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# Increasing Recycling and Related Green Business Opportunities for Northern Nevada Tribes

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October 12, 2009

# Increasing Recycling and Related Green Business Opportunities for Northern Nevada Tribes

This report prepared for

US EPA Region 9

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## Executive Summary

### Background

Tribal Environmental Directors from northern Nevada met with US EPA and Environmental Finance Center 9 (EFC) staff in July of 2008 to explore strategies for increasing recycling on the reservations. Some of the tribes are located near urban areas while others are miles from the nearest community. They have diverse populations and varying infrastructures in place to deal with discarded materials. Recycling programs range from curbside pick-up of paper, plastic, glass and metal to individual tribal members collecting material from family and neighbors and driving it to a recycling facility for sale. Some tribes are interested in expanding existing programs and others in starting recycling programs. This study looks at the conditions for recycling to identify opportunities that would be relevant for tribes in northern Nevada. Base data for this study was gathered from a survey of the Tribal Environmental Directors attending the July 2008 meeting. For a list of the tribes, recycling programs and their populations, see *Figure 1*.

The goal of this project is to identify mechanisms to increase recycling on the northern Nevada tribal lands and improve financial profitability. The diversity of locations and populations poses operational challenges to any kind of business, let alone one focused on recycling. At the same time, expanding and launching recycling-based businesses in Nevada (even given the allowances for tribal sovereignty) is made more onerous since there is no statewide mandate that creates a recycling market.

### Findings

Due to the plummeting prices of recycling commodities and the lack of a mandated market for recycling by the State of Nevada, a recycling based business would, on its own, not be profitable at this time.

In order to generate plausible business concepts, the study had to shift away from the original mandate and look more holistically at what can be done through broad resource recovery efforts. If the goal is to recycle more effectively on northern Nevada tribal lands this suggests a range of process improvements as well as business concepts that deal with discarded materials. If the goal is to increase financial assets of the tribes through green business, then there are even more enterprise possibilities. Recommendations addressing both goals are presented below.

Figure 1. Northern Nevada Tribes and Recycling Practices

Tribe	Local Pop.	No. House holds	Nearest City	Items Recycled	Recycling Entity	Solid Waste Collector
Battle Mountain Band Of Te-Moak Tribe of Western Shoshone Indians			Battle Mountain	newspapers, used oil, office paper, used inkjet cartridges, and abandoned cars.		
Shoshone-Paiute Tribes of the Duck Valley Reservation	1,800		Owyhee	aluminum, newspaper, cardboard, white office paper, abandoned cars, scrap metal, white goods, green waste, used oil, tires, vehicle batteries, C&D waste	SPT Solid Waste Program & Duck Valley Transfer Station/Recycling Center	SPT Tribal Solid Waste Program
Duckwater Shoshone Tribe	150		Duckwater	aluminum, abandoned cars, scrap metal & tires		
Elko Band of Te-Moak Tribe of Western Shoshone Indians			Elko	abandoned cars	City of Elko & Walmart	
Ely Shoshone Tribe			Ely			
Paiute-Shoshone Tribe of the Fallon Reservation and Colony	1,200		Fallon	aluminum, plastic, newspaper & cardboard	City of Fallon Transfer Station	City of Fallon
Fort McDermitt Paiute and Shoshone Tribes			McDermitt	aluminum & scrap metal	Winnemucca	Hoss Disposal & Desert Disposal
Confederated Tribes of the Goshute Reservation	200		Ipapah		hire kids to pick up recyclables	Tribe & Tooele Co thru MOA
Lovelock Paiute Tribe			Lovelock			
Pyramid Lake Paiute Tribe	1,600	500	Fernley	aluminum, cardboard, mixed paper, abandoned cars, scrap metal, white goods, e-waste & used oil	PLPT PUD	PLPT PUD
Reno-Sparks Indian Colony	900	300	Reno/Sparks	glass, aluminum, plastic, newslapaper, cardboard, paper, e-waste, used oil & inkjet cartridges	Planning Dept - Env. Program Public Works	Waste Trecent & local profit & nonprofit companies
South Fork Band of Te-Moak Tribe of Western Shoshone Indians	200	52	Spring Creek	glass, aluminum, plastic, newslapaper, cardboard, paper, abandoned cars, scap metal, used oil & tires	private contractors	Elko Sanitation
Summit Lake Paiute Tribe	120	12	Winnemucca	plastic, aluminum, paper	individuals	SLP Tribe
Te-Moak Tribes of Western Shoshone Indians			Elko			
Walker River Paiute Tribe	1,100-1,200		Schurz	aluminum & tires	individuals	WRP Tribe
Washoe Tribe	Alpine - 175; Dresserville - 514; Carson - 280; Stewart - 175	Alpine - 70; Dresserville - 147; Carson - 85; Stewart - 53	Washoe	glass, aluminum, palstic, newslapaper, cardboard, paper, abandoned cars, scap metal, white goods, e-waste, green waste, used oil, tires, compost & florescent bulbs	WEPD-collection; Douglas/Alpine/SLT/Carson City transfer stations; Computer Corps etc.	Douglas, Carson City, or Alpine County
Wells Band of Te-Moak Tribe of Western Shoshone Indians		24	Wells	aluminum & used oil	WDC Enviro Office	
Winnemucca Indian Colony			Winnemucca			
Yerington Paiute Tribe	300	90	Yerrington			D&S Waste
Yomba Shoshone Tribe	100		Austin	abandoned cars	None	

### *Process Improvements*

Independent of revenue opportunities, there are a range of process improvements that could facilitate and increase recycling rates (*see Figure 2 for a complete list of suggestions*):

- establishing a central drop off point for recyclable, reuseable and repairable materials on all reservations;
- establishing a central drop off point for hazardous waste such as chemicals, paints and cleaning supplies as well as electronic waste, batteries and compact fluorescent light bulbs on all reservations;
- arranging for the sale and proper treatment of collected items;
- applying for grants for plastic balers, industrial paper shredders and woody biomass chippers for tribes with larger volumes of discarded materials;
- developing community composting projects that may incorporate shredded paper generated by a mulch production system from recycled paper;
- setting up community gardens and community composting projects and promoting kitchen composting;
- setting up a program to remove abandoned cars from reservations and establishing an intertribal parts dismantling facility;
- designating a place on reservations for the proper collection and disposal of used car oil;
- holding an annual or bi-annual tire and/or white goods amnesty program;
- organizing an intertribal bulk purchasing program to reduce packaging; and,
- establishing intertribal environmental education and source reduction programs.

### *Increasing Tribes' Financial Assets*

To identify possible green business opportunities, the team addressed the following questions:

- 1) Is there a consistent flow and stock of a relevant resource in northern Nevada?
- 2) Is there a customer?
- 3) Can it work as a green business concept?

Based on the outcome of this analysis, the research team recommends developing a multi-modal resource recovery park that is an aggregate of several small businesses. This could either be an intertribal enterprise, an initiative of only one tribe, or of individuals from within the various tribes collaborating with a shared purpose around resource recovery and recycling and sharing a facility and base of operations. This idea is discussed in detail on pages 33-40. An optimal location for this business would be on the Reno-Sparks Indian Colony Reservation since it is nested in a large urban area that could benefit from this business and could connect other northern Nevada tribes.

**Next Steps**

Assessing the financial viability of these concepts would be the next step in the process if any of these ideas strike a chord of interest among tribal members, tribes and/or the Inter-tribal Agency of northern Nevada. EFC9 could assist in this effort.

**Acknowledgement of Bias**

This report has been prepared by a team of non-tribal members for all intent and purposes part of the established culture of the United States with all corresponding privileges. On one hand, the team's access to different knowledge sets is useful in bringing ideas or opportunities to the tribes to which they may currently not have access. At the same time, what may make sense to the team from their perspective may not be viable within the cultural setting of any of the tribes. In the final analysis, the intent of this project is to assist the tribes by gathering and analyzing information about strategies for increasing recycling and for green business opportunities.

**Figure 2.** Process Opportunities to Improve Recycling Efforts

Glass	Establish central drop off point on all reservations. As glass seems to be a low level concern for all of the tribes – this is an optimal solution. Glass could then be taken as needed to Sutta Company.
Aluminum	Establish central drop off point on all reservations. Western Metals Recycling will drop off a bin and will pick it up when it is full. The tribe will then be paid for what was collected in the following month.
Plastic (#’s 1-6)	Establish central drop off point on all reservations. If the plastic can be sorted and bags can be baled – these can be sold to Trex. Tribes with larger volumes may want to invest in a baler – there may be grants available to acquire this machinery. Plastic is accepted by Sutta Company. Currently Pyramid Lake and Washoe have balers.
Pharmaceuticals	Crush and landfill unused pills / recycle plastic bottles. This plastic can go into the collection bins destined for Sutta Co.
Paper - Sensitive	Shred It could be contracted to handle sensitive documents by any tribe – they provide locked boxes and will recycle the paper post shredding.
Paper - Newspaper	Shredded and added to mulch - this could be done on every reservation. It would require purchasing a small industrial shredder. Having a mulch production system on all tribal lands would be a useful ecological asset in addition to handling a discarded materials stream. Paper can also be baled - High Desert Recycling will lease balers.
Cardboard	Establish central drop off point on all reservations. All cardboard can be baled making it easier to transport. High Desert Recycling will lease balers.
Paper - General	Establish central drop off point on all reservations. High Desert Recycling will lease balers and assist in setting up a recycling system.
Food/Kitchen Scraps	Promote kitchen composting for all households to reduce the overall weight of discarded material headed to the landfill. The tribal governments can establish community gardens and community composting for both educational purposes and augmenting the supply of locally sourced nutrition.
Woody Biomass	Woody biomass can be chipped periodically and used for mulch - establish a location for tribal members to self haul materials. Small chippers that can be moved on a hitch on the back of a truck cost around \$250. Otherwise, they can be rented as needed.
Green Waste – non fibrous	Grass clippings, landscaping waste etc can be collected in a centralized location and included in the community compost with other food waste.
Abandoned Cars	Western Metals Recycling will buy cars. If the tribes can get the cars to their facility – it may be a wash financially, that is, the cost of hauling may only be offset by the vehicle sale revenues; however, it will reduce visual blight. Washoe Tribe is considering working with a 3rd party to haul cars from across Nevada and establishing a parts dismantling facility - this could support all tribes.



Tires	Tire Amnesty Programs on an annual or bi-annual basis grant funded possibly through US EPA could address the problem of abandoned tires. In Pyramid Lake where there are thousands of abandoned tires, a grant to underwrite the costs of hauling them to a tire shredder or incinerator would help. Or, another option would be to set up central locations on each reservation for tribal members to bring abandoned tires for a charge of \$2 per tire and these could be periodically transported either by a tribal representative or a hauling service to a shredder or incinerator.
Scrap Metal	This can be collected at each reservation in open bins and taken to Western Metals Recycling. Tribes are paid for metal by the pound – ideally this will cover the hauling and labor costs.
White Goods / Appliances	Used and/or broken appliances can be taken to Western Metals Recycling. An annual amnesty program could also encourage recycling of white goods.
Electronic Waste	Set up a permanent collection bin at each reservation for electronic goods capture. There are organizations that will pay for electronic goods.
Batteries	Set up a permanent collection bin at each reservation. A volunteer/paid staff person can take the batteries to a drop off site in Reno as necessary.
Compact Fluorescent Light bulbs	Set up a permanent collection bin at each reservation. This needs to be coupled with education as they contain mercury in them and cannot be disposed of legally in the landfill. Since they reduce energy consumption, it is desirable to use them in tribal facilities and households. Collected material can be taken to Wal-Mart and Home Depot or a volunteer/paid staff can take it to a drop off site in Reno as necessary.
Household Hazardous Waste (chemicals & paints, cleaning supplies)	Set up a permanent collection bin at each reservation. A volunteer/paid staff person can take it to a drop off site in Reno as necessary. This should also be coupled with education to encourage tribal members to not purchase toxic chemicals.
Used car oil	Designate a place on the reservation to collect used oil for periodic proper disposal. Provide proper equipment for tribal members to self-service their cars – including classes.
Establish Green Purchasing Guidelines	Implement tribal & intertribal bulk purchasing to reduce packaging waste - especially plastic & paper. Product Stewardship Council can provide guidance.
Leadership	Develop intertribal/tribal leadership declarations on recycling, resource recovery and mandates to eliminate waste.
Signage & Printed Materials	Intertribal could develop material for all tribes; tribes could individually pay for printing based on needs. Determine what educational processes can be consolidated at the intertribal level to reduce overall costs at tribal level.
Web-based information	Connect all tribal environmental directors / tribal members with online information related to recycling/resource recovery.

Source Reduction (dematerialization) Strategy	Pyramid Lake Solid Waste Management Report has many recommendations about source reduction that would be good to share and adopt at an intertribal level.
Education	Representatives from innovative companies like Trex and local recycling organizations could be invited to give presentations at local schools.

**Figure 3.** Business Concepts to Increase Financial Assets through Recycling

Glass	Crushing / sorting. Glass aggregates sold to glass brokers or directly to manufacturers.
Plastic	Bag/film collection, baling and brokering.
Paper	Re-manufacturing / Craft Paper, Cellulose Insulation, Mulch / Animal bedding (cellulosic absorbent)
Plastic	LDPE / HDPE remanufacturing - plastic bags, sheets
	Polyethylene terephthalate (combined with petrochemical inputs) to produce recycling bins and hard resin products.
Used Car Oil	Oil changing service on tribal lands may generate a cost advantage due to reduced regulatory and other costs that result in more competitive pricing.
Tires	Hauling service/rotation/changing/sales
Tires	Tire Shredding Facility (shredded tire rubber can be broken down into oil & gas or sold to remanufacturers to turn into products - metal from tires can be sold and fiber from tires can be processed into filter media for spill remediation).

**Figure 4.** Business Concepts to Increase Financial Assets through Resource Recovery

<b>Resource Recovery</b>	<b>Business Concept</b>
Transfer Station	(Inter) tribal facility to collect and transfer basic recyclables.
Event Greening	Sort (recyclables, compost, landfill) & collect discarded materials at tribal (and non-tribal) events.
Salvage & Re-sale	Urban Ore Model
Auto / White goods / Metal	Hauling service, dismantling & crushing, sell to metal scrapers // repair & resell energy efficient model.
Furniture	Refurbish used furniture and resell.
Industrial Compost Facility	Large-scale compost facility (windrows) - sell product to regional landscapers / tribes.
Food waste Collection & Hauling	Food waste collection from large institutions (casinos, hotels, universities) - sell to industrial compost facility.
Asphalt Collection & Hauling	Crush asphalt & sell as input for roof shingles, or substrate for road repair and paving.
Wood Pallets	Used pallets / industrial scraps chipped, steamed, mixed with binding agents & pressed into "hardboard" sheathing
Woody Biomass	Biochar production (using technology from Biomass Energy Corporation): collect woody biomass to produce agriculture char (biochar) - sell to soil companies as amendment product.

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## Discussion and Findings

### Introduction

Tribal Environmental Directors from northern Nevada met with US EPA and Environmental Finance Center 9 staff in July 2008 to explore strategies for increasing recycling on reservations. There are 20 participating tribes in this project. Some are located in dense urban areas like Reno while others are miles from the nearest community. They have diverse populations and varying infrastructures in place to deal with discarded materials. Recycling programs range from curbside pick-up of paper, plastic, glass and metal to individual tribal members collecting material from family and neighbors and driving it to a recycling facility for sale. Many tribes are interested in expanding existing programs and others in starting recycling programs. For a list of the tribes, their populations, the materials they recycle and who handles their recycling and waste, see *Figure 1*.

The initial impetus for this research effort was to discover ways – and in particular through enterprise – to increase recycling on northern Nevada tribal lands and to improve financial profitability. In and of itself, this posed a challenge. The tribes are located in distinct geographic regions, they have diverse populations and varying infrastructures in place to deal with discarded materials. For tribes with both small populations and remote rural locations, this poses an additional operational challenge to any kind of business. At the same time, launching recycling-based businesses in Nevada (even given the allowances for tribal sovereignty) is made more onerous since there is no statewide mandate that creates a recycling market. In California, for example, the can and bottle redemption program creates a built in fiscal incentive at the point of purchase to finance and encourage recycling initiatives.

Moreover, on a macro-level<sup>1</sup>, recycling markets are plummeting:

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<sup>1</sup> [http://www.nytimes.com/2009/03/12/business/worldbusiness/12recycle.html?\\_r=1](http://www.nytimes.com/2009/03/12/business/worldbusiness/12recycle.html?_r=1)

#### *China's Big Recycling Market Is Sagging*

“But good days are getting harder to come by. Since Mr. Tian migrated from Sichuan province, the multibillion-dollar recycling industry has gone into a nosedive because of the global economic crisis and a concomitant fall in commodity prices. Bottles now sell for half of what they did in the summer.

“Even trash has become worthless,” Mr. Tian said recently as he made his way to a collection center, his sacks nearly bursting.

The collapse of the recycling business has affected people like Mr. Tian, the middlemen who buy the waste products and the factories that refashion the recyclable waste into products bound for stores and construction sites around the world. American and European waste dealers who sell to China are finding that their shipments are being refused by clients when they arrive in Asia.”

The current economic climate is taking a bite out of the recycling industry. Demand for recyclables has dropped globally. Scaled back construction and manufacturing have gutted the markets for steel and copper. Slowed consumer spending has dampened consumer goods manufacturing and distribution, slimming demand for plastics and paper. Even troubles in the media business have begun to take their toll on the recycling industry. Newspaper, traditionally a reliable commodity material, has faltered—as ad sales drop and news moves online, newspapers are printing fewer copies of smaller papers with fewer pages.

Because demand has fallen off across the board, prices have taken a nosedive as well. Prices for many commodities fell between 50 percent and 100 percent between July 2008 and December 2008, erasing any gains they made in the first half of the year—and then some. Plastics in particular fell steeply, and in some cases recyclers had to move material at a significant loss. Even the big players have been hit hard: Waste Management (NYSE: WMI) reported that its fourth-quarter 2008 recycling revenue fell 37 percent from the previous year, and 44 percent from the previous quarter (<http://www.sustainableindustries.com/recycledmarkets/42019787.html>).

To generate plausible business concepts, the original mandate to increase recycling through enterprise was expanded to look more holistically at what can be done through broad resource recovery efforts. If the goal is to effectively recycle on northern Nevada tribal lands, this suggests a range of process improvements as well as business concepts that more broadly deal with discarded materials. If the goal is to increase financial assets of the tribes using green business, then there are even more possibilities for enterprise.

To identify possible green business options, the team addressed the following questions: 1) is there a consistent flow and stock of a relevant resource in northern Nevada (on tribal lands); 2) does a customer exist for the new product/service; and, 3) can it work as a green business concept? This analysis yielded the possibilities of recycling-based businesses, resource recovery businesses and green businesses. Embedded in the discussion are case studies, interviews and specific data that can help tribal decision-makers evaluate the options.

### **Process Opportunities to Improve Recycling Efforts**

To support the overall objective of increasing recycling by northern Nevada tribes, a number of process improvement suggestions were gathered and are presented in *Figure 3*. To illustrate these suggestions, examples of regional recycling companies and their services are highlighted. In addition to improving the way recyclable materials are collected on the reservations, there is some equipment owned by individual tribes that could benefit all tribes through a sharing/leasing arrangement.

### **Leveraging Current Equipment**

Pyramid LakeTribe has a baler capable of baling paper, cardboard, plastic bags, aluminum and possibly other metals. This enables the tribe to sell their recycled materials to



recycling businesses, e.g., commodities brokers. Purchasing balers<sup>2</sup> is an option for all tribes (see Figure 2) however, there is a scale issue and tribes with few members generating lower volumes of material would probably not find this cost effective. As an alternative they can lease balers from the tribes that own them on an as needed basis. The Reno-Sparks Indian Colony has a garbage truck that runs two days per week. Pyramid Lake has a garbage truck that runs on a weekly basis. Determining how or if these trucks could be used by other tribes could identify a way to leverage institutional assets for the collective good.

### Examples of Regional Recycling Companies

#### High Desert Recycling (HDR), Fernley, Nevada

- Pyramid Lake currently takes their paper and cardboard bales to HDR.
- HDR offers assistance in setting up recycling collection; they will send trucks to collect materials for baling at their facility and shipping via truck to recycling markets in Oakland.
- They will lease balers.
- They collect plastic bottles under certain market conditions; however, this is temporarily suspended since the market has plummeted.
- They do not collect aluminum.
- They do not collect glass.



Figure 6. Wolverine Baler

#### Sutta Company, Oakland, California

- Sutta Company partners with High Desert Recycling.
- They accept all recyclables including metal and glass.
  - Focus is on paper, cardboard and plastic.
- Metals would be accepted in an open top container and would be taken directly to a metals recycler.
- Recommendation: Tribes collect their scrap metals and sell them directly to a metal scrapper. The only reason to have Sutta Company pick up metals would be

<sup>2</sup> The Wolverine baler shown in Figure 6 is an affordable baler with a small footprint. It is for those operations that don't require high volumes, but still need the multi-product versatility, high density and low labor cost provided by the traditional baler with automatic strapping. Available with a multitude of options to tailor it to specific operations. These are sold through Harris: <http://www.harriswaste.com>

because either the volume is too low to sell to a scrapper, or because it is more convenient.

- They accept glass in small quantities – this may work for most tribes, as glass is not a significant commodity flow.

#### Western Metals Recycling (WMR), Reno, Nevada

WMR has occasionally provided bins to other tribes in the past when they have been clearing out junk metal. Pyramid Lake has a WMR bin onsite for “scrap tin,” which includes scrap metals such as old washers and dryers. WMR will drop off a bin and pick it up when it is full. They do not require baling so collection of materials in an open container is fine. The tribe will be paid for what is collected in the following month. Payments are based on a price per pound that is established by the lowest value of metal in the bin; effectively separated material earns a higher price. In terms of dealing with white goods and large items like automobiles, WMR provides a useful service to tribes as they pay the tribe to collect and recycle these materials .

WMR buys, sells and processes:

- Automobiles
- Aluminum
- Copper
- Steel/Cast Iron
- Stainless Steel
- High-Temp Alloys
- Appliances
- Sheet Iron
- Industrial Discards
- All grades of ferrous and non-ferrous metals

## Increasing Financial Assets<sup>3</sup> through Recycling

### **Recycling Markets & Transportation Corridors**

There is a market in Nevada for metal recycling. There are multiple metal scrapers in northern Nevada that will buy metal by the pound. Collecting metal for resale is relatively easy. In most cases it requires a large bin which can be provided by firms such as WMR. The material needs to be hauled to the scraper, depending on the load, by flat bed or box trucks. Metal is the most attractive resource for all tribes to begin collecting due to the revenue potential.

Markets for paper, glass and plastic are in California. All of these commodities require large volumes to make collection financially worthwhile. Glass is heavy and bulky and requires a substantial investment in overhead and infrastructure to become a viable enterprise. Since glass constitutes a small resource stream and is a minor concern for all of the tribes, pursuing anything with glass other than localized recycling process improvements is a low priority. Paper and plastic have bigger footprints and can be handled efficiently by tribes using balers, for example. These bales can be sold to brokers or companies such as Trex in Fernley.

A major railroad runs through Fernley, Reno onto Oakland, California where large quantities of recyclables are shipped overseas, primarily to China. This is a potentially useful transportation asset – especially if a large scale recycling business is developed that sells recyclable commodities to regional and global brokers. In this scenario, baled materials, (i.e., paper and plastics,) would be sent to Oakland for global resale by regional processors. Due to current market conditions this type of business may not be profitable; however, if there is interest in this type of enterprise, it would be important to begin tracking the global commodities market to assess its financial viability.

### Single-Stream Recyclable Material Business Concepts

#### **GLASS**

**Concept: Facility to crush and sort glass by color.**

Crushed glass is sold to glass brokers. However, as glass is low on the list for most tribes (see *Figure 1*) and sorting glass is time intensive, this concept would only make a marginal impact on tribal recycling volumes and income. Source stock for the operation would have to be supplemented by other sources.

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<sup>3</sup> For a information on “assets” and “asset building” see Appendix 6.

## PLASTIC LDPE/HDPE (#'s 1 &2)

### Concept (1): Facility to remanufacture plastic stock to make plastic bags and sheets.

Combined with petrochemical inputs, *polyethylene terephthalate* can be produced to make recycling bins and hard resin products. These can be sold to waste management companies and municipalities.

### Concept (2): Sell bales of plastic bags to Trex or plastic brokers.

The tribes could pool together to collect plastic bags and film wrap on the reservations and/or at regional stores. Balers at either Washoe or Pyramid Lake could be deployed for this purpose. However, without knowing the volume of plastic the tribes can generate, it is impossible to predict the revenue potential. Another possibility is to pick up bags/plastic bottles from area supermarkets and become an intermediary hauling agency transporting bales to Trex in Fernley. This might require some front end funding to acquire bins and receptacles to place at the stores. Contamination problems of plastic with food and and polylactic acid or polylactide (PLA<sup>4</sup>), biodegreable plastic, are an issue to address if this concept is pursued.

#### CASE STUDY - TREX, Fernley, NV

<http://www.trex.com/>

*Interview highlights with Mr. Raymond Hampton (January, 2009) at TREX (Winchester, VA)*

- Trex plastic lumber is made of 50% wood and 50% polyethelene (LDPE).
- Trex recycles 150,000 tons of material annually.
- 7 out of 10 recycled plastic bags in the U.S. are reprocessed at Trex.
- 1.5 billion plastic bags recycled each year.
- Trex has two manufacturing sites: Winchester, VA and Fernley, NV (near Pyramid Lake). They receive materials from across the United States.
- Trex collects polyethelene film from grocery bags, stretch film and dry cleaning bags from large retail chain stores.
- Prices paid for polyethelene are low and vary daily.
- A 3<sup>rd</sup> party trucking company drives to the grocers distribution centers to collect bales of plastic.
- Trex is interested in helping boost recycling rates in their community, for example, they have a Kids Recycling Program in Washoe County. Contact Amanda Harrington, based in Winchester, VA (540) 542-6494 for more information.

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<sup>4</sup> *Polylactic acid* is a plant-sourced plastic that can biodegrade and is used now as an alternative food ware material. "Polylactic acid or polylactide (PLA) is a biodegradable, thermoplastic, aliphatic polyester derived from renewable resources, such as corn starch (in the U.S.) or sugarcanes (rest of world). Although PLA has been known for more than a century, it has only been of commercial interest in recent years, in light of its biodegradability." [http://en.wikipedia.org/wiki/Polylactic\\_acid](http://en.wikipedia.org/wiki/Polylactic_acid)

## PAPER

### Concept (1): Remanufacturing Facility

The facility could produce items such as craft paper, cellulose insulation for homes and/or mulch for animal bedding.

### Concept (2): Cardboard Collection and Baling

Pick up cardboard from stores including supermarkets and bale it. John Moseley from Pyramid Lake mentioned that he thought the tribe was receiving \$35/ton for paper bales and possibly \$75/bale for cardboard – prices will fluctuate.

## USED CAR OIL

### Concept: Oil changing service

This concept of changing oil and car fluids could work in any urban area (Reno Sparks, Carson, Elko) as a successful tribal owned business. It could also be coupled with tire recycling, changing and sales. However, it also would be feasible on more remote rural reservations as a microenterprise. The tribes could aggregate oil disposal and sell the used oil to manufacturers that buy used oil for their products.

#### Uses for Used Motor Oil

([www.oilrecycling.gov.au/what-happens.html](http://www.oilrecycling.gov.au/what-happens.html)):

- Industrial burner oil; used oil is dewatered, filtered and demineralised for use in industrial burners.
- Mould oil to release products from their moulds, e.g., pressed metal products, concrete.
- Hydraulic oil.
- Bitumen based products.
- Used oil is an additive in manufactured products; or re-refined base oil for use as a lubricant, hydraulic or transformer oil (2008 Nevada Recycling Guide).
- Iron can be recycled to make rebar for construction.

### Environmental Note:

Improper disposal of used motor oil has been identified as a problem as many individuals dump oil in their backyards. According to Waste News, it takes 1 gallon of oil to pollute 1,000,000 gallons of fresh water. Motor oil can be recycled into industrial burner oil, hydraulic oil and re-refined oil for use as manufacturing lubricant. Many oil change stations, transfer stations and landfills accept used motor oil but often charge a fee for disposal, thereby discouraging legal disposal. Providing an oil change station on tribal land will motivate safe disposal. As oil grows scarce, markets to sell used oil for re-refining will grow and used oil may become a profitable commodity.

## TIRES / USED TIRES

### **Concept (1): Hauling Service**

This facility would collect tires in rural areas for a fee and sell the collected tires to a tire incinerator or shredder.

### **Concept (2): Facility to rotate, change, sell and effectively dispose of tires.**

Having tires rotated, changed and filled as necessary helps maintain vehicle fuel efficiency.

### **Concept (3): Tire Shredding Facility**

Shredded tire rubber can be broken down into rubber, steel and fiber. The metal can be sold to metal scrappers; the rubber can be broken down into oil and gas or turned into roofing tiles, playground mats and curb stops among other products. The fiber can be reprocessed and used as filter media for remediating oil and gas spills on land and water using a new technology developed by ESSI International<sup>5</sup>, a Canadian company. After being used as a filter material the fiber can then be processed and used as a replacement for sand and gravel in the production of a patented ultra lightweight concrete product.

## **Increasing Financial Assets through Resource Recovery**

### Mixed Stream Recyclables - INORGANIC

#### **Concept (1): Material Recovery Facility (MRF)**

This type of facility can take single stream recyclables and sort them through an industrial sized conveyor system with a magnet to pick up ferrous metal, eddy the materials current to sort out aluminum and use a system of rollers to separate out paper. Pickers are needed to sort out the remaining plastic containers. A MRF would require a large capital-intensive investment potentially achieved through a business partnership with a non-tribal entity. Capital costs can run about \$16 million for a smaller facility such as the one used to process South Lake Tahoe's recyclables in El Dorado County, California.

#### **Concept (2): Recycling Transfer Station**

This could be a tribally owned and operated facility or an intertribal initiative designed to collect and transfer basic recyclables to commodity markets. The facility could be designed to handle recyclables, food waste/compost, and landfill materials.

The cost of starting a new transfer station could be prohibitive. As there are three transfer stations (Stead, Reno, and Fernley) in the region, this idea seems financially infeasible given the cost and competition.

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<sup>5</sup> For more information see [http://www.essiinternational.com/\(Recycling](http://www.essiinternational.com/(Recycling) Product News, April 2009, p. 18)

To be a viable business, the transfer station would need to receive waste from outside the tribes. The tribes would have to develop an operations strategy to be profitable— this could involve partnering with Waste Management, Inc. As Waste Management is investing in greening its operations nationwide, this could be a win-win opportunity.

**Concept (3): Zero Waste Center Modeled after Urban Ore in Berkeley, CA**

The purpose of a “Zero Waste” center is to create a market for goods that are still viable and would otherwise be landfilled. The current economic and environmental crisis makes this an advantageous time for a startup of this sort. While it contributes to waste diversion, it also reduces tipping and hauling fees; it makes financial and environmental sense.

Compared to other possible recycling initiatives in northern Nevada, there are few options with as low startup costs, ease of entry and sound financial returns. The Urban Ore model of capturing and reselling goods may be highly replicable. The Reno-Sparks Indian Colony is only 1 mile from the Reno transfer station – an ideal distance from which to operate this kind of facility.

If the tribes are interested in developing a zero waste center, tribal members could be trained to sort and identify recyclable and resaleable goods from the material at various regional transfer stations in Stead, Reno, and Fernley as well as from items brought by junk haulers and contractors. Urban Ore model businesses could be set up directly across from the transfer station for collection of salvageable goods with monetary (even if minute) incentives for people to drop off unwanted goods and large scrap metal; or the col-

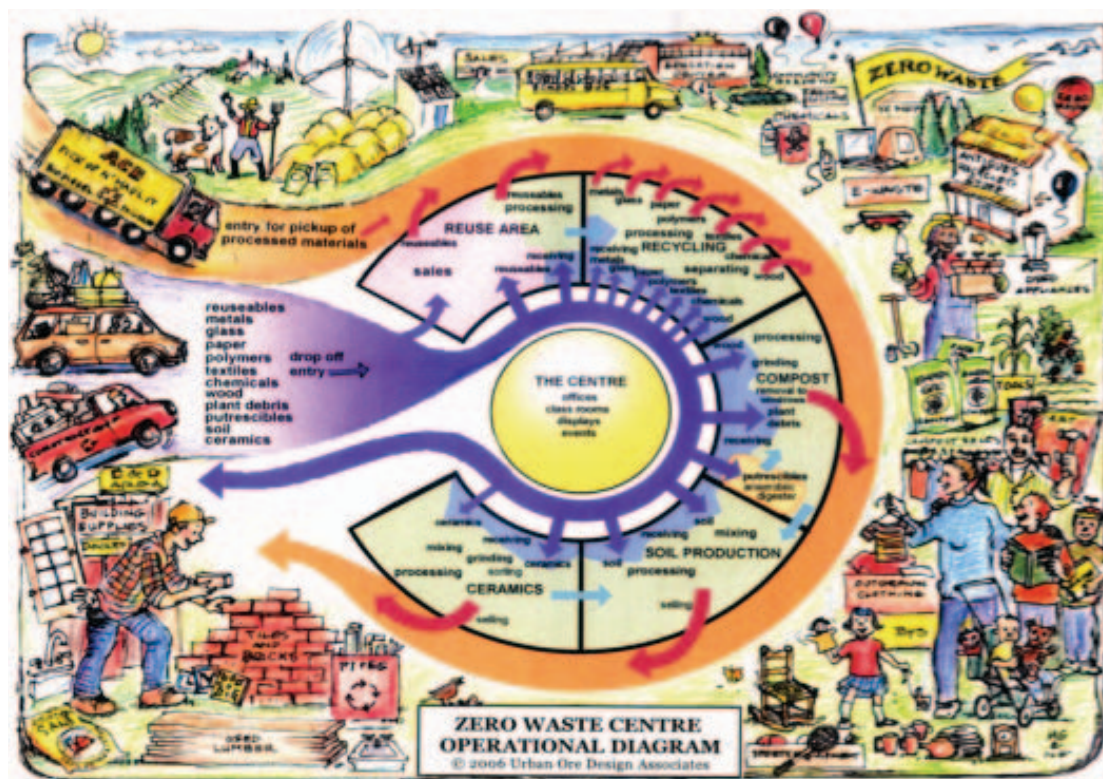


Figure 7. Nevada Transfer Stations & Landfills. 2008-2009 Recycling Guide.

lected goods could be hauled to a central location that would be transformed into a regional re-selling business.

It is commonly believed that once an item drops below the rim of a trash receptacle it has lost all value and viability for future uses. An educational component to this business venture can demonstrate that many materials do not lose value once an individual has no more use for them and that they can become valuable to another party. In a world where resources are finite, humans need to migrate away from the notion that we can continue extracting natural resources to produce goods that will inevitably be dumped in a landfill. The Native American tradition of using all parts of the animal hunted for spiritual and material needs can be extended into the modern world of manufactured goods and create a cycle of perpetuity that can change the extractive culture of mainstream society.

Figure 8. Urban Ore: A Macro View of a Prototypical Zero Waste Transfer Station



Important Considerations:

- Advertise that the facility pays for “junk” especially to building contractors and junk haulers debris to ensure a healthy product base.
- Train the sorters and operators of the salvage yard to identify recyclable and re-salable materials and to know the difference between what can be resold to the



public versus recycling brokers. (It might be possible to embed some employees at Urban Ore for a fee to learn the trade.)

- Take the time and attention to develop a sense of the public resale prices that the market will bear.
- Establish a marketing strategy that moves people’s consciousness away from an homogenous idea of “garbage” to a concept of waste as a resource, i.e., “*using all parts of the animal.*”
- In designing or finding a structure to house an operation like Urban Ore, not having pillars inside of the building is important so that the size and layout of the different departments can be changed easily.

**Figure 9.** SWOT Analysis for a Tribal Resource Recovery Facility in Northern Nevada

<p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>• Tribal ownership allows flexibility in management</li> <li>• Few competitors</li> <li>• Urban collection limits transportation costs</li> <li>• Access to diverse financial resources</li> <li>• Underutilized transportation resources</li> </ul>	<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>• No redemption program in Nevada.</li> <li>• Building the business from scratch.</li> <li>• Start-up costs could be high if there are significant equipment or vehicle needs.</li> </ul>
<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>• Potential for partnership with other tribal governments</li> <li>• Reno zero waste goal</li> <li>• Partnership with cities possible</li> <li>• No comprehensive recycling in place</li> <li>• Could develop multiple income streams from different waste/salvage materials</li> <li>• Regulatory environment could tighten, requiring more recycling</li> <li>• Worsening economy could lead people to see the financial incentives for recycling</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>• Untested market for used goods.</li> <li>• Recycling habits undeveloped.</li> <li>• Potential customers could be poached by competing businesses.</li> <li>• Culture of disposability.</li> </ul>

## CASE STUDY: *From Exploitation to Exploration - Insights from Urban Ore*

In the industrial area of Berkeley, California stands a monument to its forward-looking nature. It is a monument sans statue, sans official attribution; rather, a large warehouse and adjacent parking lot filled with windowpanes, tubs, toilets, metal scraps, marble shards, wood and terra cotta pots known as *Urban Ore*.

In 1980 with only a borrowed pickup truck and some keen eyes, Dan Knapp started Urban Ore with a simple concept: collect recyclable and reusable materials before they get dumped into a landfill and either recycle the materials or resell the goods for a profit. Knapp, a sociologist, had first come up with the idea of Urban Ore when he was performing a study of transfer station dumping and realized how much could be salvaged for reuse and that he could make a profit in the process.

The environmental and political situation at the time in Berkeley were perfect for a venture of this sort to get off the ground. Politically, the City realized it had to address its burgeoning landfill; Knapp's venture satisfied an emerging need for an innovative solution to help divert waste from the shoreline. Until that time, dumping at the shoreline of the San Francisco Bay still occurred.

In the early days, the partners set up signs on the road to the dump alerting people that they could drop off their metal and wood. Another person stationed at the dump watched as items were unloaded and would simply ask for any valuable items. In a short time the contractors and haulers knew where to bring their recyclables and Urban Ore started a practice that it still keeps to this day, *paying for the materials*. Though the sum paid may be negligible, according to Van Deventer, the “*(p)ractice of handing over cash is something that sticks in people's minds and makes them want to keep doing business with you*”.

In 2008 Urban Ore paid out \$150,000 to various contractors, haulers, and individuals for their items and sold \$2.385 million dollars of “discards”. This amounts to a return on investment of 14.9% - an excellent financial outcome by any measure. In addition to income earned on the sale of reuseable items, Urban Ore has a contract with the City of Berkeley to fund their recycling services at the transfer station.

Today, Urban Ore's operations are more diversified. The operation currently utilizes two box trucks parked daily at the Berkeley Transfer Station with trained spotters who can quickly sort and identify items of value. A third box truck trolls the streets of Berkeley. A significant amount of resalable items are brought to the facility directly by haulers and contractors.

### *Entrepreneurial Insights*

After a tour of the Urban Ore facility in Berkeley, California the Operations Manager Mary Lou Van Deventer discussed some of the key practices utilized by Urban Ore and their partners. One aspect of this model is that it relies heavily on individuals pre-sorting prior to arrival at the transfer station. Presorted goods make it easier for the sorters to decide what can be resold to the public and recyclers respectively. It also reduces labor time for Urban Ore.

The founders of Urban Ore realized early on that their best suppliers would be junk haulers, which account for a third of all material resold at Urban Ore. Additionally, since Urban Ore focuses on C&D debris and junk hauls, they also work with those businesses directly and educate them on how to split up their loads, which lowers Urban Ore's cost of operation by reducing the time sorters spend at the transfer stations. Marketing this as free or at least a less expensive way of disposing C&D waste helps reduce construction costs.

Training sorters to identify items that can be sold is paramount to a successful operation. Van Deventer explained that one team of Urban Ore sorters can sort through a 20-yard C&D bin in just 45 minutes. Regarding goods that are resold to recycling brokers, Urban Ore earns a higher premium for bales that consist of single material streams – for example, only paper or only plastic.

In designing or finding a structure to house an operation like Urban Ore, Van Deventer stressed that not having pillars inside of the building was key so that the size and layout of the different departments could be changed easily without confinement by physical barriers.

### **Concept (4) - Event Greening & Production**

This could work most effectively as an intertribal initiative whereby a service could be provided at various tribal and intertribal events, e.g., school sports events, pow wows, large gatherings, etc., to set up onsite systems to sort and collect recyclables, food waste and landfill. Initially, this could be grant funded as a bridge to developing an earned income strategy as an event production company. Taking on the full lifecycle of event planning is the easiest and most expedient way to green any event and optimal for turning it into a for-profit venture. The business would include consultation on holistic/green event management in terms of energy, green product substitution, food vendor policies, carbon offset and footprint mitigation, etc. The various discarded material streams would be managed appropriately on the backend – one idea mentioned at the intertribal meeting in Reno on January 7, 2009 was for tribes to share a trailer for this purpose, which again would reinforce the idea of this business as an intertribal initiative. Revenues from this business could help finance intertribal efforts while simultaneously providing a service

that benefits individual tribes. Detailed reports to clients documenting aggregate wastes, materials diverted from the landfill and other sundry statistics could be included as a value-add to customers.

### Mixed Stream Recyclables - ORGANIC

#### Concept (1): Food Waste Collection Service

This would target large institutions, e.g., casinos, universities, hotels. Food waste would be sold to industrial compost facilities and there could be an option to run both ends of a composting business, i.e., collection and composting. There are existing industrial composting businesses in Nevada that could be potential customers.

#### Concept (2): Industrial Composting Facility

A large-scale windrows operation to produce high quality soil products from food waste. The product can be sold to regional landscaping businesses including municipalities.

As a caveat, windrow composting can require a significant amount of water for cooling the compost and maintaining the moisture content level. Northern Nevada's dry climate requires considerable amounts of water to be pumped into the piles of compost, as the moisture is prone to evaporate quickly. Fully enclosed facilities such as Land Recovery Inc.'s compost factory in Pierce County, Washington near Seattle, have been successful in recapturing evaporated water and recycling it through the composting process but such a facility requires large upfront capital costs.

However, to assess the full cost and benefit of a traditional windrow composting facility as seen in *Figure 10*, it is important to examine not just the water usage at the composting facility but the entire lifecycle of the process. Compost can hold up to 4 times its weight in water, increasing the amount of water that farmland and gardens are able to retain. Also, food waste is often disposed of in garbage disposals, which requires water to flush it down the wastewater pipes. Though the water used at the composting facility would be considerable, there are also potential water savings when looking at the lifecycle of the resource that could be passed on to tribes and the state while improving soil quality, increasing recycling rates and keeping food and green waste out of landfills.



**Figure 10.** Compost Windrows  
<http://www.abt-compost.com/windrow.html>

One option to explore is if the Reno-Sparks Indian Colony could deploy their garbage truck to collect food waste and soiled paper for composting from casinos and regional businesses on the days it does not collect garbage. The Colony could charge the businesses for green waste collection. Research is required to assess the charges and to determine if there is a technology difference between the trucks that collect non-food waste and if there are any contamination issues that would affect the garbage service.

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### **CASE STUDIES: Regional Composting Businesses - A1 Organics, City of West Wendover and Full Circle Compost**

**A1 Organics** based in Las Vegas, Nevada<sup>6</sup> is a profitable business operating five locations in Colorado and one in Nevada. A1 subcontracts all food waste collection and hauling to their facilities. Distance, however, is a constraint for their operation as hauling input at greater than 50 miles makes the business not financially viable. Inputs that they receive include yard waste, food waste, waxy cardboard, soiled paper and manure<sup>7</sup>.

The multi-acre facility contains “tens of thousands” of cubic yards of compost. The operational capacity of A1 is up to 10,000 cubic yards/month. The facility uses over 40,000 gallons of water a day to keep piles of compost cool and moist, and “to keep the piles from catching on fire”.

A1 sells bulk product to distributors, landscapers, nurseries, and municipalities. They blend their own products and have various product lines for different applications. Their product is not bagged – it is delivered through trucks. On average sales are 1500+ yards. Purchasers bag the product with their own brand attribution.

A-1 will accept tribal green waste, but they will not pay for it.

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The **City of West Wendover**<sup>8</sup>, a small Nevada community (less than 5,000 residents) at the Nevada - Utah border, decided it needed to search for innovative ways to deal with their solid waste. While the population is small, there is still a significant waste footprint generated from the city’s 2,000 hotel rooms and five casinos plus other support businesses. West Wendover generates 35 tons a day of municipal solid waste (MSW). To

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<sup>6</sup> Information learned through an interview with Linda Parker, Customer Service Representative, [lindaparker@a1organics.com](mailto:lindaparker@a1organics.com) / /702.44.84405

<sup>7</sup> They also collect 500 cubic yards of wood per day. *If a tribe wanted to capture this resource stream, they could successfully pursue a biochar business using the technology produced by Biomass Energy Corporation.*

<sup>8</sup> This case study based on an article by N.G. in *BioCycle* November 2005, Vol. 46, No. 11.

avoid the need for a Class 1 landfill and the associated capital and operating costs of over \$1 million, the town launched a municipal action to start industrial composting.

Tom Stratton, who then served as Public Works Director spearhead the project, *"our composting plant was built solely on money from the U.S. Department of Agriculture and the general fund available to the Public Works Department."* The first action he took was to purchase some used equipment and he worked with a local fabricator to make trommel screens necessary for sifting the soil.

#### *Composting Operational Highlights:*

- Facility processes roughly 10 tons per day of food scraps, bio-solids and solid waste.
- Facility includes bio-solids dewatering beds, rotating mixing vessels, trommel screens and aeration beds.
- The facility's wastewater treatment plant supplies 1.5 million gallons per day of treatment plant effluent water to the golf courses.
- The City uses the finished compost on large landscaping projects realizing an additional cost savings by not having to import soil amendments.

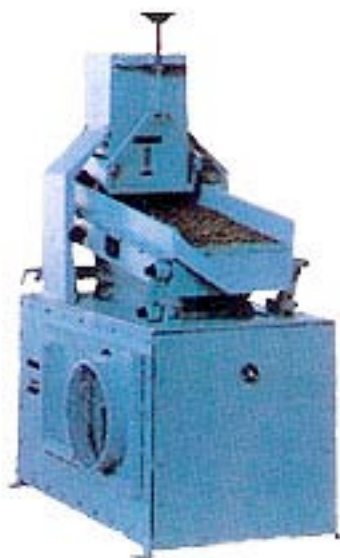


Figure 11. Destoner

Industrial composting is achieved by mixing food-rich MSW with bio-solids inside large mixing vessels. After a retention time of 48 hours, material is conveyed from the vessels into a trommel screen with 1-1/4-inch holes. Any big chunks that are greater than 1 1/4" are sent to the landfill; the screened material is placed on the aeration bed for 28 days during and turned every seven days. Once the 28-day cycle is complete, the compost is moved to an open-sided finishing building and screened in the trommel.

As much of their material was generated from casinos, glass contamination was an issue that was ultimately resolved by purchasing a destoner made by Forsberg, Inc., in Thief River Falls, Minnesota, which separates heavier debris, i.e., glass, stones and metal, from lighter material.

**Full Circle Compost** based in Carson City, Nevada and South Lake Tahoe, California<sup>9</sup> is a large-scale windrow composting facility. They process residential and commercial food and yard waste (they do not collect soiled paper or waxy cardboard) and generate 2,000 tons of compost each year, though their capacity is 25,000 tons. It is not clear why they are operating so far below capacity.

Their compost, which is certified for organic farming, is augmented nutritionally through the use of vermi-composting<sup>10</sup> technology. The organic certification enables them to sell their product at a premium. The four-fold water retention gains from the compost created could outweigh the negative effects of the amount of water needed to process the compost.

Residents can drop off food and green waste at Full Circle Compost. Due to their proximity to Full Circle's facilities, the Washoe Tribe could use their services. However, the Tribe would need to ensure that the material was effectively sorted to not include soiled paper or waxy cardboard.

#### Environmental Note: Benefits of Composting

##### **Soil Enrichment:**

- Adds organic bulk and humus to regenerate poor soils.
- Increases soil nutrient content and water retention in both clay and sandy soils.
- Restores soil structure after reduction of natural soil microbes by chemical fertilizer.
- Reduces or eliminates the need for fertilizer.
- Combats specific soil, water, and air problems.

##### **Pollution Remediation:**

- Binds heavy metals and prevents them from migrating to water resources or being absorbed by plants.
- Degrades, and in some cases, completely eliminates wood preservatives, petroleum products, pesticides, and both chlorinated and non-chlorinated hydrocarbons in contaminated soils.

##### **Pollution Prevention:**

- Avoids methane production and leachate formation in landfills by diverting organics for composting.
- Prevents pollutants in storm water runoff from reaching water resources.
- Prevents erosion and silting on embankments parallel to creeks, lakes, and rivers.

##### **Economic Benefits:**

- Results in significant cost savings by reducing the need for water, fertilizers, and pesticides.
- Produces a marketable commodity and a low-cost alternative to standard landfill cover and artificial soil amendments.
- Provides a less costly alternative to conventional bioremediation techniques.

For the full article see: <http://www.epa.gov/epawaste/conservation/rrr/composting/pubs/erosion.pdf>

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<sup>9</sup> Information gathered from the Full Circle Compost website: <http://www.fullcirclecompost.org>

<sup>10</sup> Vermiculture composting the method of composting using earthworms which eat the green waste and excrete a nutrient-rich compost in the form of worm castings.

The compost business gives Full Circle Compost market visibility to offer corollary services including event greening services<sup>11</sup> such as coordinating zero waste events, sourcing compostable (PLA) foodware and collecting compost at events.

#### Full Circle Compost's Equipment & Operations - Overview:

- AeroMaster Turner and 500 Gallon Earth Tea Brewer
  - o Used turners can be found for approximately \$25,000:  
[http://www.apolloequipment.net/categories/compost\\_turners.htm](http://www.apolloequipment.net/categories/compost_turners.htm)
  - o A tractor is required to pull the turner; used tractors in good condition can be found for approximately \$15,000:  
<http://www.tractorhouse.com>
  - o Tea Brewers cost approximately \$10,000. They are made by several manufacturers including Sustainable Agriculture Technologies:  
<http://www.composttea.com/>
- Morbark 950 Tub Grinder (for grinding branches and other large pieces of woody debris before adding this input into the windrows).
  - o Used grinders can be found for \$49,000 at:  
[http://www.apolloequipment.net/categories/tub\\_grinders.htm](http://www.apolloequipment.net/categories/tub_grinders.htm)

## VARIOUS COMMODITIES / MATERIALS

### **Concept (1): Salvage & Resale Business**

This could be modeled after Urban Ore in Berkeley, CA. Items that are resold could include: doors, windows, toilets, furniture, landscaping materials, marble, bricks, wood etc.

### **Concept (2): Furniture Repair & Revitalization**

The business would accept donations of any kind of used furniture by the general public. Before reselling, minor repairs and maintenance are made including fixing, cleaning, staining, reupholstering, etc. to increase used furniture value.

### **Concept (3): Backhaul Brokering Service**

With the economic crisis, shipping companies are looking for ways to minimize under quantity loads; 3<sup>rd</sup> party shipping companies can be contacted to find semi-full truckloads to piggyback recyclables on to market. With the train running through Fernley and Reno, it would be easy to work with a train hauler such as CSX or BNSF<sup>12</sup>, to haul paper, cardboard, and plastic containers to Oakland. Issues to work through to make this successful include: training workers and building safety into the culture of the workforce.

<sup>11</sup> The fact that they are running this business suggests that a tribal venture greening events could be viable.

<sup>12</sup> [http://www.bnsf.com/tools/reference/division\\_maps/div\\_ca.pdf](http://www.bnsf.com/tools/reference/division_maps/div_ca.pdf)



#### Concept (4): Biochar Production

Biomass Energy Corporation (<http://www.biomasse.com>) is a start up enterprise based in Colorado that has an innovative sustainability technology that turns woody biomass into agchar or biochar<sup>13</sup>. This is a carbon mitigating technology because it permanently sequesters carbon in the soil. Biochar can be sold as a soil amendment to landscaping businesses. The process of creating biochar also produces heat, which can be used to heat a co-located building or a water supply.

Specifications for the Biochar 100 beta unit:

- Cost is \$50,000.
- Inputs: 400 lbs/hr (200 kg/hr) wood-chips, at approx 20% moisture content.
- 1 gal/run (4 liters/run) propane for flare ignition pilot and startup.
- 0.15 gal/hr (0.6 liters/hr) gasoline to power generator for mechanical removal.
- 2 gal/hr (8 liters/hr) H<sub>2</sub>O for char quench.
- 2 lb/run (1 kg/run) CO<sub>2</sub> from tank for shut-down.
- Output: 100 lbs/hr (50kg/hr) biochar at controlled temperature, clean soot-free emissions.
- Operating temperature: 300-600°C, monitored & controllable by onboard software
- Dimensions: 5' x 12' x 7' (1.5m w x 3.6 m x 2.1m) • Weight: 3,000 lbs (1.4 metric tonnes).
- Operation: 200kg wood-chips are loaded into the hopper approximately every hour. The biomass is ignited by the propane flame-front, & heat from combustion pyrolyzes the biomass in the barrel. Excess heat is used to completely flare the combustible gases for clean emissions. Upon reaching desired temperature, the biochar is mechanically removed by an auger. The biochar is then quenched to safeguard against spontaneous combustion. The Biochar 100 is designed to run on consecutive 8 hour shifts. One person can operate the equipment while performing other tasks.

#### Concept (5): Wood Chipping

Agrow Dynamics<sup>14</sup> is an enterprise in the Bently family of companies that processes chipped wood to produce compost. The Northern Nevada Correctional Facility in Carson City operates a biomass plant that currently uses small diameter wood and slash. The tribes can chip their woody biomass and sell it to Agrow Dynamics and the Correctional Facility. If a hauling venture is launched, some used construction wood would also be suitable for this purpose.

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<sup>13</sup> Biochar is charcoal created by pyrolysis of biomass. The resulting charcoal-like material is a form of carbon capture and storage. Charcoal is a stable solid and rich in carbon content, and thus, can be used to lock carbon in the soil. Biochar is of increasing interest because of concerns about climate change caused by emissions of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases (GHG).

<sup>14</sup> <http://www.bentlyagrowdynamics.com/>

Alternatively, a mobile wood chipping service could be launched to service all of the tribes. The woodchip product could be hauled off-site to an industrial composting facility or used as feedstock in a biochar process. The woodchip product could also remain on site and be used as a mulching/landscaping material.

**Concept (6): Metal Scrapping**

Hauling, dismantling and crushing service - metal can be sold to brokers for remanufacturing. The facility would process autos/ white goods (appliances) and other metal products.

**CONSTRUCTION & DEMOLITION MATERIALS**

**Concept (1): Asphalt collection & Reselling**

Asphalt can be crushed to sell as road substrate. Asphalt can also be repurposed into roof shingles.

**Concept (2): Collection & Hauling**

There are firms in every city that specialize in the dismantling of buildings or the clean up of construction sites. A related, but smaller venture, would specifically address the collection of materials from a site and haul them to an end-use/re purpose destination.

**Concept (3): Hardboard Manufacturing**

Wood pallets and industrial wood scraps can be chipped, steamed, mixed with binding agents and pressed into “hardboard” sheathing and resold to the construction industry.

## Inter-tribal Green Business Concept

### Concept and Philosophy

Expanding the range of possibilities beyond a purely recycling-based business, one of the most compelling green venture options is a salvage and resale business like Urban Ore. However, it could include a greater number and variety of services which would attract more customers and generate a more varied revenue streams than Urban Ore. The inter-tribal green business concept presented below consists of multiple individual businesses in a connected enterprise ecosystem that simultaneously share an environmental ethic to either divert materials from landfill or conserve resources in general. The small businesses all feed on different materials and require different skills and expertise. This concept can develop iteratively over time, which may make it attractive, since it could be implemented methodically and without overextending any individual or respective tribe.

The most suitable location for this concept is the Reno/Sparks area, due to its proximity to one of Nevada's major population centers. Locating the facility on tribal land may be a business advantage as legal requirements on native lands may give the concept a competitive advantage.

Cultivating a business model based on material "scavenging", resource recovery and re-selling coupled with small (and potentially medium) scale for-profit businesses would generate financial assets for participating tribes (and/or tribal members) and employ tribal cultural, social/human and physical assets.

### AUTOMOTIVE SERVICES CENTER

#### Oil Changing

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**Revenue Streams:**

Oil change service, sales of oil and other car fluids, sales of incidentals and sundries.

**Environmental Benefit:**

Reduction of oil waste on tribal & non-tribal lands.

This can be set up as either as a stand-alone business or as part of the overall offering of the inter-tribal enterprise concept. Ideally oil changes for tribal members would be provided at cost thereby eliminating any need to change oil on tribal lands where proper disposal can be a problem. Profits would be generated from servicing non-tribal members vehicles. ASE (Automotive Service Excellence) Certification is likely required for em-

ployees. The certification is provided by the National Institute of Automotive Service Excellence.

The facility would sell the used oil for a small profit margin and provide free used oil disposal for all tribal members. The revenues earned from the sale of used motor oil and filters will increase as supplies of oil decrease and prices rise over time.

### **Tire Sales, Rotations and Recycling**

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#### **Revenue Streams:**

Tire sales, labor, disposal fees.

#### **Environmental Benefits:**

Reduce illegal dumping of tires on tribal lands.

As part of the overall suite of automotive services, there is a competitive advantage to locating this type of business on tribal lands which can provide a price differential that will attract customers. All tribal members should be incentivized to have their tires rotated, changed and filled as necessary as this maintains fuel efficiency. A grant to subsidize the disposal fees for tribal members or to offset this cost by charging higher fees to non-tribal members would increase tribal assets and generate a small environmental improvement.

### **Biodiesel Fueling Station**

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#### **Revenue Stream:**

Sale of biodiesel fuel, sale of used grease to Bently Biofuels.

#### **Environmental Benefit:**

Small reduction of carbon dioxide emissions.

Turns a waste stream into a useful product.

The site can become a point of sale location for Bently Biofuels based in Minden, Nevada<sup>15</sup>. They sell their products through their branded "outpost" in Minden and wholesale to retailers in the Bay Area, Tahoe and other parts of Nevada. A potential draw back of the fueling station is that it would require a sizable capital investment.

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<sup>15</sup> <http://www.bentlybiofuels.com/>

## Used Veggie Grease Collection

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### **Revenue Stream:**

Sale of used grease to Bently Biofuels.

### **Environmental Benefit:**

Reduces material in the landfill.

Strategically, it may be advantageous for at least one tribe to procure a license to be a grease hauler. Once secured, the tribe can collect grease from tribes throughout northern Nevada and surrounding areas to sell to Bently.

The Washoe Tribe's Dresslerville Community Senior Center and the Meeks Bay Resort recycles its used cooking grease and oil through an account set up with Bently Biofuels. Bently Biofuels drops off the containers then picks them up when they are full. Bently pays the Senior Center and Meeks Bay Resort a minimal fee for each container of grease picked up and recycled.

Bently Biofuels pays for each gallon of grease they collect. Tribes can collect grease on reservations and have Bently pick it up. While Bently currently picks up grease in the Reno area, it is unclear how far they are willing to travel and what quantity of grease they would require from the satellite tribes to make it worthwhile.

## Diesel Engine Retrofitting

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### **Revenue Stream:**

Labor on engine retrofitting.

### **Environmental Benefit:**

Repurposes older cars; reduces air pollution.

Trained technicians retrofit diesel engines to run on vegetable oil (processed biofuel does not require this modification). Depending on the local supply of vegetable oil fuel, the demand for this service may be low. If an employee is trained to do this as part of the overall skill set, it could be an additional offering of the facility that would add value.

## Solar Car Wash

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### **Revenue Streams:**

Car Washing / Vacuuming, Vending Machines, Tribal Souvenirs

### **Environmental Benefit:**

Conserves water; uses solar energy

Adding to basic auto care services, a car wash that conserves water and runs on solar power is a compelling addition to the automotive center. The washers are powered by solar panels on the roof; water is reclaimed and water-recycling processes are built into

the facility, which helps maintain water resources in the arid high desert region of northern Nevada.

The facility will embrace emerging environmental technologies and designs. It will cater to a broad clientele ranging from environmentalists who will hear the sustainability message, automotive enthusiasts coming for excellent car care and local residents who want to clean their car for an affordable price. The car wash will also bring people to the center as a destination resulting in more customers for the other services, which is a soft marketing approach.

Basic specifications for this idea come from a solar carwash in Van Nuys, California called GJ Solar<sup>16</sup>:

- The custom designed Sharp solar system costs approximately \$677,000 and is composed of 530 14-15 sq. ft. panels
  - o Potential for state and federal rebates for partial/full financing.
  - o Solar supplies approximately 80% of the car wash's energy.
- Facility can yield 10,000 car washes and 1,000 oil changes monthly.
  - o Recycled water system has efficiencies of conservation compared to washing at home.
- The price range for car washes is \$10.99 - \$22.95.

### **Green Auto Detailing**

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#### **Revenue Streams:**

Labor, Vending Machines, Tribal Souvenirs

#### **Environmental Benefit:**

Reduces use of chemicals through product substitution.

Offer a suite of services of auto detailing using biodegradable and non-toxic soaps and cleaners. Detailing for tribal members could be offered at steep discounts subsidized by prices paid by the general public.

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<sup>16</sup> <http://www.moderncarcare.com/hotnews/6bh714363598048.html>

## REPURPOSING GOODS FOR INDIVIDUAL & COMMERCIAL USE

### Scavenging & Reselling

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**Revenue Streams:**

Selling items to the community at large.

**Environmental Benefit:**

Repurposes still viable goods; reduces material sent to the landfill.

Depending on what material is collected at the transfer stations, at demolition sites, home foreclosures and sales by community members, the center can resell a variety of products including: used windows, doors, bathtubs, toilets, furniture, landscaping materials, wood, fencing, housewares, etc. This facility would require an outdoor yard for products that can withstand all weather. It would need an indoor facility for staging items including furniture, household goods etc and a staging area for the staff to work. Hauling trucks – either box trucks or flat beds are necessary for pick-ups at the transfer stations. Ideally, the proposed hauling business for foreclosures and construction and demolition could use the same trucks as the scavenging reselling arm.

### Furniture Refurbishing and Repair

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**Revenue Stream:**

Furniture resale & repair

**Environmental Benefits:**

Reduce chemicals through product substitution; reduce materials sent to the landfill.

Used and broken furniture is ubiquitous and difficult to discard. A service that both refurbishes and repairs furniture acquired by the salvage business and brought in by the public for repair would add value to the center. Furniture acquired through the salvaged business can be sold at the resale center and swap meets. Some training would be required which would create meaningful jobs for tribal members.

## HAULING SERVICES

### Hauling Service

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**Revenue Streams:**

Contractors pay for hauling service from construction and demolition sites. Repurposed goods sold to super center and commodities brokers.

**Environmental Benefit:**

Reduces waste in the landfills; ensures recyclable materials are properly channeled.

Theoretically any tribe or tribal member could operate a hauling service that targets the construction and demolition (C&D) industry. The service would haul scrap materials to the resource supercenter for re-purposing, sale or to the transfer stations for recycling. In the case of Urban Ore, they rely heavily on junk haulers and contractors for materials, and this concept is another way to add a revenue stream that creates jobs and maximizes profits. This service could be coordinated remotely, even while using the supercenter as a base of operation and facility to store tools and vehicles. Upfront initial investments for this business includes vehicles, training and insurance.

## COMMUNITY CENTER

A site that serves multiple needs and becomes a destination is an excellent way to serve the community. The destination helps market the facility by attracting visitors with diverse needs. As an educational facility, it can bridge tribal cultures and values with the public at large.

### **Community Drop-Off and Recycling Center (CDRC)**

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The CDRC can serve as a permanent drop off point for a variety of items for tribal members and the general public including:

- used electronics
- batteries
- household hazardous chemicals
- paint
- paper, plastic, glass, metal

To accommodate permanent drop-off needs , the center would require appropriate receptacles and equipment. This would include a baler for paper/plastic and permanent debris boxes for paper, plastic, glass, loose metal and the items listed above. Once baled, paper and plastic bales can be sold.

Additionally, the CDRC can offer scheduled pick-ups for appliances, furniture, junk, tires and abandoned cars to the public and for a reduced rate to tribal members. Pick ups would be handled by the hauling business.



## Community Meeting Space & General Store

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### Revenue Streams:

Rental fees, product sales

The center could include a community-gathering spot serving food and drink such as organic coffee and food items made with locally grown produce. Ideally there would be space to host community meetings that could be rented or offered for free to tribal members. Education and training on recycling, composting, repair, waste and regional environmental issues as well as information on northern Nevada tribal cultural events could be provided here. Having a small general store would also support the other functions at the facility and could sell a range of products from refreshments and tribal crafts to auto supplies and miscellaneous materials.

### Swap Meet

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#### Revenue:

Concessions, booth fees, admissions

The swap meet would be a place for tribal members across northern Nevada to sell goods in Reno to the general public. Financially, it would make sense to include non-tribal members while giving priority to tribal members on a first come first serve basis. Additional revenue can be generated through concessions selling native and other foods. The ownership of the swap meet could be the same as the resource facility – ideally this would be located in the parking lot and facility grounds.

Holding storytelling and any related tribal cultural events during the swap meet would create an additional draw for the general public while also sharing and supporting tribal culture.

## Re-Purposing Waste Into Art - Using Art to Inspire Recycling and Natural Resource Conservation

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This idea was inspired from a successful program operating in San Francisco, California (*see the “The Art of Recycling” below*)<sup>17</sup>. This model assumes a strategic partnership between the Washoe and Pyramid Lake Transfer Stations. These stations can serve as collection facilities for waste to be re-purposed on site. Tribal artists and artists from the community along with arts educators can pick through recyclables to find material for art-focused activities within tribal schools and for community enrichment. One possibility is an artist-in-residence program whereby artists from other tribes or elsewhere are invited to create art while they teach.

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<sup>17</sup> <http://www.sunsetscavenger.com/AIR/index.php?t=d>

### *The Art of Recycling*

The goal of the Artist In Residence Program at SF Recycling & Disposal, Inc. is to use art to inspire people to recycle more and conserve natural resources. The company provides selected local artists with the opportunity to create art using materials they gather from San Francisco's refuse. This includes 24-hour access to a well-equipped studio, a monthly stipend, and an exhibit at the end of their residency, but artists seem most excited about having 24-hour access to the materials.

The 2,000-square-foot art studio is located at SF Recycling & Disposal, Inc.'s Solid Waste Transfer and Recycling Center. The 44-acre site is where most of San Francisco's garbage and recyclables are temporarily dumped before going to a landfill or recycling plant. Recyclable items are sorted before being shipped to recycling plants and manufacturing facilities.

Throughout a residency, each artist talks to young students and adult tour groups about the experience of turning trash into treasures. At the conclusion of their residency, the company holds a reception for the artists, to show the artist's work and invites the public. Many pieces of art from the program are exhibited in office building entries and public spaces in San Francisco. Many artists have made a permanent piece for the sculpture garden adjacent to the SF Recycling & Disposal, Inc. Transfer Station and the garden is a key stop for students on recycling tours.



### **Concept Synthesis**

The inter-tribal green enterprise concept leverages existing waste streams, tribal assets and geography to create a business network across tribes. The objective is to develop a strategy for increasing recycling on tribal land, grow tribal financial assets and generate employment, education and training opportunities for tribal members. This business model would divert waste from landfills by using it as a product input and would provide a unique customer experience. Additional environmental benefits include water conservation, reduction of toxic chemicals through product substitution, increased recycling and

product reuse and the associated energy savings. In sum, this enterprise harnesses collaborative possibilities between tribes for mutual benefit and environmental stewardship.

The full project development costs would run in the hundreds of thousands of dollars. A business plan would be necessary to make a more accurate estimate; plus, additional research is recommended to identify potential funding sources including public and private grants as well as low-interest loans. To reduce upfront costs, this concept could be implemented in phases with the various businesses launching as resources and interest become available. Ownership could be cooperative or individual. The businesses could be owned by a tribal consortium, individual tribes or individual tribal members – the exact structure could be determined through an alternatives assessment.

This enterprise could generate long-term jobs for tribal members and provide training and skill-building, all of which would strengthen the tribal economies. The physical structure will memorialize tribal leadership, cooperation and the ability to innovate in response to widespread economic and environmental challenges. By establishing a community center that bridges tribes and non-tribal people, it will generate greater awareness of tribal cultures in the mainstream communities as well as create a forum for all tribal members across northern Nevada to interact with each other in an innovative setting.

No matter the final structure, what is critical is that the products and services offered at the facility be available to all tribal members either at a discount or at no cost with expenses offset by profits generated from sales to non-tribal members. By providing opportunities for tribal members to assume leadership roles in the businesses, the project can provide meaningful career opportunities. This inter-tribal green enterprise can serve as a model for other tribes and stimulate sustainable entrepreneurship among the participating tribes' members.

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## Appendix 1 - Environmental Finance Center, Region 9

EFC9 is a university-based center working for sustainable communities through cleaner business, by promoting pollution prevention, source reduction and energy conservation. EFC9's mandate is to provide our services throughout Region IX.

Our mission is three-pronged:

- To encourage industry to implement sustainable business practices;
- To educate and encourage consumers to choose green business products and services; and,
- To help communities and government promote sustainable business.

To that end, working with both the private and public sectors, EFC9 pursues its mission through numerous tools including:

- Environmental facilitation & mediation,
- Green business program development,
- Innovative finance program development,
- Business incubation,
- Local economic development,
- Conferences, workshops and roundtables, and
- Research publications and reports.

EFC9 is also part of a nine-member network of Environmental Finance Centers throughout the United States. Each EFC is associated with a local university and pursues its own environmental goals. EFC9, affiliated with Dominican University of California, is the only Finance Center dedicated to resolving environmental issues in the private sector. All EFC Executive Directors sit on the Environmental Finance Advisory Board, which advises the USEPA Administrator on issues pertaining to environmental finance.

## Appendix 2 - What is a Green Business?

There is an increasing awareness around the world about the role of green business in creating a realizable mechanism for sustainability. While sustainability is often a nebulous concept since its meaning varies from one individual to the next, ideally the basic concept is one in which business becomes a restorative and healing force in society reconciling both adverse impacts on the environment and negative consequences on people.

A green business can exist in any sector of the economy. It does not have to have an environmental or social purpose as its *raison d'etre*; however, it will ensure that in delivering products and services to the market, that the environment and people are cared for, regenerated and optimized. This is the ideal –doing no harm; completely eliminating waste is still a theoretical ideal – yet, a green business will include a commitment to continual improvement, stated operating principles and leadership that fosters these conditions.

A green business can directly work to transform a harmful system into a healthy system. The higher goal of recycling is to eliminate waste by redirecting discarded materials away from the waste stream and into productive use. Steps include moving discarded items made from recyclable materials (e.g., glass, plastic, aluminum, paper, metal,) out of a landfill stream and into a reuse, repurpose / remanufacturing stream. The act of segregating and redirecting these materials is called *resource recovery*. *Recycling* is the act of reabsorbing the material stock into an aggregate flow so that it can be used again.

### **Green MBA at Dominican University, San Rafael, CA**

Dominican University of California's Green MBA program (<http://greenmba.com/>) is an accredited, on site graduate program in the San Francisco Bay Area. Graduates receive a Master of Business Administration degree in Sustainable Enterprise. Students have a choice of two-year full-time and three-year part-time structures.

In the Green MBA, students seek solutions that promote financial viability, ecological sustainability, and social justice (profit, planet & people) using a dynamic, project-oriented learning approach to integrate the development of entrepreneurial and intrapreneurial skills with the building of critical thinking and leadership capacities.

To encourage this transformation in students' capabilities, the program has built a close-knit community of teachers and learners woven into a supportive network of business, academic and activist leaders.



The mission of the Green MBA is to create an engaging learning community where people with strong environmental and social values develop effective leadership capacities to advance economically successful, ecologically restorative, and socially just initiatives in any type of organization.

The Green MBA at Dominican University is one a few innovative business schools in the United States focused on delivering a business education exclusively devoted to managing sustainable enterprises. The program's core values are distinguished from a traditional business education that focuses on how to maximize profits.

### About Dominican University<sup>18</sup>

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Dominican University of California is an independent university of Catholic heritage located 12 miles north of the Golden Gate Bridge in Marin County, California. Founded in 1890 by the Dominican Sisters of San Rafael, Dominican enjoys a century-long reputation for excellence in scholarship, research, and community outreach.

The University offers more than 60 academic programs that reflect the diversity and creativity of the faculty and students.

With more than 2,100 graduate and undergraduate students and a student to faculty ratio of 11:1, Dominican is able to successfully blend personal direction associated with smaller schools with the academic resources of a larger university.

#### Academic Life

Dominican's focus on interdisciplinary studies provides a challenging academic environment. In the sciences, the University excels at involving undergraduates in sophisticated research projects that enable students to present at national academic conferences and publish alongside their faculty mentors in peer-reviewed journals. In the humanities, students can combine dance and musical performance with the study of philosophy, literature, world cultures, and religion. Dominican also offers strong undergraduate professional programs in business, education, and nursing, in addition to graduate offerings in these disciplines as well as counseling psychology and occupational therapy.

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<sup>18</sup> <http://www.dominican.edu/about.html>

U.S. News & World Report ranks Dominican University of California in the top tier of "Western Universities - Master's."

### **Dominican Diversity**

Students come from across the United States, although primarily from the Bay Area and Northern California, and from 21 foreign countries, including Brazil, China, Ireland, Japan, Russia, Spain, Taiwan, Thailand, and Turkey.

More than 70 percent of students attending Dominican receive financial aid. The small class sizes ensure that all students receive personal guidance from their faculty mentors. In addition, the University offers a four-year guarantee: any student who carries a full course load and meets all the requirements for eight consecutive semesters will graduate in four years or spend a fifth year at Dominican tuition-free.

## Appendix 3 - Research Methodology

Research for this project was approached using a systems thinking lens to first understand the macro trends related to recycling in northern Nevada and the related markets for basic recyclable commodities: paper, plastic (especially #1 & #2,) aluminum, glass and metal. The information collected from the survey on tribal recycling practices in the July 2008 meeting was used to assess the types of commodities on northern Nevada tribal lands, what was being recycled and where there was desire by the tribes respectively to increase recycling. Gaps in recycling efforts were noted and certain assumptions regarding volume, (i.e., flow) of each recycled material, (i.e., the stock) were made in order to frame the research process. Any business to be financially viable has to first have a consistent flow of sufficient stock to meet the demand in the market for the product.

The primary research methodology utilized Internet queries to look for products, businesses, general information and where possible to locate reports related to the topics of this study. In addition, multiple phone interviews were conducted with various actors including tribal environmental directors, EPA9 staff members, Walmart representatives, consulting firms, related not-for-profit organizations and business owners.

There was an important meeting for this project held in Reno, NV on January 7, 2009<sup>19</sup>. As a result of the meeting and ensuing conversations regarding the needs of the tribes and concern about “otherness” the team developed sensitivity to issues of tribal sovereignty and the ongoing impacts of colonialism that has resulted in disempowerment on a cultural level.

### **What is a Systems Thinking Approach?**

Systems Thinking is a core tenet of holistic decision-making and analysis. One of the reasons, if not the primary reason, that consensus on the definition of sustainability is difficult to achieve is that sustainability itself is really a misnomer and the crux of the matter is more akin to a problem set of complexity. When dealing with multiple variables and time cycles – from human individuals, societies, ecosystems, financial systems and the competing needs and requirements for all of these to function, there is no linear answer. There is no direct cause and effect so more normalized decision-making, called linear thinking, is ineffective. Systems Thinking pushes to explore the invisible spaces – the relationships between actors and variables in order to help understand the moving parts and where and how to intervene in order to cohere or align different vectors toward desir-

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<sup>19</sup> Attendees included tribal environmental directors and staff, US EPA9 staff, USDA Rural Development staff, Indian Health Services staff, EFC9 Directors Sarah Diefendorf & Susan Blachman, northern Nevada Intertribal Association staff, BIA official, State of Nevada Division of Environmental Protection staff, Karri Winn and the Green MBA Research Team.

able outcomes. Systems Thinking is a holistic approach to analysis and strategy formulation that combined with linear thinking in terms of tactics and methods, produces more successful and healthy results within a complex problem set.

The following explanation is taken from Wikipedia<sup>20</sup>:

“Systems Thinking is any process of estimating or inferring how local policies, actions, or changes influences the state of the neighboring universe. It is an approach to problem solving that views "problems" as parts of an overall system, rather than reacting to present outcomes or events and potentially contributing to further development of the undesired issue or problem<sup>21</sup>. Systems thinking is a framework that is based on the belief that the component parts of a system can best be understood in the context of relationships with each other and with other systems, rather than in isolation. The only way to fully understand why a problem or element occurs and persists is to understand the part in relation to the whole<sup>22</sup>. Standing in contrast to Descartes's scientific reductionism and philosophical analysis, it proposes to view systems in a holistic manner. Consistent with systems philosophy, Systems Thinking concerns an understanding of a system by examining the linkages and interactions between the elements that compose the entirety of the system.

Systems Thinking attempts to illustrate that events are separated by distance and time and that small catalytic events can cause large changes in complex systems. Acknowledging that an improvement in one area of a system can adversely affect another area of the system, it promotes organizational communication at all levels in order to avoid the silo effect. Systems Thinking techniques may be used to study any kind of system — natural, scientific, engineered, human, or conceptual.”

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<sup>20</sup> [http://en.wikipedia.org/wiki/Systems\\_thinking](http://en.wikipedia.org/wiki/Systems_thinking)

<sup>21</sup> O'Connor, J. & McDermott, I. (1997). *The Art of Systems Thinking: Essential Skills for Creativity and Problem-Solving*. San Francisco: Thorsons Publishing. p. 11.

<sup>22</sup> Capra, F. (1996) *The web of life: a new scientific understanding of living systems* (1st Anchor Books ed). New York: Anchor Books. p. 30

## Appendix 4 - Nevada Tribal Interagency Solid Waste Workgroup

In total there were 28 people attending the Solid Waste Workgroup meeting on July 16, 2008 representing 14 tribes, the Inter-Tribal Council of Nevada, three State agencies, the US EPA and the Environmental Finance Center. At this meeting, a survey was administered to gather basic data on the tribes and their respective recycling programs.

### **Tribal Recycling Project Survey Questions for July 16, 2008 Meeting**

#### About the reservation

How dense is the housing or how spread out?

Who lives on the reservation—tribal members, others and what is the population of each?

Are there schools on the reservations?

Where is the nearest community college?

Where are nearest commercial services to/on the reservation – Wal-Mart, casino, etc.?

What are major tribal events? And when do they occur?

#### About waste

Has anyone documented the tribal waste stream?

Is solid waste picked up curbsides on the reservations? If so, who does the collecting? How frequently is it collected?

Is there curbside collection of recyclables? If so, which items are collected and how often?

Where is the nearest landfill & recycling center to each reservation?

Who has programs that are working?

What other isolated rural areas have set up recycling programs in Nevada, Arizona, New Mexico and what works and why?

Are there vocational recycling training programs at any community colleges? If so, where?

Is there interest in providing recycling education information in schools or is this already happening?

**From this survey, the following information was learned:**

The Nevada Division of Environmental Protection has historically given recycling presentations to students throughout the state of Nevada. The presentations are designed to encourage recycling and conserving natural resources. These presentations have been very well received and as a result, the Nevada Division of Environmental Protection decided to expand the education and outreach program by creating a 10-week curriculum that can be adapted to Grades 3-12. This curriculum is intended to develop a sense of stewardship through a series of lessons, which will be aligned with the Nevada standard course of study. The curriculum is an integrated approach that meets various science, math, language arts, and social studies objectives. The 10-week program ends with an action component where the students will apply their knowledge by designing, coordinating, and implementing a school-wide recycling program.

*Are tribes reached by state sponsored e-waste events?*

In Nevada, collection events were held in Winnemucca, Carson City and Las Vegas during the fall of 2006 as part of Nevada Recycles Day.

*Are any tribal staff participating in the Nevada Recyclers' Association?*

A southern chapter was established in Las Vegas with 19 current members and the northern chapter is in the initial stages of development.

*Do the tribes have a purchasing program and if so, what do they buy?*

*If they have a purchasing program, are they open to giving preference to purchasing products made with recycled content/"buy recycled" preferences?*

*Are any tribes manufacturing products made from recycled material?*

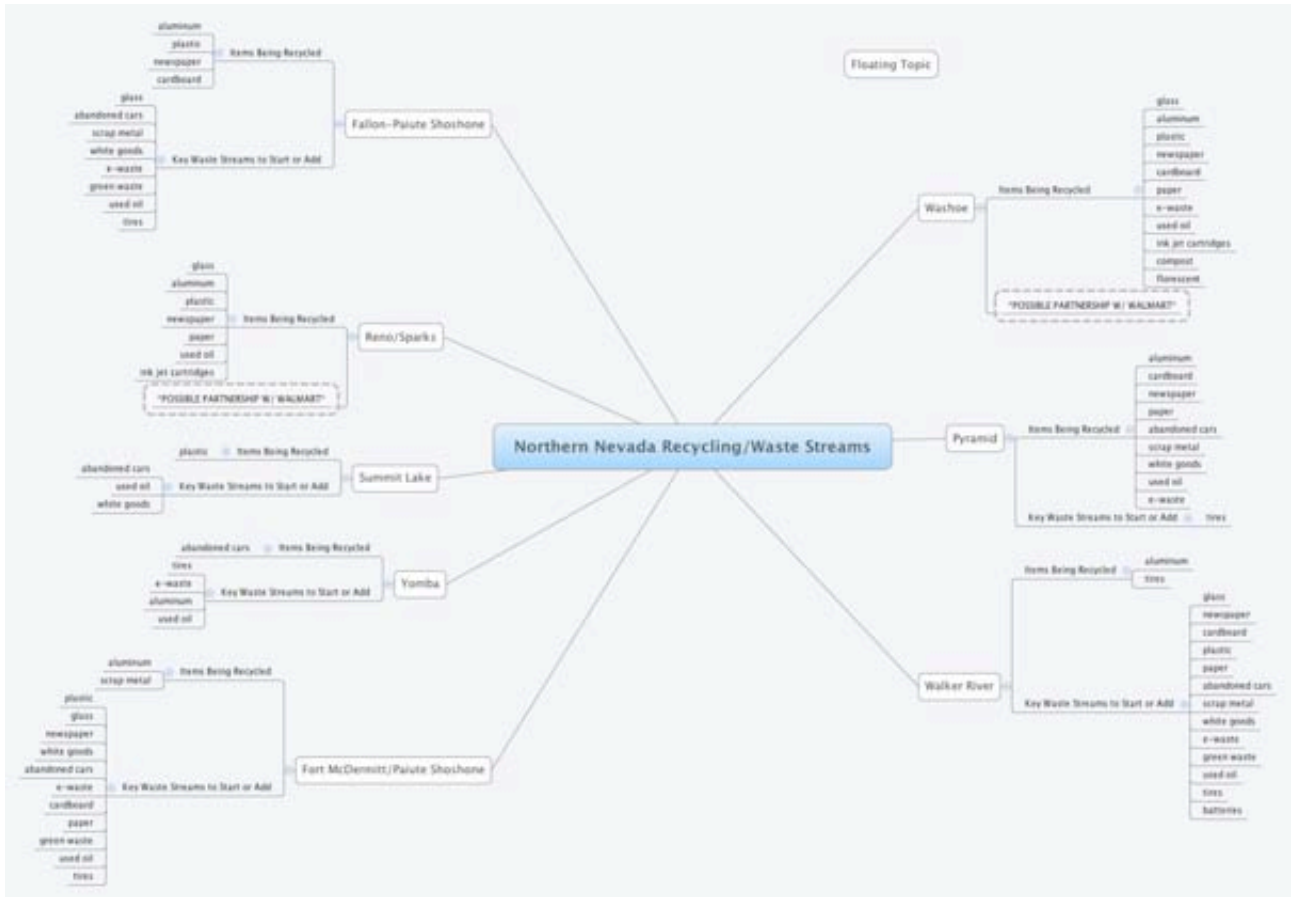
Trex is in Nevada processing film into recycled plastic lumber; RC Farms processes major food waste into pig feed; there's a gypsum manufacturer taking clean wallboard in southern Nevada that Evergreen uses, and there are several new compost facilities. Best contacts: Kevin Dick & Kathryn Fergus.

*What tribes are Wastewise Partners besides the following and what does that they do?*

Pyramid Lake Paiute Tribe Tribal Government NV 9 Partner

Walker River Paiute Tribe Tribal Government NV 9 Partner

Figure 12. Northern Nevada Recycling & Waste Streams. This visual map gives an overview of the information gathered from the July 16, 2008 meeting in Reno, NV.



## Appendix 5 - Tribal Recycling and Waste Diversion Efforts

NOTE: In addition to the following, there are other examples in the Pyramid Lake Solid Waste Management Plan (SWMP) prepared by Tribal Environmental Director John Mosley and in the Washoe Tribe SWMP and Community Recycling Program Planning report.

### **BLACKFEET (Montana)<sup>23</sup>:**

They opened a regional recycling center in 1995 as part of effort to recognize native peoples as the 'original environmentalists' by improving the economy and promoting environmental health. They developed a K-12 recycling education program in traditional and non-traditional schools. Another interesting community building and educational strategy was commissioning a local artist to build four 'found art' metal horsemen to be placed at the four main gateways to reservation.

### **SAGINAW CHIPPEWA (Michigan)<sup>24</sup>:**

The Saginaw Chippewa focused their efforts on scaling recycling and resource recovery first at the Soaring Eagle Casino in 2004 and then expanded to include a recycling program at their pow wow in 2005. Their achievements at the casino include:

- August 2004: Started recycling cardboard/paper and diverted 259 tons of paper in 2005.
- June 2005: Started recycling glass/plastic/aluminum and diverted 18 tons of material in 6 months.
- 2007: Switched from styrofoam cups to reusable mugs; and, they were selected by the Michigan Recycling Coalition as the 'Outstanding Recycling Program' in 2007.
- 2008: Stopped ordering bottled water for employees.

### **MENOMINEE (Wisconsin)<sup>25</sup>:**

- College of Menominee Nation participated in the US EPA's 2008 Great Lakes Challenge (contributed 4 tons of e-waste/pharmaceutical waste).
- College's 'Implementing Sustainable Development' class won grant for 50 recycling bins from National Recycling Coalition and Coca-Cola (*see below for information on this grant*).
- Developed a K-12 recycling program (students built 'garbage monsters' on Earth Day to promote their recycling vision).

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<sup>23</sup> <http://www.indiancountrytoday.com/archive/28219149.html>

<sup>24</sup> <http://www.themorningsun.com/articles/2008/11/10/news/srv0000004008359.txt>

<sup>25</sup>

[http://current.com/items/88927693\\_recycling-101-college-of-menominee-nation-sets-example-in-epa-great-lakes-2008-earth-day-challenge.htm](http://current.com/items/88927693_recycling-101-college-of-menominee-nation-sets-example-in-epa-great-lakes-2008-earth-day-challenge.htm)



**Coca-Cola/National Recycling Coalition (NRC) Recycling Bin Grant Program:**

IT'S NEVER BIN EASIER...TO RECYCLE!

<http://www.nrc-recycle.org/coca-colanrcbingrantprogram.aspx>

Need beverage container recycling bins for your local park, school, office or special event? We can help. The Coca-Cola/NRC Recycling Bin Grant Program supports local community recycling programs by providing selected grant recipients with containers for the collection of beverage container recyclables in public settings. Selected grant recipients will receive actual recycling bins instead of funding.

**WHY BINS?**

Because NRC and Coca-Cola are able to leverage their purchasing power to provide more recycling bins than would be possible if grantees were to use monetary grants to purchase independently. By taking care of the bin purchases internally, our program allows you to better spend your time designing and implementing recycling programs.

**HOW DOES IT WORK?**

The program offers recycling bins designed for use in various settings - special events, general utility and prestige locations. After grant recipients are selected, NRC will contact grantees to offer guidance, confirm their needs, and bin selection. Then, our suppliers will deliver bins directly to the recipients.

**WHO CAN APPLY?**

The grant program is open to government, civic, school, non-profit groups, and for-profit companies. Eligible activities include but are not limited to establishing or enhancing a recycling collection program. This includes the use of specialized containers at community events or functions, public facilities, and programs or events conducted by applicants. The bins must be intended for use in one of four types of settings: Education (K-12 and universities); Sports (parks and sport venues); Culture (music and arts); Commercial (office and facilities)

**WHEN TO APPLY?**

The application period for the 2009 grant cycle has not been determined. For application dates once they are announced, visit the program website at <http://www.bingrant.org> or call Alec Cooley at (843) 278-7686 or email [alecc@nrc-recycle.org](mailto:alecc@nrc-recycle.org).

**MOHEGAN (Connecticut)<sup>26</sup>**

The Mohegan Tribe began recycling in 1997 and diverted 44% of their waste stream into recycling the same year. One of their process innovations was implementing a post-consumer procurement program to close the recycling loop. They sell food waste to a local farm and used cooking grease to a local business that manufactures animal feed. Additionally, haulers enforce the recycling efforts by refusing to pick up unsegregated trash.

**Nambe Pueblo (New Mexico):**

- The pueblo took the initiative to create a partnership with two local facilities to recycle aluminum, plastic, paper, and cardboard.
- They received Department of Energy Pollution Prevention Award for community outreach and education (Sandoval, 2002).
- The Pueblo is working with a local group to develop an eco-industrial park to create materials-processing and energy-recovery spinoff businesses as a result of the recycling partnership<sup>27</sup>.

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<sup>26</sup> <http://www.epa.gov/tribalcompliance/prevandpurch/ppsuccessdrill.html> and <http://www.epa.gov/epawaste/wycd/tribal/thirds/mohegan.htm>

<sup>27</sup> [http://www.hss.energy.gov/pp/data\\_entry/reports/d\\_Awards\\_Before\\_2006\\_Details.aspx?ID=7](http://www.hss.energy.gov/pp/data_entry/reports/d_Awards_Before_2006_Details.aspx?ID=7)

## Appendix 6 - Asset Building

The language in this report related to “asset building” is taken from a report developed by the First Nations Development Institute titled: Asset Building in Native Communities: An Asset Building Framework (2004).

First Nations Development Institute  
10707 Spotsylvania Ave., Suite 201  
Fredericksburg, VA 22408  
540-371-5615  
[www.firstnations.org](http://www.firstnations.org)

The following is an excerpt from the document (pages 8-9):

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“First Nations Development Institute was founded in 1980 with the mission to assist Native peoples to control and develop their assets, and through that control, build the capacity to direct their economic futures in ways that fit their cultures. Since inception, First Nations Development Institute (First Nations) has been working in partnership with Native communities to implement a range of asset-building programs.

First Nations chooses to focus on assets because:

- Assets are the building blocks of wealth.
- From assets, people derive income, jobs and other benefits.
- A major difference between rich and poor people is their ownership and control of assets.
- Tribes and Native people own substantial assets (e.g., land, natural resources, trust funds,) but because they do not control them, they do not derive the most benefit.

Through building assets, tribal communities can improve the well-being of their residents and move toward self-sufficiency.

### Asset Types

First Nations has identified a broad typology of assets. These assets reflect the holistic nature of Native communities and Native economies, acknowledging the value of not just financial capital but also cultural and human resources. The eight broad asset categories are as follows:

**Financial Assets:** This is perhaps the most common form of a community's or individual's wealth. Financial assets include stocks, bonds, savings, trust funds, and other forms of monetized investments. Financial assets are the most liquid form of assets and can be readily used/exchanged to acquire other assets.

**Physical Assets:** The physical infrastructure within tribal communities, such as transportation, utilities, and technological systems are critical for economic activity. Although primarily important as a means to enhance the productivity of other assets, physical assets can generate income streams for a community and increase access to information and expand communication.

**Natural Assets:** Land and natural resources form the basis for economic production. The ability to manage these resources in a sustainable manner, while generating economic benefits is a challenge for all communities. Natural resources include water, oil, gas, minerals, agriculture, wildlife, and forests.

**Institutional Assets:** The institutions and organizations within a community can attract resources to the community, and recycle them there. Such institutions may include the creation of tribal colleges, financial intermediaries, nonprofit organizations, and philanthropic institutions.

**Human Capital:** The skills, knowledge, education and experience of people within a community are important elements within a community. Nurturing the productivity, innovation, and creativity of people is foundational to community well-being.

**Cultural Assets:** These refer to the customs, traditions and indigenous knowledge that are specific to the tribal community. Language is a cultural asset, as is tribal intellectual property. Cultural assets are often "intangible" elements that underpin a community. However, the material expressions of culture can generate income and other assets.

**Social Capital:** Social relations and networks (e.g. kinship systems) within a community, can support the building and maintenance of assets, but does not in itself, generate income. Leadership development, community empowerment, and social justice are ways of increasing the social assets of a community.

**Legal and Political Assets:** The legal rights and claims that a Native community may have can support the ownership and control of economic assets.

## Asset Strategies

The ability to use and organize the community's assets in ways that improve the well-being of the community is the basis for an asset-based sustainable development strategy. We have identified several strategies that can be used to promote asset-based development. Native communities can adopt various strategies to build their assets. Asset-building strategies include the ability to **control, retain, increase, utilize, leverage, and create** assets. These strategies have been defined as follows:

### Control

To increase the control of the asset through a variety of means, including external-institutional factors (becoming more active in political and other decision making bodies) and internal-capacity factors (increasing the skills of tribal members to effectively control assets).

### Retain

To create or establish internal controls or regulatory structures within the community to retain assets.

### Increase

To expand and/or add value to an existing asset.

### Utilize

To build/strengthen the ability of the community to manage and make use of the asset.

### Leverage

To use the asset in such a way as to attract/ generate additional resources to the asset pool.

### Create

To originate, or bring into being, a new asset.

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To illustrate the concepts above, various asset aspects of the framework were applied to the Pyramid Lake Reservation with a specific frame around green business opportunities.

### *Context*

Located near Reno, the Pyramid Lake Tribe has many resources suitable for creating and growing sustainable enterprises. Existing natural assets include Pyramid Lake and the surrounding lands, which are suitable for Wind, Geothermal, and Solar exploration. Existing studies include the feasibility of such explorations into alternative energy enterprises, and the results are promising. A list of possible funding sources for these projects

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is compiled below for tribal review and study. Additionally, the tribal museum serves a tourist destination on way to the lake for recreational activity. More opportunity exists, however, to expand in this direction using an Eco Tourist model. The following is a description of strategies that would enable the tribe to control, retain, increase, leverage and create more opportunities.

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**Opportunity: Build FINANCIAL assets by managing NATURAL assets.**

### 1. *Eco Tourism*

Opportunities worth exploring include: hiking (“Native Treks”), boating, day camping (and/or overnight), guided/self-guided tours and other recreational uses of the lake and surrounding land.

See Moki Treks as a model:

<http://www.mokitreks.com/>

“Moki Treks offers award-winning tours that specialize in cultural heritage. Moki Treks was a finalist in the 2004 World Legacy Awards, which recognizes excellence in environmental, social and cultural travel. In October 2006 our [Canyon de Chelly](#) trip was selected in National Geographic Traveler's 50 tours of a lifetime. We are proud to work with reputable members of the Indian communities who know their land intimately and are experts in history and current affairs. They give you first-hand experiences of their culture and customs that have been passed down for generations. They show you secret places, allow you a glimpse into their daily life on the reservation and share the Native American spirit. Our Native American guides make our Moki Treks itineraries a very exclusive, one of a kind experience.”

### 3. *Industrial Composting*

Use mycelium planting to fertilize land and grow organic foodstuffs to be sold to surrounding markets. Refer to Fungi Perfecti for more information:

<http://www.fungi.com/>

“**Fungi Perfecti®** is a family-owned, environmentally friendly company specializing in using gourmet and medicinal mushrooms to improve the health of the planet and its people. Founded by mycologist and author Paul Stamets, we are leaders in a new wave of technologies harnessing the inherent power of mushrooms and fungal mycelium worldwide.”

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**Opportunity: Leverage PHYSICAL & NATURAL assets to increase HUMAN & SOCIAL assets and FINANCIAL assets.**

### 1. Expanding Recycling Efforts

Create a full-scale recycling center to handle waste streams and employ tribal members to run the program. The tribe already makes use of a baler for processing paper and has a can crusher. The Washoe Tribe has a excellent transfer station feasibility studies that can lend insight into process and payout.

### 2. Exploring WIND, GEOTHERMAL, & SOLAR

#### **WIND**

This could be an excellent location for wind turbines. The National Association of State Energy Officials (NASEO) funds energy projects on tribal lands.

<http://www.naseo.org/>

Nevada state contact: (775) 687.9706

[nup@energy.nv.gov](mailto:nup@energy.nv.gov)

The National Association of State Energy Officials (NASEO) is the only national non-profit organization whose membership includes the governor-designated energy officials from each state and territory. NASEO was formed by the states and through an agreement with the National Governors Association in 1986. The organization was created to improve the effectiveness and quality of state energy programs and policies, provide policy input and analysis, share successes among the states, and to be a repository of information on issues of particular concern to the states and their citizens. NASEO derives basic funding from the states and the federal government.

#### **Example: Rosebud Sioux Indian Reservation**

In 1998 the Rosebud Sioux Tribe applied to the Department of Energy (DOE) for a cooperative grant (50/50) to build a commercial utility turbine. Part of the tribe's success in obtaining the grant can be attributed to having recorded wind data for 18 months prior to their application. Working closely with the Intertribal Council On Utility Policy (ICOU) and Distributed Generation, Inc., the Rosebud Tribe negotiated the first U.S. Department of Agriculture (USDA) Rural Utilities Service loan to a tribe for a commercial wind energy project.

[http://www.eere.energy.gov/windandhydro/windpoweringamerica/na\\_rosebud.asp](http://www.eere.energy.gov/windandhydro/windpoweringamerica/na_rosebud.asp)

## GEOTHERMAL

Case study funded by EPA (GAP), Tribal Resource Conservation Funds

**Example: *Potawatomi Nation in Shawnee, Oklahoma***

This tribe created a geothermal pond to meet the energy needs of their casino and residents. Benefits of this project include low operation and maintenance costs.

Contact: Art Muller (405) 878.4672

[amuller@potawatomi.org](mailto:amuller@potawatomi.org)

**Example: *NANA Regional Corp (Northwest Alaska Native Association Regional Corporation)***

This native-owned corporation improves regional energy security through strategic energy planning and an improved understanding of available energy options.

Contact: Marie Green

(907) 442.3301

[marie.green@nana.com](mailto:marie.green@nana.com)

-Or-

Stuart Parks

(907) 257.1735

[sparks@nanapacific.com](mailto:sparks@nanapacific.com)

## SOLAR

Consider applying for the Investment Tax Credit (ITC) or a grant from the US Treasury Department to fund solar projects that may include 3<sup>rd</sup> party ownership of solar panels.

For funding refer to New Resource Bank:

<http://www.newresourcebank.com/>

**Example: *Washoe Environmental Protection Department, CA & NV***

<http://www.wapa.gov/es/greennews/2004/dec604.htm>

The Tribe installed installed solar panels on the 2,800-square-foot roof of the Washoe Environmental Protection Department building in Gardnerville, NV. The three 2.5-kilowatt modular photovoltaic panels produce 7.5 kilowatts of power for lights, computers, copiers and a fax machine. The Washoe Environmental Protection Department (WEPD) was the first Nevada business to be awarded a rebate under the state of Nevada's Solar Power Program.

**Example: *Hacienda Mobile Home Park, Barstow, CA***

<http://www.borregosolar.com/solar-power-systems/case-studies/client-hacienda.php>

The mobile home park is on 6.5 acres located in the Mojave Desert of Southern California. Hacienda Mobile Home Park did their research and found solar energy



to be a cost-effective, environmentally responsible way to reduce the park's dependence on the supply and prices offered by the local utility company, Southern California Edison (SCE).

**Example: *Ramona Band of Cahuilla Indians***

[http://www.youtube.com/watch?v=NMd7\\_amitfM](http://www.youtube.com/watch?v=NMd7_amitfM)

The Ramona Band Tribe lives completely off-grid on their 560-acre reservation. They created a macro and micro hybrid system incorporating wind and solar energy generating systems. In addition, by creating an eco-tourist lodge they have found a way to preserve their cultural heritage and increase tribal financial assets.

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Opportunity: **Utilize surrounding INSTITUTIONAL assets through strategic partnership.**

1. *Burning Man Festival*

Pyramid Lake's Tribal Chairman is already developing a relationship with the festival to explore potential business opportunities. Additional enterprise ideas include: providing emergency response services, festival security services, picking up recyclables during the event and long-term storage services. Additionally, this festival could prove a high season for any ecotourism activities the tribe establishes.

## Appendix 7 - Increasing Financial Assets through Green Business

The following business concepts fall outside of the scope of this research project in that they do not specifically address resource recovery and/or increase recycling. They are included as examples of additional ways financial assets could be cultivated through an earned-income, i.e., enterprise strategy within the context of northern Nevada.

**Concept: Green RV Park & Long-term Storage**

A solar powered facility offering services for RV tenants and long term RV storage. Build out of amenities for the facility could be constructed using green building materials, e.g., Trex lumber. Xeriscaping and water conservation measures could be included in the design. Overall, this could be a very low overhead enterprise.

**Concept: Green Self-Storage Facility**

This could work in an urban center – potentially on the Reno-Sparks Indian Colony. It could also work well in Pyramid Lake where they could cater to the Burning Man community – a large number of Burning Man participants store supplies in the region year-round.

**Concept: Green Restaurant / Café**

Featuring organic and regional foods; the restaurant could also disseminate cultural information about regional tribes and be a potential drop off location for various kinds of recycling for tribal members. A business like this would probably do better in a more urban location like Reno Sparks.

**Concept: Eco / Cultural Tourism**

Pyramid Lake could increase its ecotourism efforts; other tribes could explore small hotel concepts as a business and way to promote their culture.

**Concept: Conservation Landscaping**

This business would focus on landscaping solutions using xeriscaping strategies to conserve water and Integrated Pest Management (IPM) to reduce use of pesticides. This would include specialization in native and regional endemic plant species. Additional services could include installing home composting systems, rooftop or land-based cisterns for rainwater harvesting, managing beehives, installing fences or other minor earthworks.

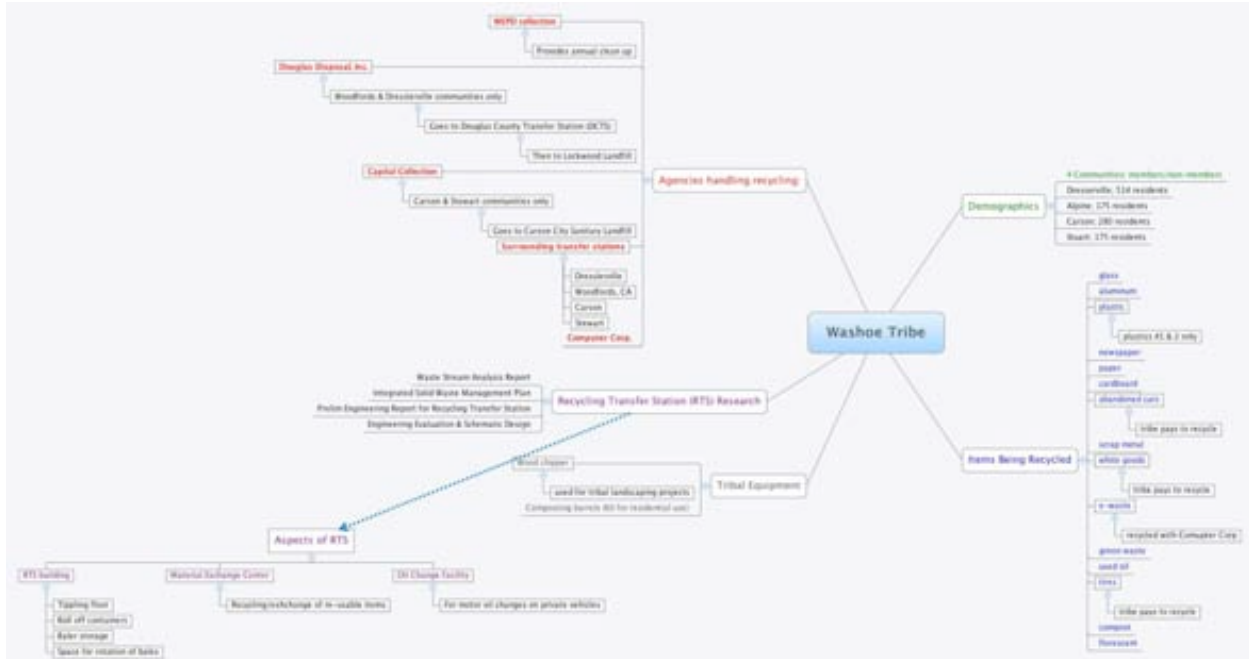
## Appendix 8 - Washoe /Pyramid Lake Tribal Recycling Maps

The mind maps (Pyramid Lake and Washoe respectively) depict the current waste streams and recycling flows and also visually represent ideas for expanding processes and generating income from renewable resources (as in the case with Pyramid) or a transfer station enterprise (Washoe).

### Washoe Tribe

Washoe Tribe has plans to build a transfer station. Extensive research and analysis has been provided by a third party (Ridolfi & Associates,) proposing the location and capacity of the planned transfer station, which will process (via curbside collection) paper, cardboard, aluminum and recyclable plastics. An ideal scenario would be to build a transfer station that meets the needs of residents in the town of Dresslerville, Nevada. Financial feasibility of the project needs more analysis. Waste stream reports require updating. This tribe also owns a chipper used for landscaping projects in addition to a composting program for tribal residents. Currently e-waste, auto, white goods and scrap metal are recycled; the tribe pays for the proper disposal of tires and batteries.

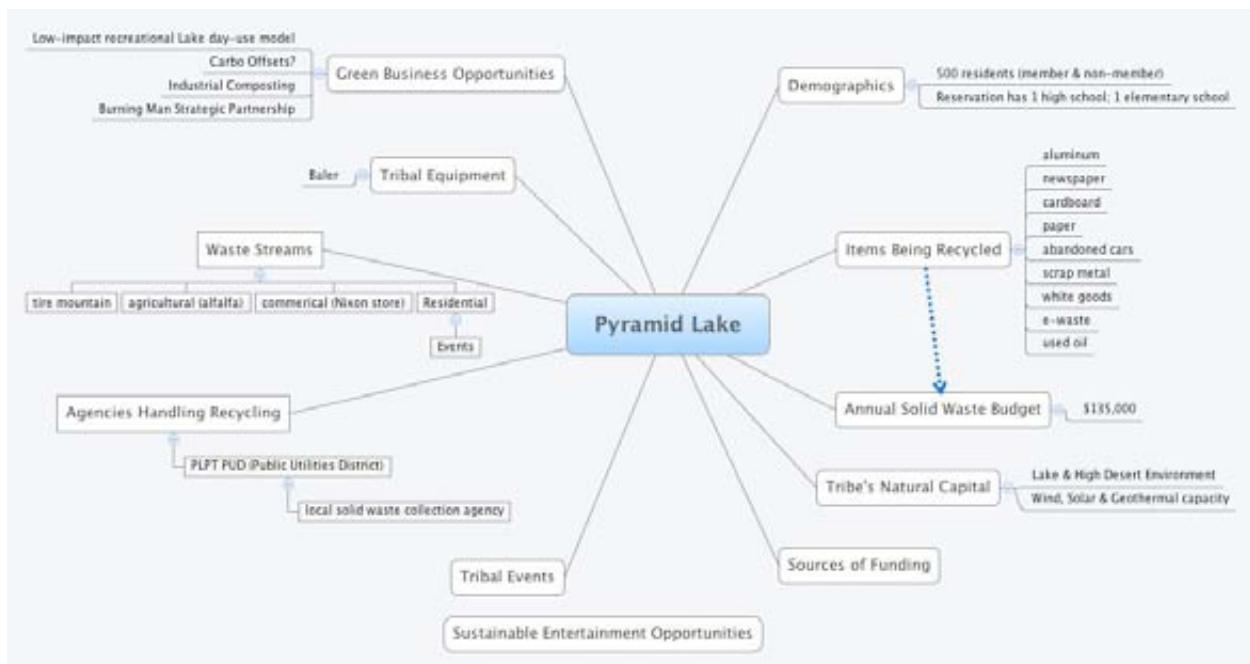
Figure 14. Washoe Tribe Resource and Recycling Mind Map



## Pyramid Lake Tribe

The Pyramid Lake mind map offers a visual representation of the tribe's current state process flows (demographics, solid waste budget, recycling streams, facilities and agencies handling recycling, etc.) and depicts green business and renewable energy opportunities in the areas of solar, wind and geothermal. Several references to possible funding sources and case studies are also included as links.

Figure 15. Pyramid Lake Resource and Recycling Mind Map



## Appendix 9 - State of Nevada Recycling Laws and Incentives

The following excerpts are taken from: *2009 Recycling and Waste Reduction Report*, Nevada Division of Environmental Protection<sup>28</sup>.

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“Nevada's recycling program began with passage of Assembly Bill (AB) 320 during the 1991 legislative session. AB 320... established solid waste recycling requirements for certain municipalities, a statewide goal of recycling at least 25% of the solid waste generated, a preferential procurement policy for goods made with some recycled-content materials, and directed the Division to provide a program of education and technical assistance to the public and municipalities concerning recycling.

“...NRS 444A.040 requires municipalities to establish different levels of recycling services depending on the size of their populations. When originally created in 1991, the statute required municipalities with populations greater than 40,000 to provide curbside recycling and household hazardous waste disposal programs. Smaller municipalities, between 25,000 and 40,000 in population, were required to provide recycling drop-off centers, rather than curbside collection...

“...Since passage in 1991, NRS 444A.040 has been amended twice, each time raising the population thresholds that trigger different levels of required recycling services. In 1995, the population threshold of 40,000 was increased to 100,000, and in 2001, the 25,000 threshold increased to 40,000.

“...Funding for these statutory mandates was established in NRS 444A.090, by the creation of a \$1 surcharge on the retail sale of all new vehicle tires in the state. The surcharge was originally designed to sunset on March 15, 1993 and the revenue generated from this surcharge was placed in a special account, (the "Account for Recycling"). The statute was subsequently amended to eliminate a sunset date and the account was renamed the, ‘Account for Solid Waste Management.’ The Account for Solid Waste Management currently funds all of the solid waste regulatory programs in the state, not just recycling.

“...Nevada adopted regulations governing the management and transportation of waste tires in 1994. Given that most landfills accept used tires from the public and commercial haulers, and that waste tire haulers are required to properly document waste tire disposal, Nevada does not have a large illegal tire dumping problem. On the other hand, because of the low-cost of landfilling and the relatively high cost of tire recycling, waste tire recycling markets have not developed in Nevada; however, some landfill owners/operators have recently raised their waste tire disposal fees which could result in recycling being seen as a more attractive means of managing waste tires. The developments of tire-

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<sup>28</sup> [http://nevadarecycles.gov/doc/2009\\_biennial\\_report.htm](http://nevadarecycles.gov/doc/2009_biennial_report.htm)

derived fuel markets, such as use in cement and lime kilns, have been proposed in Nevada, but are not yet in operation. The use of tire-derived fuels can be a viable means of reducing the landfilling of waste tires while recovering their energy value. Other markets, such as tire rubber crumbing, have also been discussed but are not, as yet, actively operating in Nevada.

“...Most of the tires recycled in Southern Nevada are being retreaded, some in-state and some out-of-state, while tires in Northern Nevada are retreaded, crumbed, or used as tire-derived fuel out-of-state. It should be noted that retreading is considered a form of ‘reuse’ by the EPA.

“...Three major obstacles continue to hinder progress toward increasing recycling in rural Nevada: 1) the lack of infrastructure for collecting and storing recycled materials in-state, 2) the large distances to existing recycling centers, and 3) the relatively small volume of recyclable materials in rural Nevada. To address these challenges, Division staff regularly meets with local government officials and public utilities managers in rural counties to discuss recycling options that may be viable in rural communities and in April 2008, staff facilitated a workshop with the City of Elko and the Nevada Rural Water Association targeted for rural public utilities managers. Division staff also research recycling strategies, community alternatives, and financial options such as developing co-operative partnerships with local businesses and industries.”

“...Nevada continues to make progress toward achieving the 25% recycling goal set by the Legislature in 1991. Nevada's statewide recycling rate increased by 4.4% from 17.2% in 2006 to 21.6% in 2007. The state remains 3.4% away from the 25% goal.

“Nevada's low population and large geographic area present unique challenges, especially in the rural areas of the state where it will be difficult for the environmental and economic benefit of recycling relatively small quantities of waste to overcome the costs. Nevada's sheer geographic size means the costs of long-distance transportation (labor, time, fuel resources) to the current out-of-state markets will tend to be high. Another significant challenge is that Nevada lacks the infrastructure that will support recycling collection, processing, and manufacturing. Currently, there are no incentives for manufacturers to use locally recycled materials, nor are there incentives for local manufacturers to convert to using recycled feedstock. In the absence of local manufacturers that use locally recycled materials as their feedstock, all recyclables must be transported out-of-state.”

Although Nevada doesn't have the most aggressive waste diversion profile when compared to other states, it does provide some financial advantages to companies entering the recycling industry: “Personal property tax exemption of 75 percent for 10 years. Real property tax exemption of 25 percent for 20 years. (For manufacturing and recycling

companies that meet the state's job creation and development goals and use raw or solid waste material from within Nevada.)”

**Table 2-2 State Recycling Rate**

	2006	2007
Tons of MSW Recycled (tons)	719,223	894,652
Tons of MSW Disposed <sup>1</sup> (tons)	3,463,395	3,245,596
Percent Recycling Rate <sup>2</sup>	17.2%	21.6%

- <sup>1</sup> Tons of MSW disposed is the amount of waste generated in counties required to have a recycling program and disposed of in Nevada.
- <sup>2</sup> The recycling rates are lower than actual since data from some recycling businesses was not reported.

## Appendix 10 - A Case for Local Remanufacturing

A community's success in achieving zero waste depends upon having a good plan for resource flows. Local management of these resources provides benefits in conservation, transportation, and economic incentives for sourcing second-generation raw materials.

While remanufacturing traditionally refers to the process of disassembly, repair and resale of consumer goods, it can be applied to the breaking down of "waste" into its component parts and producing new products from materials that still retain a use value. Remanufacturing facilities that provide this service make money by producing a finished good. The examples below incorporate down-cycled raw materials as well as a combination of used components and virgin material.

- Fibrous pulp used in shredded insulation, cat litter, new paper/cardboard products
- Plastic in hard resin products: shopping crates, recycling bins
- Plastic in flexible products: bags, agricultural sheets, floor mats, hand bags, clothes
- Aluminum: house siding, cans, sheets
- Re-treaded tires (agricultural, commercial)
- Tire shreds in road surfacing substrate, irrigation hoses.

The recent federal stimulus bill will bring billions into cities' utilities and infrastructure in the next 3-5 years. This could create optimal conditions for launching remanufacturing based businesses. The cost of initial capital requirements do not outweigh the financial, social and ecological benefits of keeping these services publicly owned.

Neil Seldman from the Institute of Local Self-Reliance describes how one of the challenges that face a local remanufacturing effort is that large waste companies have a monopoly on recyclable collections. He claims that incineration is only used by large waste companies to eliminate recycling competitors. While there is talk about tire pyrolysis and plasma arc (super high heat) processes, most of the facilities being built are still 'mass burn' plants<sup>29</sup>.

Another approach to consider is Extended Producer Responsibility (EPR), which shifts the burden of disposal onto manufacturers. Some consumers have sought visibility for this movement by removing products from their packaging in retail stores, hoping the pressure to handle this waste will travel upstream to the source. Others look to regulation that can enforce the growing momentum for smarter production and distribution models.

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<sup>29</sup> Interview with Neil Seldman, President, Institute For Local Self-Reliance; March 11, 2009.



LeCompte explains how

“... Oregon’s recently implemented e-waste program, which requires electronics manufacturers to take back products at their end of life, [i]s an attempt to encourage just such market development. If manufacturers are responsible for take-back programs, either on their own or through a partner,... it becomes in their own self-interest to design products for simple, cost-effective disassembly, reuse and recycling. That could create better, safer jobs for disassembly, reduce manufacturing costs and reduce disposal costs for consumers.”

According to Kevin Drew, Zero Waste Program Coordinator for the City of San Francisco, California, the ideology behind EPR can translate into less trash handling by cities, which removes the power from local waste management unions. Keeping manufactured materials in the immediate 'wasteshed' encourages retaining the value addition from these products, as opposed to expending energy to break them down into more basic parts and shipping those overseas for recycling (through Oakland)<sup>30</sup>.

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<sup>30</sup> Interview with Kevin Drew, Zero Waste Program Coordinator, San Francisco Department of the Environment, March 11, 2009.

## Appendix 11 - Overview of Nevada Wal-Mart

### Wal-Mart's Potential Role as a Strategic Recycling Partner in Nevada

While not directly a strategy for the tribes of northern Nevada, the research team studied how Wal-Mart may play a role in increasing recycling opportunities for tribes and tribal members. Debbie Hoover, Manager of Outreach Programs for Elko's Wal-Mart, provided some observations about creating successful recycling partnerships based on her experience in Elko:

- Clothes hangers, shredded paper, plastic bags, and milk containers are bailed and backhauled to recycling facilities on Wal-Mart trucks; stores have an opportunity to collect and transport local waste in addition to their own.
- One of the greatest barriers to utilizing the store's parking lot for a recycling drop-off location has been the hiring and retaining of employees to manage the materials and integrate with the store's internal collection and bailing operations.
- Promoting the donation of second-generation goods (used coats, cell phones) by linking up with local groups in need is an effective way to incentivize waste diversion.

### Recycle Bank

Under this program, individuals receive RecycleBank, (<https://www.recyclebank.com/>), points for the material they recycle that can be redeemed for products and services. Tribes, or perhaps the Intertribal Council, may explore the potential of encouraging the northern Nevada Wal-Marts to adopt a program like RecycleBank as part of their corporate commitment to community development, social responsibility and environmental stewardship.

Scenario 1: Create a mini transfer station modeled after RecycleBank using a portion of the parking lot for recyclable/salvageable drop-offs. Offer incentives for customers to drop off recyclables by offering Wal-Mart gift cards for products made with post-consumer content, and discounted water/energy efficiency improvements.

Scenario 2: Wal-Mart partners with RecycleBank to help market the program by engaging customers in educational outreach and let customers earn points from recycling that earn discounts on products at Wal-Mart.

RecycleBank Statistics<sup>31</sup>:

- Services were expanded from 35 municipalities and 100,000 homes in 2007 to over 90 municipalities and 210,000 households in 2008.
- RecycleBank households redeemed over 46 million points for RecycleBank Rewards in 2008, an increase of 242% from the previous year.
- 668 new local and national RecycleBank Reward Partners signed up in 2008, an increase of 274 % from 2007.
- RecycleBank members donated 750,000 points to local school environmental initiatives in 2008, the equivalent of \$75,000.
- “2008 was a big year for us because over 1,000 rewards partners participated in the RecycleBank Rewards Program,” said Morley Ivers, Chief Rewards Officer of RecycleBank.
- RecycleBank has more than doubled recycling rates in the communities where the program has been deployed. To date, over 60 million pounds of recyclables have been diverted from the waste stream, representing a savings of \$6 million for municipalities in 2008.

**Background Statistics on Wal-Mart Nevada** <sup>32</sup>:

WAL-MART LOCATIONS IN NORTHERN NEVADA

- Store #2453: 2333 Reno Highway, Fallon, NV 89406
- Store #4370: 1550 East Newlands Drive, Fernley, NV 89408
- Store #1648: 3770 South Highway 395, Carson City, NV 89705
- Store #3408: 3200 Market Street, Carson City, NV 89706
- Store #3277: 155 Damonte Ranch Pkwy, Reno NV 89521
- Store #2189: 4855 Kietzke Ln., Reno NV 89509
- Store #2106: 2863 Northtowne Ln., Reno NV 89512
- Store #3254: 5260 W. Seventh St., Reno NV 89523
- Store #3729: 5065 Pyramid Lake Road, Sparks, NV 89436
- Store #2617: 3010 Potato Road, Winnemucca, NV 89445
- Store #2402: 2944 Mountain City Hwy, Elko, NV 89801

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<sup>31</sup> <http://www.recyclebank.com/how-it-works>

<sup>32</sup> <http://walmartstores.com/FactsNews/StateByState/State.aspx?st=Nv>

*As of August 2008, Wal-Mart's presence in Nevada includes:*

Supercenters:	26
Discount Stores:	4
Neighborhood Markets:	12
Sam's Clubs:	7
Distribution Centers:	1

*Average store size (national average)*

Supercenter:	185,000 sq. ft. with approx. 142,000 items
Discount Store:	101,000 sq. ft. with approx. 120,000 items
Neighborhood Market:	41,000 sq. ft. with approx. 29,000 items
Sam's Club:	130,000 sq. ft. with approx. 5,500 items

*People*

- As of May 2009, the total number of Wal-Mart associates in Nevada is 14,707.
- The average wage for regular, full-time hourly associates in Nevada is \$11.69 per hour (Wal-Mart Discount Stores, Supercenters, and Neighborhood Markets). Additionally, associates are eligible for performance-based bonuses.
- In recent years, Wal-Mart has contributed four percent of an associate's eligible pay to their combined Profit Sharing and 401(k) Plan.

*Suppliers*

In FYE 2009, Wal-Mart Stores, Inc. spent \$237,111,686.00 for merchandise and services with 352 suppliers in the state of Nevada. As a result of Wal-Mart's relationship with these suppliers, Wal-Mart supports 19,106 supplier jobs in the state of Nevada. Supplier figures provided by Dun & Bradstreet.

*Taxes and Fees*

- Wal-Mart collected on behalf of the state of Nevada more than \$132.8 million in sales taxes in FYE 2009.
- Wal-Mart paid more than \$20.7 million in state and local taxes in the state of Nevada in FYE 2009.

*Community Involvement*

In 2008, Wal-Mart Stores and Sam's Club gave \$3,434,540.00 in cash and in-kind donations to local causes and organizations in the communities they serve in the state of Nevada. Through additional funds raised through stores and clubs throughout the state, Wal-Mart contributed and raised a grand total of \$4,072,847.00 as a result of its presence in Nevada.