Project No.

NITROGEN FERTILISING ON SAND DUNES: AN UPDATE OF A GROWTH MODEL MODIFIER

by

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EXECUTIVE SUMMARY

An updated version of a growth model modifier has been produced. The modifier enables the user to model the effect of applying nitrogen fertiliser to sand dune forests. The modifier now incorporates the results of 144 annual measurements of fertiliser trials in sand dune forests - measurements representing ,conservatively, $ 500,000 worth of effort in trial establishment and maintenance.

In this latest version the data set has been increased by 71% and a model which is both stronger and more generally applicable has been built.

Introduction

Since 1983 successive attempts have been made at incorporating the results of fertiliser trials in growth models. The first such sub-model produced incorporated the results of the Nitrogen fertiliser trials on pumice soils as a modilfier to the Kaingaroa growth model. It was the first modifier tackled because it was the simplest. We knew that N fertiliser did not affect mortality, height growth or tree shape in a way which the base model (KGM) could not cope with. Basal area growth was affected transiently and in a predictable way. Thus the strategy was to model the briefly accelerated basal area growth as a function of data already "known" by the model - site index, stand age, existing basal area, stocking - with two additional pieces of information - amount of fertiliser applied, and time since fertilising. The model chosen was simple and easy for a forest manager to use. The approach was, at the time , radical and unique in the World. It was subsequently copied, usually without attribution, by several forestry organisations.

Having been satisfactorily successful in developing the pumice land model we turned our attention to the coastal sands. The pattern of response to nitrogen fertiliser on coastal sands was different in some respects. There was a height response in very nitrogen deficient stands and the basal area response was both larger and in some trials more sustained. However the same modelling principles were used to develop a growth model modifier which was combined with the Auckland Growth Model to predict the effects of fertilising.

After developing the Sand modifier we attempted to model the very much more complex phosphorus response on Auckland clay soils. Fortunately we were attempting this before the days of "User-pays" because we had a couple of abortive attempts before we managed to develop an approach that worked. The principle behind the phosporus model "modifier" is completely different to that used in the sand and pumice modifiers. In the P model the very base parameters of the model themselves are affected by the P nutrition of the stand. This approach too is totally new, very radical and quite without precedent.

So far we have modelled the elements N and P independently. However we know that, increasingly, our stands are responding to both elements at the same time. Research is therefore currently underway to develop a modifier to incorporate both elements at once. At present research is concentrating on describing mathematically the shape of the response pattern to both elements.

Since the sand and pumice modifiers were developed we have continued to acquire more trial results, more so on the sand dunes than on the pumice land. The sand dune modifier is now out of date and would benefit from updating. However the area of sand dune forestry is relatively small and for this reason a cost effective solution to updating has been sought. We have therefore decided to incorporate later data and recalculate the co-efficients.

THE TRIAL RESULTS

There are 13 trials in the database. They are located in all of the major sand forests with the exception of Waitarere, Matakana Island and Mangawai. Full results are listed in Appendix 1.

Wn 205. Santoft Forest.

This trial is in the most nitrogen deficient stand sampled by the trial series. Four hundred kg of nitrogen was applied to a 13 year old stand with extremely severe N deficiency (foliar N 0.6%). The stand was totally unthinned and standing at it's planting stocking of 2270 s/ha. Despite the high stocking it had a basal area of only 18.3 m^2/ha and an indicated site index of only 13 metres. The stand responded very strongly to fertiliser and showed a peak basal area increment gain of 488% relative to the control, 3 years after fertilising. Ten years after fertilising the fertilised trees are still growing 20% faster than the controls. The stand also responded in height growth but not nearly as strongly or for so long.

Wn 201 Santoft Forest

This trial was located in a better part of the forest than Wn 205. It was established in 11 year old trees that had just been thinned from 2240 to 530 s/ha. Three rates of nitrogen fertiliser were used :- 100,200 and 300 kg/ha. The basal area ratio peaked at 191% in the highest rate 2 years after fertilising. The 200kg rate was only slightly poorer than the 300 kg rate. The ratio peaked at 151% in the 100 kg rate. By 5 years after fertilising the ratio approximated 100%; that is to say, both fertilised plots and unfertilised plots were growing at the same rate.

There was a slight height response in this trial.

Foliar nitrogen averaged 1.07% and foliar P , 0.15% in the controls . Soil nitrogen in the controls was 0.018%.

Wn 276 Santoft Forest

Wn 276 was located in a semi-mature (19 year old) heavily stocked part of the forest. Part of the stand was thinned from 1280 to 960 s/ha and nitrogen fertiliser at 200 kg/ha was interacted with the thinning treatment. This trial yielded a surprising result:- the unthinned portion responded - the thinned portion did not.

Foliar nitrogen averaged 1.2% and foliar P 0.13% in the controls. Soil N was 0.031%.

Wn 277 Santoft Forest

Wn 277 was located in a semi-mature stand at the back of the forest on older sand dunes with a higher nitrogen status and a good site index (31 metres). The stand had not been thinned for 5 years, had a stocking of 280 s/ha at age 20 and a basal area of 42 m^2/ha. This is precisely the type of stand that we would predict would not respond to fertiliser if it were located in a pumice forest and it didn't here either.

Foliar nitrogen averaged 1.58% and foliar P 0.11%. Soil N was 0.056%.

Wn 278 Santoft Forest

Wn 278 was established in young trees (6 years old) that had just been thinned from 1750 to 650 s/ha. It was laid out to be a factorial in repeat fertilising and was refertilised in 1985. It behaved as we would expect in its initial fertilising , giving a satisfactory peak response of 138% in the first year after fertilising. We are currently measuring the trial to see if the second application of fertilising is additive to the first.

Foliar N averaged 1.37% and foliar P 0.15% . Soil N was 0.013%.

Ak 693 Woodhill Forest

Ak 693 was established in a 12 year old stand which had just been thinned from 2000 s/ha to 370 s/ha. It was fertilised with the standard varying rates of 100,200 and 300 kg of N. It responded, but not very strongly to fertiliser. The peak basal area ratio was 142% in the 300 kg rate 1 year after fertilising.

Foliar N averaged 1.28% and foliar P 0.16%. Soil N was 0.02%.

Ak 670 Aupouri forest

Ak 670 was established in an 8 year old stand which had just been thinned from 750 to 320 s/ha. It responded much as expected to the standard rates of applied fertiliser. Foliar N was 1.34% , foliar P 0.17% and soil N , 0.027%.

Ak 704 Waiuku Forest

Ak 704 was established in a mature (24 year old) stand that had just been thinned from 750 to 320 s/ha. It was a poor stand (site index 20 m).The standard rates of N were applied. The stand responded satisfactorily. The peak basal area ratio of 167% was achieved in the 100 kg rate 1 year after fertilising. Foliar N averaged 1.1% , foliar P 0.16% and soil N 0.02%.

Ak 830 Aupouri forest

Ak 830 was established in 6 year old trees recently thinned from 1800 to 840 s/ha. One rate, 200 kg of N , was applied. Basal area ratio peaked at 149% 1 year after fertilising. Foliar N averaged 1.39%, foliar P 0.19% and soil N 0.017%.

Ak 911 Woodhill Forest

Ak 911 is a complex trial with treatments in pruning, fertilising and thinning that was established in a 5 year old unpruned stand with 1594 s/ha. Part of the trial was thinned to 758 s/ha. Part of the trial was pruned in 3 lifts to 6m. Nitrogen fertiliser was applied at 1 rate, 200 kg/ha.

The unthinned, unpruned part of the trial responded with a peak b.a. ratio of 141% 1 year after fertilising, tapering away to 104% 6 years after.

The other portions of the trial responded very similarly. However, since the growth of the trees is affected by the treatments - both thinning and pruning reduce growth per hectare - a similarity between the response ratios necessarily implies a difference in actual growth. The thinned and pruned portion made the slowest growth and therefore because it had similar response ratios to the rest of the trial must, of necessity, have had the smallest total response.

Foliar N averaged 1.25% and foliar P 0.14%. Soil N was 0.006%.

Ak 888 Waiuku Forest.

Ak 888 was established in a 12 year old stand , standing at 223 s/ha and heavily infested with pampas grass. In part of the trial the pampas was sprayed out. Nitrogen fertiliser at 200 kg was used. The infested part of the trial grew at the same rate as the sprayed part but the response to N was smaller in the infested part. We have chosen to use the average response.

Ak 1053 Woodhill Forest

The first years results from the whole tree thinning trial in Woodhill forest have been included. There was little difference between the different types of thinnings in their first year response to N so the overall average has been used here.

Ak 977 Aupouri forest

Ak 977 is a complex trial similar to Ak 911 Woodhill with the added feature of more than one level of thinning. Parts of the stand of 5 year old trees have been left at 2021 s/ha, part thinned to 1200 s/ha and part thinned to 600 s/ha. Pruning of a crop element of 600 s/ha is progressing and N fertiliser at 200 kg/ha was used. The response pattern is similar to Ak 911 although more muted, with one exception - the response of the 600 s/ha pruned portion is stronger than the rest of the trial. However this treatment disastrously affected the unfertilised trees at Aupouri and the greater response ratio merely implies more of a "catch-up" to the other treatments.

General discussion of results

When first calculated there were 84 observations of fertiliser response over time in sand dune forests in the model. There are now 144 observations, an increase of over 70%.

In table 1 the minimum , mean and maximum values for each component of the model are given.

Table 1. Mean, minimum and maximum value for each component of the model

Term	mean value	minimum	maximum
Basal area response ratio	1.279	0.76	4.88
Height response ratio	1.595	0.18	78.0
Age at fertilising		5	24
Fertiliser applied	215	100	400
Time since applied	3	1	11
Site Index	24	13	31
Pruned?	0.42		
Thinned?	0.70		
Stems before thinning	1597	223	2270
Stems after thinning	849	200	2270
Basal area at start	13.40	4.5	46.1
Time since thinning	2	0	13

The basal area increment ratio averaged 127.9% that is to say on average there was a 28% response to fertiliser. The maximum values occured in the special case of Wn 205. Values less than 1 are clearly possible although values less than 0.95 occured only 15 times in the whole data set. Values less than 0.9 occured only 6 times. Given that the ratio is constructed by dividing the increment in the fertilised plots by the increment in the control, then it is clear that any small error at either end of the period in either set of plots could have a noticeable effect. This error could be induced by the death or windthrowe of only one or two trees. For this reason it seems likely that fluctuations of ± 10% around the 100% are not "real" but represent minor data fluctuations.

The 6 values less than 90% (0.9) occur as follows:-

1. in the last two years measurements of the thinned portion of Wn 276
2. in the last year of measurement at Ak 670 in the 300 kg rate.
3. in the middle of a series of measurements at Ak 693
4. in the last measurement taken in the 100 kg rate at Ak 704
5. in the latest measurement at Ak 977 of the thinned and pruned 1200 s/ha portion.

Thus the majority of these observations are occuring towards the end of trial life. At the moment they merely raise the question, which will be answered by other work, do N responses last?

The height growth response ratio is extremely variable. When the distorting effect of the one massive outlier is removed the overall average reduces to 1.06. In other words there was a very small positive effect of N fertilising on height. However it is very difficult to analyse the nature of this response because of the variability in the ratio. The reason for the very high variability is not hard to find. Mean top height is calculated in the PSP system by a regression approach. Regressions are most accurate close to the average, which mean top height is not.

Age at fertilising is well spread between 5 and 24 years. 42% of the stands were pruned and 70% thinned just prior to trial establishment. There was a good spread of stocking and basal area in the trials. Site index varied from 13 to 31 and averaged close to the overall average for sand forests. Thus the stand characteristics are well representative of the range of stands present in sand dune forests.

One trial has been followed for 11 years but the average length of time is only three years. This remains the one somewhat unsatisfactory characteristic of the data set.

The growth model modifier

The design constraints for the growth model modifier are:-

1. it should reflect the characteristics of the fertiliser trial data and they are:

   1a. a rising then declining basal area increment ratio which has a tendency to peak within the first two years after fertilising and then tends back towards a ratio of 1.0 with the unfertilised state.

   1b. a tendency for the response to be greater in low site index, nutrient poor sites. Unfortunately low site index sites occur in sand forests for reasons other than nutrient deficiency, particularly due to sea exposure.

   1c. decreasing additional returns to increasing amounts of fertiliser.

   1d. a fairly complex interaction between thinning and fertilising such that at low site indices fertiliser responses occur regardless of thinning while at high SI the pattern observed on the pumice plateau occurs; i.e. thinning is necessary to obtain a response. Moreover, if the thinning is very severe the stand seems to suffer a "shock" and will not respond to N fertilising as well as a less heavily thinned stand.

   1e. a weak and very variable height response noticeable at the poorer sites.

2. a requirement that the information requested and the output produced be compatible with existing growth models. This is an important and very real constraint. We have the data to consider the effect of pruning and to incorporate information on soil and foliar nutrition. However such information is not available to the operator of a standard growth model, nor can the model utilise the output.

The model finally chosen is compatible with these constraints. It has:-

3a. A function in fertiliser amount which reduces the incremental response to increasing amounts of fertiliser.

Response function in N = 1 - exp (- kg N /100)

3b. A function in time since fertiliser applied which rises to a peak in the first year or two after fertilising and then declines to 1.0. It is important to note that this type of function cannot give a value less than 1.0 and so if it is finally shown that lower values are real and to be expected in certain predictable circumstances then this function will need to be modified to cope.

Time function = TSA / exp ((TSA/3) ** (4/3))

where TSA = time since fertiliser applied.

3c. A complex function in thinning weight that attempts to model the pattern of thinning response given above.

Thinning function = TRAT ** (TST + 1) * exp (- TRAT) / TFAC

where

TRAT = (stocking before thinning / stocking after) - 1

TST = time since thinning

TFAC = Sqrt (6.3 * (TST + 1)) * ((TST + 1) / 2.7) ** (TST +1)

Table 3. Analysis of variance of model

Source	degrees of freedom	SS	mean square
Regression	5	44.31	8.8617
Residual	139	12.30	0.0885
Total	144	56.31	

Percentage variation accounted for 72.1

Height Function

Because of the very high variability in the observations it did not prove possible to fit a height model. We do not consider this to be very serious since only a few sites that were very N deficient responded in height. The consequence of not having a height model is that the fertiliser response on very deficient sites would be underestimated. However since such sites are very poorly represented in the base growth model we consider it very likely that a more serious error would be introduced by the model itself.

CAUTION:

THE MODIFIER IS TO BE USED TO PREDICT RESPONSES TO NITROGEN FERTILISER IN THE PART OF THE FOREST SHELTERED FROM IMMEDIATE SEA INFLUENCES. IT MUST NOT BE USED ON LOW SITE INDEX STANDS WITHIN 500 metres OF THE SEA.

These complex non-linear functions were fitted using GENSTAT modelling capabilities.

These functions were then combined with other terms and used in multiple regression analysis. The final model form is similar to but stronger than the first version produced in 1984 (Table 2). The current version explains 72% of the variation in the observations , the first version explained 67%.

Table 2. Sand dune growth model modifier

Term	coefficient in first version	coefficient now	t	s.e.
Intercept	1.0	1.0		
N_function	5.32	4.888	19	0.26
N_func * site_index	-0.1967	-0.1922	18	0.01
N_func * thinning_func	-25.300	-16.32	9	1.72
N_func * thinn_func * Site_index	0.984	0.641	9	0.07
N_func * Age at fertilising	N/a	0.022	4	0.006

where N_function = response function in N * time function

Appendix 1 . Data used in the model construction

Key

Column 1 : trial number concatenated with year of measurement.
e.g. 20577 = Wn 205 measured in 1977
The trials are listed in the same order as in the text.

Column 2 : ratio of basal area increment in the fertilised plot to increment in the control for that increment period.

Column 3 : ratio of height increment in the fertilised plot to increment in the control for that increment period.

Column 4 : Age of trees at time of fertilising.

Column 5 : Amount of fertiliser applied as kilograms of elemental N

Column 6 : Years since feriliser applied.

Column 7 : Projected site index of the stand.

Column 8 : 1 if pruned at trial establishment, 0 otherwise

Column 9 : 1 if thinned at trial establishment, 0 otherwise

Column 10: stocking before thinning

Column 11: stocking after thinning

Column 12: Basal area at time of trial establishment

Column 13: Years since last thinning.

Column number:

1	2	3	4	5	6	7	8	9	10	11	12	13
20577	3.44	1.42	13	400	1	13	0	0	2270	2270	18.3	13
20578	3.18	1.72	13	400	2	13	0	0	2270	2270	18.3	13
20579	4.88	78.0	13	400	3	13	0	0	2270	2270	18.3	13
20580	3.78	2.39	13	400	4	13	0	0	2270	2270	18.3	13
20581	4.17	1.22	13	400	5	13	0	0	2270	2270	18.3	13
20582	2.38	1.32	13	400	6	13	0	0	2270	2270	18.3	13
20583	1.58	1.01	13	400	7	13	0	0	2270	2270	18.3	13
20584	1.44	0.18	13	400	8	13	0	0	2270	2270	18.3	13
20585	1.36	0.47	13	400	9	13	0	0	2270	2270	18.3	13
20586	1.36	0.68	13	400	10	13	0	0	2270	2270	18.3	13
20587	1.20	0.67	13	400	11	13	0	0	2270	2270	18.3	13
20176	1.50	0.97	11	100	1	24	1	1	2240	530	10.9	0
20177	1.51	1.15	11	100	2	24	1	1	2240	530	10.9	0
20178	1.28	0.90	11	100	3	24	1	1	2240	530	10.9	0
20179	1.02	1.14	11	100	4	24	1	1	2240	530	10.9	0
20180	1.04	0.91	11	100	5	24	1	1	2240	530	10.9	0
20176	1.75	0.94	11	200	1	24	1	1	2240	530	10.9	0
20177	1.77	1.38	11	200	2	24	1	1	2240	530	10.9	0
20178	1.57	0.92	11	200	3	24	1	1	2240	530	10.9	0
20179	1.30	1.30	11	200	4	24	1	1	2240	530	10.9	0
20180	1.11	0.87	11	200	5	24	1	1	2240	530	10.9	0
20176	1.82	0.96	11	300	1	24	1	1	2240	530	10.9	0
20177	1.91	1.45	11	300	2	24	1	1	2240	530	10.9	0
20178	1.78	1.15	11	300	3	24	1	1	2240	530	10.9	0
20179	1.23	1.25	11	300	4	24	1	1	2240	530	10.9	0
20180	0.98	1.05	11	300	5	24	1	1	2240	530	10.9	0
27681	0.97	0.88	19	200	1	25	0	1	1280	960	37.9	0
27682	1.07	1.00	19	200	2	25	0	1	1280	960	37.9	0
27683	0.96	1.29	19	200	3	25	0	1	1280	960	37.9	0
27684	0.87	0.88	19	200	4	25	0	1	1280	960	37.9	0
27685	0.83	0.40	19	200	5	25	0	1	1280	960	37.9	0
27681	1.35	1.0	19	200	1	25	0	0	1280	1280	46.1	10
27682	1.41	1.0	19	200	2	25	0	0	1280	1280	46.1	10
27683	1.44	0.91	19	200	3	25	0	0	1280	1280	46.1	10
27684	1.22	1.0	19	200	4	25	0	0	1280	1280	46.1	10
27685	1.29	1.0	19	200	5	25	0	0	1280	1280	46.1	10
27781	0.94	1.43	20	200	1	31	0	0	280	280	42.0	5
27782	0.93	1.26	20	200	2	31	0	0	280	280	42.0	5
27783	1.0	0.99	20	200	3	31	0	0	280	280	42.0	5
27784	1.04	1.22	20	200	4	31	0	0	280	280	42.0	5
27785	0.97	0.99	20	200	5	31	0	0	280	280	42.0	5
27881	1.38	0.90	6	200	1	26	1	1	1750	650	7.3	0
27882	1.24	0.82	6	200	2	26	1	1	1750	650	7.3	0
27883	1.11	1.06	6	200	3	26	1	1	1750	650	7.3	0
27884	1.08	1.02	6	200	4	26	1	1	1750	650	7.3	0
27885	1.01	1.11	6	200	5	26	1	1	1750	650	7.3	0
69377	1.25	1.0	12	100	1	26	0	1	2000	370	10.6	0
69378	1.18	1.73	12	100	2	26	0	1	2000	370	10.6	0
69379	0.98	1.03	12	100	3	26	0	1	2000	370	10.6	0
69380	0.91	1.13	12	100	4	26	0	1	2000	370	10.6	0
69381	0.93	0.70	12	100	5	26	0	1	2000	370	10.6	0
69382	0.95	1.48	12	100	6	26	0	1	2000	370	10.6	0

69383	1.06	0.47	12	100	7	26	0	1	2000	370	10.6	0
69377	1.34	1.0	12	200	1	26	0	1	2000	370	10.6	0
69378	1.15	1.51	12	200	2	26	0	1	2000	370	10.6	0
69379	0.98	1.04	12	200	3	26	0	1	2000	370	10.6	0
69380	0.98	1.38	12	200	4	26	0	1	2000	370	10.6	0
69381	0.86	0.48	12	200	5	26	0	1	2000	370	10.6	0
69382	0.96	2.07	12	200	6	26	0	1	2000	370	10.6	0
69383	0.94	0.37	12	200	7	26	0	1	2000	370	10.6	0
69377	1.42	1.0	12	300	1	26	0	1	2000	370	10.6	0
69378	1.15	1.60	12	300	2	26	0	1	2000	370	10.6	0
69379	0.98	1.36	12	300	3	26	0	1	2000	370	10.6	0
69380	1.01	1.10	12	300	4	26	0	1	2000	370	10.6	0
69381	0.95	0.92	12	300	5	26	0	1	2000	370	10.6	0
69382	0.92	1.38	12	300	6	26	0	1	2000	370	10.6	0
69383	0.96	0.87	12	300	7	26	0	1	2000	370	10.6	0
67077	1.26	0.53	8	100	1	26	1	1	750	320	5.8	0
67079	1.25	1.55	8	100	3	26	1	1	750	320	5.8	0
67080	1.07	1.05	8	100	4	26	1	1	750	320	5.8	0
67081	1.09	1.16	8	100	5	26	1	1	750	320	5.8	0
67084	1.06	1.01	8	100	8	26	1	1	750	320	5.8	0
67077	1.37	0.99	8	200	1	26	1	1	750	320	5.8	0
67079	1.27	1.18	8	200	3	26	1	1	750	320	5.8	0
67080	1.03	0.80	8	200	4	26	1	1	750	320	5.8	0
67081	0.93	1.26	8	200	5	26	1	1	750	320	5.8	0
67084	0.90	1.25	8	200	8	26	1	1	750	320	5.8	0
67077	1.45	1.11	8	300	1	26	1	1	750	320	5.8	0
67079	1.41	1.40	8	300	3	26	1	1	750	320	5.8	0
67080	1.04	1.27	8	300	4	26	1	1	750	320	5.8	0
67081	1.03	1.23	8	300	5	26	1	1	750	320	5.8	0
67084	0.87	1.09	8	300	8	26	1	1	750	320	5.8	0
70478	1.67	1.0	24	100	1	20	0	1	570	200	15.8	0
70479	1.22	1.0	24	100	2	20	0	1	570	200	15.8	0
70480	0.80	1.0	24	100	3	20	0	1	570	200	15.8	0
70478	1.54	1.0	24	200	1	20	0	1	570	200	15.8	0
70479	1.17	1.0	24	200	2	20	0	1	570	200	15.8	0
70480	1.05	1.0	24	200	3	20	0	1	570	200	15.8	0
70478	1.36	1.0	24	300	1	20	0	1	570	200	15.8	0
70479	1.43	1.0	24	300	2	20	0	1	570	200	15.8	0
70480	1.08	1.0	24	300	3	20	0	1	570	200	15.8	0
83080	1.49	1.15	6	200	1	30	1	1	1800	840	7.0	0
83081	1.09	0.83	6	200	2	30	1	1	1800	840	7.0	0
83082	1.07	1.21	6	200	3	30	1	1	1800	840	7.0	0
83083	1.06	1.16	6	200	4	30	1	1	1800	840	7.0	0
91182	1.32	1.0	5	200	1	24	0	1	1594	758	6.4	0
91183	1.32	0.87	5	200	2	24	0	1	1594	758	6.4	0
91184	1.26	1.22	5	200	3	24	0	1	1594	758	6.4	0
91185	1.06	1.00	5	200	4	24	0	1	1594	758	6.4	0
91187	1.04	1.28	5	200	6	24	0	1	1594	758	6.4	0
91182	1.30	0.80	5	200	1	22	1	0	1594	1594	11.4	5
91183	1.27	0.82	5	200	2	22	1	0	1594	1594	11.4	5
91184	1.28	1.62	5	200	3	22	1	0	1594	1594	11.4	5
91185	1.19	0.83	5	200	4	22	1	0	1594	1594	11.4	5
91187	1.06	1.03	5	200	6	22	1	0	1594	1594	11.4	5
91182	1.40	0.43	5	200	1	24	1	1	1594	758	6.4	0
91183	1.40	0.78	5	200	2	24	1	1	1594	758	6.4	0

91184	1.14	1.18	5	200	3	24	1	1	1594	758	6.4	0
91185	1.21	0.99	5	200	4	24	1	1	1594	758	6.4	0
91187	1.12	1.08	5	200	6	24	1	1	1594	758	6.4	0
91182	1.41	0.81	5	200	1	22	0	0	1594	1594	11.4	5
91183	1.32	0.78	5	200	2	22	0	0	1594	1594	11.4	5
91184	1.19	1.14	5	200	3	22	0	0	1594	1594	11.4	5
91185	1.09	1.02	5	200	4	22	0	0	1594	1594	11.4	5
91187	1.04	0.91	5	200	6	22	0	0	1594	1594	11.4	5
88884	1.22	0.93	12	200	1	26	0	0	223	223	9.7	2
88885	1.45	1.53	12	200	2	26	0	0	223	223	9.7	2
88886	1.22	1.07	12	200	3	26	0	0	223	223	9.7	2
88887	1.07	0.75	12	200	4	26	0	0	223	223	9.7	2
105387	1.24	1.03	10	200	1	28	0	1	1578	769	18.8	0
97784	1.29	0.93	5	200	1	25	0	0	2021	2021	10.7	5
97785	1.13	0.92	5	200	2	25	0	0	2021	2021	10.7	5
97786	0.99	1.10	5	200	3	25	0	0	2021	2021	10.7	5
97787	0.94	1.18	5	200	4	25	0	0	2021	2021	10.7	5
97784	1.23	0.96	5	200	1	25	1	0	2021	2021	10.7	5
97785	1.15	1.08	5	200	2	25	1	0	2021	2021	10.7	5
97786	1.06	1.18	5	200	3	25	1	0	2021	2021	10.7	5
97787	0.98	1.33	5	200	4	25	1	0	2021	2021	10.7	5
97784	1.09	1.03	5	200	1	24	0	1	2021	1200	7.7	0
97785	1.02	1.01	5	200	2	24	0	1	2021	1200	7.7	0
97786	0.93	0.99	5	200	3	24	0	1	2021	1200	7.7	0
97787	0.95	1.13	5	200	4	24	0	1	2021	1200	7.7	0
97784	1.14	0.94	5	200	1	24	1	1	2021	1200	7.7	0
97785	0.97	1.01	5	200	2	24	1	1	2021	1200	7.7	0
97786	1.02	0.91	5	200	3	24	1	1	2021	1200	7.7	0
97787	0.76	1.25	5	200	4	24	1	1	2021	1200	7.7	0
97784	1.08	1.01	5	200	1	25	0	1	2021	600	4.5	0
97785	1.11	1.03	5	200	2	25	0	1	2021	600	4.5	0
97786	1.01	0.98	5	200	3	25	0	1	2021	600	4.5	0
97787	0.95	0.90	5	200	4	25	0	1	2021	600	4.5	0
97784	1.48	1.05	5	200	1	25	1	1	2021	600	4.5	0
97785	1.38	1.44	5	200	2	25	1	1	2021	600	4.5	0
97786	1.26	0.92	5	200	3	25	1	1	2021	600	4.5	0
97787	1.20	1.07	5	200	4	25	1	1	2021	600	4.5	0