Fire Ecology Restoration Project

DEVELOPING SOCIAL FORESTRY as a PERMACULTURE PRACTICE

Permaculture Institute of North America (PINA)

What's Permaculture?

- Holistic ecological design system focused on resilience, regeneration, conservation and cooperation with communities of nature and people

- Incorporates regional and location values, ecosystem models, patterns in nature and communities, drawing on traditional knowledge and modern science.

What's PINA?

Professional Permaculture Institute:

- Bring permaculture solutions to social justice, land regeneration, and climate cooling challenges
- Ensure integrity and quality of permaculture information and design
- Train, develop, promote, network permaculture professionals

Forests and Agriculture

Appropriate Technology

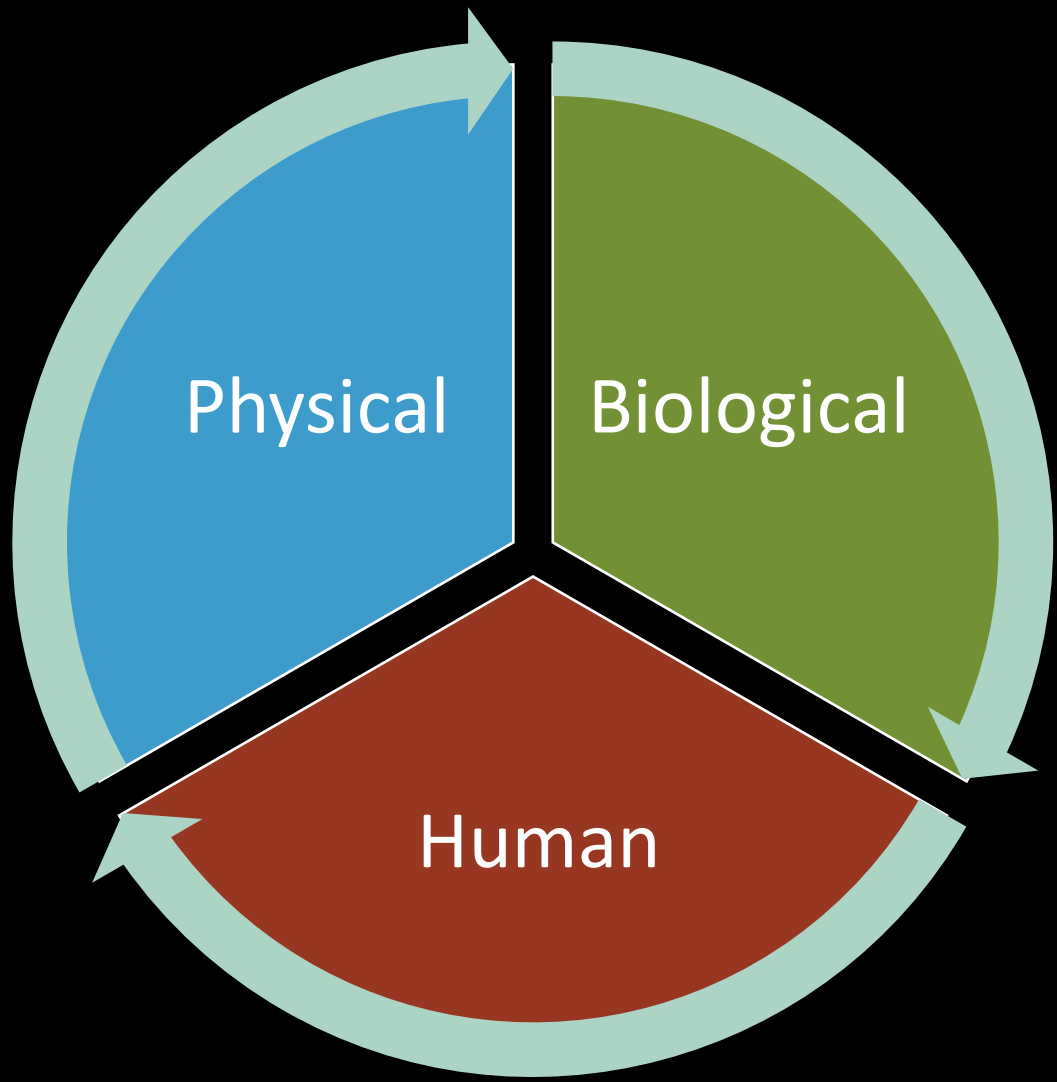
Infrastructure

Whole System Thinking

Ecosystem Services

Economics

Dimensions of Ecosystem Management



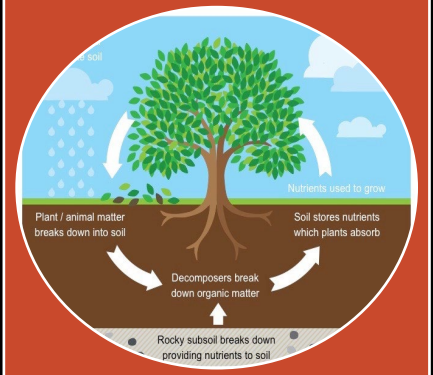
Communities of People and Place

PROTECTING

Air & Water

Soil & Habitats

Special Tricks



Systems Support

Ecosystem Services

So what’s the problem?

Physical/Biological Issues:

- 100+ years of fire suppression
- Increasing tree density
- Favors shade tolerant trees with lower fire tolerance
- Increasing competition
- Less water & nutrients per tree
- Drought stress
- Increasing insect and disease
- Higher mortality
- Increased fuel loading

Thus forests are more susceptible to uncharacteristic fire behavior!

Of the forests that supply clean water in the West, that are at a high risk of wildfire…

>40% are

private and family-owned.

Western Water Threatened by Wildfire: It's not just a public lands issue: American Forests Foundation, 2016. www.forestfoundation.org

The problem is the solution.

Involve private forest landowners in forest restoration and resilience on their own properties.

The FERP Elements:

+ Research

SITE ASSESSMENT
- Physical & Social Elements
- Capabilities

SITE POTENTIAL
- Manage Biomass & Precipitation
- Build Soil

ECOSYSTEM RESTORATION
- Forest
- Grasslands
- Connectivity

Project Processes

People

- Engage landowners in reducing wildfire risk w/restoration focus
- Offer assistance
- Hire/train 9 crew leaders in ecosystem & forest health, site assessment, Rx's, biochar
- Lead crews to thin, reduce biomass, make biochar, spread
- Connect people and communities to their landscapes

Nature

- Reduce wildfire risk
- Improve visual quality and habitats
- Convert biomass to biochar on-site
- Improve soil and moisture retention by distributing biochar
- Install on-contour logs for erosion control
- Research processes and effects. Apply and share findings.

Biochar production in a Ring of Fire kiln, piloting hot-loading with green material.

Finished biochar, ready for distribution onto forest floor, around preferred and drought-stressed species.

Photos courtesy of Wilson Biochar

Socio-Economic and Ecological Research

Photo courtesy of Wilson Biochar

- Waste becomes a quantifiable resource with economic value
- Air quality and carbon neutrality assured, supporting human, ecosystem health and climate stability
- Regulators can issue permits based on real data
- Carbon credits quantifiable and assignable
- Appropriate equipment matches the feedstock, topography & ecosystem for maximum efficiency
- Land managers can contractually specify clean, efficient equipment and ecological outcomes with confidence
- Businesses have appropriate tools for sustainable outcomes, output data, jobs and profit

For more information…

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"Burning" Series
by Aron Demetz
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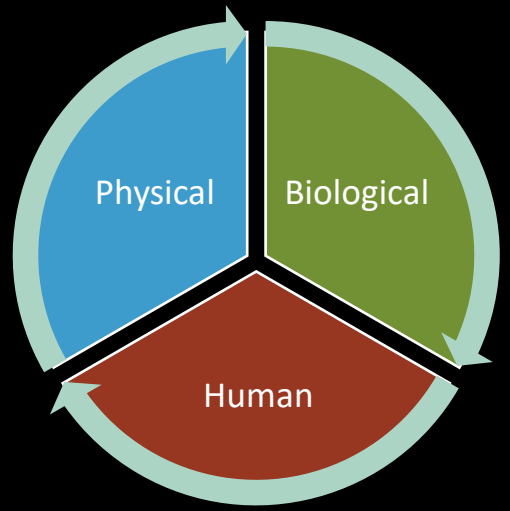


Additional Resources

Biomass to Biochar Sustainability Guidelines for Individuals and Businesses

PHYSICAL SUSTAINABILITY GUIDELINES

1. Minimize soil and duff layer disturbance and soil compaction
2. Identify and avoid sensitive lands
3. Build no new permanent roads
4. Minimize transportation distances and biomass delivery infrastructure
5. Ensure air quality
6. Ensure erosion protection

BIOLOGICAL SUSTAINABILITY GUIDELINES

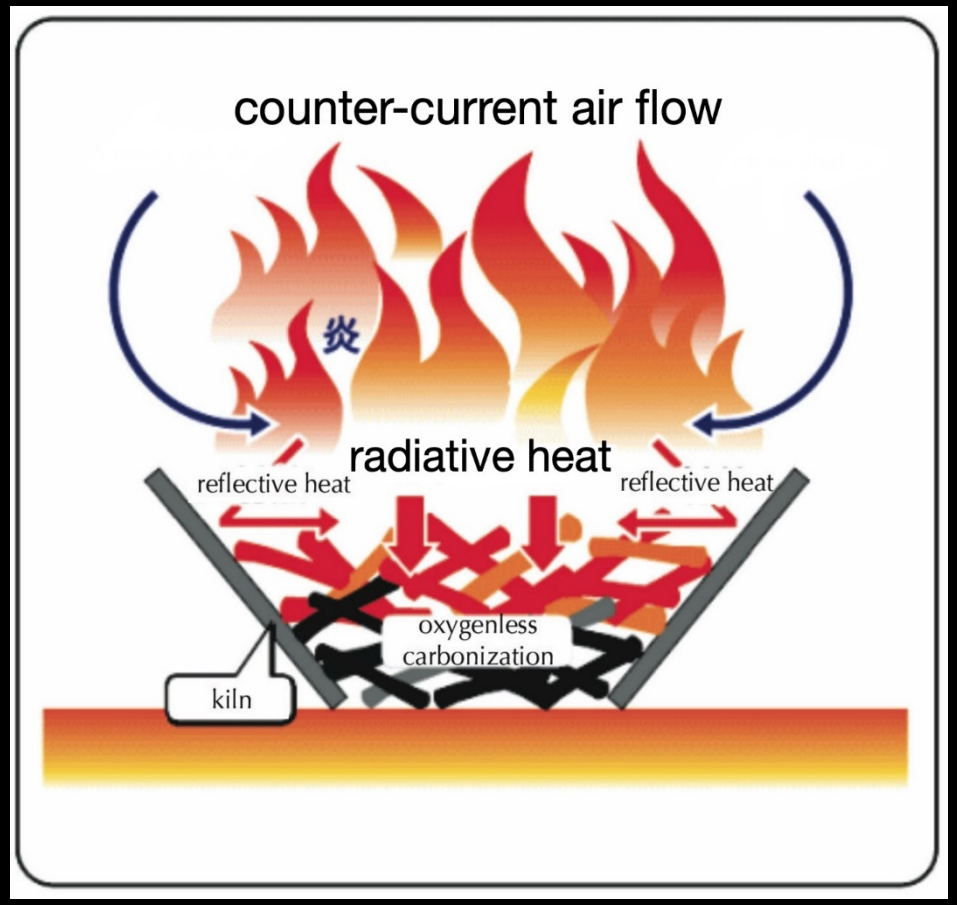
1. Leave well-graded residual biomass in quantities necessary for all benefits
2. Maintain or improve wildlife habitat
3. Maintain biodiversity
4. Improve baseline forest mortality
5. Avoid monocultures
6. Establish tree diameter class limits for biomass harvest
7. Ensure agricultural soils replenishment

HUMAN SUSTAINABILITY GUIDELINES

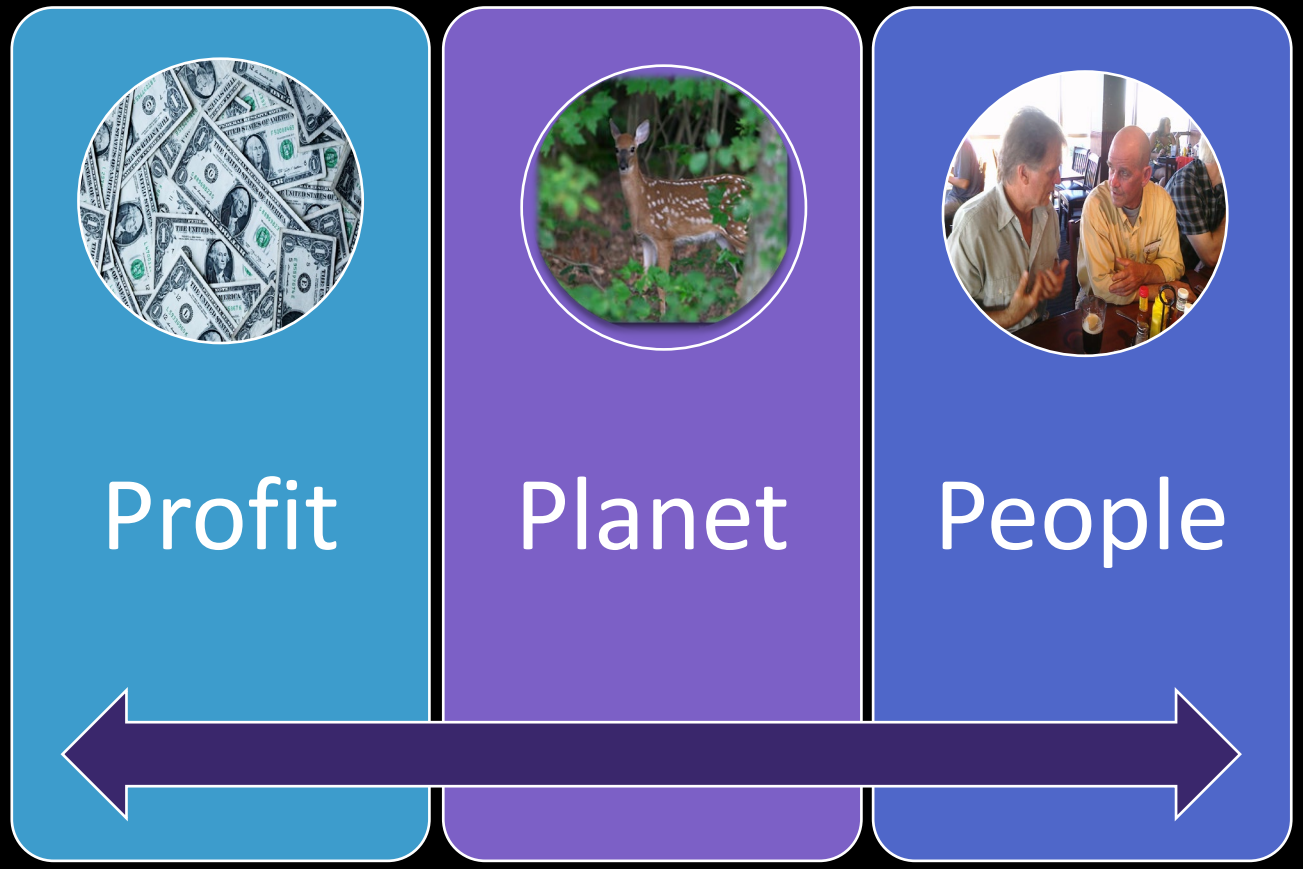
1. Avoid land use changes that degrade current character and function
2. Reduce wildfire risks in wildland-urban interface
3. Meet visual quality objectives
4. Contribute to local economic integrity
5. Educate and be educated
6. Develop sustainability models by habitat type and agricultural uses

Engineering and Ecological Imperatives

- Scalable flame-carbonizing devices to pyrolyze or gasify woody crop residue and forest slash in the field
- Flame-cap passive devices with no moving parts. Relatively low cost, scalable, and portable
- Design matched to environment and residues for quantifiable outputs
- Measureable carbon sequestration values
- Emissions measured to: improve design, reduce pollution/GHG's, be permit-ready, support industry-wide sustainable BMP's



Sustainable businesses address the Triple Bottom Line



Economic profitability

Environmental protection

Social equity

Triple Bottom Line Biomass Summary

Profit – Planet - People

1. Localization & balance
2. Support climate & ecosystem services
3. Employ skilled workforce

Biomass Renewability + Availability + Accessibility + Demand

requires intelligent use and sharing of biomass resources

Triple Bottom Line Products and Markets Summary

Profit – Planet - People

1. Economically accessible, meeting local to regional markets
2. Improve environmental conditions
3. Transparency & quality solutions

Triple Bottom Line Production Technology Summary

Profits – Planet - People

1. **Revenues exceed operating costs, expandable with zero waste**
2. **Energy efficient, low emissions**
3. **Community asset**

Sustainability, Business Models, and Techno-economic Analysis of Biomass Pyrolysis Technologies, Garcia-Perez, et.al.

Sustainable Biochar

Derived from terrestrial biomass and produced in way that, on a life-cycle assessment basis, at both the feedstock source and point of use:

- Preserves smallholder farms and watersheds
- Reduces competition for & use of natural resources and energy
- Maintains or improves soil quality
- Reduces greenhouse gas emissions
- Protects habitats and native ecosystems
- Mimics nature and natural processes
- Provides community benefits, jobs and fair labor

Sources: PNW Biochar, USBI and SOS

Sustainable Biochar Industry

Meets triple bottom line metrics of economic profitability, environmental protection and social equity because it's:

- Geographically decentralized, distributed
- Close to biomass sources and markets, minimizing transportation
- Supplying diverse markets and value-add products with no waste
- Participating in carbon markets and trading programs
- Production is carbon neutral or negative in life cycle assessment
- Product is quality-assured through transparent processes
- Compatible with and supportive of ecosystem services
- Provides community benefits, jobs and fair labor

Sustainability, Business Models, and Techno-economic Analysis of Biomass Pyrolysis Technologies, Garcia-Perez, et.al.