The Forest Resilience Bond

Katoomba Marketplace: Investment Opportunities in Green Infrastructure

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Introduction to Forest Restoration
Crisis: Overgrown Forests

Sierra Nevada forests provide...

- 60% CA water supply\(^1\)
- 75% of CA’s in-state hydropower\(^2\)
- 420M tons of carbon storage\(^3\)

Today’s forests...

- Up to 10x more trees per acre\(^4\)
- 58M acres at risk of intense fire\(^5\)
- 2015 snowpack lowest level ever recorded\(^6\)

Photo credit: USFS - *Viewing Forests Through a Historical Lens*, Fall 2009.
Threats to Watersheds

DROUGHT

Threaten the **cost effectiveness, reliability, and efficiency** of our watersheds

Drought or “abnormally dry conditions” affecting all 11 Western states\(^7\)

Nine of the ten worst wildfire seasons have occurred since 2000\(^8\)

Climate change only intensifying the crisis\(^9\)

Photo Credits:  Leah Millis, The Chronicle; MSN – Study: 58 million dry California trees threatened by drought
Darvin Atkeson, Associated Press; SF Gate – What causes California’s most devastating wildfires
North Fork, Feather River circa 1890
North Fork, Feather River 1890 - 1993
Forest Restoration as a Solution

In line with US Forest Service policies to address fire, climate change, bark beetle infestation, and more

Forest restoration is widely endorsed

- Improves a forest’s ability to sequester carbon by preventing severe wildfires and protecting tree health
- “Treatments in dense Sierra Nevada forests could increase water yield by up to 16%”

Photo Credits: New Mexico State University – NMSU Researchers Test Giant, Gentler Tree-Thinning Machine
Bell Timber – Lakes States Forest Management
Budgetary Limitations of the USFS

US Forest Service

Vicious cycle in which USFS is forced to pay for today’s fires out of the funds designed to prevent tomorrow’s

Cost of Wildland Fire (% of USFS Annual Budget)
Preparedness, Suppression, FLAME, and related programs

FY 1995: 16%
FY 2015: 52%
FY 2025E: 67%
The Forest Resilience Bond
FRB Structure

Debt Investors
Debt Investors

Equity Investors
Equity Investors

Forest Resilience Bond
Forest Resilience Bond

Contracted cash flows as determined by evaluator
Contracted cash flows as determined by evaluator

Water Benefits Accrue to Water and Electric Utilities
Water Benefits Accrue to Water and Electric Utilities

Fire Suppression Benefits Accrue to USFS and State
Fire Suppression Benefits Accrue to USFS and State

Evaluation Platform
Evaluation Platform

Funds
Funds

Interest
Interest

Funds
Funds

Residual CF
Residual CF

Contracted cash flows as determined by evaluator
Contracted cash flows as determined by evaluator

Forest Restoration
Forest Restoration

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Illustrative Cash Flows

- Year
- Investment
- State Benefits
- Utility Benefits
- Fire Suppression Benefits

Year 1: Investment
Year 2: State Benefits
The Opportunity for Forest Restoration

US Market\textsuperscript{14}:
$41$ Billion
(58M acres)

CA Market\textsuperscript{15}:
$5.3$ Billion

2014 USFS Restoration\textsuperscript{16}:
$776M$

Note: Dollar amounts based on restoration costs of $705/acre (average price paid by USFS in 2014 for Integrated Resources Restoration program).
Components of an Environmental Impact Bond
(1) Private Capital

- Potential to tap into billions of dollars
- Preventative investments not prioritized in current funding structure
- Opportunity to influence policy by demonstrating that this work can be successful
- Delays repayment by beneficiaries, allowing for cost sharing once benefits are proven

Vast, Underutilized Resources

Budget-Constrained Gov’t

Potential to Set Precedent

Enables Cost Sharing Ex-Post
(2) Measurable Benefits

Stream Gauge/ Flow Measurement

Remote Sensing

Field-Based Sensors
(3) Innovative Contracts

**Pay for Success Facilitates Collaboration with Private Sector**

<table>
<thead>
<tr>
<th>What is Pay for Success?</th>
<th>Benefits</th>
</tr>
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</table>
| Private investors provide upfront capital and stakeholders make contracted repayments based on pre-determined outcomes only after benefits are measured and proven | ► Relieves public of upfront financial burden  
► Payments on an ex-post basis once proven  
► Scales investment in high-impact areas  
► Portfolio diversification opportunity |

**Status Quo**

- **Multiple Beneficiaries**
  - US Forest Service
  - Utilities
  - State Gov’t

- **Single Payer**
  - US Forest Service

**Forest Resilience Bond**

- **Beneficiaries = Payers**
  - US Forest Service
  - Utilities
  - State Gov’t
(4) Financial Structure

**Forest Resilience Bond Structure**

- **Offtaker**
- **Utilities**
- **Forest Resilience Bond SPV**
- **Noteholders**
- **Trust**
- **Implementation Partners** (SNC, CalFire, Conservancies, other NGOs/Non-profits)
- **Contractors + Restoration Entities**
- **U.S. Forest Service**
- **State**

**Key:**
- Green = cash flows
- Blue = contracts
- Orange = work
- Red = products/benefits

**Trust Agreement**

**Project Contracts**
- Pay for Products
- Pay for Benefits

**Forest Resilience Bond Agreement**

**State Good Neighbor Agreement**

**Good Neighbor Agreement**

**Work**
- (Contracts subject to USFS governance and procedures)

**Products** - Benefits

**Benefits** - Products
(5) Collaboration
(6) Diverse Sources of Capital

Development 2016-2017
- Relationship development
- Contracting scheme
- Deal structure

Pilots 2017-2019
- Implementation capabilities
- Measurement technology
- Contracting scheme

Market 2019+
- Scale model across CA and Western US
- Financial sustainability

Goals

Funding
- Philanthropic capital (Rockefeller, Packard, and Fink Foundations)
- Pro-bono legal support

- Philanthropy (PRIs), government, and concessionary capital for pilot

- Market-rate capital for deals
- Deal revenues create BFC financial sustainability
Summary of Development Process

Forest Resilience Bond

- **Ecosystem Services**
- **Evaluation Toolkit**
  - Quantifies benefits accruing to multiple stakeholders
- **Innovative Contracts**
  - Monetizes multi-faceted benefits as payments
- **Financial Vehicle**
  - Converts contractual payments into investor returns
- **Investor Capital**
  - Immense, untapped resource to fund conservation

**Hydro, water, and fire benefits valuable to stakeholders**
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Follow us @BlueForestConsv
Like us at www.facebook.com/blueforestconservation
Appendix
Sources

4. Dick Fleishman of USDAFS Flagstaff Office in an article by Elizabeth Harball of E&E Publishing, LLC
8. National Interagency Fire Center
10. *Increasing the Pace of Restoration and Job Creation on Our National Forests*, US Forest Service
12. *Sierra Nevada Watershed Ecosystem Enhancement Project*; Sierra Nevada Research Institute & UC-Berkeley
Meet the Blue Forest Conservation Team

Zach Knight
Leigh Madeira, CFA
Chad Reed
Nick Wobbrock

An Experienced & Interdisciplinary Team

Finance and Investing
Social & Environmental Impact
Government
Engineering

Recent Progress
► Principal Investigator on Rockefeller, Packard, and Fink Foundations grants
► NRCS CIG award - Partnering with WRI & American Forest Foundation
► Multiple Pro Bono legal counsels for contract development
► Panel lead @ Milken Institute Global Conference 2015 & SOCAP 2015/2016
► 1st Place, 2015 Morgan Stanley Sustainable Investing Challenge (out of 127 teams)
Potential Value for Utility Stakeholders

Water Utilities
- Increases water volumes at lower cost compared to alternatives
- Reduces fire risk to water quality

Electric Utilities
- Underutilization of cheap, carbon-free hydropower generation
- Protects against reservoir sedimentation

Watershed Challenges
- Water quality
- Infrastructure damage
- Instream flow protection
- Timing of flows/runoff
- Declining yield
- Sedimentation
- Flood control
- Insect and disease
- Threatened and endangered species

California hydropower net generation
- Million megawatt-hours
- 2004-13 range & average
- 2014
# Precedents for Forest Restoration Deals

<table>
<thead>
<tr>
<th>Upfront Capital Provider</th>
<th>Stakeholders Involved</th>
<th>Benefits to Capital Providers</th>
<th>Pay for Success?</th>
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<tr>
<td>Flagstaff Watershed Protection Project&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Tax payers</td>
<td>USFS, city of Flagstaff</td>
<td>Fires suppression, water protection, flood prevention</td>
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<tr>
<td>Denver&lt;sup&gt;2&lt;/sup&gt;</td>
<td>USFS &amp; Denver Water</td>
<td>USFS &amp; Denver Water</td>
<td>Fire suppression &amp; protection of water quality</td>
</tr>
<tr>
<td>Four Forest Restoration Initiative&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Good Earth Power (private biofuels company)</td>
<td>USFS, Good Earth Power</td>
<td>Biofuels/ composting value</td>
</tr>
<tr>
<td>NFF Coalition&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Municipal utility, corporations, CA government board</td>
<td>USFS, capital providers</td>
<td>Water quality and quantity</td>
</tr>
<tr>
<td>FRB</td>
<td>Private Investors</td>
<td>EBMUD, PG&amp;E, USDAFS</td>
<td>Water quantity, hydroelectric power, fire suppression</td>
</tr>
</tbody>
</table>

Note: Not included in above table is the Chiefs’ Joint Landscape Restoration Partnership including the Oregon initiative, East Face of the Elkhorn Mountains Project, because it is a partnership between public agencies (USFS and NRCS).

1. [Flagstaff Watershed Protection Project](#)
2. [From Forests to Faucets: U.S. Forest Service and Denver Water Watershed Management Partnership](#)
3. [High hopes and tensions surround nation’s biggest forest restoration project](#)
4. [National Corporations Step Up To Relieve California Drought](#)
Advantages of the Forest Resilience Bond

**Sizeable Investment Opportunity**
- Deal size substantial enough to warrant due diligence
- Highly replicable w/ total investable market over $4Bn
- CA-focused investment for green infrastructure initiative (CA Pension Fund specific)

**Real Fixed Income Asset**
- Annual cash flows to support and amortize a debt tranche
- No refinancing risk for principal repayment
- Significant credit enhancement via equity tranche
- Portfolio diversification tool

**Multiple Payers for Robust Economics**
- Highly rated counterparties (AA+, AA+, A+ in our example deal)
- Other potential cash flows further enhance returns and debt coverage
- Fiduciary-friendly returns

**Ability to Contract for Outcomes or Output**
- Hybrid approach enhances security of cash flows
- Avoids requirement of high precision measurement
Longer and More Severe Wildfire Seasons

Total Acreage Burned by Wildfire - West Slope Sierra By Decade


Over one million acres already burned - expected to be worst wildfire decade ever.
Widespread Benefits of Forest Restoration

Lassen Natural Forest Post September 2002 Fire

- Reduces Fire Severity
- Improves Retention of Snow Pack = Water Benefits
- Creates Rural Jobs, Preserves Ag Jobs

1. All Lands Approach to Watershed Health, California Forestry Association
2. Increasing the Pace of Restoration and Job Creation on Our National Forests, US Forest Service
3. Sierra Nevada Watershed Ecosystem Enhancement Project; Sierra Nevada Research Institute & UC-Berkeley