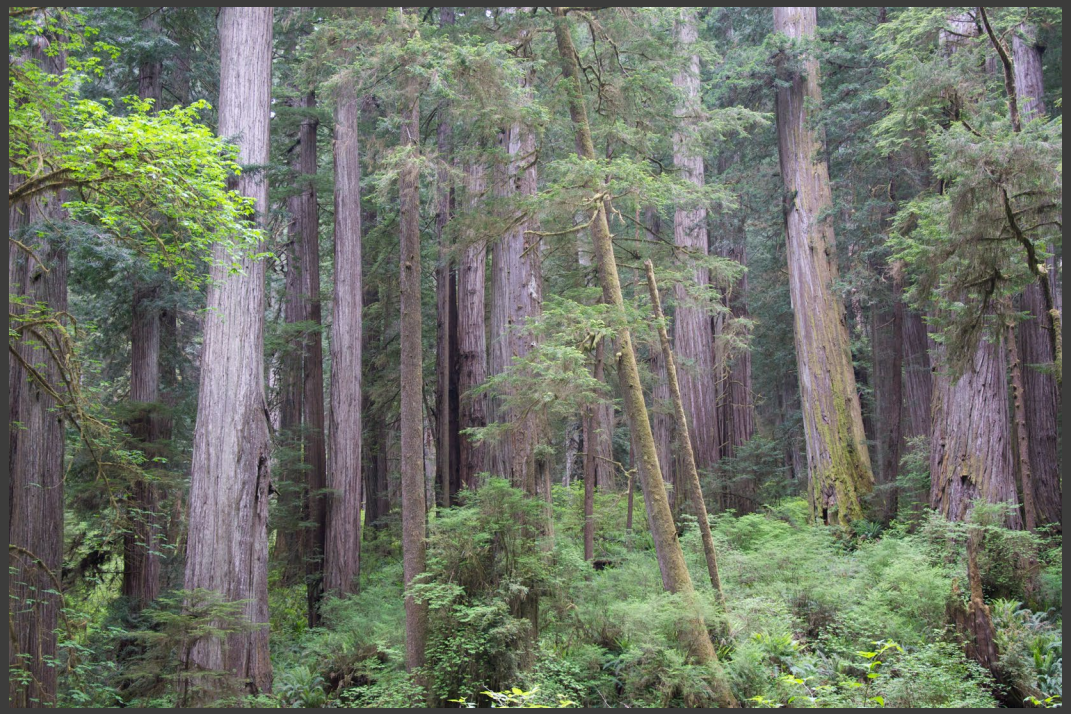
December 5, 2018

Ecosystem Service Tradeoffs Between Different Forest Management Strategies in the PNW



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OUR CHOICES MATTER

- Forest carbon balance exerts a significant influence on our global climate.

- Coastal forests in the Pacific Northwest are among the most productive ecosystems on the planet.

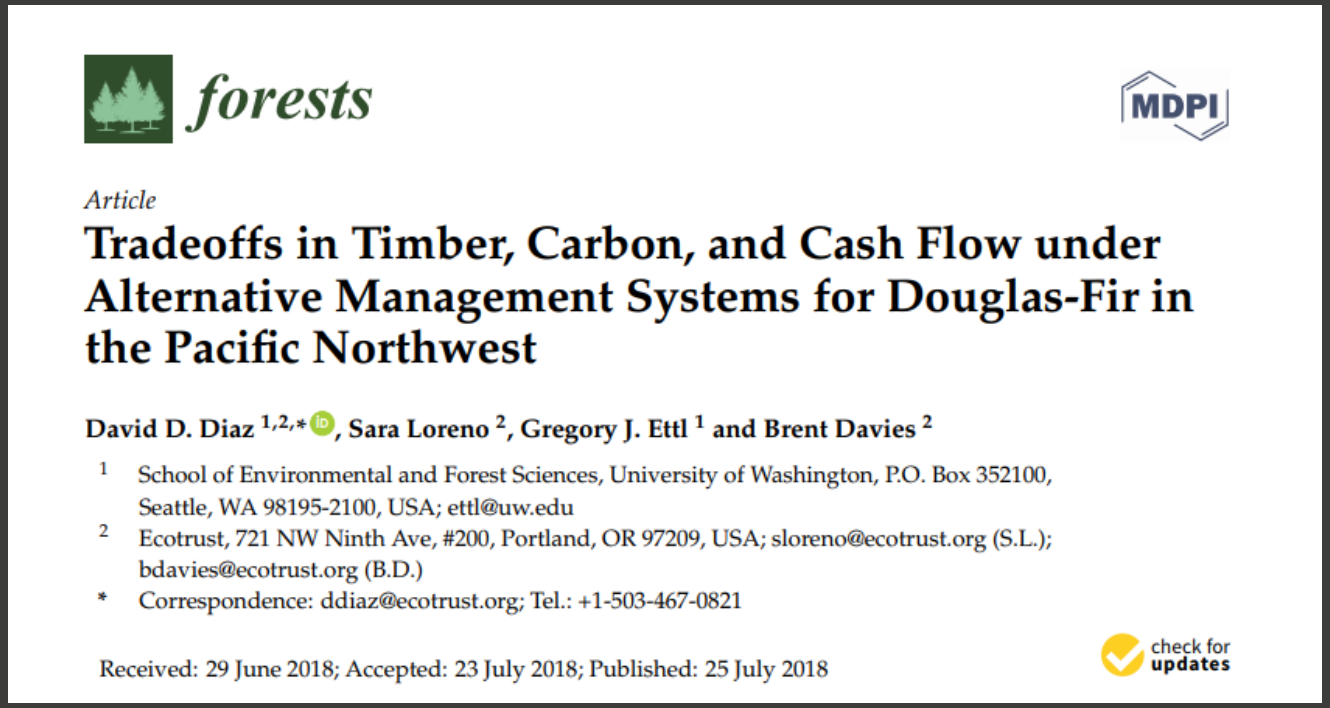
- Hold 8% of total US forestlands but represent 15% of the nation's carbon sink

- Currently at 1/ 3 capacity

- Produce 30% of US softwood lumber is produced in OR & WA

- Built environment produces 40% of US GHG emissions
- Wood is renewable
- Lime and sand are finite
- Wood is good!
- But, not all wood embodies the same amount of carbon

FSC vs. Business-as-Usual in Pacific Northwest Douglas-fir



forests

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Article

Tradeoffs in Timber, Carbon, and Cash Flow under Alternative Management Systems for Douglas-Fir in the Pacific Northwest

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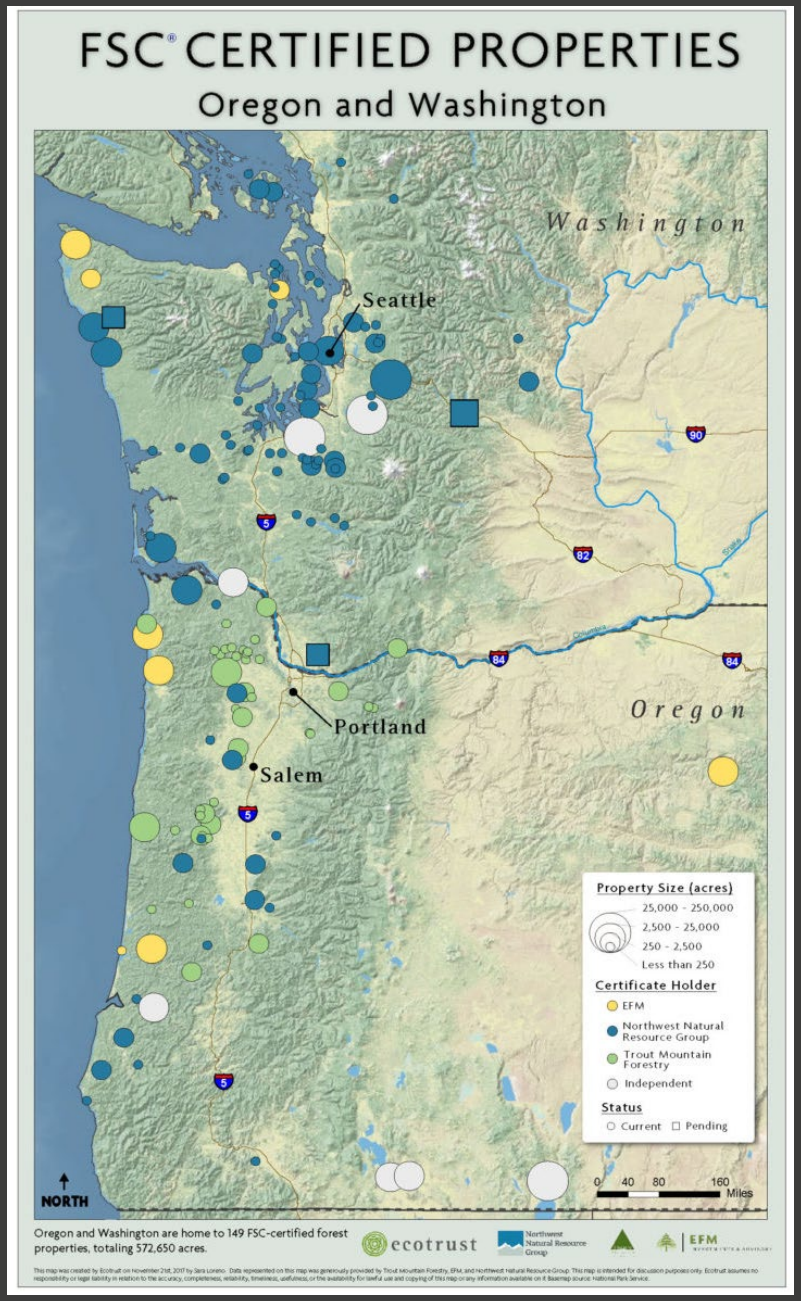
CLIMATE SMART FORESTRY

FSC as a middle path?

The Forest Stewardship Council (FSC) offers third-party certification for management and conservation practices that go above-and-beyond business as usual in the Pacific Northwest (PNW).

We consider two key requirements of FSC certification in the PNW:

- Green Tree Retention: FSC requires more trees to be kept during harvests
- Riparian Management Zones: FSC requires wider protective stream buffers



OUR STUDY LOOKED AT:

- Given even-age management of Douglas-fir under minimum FPA and minimum FSC rules, we focused on the direct effects of two forest practice rules (stream buffer widths and green tree retention levels).

- Consider two management scenarios under each set of forest practice constraints designed to either:
  (a) **maximize sustained timber yield** (longer rotations); or
  (b) **maximize net present value** (shorter rotations).

- Quantifying the carbon, timber, and financial outcomes among alternative management scenarios to help characterize the potential for improved performance from private forestlands.

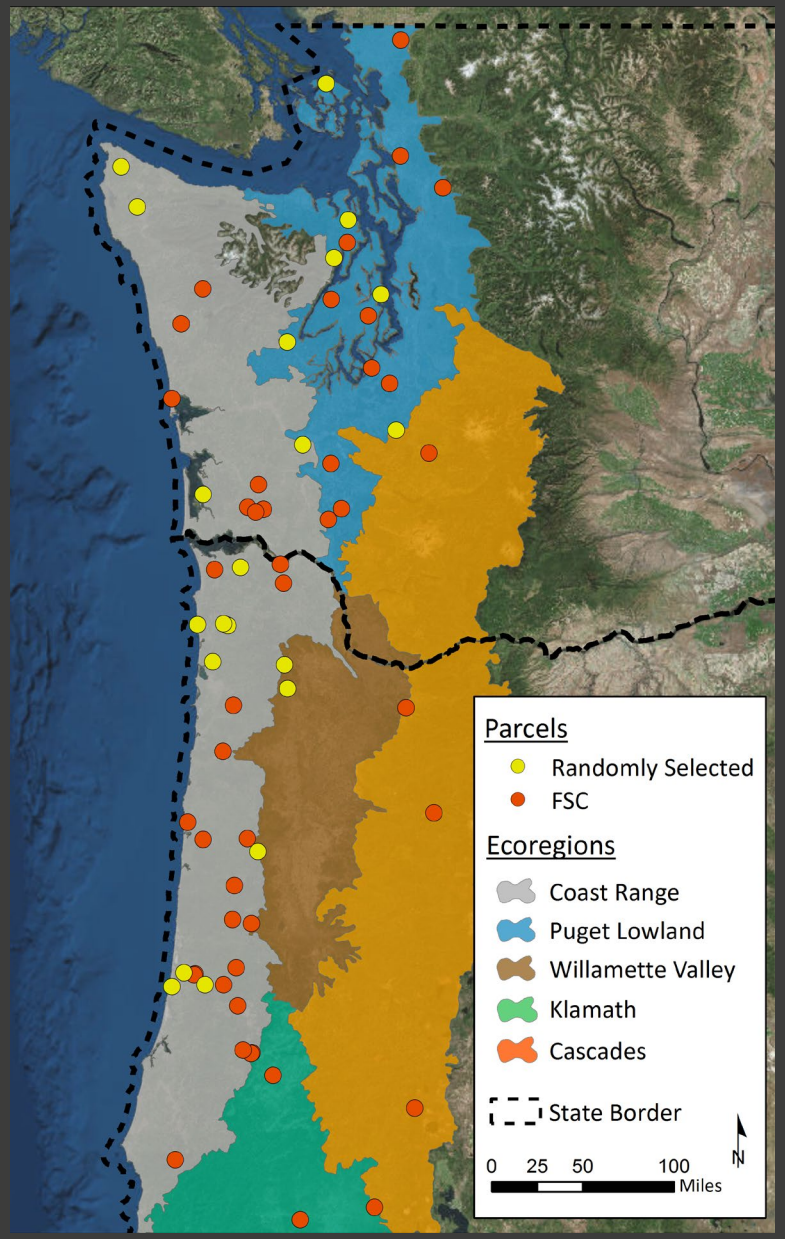
WHAT OUR STUDY DID NOT LOOK AT:

- Quantifying what actual FSC landowners are doing on the ground.

Sampling a cross-section of forests across western Oregon and Washington

We selected 64 properties (44,250 ac) from small-to-large parcel sizes and sparse-to-dense stream cover.

We estimated initial forest conditions using remotely-sensed data, then simulated 100 years of management using four alternative management scenarios.



WHAT RIPARIAN BUFFERS LOOK LIKE

on coastal Oregon timberland

WHAT RIPARIAN BUFFERS LOOK LIKE

under Oregon state law

WHAT RIPARIAN BUFFERS LOOK LIKE

under FSC

THREE KEY PERFORMANCE INDICATORS

- How much carbon do our forests store?
  Average carbon storage in the forest + products, net of leakage, over 100 years (~ARB Protocol)

- How much timber do our forests produce?
  Cumulative timber yield (and growth) over 100 years

- How much financial value do our forests generate?
  Net Present Value incorporating management costs and timber revenue over 100 years (5% discount rate)

BOILING DOWN THE KEY PERFORMANCE INDICATORS

OREGON	Carbon Stored *tCO_2e/ha*	Timber Yield *MBF/ha*	Embedded Carbon tCO_2e / MBF	Timber MAI *CF/ha/ yr*	NPV *$K/ha*
BAU	497	199	2.4	624	19.1
FSC-Short	679	153	4.2	596	14.3
FPA-Long	608	197	3.1	669	17.1
FSC-Long	646	168	3.9	595	15.3
WASHINGTON					
BAU	518	185	2.9	639	18.0
FSC-Short	659	159	4.1	625	14.0
FPA-Long	639	174	3.7	680	15.6
FSC-Long	616	165	4.1	652	14.4

Median values among the properties in each State

- BAU always stored the least carbon, and usually yielded the most timber and highest NPV.
- FSC consistently showed an embedded carbon benefit.
- Lengthening rotations under FPA rules increases annual average timber growth.

WE CAN DO BETTER THAN BUSINESS-AS-USUAL

- FSC stores more carbon. ~**30% more than BAU**
- FSC-certified wood carries an embedded carbon benefit.
- Conservation isn't free: 10% price premium and/ or $57 ton of Carbon. Opportunity costs for climate-smart forests are not trivial.
- Rewarding FSC-certification could be more cost-effective and equitable than carbon offset certification for demonstrating additional carbon storage.
- Lengthening rotations (towards Max. Sustained Yield) would store more carbon and grow more timber per acre per year than business-as-usual, at relatively modest opportunity costs. Whether you believe carbon is better stored in a forest or in wood products, the conclusion is the same.

Climate-smart Forestry

- Longer rotations (growing trees for longer periods of time between harvests) and managing forests to maintain a diversity of native species, ages, sizes, and spatial structure of live and dead trees.
- Protecting water quality and aquatic habitats with effective buffers around streams and wetlands.
- Tightly restricting the use of chemicals and prohibiting particularly hazardous chemicals.
- Safeguarding High Conservation Value forests, recognizing unique old growth forest characteristics, and protecting and restoring habitat for threatened and endangered species and critical ecosystem services for local communities.

- Restoration
- Protection
- Diversity
- Integrity
- Function

More reliable production of ecosystem services

Photo: Sam Beebe, Ecotrust

Climate-smart Forestry

Photo: Sam Beebe, Ecotrust

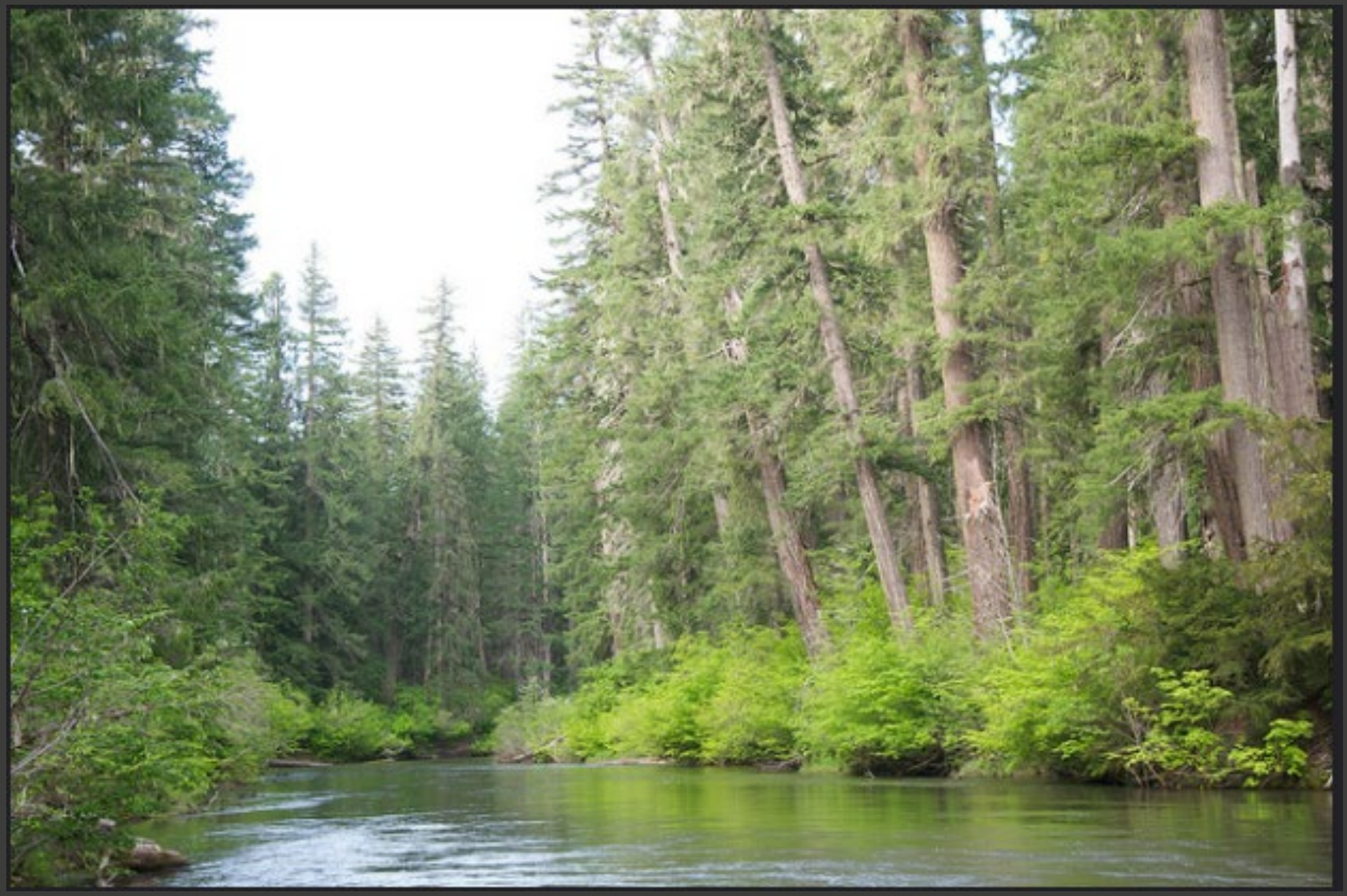


Photo: Sam Beebe, Ecotrust

Climate-smart Forestry

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Climate-smart Forestry

Photo: Sam Beebe, Ecotrust

FSC is climate-smart in the PNW

Why these findings matter?

Increasing the capacity of forests to sequester and store carbon is within reach, if we implement:

- Targeted changes to existing federal programs, like WRP/ CRP/ HFRP
- State and federal TA programs that support certification and aggregation of ecosystem services
- Climate legislation that provides meaningful and accessible incentives
- Climate-smart wood purchasing: buy FSC

Thank you.

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For more details and the full report, see ecotrust.org

Photo: Sam Beebe, Ecotrust

Mt Rainier, WA

Dominant Forest Management

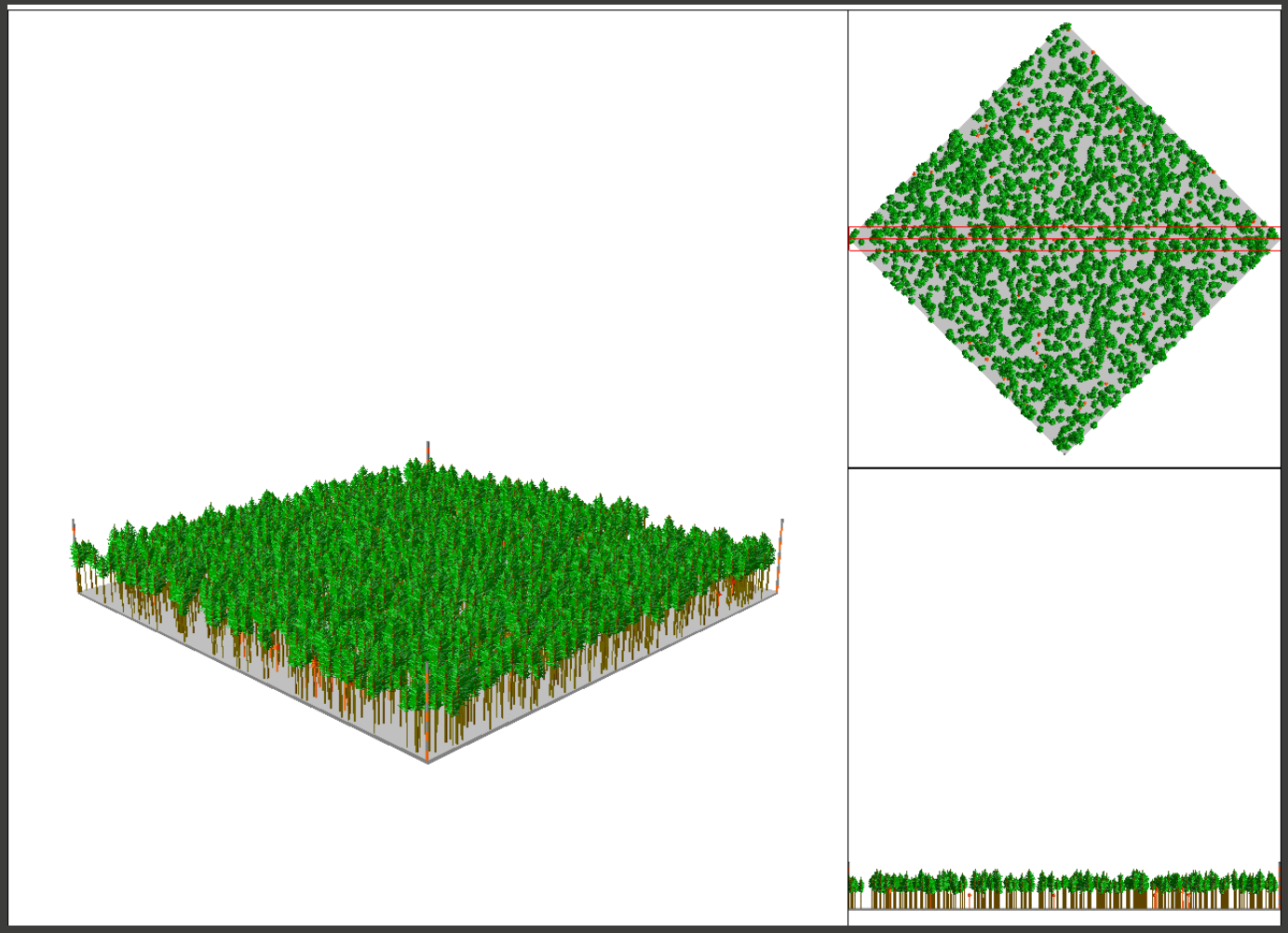
Photo: Sam Beebe, Ecotrust

We evaluated four management scenarios for Douglas-fir over 100 years using the Forest Vegetation Simulator

"SHORT~FPA" Maximize NPV *State Forest Practices*	"SHORT~FSC" Maximize NPV *FSC Rules*	"LONG~FPA" Max. Sustained Yield *State Forest Practices*	"LONG~FSC" Max. Sustained Yield *FSC Rules*
➢ Plant 450 DF TPA	➢ Plant 450 DF TPA	➢ Plant 450 DF TPA	➢ Plant 450 DF TPA
➢ Thin @age 15-20 to 250 TPA	➢ Thin @age 15-20 to 250 TPA	➢ Thin @age 15-20 to 250 TPA	➢ Thin @age 15-20 to 250 TPA
➢ Regen. harvest @age 38-44 to 4 TPA	➢ Regen. harvest @age 38-44 to 30% of BA	➢ Regen. harvest @age 75 to 4 TPA	➢ Regen. harvest @age 75 to 10% of BA
➢ Pile and burn slash	➢ Pile and burn slash	➢ Pile and burn slash	➢ Pile and burn slash
		➢ Intervening thins to capture density-driven mortality	➢ Intervening thins to capture density-driven mortality
➢ Minimum state riparian rules (buffer widths and retained trees).	➢ Minimum FSC riparian rules (expanded no-touch buffers).	➢ Minimum state riparian rules (buffer widths and retained trees).	➢ Minimum FSC riparian rules (expanded no-touch buffers).

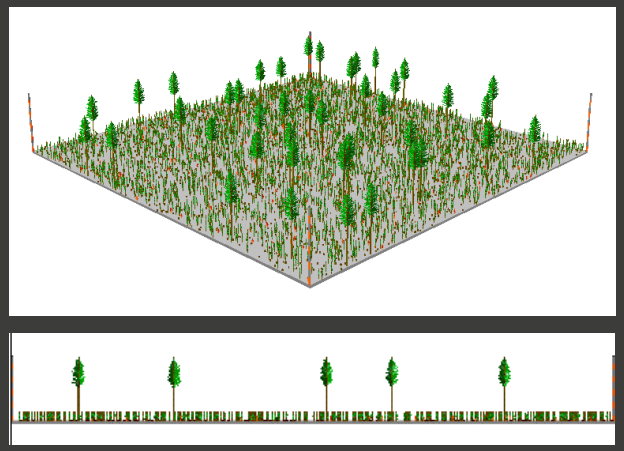
WHAT GREEN TREE RETENTION LOOKS LIKE

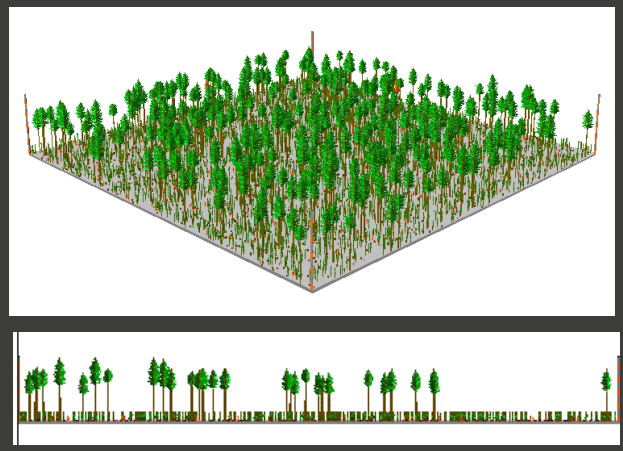
initial forest conditions

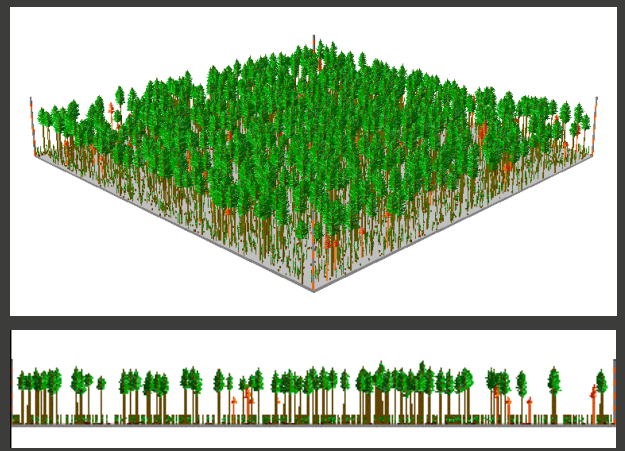


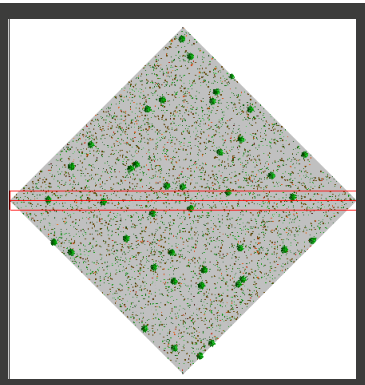
WHAT GREEN TREE RETENTION LOOKS LIKE

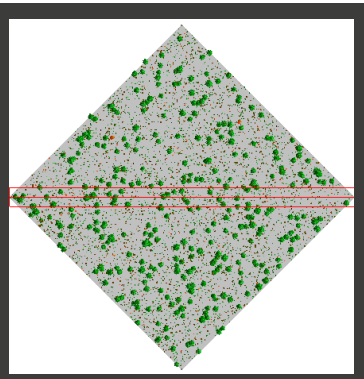
following the first harvest (on 10 acres)

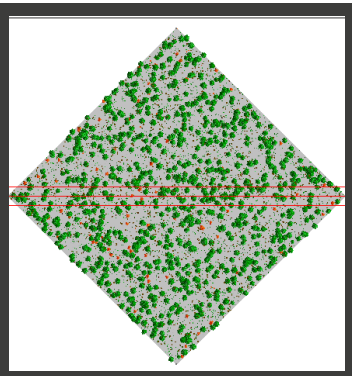












4 trees per acre
(FPA Rules)

10% of basal area
(FSC Rules)

30% of basal area
(FSC Rules)