WISCONSIN INSTITUTE FOR SUSTAINABLE TECHNOLOGY

University of Wisconsin Stevens Point

PLA Recovery & Recycling

- a pilot project at University of Wisconsin - Stevens Point

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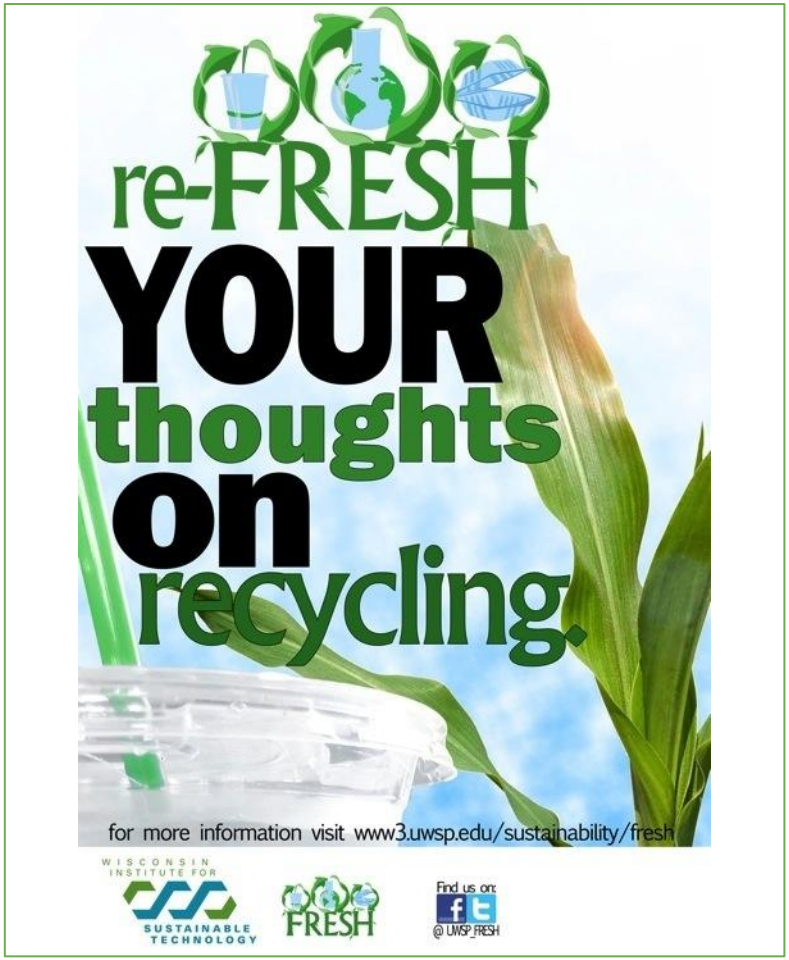
FRESH project overview

- Focused Research Effort for Sustainable Habits
- UW-Stevens Point Dining Services began purchasing PLA food serviceware in Fall of 2009 to replace styrofoam containers
- However, no industrial composting capability on campus or source segregation of bio-based plastics
- Explore landfill diversion options other than composting
- Chemical recycling of post-consumer PLA waste
- Study environmental sustainability and economic feasibility of using and recycling PLA products

Objectives

- Study the environmental sustainability and economic feasibility
- Divert from landfill as much post-consumer PLA on campus as possible
- Work toward engaging Stevens Point area businesses using PLA products and implement collection efforts
- Evaluate quality & end uses of post-consumer derived lactic acid
- Undertake LCA study



Marketing & Education

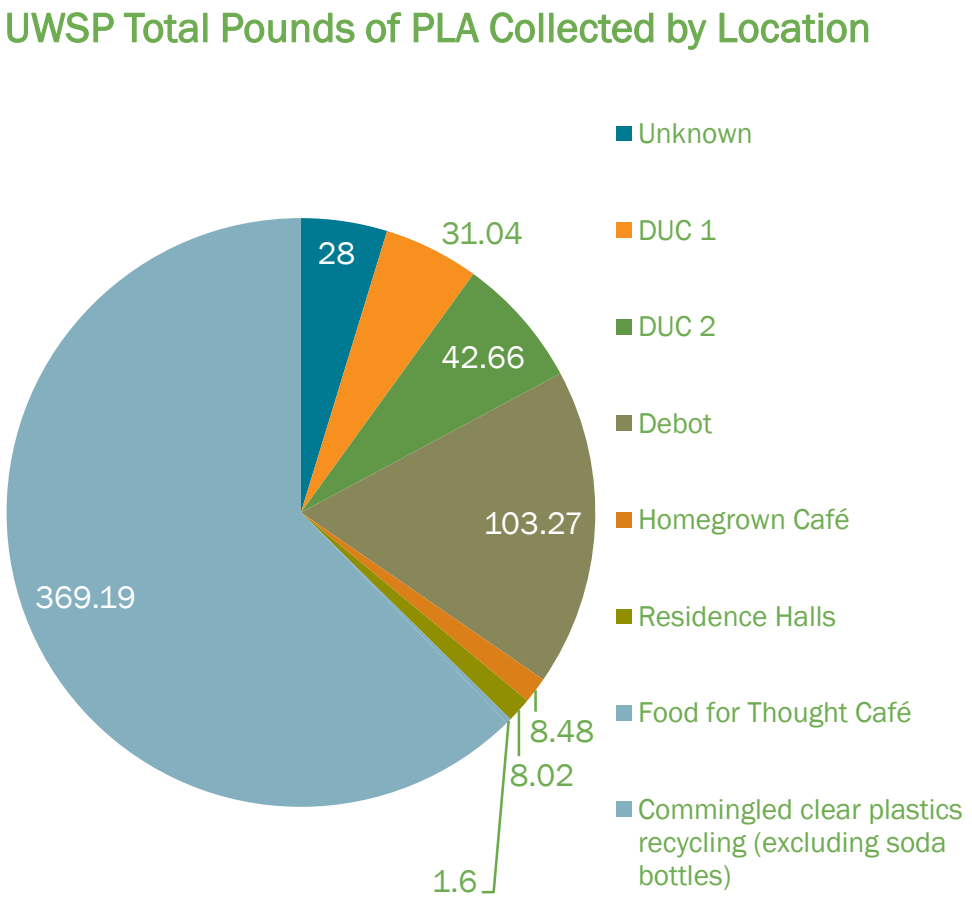
- Promotional effort with unified brand
- Poster campaign
- Collection bin advertising
- Facebook and Twitter campaigns
- Presence at Freshman orientation
- Website (http://www.uwsp.edu/fresh)
- Questionnaire and survey

Logistics & Research

- Secure support from diverse campus entities:
  - Dining Services
  - Facilities' Management
  - Custodial staff
  - Materials' Recovery Center
- Collect weight data for material recovered
- Compare source segregated product against stock inventory
- Undertake waste audit to check for material not source separated
- Monitor for PLA occurring in other campus recyclate streams
- Evaluate chemical recycling

Results: 1

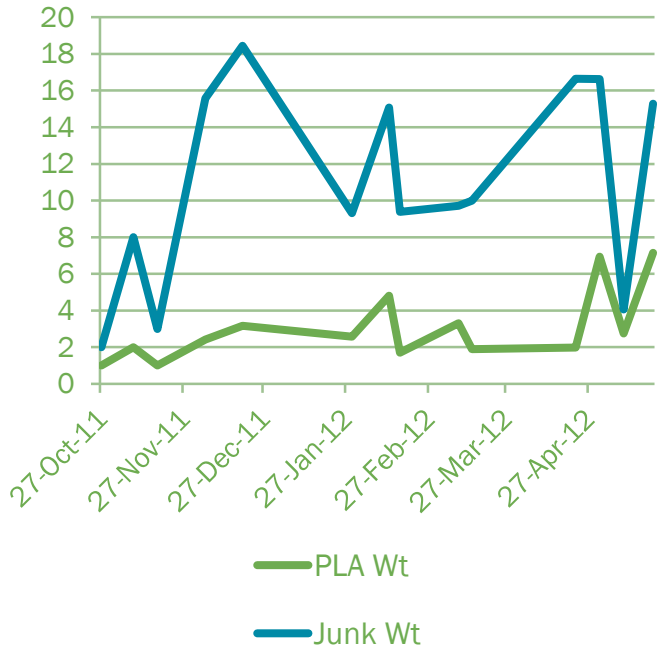
- Recovered 592 pounds of post consumer PLA
- Largest proportion recovered from existing commingled plastic recycling bins across the campus
- Next largest portion from the main residential dining hall with few bins for disposal choices
- Picture for recovery from Residence Halls skewed because 2nd phase implementation of program



Results: 2

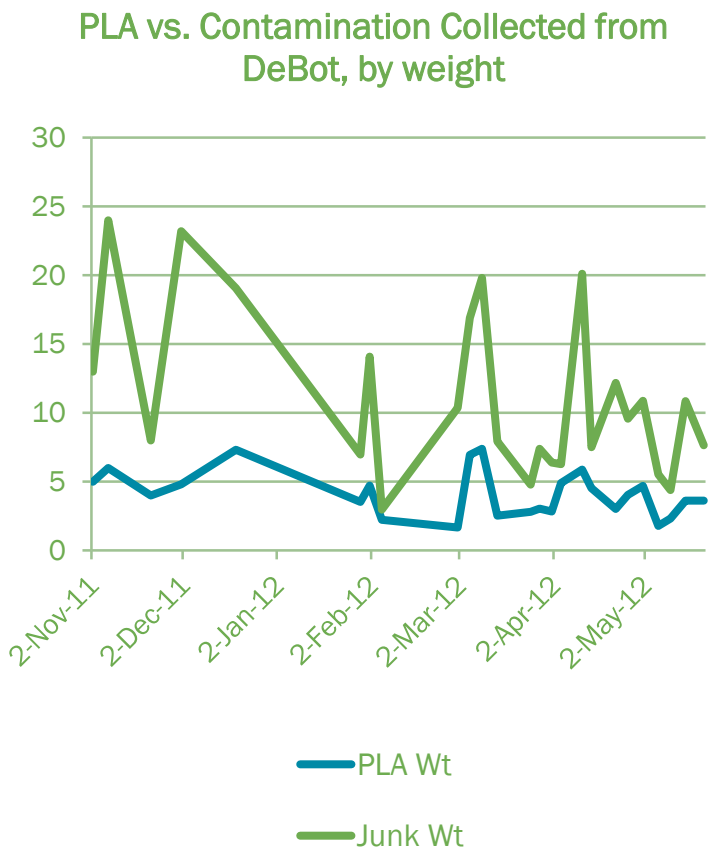
- In all cases the amount of contamination in source-segregated bins outweighed the amount of post-consumer PLA recovered
- Majority of contamination was food waste
- PLA was separated from contaminants, rinsed and dried to determine dry weight recovery

PLA vs. contamination collected from FRESH bin in DUC 2, by weight



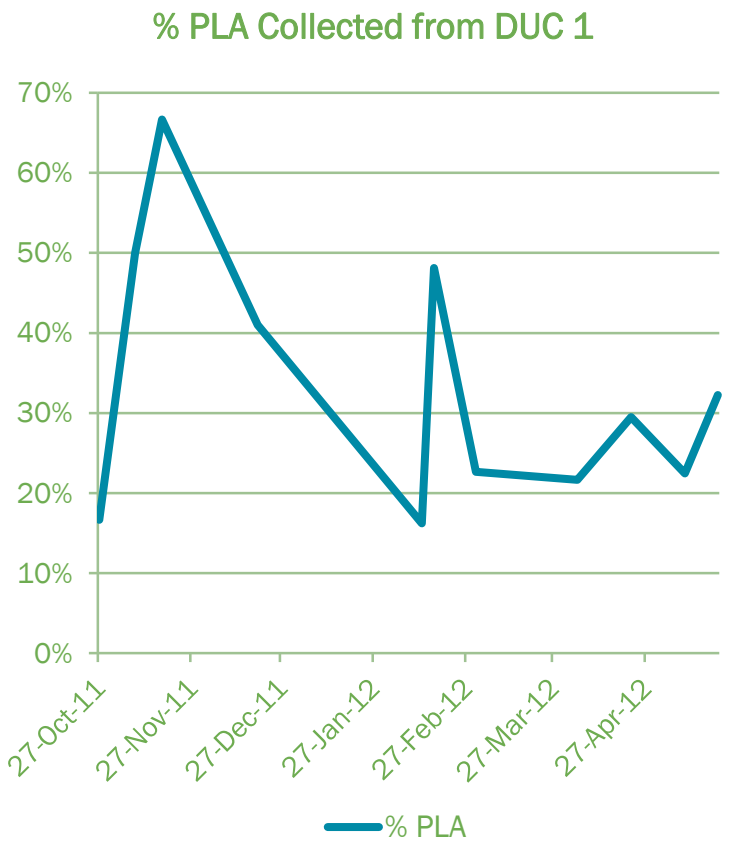
Results: 3

- Contamination was removed by hand sortation and warm water rinsing of the post consumer PLA
- Rinse rate 3-5 lbs PLA per gallon of water, approx 90 degrees F



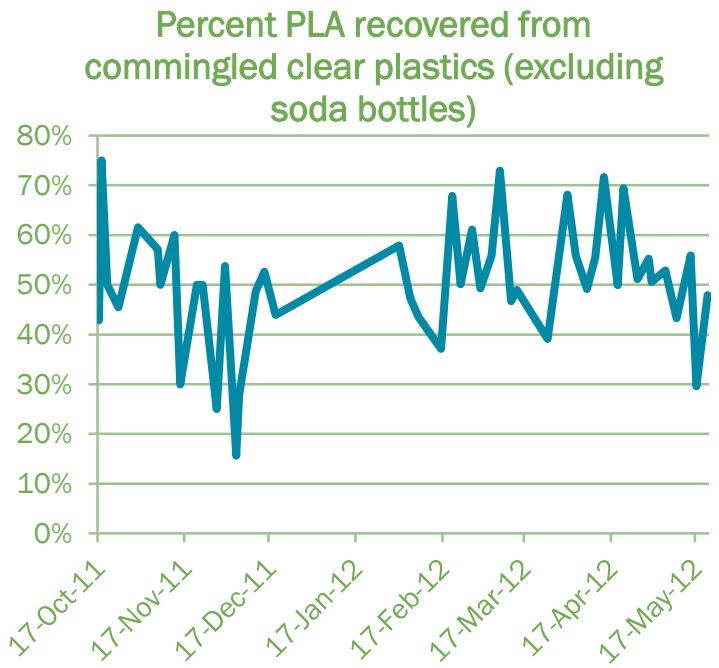
Results: 4

- Levels of source-segregated PLA recovery increased with publicity campaigns
- Publicity campaigns had short-lived effects
- Typical recovery of PLA versus contaminants in source-segregated bins ranged between 11% and 67%



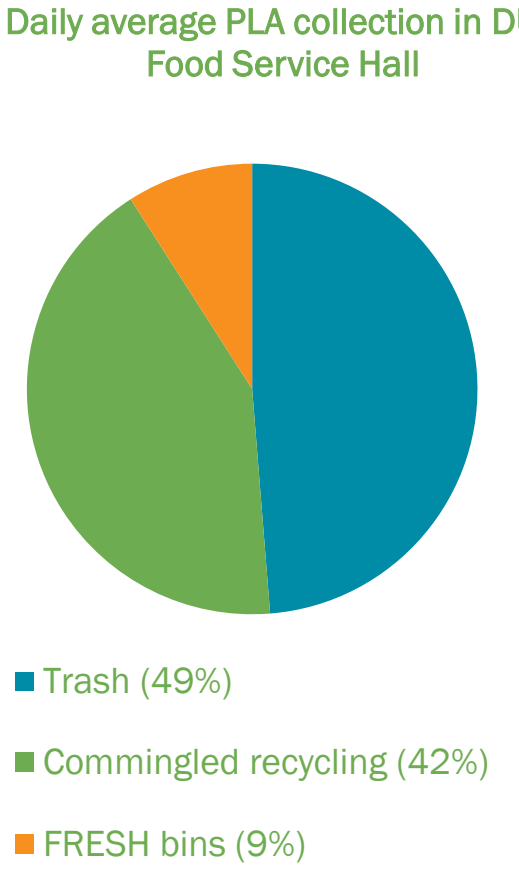
Results: 5

- PLA recovery from pre-sorted commingled plastics to remove soda bottles, opaque and colored plastics



Results: 6

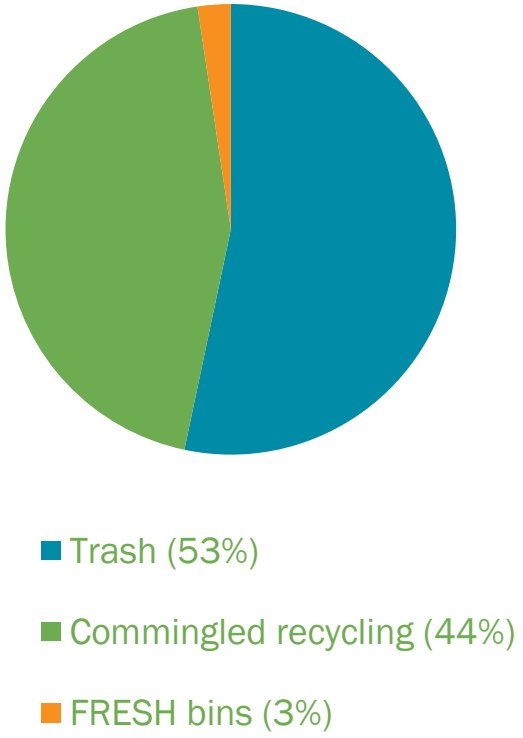
- In the dining services hall (DUC 1 and DUC 2)
  - Recovery of all PLA inventory by either source segregation or commingled recycling is 51%
  - Some 49% is entering the trash waste stream



Results: 7

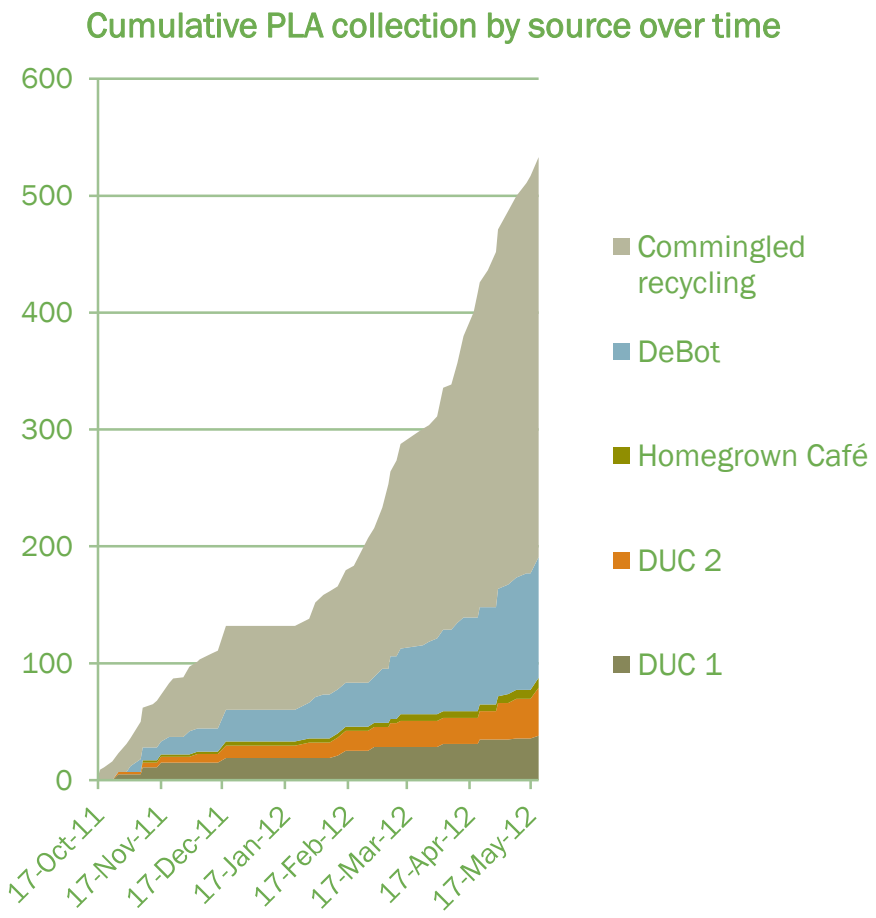
- In the Homegrown Café:
  - Recovery of all PLA inventory by either source segregation or commingled recycling is 47%
  - Some 53% is entering the trash waste stream

Daily average PLA collection from Homegrown Café



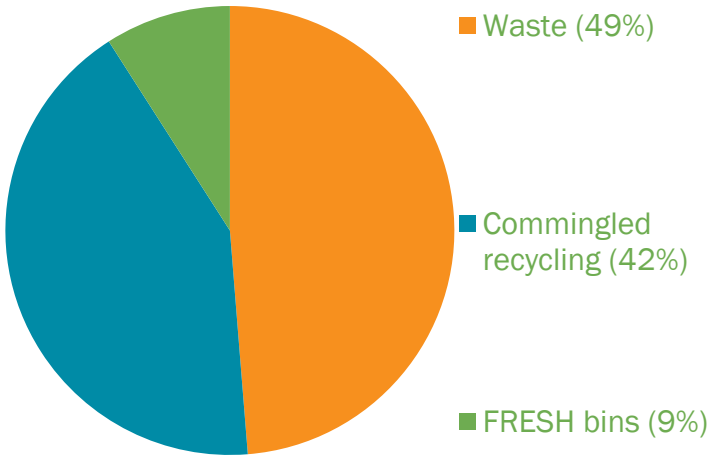
Results: 8

- Recovery from campus-wide commingled plastics collection contributes most significantly to yields
- Rate of recovery remained constant over the campaign
- Winterim and spring breaks impact on accumulated PLA

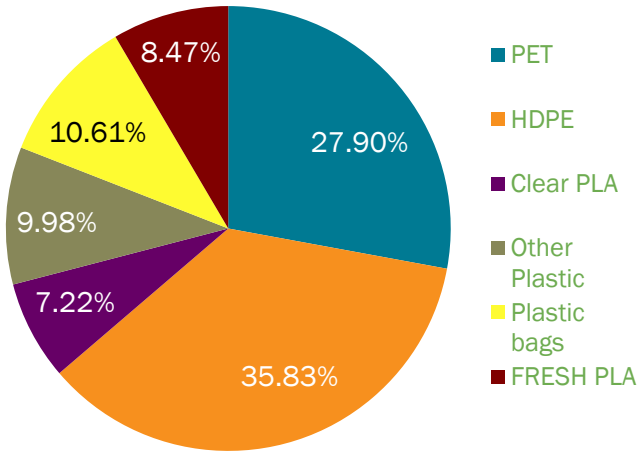


Results: 9

Daily average PLA collection in DUC 1&2



Breakdown of DUC Plastics Recycling Stream



Data courtesy: UWSP Advanced Solid Waste Class

Chemical recycling

- Breakdown PLA to constituent lactic acid molecules
- Acid hydrolysis at elevated temperature and pressure
- Result is concentrated solution of lactic acid

Lactic acid evaluation

- Three PLA samples used in hydrolysis experiments:
  - Pre-consumer
  - Post-consumer (H_2O wash)
  - Post-consumer (PET wash)
- Performance evaluation underway
- Cost evaluation to be undertaken

- RESULTS
- Pre-consumer: afforded 96% of theoretical recovery of lactic acid (pale yellow appearance)
- Post-consumer (H2O wash): afforded 92% of theoretical recovery of lactic acid (amber appearance)
- Post consumer (PET wash): afforded 90% of theoretical recovery of lactic acid (pale amber appearance).

Opportunities for re-generated lactic acid

- Non-food end uses
  - Descaling properties and widely applied in household cleaning products
  - Lactic acid is used as a natural anti-bacterial agent in disinfecting products

  - Runway anti-icer and de-icer

- Use LCA to assess comparative impacts of different end-of-life scenarios in context of UWSP

Challenges

- A diversity of stakeholders on the University campus – achieving buy-in from all constituents
- Our campus audience recognizes PLA serviceware as being compostable
- Starting recycling effort requires different messaging
- Messaging in a sea of other messages vying for the campus attention
- Differing opinions about what is the ‘best’ end of life management option
- Small proportion of overall waste stream

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Videos, website, contact

- http://tinyurl.com/7gc2q3g
- http://tinyurl.com/7ymkxxw
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