From:	Beaudette, Dylan - NRCS, Sonora, CA
To:	Wood, Jennifer - NRCS, Davis, CA; Tallyn, Ed - NRCS, Davis, CA
Cc:	Houdeshell, Carrie-Ann - NRCS, Davis, CA
Subject:	RE: RV Definition NSSH Proposal_171117 - PB comments
Date:	Wednesday, December 20, 2017 12:39:44 PM
Attachments:	image001.png

Ed, thank you for the for detailed commentary. Your concerns about the proposal are actually quite similar to many of the concerns that I have with the DSM team's approach to CONUS-scale soil property modeling.

I have added some notes / ideas / follow-up below in **bold font**.

From: Wood, Jennifer - NRCS, Davis, CA
Sent: Wednesday, December 20, 2017 11:23 AM
To: Tallyn, Ed - NRCS, Davis, CA <Ed.Tallyn@ca.usda.gov>
Cc: Houdeshell, Carrie-Ann - NRCS, Davis, CA <Carrie-Ann.Houdeshell@ca.usda.gov>; Beaudette, Dylan - NRCS, Sonora, CA <Dylan.Beaudette@ca.usda.gov>
Subject: RE: RV Definition NSSH Proposal_171117 - PB comments

This is great feedback Ed, thank you. Exactly what we are looking for I think.

That is a really good point about the clay example we give. Maybe that is a good place to talk about what a soil scientist might do in that situation: Go back and reexamine the group of pedons that were used - Were the field estimates reliable? Were they correctly classified? Were all the other properties of that pedon within the range of the component. Do you remove the pedons with the higher values out of the data set? Make a conscious decision to populate outside the particle-size class for that component? Make a conscious decision to restrict the upper clay to the class value because that is representing the central map unit concept and interpretive values that you want to represent?

[Beaudette, Dylan - NRCS, Sonora, CA]
As stated below, this tiny example would be an excellent source for documenting "what would a soil scientist do?".

Not quite sure how to communicate that, but it goes to the core of what we do when populating the tabular database. The more explicit we can be about the way the data were derived the better, even if it involves qualitative approaches.

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From: Tallyn, Ed - NRCS, Davis, CA
Sent: Wednesday, December 20, 2017 11:02 AM
To: Wood, Jennifer - NRCS, Davis, CA <Jennifer.Wood@ca.usda.gov>
Cc: Houdeshell, Carrie-Ann - NRCS, Davis, CA <Carrie-Ann.Houdeshell@ca.usda.gov>
Subject: RE: RV Definition NSSH Proposal_171117 - PB comments

Good morning Jennifer
I too did not want to argue the point since I have made my opinion known and the proposal has marched forward and is currently on the standards table for comment. I will briefly state my "opinion" on the proposal.

[Beaudette, Dylan - NRCS, Sonora, CA]

Sometimes I get wrapped up in the argument part of the discussion, so I apologize if that got in the way of me hearing your commentary until now.

Using statistics on the environmental factors from raster data is appropriate. There are thousands if not tens of thousands of values that are being analyzed making the sample size large enough that statistics are appropriate. Ultimately I'd prefer that when we go to raster soil maps that we only concentrate on the soil properties and let the precipitation, slope and other raster data sets stand on their own with their own set of metadata and confidence.

[Beaudette, Dylan - NRCS, Sonora, CA]
I agree that we should eventually let the ancillary data stand on their own, perhaps via reference to a specific map or time interval of relevant climate data.

Your example for the NSSH uses 11 clay percentages. It's been too long since I've had a formal statistics course but is the sample size large enough to give a meaningful R? With this year's increase in goal and with subsequent increases, will we ever have a sample size large enough to be statistically valid?

[Beaudette, Dylan - NRCS, Sonora, CA]
Short answer: yes, as long as we can collect 5 or more observations that are reliably grouped.

Stats classes that we took in college or high school were largely focused on the topic of hypothesis testing: "is there a measureable difference between a vs. b?". Sample size is a critical component of that framework, along with other assumptions such as sample independence and approximately normally-distributed values.

Fortunately, that framework isn't typically relevant to soil survey work--we don't have the luxury of designed experiments, distributions aren't always approximately normal, samples aren't independent, and we don't care about "statistical differences", we care about practical or functional differences.

Percentiles are and ideal approach to summarizing data in exactly this context--as long as you

have 5 or more observations. Clearly, the trust we can place in the calculated percentiles is a function of both sample size and confidence in our grouping criteria.

We are soil scientists, not soil technicians. A technician will dig a soil pit, describe the pedon, enter the data into the database, push a button and accept whatever the results are because that's what the computer program results are and it must be right. My fear is that with continued automation we will lose the scientist part of our jobs and just accept what the computer dictates. How many of the soil scientists can examine the AASTO or UNIFIED classification and know if it's right (of course it's right since it is a calculation but one percentage point could change the class) let alone determine the classification in the field? I've discussed this with some of the new soil scientists and they don't hav3e a clue what or how AASHTO is calculated.

[Beaudette, Dylan - NRCS, Sonora, CA]
I agree whole-heartily! The march towards automation of science scares me both as a scientist and as someone who derives an income from a specialized skill set. I expressed these exact concerns when I submitted a review of the SoilGrids+ paper several months ago.

Perhaps we can be more explicit in the proposal (and similar communication) about the difference between science and technical work. As I have mentioned in a comment to the standards staff:

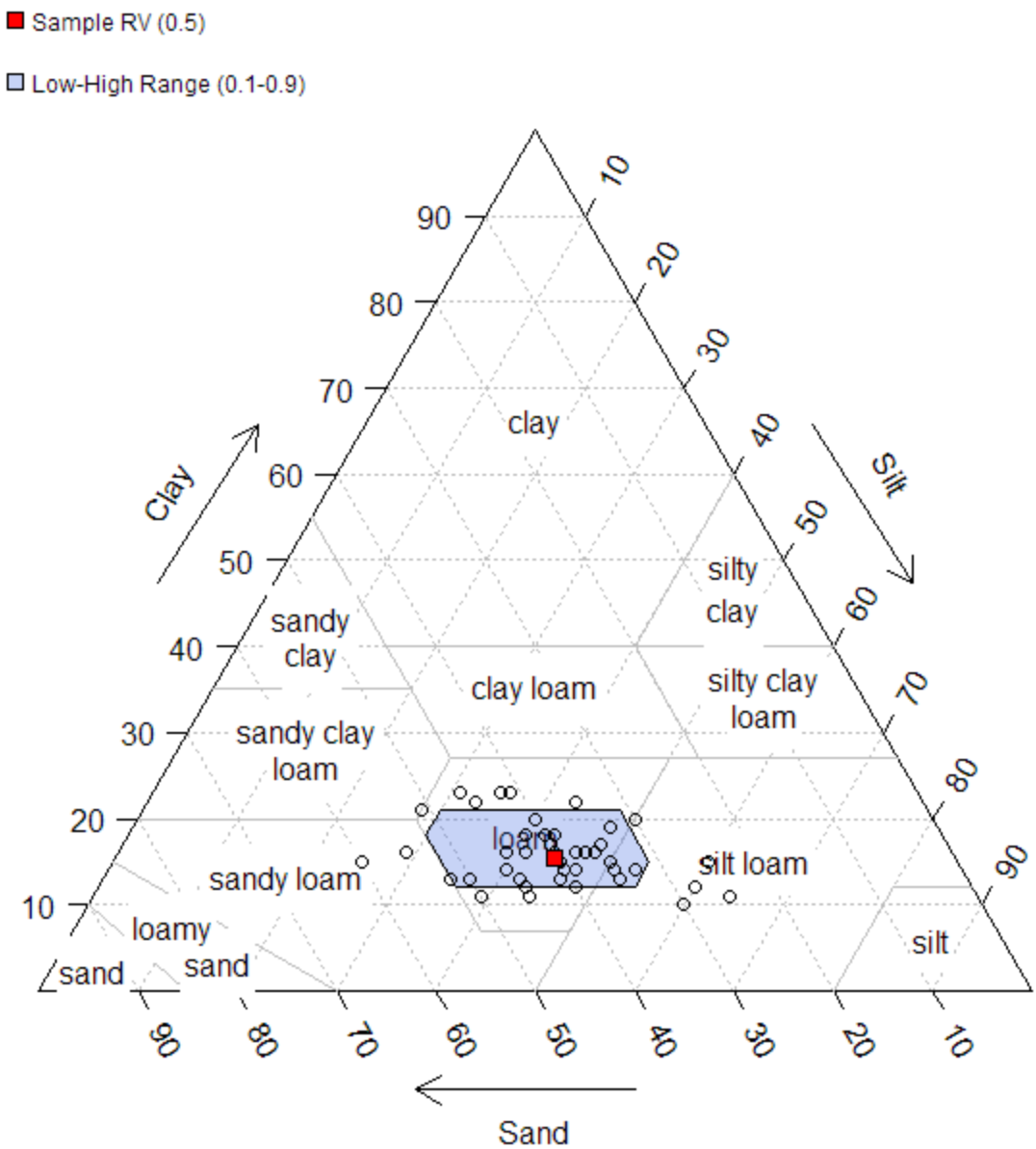
Removing subjectivity from the aggregation process was a large part of the motivation for this proposal. Perhaps we can adjust the wording to emphasize that (given sufficient data) percentiles are a scaffolding upon which objective RIC can be built and customized.

You bring up an important subtext vis a vis-a-vis AASHTO: there is a lot of mechanical manipulation of data in NASIS via calculation. I for one would like a better understanding of what our calculations are doing and what key assumptions are built into the process.

The example in the NSSH proposal reinforces my opinion. The clay crosses 2 class limits and not by just a few percentage points, 6 lower and 5 higher than the fine/coarse loamy break. How similar or contrasting will the interpretations be for 16 percent compared to 24 percent? Okay maybe it's a lithic soil and the bedrock is the most limiting but I would chose a different example. What is the central concept of the soil?

[Beaudette, Dylan - NRCS, Sonora, CA]
The example was derived from "A" horizons from a subset of pedon data correlated to Loafercreek. Using the entire set may have been more realistic, but we were trying to save some space.

Here is a representation of the "full" set of Loafercreek "A" horizon data on the texture triangle:



Note that the 10th--90th percentile does a reasonable job of capturing the variability, even when the variability jumps classes. We all know that there is no reason for a given horizon or soil to fit nicely within our morphologic or taxonomic boxes.

I understand the complications that such a wide RIC would create, but perhaps that isn't a problem--given that the percentiles are a framework for objective development of a RIC. If the RIC generated by a repeatable process (e.g. the proposed changes to NSSH) yields unacceptable results then perhaps there are other issues at hand: pedon correlation, inter-staff variability, etc..

It might be useful to write a short document on the development of objective, reasonable RIC. It should contain all of the questions you have posed here, along with some expert guidance on the matter. In fact, this would be an excellent addition to the current "stats" class or whatever we come up with for RO2.

Yes with every passing day I'm becoming more of an older fart but soil survey has always had a bit of an art to it and the soil scientist were allowed to use their tacit knowledge to portray the landscape to the best of their abilities. I don't want this to be replaced.

[Beaudette, Dylan - NRCS, Sonora, CA]
I know the feeling. We have to consistently insert our expertise into the conversation otherwise we risk irrelevance and poor decisions made by others. However, we also risk irrelevance when we fail to communicate how we arrived at a given set of values or interpretations. We may not be able to get away with justification based on "because I said so" for much longer.

I think that this proposal (with additional commentary and documentation on how to impose expert judgement) positions our work and discipline favorably in both integration of expert knowledge and scientific rigor.

Ed Tallyn
Senior Regional Soil Scientist
Pacific Soil Survey Region

From: Wood, Jennifer - NRCS, Davis, CA
Sent: Wednesday, December 20, 2017 8:17 AM
To: Tallyn, Ed - NRCS, Davis, CA <Ed.Tallyn@ca.usda.gov>
Cc: Houdeshell, Carrie-Ann - NRCS, Davis, CA <Carrie-Ann.Houdeshell@ca.usda.gov>
Subject: FW: RV Defnition NSSH Proposal_171117 - PB comments

Good morning Ed. As usual, I came across too strongly yesterday in the meeting about this rv proposal. I didn't want bring that much emotion into it!

Below is a separate email I sent to Curtis and Ken and Paul just to see if they agreed with our thinking on one aspect of this proposal. It is what I was attempting communicate in the meeting yesterday. There is one response from Ken that seems to more address the issue about how to tell which is the older data vs the newer data.

But to hopefully clarify even a little more about what I was trying to say yesterday:

Say we have component pedon data with A horizon rock fragment values from various delineations or from different places in a delineation as follows:

0, 2, 2, 2, 2, 2, 5, 5, 5, 7, 25

Using the percentile approach, the l-rv-h would be 2-2-7, based on the data list. That is pretty much what I would have used to populate CA601, without thinking about it being a percentile.

Is your objection more about the danger of having people use the computational summaries blindly and strictly, rather than thinking about whether the number spit out is reasonable or whether it comes from the correctly grouped pedon data? Perhaps we can add some language related to that in there?

The problem is that now there is no definition at all.

From: Scheffe, Kenneth - NRCS, Lincoln, NE
Sent: Tuesday, December 19, 2017 2:13 PM
To: Wood, Jennifer - NRCS, Davis, CA <Jennifer.Wood@ca.usda.gov>; Monger, Curtis - NRCS, Lincoln, NE <Curtis.Monger@lin.usda.gov>
Cc: Beaudette, Dylan - NRCS, Sonora, CA <Dylan.Beaudette@ca.usda.gov>; Paul Benedict <soilwarden@verizon.net>
Subject: RE: RV Defnition NSSH Proposal_171117 - PB comments

Good afternoon Jennifer,

Thank you for the clarifications. I agree that we don't want to have to recompute all populated values for (l, rv, h), but I would like to encourage field staff to look critically at the data with an understanding of what we populated and how, prior to having the robust NASIS data system. I know we made many entries for various properties that we based upon crude calculations and generalized guides. We tended to be broader than what the range was known to be, always anticipating we would 'tighten it up' once we got that survey area in to the MRLA update process. I, for one, didn't feel too good about some of the data population we performed to fill the NASIS voids. Some were S.W.A.G.s (Scientific Wild-Ass Guesses). For others NASIS, gave us an opportunity to record what we really knew, but had no place to record on SSSD or the Form-5. It's a mixed bag. Much of it is very good, but I would suggest we address these concerns and resolutions in a record(?) somewhere stored in NASIS or metadata for those who might wonder about or question what we have done as we have progressively moved data forward.

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From: Wood, Jennifer - NRCS, Davis, CA
Sent: Tuesday, December 19, 2017 3:44 PM
To: Monger, Curtis - NRCS, Lincoln, NE <Curtis.Monger@lin.usda.gov>
Cc: Beaudette, Dylan - NRCS, Sonora, CA <Dylan.Beaudette@ca.usda.gov>; Scheffe, Kenneth - NRCS, Lincoln, NE <Kenneth.Scheffe@lin.usda.gov>; Paul Benedict <soilwarden@verizon.net>
Subject: RE: RV Defnition NSSH Proposal_171117 - PB comments

Dear Curtis, Ken, and Paul,

I thought I would also write separately, to work through something I think we want to communicate. Either we are off-base or not communicating clearly – equally likely to be true!

We want to say that there is no need to specifically repopulate legacy values to accord with this proposed, approximate definition, because they already do. Also want to communicate that it is not necessary to computationally derive values from a lot of data in order to populated the database with this approach in mind. I believe that how we have populated l-rv-h values in the past is actually pretty close, philosophically, to the proposed approach - even if we were eyeballing data from individual pedons and field notes:

- We used values from the observed data set
- We picked rv values that generally fell within the middle of the ranked values observed
- We didn't use the full range, when very high and very low values were not commonly observed.

This is pretty close to the percentile approach.

To further include legacy data under the umbrella of the percentile approach:
Even class limits could be common low/high values in a ranked set of observed values.
Values of 0 could easily end up as a 5th or 10th percentile value if that is a commonly observed value in the soil/on the landscape
Component data can always be subsets of mapunit values - field observations and knowledge help create custom ranges

Fun stuff right?

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Sent: Tuesday, December 19, 2017 12:41 PM
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Cc: Beaudette, Dylan - NRCS, Sonora, CA <Dylan.Beaudette@ca.usda.gov>; Stiles, Cynthia - NRCS, Davis, CA <Cynthia.Stiles@ca.usda.gov>; Tallyn, Ed - NRCS, Davis, CA <Ed.Tallyn@ca.usda.gov>; Scheffe, Kenneth - NRCS, Lincoln, NE <Kenneth.Scheffe@lin.usda.gov>; Paul Benedict <soilwarden@verizon.net>

Subject: RE: RV Defnition NSSH Proposal_171117 - PB comments

Thank you Paul and Ken,

Those are great comments, including ones that had been made in Boise that I had neglected to record and accommodate.

There were more people than just me and Dylan who put this together, so I am circulating this to them so we can respond to/modify the proposal.

I appreciate your time and insights.

Jennifer

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From: Monger, Curtis - NRCS, Lincoln, NE
Sent: Tuesday, December 19, 2017 11:28 AM
To: Wood, Jennifer - NRCS, Davis, CA <Jennifer.Wood@ca.usda.gov>
Cc: Beaudette, Dylan - NRCS, Sonora, CA <Dylan.Beaudette@ca.usda.gov>; Stiles, Cynthia - NRCS, Davis, CA <Cynthia.Stiles@ca.usda.gov>; Tallyn, Ed - NRCS, Davis, CA <Ed.Tallyn@ca.usda.gov>; Scheffe, Kenneth - NRCS, Lincoln, NE <Kenneth.Scheffe@lin.usda.gov>; Paul Benedict <soilwarden@verizon.net>
Subject: FW: RV Defnition NSSH Proposal_171117 - PB comments

Hello Jennifer,

Pasted below are comments by Ken Scheffe and Paul Benedict on the RV Definition proposal. Also see the attached document with Track Changes.

Please address the comments and send a revised proposal (or rebuttal). If you would like to discuss any of the comments by phone, please let me know. Once received, I will post the RV proposal for its 30-day comment period.

Thank you and let me know if you have any questions.

Curtis

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ALSO, need to remember we populated map unit component data, which may have been wider, or narrower than the series named in the map unit. Similarly, there were certainly real world occurrences, for example, where we had a soil with a fine-loamy argillic (upper 50cm for the family class) that very often was a sandy clay loam, however, it was known that on occasion in the 'real world' there were layers in the argillic that were actually heavy fine sandy loams at 18-20% clay. This is still in the fine-loamy family, but we might have only entered the weighted average for he control section (sandy clay loam) to avoid potential confusion. When the clay 'low value' was assessed and entered, we probably used 20% for the sandy clay loam class limit.

As you stated, similar situations and accommodations were likely made for all the entries of low, representative value, and high. And also, sometimes the value of zero is appropriate for such things as salinity in leached soils, slope on level soils, etc. I don't know that using the 5 or 10 percentile is appropriate when values of zero real. You also mentioned in your track changes the need to avoid creating 'gaps' between classes if we restricted the current class limits to the 5th and 95th percentiles of that class.

Perhaps this is not so easy to do with existing data for (l, rv, h) as some would like to think.

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From: Paul Benedict [mailto:soilwarden@verizon.net]
Sent: Tuesday, December 19, 2017 11:10 AM
To: Scheffe, Kenneth - NRCS, Lincoln, NE <Kenneth.Scheffe@lin.usda.gov>
Subject: RE: New RV definition proposal for NSSH

Yes, your points were what I was thinking (although not in the detail you used) when I said I wondered if the same rules need to apply to all data elements. Sometimes for example, the lower value really should be a zero, even if the 10th percentile is a 0.1.

Paul

From: Scheffe, Kenneth - NRCS, Lincoln, NE
Sent: Tuesday, December 19, 2017 9:55 AM
To: Monger, Curtis - NRCS, Lincoln, NE <Curtis.Monger@lin.usda.gov>
Subject: RE: New RV definition proposal for NSSH

Good morning Curtis,

I read the proposal by Dylan and Jennifer regarding the population of low, rv, and high values in the NASIS database using percentiles. It is a good proposal and would allow our scientists to increase the accuracy/precision in the database. I believe this is the correct way to move forward, but I have a few caveats and perhaps warnings that need to be considered.

The original population for low, rv, high values in NASIS most often was not with observed values, but actually represented the numeric limits of descriptive classes for the property or feature. In some circumstances, the low and high actually represented the limits spanning two adjacent classes (soil reaction or pH was one of these).

For example, if the texture was recorded in SSSD or the Soils-5 as 'sandy clay loam' the population of low, and high values for clay percentage in NASIS would have been low=20%, high=35% --- the class limits for clay for the texture 'SCL'. We were permitted to modify the range with observed limits and the rv was to be the most commonly observed value based upon the experience or other supporting data. However, most often, there was no one with field experience, nor time, nor desire to populate individual layers with tailored data. We were 'instructed' by National Bulletin to populate l, rv, h – just get it done because it was needed now in order to generate new calculated interpretations (every property, every horizon, every component, every map unit, every survey in the state – and do it this year!)

In NM, we were fully engaged in initial and update projects under reimbursable agreements during this time, so we had limited time/staff to research manuscripts, laboratory data, or field notes, so we developed routines to query for properties, such as texture = scl, and would populate in-mass using NASIS calculations, the low, rv, and high values at the class limits, and the rv as an approximation of the middle of the class. I don't believe NM was different than many other state, so much of the original population of l, rv, h in NASIS was by algorithms which generated class limits and a median value.

Not all is lost. It has been 15 years since this was done. Survey offices have done a lot of update work, and hopefully during this time, have adjusted the low, rv, and high values away from strict class limits with observations, lab data, and descriptive narratives gleaned from available sources to better approximate the real world. Kudos to those who tailored their data. The problem is knowing which values for low, rv, and high have been tailored and which have not. Perhaps the most telling thing would to be look for populated values that correspond to descriptive class limits as they likely have not been appropriately adjusted.

My concern, in addition to those expressed in the proposal by Dylan and Jennifer, as we go into this percentile representation of low, rv, and high would be a direct conversion, or simply a redefinition

of data elements to the 5 or 10 percentiles and 90 or 95 percentiles. I don't believe it to be wise to simply redefine the terms low, representative value, and high to the percentiles without actually validating the numbers. It would give the impression of a more statistically evaluated entry, without actually being true. I didn't see anything in the proposal by Dylan and Jennifer that indicating an evaluation method to assure appropriateness or validity would be performed as part of the redefinition. I'm not worried about new data population based upon observations or measurements, but rather the legacy entries that simply represent the lower and upper limits of descriptive classes and the median value (rv).

I think we should move forward on the proposal, but we probably need to talk with Dylan and Jennifer to see how this would be done. It is not simply or only a redefinition of terms in the NSSH. I believe the only honest way to do this would be to design and effort or initiative to systematically evaluate whether the current entries represent class limits, or are tailored values based upon observations, measurements, and documentation. If the entries represent class limits, we need to evaluate and adjust them to more appropriate values which represent the reality on the ground for the appropriate percentile being used.

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From: Paul Benedict [mailto:soilwarden@verizon.net]
Sent: Tuesday, December 19, 2017 10:30 AM
To: Monger, Curtis - NRCS, Lincoln, NE <Curtis.Monger@lin.usda.gov>; Scheffe, Kenneth - NRCS, Lincoln, NE <Kenneth.Scheffe@lin.usda.gov>
Subject: RV Defnition NSSH Proposal_171117 - PB comments

Hi Curtis,

I had some comments and suggestions on this proposal. A clear guide on low, RV and high values is probably needed, but I also wonder if the same rules need to apply to all data elements. I hope my comments don't come across as too negative as I know this issue is important to those that proposed it and they are the ones dealing with this issue in their daily work and not me.

Thank you,
Paul Benedict
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