Aqua Case
Salmar – Troms Stamfisk

Exercise

Finding the production potential at the site based upon measured flow from the catchment area

2111
2005

Learning goals

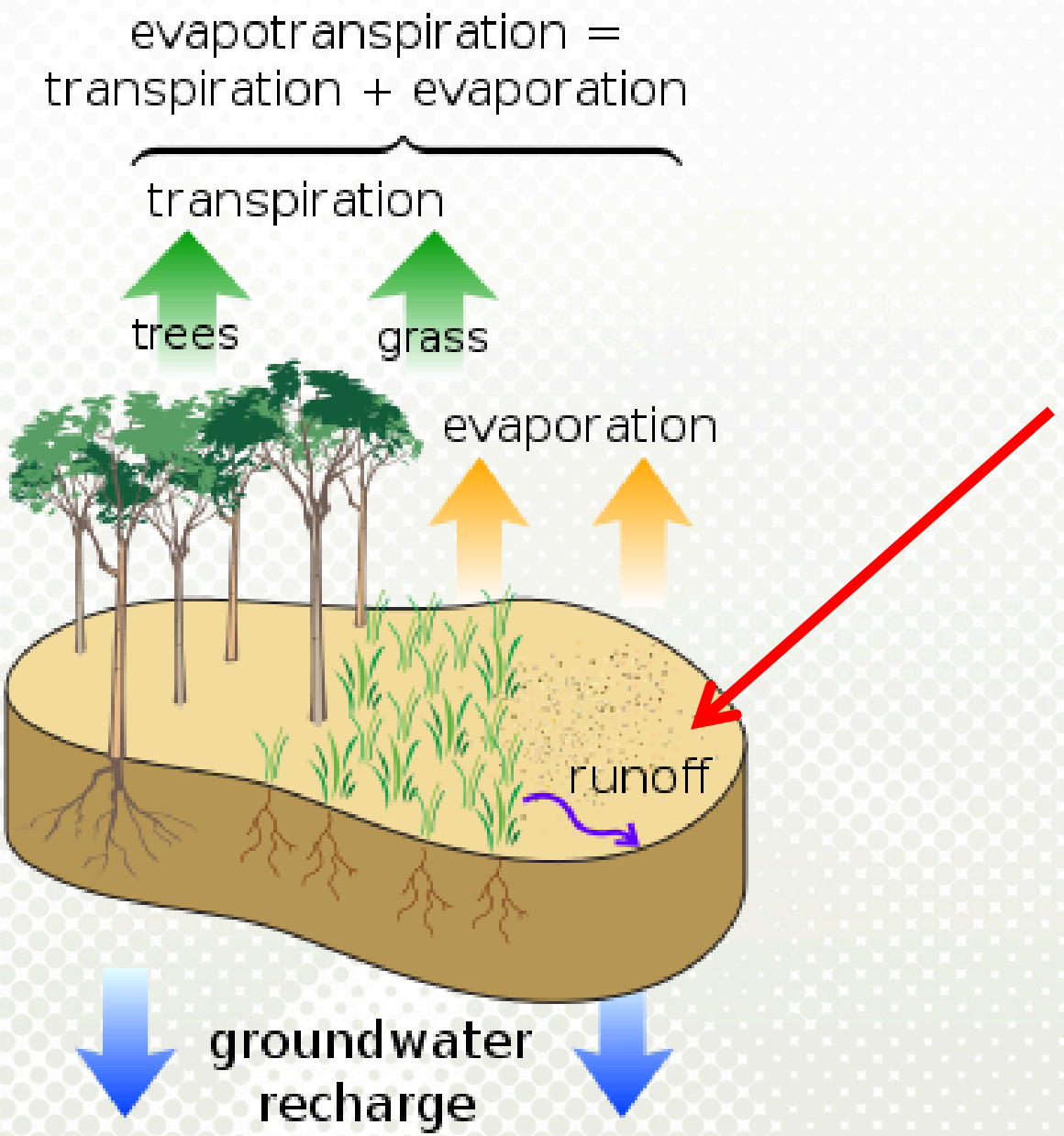
- to understand the connection between production capacity and available natural water recourses
- to identify water catchment area and be able to calculate for yearly and monthly draining from the area
- to understand the difference in maximum water requirement in production peaks and maximum draining from the catchment area
- To understand the benefits of establishing dams in the draining area

Question to answer

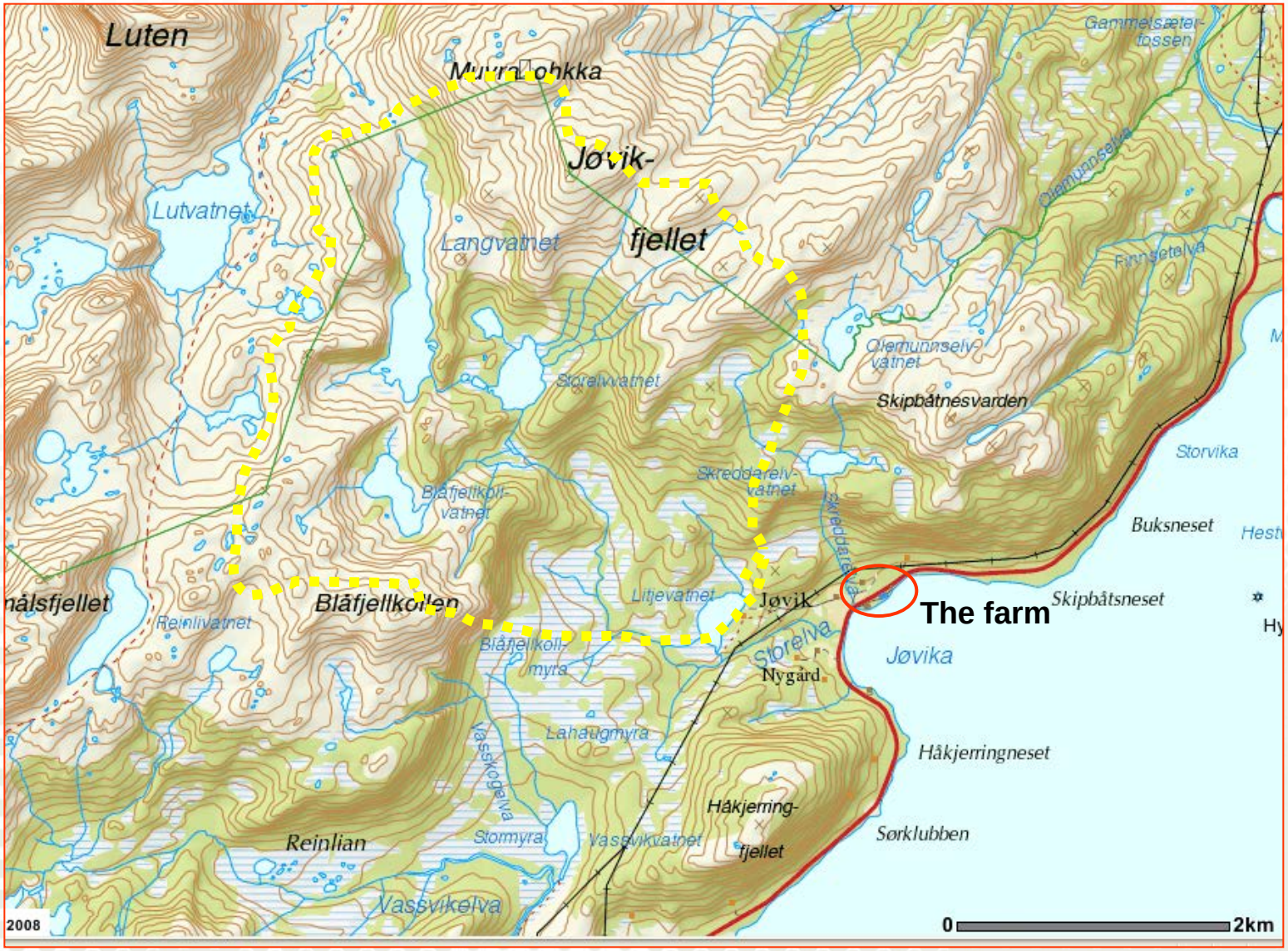
1. How many smolt is it possible to produces at the site without making of any dams in the draining area
2. How many smolt can be produced if allowed to dam up one of the lakes in the draining area 2 m

In addition to the case the following information is supplied

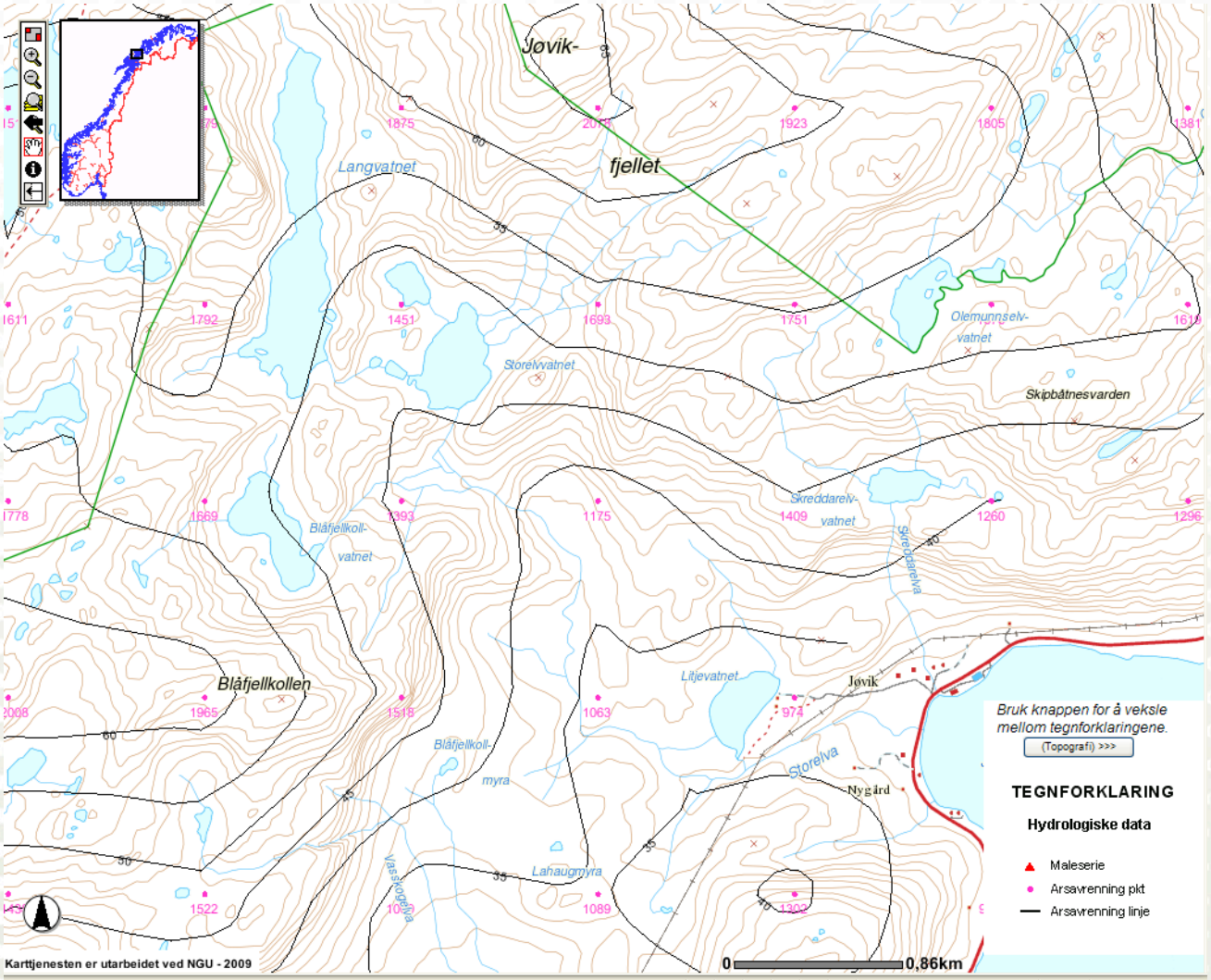
- The water draining area (MAP)
- water drainage from specific point in the draining area expressed as mm water.pr. year (MAP)
- Monthly drainage from the catchment area in percentage of total yearly (graph)
- Monthly Water requirement expressed as l/min pr 100000 produced smolt (graph)


evapotranspiration =
transpiration + evaporation
transpiration
trees
grass
evaporation
runoff
groundwater
recharge

The Catchment area is marked with yellow stippled line
To calculate the size of the area for instance by using the link:
http://www.norgeskart.no/adaptive2/default.aspx?gui=1&lang=2
http://gislaugny.nve.no/Geocortex/Essentials/Web/Viewer.aspx?Site=Lavvann&ReloadKey=True

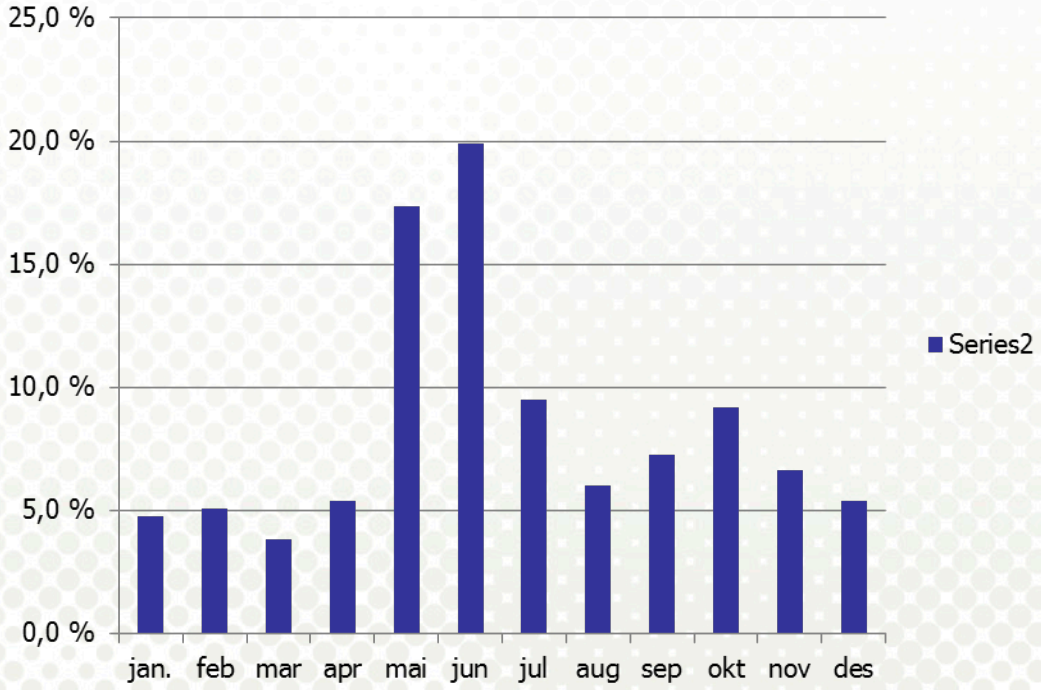


The red numbers in this map shows measured water drainage from each specific point expressed as mm water.pr. year.



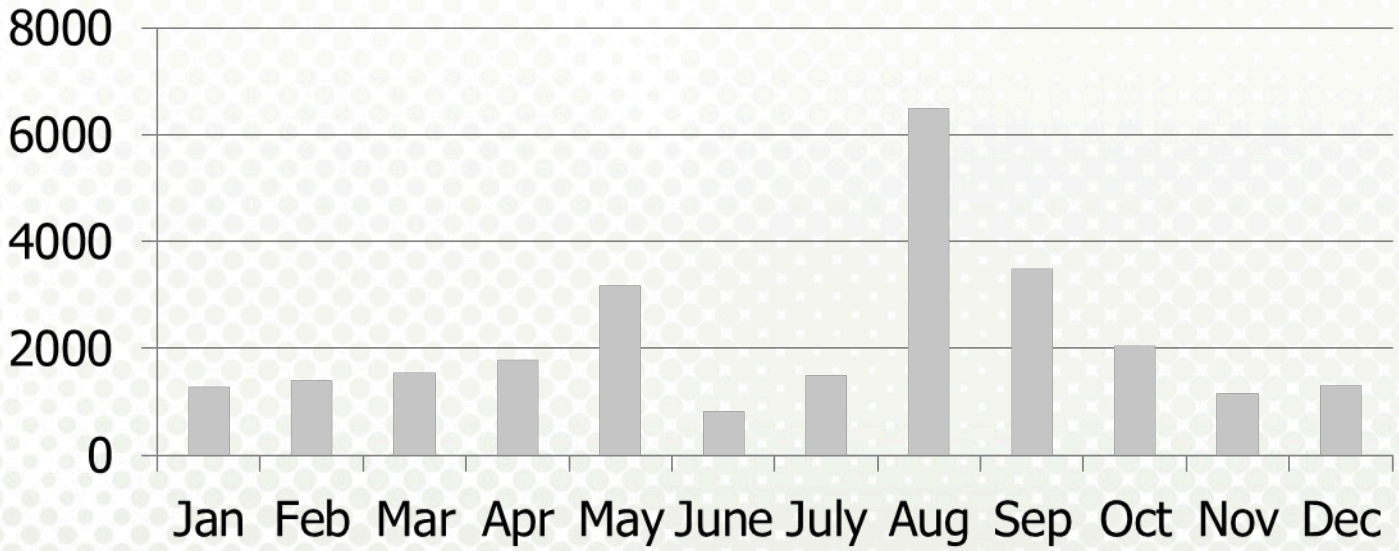
http://gislaugny.nve.no/Geocortex/Essentials/Web/Viewer.aspx?Site=LavVann&ReloadKey=True

Monthly drainage from the catchment area in percentage of total yearly



jan.	feb	mar	apr	mai	jun	jul	aug	sep	okt	nov	des
4,7 %	5,0 %	3,8 %	5,4 %	17,4 %	19,9 %	9,5 %	6,0 %	7,3 %	9,1 %	6,6 %	5,4 %

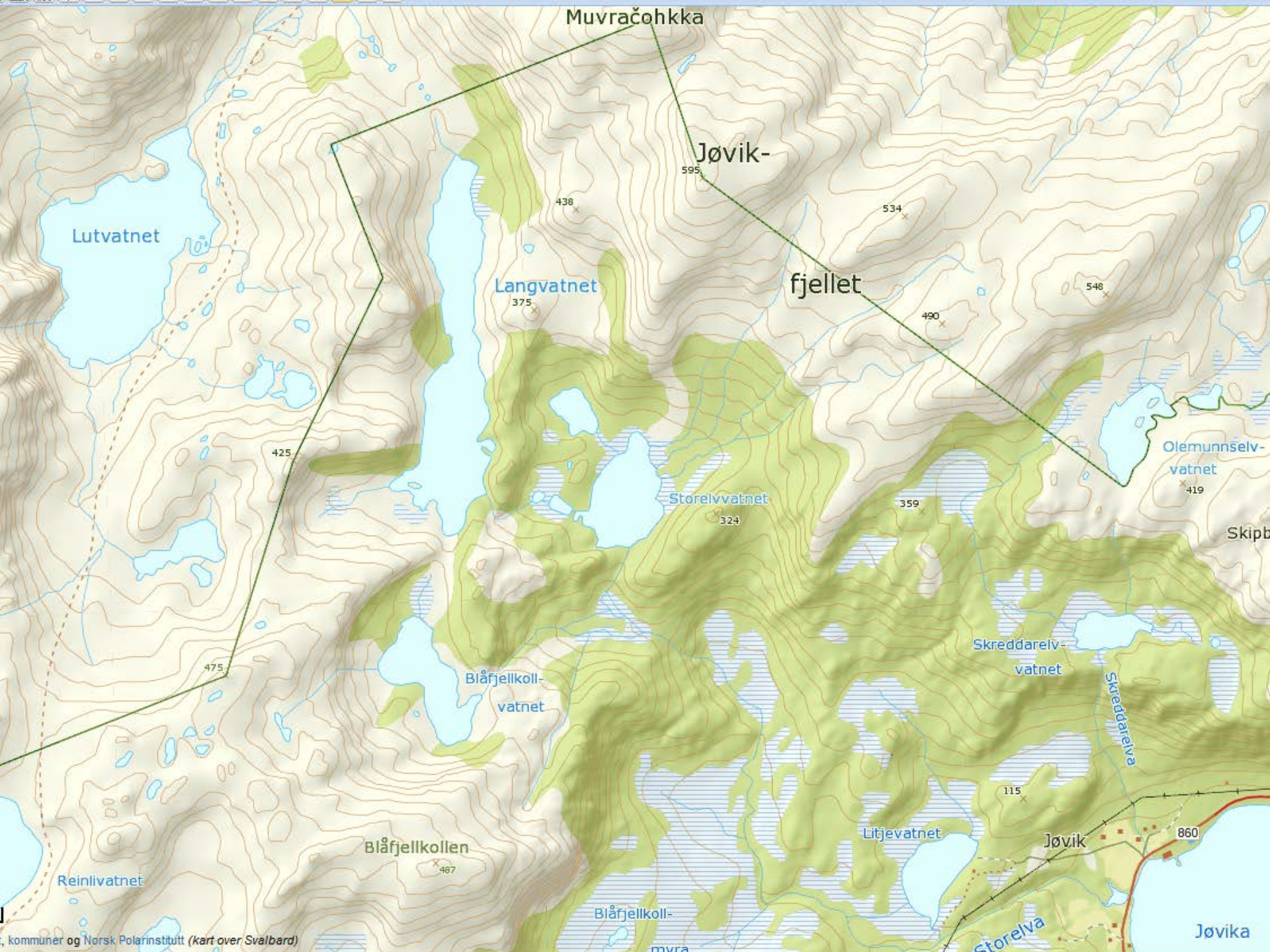
Water requirement expressed as l/min pr 100000 produced smolt



Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
TOTAL WATER REQ. (l/min)	1267	1396	1540	1778	3186	830	1487	6490	3484	2050	1167	1292

Solution

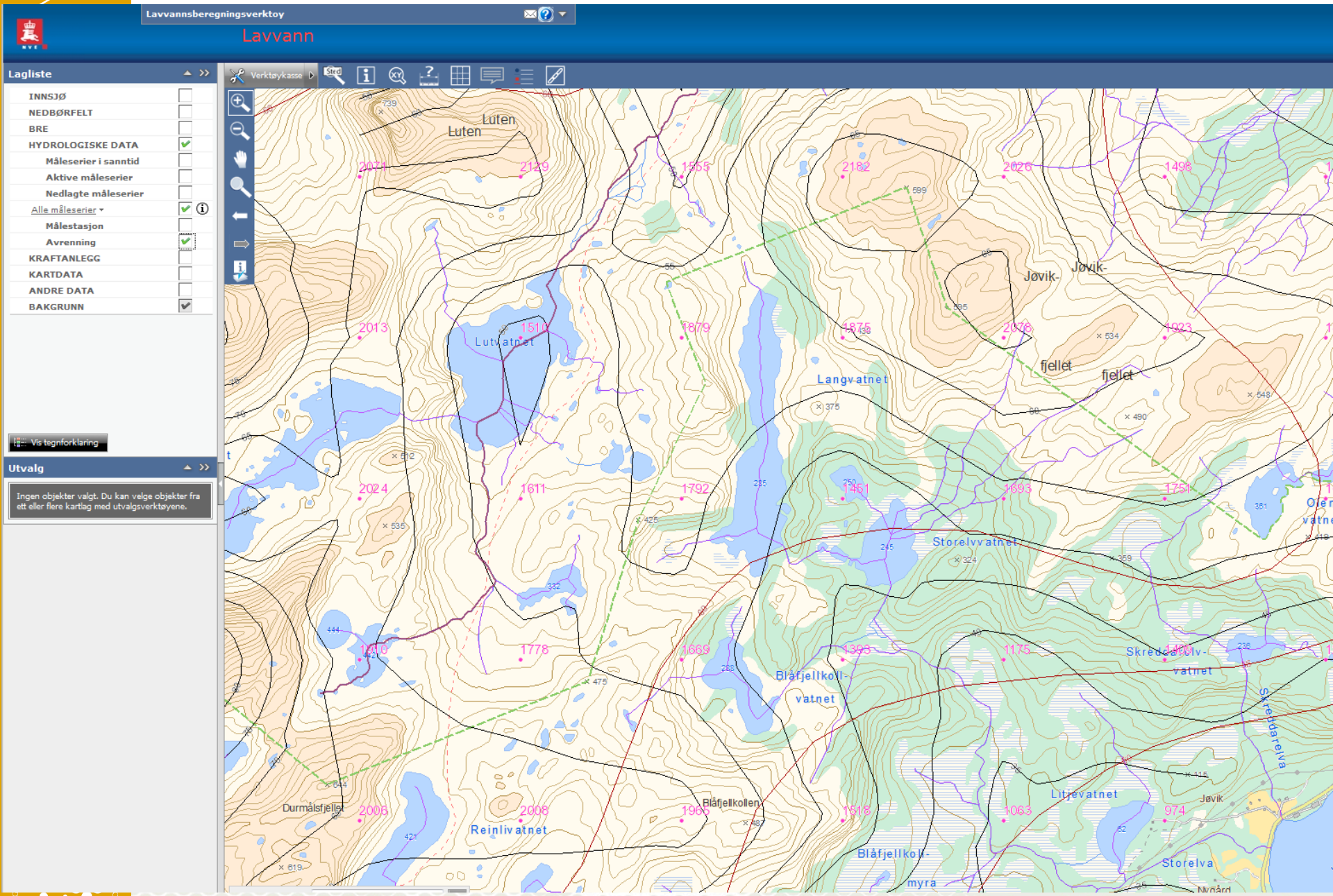
- First find the size of the catchment area by some of the links

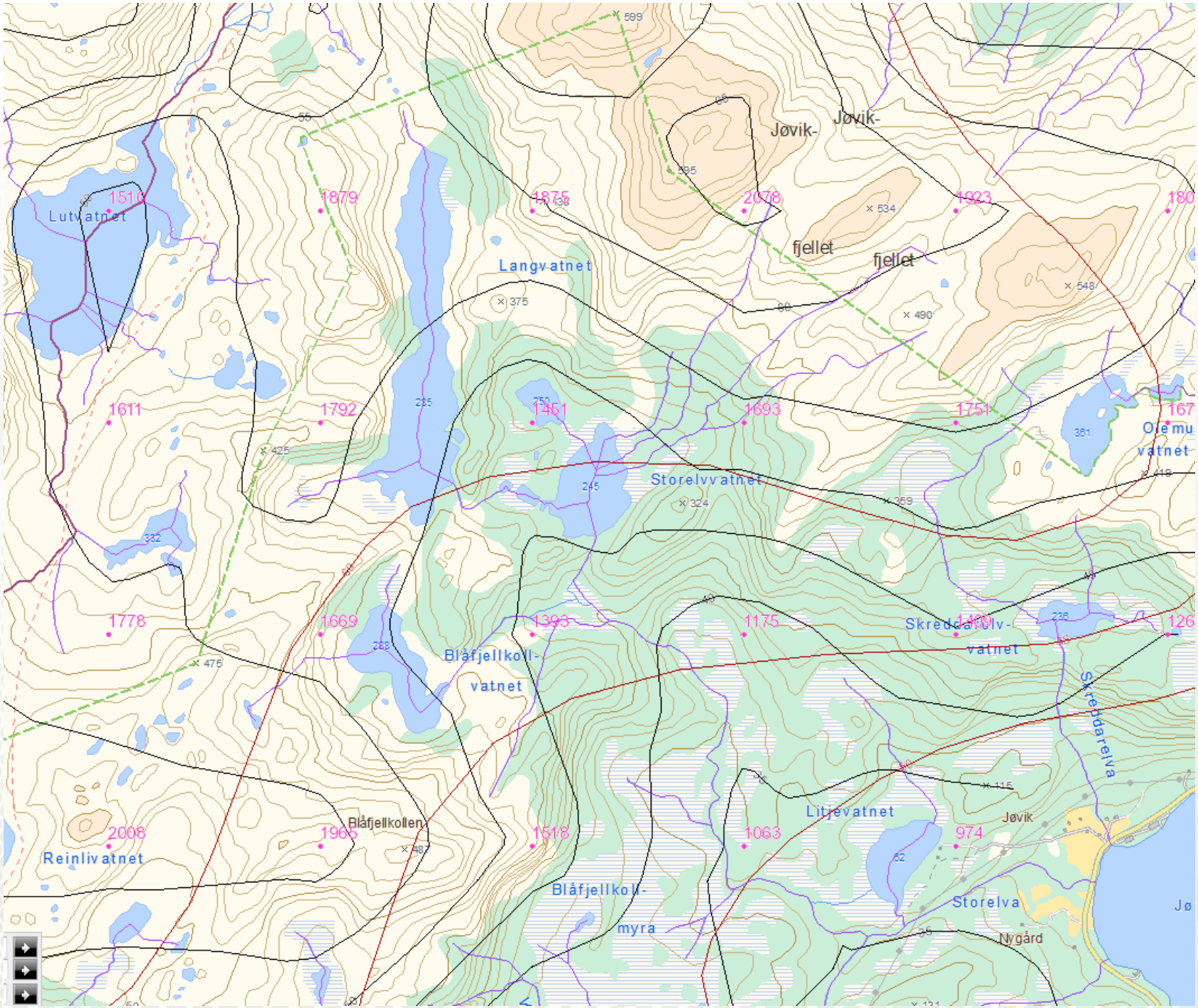

Muvračohkka
Jøvik-
fjellet
595
438
534
548
490
Lutvatnet
Langvatnet
375
425
475
Storelvvatnet
324
359
Olemunnselv-
vatnet
419
Skipb
Skreddarelv-
vatnet
Skreddarelva
Blåfjellkoll-
vatnet
115
Litjevatnet
Jøvik
860
Blåfjellkollen
487
Reinlivatnet
Blåfjellkoll-
myra
Jøvika
kommuner og Norsk Polarinstitutt (kart over Svalbard)


Muvračohkka
Jøvik-
fjellet
Langvatnet
Storelvvatnet
Olemunnselv-
vatnet
Skipbåtnesvarden
Skreddarelv-
vatnet
Skreddarelva
Blåfjellkoll-
vatnet
Litjevatnet
Jøvik
Blåfjellkollen
Blåfjellkoll-
myra
Storelva
Jøvika
595
438
534
404
548
490
375
425
359
324
419
442
395
115
860
487
Måle avstand/areal
Areal:
11.16 km2
over Svalbard)

Find average draining

- Average draining approximately 1500 mm per year
- Total draining area 11,1 km2
- Total water volume that drains of from the entire draining are during a year
- 1,5 m * 11100000 m2 = 16 650 000 m3/year


Lavvannsberegningsverktoy
Lavvann
Lagliste
INNSJØ
NEDBØRFELT
BRE
HYDROLOGISKE DATA
Måleserier i sanntid
Aktive måleserier
Nedlagte måleserier
Alle måleserier
Målestasjon
Avrenning
KRAFTANLEGG
KARTDATA
ANDRE DATA
BAKGRUNN
Vis tegnforklaring
Utvalg
Ingen objekter valgt. Du kan velge objekter fra ett eller flere kartlag med utvalgsverktøyene.
Verktøykasse
Luten
Lutvatnet
Langvatnet
Storelvvatnet
Blåfjellkoll-vatnet
Blåfjellkollen
Blåfjellkoll-myra
Reinlivatnet
Durmålsfjellet
Litlevatnet
Storelva
Jøvik
fjellet

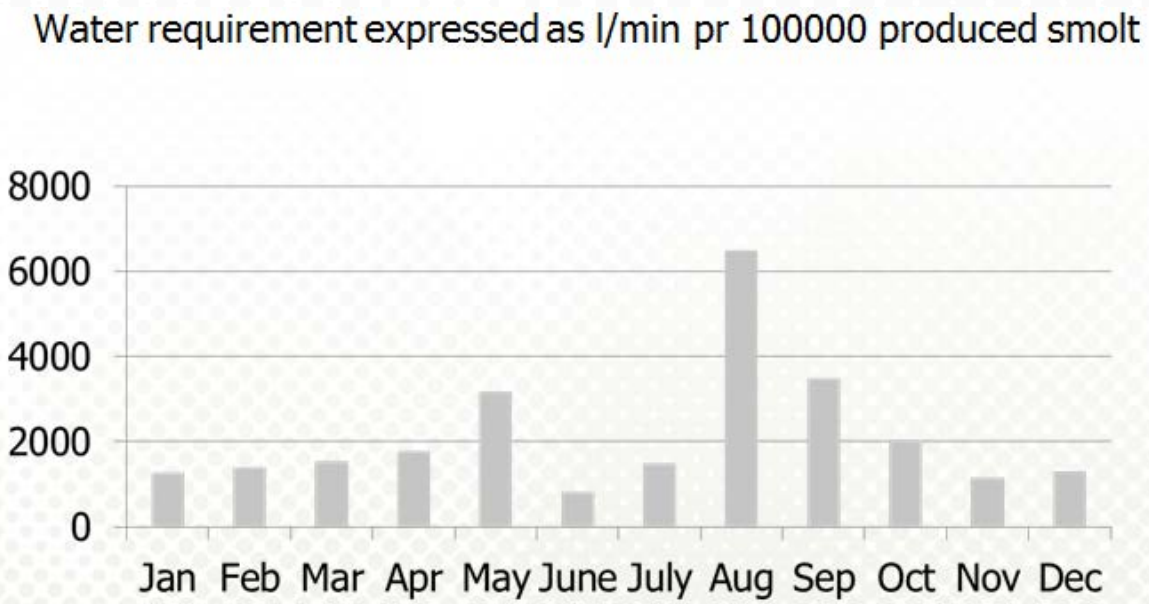


But we need to have it on monthly bases because it vary so much over a year

jan.	feb	mar	apr	mai	jun	jul	aug	sep	okt	nov	des
4,7 %	5,0 %	3,8 %	5,4 %	17,4 %	19,9 %	9,5 %	6,0 %	7,3 %	9,1 %	6,6 %	5,4 %

	percent	m3 per month	m3 per min
jan	4,7	782004,4992	17,80520262
feb	5	831919,68	18,94170492
mar	3,8	632258,9568	14,39569574
apr	5,4	898473,2544	20,45704131
may	17,4	2895080,486	65,91713311
jun	19,9	3311040,326	75,38798557
jul	9,5	1580647,392	35,98923934
aug	6	998303,616	22,7300459
sep	7,3	1214602,733	27,65488918
oct	9,1	1514093,818	34,47390295
nov	6,6	1098133,978	25,00305049
des	5,4	898473,2544	20,45704131

Then control against the water requirement



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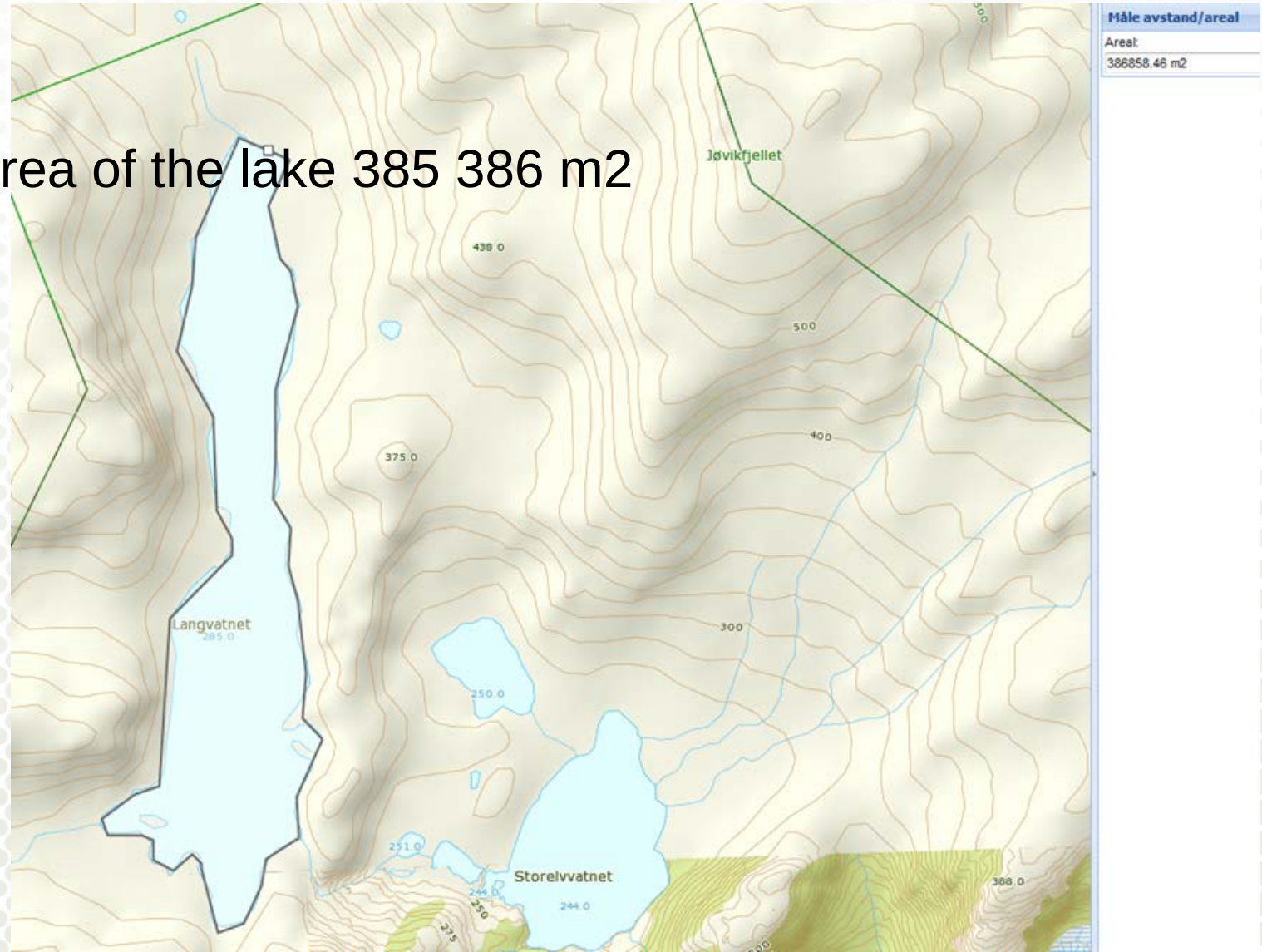
The critical month will be august

- We have available 22 730 l/min and the fish need 6,49 l/min per 100 000 smolt meaning that we can produce 350 000 smolt

	percent	m3 per month	m3 per min	fish requirement per 1000000 m3/min	possible fish production
jan	4,7	782004,4992	17,80520262	1,267	14,05304
feb	5	831919,68	18,94170492	1,396	13,56856
mar	3,8	632258,9568	14,39569574	1,54	9,347854
apr	5,4	898473,2544	20,45704131	1,778	11,50565
may	17,4	2895080,486	65,91713311	3,186	20,68962
jun	19,9	3311040,326	75,38798557	0,83	90,8289
jul	9,5	1580647,392	35,98923934	1,487	24,20258
aug	6	998303,616	22,7300459	6,49	3,502318
sep	7,3	1214602,733	27,65488918	3,484	7,937683
oct	9,1	1514093,818	34,47390295	2,05	16,81654
nov	6,6	1098133,978	25,00305049	1,167	21,42506
des	5,4	898473,2544	20,45704131	1,292	15,83362

Now we establish a dam

Area of the lake 385 386 m2



Volume of the water in the dam

- Says that the area of water when it is dammed 2 meter is 10 % larger than
- The average are is therefore 5% larger
- Average dam area is 385 386 + 5% = 404 655 m2
- The volume of the dam is 404 655 *2 =809 310,6 m3
- Meaning that only form the dam it is possible to supply the 100 000 smolt for a period of
- 809 310,6 m3 /3,484 m3/min = 232293 min = 161 days
- 1 million smolt can be supplied for 16 days only by water from the dam, in addition will however then natural drainage occur

it will be an optimization to find maximum production

August the critical month

- Supposing that the dam is filled up in the start of august, and we can drain all the 2 meter in this month we can calculate how much fish it then is possible to keep.
- As seen from below the production at the farm can be doubled

total draing per month	total form the dam	water requiremnet for 100 000 fish per month	possible production
999000 m3/month	809310 m3/month	285040,8 m3	6,344039

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