendix \*) shows that there is large variation between departments. This large variation means that there is room for improvement and there is potential for the high paper consuming offices to save paper and the low consuming offices could have ideas about how to conserve paper. When we asked about the primary uses of the department's printing, our expectations were confirmed, the academic departments frequently listed class handouts and the non-academic offices reported forms, e-mails and memos most frequently. This is useful for any future project that aims to reduce paper consumption as it shows that these offices would need to be targeted differently. For example, an academic office would need professor to post things on moodle instead of giving handouts while a non-academic office would need to implement

paperless systems that would replace forms and memos. When asked if their printers were capable of double sided printing, a total of 17 offices said yes while only 3 said no and 11 said that some do and some don't (12 participants did not answer). This is good as it shows that we mostly have double sided printing available to employees. When asked if the computers were set to print double sided as a default 4 said yes, 9 said no, 7 did not know, 6 said other, and 13 did not answer. Most of the "other" responses indicated that each person was free to change their own default settings so duplex printing settings varied throughout the office. This shows that there is significant room for improvement in encouraging offices and individual employees to change their defaults.

### **III) Pilot Study:**

*Purpose:* The Pilot program looks at changes in printing behavior, and waste generation. This is done by reusing the paper that would have normally been recycled therefore saving new paper from being used. We want to see if marked bins for clean single sided paper for reuse on campus before recycling would be adopted.

*Hypothesis:* The goal is to see if the new bins will be able to raise the double sided printing recycling to greater than the current 20% of clean 8 1/2" by 11" paper collected defined by our original study. This program is also intended to increase awareness of reducing paper waste.

*Site:* Library and Siemens Hall

Just like the study program we have chosen to use the Library labs because they are the most used labs on campus (identified by ITS).

*Procedure:*

We will collect paper that is single sided computer, or binder paper that is lightly used (for specific details see the original study for guidelines). Just like the study the program entails: collecting, sorting and weighing the paper to determine how many clean sheets are recycled. This will judge if our new bins helped reduce single sided paper put into recycling bins. For sensitive documents the traditional recycle bins will still be available.

On Friday 16th our group handed out single sided recycle trays to six offices within Sieman's Hall. Three of those offices told us that they have their own systems to deal with single sided paper. This action marked the beginning to our pilot program. The bins were reused bins themselves from the ROSE office and when full will be distributed to groups that have a use for them. Then on Monday 26th the four student labs that were in the study gained a single sided bin with proper signs. Starting on Thursday November 30th we began collecting the recycling once again to compare the results to our late October study without single sided paper diversion bins.

**Results:**

At first the new bins had small success but throughout the week added clarity came from increase signs.

**Key:**

5lbs= 1 ream 500

sheets=1 ream

100 sheets= 1lbs

**Labs:**

1.5lbs single= 880 sheets 59.5%

7.1 pounds of other,

4lbs double, =600 sheets 40.5%

Total sheets of paper: 1480

**Office:**

6.1 pounds of Single Sided paper = 610 sheets 60.4%

4 lbs. of Double Sided Paper = 400 sheets 39.6%

Total sheets of paper: 1010

26.7 pounds of other paper recycling

**Total Pilot Study Results:** lab and Office is 2490 sheets of paper

Single: 1490 sheets = 59.8%

Double: 1000 sheets = 40.2%

**Compared to the Study** (without singled bins)

Single sided 22.6 lbs or 2260 sheets 80.1%

Double sided paper was 5.6 lbs or 560 sheets 19.9%

other: 34.1 lbs

**In conclusion** our results are based on only a two week glance; however some comparison can be made between the study and pilot studies results. Our marketing campaign as well as our newly placed bins has influenced the decrease of single sided sheets found in the recycle bins. A reduction of 20.3% could have been coincidence however, this substantial number we like to believe is in part as a result of our campaign.

**Marketing Campaign:**

We tabled during the "Spooky Science" event on Halloween to show the public the process to recycle paper. Our goal was to demonstrate how water intensive the process is after placing paper into the recycling bin. This was not as successful as we had hoped due to weather and lack publicity for the event. Then we created six different posters that were placed in the labs

as well as displayed in ITS's case in Gist Hall. Also posters were placed in the Provost and Vice President of Academic Affairs's bulletin board. We also self advocated through going door to door in Sieman hall explaining our project to participating offices as well as any interested groups.

#### **IV) HSU Duplex Printing Proposal**

##### **Background:**

As HSU approaches 100 years of education, paper use has decreased considerably over time due to positive implemented policies. For example before the "pay for only what you print" program went into effect the labs were printing 2,637,137 pages of paper in fall 2008-2009. After the "pay for only what you print" program was set up in fall 2010, paper consumption on campus dropped to 1,900,696 pages. Then in fall of 2010-2011 paper used by students dropped to 957,543 sheets of paper (Mann, 2012). This dramatic decrease was a great achievement in reducing paper waste. Yet there are still efficiency improvements to be made.

A group of students conducted a week long study to determine how much double sided and single sided paper was recycled. The study was conducted in the library computer labs 121/122, Sieman's Hall labs 118/119 and eight participating offices. The result showed that of clean 8 ½" x 11" papers, 22.6 lbs or 2,260 sheets of single sided paper and 5.6 lbs or 560 sheets of double sided paper were recycled. Therefore, only 20% of the defined clean 8 ½ "by 11" paper (Appendix 1) was double sided, yet the labs in the study all had double sided printing available. Currently only printers in HGH 115, JH 212 and LIB 21 labs do not have double sided printing available, but there are plans to upgrade these printers within the next 16 months (Takao, 2012). The rest of the Labs that ITS operates have double side printing as an option and single sided printing as the default.

##### **Solution:**



In order to reduce the use of resource costs and energy needed to recycle paper, we have two solutions. First we should set all computer labs to print duplex as the default. Single sided printing would still be available but only if you manually change the settings before printing. This would lead to more double-sided and less single-sided printing, reducing total paper consumption. Our second solution involves the on screen pop-up when a print job is selected. Currently, this pop-up displays a balance due along with how much is left on the account. We would like to include facts about paper and printing to remind users of the impacts of their actions and reduce wasteful printing jobs. Below is an example of what a pop-up may say.

#### **HSU Paper Fact #1**

“It takes 3 gallons of water to make 1 sheet of paper”

Do you still want to print this job?”

#### **Savings:**

If we can reduce the single sided paper printing we would save:

Currently the study has shown the recycling collected is 80% single sided and 20% double sided paper sheets. This result is 861,788.7 total paper sheets printed in 2010/ 2011. This also meant that 1,723,577.4 gallons of water was use to create the paper (Appendix 2A)

If there is an increase of double sided printing placed in the recycling bin to 50% double sided and 50% single sided paper sheets then there would be a savings of 287.26 reams or \$1,206.50 per year. This also saves 430894.35 gallons of water per year that would have gone to making the paper (Appendix 2B).

If printing habits changed to be 80% double sided and 20% single sided paper sheets than HSU would save 574.53 reams or \$2,413.03 per year. Also this means that 861788.7 gallons of water would be saved (Appendix 2C).

Our study took place on the week of October 22nd 2012.

We collected a total of 61.3 lbs, 5.6 lbs double sided, 22.6 lbs single sided and 34.1 lbs of "other".

We define single sided paper as non-ripped/ or torn paper that is 8 1/2" by 11" including folded or glossy paper. Blank pages that are lightly folded also count as single sided paper.

We define double sided as paper that has some markings on both sides of the paper. The paper also have to be non-ripped/ or torn paper that is 8 1/2" by 11" including folded paper.

We define "other" as an object that does not qualify as single or double sided categories.

## **Appendix 2**

Sheets of toner is defined as sheets of printed text this is different than paper sheets.

Paper sheets can be printed on both sides and still counted as one piece of paper whereas a double sided paper sheet counts as two sheets of toner.

### **Appendix 2-A**

Pay for only what you print gave us 957,543 sheets of toner printed in 2010/ 2011. Using our week study results that included four labs and eight offices, 20% was double side paper sheets and 80% single sided paper sheets. This comes to 191,508.6 double sided and 766,034.4 single sided toner sheets. This translates to 95,754.3 double sided paper sheets and 766,034.4 single side paper (because single side paper and single side toner sheet are the same). The total is 861,788.7 paper sheets printed in the year. Then the use of this paper resulted in 1723577.4 gallons of water to make the paper.

### **Appendix 2-B**

From this result a 50-50 percentage is 478,771.5 single toner sheets and 478,771.5 double sided toner sheets. This translates to 239,385.75 double sided paper sheets and 478,771.5 single sided sheets. The total is 718,157.25 paper sheets per year and a saving of 143631.45 paper sheets for one year. This comes to 287.26 reams or a savings of \$1,206.50 per year. [\$42/ carton (10 reams) = \$4.20/ ream which is 500 paper sheets per ream]. This would save 430894.35 gallons of water per year.

### **Appendix 2-C**

If the percentage is 80% double and 20% single, and then there would be 766,034.4 double sided and 191508.6 single side toner sheets. This translates to 383017.2 double sided and 191508.6 single sided paper sheets. The total comes to 574,525.8 paper sheets. The increase of double sided printing will bring a savings of 287262.9 paper sheets (574.53 reams) or \$2,413.03 per year. Also 861788.7 gallons of water would be saved (roughly it takes 3 gallons of water to make 1 sheet of paper, Water Footprint Corporate, 2012).

### **Appendix 3**

#### **Paper Study Definitions:**

Both printer and binder paper was included for this project.

#### **Single Sided Paper:**

We accept single sided paper as non ripped/torn paper that is 8 1/2" by 11". This includes lightly folded paper, none wrinkled, and glossy. Blank side must have no marks to be accepted.

#### **Double Sided Paper:**

We accept double sided paper as non ripped/torn paper that is 8 1/2" by 11". This includes lightly folded paper, none wrinkled, and glossy paper. Although markings on both sides are included those with stains go in the other category.

**Other:**

We accept paper under this category if it does not fit in either single or double sided categories. This includes paper that is heavily wrinkled, stained, has water damage, and markings. Markings is defined as any kind of stains, dirt, ink smudges.

**List of paper found as other:**

- binder dividers
- paper
- candy boxes (Dots)
- flashcards
- book
- phonebook
- paper bags,
- postcards,
- tickets,
- magazines,
- folder paper cutting edges (odd sided cut)
- rip out  
pages from a book
- cardboard
- sticky notes
- business cards
- packing paper

**Trash:**

Items in this category includes non paper materials or dirty wet paper.

List of items found:

- one piece of paper that had gum on it
- paper coffee mugs
- candy wrappers
- plastic wrap

#### Appendix 4

#### Survey Results

Non-Academic Departments: 28 started survey, 19 finished survey

1. Does your department order its own paper?

Yes: 24

No: 4

2. If no, who is responsible for ordering paper for your office?

- Academic Programs
- Kathryn Blaisdell- Office of Admissions
- Kathryn Blaisdell in Admissions & Records Office
- Contracts and Procurement

3. Do you have records of your department's paper use over the last year?

- Yes: 7
- No: 9
- Some records exist but they are incomplete: 8
- Number of participant that did not answer this question: 4

4. How many reams of paper does your department use in a year? (1 ream = 500 sheets)

- We keep record and this is how many reams we use in a year
  - 4

- 32
- 311
- 41
- 20
- 150
- 25
- 40
- 1889
- We do not keep record and this is an educated guess of how many reams we use in a year
  - 15
  - 24
  - 15
  - 30
  - 20
  - 20
  - 180
  - 40
  - 180
  - 150
  - 100
  - 5
- Number of participant that did not answer this question: 7

5. What printers are supplied with the paper your department buys?

- Responses:
  - None
  - lanier copier
  - None, we do not buy paper
  - 3 departmental printers
  - ALL
  - Laser Printers, and Copier
  - A network printer and color printer in the main office, several personal faculty printers, and a student-use printer in a small majors lab.
  - Photocopier; HP printer, small deskjet printer, fax machine
  - brother printer/fax intel2820
  - lanier
  - Several staff have individual printers (HPs), and there is a main printer/copier shared by the group (Konica Minolta C280)
  - don't understand the question
  - many

- All office laser printers and copier in Office of Distance and Extended Education
- All
- 2 office copy machines
- Main Office Lanier and 4 individual offices
- 4 HP Printers
- HP 1500 Laser HP 820 inkjet color
- Number of participant that did not answer this question: 9

6. What are the primary uses of your printing? (i.e. printing mostly handouts for classes, hard copies of e-mails, forms, memos, etc.)

- Responses:
  - hard copies of e-mails, forms, memos, etc.
  - printing mostly handouts for classes, hard copies of e-mails, forms, memos, etc
  - Forms, emails, memos,
  - Forms, reports,
  - e-mail hard copies, agreements, forms, memos etc.
  - mostly handouts and fliers
  - Notes, Tests, Forms, etc.
  - Class assignments, syllabi, exams, faculty research materials, office records, and office forms, like major contracts.
  - agendas, minutes, documents for meetings; memos; letters
  - Copies for Office Forms Copies for Clubs Copies of receipts Printing flyers
  - Documents
  - Letters, reports, call sheets, forms
  - don't know
  - Instructions, chart copies requested by students, invoices.
  - Forms, class handouts, printer proofs, student documents, instructor documents, flyers, posters, brochures, etc.
  - Handouts, hard copies of important documents
  - handouts and forms
  - Budget print-outs, AP & proc. docs, file copies after signature, other office docs
  - photo copies, reports, memos, letters
  - email, forms, budget spreadsheets, agendas, flyers, memos, travel itineraries and reservations, handouts for meetings
  - Occasional invoices, EH&S program copies, OSHA & EPA regulations
- Number of participant that did not answer this question: 7

7. Do your printing devices print double-sided?

- Yes: 11
- No: 2

- Some do some don't: 7
- Number of participant that did not answer this question: 8

8. If yes, are computers in your office set to print double sided as a default?

- Yes: 4
- No: 10
- Don't know: 3
- Other (please specify): 2
  - Our printers are not capable of double-sided printing
  - Does not Apply
- Number of participant that did not answer this question: 9

9. Thank you for taking the time to complete our survey. If you have any questions about this survey or additional information you think would be helpful to us please feel free to enter it here or e-mail [HumboldtPaperUse@gmail.com](mailto:HumboldtPaperUse@gmail.com)

- [llb44@humboldt.edu](mailto:llb44@humboldt.edu)
- Denise Gentry in the Contracts & Procurement Office collects information about the usage of main office network printers/copiers on campus. Departments send to her on a quarterly basis copier counts for their main office printer, which I know for my three departments is the most used printer by far (many of my professors do have personal printers in their offices, but the main office network printer is much faster for large jobs, so that is the one that's used for printing exams, syllabi, etc.). Denise could give you one-stop information about the network copier/printer usage of most if not all departments on campus. She can be reached at [drg34@humboldt.edu](mailto:drg34@humboldt.edu) or 707-826-3303.
- We use our copier more than our printer, which allows double-sided printing which we use most often.
- We re-use outdated one-sided forms in many office printers.
- Our office went paperless in March 2012 so the number of reams that we will continue to use over the years will diminish drastically.

Academic Offices: 15 started survey, 11 finished survey

1. Does your department order its own paper?

Yes: 14

No: 1



2. If no, who is responsible for ordering paper for your office?

- Debra Ryerson, ASA
- ASC
- Contracts and Procurements (Denise Gentry) orders the paper used in the copy machine. The department orders a small amount of paper each year (color) for special use.

3. Do you have records of your department's paper use over the last year?

- Yes: 5
- No: 4
- Some records exist but they are incomplete: 3
- Number of participant that did not answer this question: 3

4. How many reams of paper does your department use in a year? (1 ream = 500 sheets)

- We keep record and this is how many reams we use in a year
  - 57
  - 50
- We do not keep record and this is an educated guess of how many reams we use in a year
  - 150
  - 70
  - 1
  - 200
  - 300
  - 150
  - 300
  - 15
- Number of participant that did not answer this question: 5

5. What printers are supplied with the paper your department buys?

- Responses:
  - LD151, HP4200, Xerox 8500
  - we have 5 8.5x11 type laser printers. We have 1 HP500 24"xroll printer. a fax machine and a copier.
  - 3
  - We have numerous printers in faculty offices and a Lanier 325 copier/printer.
  - Dept copier, 6 various office printers
  - HP printer in office, Lanier copier, individual printers in various staff offices.
  - HP Laser Jet Lanier LD 365
  - office copier and office printer for faculty use
  - Department Office.

- faculty printers, office printers/copier
- I am not sure.
- Number of participant that did not answer this question: 4

6. What are the primary uses of your printing? (i.e. printing mostly handouts for classes, hard copies of e-mails, forms, memos, etc.)

- Responses:
  - Exams, quizzes, handouts for classes
  - Students use one printer (lab printer): I use my laser printer to print Hard copies of emails, and student info for their files, as well as for articles on topics for student papers. and one printer is used for the resource center.
  - class materials, forms, flyers, brochures
  - I cannot answer for our many faculty unless I asked each one of them.
  - forms, handouts, tests
  - class handouts, programs and posters for theatre productions, hard copies of emails and memos, forms.
  - printing mostly handouts for classes, hard copies of e-mails, forms, memos
  - Printouts for classes is accounts for the vast majority of paper use. Copies of administrative forms, etc, for departmental files account for some use.
  - class handouts, forms, copies of forms
  - tests, handouts, forms, etc
  - exams, quizzes, student related docs (advisee lists, major/minor contracts, etc), budget and financial docs, certifications, scheduling information (courses, faculty, rooms, etc), seminar announcements, personnel documents, meeting docs, field trip docs.
- Number of participant that did not answer this question: 4

7. Do your printing devices print double-sided?

- Yes: 6
- No: 1
- Some do some don't: 4
- Number of participant that did not answer this question: 4

8. If yes, are computers in your office set to print double sided as a default?

- Yes: 0
- No: 7
- Don't know: 0
- Other (please specify): 4
  - The Lanier is not, and the one at my work station is not;
  - defaults set by individual users (faculty and staff)--DS default is encouraged.
  - some are, some are not. All have the option

Borromeo Charles, Tai Angie, Tsoi Opttie. A Feasibility Study on the Life Cycle of 30% and 100% Post Consumer Waste and Virgin Paper. The University of British Columbia Department of Chemical and Biological Engineering. (April 2008) [https://circle.ubc.ca/bitstream/handle/2429/28930/A\\_Feasibility\\_Study\\_on\\_the\\_Life\\_Cycle.pdf?sequence=1](https://circle.ubc.ca/bitstream/handle/2429/28930/A_Feasibility_Study_on_the_Life_Cycle.pdf?sequence=1)

Californians Against Waste, Conserving Resources. Preventing Pollution. Protecting the Environment. *California Recycling Laws*, Sacramento CA 2012, [http://www.cawrecycles.org/facts\\_and\\_stats/california\\_recycling\\_laws#ab1305](http://www.cawrecycles.org/facts_and_stats/california_recycling_laws#ab1305)

CASCADIA consulting group, Humboldt County Waste Characterization Report hwma, Seattle/San Jose [www.cascadiaconsulting.com](http://www.cascadiaconsulting.com) , study web site is: [http://www.hwma.net/sites/default/files/sara/FINAL\\_HWMA\\_waste%20characterization%20study1.pdf](http://www.hwma.net/sites/default/files/sara/FINAL_HWMA_waste%20characterization%20study1.pdf)

How is Paper Recycled. ©TAPPI. (2001) [http://www.tappi.org/paperu/all\\_about\\_paper/earth\\_answers/earthanswers\\_recycle.pdf](http://www.tappi.org/paperu/all_about_paper/earth_answers/earthanswers_recycle.pdf)

Humboldt Planning Commission, Humboldt County General Plan, Conservation and Open Space Co Planning Waste Management final edits 6-21. Doc. Section 10.5 Waste Management, Part 3 Chapter 10, <http://co.humboldt.ca.us/gpu/docs/20110623-waste-management.pdf>

Marketing & Communications. 100% Recycled Paper Policy: Benefits of Policy. Humboldt State. (2004-09) <http://www.humboldt.edu/paperpolicy/benefits.html>

Paper Life Cycle. ©GREENBLUE. (2011) <http://thepaperlifecycle.org/>

Paper Task Force. Economics of manufacturing Virgin and Recycled-Content Paper. (December 1995) [http://calculator.environmentalpaper.org/documents/1619\\_WP9.pdf](http://calculator.environmentalpaper.org/documents/1619_WP9.pdf)