Supporting Olympic Peninsula Forest Economies and Cultures with Local Jobs in Forest Protection

Presentation to the North Olympic Development Council

February 26, 2026

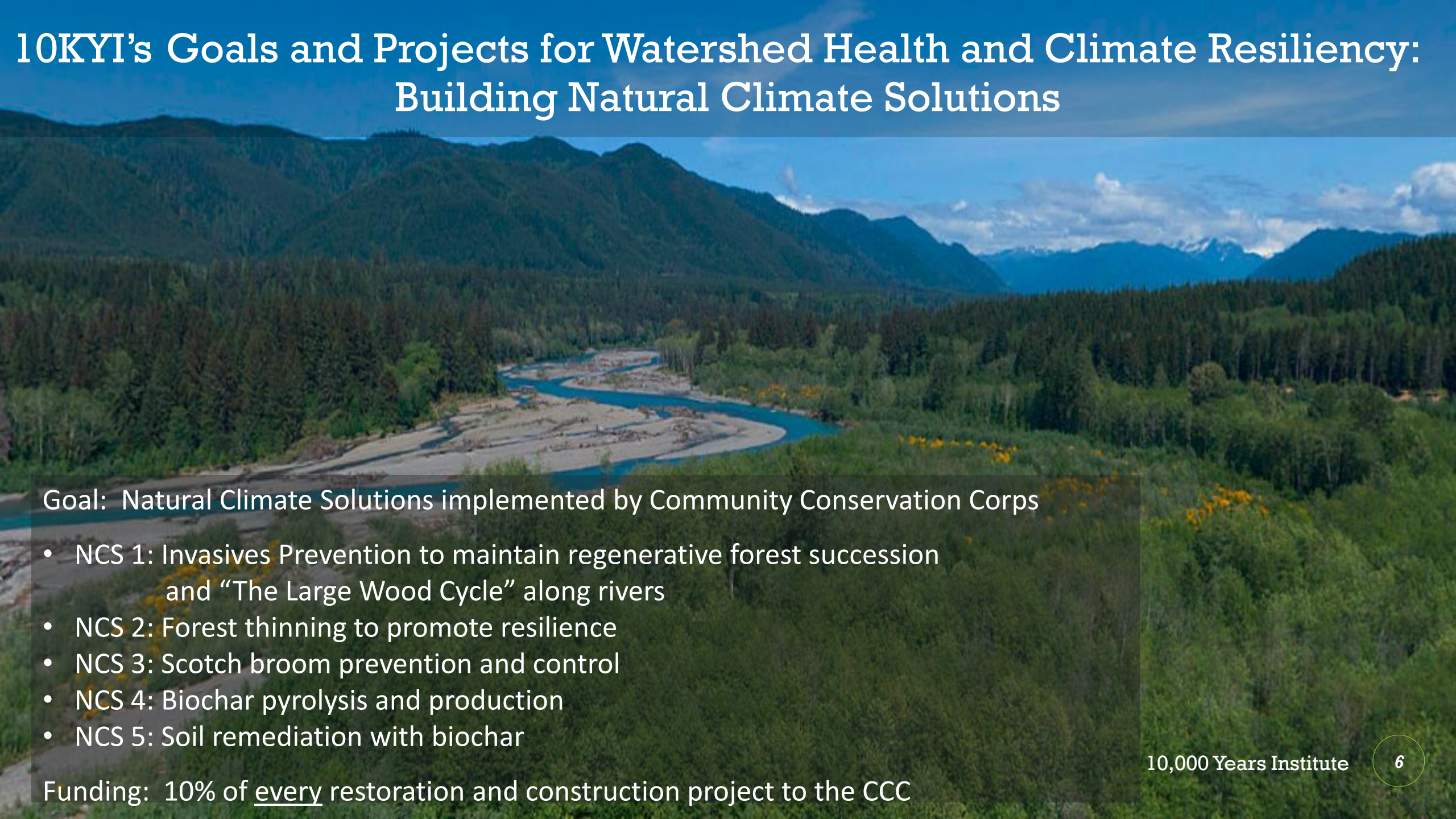
Jill Silver, 10,000 Years Institute

About 10KYI

With our many partners, we evaluate the effects of human activities on natural environments – the forests, rivers, wetlands and estuaries that sustain communities and ecosystems.

Through development of innovative, science-based approaches to restore ecological integrity, we promote regenerative practices in landscapes across the region.

10KYI's Goals and Projects for Watershed Health and Climate Resiliency: Building Natural Climate Solutions



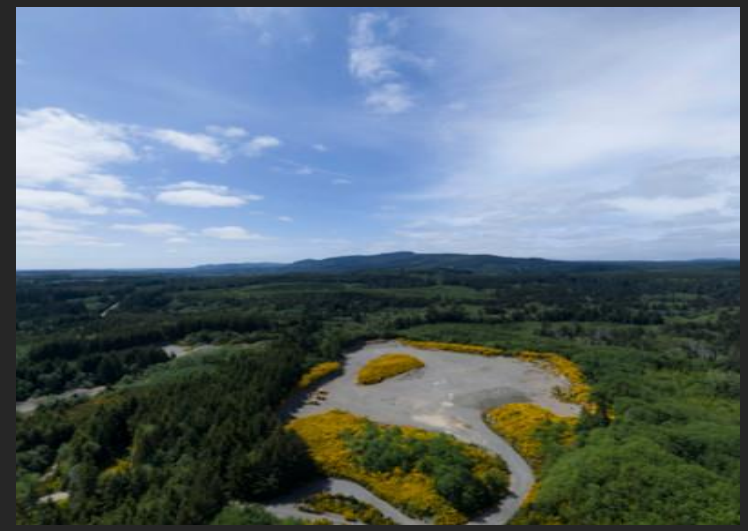
Goal: Natural Climate Solutions implemented by Community Conservation Corps

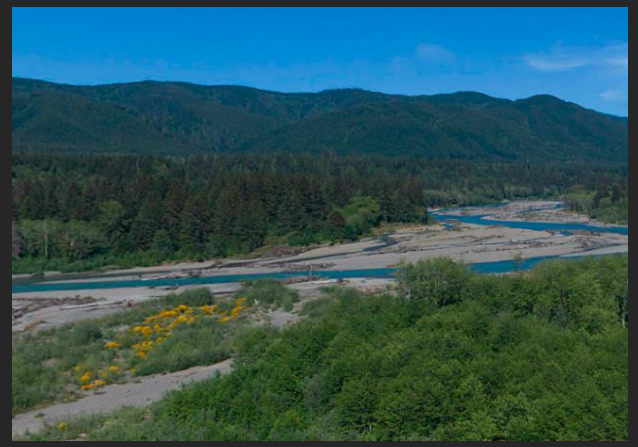
- NCS 1: Invasives Prevention to maintain regenerative forest succession and "The Large Wood Cycle" along rivers
- NCS 2: Forest thinning to promote resilience
- NCS 3: Scotch broom prevention and control
- NCS 4: Biochar pyrolysis and production
- NCS 5: Soil remediation with biochar

Funding: 10% of <u>every</u> restoration and construction project to the CCC

Disturbance: Glacial retreat, atmospheric river events, channel migration, bank erosion, sediment flux…

These disturbances facilitate invasive exotic species… from gravel mines to roads, to harvest units and river bars…





…affecting bar, floodplain and forest succession and diversity, ecosystem services and functions.

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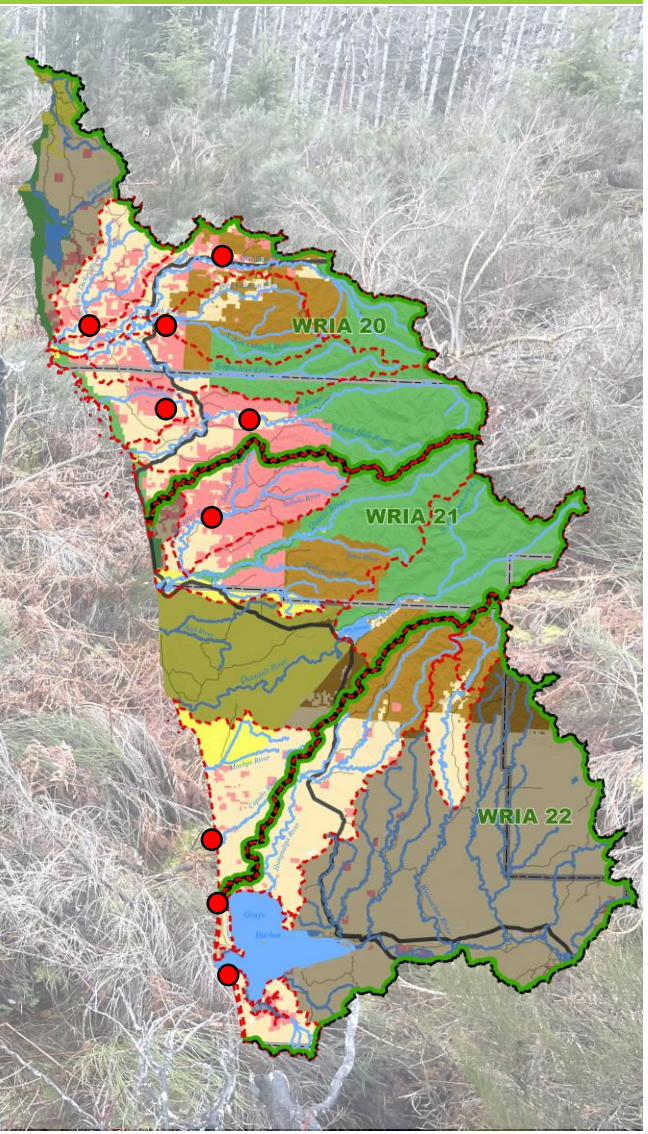
Working across the OP on Scotch Broom in 2025

Tribes, ONP, ONF, WA DNR & State Parks, Counties, Cities, TNC, EFMI, WSC

River/Road Miles	30/45
Acres Surveyed	2763
Acres Treated	438



Watershed Resiliency via Scotch Broom Prevention and Control

Carbon, Methane, & PM Emissions

Needed to Support Investments in Forest Health and Workforce Development

Research – Carbon Stocks, Seedbank, Red Alder, Nutrients, Water, Mycorrhizae...

Remote Sensing - Aerial photography in bloom and more...

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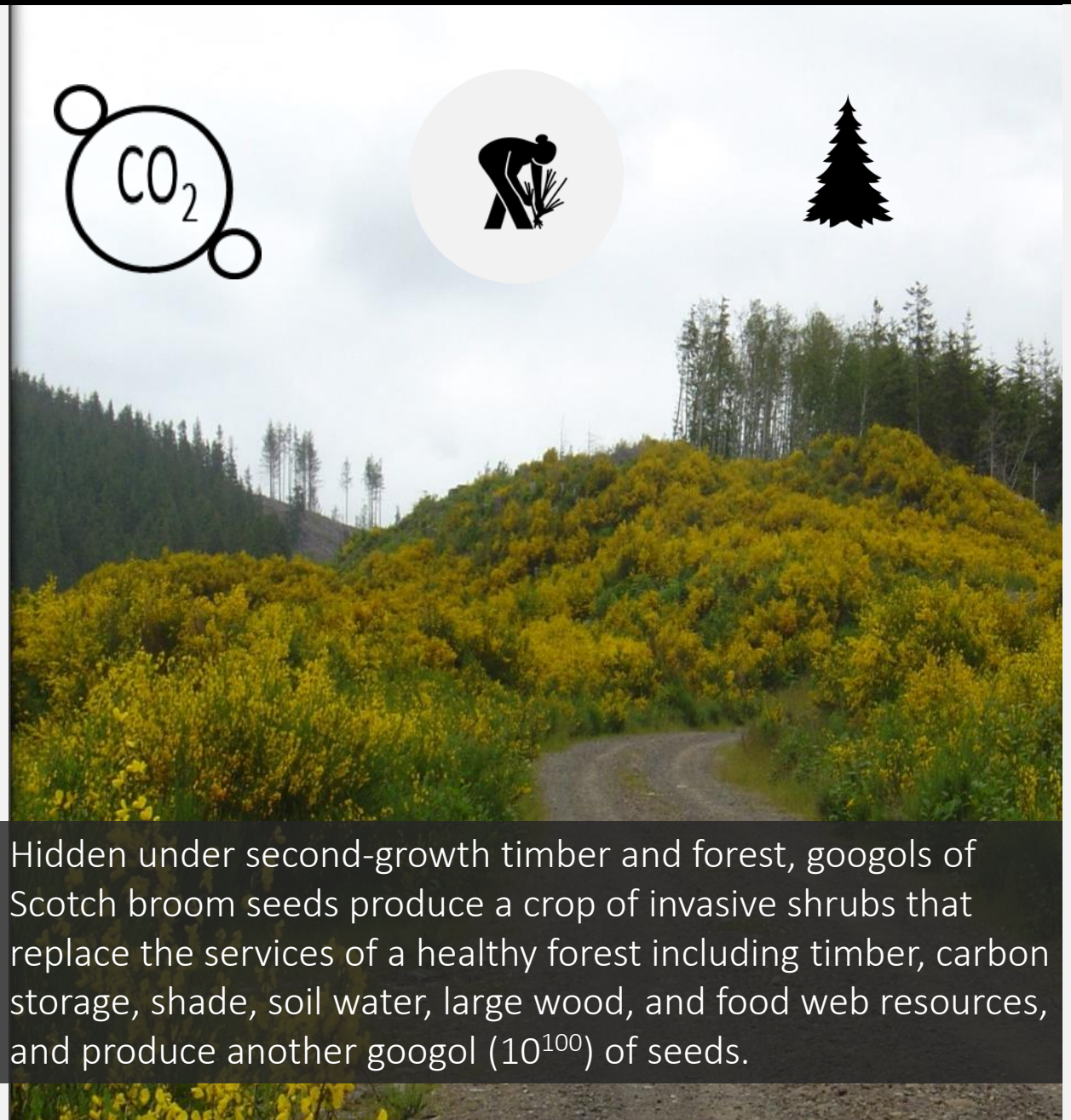
Impacts to Forestry, Fires, and Climate

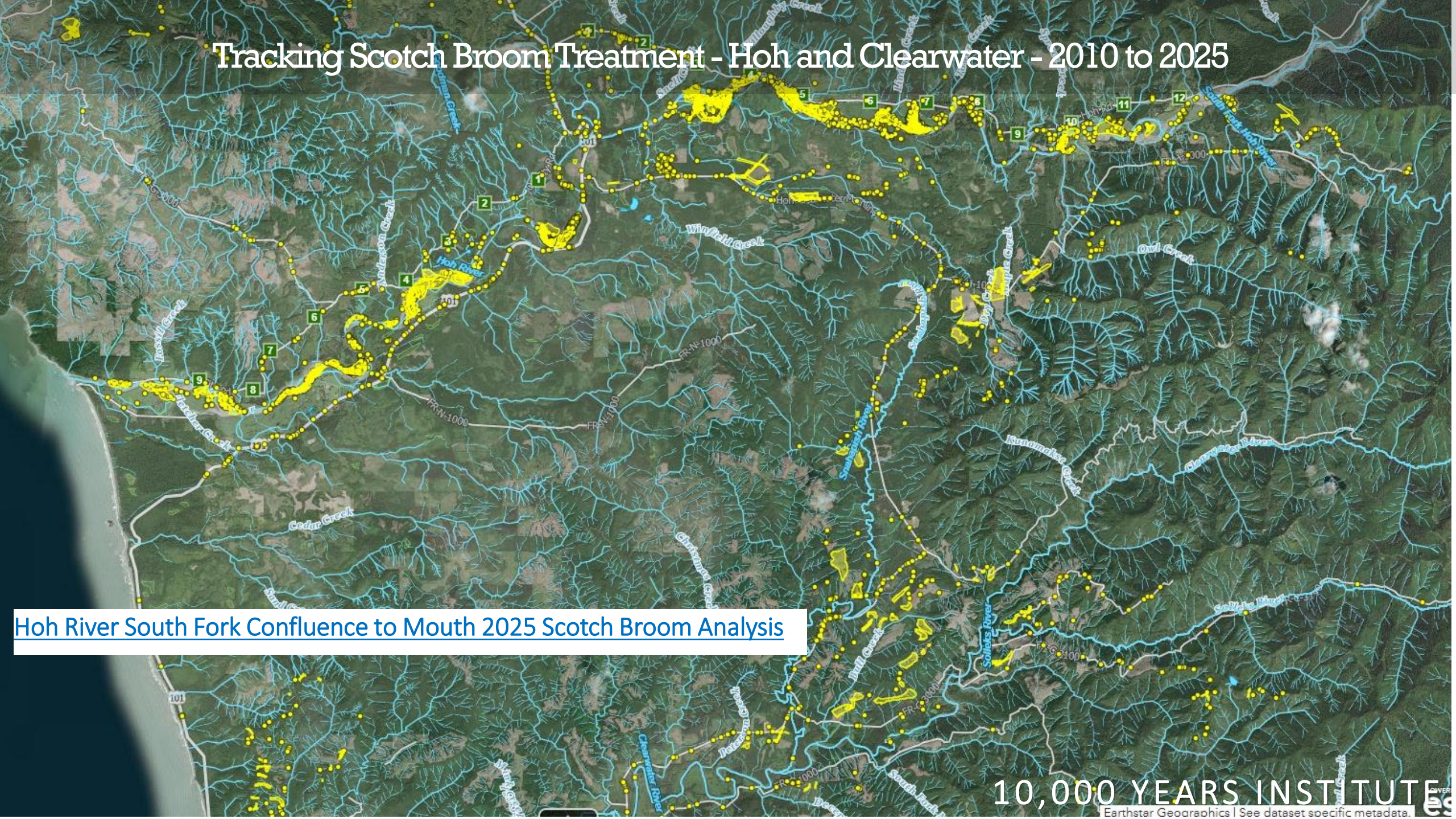


Hidden under second-growth timber and forest, googols of Scotch broom seeds produce a crop of invasive shrubs that replace the services of a healthy forest including timber, carbon storage, shade, soil water, large wood, and food web resources, and produce another googol (10^{100}) of seeds.

2021 – H-1500 Road – A rare fire in the wet Hoh watershed. Oil-rich Scotch broom likely increased wildfire intensity & severity.

Most fires scarify Scotch broom seeds, promoting germination. (CNLM, 2020)

Tracking Scotch Broom Treatment - Hoh and Clearwater - 2010 to 2025



[Hoh River South Fork Confluence to Mouth 2025 Scotch Broom Analysis]

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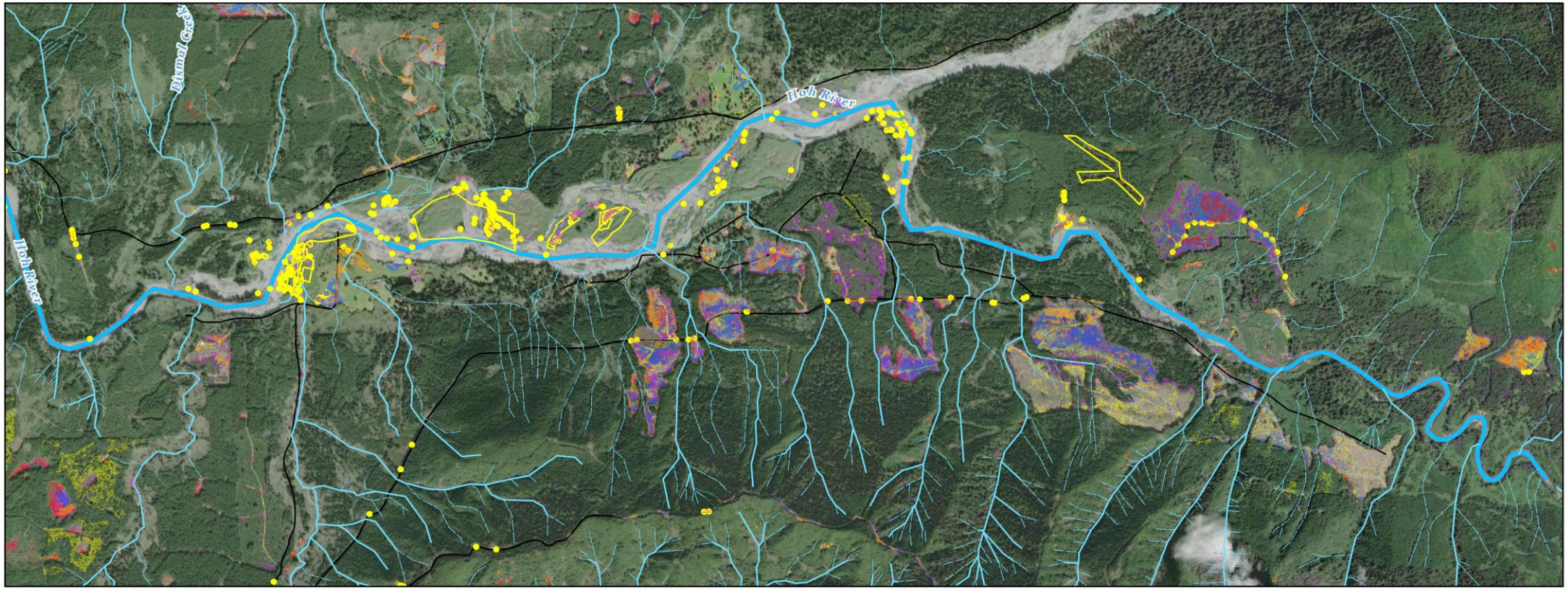
Hoh River - South Fork Confluence to Spruce Canyon - Treatment and Inventory 2010-2025, Classification 2021-2025



The analysis focuses on a 37,686.7-acre area beginning roughly 3 miles east of the South Fork Hoh River confluence, extending west approximately 8 miles along the Hoh River to Spruce Canyon. Imagery for this work was collected from Planet Labs SuperDove satellites using 8-band imagery, with scenes captured between May and June of the years analyzed. Within the study area, Scotch broom extent has increased over time, measuring 280.57 acres in 2021, 236.86 acres in 2022, 446.9 acres in 2023, 536.3 acres in 2024, and 601.2 acres in 2025. Over the five-year period, the average mapped extent was approximately 420.4 acres, with a low of 236.86 acres (2022) and a high of 601.2 acres (2025). In addition to these annual classifications, the map also includes yellow polygons and yellow point features representing 10,000 Years Institute's Scotch broom inventory and treatment work dating back to 2010.

Legend

- Scotch Broom 2021
- Scotch Broom 2022
- Scotch Broom 2023
- Scotch Broom 2024
- Scotch Broom 2025
- Scotch Broom Inventory and Treatment 2018-2025
- Scotch Broom Inventory and Treatment 2010-2025
- Hoh River
- Local Roads

0 0.5 1 2 3 4 Miles

0 1 2 4 6 Kilometers

N W E S

Content Item: U.S. Environmental Protection Agency, Office of Mission Support; Data Steward: U.S. Geological Survey, The National Map, Earthstar

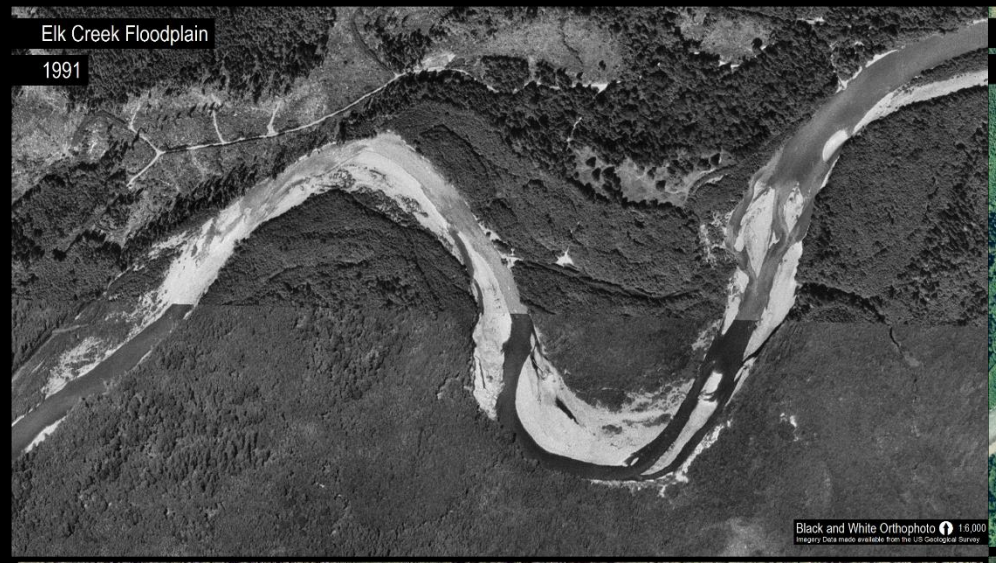
Hoh River confluence with the South Fork Hoh River...

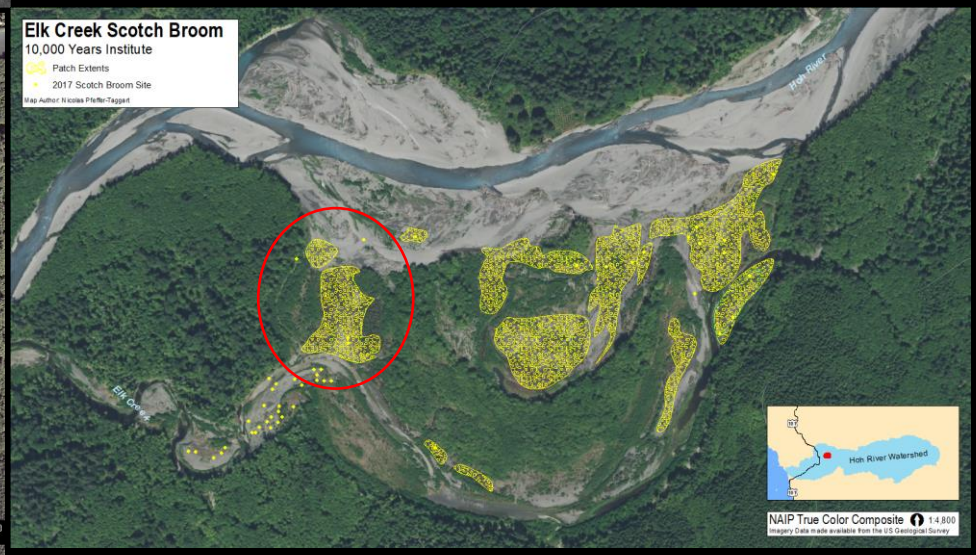
Downstream of the South Fork confluence, Scotch broom seeds flow downslope from hillslope harvest units and roads into the mainstem river gravel bars and the alder floodplains.

SWOT Analysis 2016-2020 - SWOTS in Forestry

	Strengths	Weaknesses	Threats	Opportunities for a CCC
Forests	Economic Driver	Declines in forest health	Climate change & CO^2/methane	Restoration thinning
	Jobs	Low pay scale	Wildfire	Biochar production and distribution
	Training	Decline in skilled workforce	Reduced or delayed forest growth	Invasive species prevention and management
	Timber	Loss of mills	Invasives	Road maintenance and fish passage/slope stability
	Lumber	Cost of transportation	Loss of water resources	
	Building Materials	Cost of energy	Conversion to residential	**Opportunities for BUCs**
			Roads - Sediment, fish barriers	Development of value-added products
				Waste biomass to Biochar
				Waste biomass to ENERGY
				Green hydrogen, biodiesel, syngas, electricity
				Green policies to promote green infrastructure
				Ecosystem Services Valuation - Fees for services
				Carbon sequestration
				Carbon credits and fees

Hoh River and Elk Creek Aerial Imagery Sequence:
Glacial Sediment and Scotch Broom Reduce the LWC





Scotch broom produces ~10,000 seeds per plant/year, lasting ~40-80 years.

10KYI & Public Investment in Forest Health & Scotch Broom Treatments

Year	Species	Crew Hours at Site	Acres Surveyed	Infested Acres Treated	Condensed Acres
2021	CYSC	7266.52	1578.03	925.21	47.91
2022	CYSC	9619.73	986.18	489.70	132.89
2023	CYSC	8348.013	2177.15	515.38	158.31
2024	CYSC	6674.98	2407.00	536.18	55.40
2025	CYSC	5583.45	2762.53	437.68	34.28
Total		**37492.69**	**9910.88**	**2904.16**	**428.79**

10KYI & Public Investment in Forest Health & Scotch Broom Treatments

Year	Species	Crew Hours at Site	Average @ $35/hour
2021	CYSC	4,663.00	$ 163,205.00
2022	CYSC	5,392.00	$ 188,720.00
2023	CYSC	4,260.00	$ 149,100.00
2024	CYSC	4,230.00	$ 148,050.00
2025	CYSC	2,146.00	$ 75,110.00
Total		**20,691.00**	**$ 724,185.00**


Pathways of invasion include roads, rivers, landslides, restoration - leaving successional legacies…altering soil nutrients, water, and influencing sediment deposition and storage influenced by Scotch broom morphology.
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Upper Hoh Road Dolosse Project...

Scotch broom transported in river flows and gravel, and introduced in road construction, is repeatedly treated on the bank and bars.

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Cut-stump treating the one blooming Scotch broom in the dolos, in time to stop seeds.

Scotch Broom Ecological Impact Study

Questions of interest:

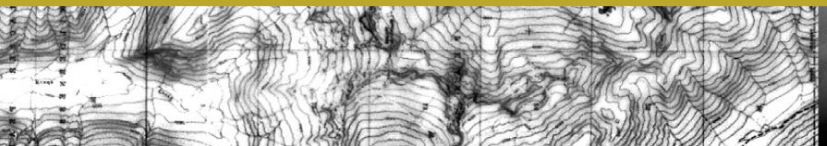
- Is Scotch broom arresting the succession of riparian communities?
- Is Scotch broom arresting the growth of trees in forestry?
- What factors are limiting riparian and upland plant establishment and growth in areas where Scotch broom occurs?
- Do soil legacy effects of Scotch broom limit native riparian and upland species establishment and success?

Partners:

UNIVERSITY OF CALIFORNIA SANTA CRUZ

The Nature Conservancy

WASHINGTON DEPARTMENT OF NATURAL RESOURCES



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watershed ecological services

10KYI's Lessons Learned about Scotch Broom

Scotch broom has deep roots, a trait not shared by early successional willow and alder, or conifer saplings that it replaces, which enables it to:

- **Maintain hydration in summer droughts – where alder is turned crispy dry and dies.**
- **Resist erosion in winter floods – where alder and willow are scoured off bars and banks.**
- **Remains on bars, banks, and terraces where the following is observed, and more study is needed to confirm the mechanisms that result in loss of native or desired species:**
  - **Is Scotch broom arresting the succession of riparian communities? YES**
  - **Is Scotch broom arresting the growth of trees in forestry? SEEMS SO – NEED DATA**
  - **What factors are limiting riparian and upland plant establishment and growth in areas where Scotch broom occurs? RESEARCH POINTS TO SOIL WATER AND MYCORHYIZAL FUNGI**
  - **Do soil legacy effects of Scotch broom limit native riparian and upland species establishment and success? 10KYI's DATA = YES – NEED TO PRODUCE**
  - **Scotch broom seeds last decades, and the plants grow fast.**

Questions: Will wildfire be the kickstarter for investment into Scotch broom eradication and jobs?
What will be the cost of fire and delayed forest regeneration to OP?
What more do planners need to include SB in SWOT analyses?

Coastal/Carbon/Climate Conservation Corps

Permanent place-based conservation corps

Matching local skilled experience with local youth-in-training in work that supports coastal economies.

Carbon Conservation Corps

Conduct mobile biochar production from waste biomass – especially Scotch broom!

We already employ large hand crews in the dangerous work of firefighting.
We could use this labor to reduce fire danger by thinning overcrowded plantations, and improve forest soils by adding biochar, while sequestering carbon from the atmosphere.

Kelpie Wilson
Wilson Biochar Associates

www.slideshare.net/kelpiew/a-carbon-conservation-corps-for-mobile-biochar-production

Pyrolysis Methods – Flame Cap Kiln

Ring of Fire Kiln - https://wilsonbiochar.com/

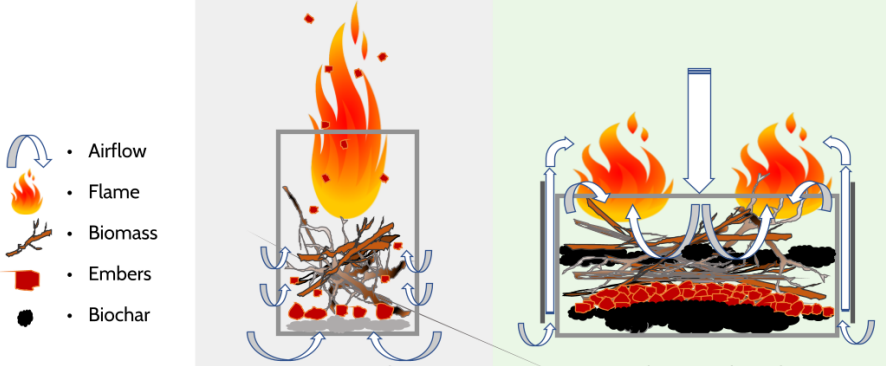
US-IBI – Onsite Biochar Production and Use for Conservation Objectives

https://www.youtube.com/watch?v=sYTCvVp5bZ8&ab_channel=USBiocharInitiative

Are Flame-cap Kilns the same as Burn Barrels? NO.

A quick explainer in support of SSB 6121

Six key differences to know about:	Burn Barrels	Flame-cap Kilns
#1 - What is the intent of use?	Get rid of **trash** and convert it to **ash**.	Create as much high quality **biochar** as possible. Biochar, in addition to sequestering carbon, is a high-value soil amendment.
#2 - What inputs are put into the vessel?	Typically **trash** - which could include anything, including plastics. This a big part of why they're illegal.	**Clean biomass** from forestry or agricultural activity, such as wood, brush, and crop residue - the same materials that are regulated as part of **legal** open pile burning. There's a big incentive to use clean material that will positively impact the quality of the biochar.
#3 - What are typical designs of these vessels?	Tall & narrow, typically using a 55 gallon drum. **Air holes** around bottom and base.	Wider than tall, **purpose-built** for biochar production. **Completely sealed around the bottom** by soil or metal.
#4, 5 - What impacts do air flow and flame caps have on carbon sequestration, air quality, and emissions?	With **co-current** air flow, **sparks and embers** from incinerating trash rapidly move from the bottom, up and out of the burn barrel, thanks to the constant supply of **fresh air through the bottom**. Oxygen & carbon meet, join as CO_2 and escape with other **greenhouse gasses** like **methane**.	With **counter-current** air flow, the fire burns at the **top of the kiln** creating a **vortex**; **little oxygen** makes its way inside. Low oxygen + high temperatures enable **pyrolysis**, where **durable biogenic carbon** manifests in **biochar** and collects at the bottom of the kiln. The **flame cap burns off combustibles** like methane, plus most smoke & embers resulting in a cleaner burn and lower emissions.
#6 - How does the process end?	When the people doing the burn believe that the burn barrel is safe to leave. Spoiler alert: it's often still burning.	When the flames have subsided and hot coals remain, the biochar is **quenched with water to stop the burn** and then raked out to cool it quickly, **ensure there are no hot spots**, prevent the transition to ash, and maximize the volume of valuable biochar from the batch.



Illustrations courtesy of wilsonbiochar.com

Let's get SSB 6121 to the Governor's desk!

A Coastal Conservation Corps is the next big step to take…

Permanent place-based year-round Conservation Corps


Photo by: CSIRO

Marine

- Marine debris collection
- Disaster response
- Invasive species:
  - European green crab
  - Spartina
  - Scotch broom
  - Gorse

Forestry

- Forest thinning
- Young stand thinning
- Biomass for biochar
- Wildfire fuels reduction
- Invasive species:
  - Scotch broom
  - Reed canarygrass
  - Blackberry
  - Herb Robert


Photo by: Wild Salmon Center/Trout Unlimited

Restoration

- Road maintenance
- Restoration project support
- Native plant revegetation
- Invasive species:
  - Scotch broom
  - Reed canarygrass
  - Herb Robert

Recreation

- Trails
- Facilities maintenance
- Bunkhouses for crews
- Invasive species:
  - Reed canarygrass
  - Blackberry
  - Herb Robert

PTIR Partners, Collaborators, and Project Sponsors

Protecting OP economies with regenerative native forests...