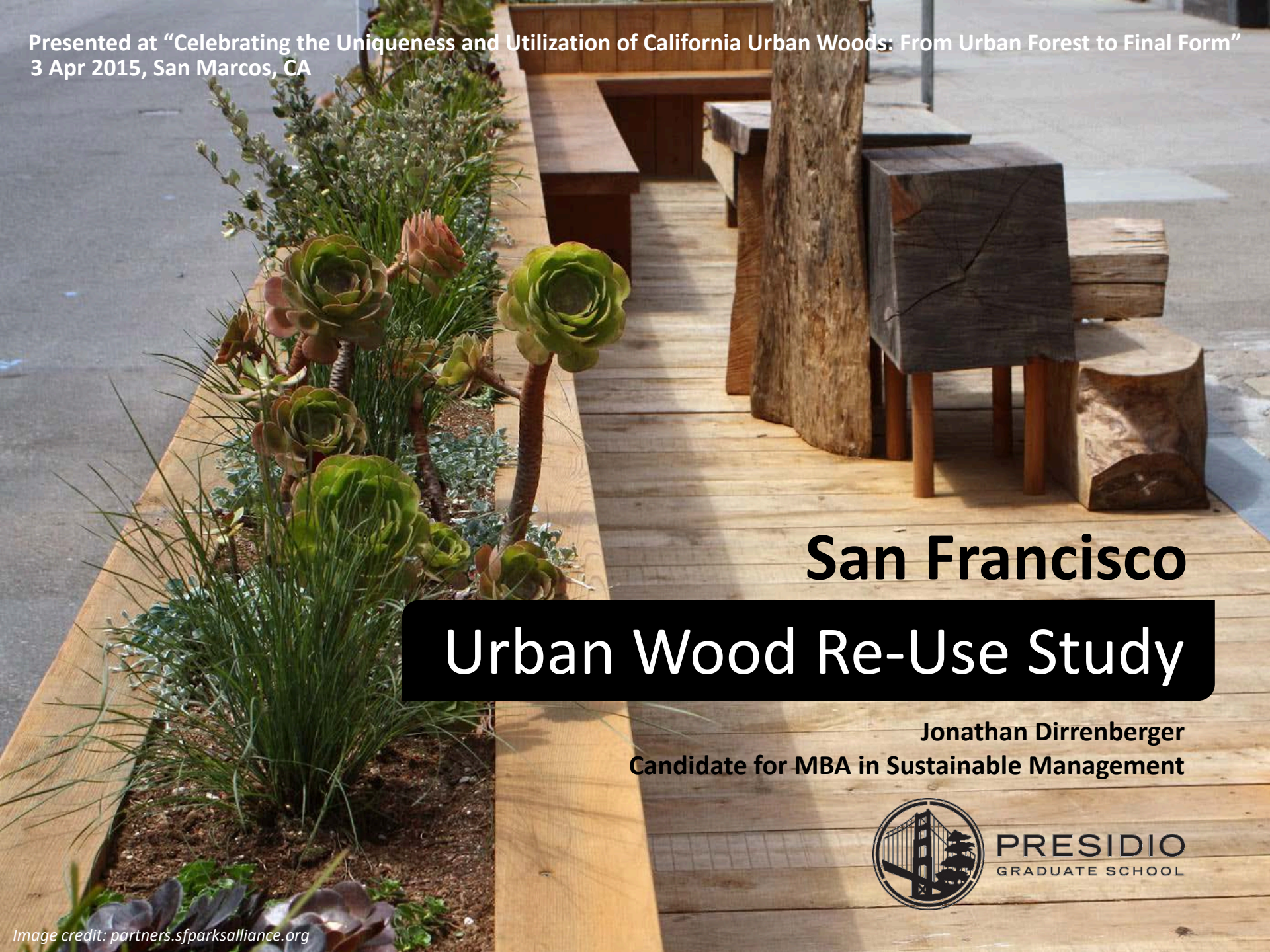
Presented at "Celebrating the Uniqueness and Utilization of California Urban Woods: From Urban Forest to Final Form"
3 Apr 2015, San Marcos, CA



San Francisco

Urban Wood Re-Use Study

Jonathan Dirrenberger
Candidate for MBA in Sustainable Management

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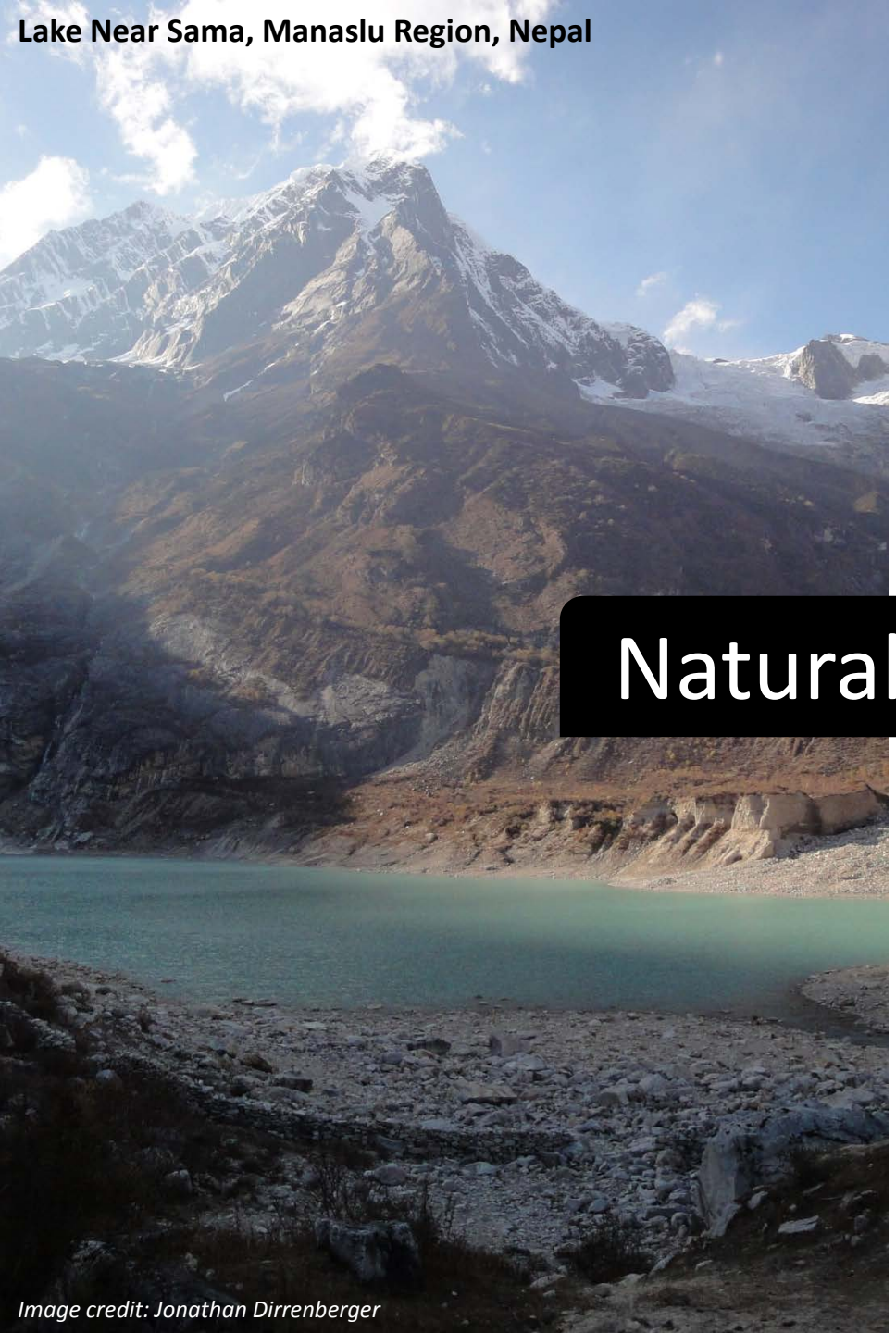
Image credit: partners.sfparksalliance.org

Who am I?



Natural World

Noe Valley, San Francisco

Dubrovnik, Croatia

Urban World

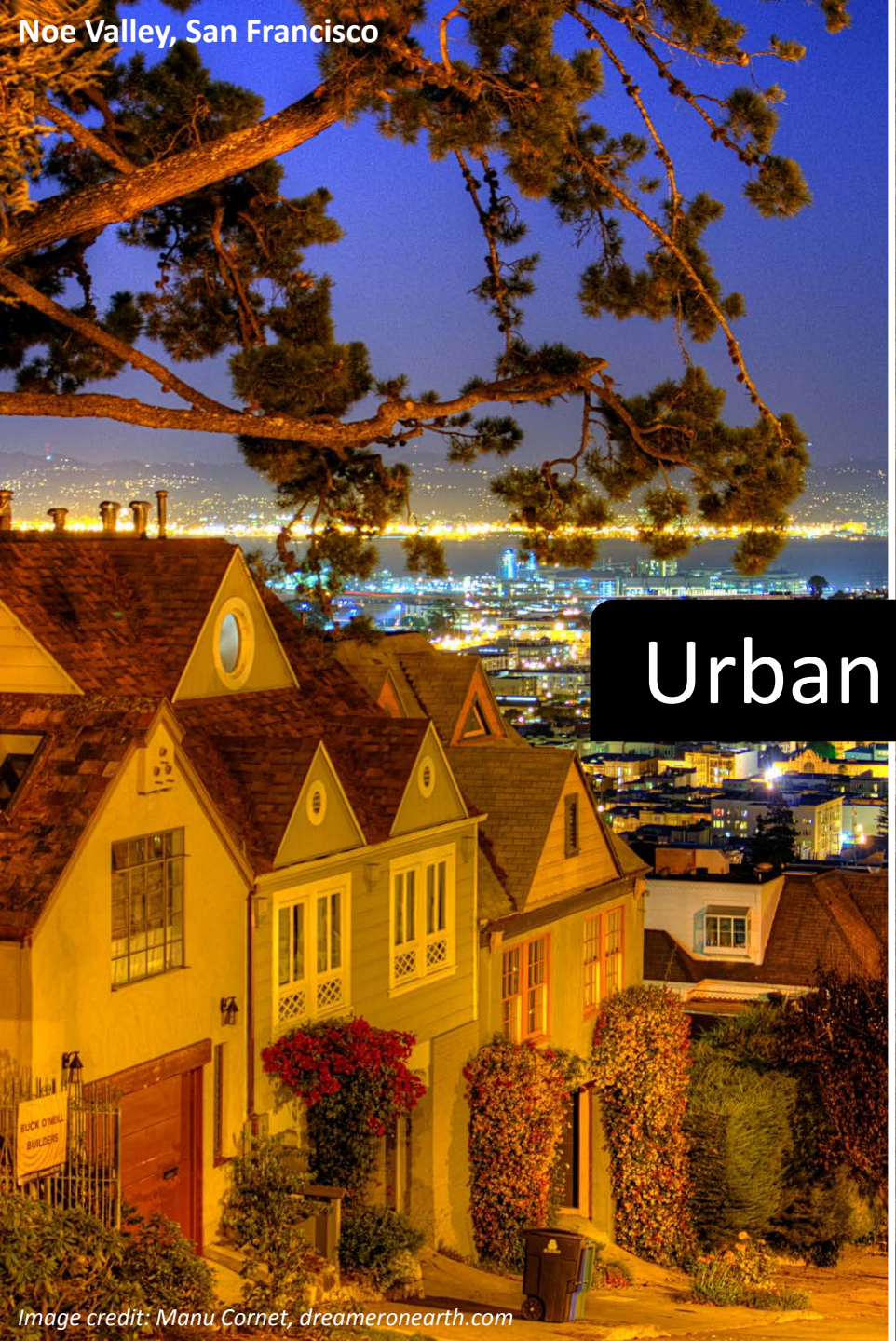


Image credit: Manu Cornet, dreameronearth.com

Image credit: Korhonen Marjut, http://olympicphotocircuit.com

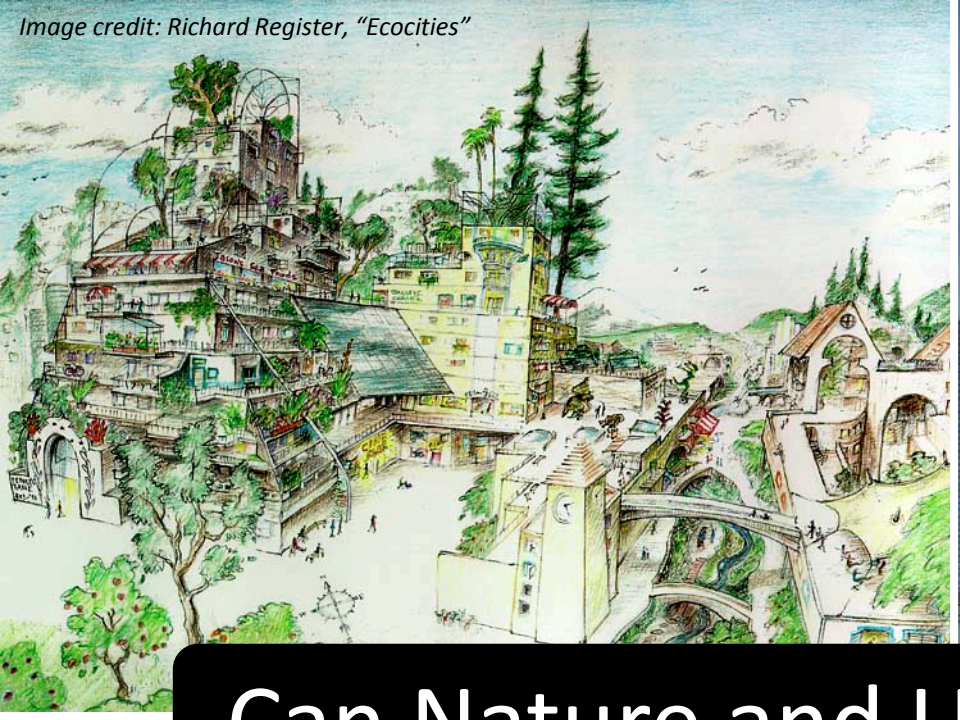
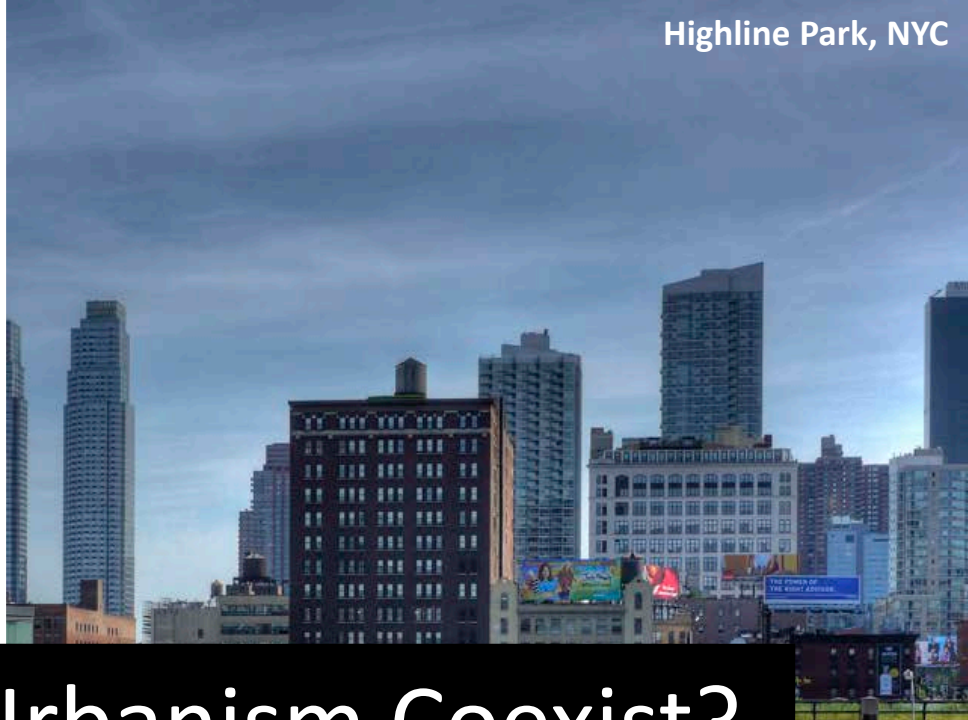


Image credit: Richard Register, "Ecocities"


Highline Park, NYC

Can Nature and Urbanism Coexist?


Image credit: faradaybikes.com


Image credit: flickr.com/photos/wasabi_bob

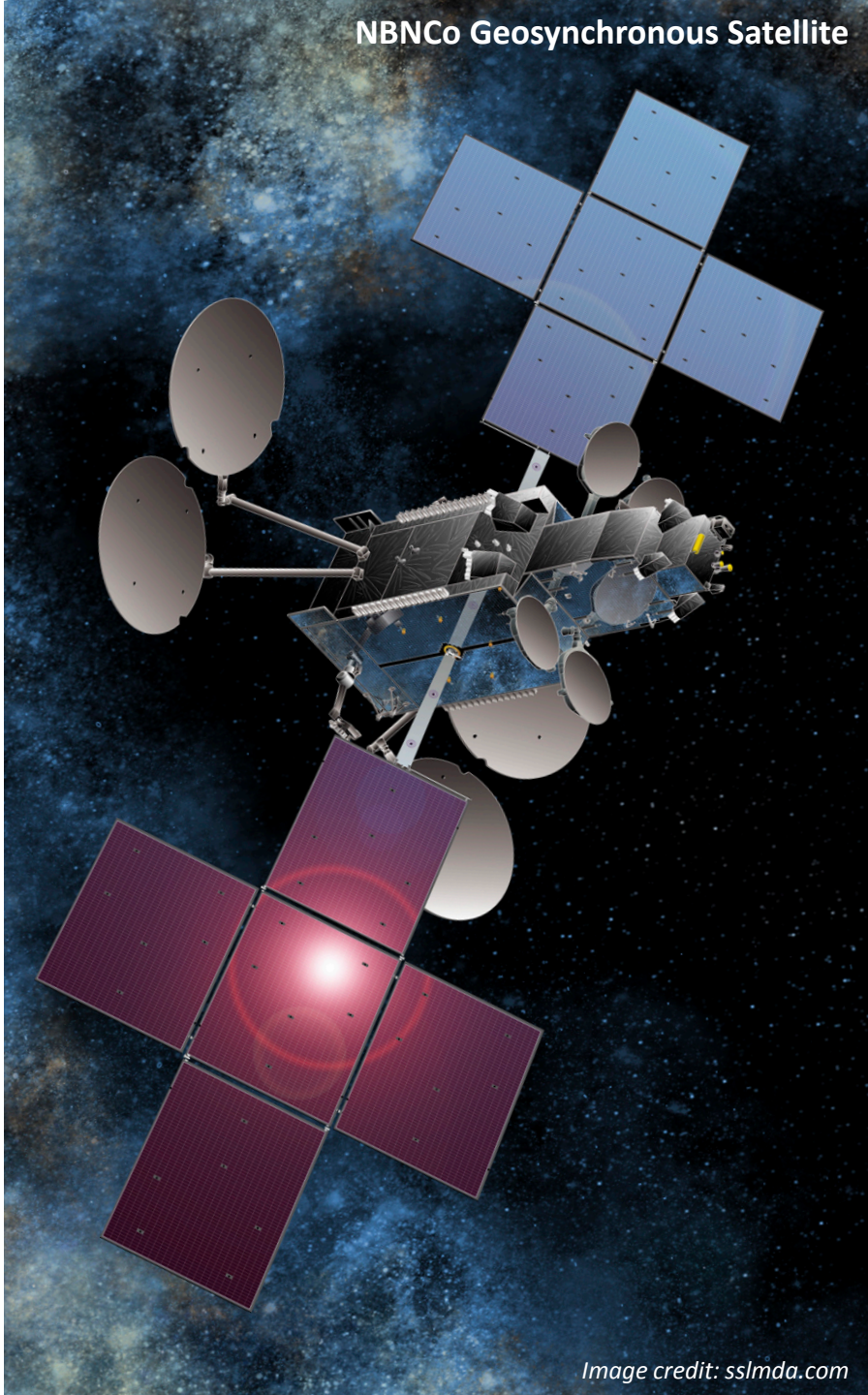
Education & Career

BS & MS
Mechanical Engineering
Rochester, NY

Engineer's Degree
Aeronautics & Astronautics
Stanford, CA

Thermal Systems Engineer
8+ years
Palo Alto, CA

Candidate for MBA
In Sustainable Management
San Francisco, CA



PRESIDIO
GRADUATE SCHOOL

#1 MBA for Social Impact
- Net Impact Business As UNusual

#2 MBA for Environmental Sustainability
- Net Impact Business as UNusual

#13 Global Green MBA
- Corporate Knights

Mission

"Presidio Graduate School educates and inspires
a new generation of skilled, visionary, and enterprising leaders
to transform business and public policy
and create a more just, prosperous, and sustainable world"

Image credit: upload.wikimedia.org

Image credit: Ryan Miller

Project Background

Operations & Production
Spring 2014

Experiential Learning Project
w/SF Planning Dept
on Urban Forest Plan

Team Members
Ryan Miller, Cheryl Dorsey,
& Sonja O'Claire

SAN FRANCISCO
URBAN FOREST PLAN

13.7%
SAN FRANCISCO

17%
CHICAGO

21%
LOS ANGELES

23%
SEATTLE

24%
NEW YORK CITY

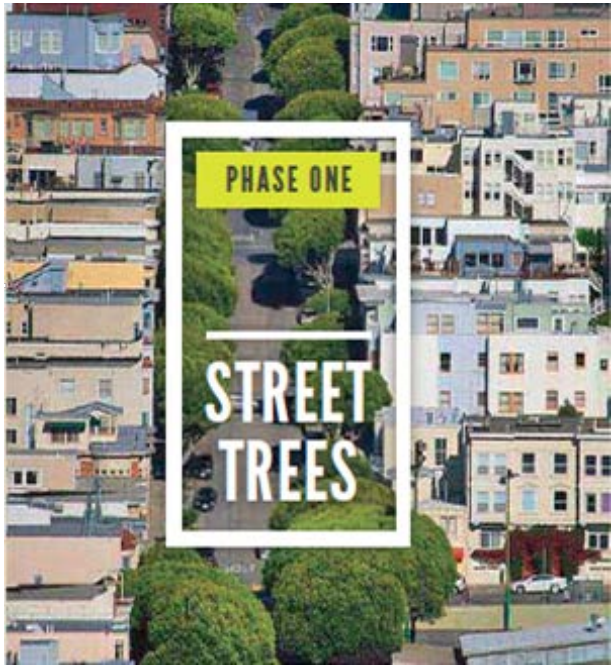
30%
PORTLAND

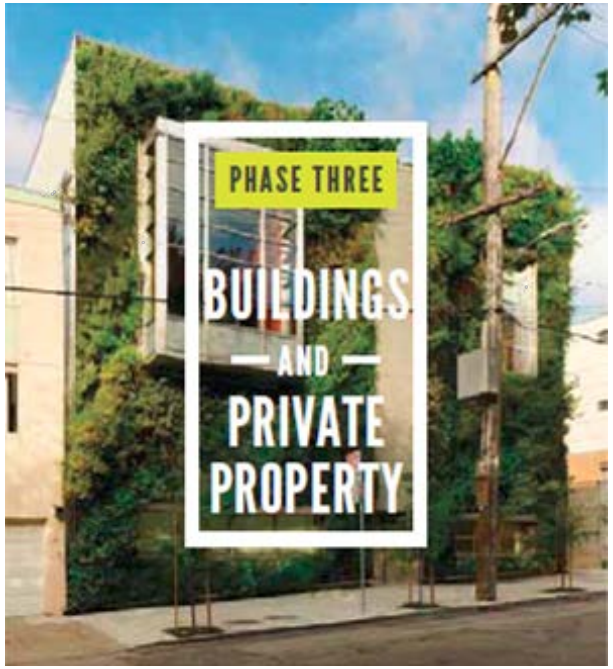
San Francisco has one of the
smallest tree canopies
of any major U.S. city.

SAN FRANCISCO
URBAN
FOREST
PLAN

Image credit: San Francisco Urban Forest Plan

SF Urban Forest Plan





Goals

Maximize the benefits of urban trees

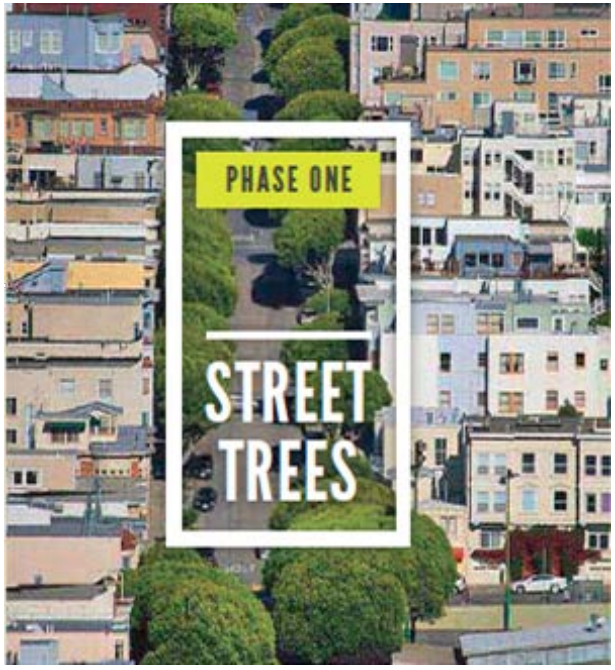
Grow the street tree population by 50%

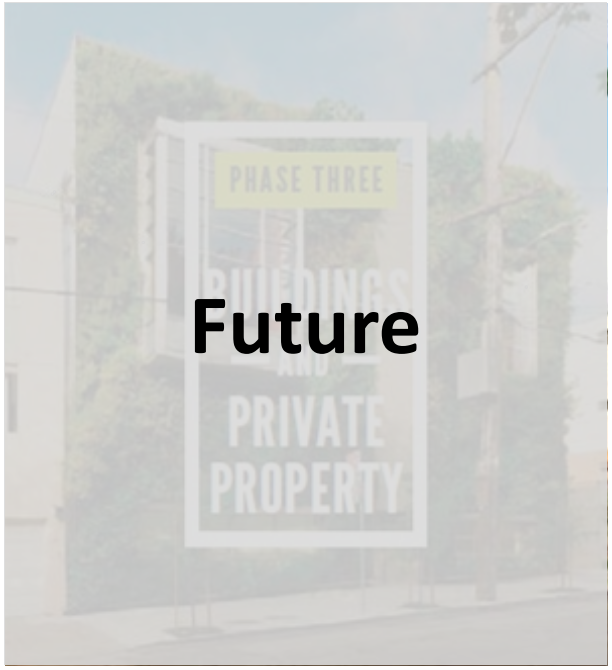
Establish and fund a citywide street tree maintenance program

Manage trees throughout their entire life-cycle

Image credit: San Francisco Urban Forest Plan

SF Urban Forest Plan





Phase One Timeline

2012-14 Planning and outreach
2014 Plan completed
2015 Adopted by Board of Supervisors & Mayor
2016 Consideration of potential ballot measure for funding

Image credit: San Francisco Urban Forest Plan

SF Urban Forest Plan & Wood Re-Use

RECOMMENDATION 4

Manage trees through their entire life-cycle

...from seeds to stumps & trees to tables.

Image credit: San Francisco Urban Forest Plan

Image credit: Sonja O'Claire

Project Scope & Key Partners

Scope

1. Ascertain current City processes
2. Evaluate types of EOL wood re-use
3. Recommend improvements

Key Partners

SF Planning Dept
SF Dept of Public Works (DPW)
SF Recreation & Parks Dept (RPD)
Friends of the Urban Forest
Recology

Project Methodology

Meetings with Key Partners

Phone Interviews

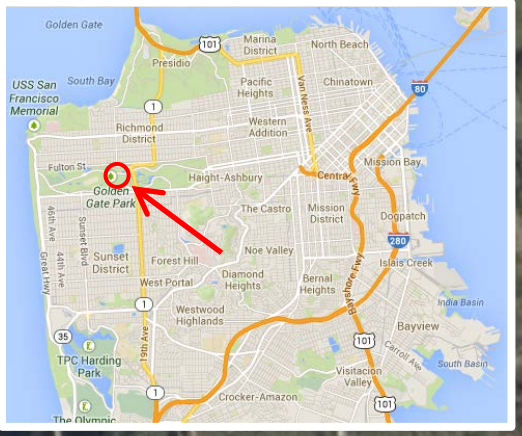
Literature/Online Research

Facility Tours

Demand Forecast (Operations)

Value Analysis (Operations)

Image credit: shutterstock.com



Current Wood Re-Use Efforts

Street Trees (DPW)

Chipped (by DPW or Recology)

Processed by Recology

External compost or hog fuel

DPW buys compost/mulch

Park Trees (RPD)

Processed in-house

Internal compost/mulch

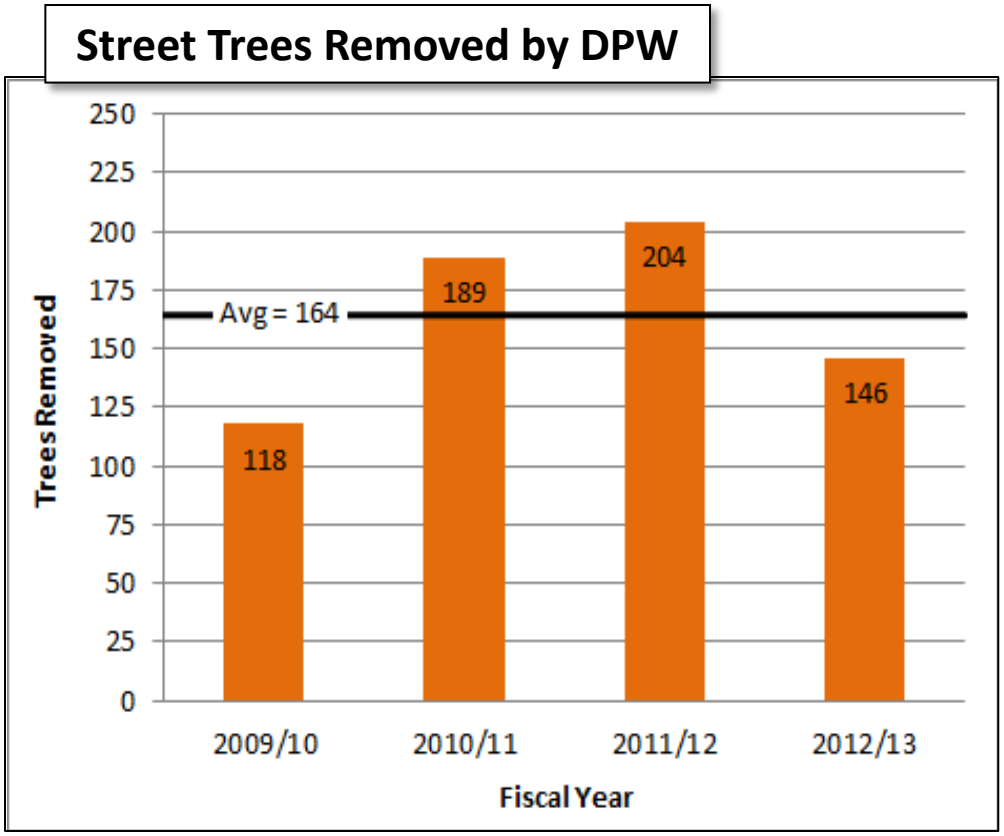
Some logs

Private Property Trees

Leave the city

Image credit: maps.google.com

The Numbers



Suitable as Lumber

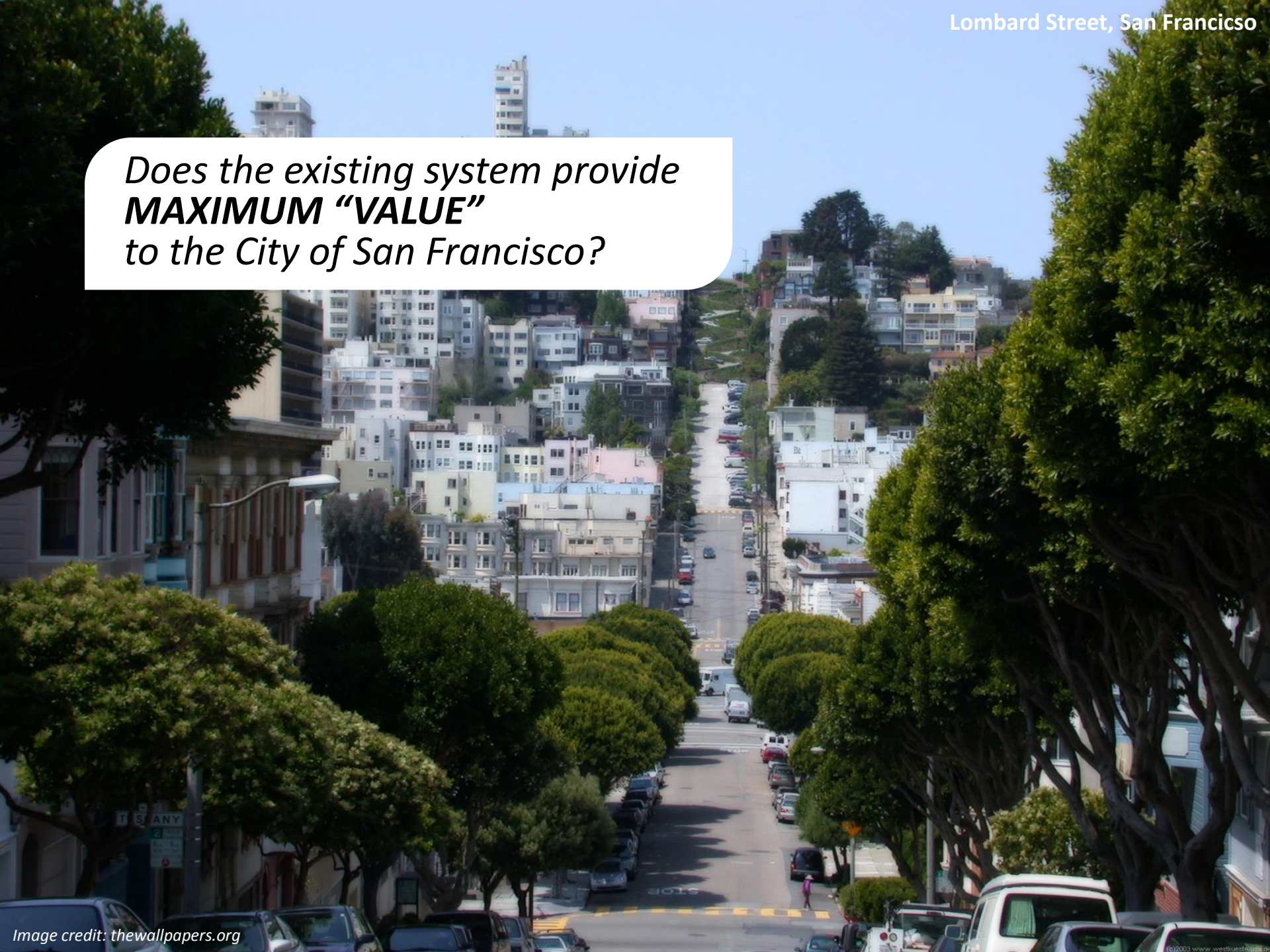
DPW: 10-15% RPD: 15-20%

Street Trees

DPW:	40,000
Citizens:	65,000
2014 Total:	105,000 (16%)
Add in 20 Yrs:	50,000
2034 Total:	**155,000**

Park Trees (RPD)

2014 Total:	131,000 (20%)
Add in 20 Yrs:	0
2034 Total:	**131,000**


Lombard Street, San Francicso
Does the existing system provide
MAXIMUM "VALUE"
to the City of San Francisco?
Image credit: thewallpapers.org

Uses of Urban Tree Wood


Image credit: www.vincentkohler.ch


Image credit: starryroadstudio.blogspot.com


Image credit: urbanhardwoods.com


Image credit: bkusler at flickr.com

Increased Processing

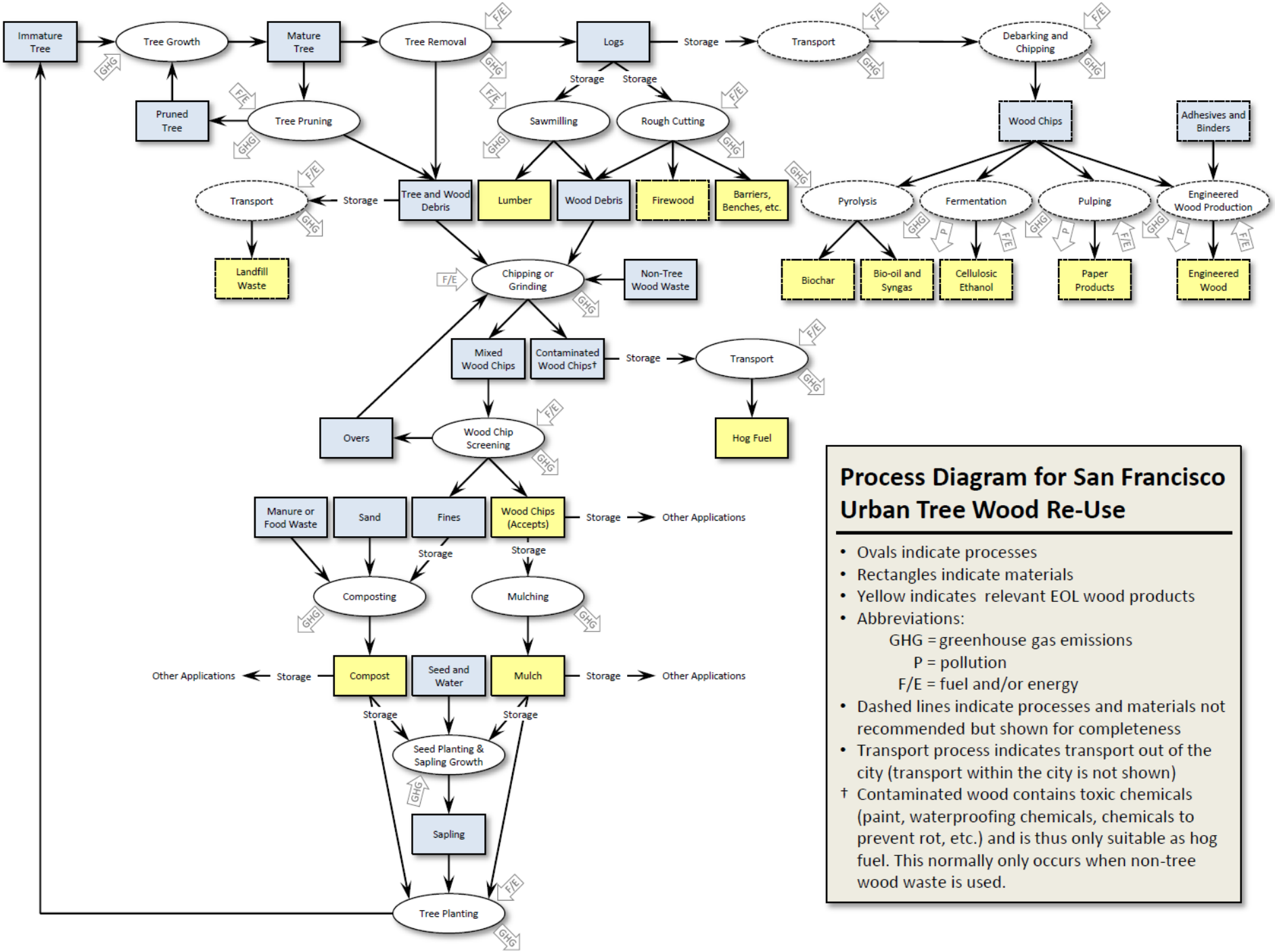
Logs
Lumber
Wood Chips
Mulch
Compost
Hog Fuel
Biochar
Paper Products
Cellulosic Ethanol
Engineered Wood

Increased "Value"


Image credit: latimes.com


Image credit: facebook.com/Out-of-Ashes-BioEnergy-Inc


Image credit: anzferfarms.blogspot.com



Process Diagram for San Francisco Urban Tree Wood Re-Use

- Ovals indicate processes
- Rectangles indicate materials
- Yellow indicates relevant EOL wood products
- Abbreviations:
  - GHG = greenhouse gas emissions
  - P = pollution
  - F/E = fuel and/or energy
- Dashed lines indicate processes and materials not recommended but shown for completeness
- Transport process indicates transport out of the city (transport within the city is not shown)

† Contaminated wood contains toxic chemicals (paint, waterproofing chemicals, chemicals to prevent rot, etc.) and is thus only suitable as hog fuel. This normally only occurs when non-tree wood waste is used.

Defining "Value"

*Urban trees provide the greatest **VALUE** when they are **ALIVE** and **THRIVING***

Minimize GHG emissions and pollution

Raise awareness

Minimize waste to landfill

Keep local

Reduce costs

Optional/bonus: obtain revenue

Estimated financial value

2014: ~$40k

2034: ~$150k

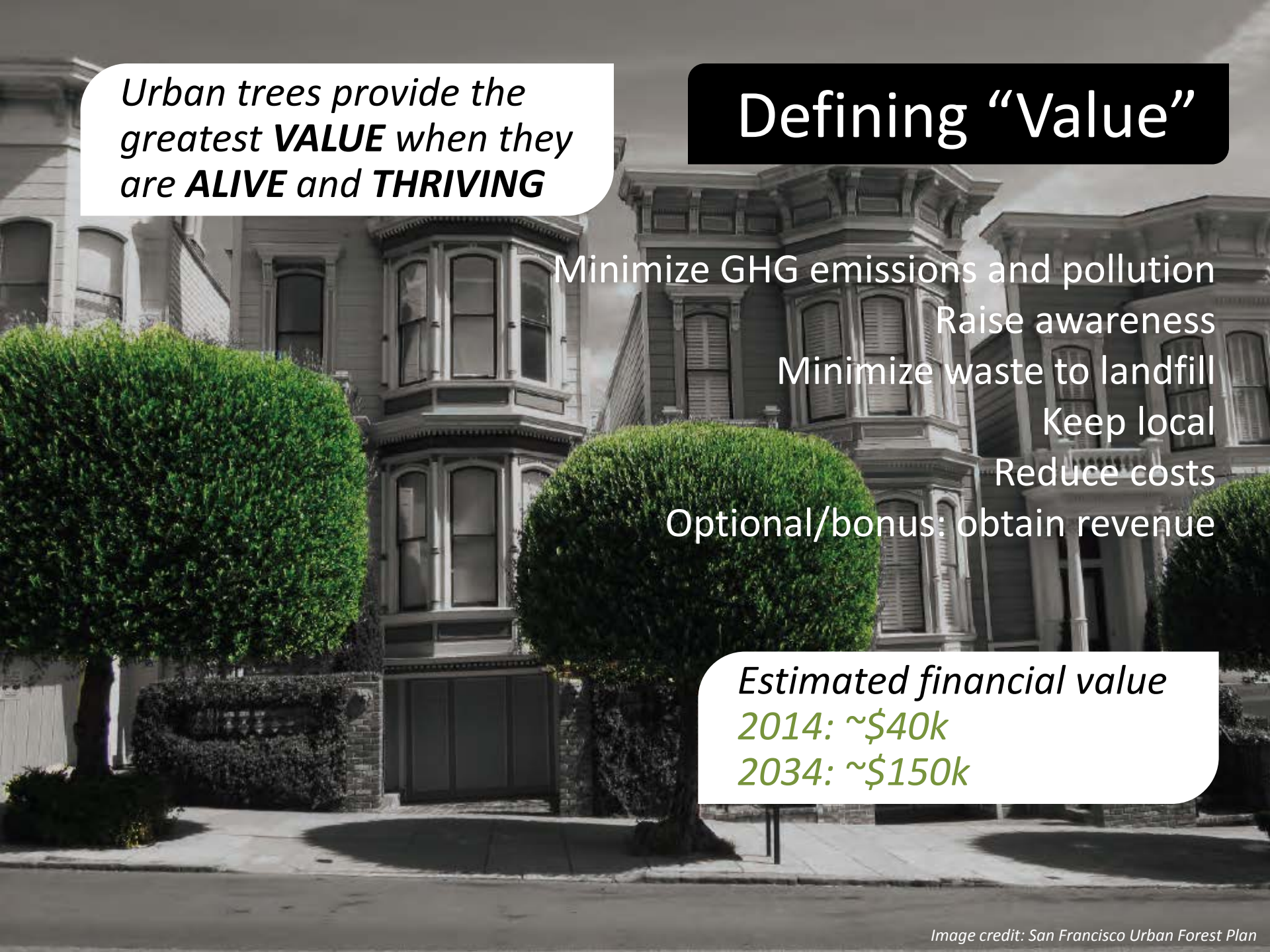
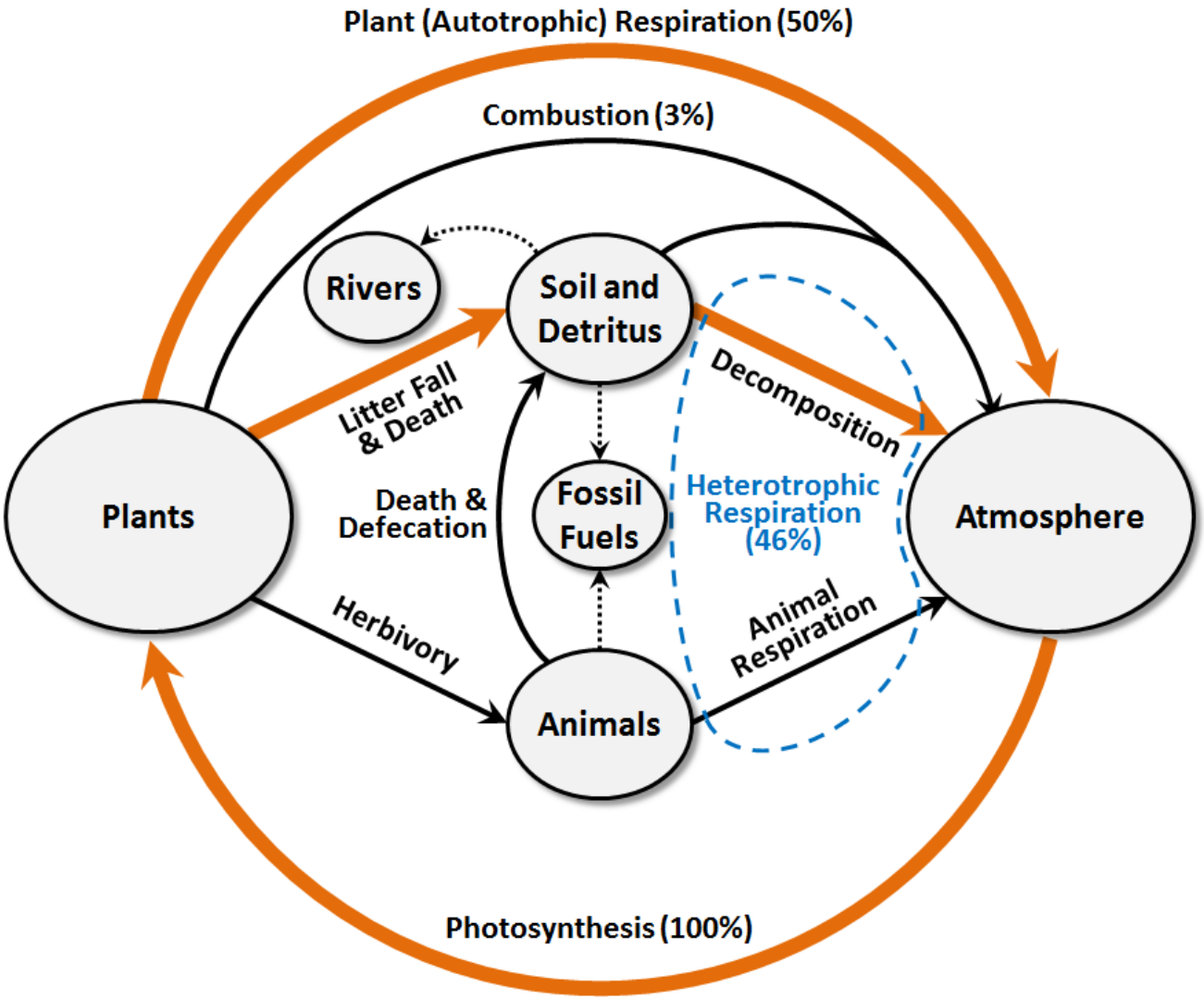
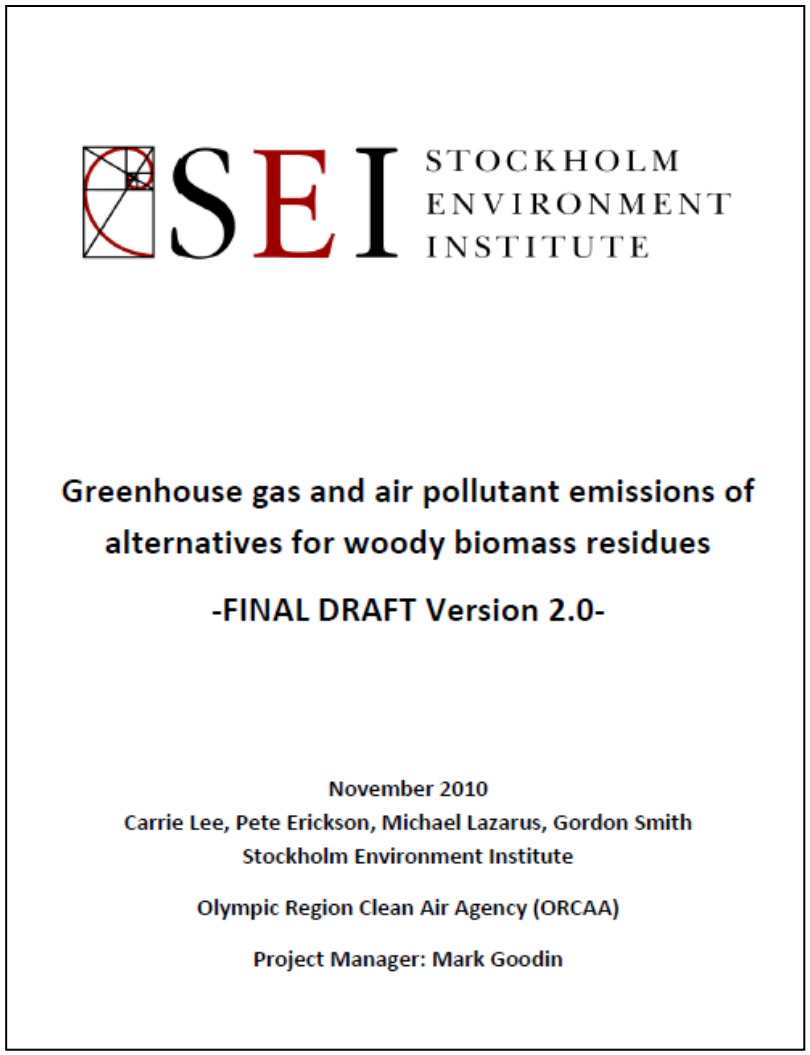


Image credit: San Francisco Urban Forest Plan

Terrestrial Carbon Cycle



LCA for EOL Wood Fates



SEI STOCKHOLM ENVIRONMENT INSTITUTE

Greenhouse gas and air pollutant emissions of alternatives for woody biomass residues

-FINAL DRAFT Version 2.0-

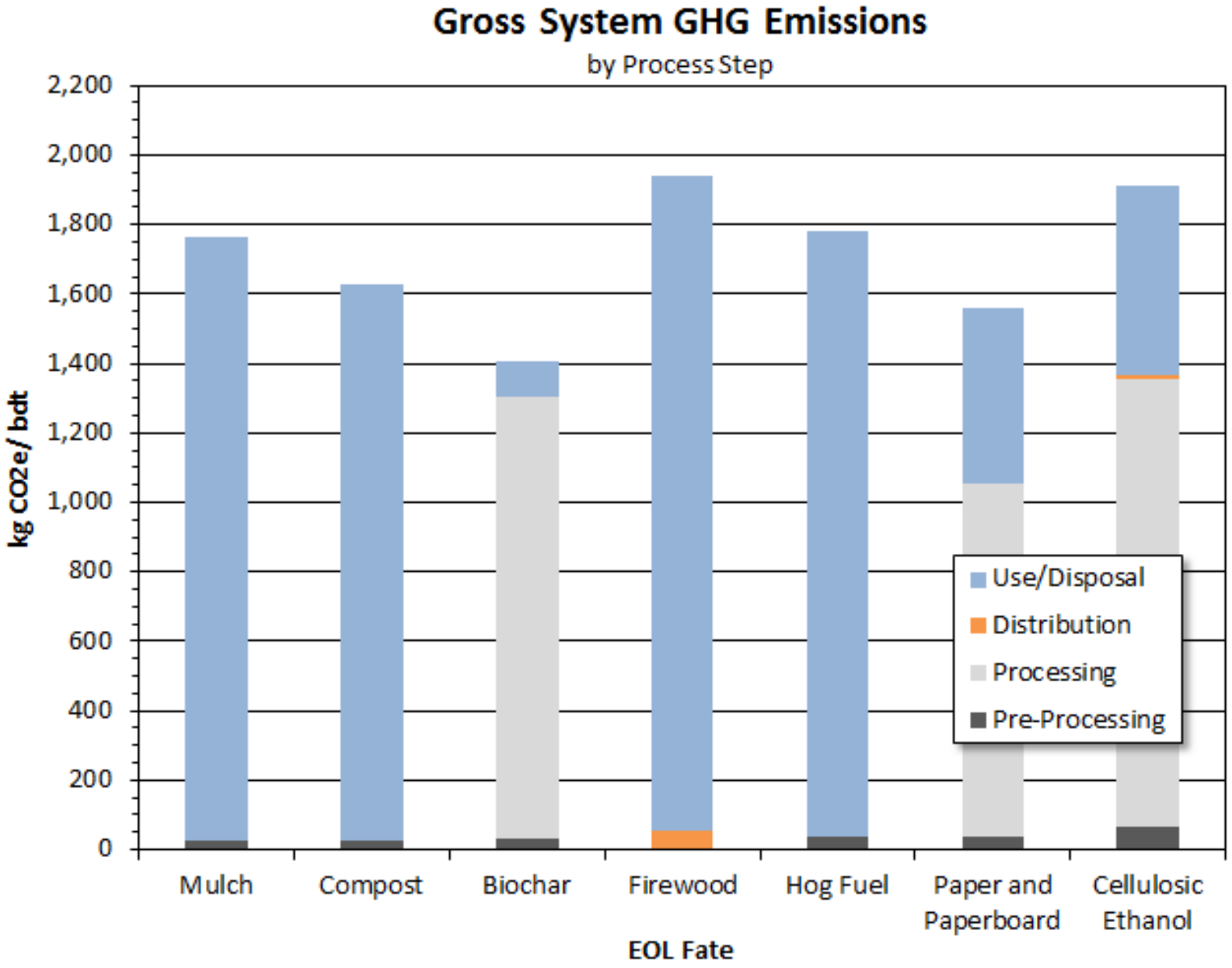
November 2010

Carrie Lee, Pete Erickson, Michael Lazarus, Gordon Smith
Stockholm Environment Institute

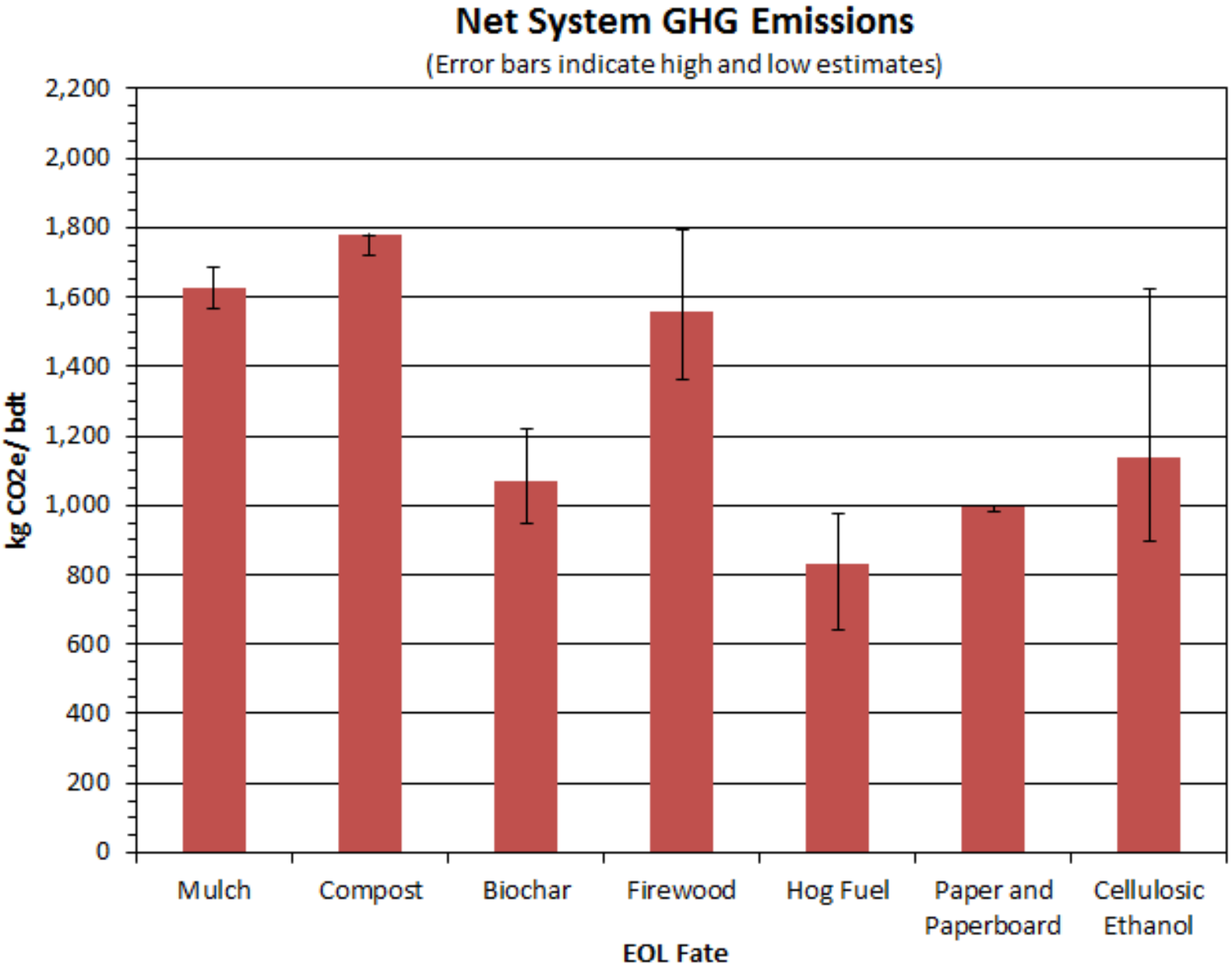
Olympic Region Clean Air Agency (ORCAA)

Project Manager: Mark Goodin

Fate
1a: on-site decomposition
1b: on-site combustion
2a: chipping for mulch
2b: composting
2c: biochar
3a: combustion in fireplace
3b: combustion in EPA-certified stove
3c: pelletization & combustion in pellet stove
4b: displacement of NG, diesel, or residual oil in boiler
4c: displacement of hog fuel in boiler
4d: integrated gasification & combustion
4e: new exported electricity by cogenerator
5a: pulp or paper industrial feedstock
6a: ethanol by hydrolysis & fermentation
6b: ethanol by gasification & synthesis



Reference: Lee, C., Erickson, P., Lazarus, M., & Smith, G. (2010). Greenhouse Gas and Air Pollutant Emissions of Alternatives for Woody Biomass Residues, Final Draft Version 2.0. Stockholm Environment Institute



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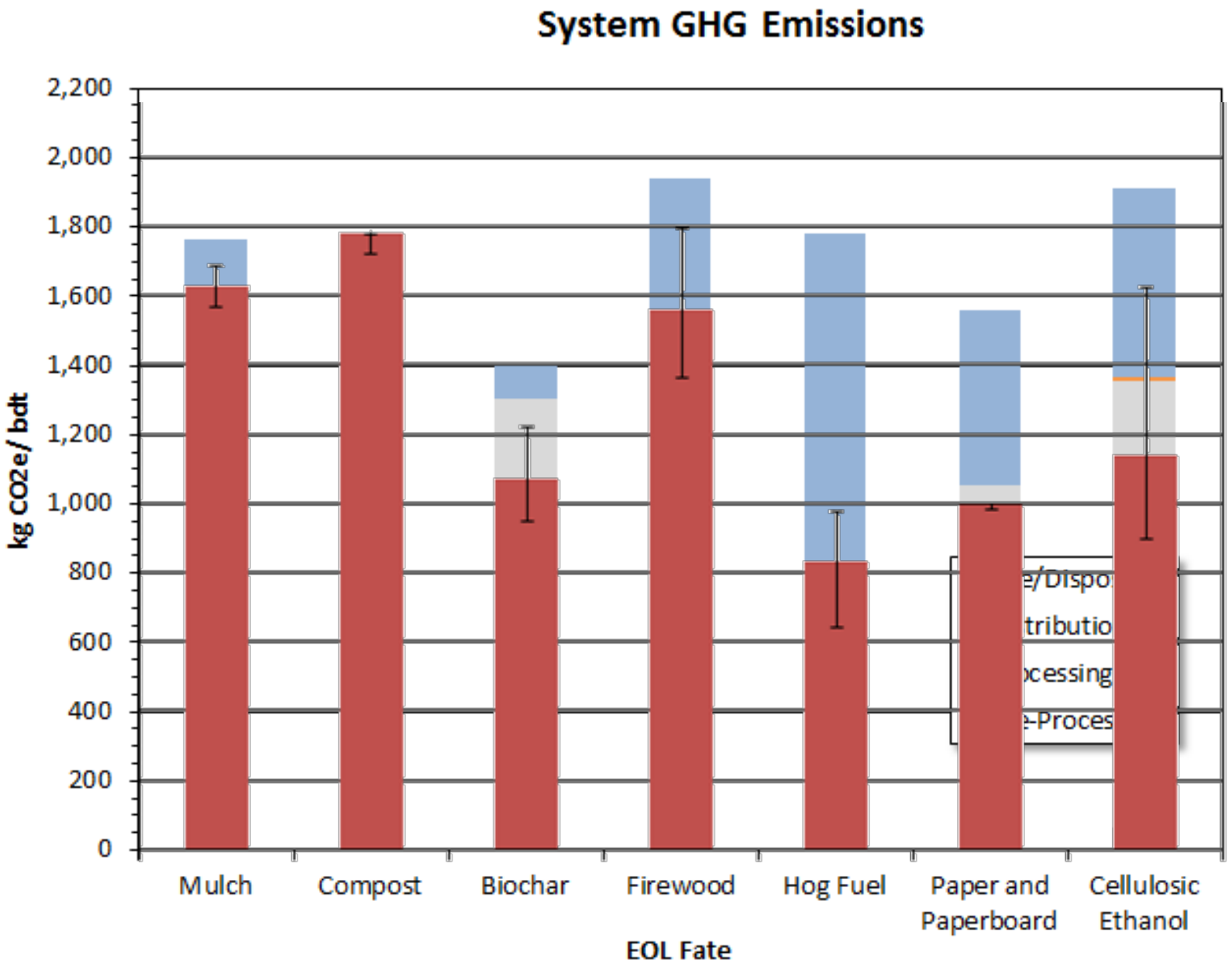

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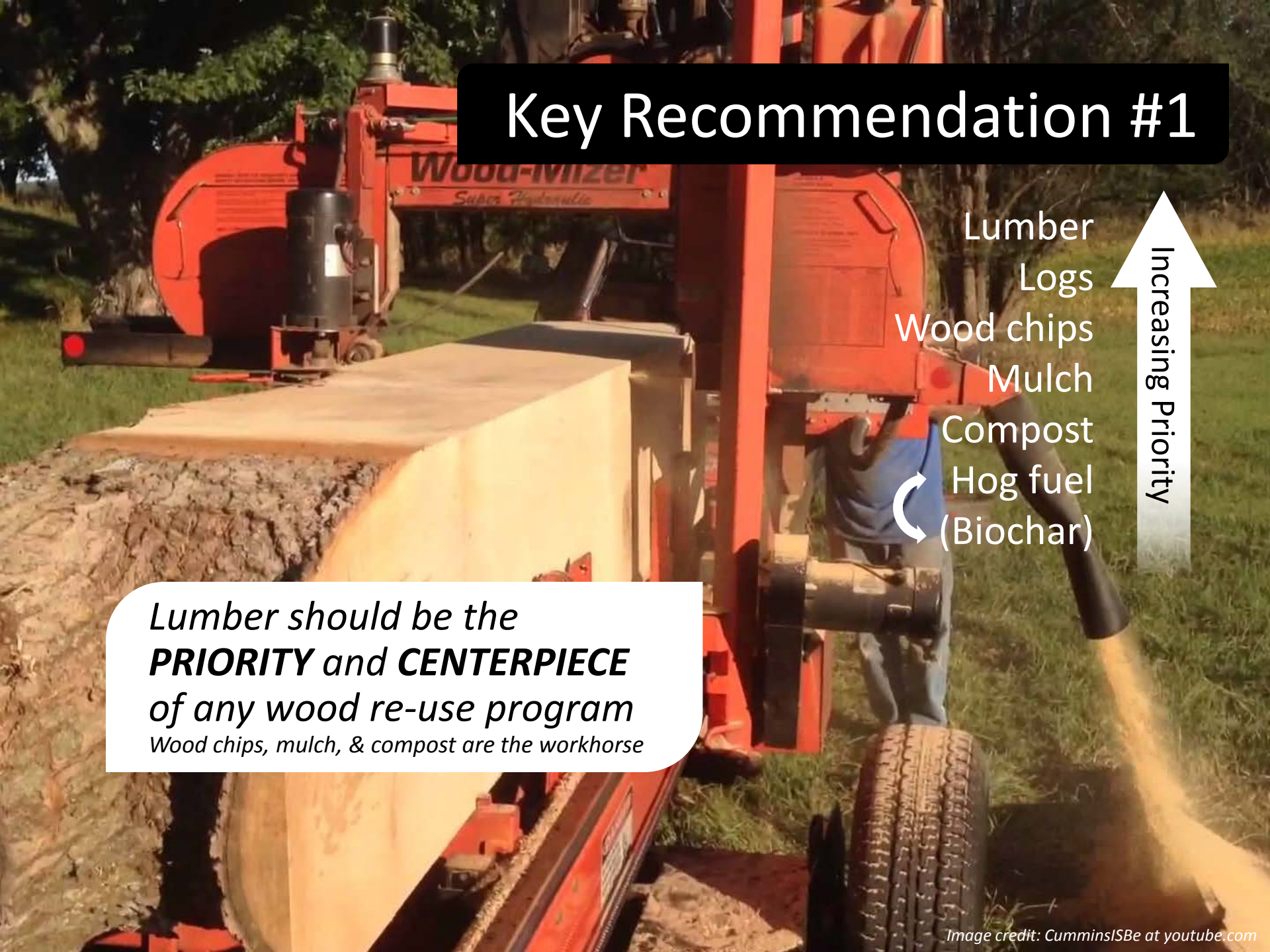

Key Recommendation #1

Lumber
Logs
Wood chips
Mulch
Compost
Hog fuel
(Biochar)

Increasing Priority

Lumber should be the ***PRIORITY*** *and* ***CENTERPIECE*** *of any wood re-use program*

Wood chips, mulch, & compost are the workhorse

Image credit: CumminsISBe at youtube.com

Key Recommendation #2

DPW should process, store, and use wood chips, mulch, and compost from street trees instead of sending to Recology

Image credit: fuf.net

Key Recommendation #3

*DPW and RPD should **SHARE** wood-processing facilities and equipment while leveraging RPD's experience*

Image credit: Jonathan Dirrenberger

Secondary Recommendations

Pre-empt citizen concerns
about exploitation of the urban forest

Consider EOL fate when planting trees
all else being equal

Research & stay tuned to biochar
work with Recology

Accurately determine GHG emissions
of various EOL wood fates

Collect Christmas trees
for compost (500 tons per year)

Negotiate policy/regulatory/legal barriers
can be overcome, just need the willpower

Long-term: create a network and database
to connect producers (City) with users (artists, craftsman, small-business owners, etc.)

Image credit: sfcitizen.com

Thank You!

Full Report

www.sfenvironment.org/sites/default/files/agenda/attach/urban_forest_wood_reuse_pgs_presentation_0.pdf

Image credit: sfforest.net