September 12, 2017

Climate Smart Forestry for a Carbon-Constrained World

Carbon storage and timber production under alternative management strategies in the Pacific Northwest.

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ecotrust

Ecotrust is powered by the vision of a world where people and nature thrive together.

Since 1991, we have partnered with local communities from California to Alaska to build new ways of living and doing business.

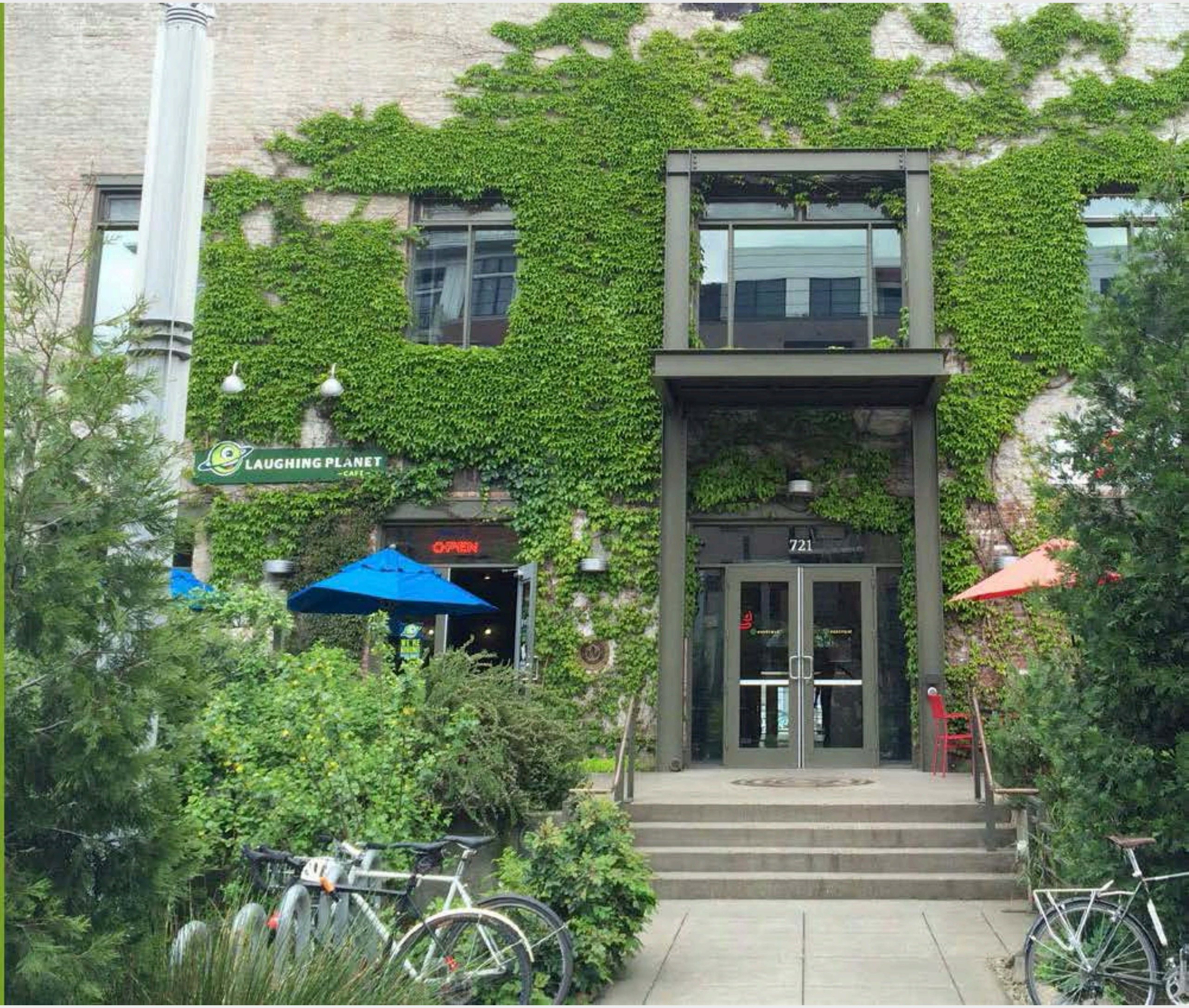
From forestry to finance, food access to green building, we work to advance social equity, economic opportunity, and environmental well-being.

50

staff

$11M

annual budget



WHAT IS CLIMATE SMART FORESTRY?

Conserving and restoring the integrity and function of forest ecosystems by conscientiously anticipating and responding to the potential—though often uncertain—impacts of our changing climate.

In practice, this means:

- Longer rotations and uneven-aged managed systems to maintain diversity of native species, ages, sizes, and spatial structure of live and dead trees.
- Protection of water quality and aquatic habitats with effective no-touch and light-touch buffers around streams and steep and unstable slopes.
- Judicious and targeted use of chemical herbicides, with prohibitions against particularly hazardous chemicals.
- Protection and creation of High Conservation Value forests, recognizing unique old growth forest characteristics, habitat for threatened and endangered species, critical ecosystem services for local communities, and cultural significance.

WHAT YOU'RE GOING TO HEAR:

- **Industrial timberlands are managed for *financial return.***
  With current policies and markets, the delivery of other forest values such as timber, jobs, habitat, or carbon storage is indirect, incidental, and undervalued.

- **FSC stores more carbon.**
  As modeled here, FSC offers much greater carbon value and can maintain competitive timber output compared to business-as-usual.

- **Carbon storage and timber production are aligned.**
  Accessible policies and incentives that reward carbon storage could offer a win-win in western PNW forests, as incentivizing carbon storage would make long rotations with higher timber output and higher carbon storage more financially attractive.

01 *How our forests grow and how we choose to manage them.*

OUR CHOICES MATTER

The accumulation of biomass in forests takes CO_2 out the atmosphere, and exerts a significant influence on our global climate.

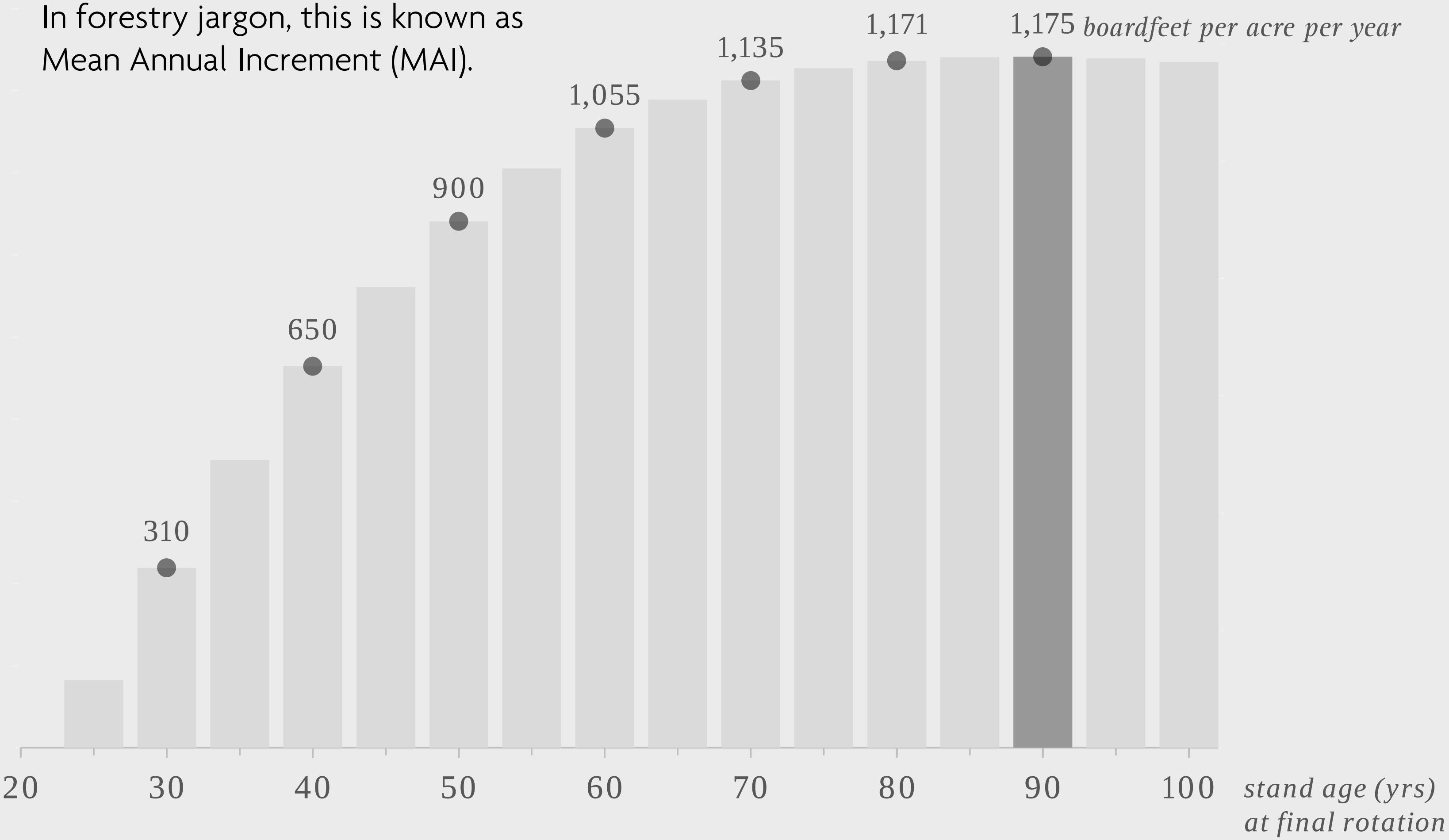
The coastal temperate rainforests of the Pacific Northwest are among the most productive ecosystems on the planet.

If we choose to, we can manage our forests to store more carbon and help mitigate climate change, but are there important tradeoffs between carbon storage and timber production?

Douglas-fir forests don’t hit peak productivity for an entire human lifetime.

This graph shows average annualized timber growth for even-age harvest rotations of a moderately productive Douglas-fir forest.

In forestry jargon, this is known as Mean Annual Increment (MAI).



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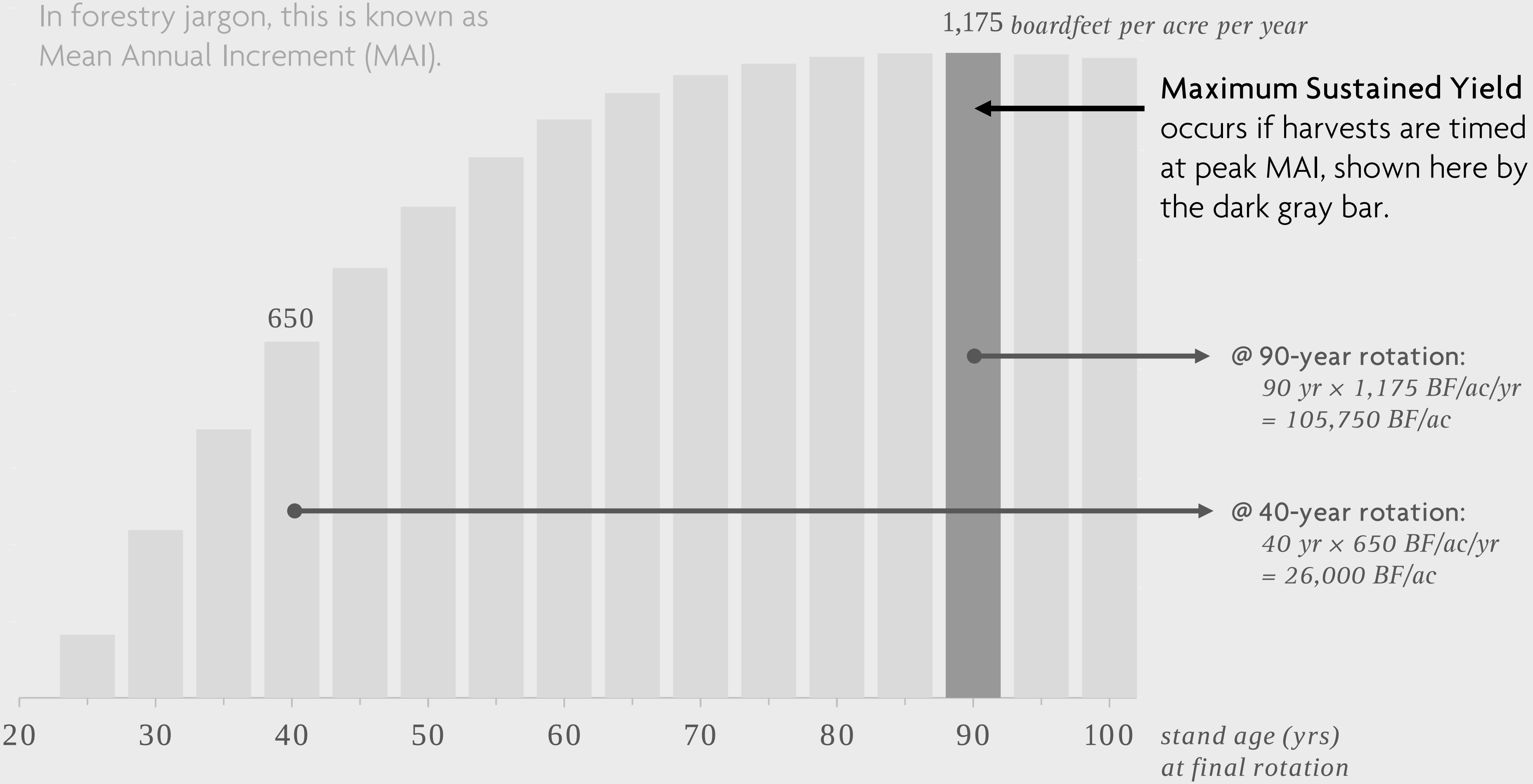
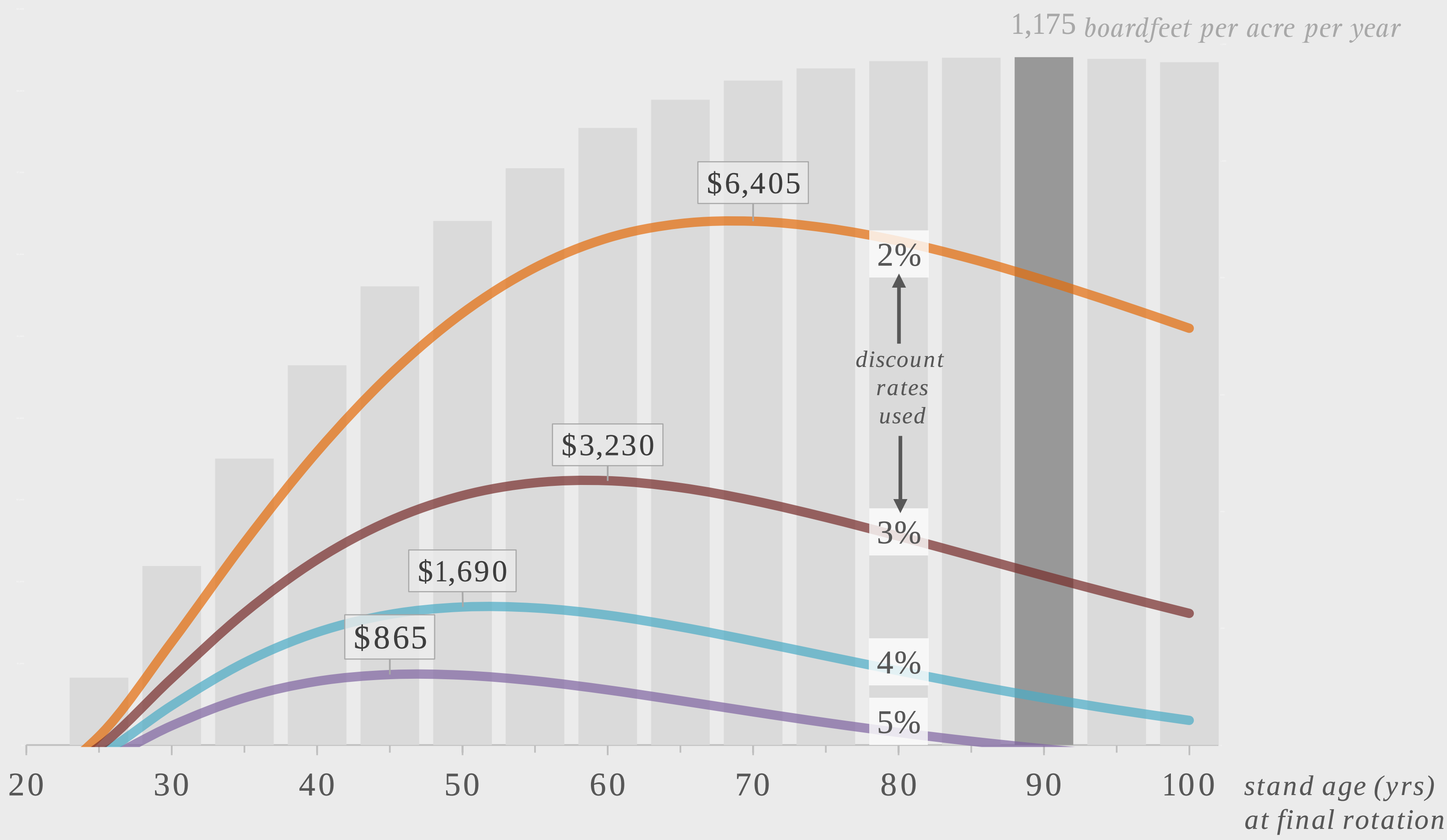


But we discount the future and choose lower timber yields in exchange for higher Net Present Value

Each line in the graph below shows Net Present Value (NPV) per acre for a timber harvest at each rotation age using a different annual discount rate (%).



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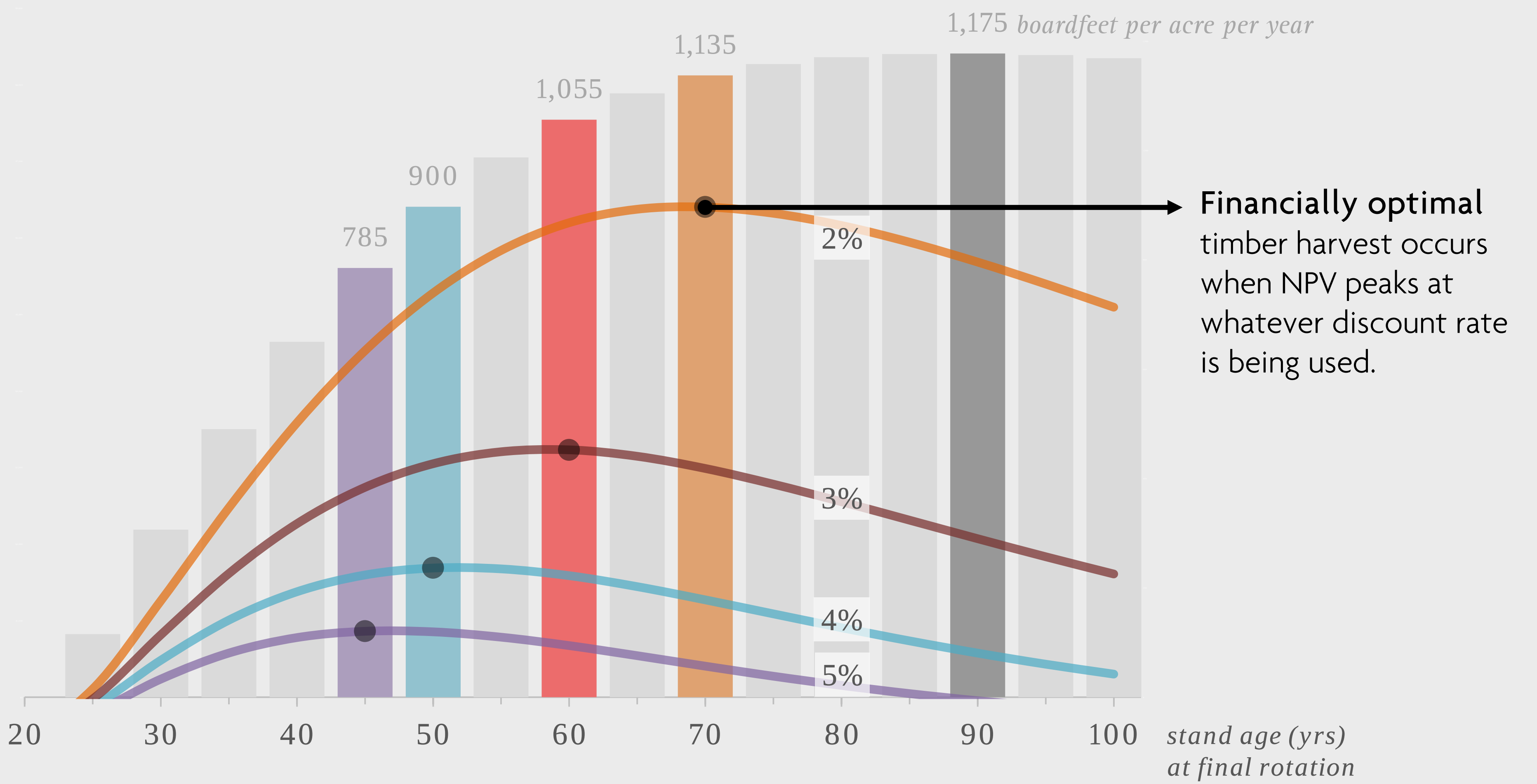

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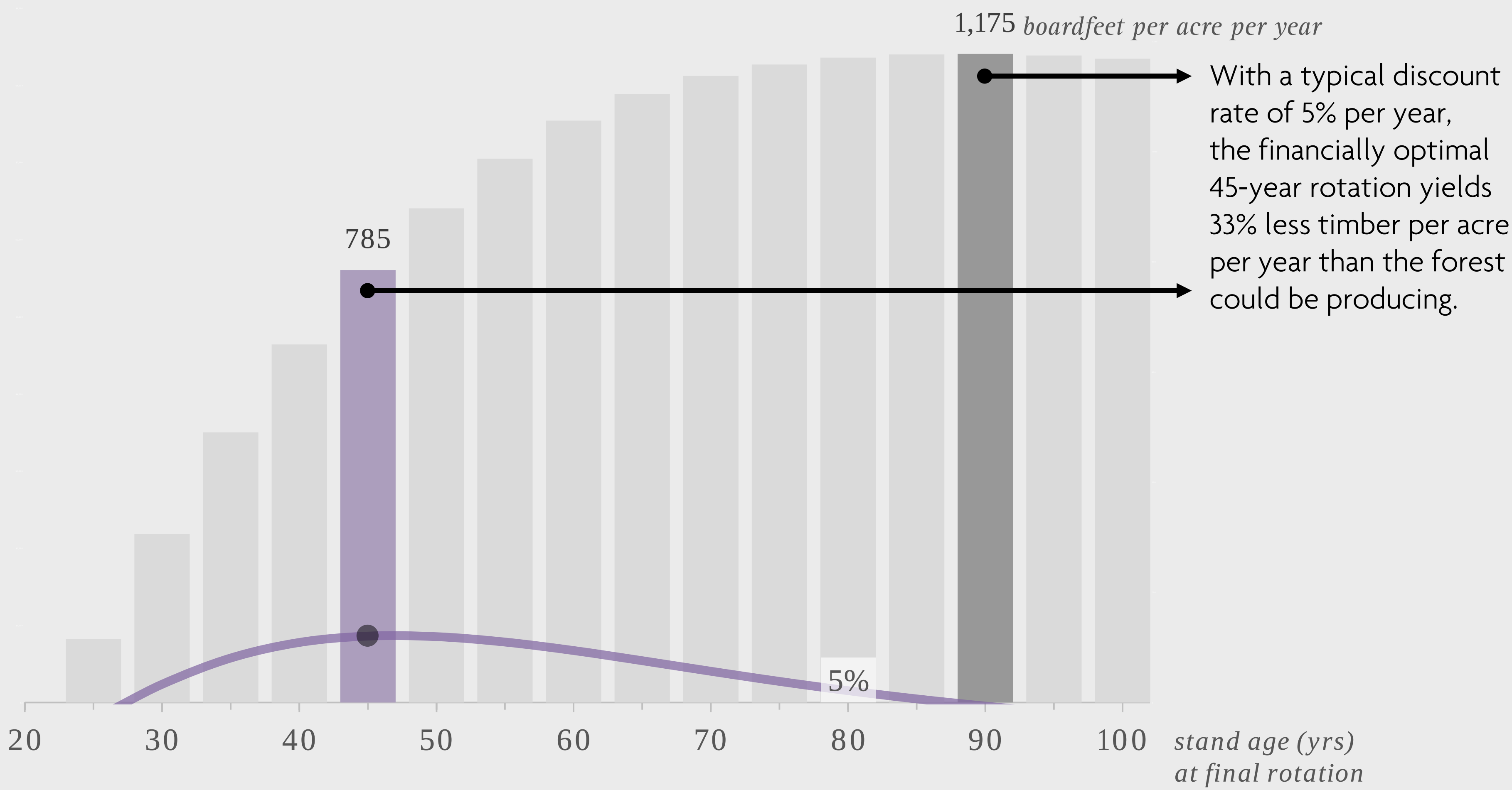


WHAT WE VALUE MATTERS

Modern industrial timber companies usually have a fiduciary obligation to prioritize return on investment (not timber output).

The only forest resource typically valued and monetized is timber (and sometimes development potential).

Our markets tend to ignore nearly every other forest resource value, including carbon storage.

02 *Exploring FSC as a middle path*

FOREST MANAGEMENT MATTERS

The Forest Stewardship Council (FSC) certifies management that ensures the protection of High Conservation Value forests, retains more trees during harvests, protects wider stream buffers, and requires smaller harvest blocks than are permitted under Oregon & Washington Forest Practices.

Retaining more trees under FSC will undoubtedly leave more carbon standing in the forest, but how would it affect timber production and total forest carbon stored (including wood products)?

TWO KEY FORESTRY METRICS
FOR A CARBON-CONSTRAINED WORLD

- How much carbon do our forests store (both in an out of the forest)?
- How much timber do our forests produce?

WHAT WE'LL BE DOING TODAY:

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

- Consider two management scenarios designed to either
(a) **maximize sustained timber yield** (longer rotations); or
(b) **maximize net present value** (shorter rotations).

- Quantifying the average carbon storage and cumulative timber yield of these scenarios to help characterize the potential for private forestlands to increase both carbon storage and timber output.

WHAT WE AREN'T DOING (TODAY):

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

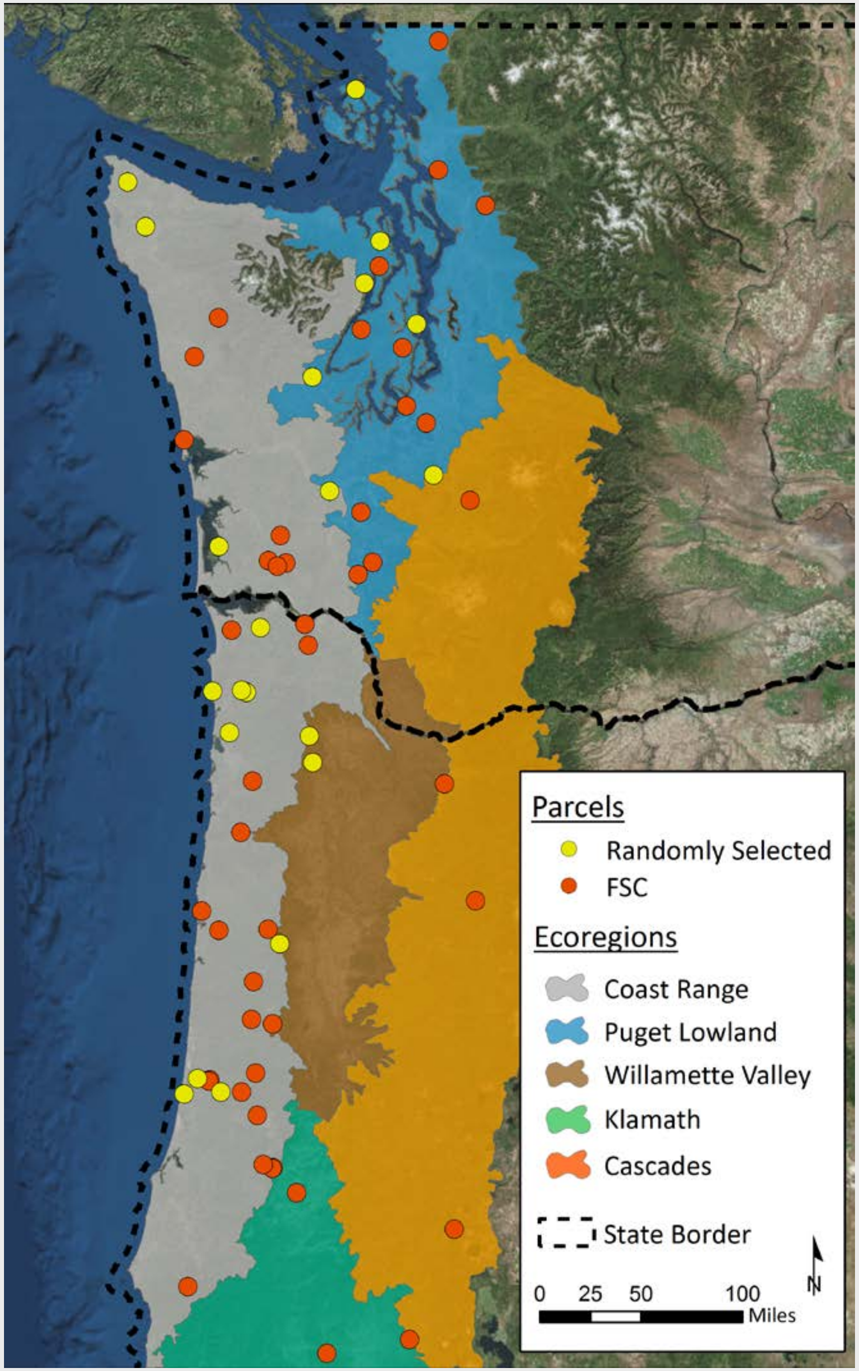
03 *Simulating timber production and carbon storage*

A CROSS SECTION OF FORESTS ACROSS THE PACIFIC COAST

We selected 67 properties across western Oregon and Washington.

22 FSC-certified properties were included, along with 45 randomly selected properties.

These cover a spectrum from small-to-large parcel sizes and sparse-to-dense stream cover.



STARTING WITH REMOTELY-SENSED INVENTORY DATA

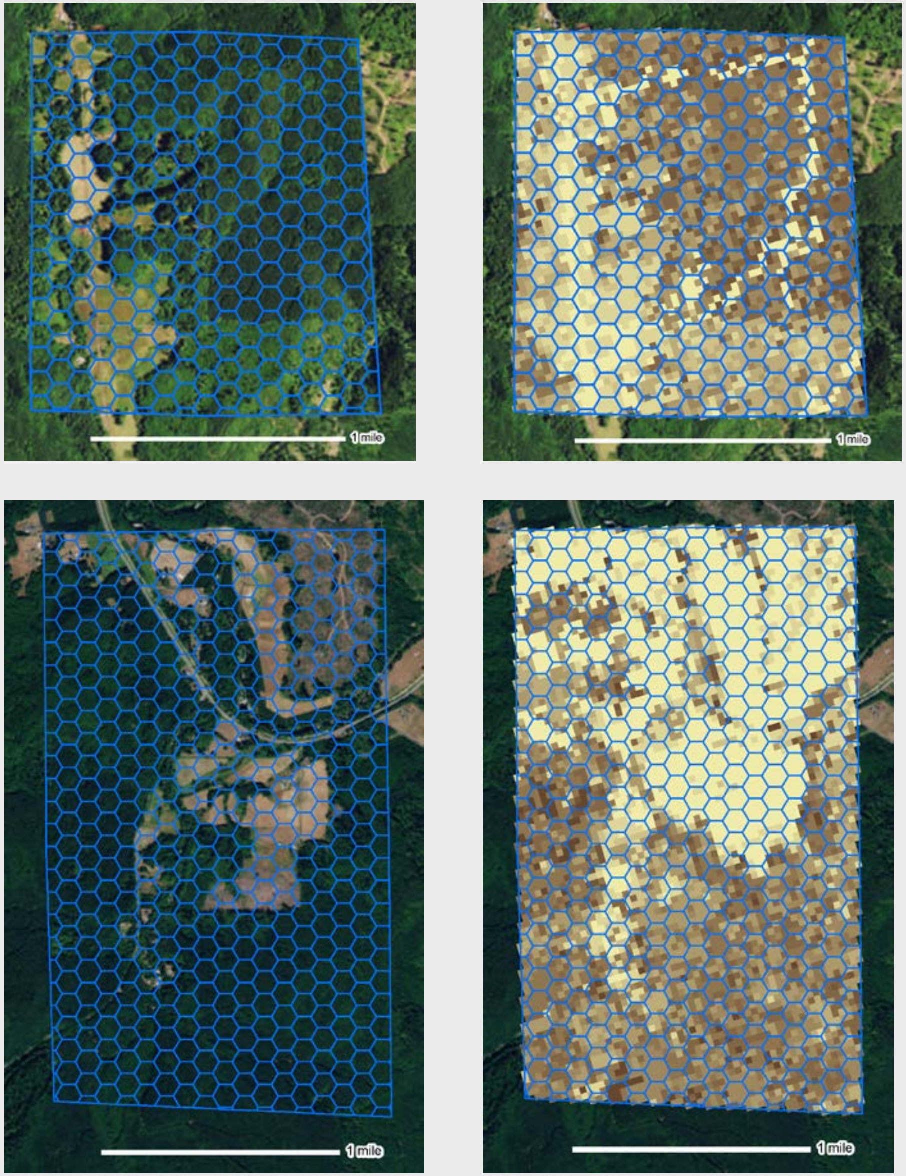
The Gradient Nearest Neighbor (GNN) dataset produced by Oregon State University researchers provides estimates of forest inventory across the region.

We subdivided properties into 5-acre management units, and used GNN inventory data as inputs for growth-and-yield modeling.

Two parcels illustrating the GNN dataset and our hexagonal management units are shown at right.

Aerial Imagery with Hexagonal 5-acre Units

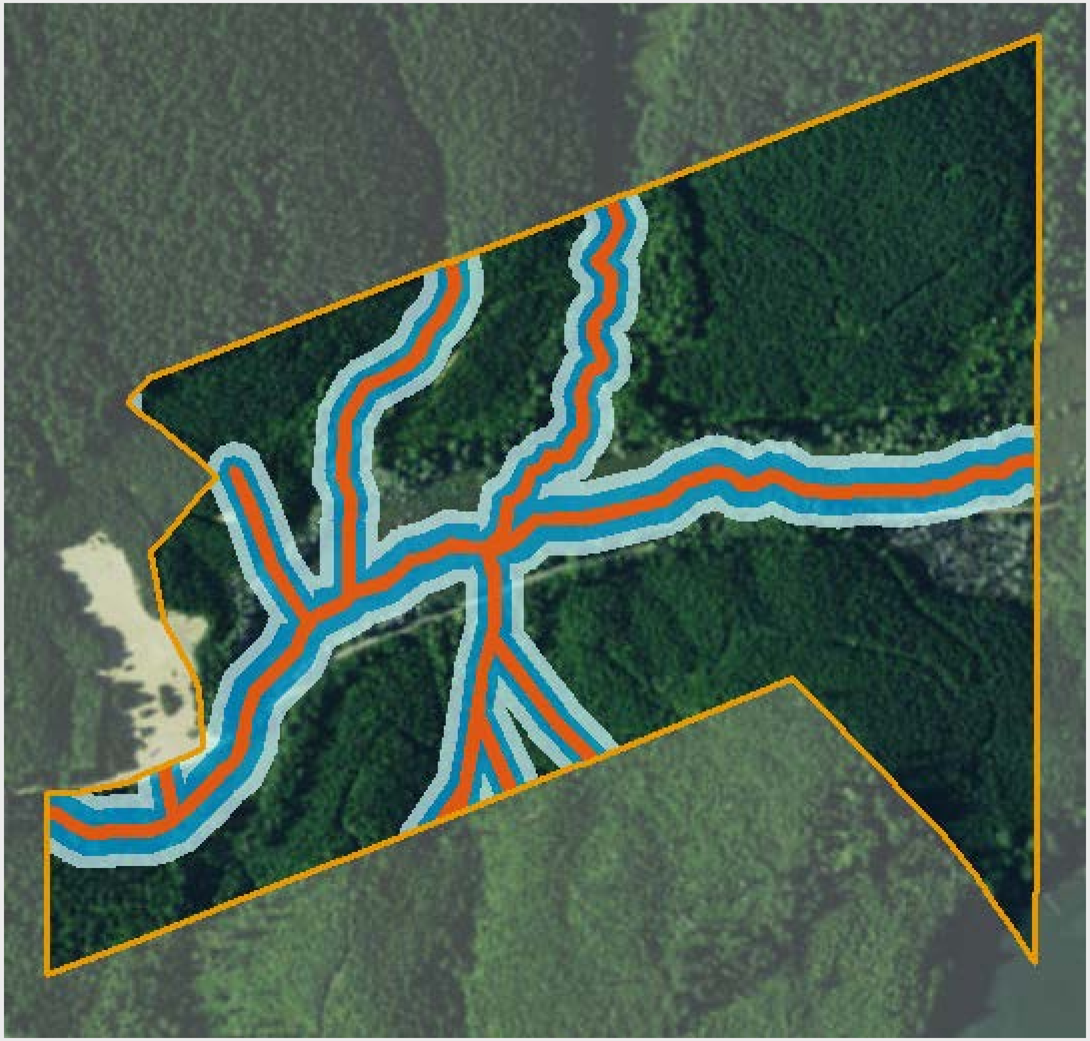
GNN Estimate of Stand Density



We evaluated three management scenarios for a Douglas-fir monoculture over 100 years using the Forest Vegetation Simulator growth-and-yield model

"FPA-SHORT" Maximize NPV *State Forest Practices*	"FSC-SHORT" Maximize NPV *FSC Rules*	"FSC-LONG" Max. Sustained Yield *FSC Rules*
➢ Plant 450 DF TPA	➢ Plant 450 DF TPA	➢ Plant 450 DF TPA
➢ Thin from below @ age 15-20 to 250 TPA	➢ Thin from below @ age 15-20 to 250 TPA	➢ Thin from below @ age 15-20 to 250 TPA
➢ Regeneration harvest @ age 35-55, retain 4 TPA ≥12" DBH	➢ Regeneration harvest @ age 35-55, retain 30% of BA	➢ Regeneration harvest @ age 70-115, retain 10% of BA
➢ Pile and burn slash	➢ Pile and burn slash	➢ Pile and burn slash
		➢ 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 FSC riparian rules (expanded no-touch buffers).

Example property with ***FPA*** *riparian management areas*

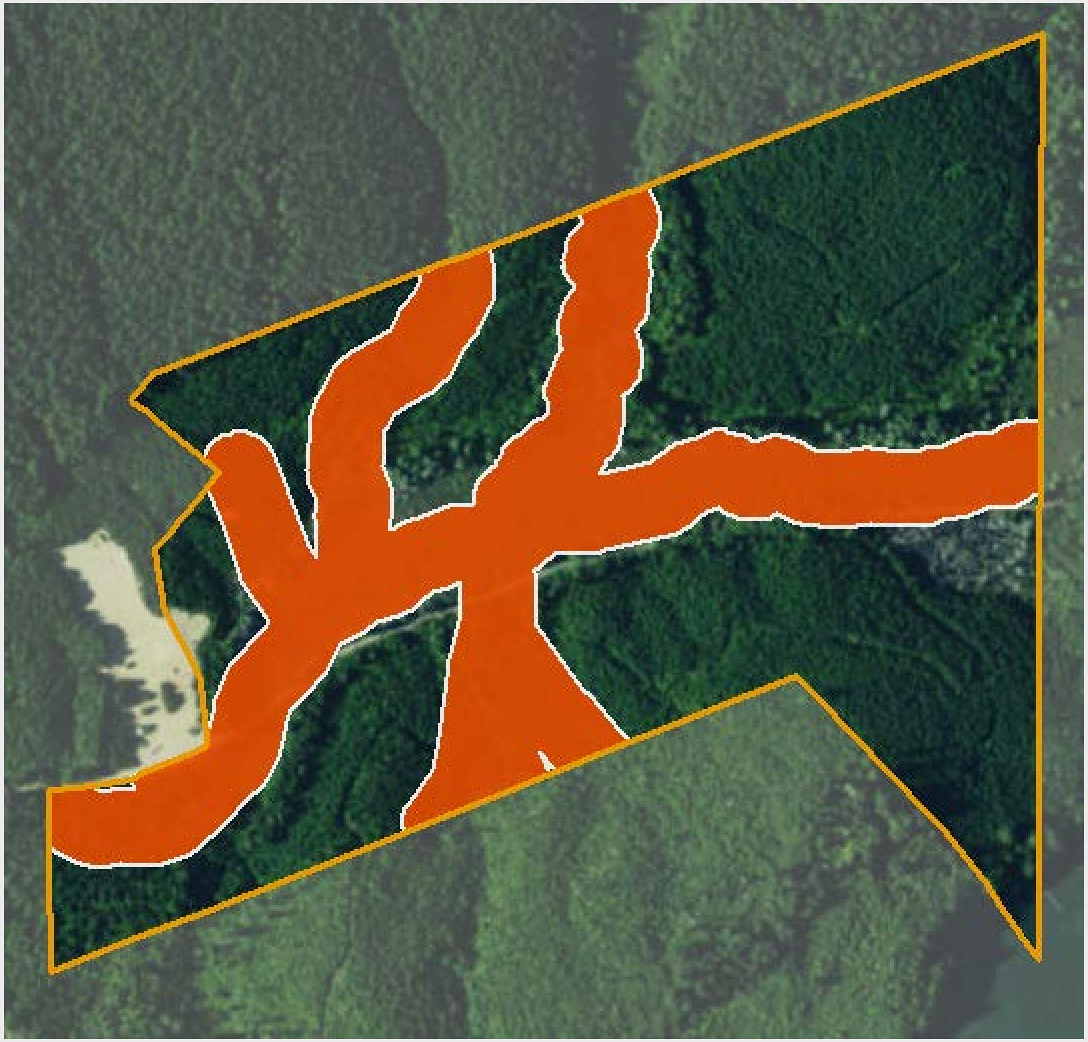


No Touch
(20-50 ft)

Light Touch
(50-150 ft)

Light Touch
(150-200 ft, WA only)

*Example property with **FSC** riparian management areas*



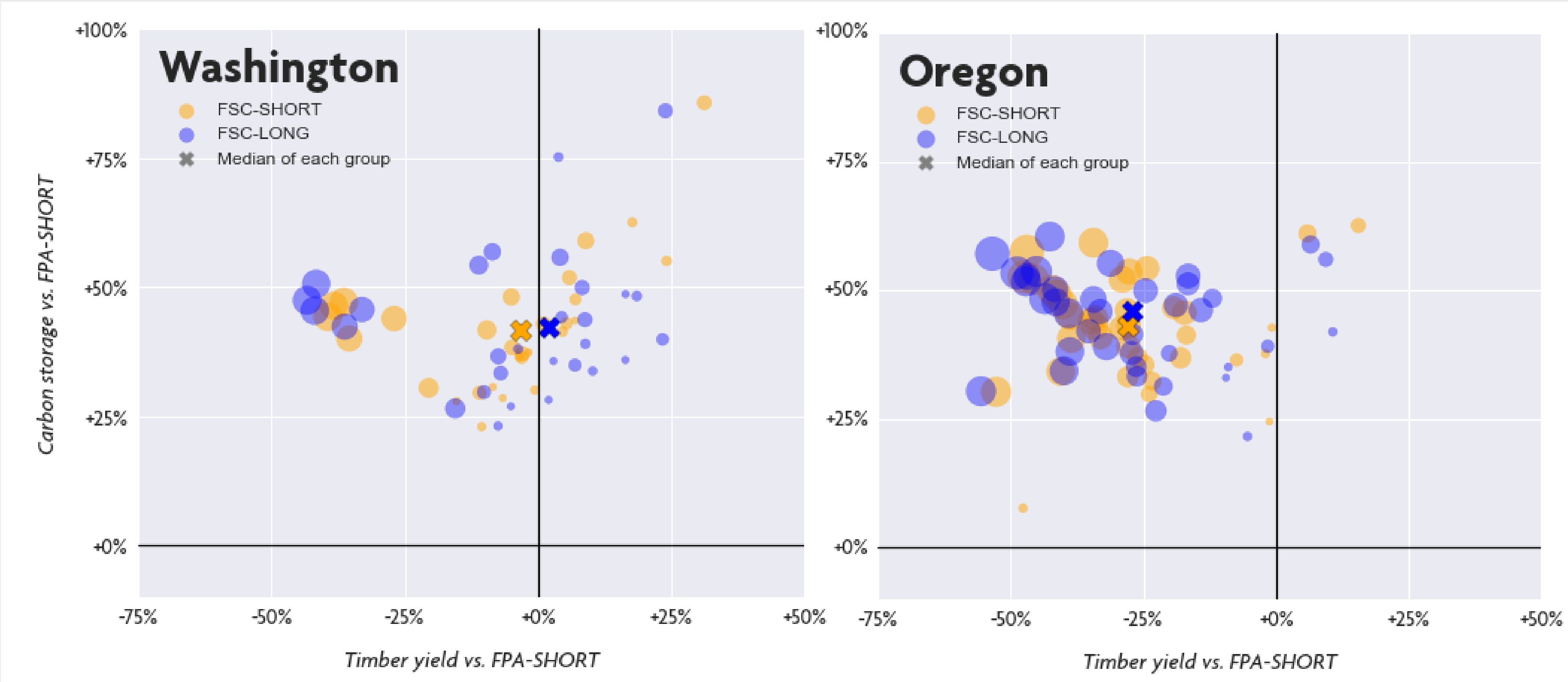
No Touch
(150-200 ft)

Across our 67 properties, FPA no-touch riparian buffers covered 4% of the land area, on average.

Under FSC, the average area in no-touch buffers increased to 17%.

04 *Focusing on the “FSC Effect”*

The combined effect of FSC retention and buffers on timber and carbon



Each dot shows the cumulative timber yield and average carbon for each property's FSC scenarios compared to FPA-SHORT. The size of each dot corresponds to the proportion the property covered by no-touch riparian buffers (larger dots mean more extensive riparian cover).

- FSC scenarios always stored more carbon than business-as-usual.
- FSC could produce more timber, particularly in Washington and with FSC-LONG.
- More extensive riparian cover and larger discrepancy between FSC and FPA riparian buffers in Oregon contribute to lower average timber yields under FSC.

Leveling the playing field: WASHINGTON

If we control for the direct effects of our two main forest practice changes—(1) increasing green-tree retention and (2) expanding no-touch riparian buffers—here's how each change in practice affected cumulative timber yield and average carbon storage over 100 years (using business-as-usual as a benchmark).

Median changes in timber and carbon relative to business-as-usual for 67 properties

retention → / *↓ buffers*	Min. FPA retention (FPA-SHORT)		30% retention (FSC-SHORT)		10% retention (FSC-LONG)	
	timber	*carbon*	*timber*	*carbon*	*timber*	*carbon*
FPA buffers	---	---	+1.2%	+31.8%	+2.0%	+37.3%
FSC buffers	-3.5%	+6.4%	-3.4%	+42.2%	+2.0%	+44.3%

FPA buffers + min. FPA retention	*FPA buffers + 30% retention*	*FPA buffers + 10% retention*
FSC buffers + min. FPA retention	*FSC buffers + 30% retention*	*FSC buffers + 10% retention*

Leveling the playing field: OREGON

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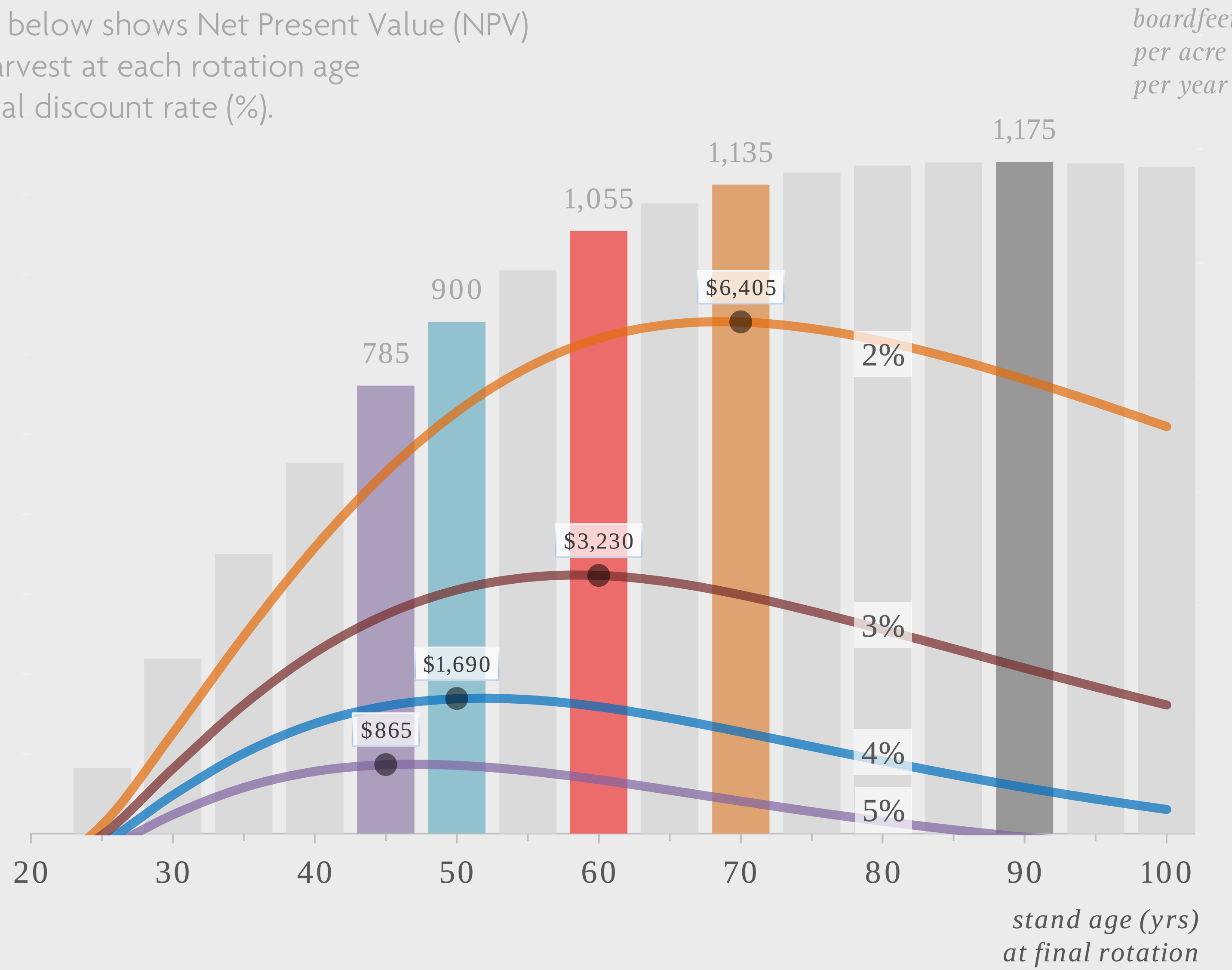
retention → / *↓ buffers*	Min. FPA retention (FPA-SHORT)		30% retention (FSC-SHORT)		10% retention (FSC-LONG)	
	timber	*carbon*	*timber*	*carbon*	*timber*	*carbon*
FPA buffers	---	---	-7.0%	+24.9%	-9.7%	+30.8%
FSC buffers	-22.4%	+23.0%	-28.0%	+45.0%	-27.1%	+48.2%

FPA buffers + min. FPA retention	*FPA buffers + 30% retention*	*FPA buffers + 10% retention*
FSC buffers + min. FPA retention	*FSC buffers + 30% retention*	*FSC buffers + 10% retention*

05 *Getting more from business-as-usual*

Current markets and policies give no incentive to produce more timber or carbon. They don't change Net Present Value.

Each line in the graph below shows Net Present Value (NPV) per acre for timber harvest at each rotation age using a different annual discount rate (%).

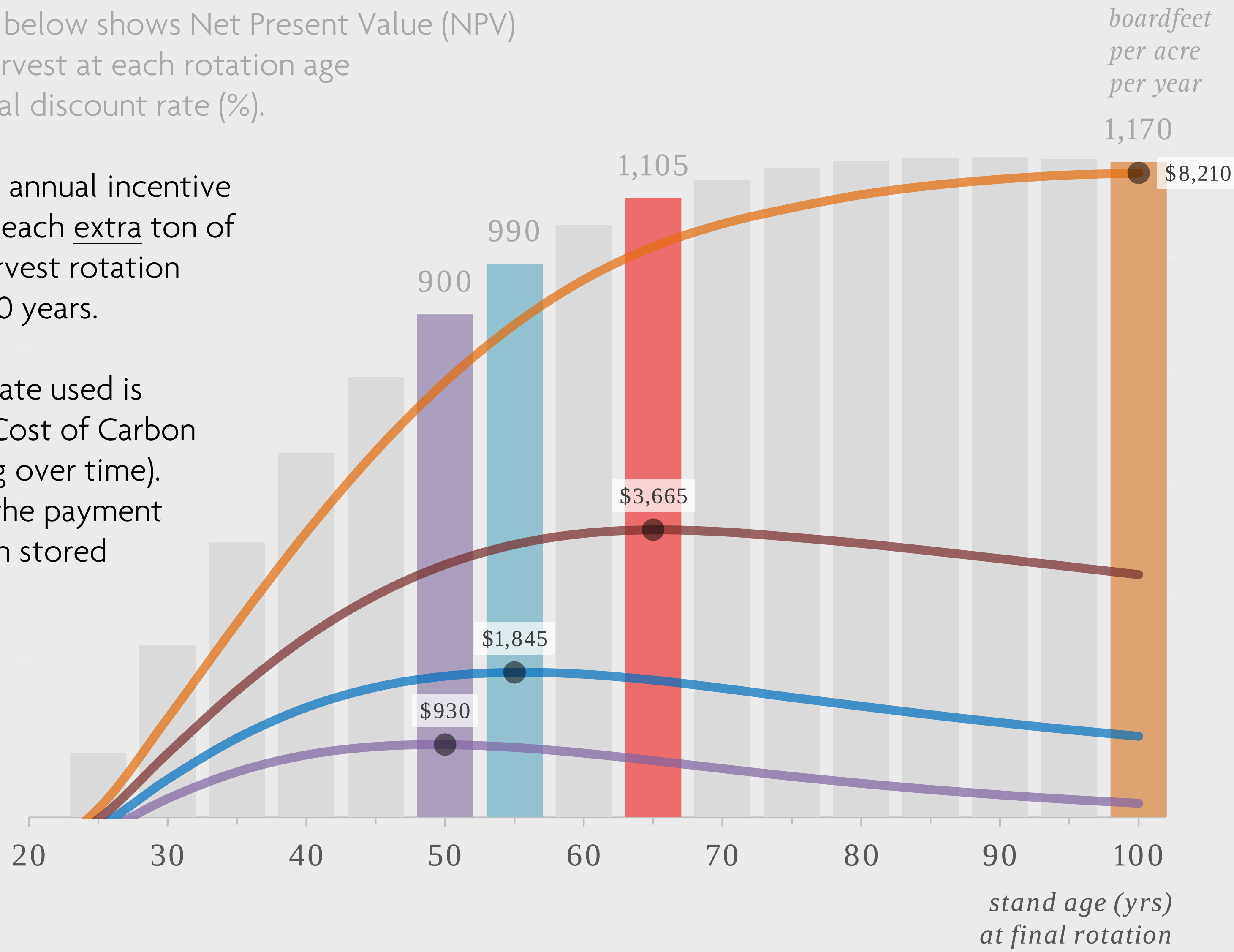


Pricing carbon and rewarding climate-smart forestry would shift rotations to produce more carbon and more timber.

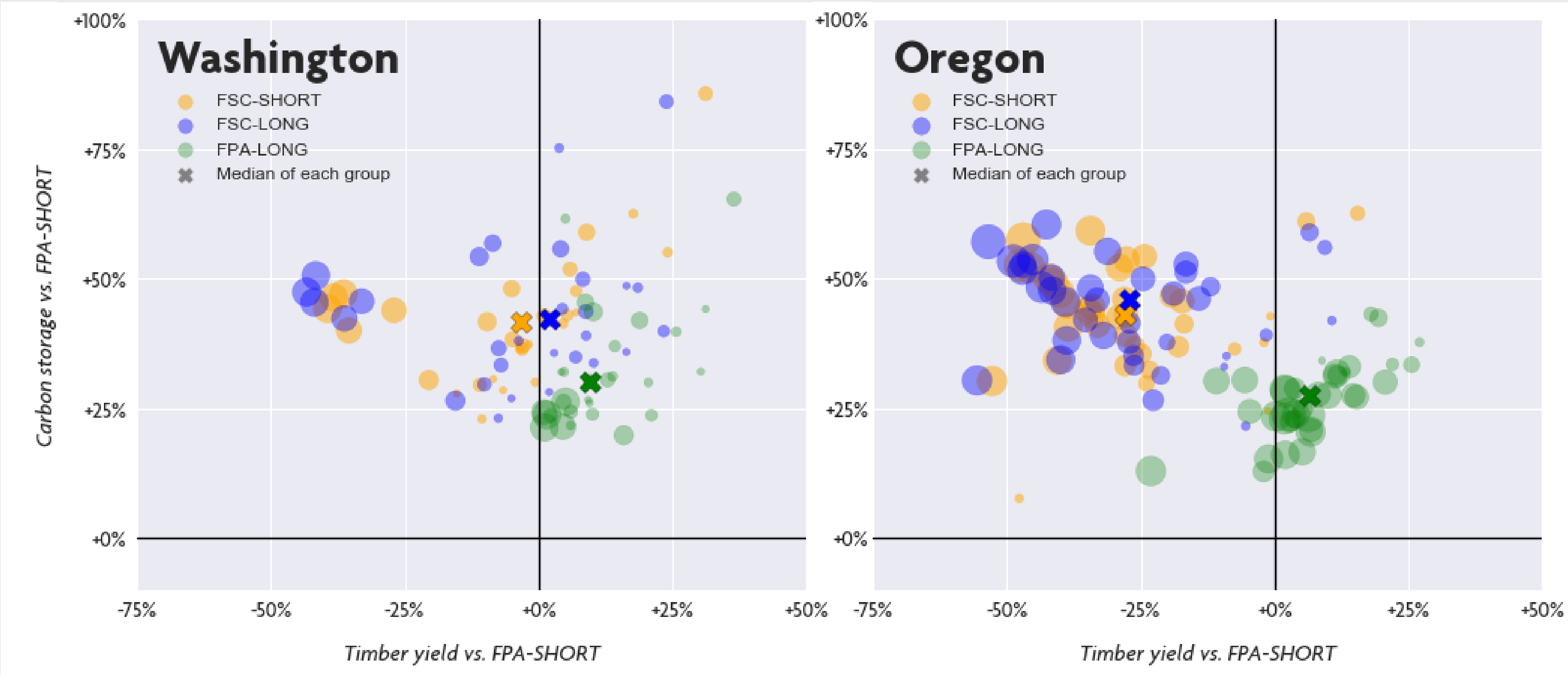
Each line in the graph below shows Net Present Value (NPV) per acre for timber harvest at each rotation age using a different annual discount rate (%).

However, this time an annual incentive payment is added for each extra ton of carbon stored as a harvest rotation is extended beyond 40 years.

The annual payment rate used is 1/100th of the Social Cost of Carbon ($36 in 2015, increasing over time). This is like spreading the payment for each ton of carbon stored out over 100 years.



Get more timber by valuing carbon: FPA-LONG



Longer rotations would produce more timber and more carbon than business-as-usual, even without changing buffers or green tree retention.

- Washington: **+9.4% timber** and **+30.6% carbon**
- Oregon: **+6.5% timber** and **+30.3% carbon**
- Simply extending rotations won't sequester as much carbon widening buffers or increasing retention, but FPA-LONG delivers maximum timber output under FPA rules.

06 *Choosing a climate-smart path ahead for PNW forests*

INVESTING IN PNW FORESTS AS A CLIMATE MITIGATION STRATEGY

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What are we waiting for?

Sierra Sun Times

Sierra National Forest Receives $5 Million as CAL FIRE Announces Forest Health Grants to Reduce Greenhouse Gases

Last Updated: Tuesday, 15 August 2017 15:47

Sierra National Forest

Three of the six grants announced today fall under CAL FIRE's Forest Legacy Program. These grants enable the purchase of conservation easements on properties in Mendocino, San Bernardino and Siskiyou counties, protecting the land from being used in ways that would increase greenhouse gas emissions – such as urban or agricultural development – and harnessing the ability of trees to "sink" or sequester carbon from the atmosphere. Landowners will retain ownership of their land and will not be restricted from using it for activities such as timber harvest, hunting, fishing and hiking. These grants will protect more than 28,285 acres of forests from development.

The grants use proceeds from California's cap-and-trade program to combat climate change. Through the Greenhouse Gas Reduction Fund, CAL FIRE and other state agencies are investing in projects that directly reduce greenhouse gases while providing a wide range of additional benefits in California communities.

This work was made possible by the generous support of the Bullitt Foundation, the Edwin W. and Catherine M. Davis Foundation, and the Weyerhaeuser Family Foundation.

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Thank you.

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