### November 30th, 2021

# zerohero





# USFS GREENING FIRE INCIDENT RECYCLING REPORT

THE DIXIE FIRE EAST ZONE CA-BTU-009205





ZeroHero, INC fire@zerohero.org

Sophia Nielsen - Dixie Recycling Lead Michelle Mills - Support Lead Kelsey Brixon - Support Lead Jessica Lewis - Support Lead Facit Tarin - Manager Joe Contreras - Manager Doug Landers - Manager Bryan Birch - Field Director

## The Dixie Fire Quincy, California

#### Background

Lydia Moore-Ward, contracting officer for the Dixie fire incident contacted Bryan Birch, ZeroHero field director, to mobilize for the Dixie fire on July 22nd, 2021. Sophia Nielsen, the fire lead, Birch, and company mobilized and arrived at the incident site on July 23rd, 2021 at 1:00 PM.

The Dixie response effort was divided by East and West Zones during our 99 days providing waste diversion services. Due to this division, the exact personnel numbers came from logistics personnel and catering meal count, rather than the situation report. From July 23rd, 2021 to September 10th, 2021, there were 1,300 - 1,800 personnel

# **OVERVIEW OF INCIDENT**

Order Received: July 22nd, 2021 Team Arrival: July 23rd, 2021 at 13:00 Incident Management Team: IMT 1 CAL TEAM 2 Incident Commander: Mike Minton Average Daily Personnel: 981 people Total # of Spike Camps: 0 Military Camps: 1 Demobilized: October 30th, 2021 Total Waste Diverted: 156,874.65 lbs Published Date: November 30th, 2021

at the camp. After September 10th, the total personnel decreased to under 1,000. The military camp fluctuated between 300 and 600 personnel. The average number was 981 personnel. We provided waste diversion services to the East side camp, and one military camp.

This fire affected multiple counties in California, including Butte, Plumas, Lassen, Shasta, and Tehama county. It burned roughly 963,309 acres until it's containment.

The team demobilized on October 30th, 2021.

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# TRASH AND RECYCLING DIVERSION SUMMARY

## ZeroHero Operational Priorities: Observe, Understand, Implement, Execute, Document

At the Dixie fire incident, we were able to divert cardboard, plastic #1 bottles, aluminum cans, batteries, paper, used cooking oil, scrap metal, nonperishable foods, perishable foods and compost. The estimated total weight of materials diverted from landfill is 156,874.65 lbs.

By volume, the waste diversion at the Dixie Fire Incident was 30%. By weight, the waste diversion was approximately 23-43%, most accurately 31%.

This fluctuation in weight diversion percentages is due to Waste Management being unable to provide an exact weight of landfill waste. The EPA standards volume-to-metric conversion ranging from 56 lbs to 138 lbs per cubic yard of landfill. This results in a 23% to 43% diversion rate.

To achieve these approximations, our team lead Sophia Nielsen maintained daily communication with Waste Management dumpster drivers. With each dumpster taken, the driver reported the approximate fullness. Based on incident materials at the Dixie fire incident, we estimate a MSW rate of 138 lbs per cubic yard to be the maximum estimated weight.

## Dixie Fire Incident Diversion Summary

Material Type	Estimated Weight	
Cardboard	94,560 lbs	
Plastic #1 Bottles	5,107.44 lbs	
Aluminium Cans	491.62 lbs	
Batteries	8,656 lbs	
Paper	9,825 lbs	
Used Cooking Oil	13,040 lbs	
Scrap Metal	1,488 lbs	
Non-Perishable Foods	8,546.2 lbs	
Perishable Foods	10,480 lbs	
Compost	4,680 lbs	
TOTAL	156,874.65 lbs	

# DIVERSION SUMMARY CONTINUED



The total waste taken to landfill by volume was 3,696.75 cubic yards. The total recycling by volume was 1,573.04 cubic yards. The overall diversion by volume is roughly 30%.

Whereas the total landfill by weight is 510,137.7 lbs.

The total recycled by weight is 156,874.65 lbs.

Diversion by weight is 23%. It is likely that calculation is low without a more exact weight calculation. 31% is a more accurate representation of our total diversion.



Main Dixie transfer station in Engine lot





# EDUCATION & OUTREACH

Sophia Nielsen executed a comprehensive education strategy to ensure widespread waste diversion success at the Dixie fire.

Our team created a Public Transfer Station recycling center at the Engine Lot. This acted as a front-of-house sorting service. We handed blue bags to teams on their way out for sorting while on the job. On their way in, our team received bags and sorted recycling. This team presence encouraged waste diversion. We emphasized a friendly, customer service approach to encourage participation. We also assisted crew members without the bandwidth to maximize diversion themselves.

Nielsen regularly made a one minute or less announcement at the morning and evening briefings to crews. At the announcement, she would describe the impacts to local communities when personnel participate in the waste diversion program. The hope was to make a connection as to why the personnel were there in the first place, to serve said community. She provided updates on diversion rates and emphasized the positive impact on sorting waste to create local community resources.

Recycling messaging was posted around the camp, including in all porta-potties. Messaging included bite-size informative pieces that visually described the benefits of participating in the waste diversion efforts at the incident. This approach allowed us to reach everyone at the ICP without the interpersonal pressure of asking people to change their habits. The private

# MEET OUR TEAM LEAD,

# Sophia Nielsen

Sophia is the owner of WEgenerative, a sustainability consulting company. Her six years of professional experience in waste management and recycling program implementation makes her an invaluable member of the ZeroHero team. She provides an artful approach to visualize a better future for waste management.



Sophia Nielsen, and Rotary Club Members with their pup, picking up food donations.



# EDUCATION & OUTREACH CONTINUED

information allowed individuals to explore the benefits of the program on their own.

Custom signage was also created to provide information for specific recyclable items. The hope was that this signage would address specific needs of waste management, including:

- Keeping hazardous materials out of landfills, like Phos-Chek jugs, batteries, High-Def, and gas or oil containers.
- Encouragement to break down boxes to maximize recycling bin space.
- Detailed instructions to prevent stream contamination at sorting station.

We placed large color coded signs on dumpsters to maximize sorting and minimize contamination. We put other signs on boards throughout the ICP and distributed by managers. One was even put into the Incident Action Plan.

# Bite-Size Educational Bits for the Port-a-Potties

- Didn't finish your snack? Donate it!
- How 'bout them apples? Donate excess fruits to evacuees and evacuated animals.
- Sort your trash to turn waste into resources for the local community.
- Sort your recycling and donate money back to the local community.



Volunteers with the Grange raise funds by take returnables donated by the Fire



# COST SAVINGS AND BENEFITS

ZeroHero connected with the local community to support efforts serving those impacted throughout the county by the wildfire. Our efforts decreased the impact felt by the local community due to the spike in population (and thus, spike in waste), and provided additional resources when applicable.

## **Monetary Benefits**

By sorting trash dumpsters (entering a dumpster to pull out recyclable) they require less dumping. This practice minimizes the amount of dumpsters that need to be dumped, and maximizes cost efficiency.

At Dixie's East ICP, 3,696.75 cubic yards, or 198 dumpsters, went to landfills. Landfill dumpsters cost \$500/dumpster. The total cost for waste removal came out to roughly \$94,500.

#### **Cardboard Recycling Cost Savings Analysis**

Constructed cardboard boxes take up a significant amount of volume in landfill dumpsters. We diverted 94,560 lbs of cardboard at the Dixe fire. That's equivalent to 29,095, 24x24 inch cardboard boxes when each box weighs 3.25 lbs. 99 (24 x 24 inch) constructed cardboard boxes fit in a 30 yard roll-off.

Keep in mind that even mismanaged waste programs break down some cardboard, and fill boxes with trash which lowers this number. However, managed waste with a recycling program saves the government tens of thousands of dollars at large incidents.



Signage provided on all dumpsters to ensure no recyclables were sent to landfills.

## Cardboard Recycling Cost Savings Analysis

It cost **\$500** to haul one 30 yard landfill dumpster at the Dixie fire **29,095 boxes** were diverted from landfills at the Dixie fire X **\$5.05** (cost to haul one box in a 30 yard landfill roll off)

**\$146,930** in landfill hauling saved from the cardboard recycling program

# COST SAVINGS AND BENEFITS CONTINUED

We filled 42 recycling dumpsters at Dixie East's ICP containing 1,330 cubic yards of cardboard. It costs \$600 per dumpster. Overall, the Fire spent \$25,200 hauling recyclables.

Dixie was the first incident that contracted ZeroHero that met the BPA requirements for the government to pay for recycling hauling. The BPA specified that large incidents pay for their own recycling hauling so the recycling vendor can provide cost savings despite the government paying the hauling bill. The Dixie Fire is a perfect example of this. By dedicating more staff to manage and operate the program, and less time hauling cardboard, ZeroHero saved the government over \$121,730 in cardboard hauling fees, surpassing their actual cost of hauling. ZeroHero also hauled an estimated 322 yards of other recoverables, including food donations, batteries, compost, and plastic #1.

## **Additional Cost & Environmental Benefits**

Another cost benefit is cost avoided due to improper disposals. Though difficult to estimate, these costs are important to consider:

- Fines for landfilling potentially hazardous materials
- Additional hauling costs due to over full dumpsters
- Battery fines

Monitoring dumpsters for finable materials allowed the Dixie fire incident to avoid any additional fines. The daily communication between waste management and Nielsen ensured she addressed any issues and rectified them before they incurred a cost.



ZeroHero team member, Kelsey, with boxes pulled from landfill to break down and properly sort.

#### **Waste Diversion Cost Savings**

Actual Cost of Landfill Waste	\$94,560
Worst case hauling costs with improper cardboard recycling	\$241,430
Amount Saved	\$146,930
Actual cost of Recycling hauling	\$25,200
Cost difference between managed and mismanaged cardboard programs	\$121,730



# COST SAVINGS AND BENEFITS CONTINUED

Lastly, one of the biggest benefits is that waste diversion efforts of nonperishable goods allows us to support communities in crisis. Diverting these items from landfill bins not only saves money via hauling costs, but also via government crisis support costs.

# **Community Benefits**

At this fire, non-perishable food donations became a foundational component of our waste diversion practices. We redistributed nonperishable, uneaten food to evacuee support networks throughout the county. By recycling food into the community, we were able to benefit the following organizations:

**Community Action Network (CAN)**, Quincy California CAN is a food bank and support network that provides food for over 200 families a year. During the Dixie fire, CAN acted as a central hub of food distribution. They distributed food to multiple communities in crisis, including Greenville, Chester, Portola, Crescent Mills, and more.

**Plumas Crisis Intervention (PCIRC)**, Quincy, California We were able to provide food donations to this Women's Crisis Support Center.

**Rotary Club International**, Various Counties, California By partnering with Rotary Clubs, we were able to broaden our impact. These organizations distributed food to local schools, food drives, and more.



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# COST SAVINGS AND BENEFITS CONTINUED

#### Veterans Benefit BBQ, Quincy, California

This was one of our partnerships with CAN. We donated nearly 1,000 Ibs of frozen meat to this event. We also provide 500 lbs of additional food, making the total donation 1,500 lbs of food that would have went to landfills. The BBQ fed local veterans, including many who were house-less or evacuees.

#### **Evacuated Animals at the ICP Site**

Unwanted fresh produce was regularly fed to rescued animals on the site.

#### Paiute Native Tribe, Near Reno, Nevada

We were able to provide non-perishable items to members of this tribe.

Our team was also able to monetize recycling and donate it to two local organizations. The monetized materials were CRV Plastic #1 Bottles and Aluminum. This monetization benefited The Emily Jane Wilbanks Fund and the Grange Hall Evacuee Support Center.

#### The Emily Jane Wilbanks Fund

The Emily Jane Wilbanks Fund received \$2,383.97 in monetized recycling. Since 2001, the fund has granted over \$50,000 to young people in the Sierra Valley. This fund was founded by two wildfire



ZeroHero team member, Kimber, with food sorted for local organizations for donation.

# COST SAVINGS AND BENEFITS CONTINUED

workers, Sam "Woody" Wilbanks and Kim Wilbanks, on behalf of their daughter, Emily, who passed before she had a chance to attend college. The memorial fund lives on to give that opportunity to other young people.

#### **Grange Hall Evacuee Support Center**

We donated over \$500 in recycling to the Grange Hall Evacuee Support Center. This organization provides ongoing crisis support to the communities affected by the Dixie wildfire. Our donation paid for a year's worth of electricity for the center, and a cash fund for evacuees support effort. This includes food delivery donations and crisis support supplies.

Lastly, we donated used cooking oil from the ICP catering to a local individual who turns such waste into biodiesel.

# **Environmental Benefits**

As always, one of the biggest benefits of waste diversion is the environmental benefit of keeping waste from landfills. We are able to estimate that we diverted 156,874 lbs of materials from landfills, or 78.437 tons. Knowing this and using the EPA's WARM calculator, we're able to calculate that we diverted 270.45 metric tons of CO2E emissions. This is equivalent to keeping around 701 cars off the road for an entire month.

# WASTE DIVERSION CARBON IMPACT

78.437 tons

 $\times$  3.447965 ton CO2e

## 270.45 tons of CO2E emissions



# LESSONS LEARNED AND RECOMMENDATIONS FOR IMPROVEMENT

Given our expanded period of time at this incident, we were able to refine processes and put enact best practices. Our lessons learned and recommendations span from waste diversion efforts, community benefits, and safety best practices.

# **Waste Diversion Lessons and Recommendations**

A "dumpster outreach" program was the most effective way to engage the ICP community in waste diversion efforts. We hosted regular hours at the engine lot dumpsters between 6 AM and 1 PM during peak fire times, and adjusted with personnel fluctuations. This enabled our team to engage with nearly every engine crew and bag of waste. We utilized this as our educational "front of house". We provided blue bags to outgoing crews and answered waste diversion questions with incoming crews. We shared these hours during the morning meetings to help spread awareness.

Most engine crews were enthusiastic participants in the program. Focusing on the benefits provided to the community via waste diversion maximized the positive response. The widespread adoption was also likely due to the waste diversion team's helpful and assisted approach rather than instructional. Our team was also able to fix many waste issues before the waste went to dumpsters.



Waste Management driver, Pat, picking up a full container of flattened cardboard.

# LESSONS LEARNED AND RECOMMENDATIONS FOR IMPROVEMENT CONTINUED

We found that by resource recovering we can maximize landfill space by 10% to 100%. Approximately 50 to 100 crew meal boxes can fit inside a 35 yard dumpster if the boxes are not broken down. When boxes are broken down and loaded into a cardboard dumpster of the same size, 2,000 to 5,000 boxes fit in the same size dumpster.

Partnering with local organizations like the California Conservation Core (CC) was indispensable to the success of the waste diversion program. They continually went above and beyond their duties and contributed greatly to the waste diversion program. They utilized the availability of cardboard dumpsters responsibly and took it upon themselves to break down constructed boxes and sort improperly disposed of waste.

This efficient and widespread collaboration between waste management and waste diversion teams is integral to the success of both programs.

Lastly, we need to consider creating a diversion system that doesn't strain incident communities, but rather works within them and becomes a resource in and of itself

Example: Quincy is a town of 1,900 people. Three dumpster drivers service the whole town. An incident of this size produces 2-3x the amount of waste normally produced by the town. All three drivers were evacuated from their homes, and one lost their home. Providing communities like these with more comprehensive emergency waste diversion resources alleviates strain on the town and it's community members.





# LESSONS LEARNED AND RECOMMENDATIONS FOR IMPROVEMENT CONTINUED

## Make Waste Diversion a Community Benefit

Our strategy was to turn what could be considered waste into a resource that addressed community needs. By utilizing local support groups like CAN, Grange Evacuee Center, and Rotary Club International, we were able to maximize our waste diversion and re-allocation efforts. By partnering with these organizations, when resources outmatched waste diversion personnel, the organizations could provide volunteers to make the most out of would be waste.

This waste diversion effort also included providing fresh produce to the evacuated animals team to feed hungry goats, pigs, horses, and chickens. We recommend framing food donation signage as "Non-Perishable Food Donations for Evacuee Community Members" rather than "Non-Perishable Food". We found the boxes were less likely to be contaminated when signs reflected the first verbiage.

We also recommend partnering with organizations who can pick up and recycle materials themselves. This minimizes the mileage charged by waste diversion teams to the government and maximizes haulable recycling. Allowing community organizations to self-haul their recycling meant waste diversion teams could focus on providing resources vs. hauling resources, thus expanding waste diversion opportunities. This can also be beneficial as community organizations, like recycling centers, often close due to crisis.



A waste diversion tent, including streams for plastic recycling, aluminum recycling, nonperishable foods and uneaten fruits and vegetables.

# LESSONS LEARNED AND RECOMMENDATIONS FOR IMPROVEMENT CONTINUED

Further, certain states have specific jurisdictions that might limit a waste diversion team's abilities to recycle. In California, for example, there's a limit of 100 lbs of aluminum and 100 lbs of plastic #1 per vehicle or person. Having multiple volunteers available to assist with this repurposing enables more recycling opportunities.

## **Safety Best Practices**

For resource recovery best practices, we recommend diving in pairs. One person on the inside of the dumpster and one person on the outside keeps unknowing personnel from throwing trash on someone. Also, be sure to utilize "dumpster diver below" signage.



Example of dumpster diving signage.





# ZEROHERO'S CARBON OFFSETTING

ZeroHero partnered with Trees, Water, and People in 2021 to offset our carbon footprint. This year we emitted 50 tons of CO2 via travel and operations. Trees, Water, and People were able to offset our emissions by planting 250 trees in Central America.

We chose to partner with Trees, Water, and People because of their ability to offset our carbon emissions and their commitment to the communities they serve. They understand that deforestation is a complex problem and address all issues rather than simply planting trees.

Through our donation, they were also able to provide three families in Central America with a Justa Stove. This stove reduces the CO2 emissions from cooking with firewood by 50% and improves the air quality in the home. This stove also creates employment opportunities for individuals in Central America.

We're grateful for the opportunity to partner with Trees, Water, and People to offset our carbon footprint in 2021.





# APPENDIX A

Photos Taken from the Dixie Fire Incident

Below are photos taken from the Dixie fire incident throughout our time providing waste diversion services.



Scrap metal our team was able to divert from landfills.







We donated used cooking oil that to a community member who uses it to create biodiesel.



Food that was diverted from landfills and donated to non-profit organizations in the immediate community.



Sophia Nielsen unloading food at CAN.



# **APPENDIX A** (continued) Photos Taken from the Dixie Fire Incident

Below are photos taken from the Dixie fire incident throughout our time providing waste diversion services.





Staged battery diversion. You can see the AA batteries in the bin closest to the camera in the first photo.



ZeroHero team member, Joe, at the recycling center at the East ICP for the Dixie fire incident.



On the left are donated fruits and vegetables for the rescued animals at camp. On the right are ZeroHero team members giving rescued animals salvaged fruit and vegetables.



Photo of the front of the Grange evacuee center.



# APPENDIX B

## Table 1: Materials Diverted by Facilities

This incident was especially unique in regards to facilities partnered with in order to recycle materials. It includes traditional waste management, recycling, and compost facilities, battery recyclers, non-profits, and tribes.

Name of Facility	Address	Material Recycled
Waste Management Susanville Recycling Center	125 S Lassen St, Susanville, CA 96130	Cardboard and Commingled Recycling
Daw's Recycling	165 Taylor Ave, Portola, California 96122	CRV Plastic #1 and Aluminum Cans
Ivan's Recycling	8002 Zenith Dr, Citrus Heights, California 95621	CRV Plastic #1 and Aluminum Cans
<b>Battery Recyclers of America</b>	N/A	Batteries, including AA alkaline and 7.5v alkaline lantern batteries
Feather River Transfer Station	1166 Industrial Way, Quincy, California, 95971	Scrap Metal, E-Waste, Batteries
Quincy Compost Drop Off (Name is Unofficial)	1166 Industrial Way, Quincy, California, 95971	Compost
Grange Hall	65 CA-89, Quincy, California 95971	Food Donations, CRV Plastic #1 Bottles, Aluminum



# APPENDIX B (continued)

Table 1: Materials Diverted by Facilities

Name of Facility	Address	Material Recycled
Community Action Network	176 Lawrence Street, Quincy, California 95971	Food Donations
Rotary Club International	204 Fairgrounds Road, PO Box 1717, Quincy, California 95972	Food Donations
Animal Rescue Team, Dixie East ICP	Dixie Fire Incident, East ICP Camp	Food Donations
PCIRC (Women's Crisis Support Center)	175 Main Street, Quincy, California 95971	Food Donations
Veterans Benefit BBQ	Quincy, California	Food Donations
Emily Jane Wilbanks Fund	N/A	CRV Plastic #1 Bottles, Aluminum
Paiute Native Tribe	Near Reno, Nevada	Food Donations
Tony (Quincy Resident)	N/A	Cooking Oil