Oak at the Edge

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Results

Table 1: Species codes

Species code	Scientific name	Common name
ABBA	*Abies balsamea*	Balsam fir
ACPE	*Acer pensylvanicum*	Striped maple
ACRU	*Acer rubrum*	Red maple
ACSA	*Acer saccharum*	Sugar maple
BEAL	*Betula alleghaniensis*	Yellow birch
BEPA	*Betula papyrifera*	Paper birch
BEPO	*Betula populifolia*	Gray birch
FAGR	*Fagus grandifolia*	American beech
FRAM	*Fraxinus americana*	White ash
OSVI	*Ostrya virginiana*	American hophornbeam
PIRU	*Picea rubens*	Red spruce
PIST	*Pinus strobus*	White pine
POGR	*Populus grandidentata*	Bigtooth aspen
POTR	*Populus tremuloides*	Quaking aspen
PRPE	*Prunus pensylvanica*	Pin cherry
PRSE	*Prunus serotina*	Black cherry
RUS	*Rubus spp.*	Brambles genus, including raspberries and blackberries
QURU	*Quercus rubra*	Northern red oak

Species code	Scientific name	Common name
TIAM	*Tilia americana*	American basswood
TSCA	*Tsuga canadensis*	Eastern hemlock

Stand characterization

Understory competition

In burned stands, *Q. rubra* mainly competes with early successional seedlings e.g. *Rubus spp.* RUS, *A. rubrum* ACRU, *B. alleghaniensis* BEAL and stump sprouts e.g. *F. grandifolia* FAGR.

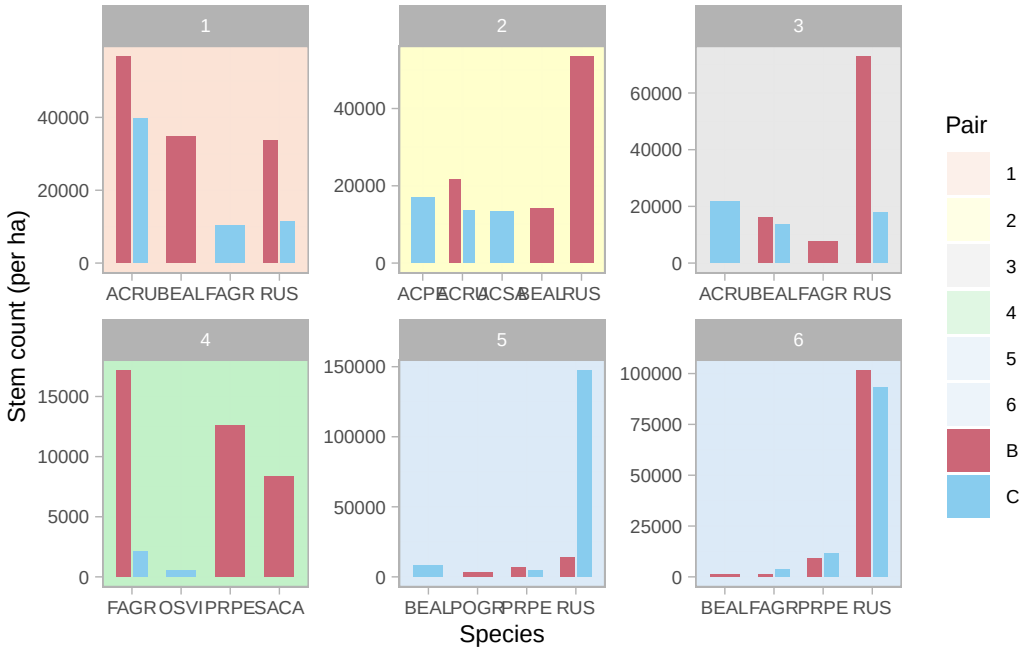

Figure 1: Stem density (per ha) of understory species in study stands

Overstory composition

Burn stands have lower overstory basal areas than control stands. Pairs 5 and 6 stand out especially due to their clearcut treatment i.e. absence of mature trees of 20 cm and above in DBH. Their compositions are also the least diverse, consisting of *Prunus* (PRPE,PRSE), *Populus* (POGR,POTR), and *Betula spp.* (BEAL,BEPO,BEPA). The remaining stands have a significant presence of mature *Q.*

rubra as well as *Acer* and *Betula* spp. of mid-ranged DBH classes. Additionally, Pair 1's overstory composition includes a large basal area of high-DBH *Pinus strobus* PIST.

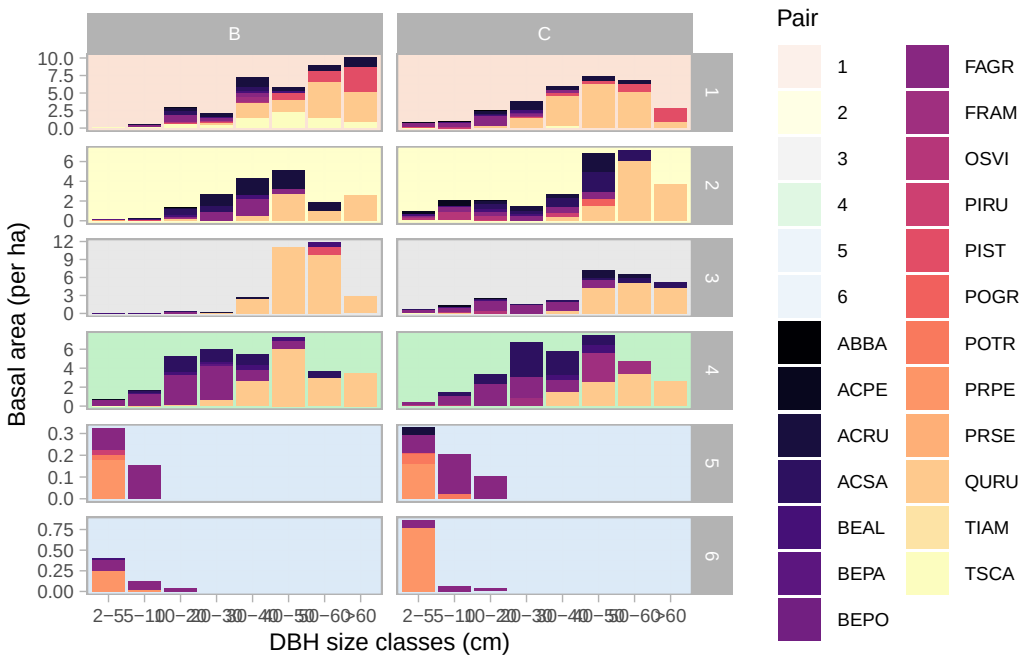

Figure 2: Basal area (per ha) of overstory species in study stands by DBH size classes

Oak seedling density and measurements

2023 oak seedling density

Seedling density increased threefold in burned stands (2359+/-211 per ha) relative to control stands (778+/-121 per ha, p<0.001).

Table 2: Summarized statistics of 2023 oak seedling density per ha

Disturbance	min	max	median	mean	sd	se
B	0	17189	1146	2359.163	3045.723	211.183
C	0	12096	0	777.793	1637.060	120.686

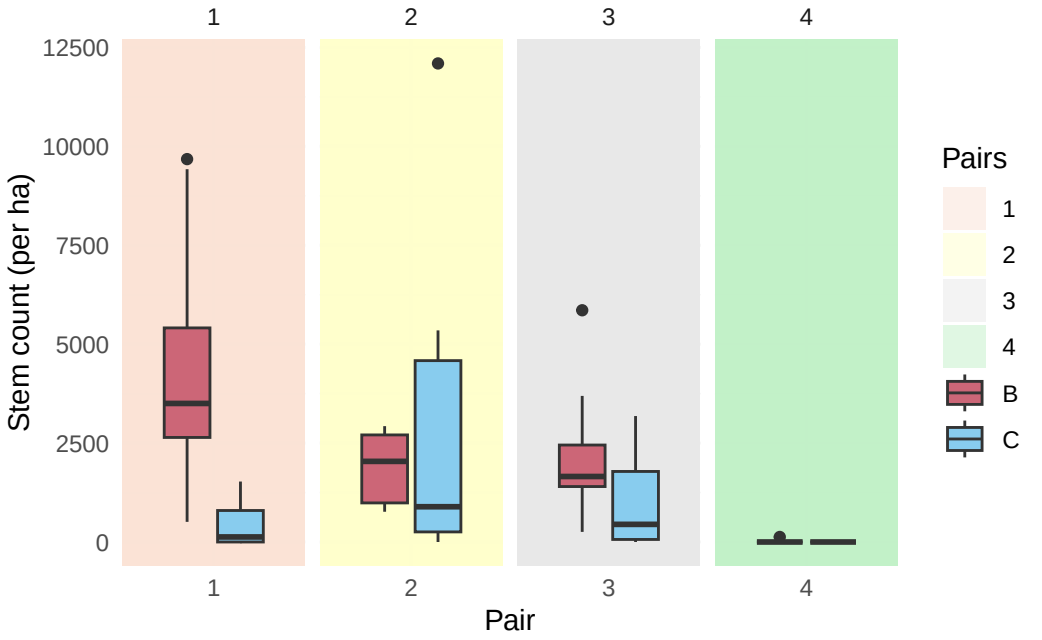

Figure 3: 2023 oak seedling density per ha of study stands

2023 diameter at root collar (DRC, mm)

DRC was greater for seedlings in burned stands (4.6+/-0.3 mm) versus control stands (3.3+/-0.3 mm, $p<0.01$).

Table 3: Summarized statistics of 2023 oak seedling measurements

Disturbance	variable	min	max	median	mean	sd	se
B	Height_cm	5.00	182.00	13.750	24.314	25.944	2.349
B	DRC_mm	1.05	17.54	3.650	4.614	3.161	0.286
B	nlive_branches	1.00	18.00	2.000	3.022	3.119	0.331
B	ndead_branches	0.00	35.00	2.000	3.079	4.969	0.527
C	Height_cm	4.30	184.00	14.000	19.780	25.619	3.178
C	DRC_mm	1.12	17.37	2.875	3.348	2.297	0.287
C	nlive_branches	1.00	4.00	1.000	1.327	0.585	0.081
C	ndead_branches	0.00	7.00	1.000	1.385	1.402	0.194

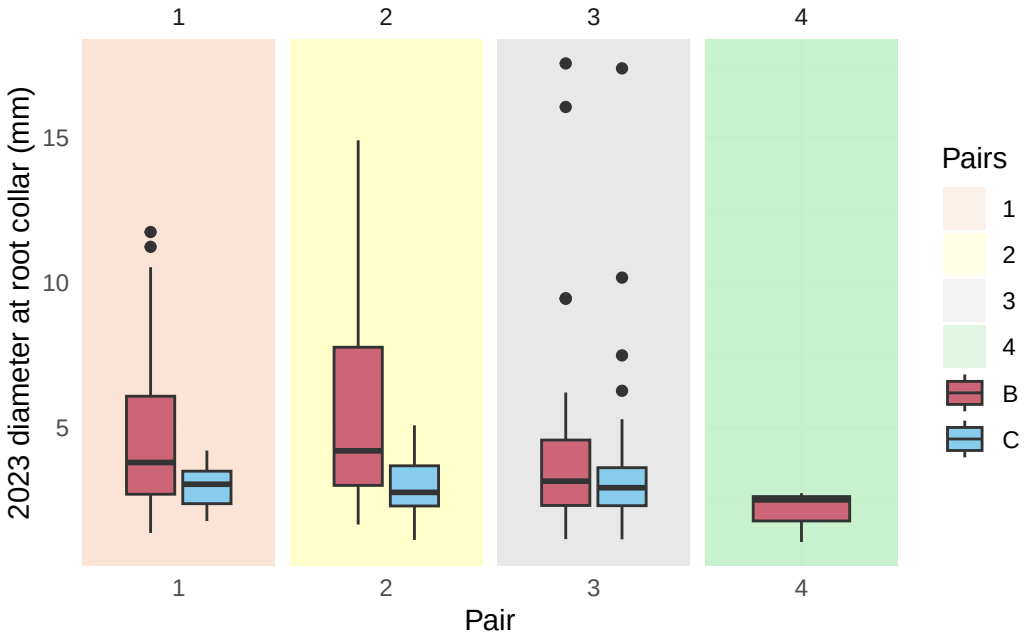

Figure 4: 2023 seedling DRCs by study stands

2024 extension growth (cm)

Extension growth was greater for seedlings in burned stands (6.43+/-0.5 cm) versus control stand (2.6+/-0.4 cm, p<0.001).

Table 4: Summarized statistics of 2024 oak seedling measurements

Disturbance	variable	min	max	median	mean	sd	se
B	Height_cm	1.55	263.00	18.00	31.105	35.808	2.465
B	Extension_growth_cm	0.00	38.00	3.50	6.432	7.306	0.503
B	DRC_mm	0.86	27.58	3.92	5.170	3.939	0.271
B	nlive_branches	1.00	38.00	2.00	3.578	4.398	0.303
B	ndead_branches	0.00	37.00	2.00	3.858	5.983	0.412
C	Height_cm	6.00	225.00	15.00	21.414	29.999	2.773
C	Extension_growth_cm	0.00	40.30	1.60	2.622	4.190	0.387
C	DRC_mm	1.44	22.55	2.85	3.530	2.937	0.272
C	nlive_branches	0.00	31.00	1.00	1.880	2.986	0.276

C	ndead_branches	0.00	25.00	2.00	2.410	3.265	0.302

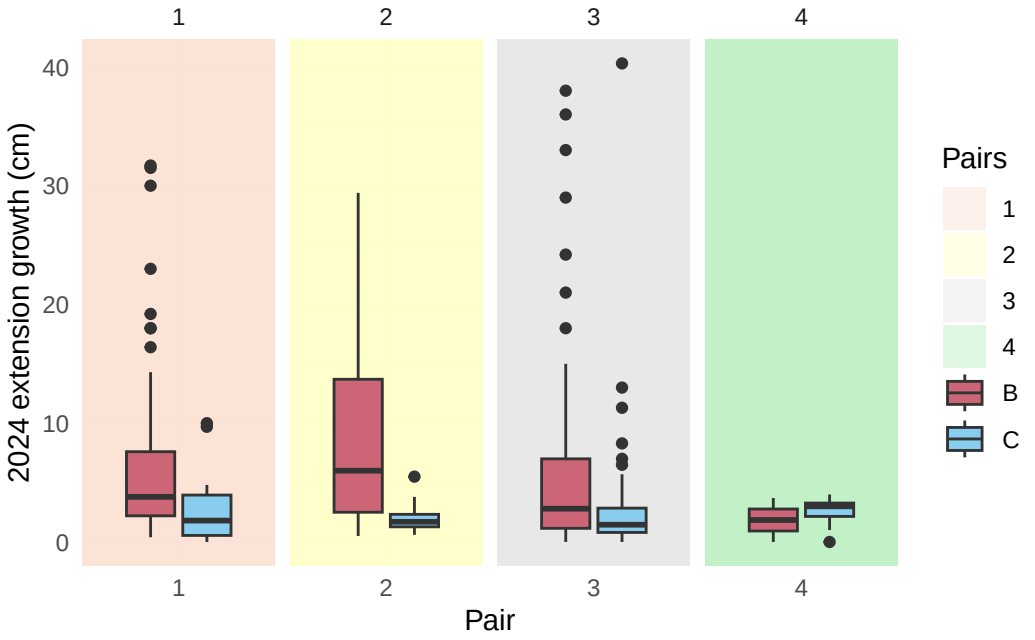

Figure 5: 2024 seedling extension growths by study stands

2024 number of live branches

There were more live branches per seedling in the burned stands than the control stands, respectively 4+/-0 and 2+/-0 ($p<0.001$).

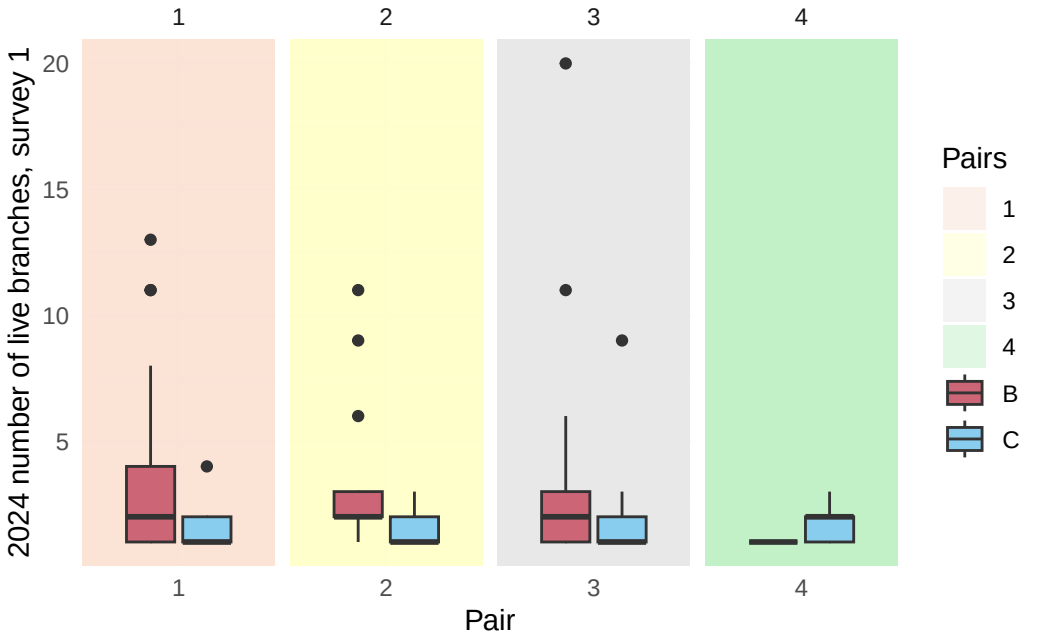

Figure 6: 2024 number of live branches per seedling by study stands and surveys

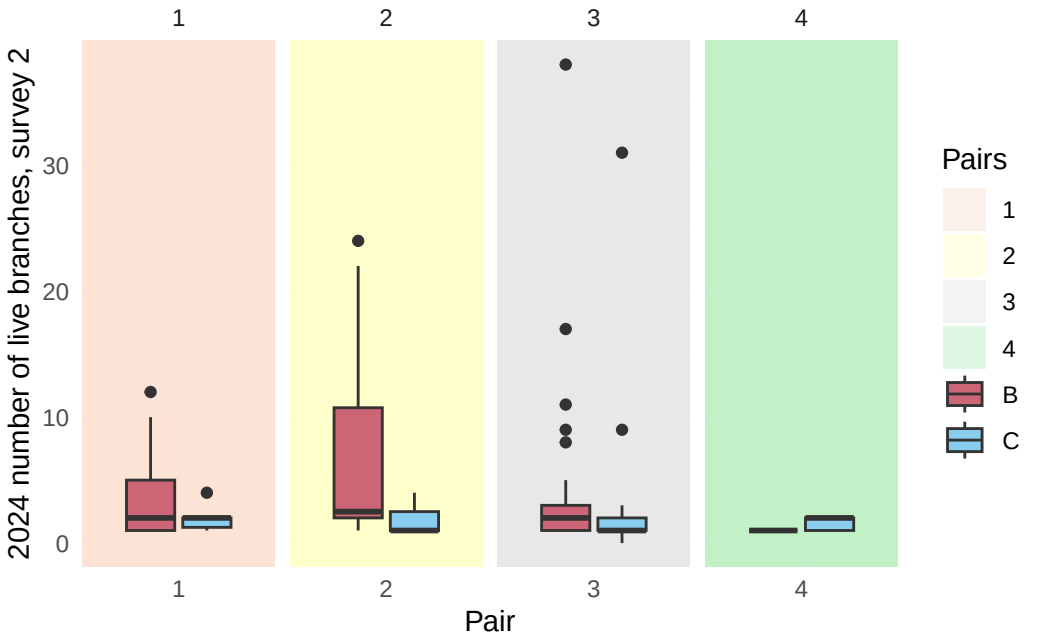

Figure 7: 2024 number of live branches per seedling by study stands and surveys

2024 number of leaves

Seedlings in burned stands sprouted more leaves (16+/-1) than in control stands (7+/-1, p<0.001).

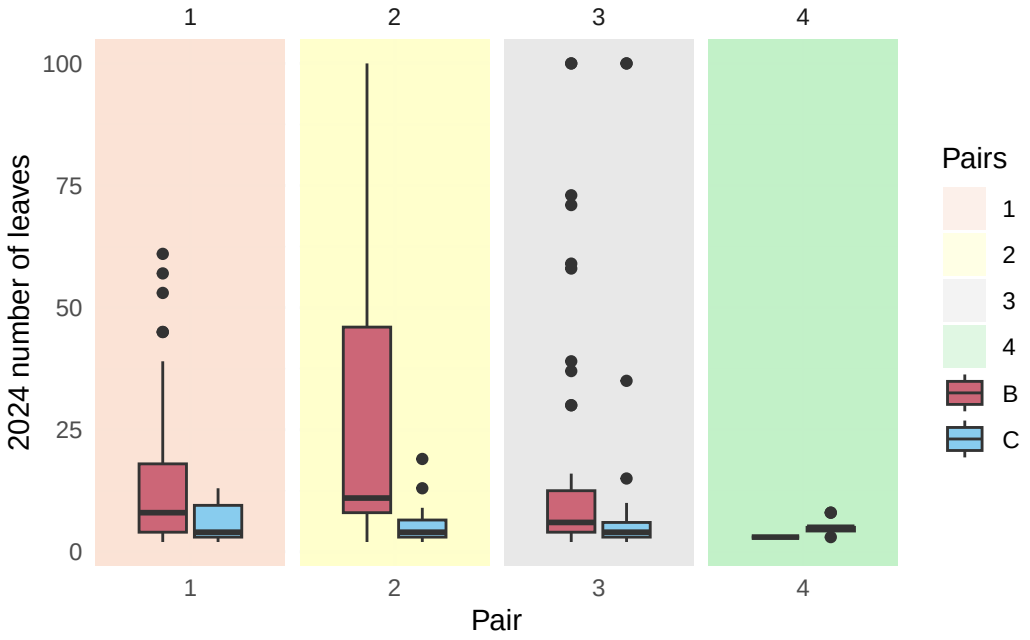

Figure 8: 2024 number of leaves per seedling by study stands

Leaf Area Index (LAI)

Burned stands have lower LAI values (averaging 3.2+/-0.2) than control stands (5.4+/-0.2, $p<0.001$).

Table 5: Summarized statistics of LAI values

Disturbance	min	max	median	mean	sd	se
B	0	9.233	2.928	3.159	2.136	0.150
C	0	9.825	5.915	5.400	2.347	0.176

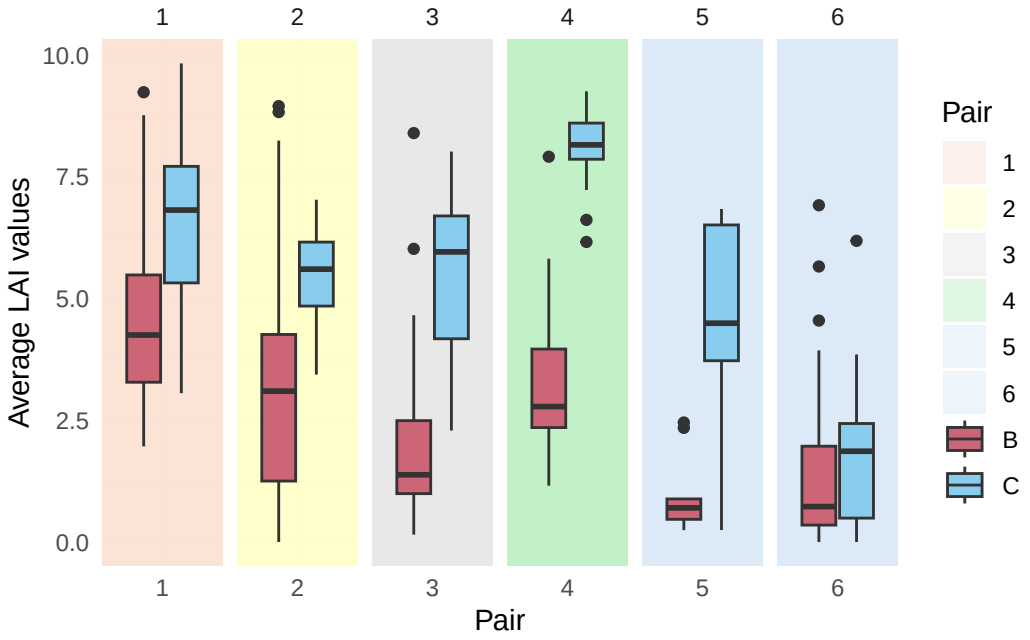

Figure 9: LAI values by study stands

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