Curve Number Oral History Interview: Miguel Ponce

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SPEAKERS
Glenn Moglen, Donald Woodward, Victor Miguel Ponce

Glenn Moglen 00:02
Okay, we've started recording. So just so we have it on tape. Miguel, are you comfortable with us recording this interview?

Victor Miguel Ponce 00:17
Yes, of course.

Glenn Moglen 00:18
Wonderful. And so, our group's habit is after we finish a recording, we will use that recording to develop a transcript. And in that process, I usually upload the video to an unlisted location at YouTube. In your case, I can just simply give you the link, and you can share it freely.

Victor Miguel Ponce 00:52
That is fine. That would be fine.

Glenn Moglen 00:54
Wonderful. Well, before we get started, do you have any questions about the process?

Victor Miguel Ponce 01:05
No, I think it's pretty straightforward. I read the questionnaire. And I must be honest and tell you that I may not be able to answer all your questions, but I will try.

Glenn Moglen 01:21
Whatever answers you have, will be welcome. And yes. And if there are items that you don't have an answer for, then that's fine. Okay, so I just like to read this introductory material into the record. So today is Tuesday, June 22, 2021. And today, we are interviewing Victor Miguel. And helped me (to pronounce your last name).

Victor Miguel Ponce 02:00
Ponce.

Glenn Moglen 02:08
And Miguel help me ... your current status is? Are you retired? Are you still teaching?

Victor Miguel Ponce 02:21
I am in what they call FERP status, which means Faculty Early Retirement Program and legal status as well as many other universities. I'm sure throughout the United States there is a transitional retirement program. It's a five year... up to five years, you can choose one to five years. After five years, then you fully retire. I'm beginning my fourth year of transitional retirement. So that means that in two more years, I will completely retire. I'm old enough anyway.

Glenn Moglen 02:54
Okay, so you are currently in a transitioning towards retirement professor at San Diego State University. You're active in ASCE and I assume other professional societies as well.

Victor Miguel Ponce 03:15
Yes. My title at this point is Professor Emeritus. They add the emeritus when you retire and I am technically retired. But the way the system works, they try to help the faculty that are retired but still not totally out, you know. So just about everybody, not everybody. I know people that have just retired and that's it, they disappeared. But a lot of retiring faculty take this option of FERPing, as they call it. It's a verb now, you FERP.

Glenn Moglen 03:57
Well, congratulations on your emeritus status. And so you know, this interview is being conducted as part of ASCE's Watershed Management Committee's Curve Number Hydrology, subcommittee's Oral History Project. That's quite a mouthful. And we're conducting this interview via zoom. And as you know, this interview is being recorded. You are, I assume, at home or somewhere in San Diego?

Victor Miguel Ponce 04:31
I'm at home right now. I have a setup where we have several computers here. Just in case, you know, if something fails, you always have a backup and another backup. I taught online for a year last year during the pandemic. And this year, interesting, if you care to listen. The California State University, of which San Diego State University is part of, has permitted some faculty to teach either virtually or 50:50 hybrid. I chose a hybrid mode so I'm going to be teaching 50% from home and 50% at the University "presential", I guess that's what they call it. I chose that way of doing it. I think it contributes to global warming. Just kidding, I mean it contributes to stop global warming because people don't drive. But at any rate, that's the status here. I am at home. Short answer. That's just the background. It's a fancy background.

Donald Woodward 05:53
The palm trees in the ocean. Wow!

Glenn Moglen 06:00
And so Don, you are I assume at home as well.

Donald Woodward 06:06
Yes, I'm at home.

Glenn Moglen 06:08
And I'm actually at work this morning. Wow, this noon, in Beltsville, Maryland. So let's get into it. So maybe Don, you and I will alternate asking questions, if that's okay. I'll go first. So, Miguel, professionally, how would you characterize your work throughout your career? What would you call your primary title and possibly other titles?

Victor Miguel Ponce 06:47
A little bit of background, I studied civil engineering in Lima, Peru. I'm originally Peruvian. About 40, a little more than 40 years ago, actually, 47 years ago, I came to the United States to pursue a PhD at Colorado State University. And then one thing led to another and I was offered a job at my alma mater at Colorado State when I graduated, so I'd stayed and I started climbing the, I guess you could say, the stairs of academia. And here I am 40-something years later. So my basic degree is in civil engineering, but I chose graduate school at Colorado State. As most of you know, Colorado State specializes in water. And I was going to Colorado State because of their water program. And there I got a degree in hydraulics. I should tell you that Colorado State was such a huge place that they had seven or eight water programs or subwater programs, among them hydraulics, hydrology, water resources, water resources systems, irrigation, and so forth. So you as a student had ample choice, you could do this, you could do that. I picked hydraulics, because that was where my heart was at the time. But since then, I have expanded into hydrology, water resources, I mean, we've done a lot of things. I guess people choose what they want to do if they can, of course, if somehow the situation allows it. So my career has been very interdisciplinary over the last 20 years. But 40 years ago, I was a sediment man; sedimentation. That was the start of my career. I studied under Daryl Simons and Khalid Mahmood. Daryl had a big operation out there. And he had faculty members helping students. So those two people plus Everett Richardson were my three mentors at the time.

Glenn Moglen 09:09
Small world - I got my masters at CSU. And I actually earned my MS at the same time as Everett Richardson's son earned his PhD.

Victor Miguel Ponce 09:23
Yeah, he's at University of Missouri (Kansas City) now.

Glenn Moglen 09:28
Jerry, you're talking about Jerry Richardson.

Victor Miguel Ponce 09:30
Jerry, right.

Glenn Moglen 09:31
I think that's right.

Victor Miguel Ponce 09:36
I've communicated with him off and on. As a matter of fact, when Rich, his Dad, passed away, somehow we got to communicating and he sent me a video that Rich (we called him "Rich" Professor Richardson) had put together a year or two before he passed away. And I posted that video on my site. It's a great video to remember, for those people that are fans of Colorado State, and there's a lot of them. Colorado State was and continues to be a huge place; a huge place for studying hydraulics.

Glenn Moglen 10:23
I'll pass it to you. Don,

Donald Woodward 10:24
You told us kind of how you chose hydrology. But I'd like to know how you found out about curve number hydrology?

Victor Miguel Ponce 10:37
Well, that's kind of a long story. I don't know if I should give you the short version or the long version. We have an hour, but I guess we'll do whatever. The short version, right?

Donald Woodward 10:53
Yes.

Victor Miguel Ponce 10:54
Six years into my teaching, this is interesting... Sometimes I'm like (Vic) Mockus, I try to ad lib. First, I should tell you, that when I went to San Diego State in 1980, I had been labeled, you know, "hydraulic engineer". And the chair of the department, Prof. Noorany, at that point, said to me: "Ponce, I know you're a hydraulics man, but can you teach hydrology?" What was I going to say? I said, "Yes". So that was my initiation in hydrology. Then, six years later, I had been teaching hydrology in and out. And I felt that because I was the hydrology person at San Diego State, I thought I knew the subject and I decided to write a book. So I took three years '86 to '89. Actually, it was two and a half. And then we had it published by Prentice Hall. And in order to do the research to write a book, well, I already knew it and I already had taught it. So after writing the book, I became a hydrology expert. Not too many books in hydrology, there's a few but not too many, maybe five or six in the U.S. Of course, there's books all over the place around the world, but those are foreign books, let's say. So, I became a self-anointed expert in hydrology. And that was 1989, when I published my book, because I was teaching. That was basically it. I became a hydrologist. I had not left hydraulics; I kept teaching hydraulics. The first class I taught was Computational Hydraulics. So, I inaugurated a course in computational hydraulics at San Diego State. But I was a flood routing person. You gentlemen know that routing sits in the middle between hydraulics and hydrology, I also call myself hydrologist. So I called the course computational hydraulics and hydrology to emphasize that I was not making a fuss between these two fields. So that was my initiation in teaching. I reviewed the curvenumber. I should have known it already from my

classes at Colorado State, but you always have to review two or three times before you can actually learn it. So by the early 90s, I was already a recognized hydrologist because I had written a book. Okay, and how did I get to the curve number? Oh, boy, that is a very good question. I'm not sure if I should talk about all the details. Maybe I should. Okay, back in 1993, because I have good memory with dates, I was invited by the Army Corps of Engineers to a meeting in Denver. And I met personally with Pete Hawkins there. I had known Pete already through the mail, but not personally. So I met with Pete Hawkins and we got to chatting. And I said point-blank to Pete, "Pete, let's write a paper on the curve number. Because I know you know the curve number, and I know how to write a paper." Because I did. At the time, I had a record of about 30 or 40 papers. At any rate, so that was my introduction to heavy lifting on the curve number. Pete and I spent two years writing that paper, '93 to '95. And I should say that Pete was the most active coauthor that I had ever had, not that I had too many. But he was a very active coauthor, because most coauthors are kind of sleeping, you know, they let you do it. But not Pete. He was very active, he interacted with me a whole lot. And I was happy that was the case, because he was going to be the coauthor anyway, I believe that when a coauthor is a coauthor, he/she should coauthor, right? So we co-authored, and the paper that came out in 1996. And with our luck, and I've always been a lucky person, our paper came out on the first issue of the Journal of Hydrologic Engineering, in January 1996.

Donald Woodward 16:36
Wow.

Victor Miguel Ponce 16:39
We came out on the first issue. If you open up the first issue of Journal Hydrologic Engineering, 1996, there is Ponce and Hawkins writing about the curve number. So I guess that's the beginning of our heavy involvement on the curve number. I decided to write up a review paper. And you know, I've been around long enough to know that you don't write a review paper if you're a nobody. That's a fact. They turn you down. But I was not a nobody at the time. Plus, I had a heavyweight right next to me. So I said to me: We're not going to miss this! And we didn't. We published the paper. And it was a good paper, because one of the things that we have ... is that we know how to write, and we know how to write clearly. And when you write clearly, everybody reads it. That's a fact. Therefore, everybody read the paper, and they liked it. And they continue to like it. In my Google Scholar scale, listed with the most citations is my book, because everybody read it. But second on the list of papers with most citations is the paper on the curve number, with Pete Hawkins. I believe, at this point, 1100 citations, that paper that I wrote with the Pete Hawkins published in 1996. So that was the beginning. However, that's the beginning. There's more on that, but I'm hoping that you guys will ask me later on.

Donald Woodward 18:27
Okay, ... How far did you go back into Vic Mockus's work? To look at how he got the curve number?

Victor Miguel Ponce 18:43
Ah ha! Very specific question. No, I don't claim to have seen the original data. As you guys probably know, some of that data had been lost, or was lost. I basically trusted Pete. I wasn't going to argue with Pete. Pete had written 20 papers on the curve number. And I had written none. So I figured, you know,

I was going to do the writing, the nicely putting it together, and making sure that ... it was readable. But we did have a point of disagreement, if I am allowed to diverge a little bit.

Donald Woodward 19:30
Go ahead.

Victor Miguel Ponce 19:31
We did have a disagreement with Pete. One disagreement. I was going to take everything he did on face value. But I am an organizer; that's one of my strengths. And I felt that the curve number was a conceptual model. And Pete didn't agree with me. He said that it was empirical. And I said: "Pete, I'm sorry. This is conceptual, as far as I'm concerned, and I'm the lead author. You're going to have to take it." And he took it. He said, "Well, okay." So, for the first time, I believe, if I'm not wrong, the curve number method was labeled as conceptual. Now, I'm not sure if it's right or wrong, or if people have accepted it, but I do believe it is conceptual, because it's not empirical. It's based on empirical data. True. I mean, there was data from Waco, from Hastings, and so forth, and from places that Vic mentioned to me when I was there. But it is based on a concept that the curve goes up and it does not grow up infinitely. That it kind of achieves a constant value which is the S. So that, in my mind, is conceptual. And why is this conceptual? Because in hydrology, we have four types of methodologies: we have the deterministic based on physical equations, the stochastic/statistical which you guys already know, the conceptual which comes in third, which is an approximation based on some concept like VIc's. And finally, at the low end is the empirical. And this method was not empirical because, had it been empirical, it could not have been applied everywhere in the world as it was and as it is. So I defended the term conceptual and I imprinted it in our paper, forcefully, I think a little bit. You guys will tell me, or time will tell me, if I was right or wrong. But I do believe I'm right.

Donald Woodward 21:48
I think you're right.

Victor Miguel Ponce 21:50
Well, yeah, conceptual. Don't degrade the curve number calling it empirical. And don't raise it to the first level calling it deterministic because it isn't. It is not stochastic. So conceptual is the appropriate term among the classification of four types. Because in my book, ... I had already written my book by that time. And I had divided all hydrology into four types. And I believe that is correct. So having said that, I defended it. And I won the argument with Pete; I know he remembers this. And he'll be listening to what I say. So we inaugurated the definition of conceptual for this method. So basically, go back now to the answer. ...

Donald Woodward 22:48
I'm pretty much convinced you're right. Because, in my experience with Vic, that's how he thought.

Victor Miguel Ponce 22:59
Oh, yeah. Well, your experience goes far beyond...I had a two hour conversation with Vic. But like I said, it is not deterministic, it's not stochastic. A little bit statistical. Definitely not stochastic. And a little bit empirical. But the word "conceptual" fits there very nicely. More so. because Vic told me in his own

words, that he had developed a formula after trying many others, and finding that this formula fit the data better. So it was a good concept. It's a nonlinear fit.

Donald Woodward 23:44
I would have liked to have seen his scribblings on graph paper where he came to that conclusion. I've been aware of other things he did, but somehow the original work of Vic's got lost. And I think I can tell you why. But that's not here nor there.

Victor Miguel Ponce 24:09
And now I have to tell you as Ponce... I'm going to tell you the juicy part. Short. Okay, because I have a tendency to be long winded. But the short part is that I was invited to go to India to do some consulting over there teaching people how to do hydrology. It was catchment hydrology that I had been hired to do. So I went over there and spent three weeks with young scientists from the National Institute of Hydrology. They have five centers throughout India. And they hired, they used to at that time anyway, they used to hire scientists, well-recognized scientists, to go over there and teach their wares, the stuff they knew. So when I got over there, I was talking about watershed modeling and the curve number. And point blank, those kids asked me, "Where did this equation come from?" We were talking about the curve number equation, if I could explain it to them. And that's when I really, really had to do my work, which I had not done when I wrote the book, because I'm talking here about 1991, 1992. We wrote the book in 1987. I said, "You know, let me think about it. I'll give you an answer tomorrow." So I went to the hotel, and I sat for a couple of hours on that equation, on the famous equation. Trying to figure out, or trying to justify the work of Mockus to the students. And I basically came up with the conclusion that somehow that was the formula that he chose, which is correct, right. So I went back, and I said, "Well, you know, this is a formula that was based on data, which he chose. It does not have, like empirical formulas that you know very well, coefficients or exponents pulled out of the air. This one is very specific. Although at the end, they did pull out of the air the 0.2 (for Ia/S), but that's another story. We'll get there when we get there.

Donald Woodward 26:24
We are going to get there.

Victor Miguel Ponce 26:26
I justified myself saying that that was it. That was it. But ... they also wanted to know the conversion, where the conversion from S to CN came from. That's where I hit a snag ... Because I really didn't know at the time, I couldn't realize that it was just a conversion. It was a mapping equation. And we later described that as a mapping equation. Nobody could argue with Mockus's mapping, because it was his mapping. I could have done another mapping, but I'm not Mockus. Okay, so Mockus mapped the equation with the 10 in the denominator that you guys are familiar with. And he says, this is where I'm going to go, because I'm going to have the curve number vary between one and 100, no more than 100 or less than one. And this is Mockus's mapping equation, because that's where most people wonder, Where did this come from? You know, if it's a mapping equation, you can come up with another mapping, and it'd be your equation. But you're not Mockus.

Donald Woodward 27:34

That's for sure. Now you just mentioned that you spent two hours talking to Mockus. Yeah. Less than two hours, an hour and 45 minutes. Okay. When he had retired, and you're still working, and at your website, you have the notes of that meeting. I guess is the best way I can say it...

Victor Miguel Ponce 28:17
It's true. You want me to tell you the story?

Donald Woodward 28:21
Yes. You're supposed to let me ask the question. Would you please tell the story?

Victor Miguel Ponce 28:30
Okay, so we published a paper, okay. And when you publish a paper, people have a chance for six months, I believe, to discuss it, so that you can close at the end. So we had three discussions. One discussion, I don't remember the names right, now you can go to the record. Two of them were, I guess you can say, inoffensive, meaning they were just people writing discussions to get themselves on the record. Right? That's understood. So there were two discussions to get yourself on the record. And there was one discussion which was a little bit belligerent. I don't want to mention names; it is not necessary. So then I got together with Pete and I said, we got to come up with a closure, and I better prepare myself because it's the only chance we have to tell our story, or try to set it straight if we had made a mistake, or whatever. So that's when I decided to interview Mockus. Because I was going to go to the, as they say, the lion's mouth. So I called Don, and I think Don, you will remember that I asked you if Mockus was still alive, and you say yes, as far as we know. I said, Well, I'm going to look for him. And I remember very clearly that you, Don, said, Good luck! Because you never talked to him. I said, really? Yes. It's because Vic is mad at us, I said, Whoa, that's interesting. Well, I don't want to get into this situation, too. Why is he mad at you, or whatever. Besides, he retired 20 years ago. I mean, people retire in their middle 60s or early 70s. This guy was well past that age. So then, I said, well, you know, Don, I'm gonna try it. I can only try. So I tried, I developed into a detective to figure it out where he was; I felt that the last name Mockus was not very common. And I was wrong. There's a lot of Mockus in the United States. I didn't know at the time that it originated in Lithuania. But later I found out; actually, he told me because I, being ethnic myself, asked him, what was his ethnic background? So he did tell me that he was originally from Lithuania. So basically, that was it. So I looked him up, I found him, even though at that time, it was hard. Now, it's easy. Everything's posted on the web. But at the time, the web was just getting started. But I did find him. I was lucky. And I called him up. And I said, Well, I said to myself....what he could do is he could hang up the phone on me. Fine, you know, everything attempted and tried. But he did not hang up the phone. He did not. And why did he not do that? Because I basically point blank told him that I was writing a paper, or had written a paper on his method. And wanted to get to the foundation of the method, since I had not developed the method. It was he that had written the method, so I put it on him. And that's one way of winning. Okay, you put it on him not on you. ... We need to get to the bottom of how this thing was created. The formula? Where did it originate? ... and so forth. And I used a tool that is a very well known. And that is that the farthest you come from, the friendlier, or the more of a friend, you are. And I said to him, I'm a professor from California. That opened the doors. Had I been a professor from Maryland, he probably would have shut the doors on me. But being from California, that (was) ... different and ... he accepted. He said, "Okay, you can come tomorrow." So I was there promptly at three o'clock the next day. And that was it. That

was the beginning of the interview. The origin of the interview, is how I found him on the phone. I had gone to D.C. to do some other work, some research, I believe. And I was taking advantage of the fact that I was already in D.C. to meet with the Mockus. And I was, at a time, writing the closure. That was the objective.

Donald Woodward 33:53
Okay, good. And how much did Vic tell you about his original datasets?

Victor Miguel Ponce 34:03
Not too much. As you can imagine, we didn't have a whole lot of time. I didn't want to load on the gentleman. He was an old gentleman anyway. At the time, he was 83 years old, he told me, so I did not want to load him with details. I was really interested, and that was the crux of the matter, in how did he develop the two equations that were at issue in India, which were: 1) the general equation, and 2) the conversion from S to CN. And that was the two. For the S to CN I already had some inkling as to how that had been done. It was to better the presentation of the method, to come up with a parameter that everybody would understand. That was fine. But the curve number equation, that was a little more difficult. So I asked him point blank at the beginning... although to answer your question, he dwelled on the origins, but not too much. So you won't really get a whole lot ... he did talk about Waco and Hastings. He did say that they had used, or his group had used those two sites at the beginning, and I'm not sure if that is correct or not. But you mentioned Waco, Texas, and Hastings, Nebraska. But like I said, from the origin, I didn't get too much from him. But he did say something important, which I really was after: "Where and how did he originate the famous equation?" He said, and I quoted him in my report of it, because I thought that was really cute. Because I had the same experience. He said one day, and on the kitchen table, you know, just working. And it just occurred to him that that was the equation that best fitted the data. That was the origin of it, and I was happy that I was able to find that he had done it on the kitchen table. Because I had also done a lot of things on the kitchen table. So I can relate to it. I said, Hey, yeah, that's the way, because you're working after dinner, and so forth. And that was it. So the kitchen table really linked with Vic and I, because I'm Vic too. Some people call me "Miguel", but I'm Victor.

Donald Woodward 36:35
Well, let me point out to you. I appreciate what you're telling me. Because the story I was led to believe that he dreamed this up in the evening, in his den with other hydraulic engineers around, and the question was: "Was he drinking scotch or martini? Or smoking cigarettes, or pipe?" You said that he did it at home, in the kitchen. I've heard that it may have been on a napkin. Now I have another question that has come up. And it's coming up more and more ... Did he ever say anything about whether he used natural data or ordered data? And do you understand what I mean?

Victor Miguel Ponce 38:52
Can you explain please? To be sure.

Donald Woodward 38:56
Natural data is the runoff and rainfall for the event together...

Victor Miguel Ponce 39:05
...What I said in the statement that I wrote afterwards, it is very clear in my mind that he said that he wanted to use event data. But he realized that he didn't have a whole lot of events. So he ended up using daily data. Because in the places where he was working, daily data was very numerous. And also it made some sense because the events lasted one day or so. There was a little bit of fuzziness in there because daily could be like 24 hours, and you can only have 6 or 12 hours of rain and then the remaining rain falls into the next day. That's fuzziness. I can't tell you in detail what actually happened. What I know is that he told me that instead of using event data, he had used daily data; that is what he said.

Donald Woodward 40:03
Okay, that's another rock established.

Victor Miguel Ponce 40:09
And to be honest with you, I mean, if I had been doing this, I would have done the same. You want quantity in there, you want a lot of data, so that you can get a sense out of the whole. If you have a few dots in there, it's not going to work. As a matter of fact, Pete Hawkins knows very well that some of these data sets have a way of being very spread. And it's hard to discern exactly what went on. And I attribute that, and I believe I'm right, to the fact that the method assumes that it rained uniformly throughout the basin, whatever size the basin is, one mile, 10 miles, whatever, it assumes that it rained uniformly. And that's not true. Everybody knows that. So there, that's the main drawback of the method, the fact that the assumption of rain uniformity is not generally satisfied, or could not be satisfied on a case-by-case basis. So that's the drawback. That's where we have to have a little bit of humility in realizing what exactly is it that we're doing.

Donald Woodward 41:21
I agree with you. Okay, Glenn, you have your hand up. And you can talk now.

Glenn Moglen 41:28
I hate to interrupt, but I want to be sure we're clear on this. Don was asking about natural versus ordered data. And Miguel, you've responded that he used daily data. And I just want to make sure we're clear on this ... Natural data is that you have P and Q rainfall and runoff pairs. So the P that falls, it results in the Q that's observed. Ordered data is if you had a set of say 50 events, you take your data, and you independently sort your P's and Q's and then you pair them up: biggest P with biggest Q, and so forth. So that it could well be that the precipitation from 1973 is paired with the runoff from 1958, or something like that, depending upon how your data worked out. So I guess the question to you that I want to just really pin you down on is, do you believe that Mockus worked with naturally ordered data, so causal P with causal Q, or ordered data where the data are sorted independently?

Victor Miguel Ponce 42:55
Okay, that is a good question. And the answer to that, ... and I'm gonna tell you how it happened. Okay, I was there to interview Mockus. I took a notebook, and a pen. Because at that time, we weren't really too adept at recording the stuff we could have recorded, but we didn't. So I just wrote down everything he said very quickly, trying to make sure I was putting down everything important that he said. So

everything he said, in an hour and a half, an hour and 45 minutes, I kind of digested it, and put it into my report. And I wrote my report, just to have the report written, transcribing everything in the notebook. And then I just sat on it for a couple of years, two or three years, I didn't do anything I just said, I'm going to sit on it. And then after the web became available, actually, the web became available in 1994, 1995. But it took me actually five years to get on top of it. So by 1999, I was on top of the web, and within a year we published it, we put it on my site. And then I believe SCS at the time, discovered it. I believe it was Don who called me and said that he had noticed that this was done, congratulated me on it, and he did say, and I'm quoting Don, at this point, he said that you did something nobody had ever done. Really, I didn't know that. We did something nobody ever did, which is interview Mockus. So at that point, I became part of history. Right? But Mockus didn't dwell on ordered versus unordered data. He just said to me, and I'm going to read clearly, he said that the method was developed for events... The events is what's important in hydrology. But then it was based on daily data, because that was the only data available in large quantities.

Donald Woodward 45:10
You're right.

Victor Miguel Ponce 45:12
It's true, you have daily data 50 times more than event data. And that was it. So I'm not going to try to explain what Mockus did. I don't think that is my role. I'm just a teller. I'm telling you what he told me; whether he was right or wrong, I don't know. That's what he told me at the time. I know Pete and other people, like Glenn, have done extensive work on what kinds of data, and I'm not going to second guess you guys; I have not done the work. I can't argue with you on that. All I'm going to say is that Mockus used a pile of data. And I believe he was using lots of years, like 10 to 20 years. As a matter of fact, he mentioned 10 to 20 years of field research. "The method was based on data encompassing 10 to 20 years of field research…" That came out of his mouth. Exactly when were those 10 to 20 years? I don't know. He didn't say. So I'm assuming that it would have been like, if we got 20 years, it would have been from 1930 to 1950. Because it was in 1954 that he finally came up with the answer. Right? So I would say he must have been employed with SCS for at least 20 to 30 years. Because he retired at the age of 65. You know, the federal government is a good place to work. He must have got in young, and risen through the ranks. And, as I understand it, and Don correct me if I'm wrong, Vic came up through the ranks.

Donald Woodward 45:12
Correct.

Victor Miguel Ponce 45:13
You told me that. How would I know that? Vic never told me that. You told me that he came up through the ranks. And I know what coming up through the ranks means. That can be a plus and a minus.

Donald Woodward 47:17
Oh, yeah, in his case it was definitely a plus. He started as a technician.

Victor Miguel Ponce 47:24

Exactly. Right. So it shows your hard work. It's a minus, because people with more education are going to have a tendency to look down on you. So you have to live with that. ... Vic was a guy that ... in my short interview with him, that he was, how can I say it? What's the word for that? He liked to talk. And he talked, and he talked to me on things that were not necessarily technical, but it was his experience.

Donald Woodward 48:06
Well, you're right. Now I'm going to have to ask another question. ... About the Ia/S ratio.

Victor Miguel Ponce 48:26
That's a big can of worms, isn't it?

Donald Woodward 48:30
Oh, yeah!

Victor Miguel Ponce 48:33
I, of course, at the time, didn't know anything about it. Because I took the manual at face value. The manual said we ran the data and it's 0.2, that's what the manual said, at the time. And who was I to argue with it? I don't have any way to say no, it's not that. Now, Pete, of course, has spent a lot of time reanalyzing and rediscovering the data, and he has come up with the conclusion that it should be 0.05. Okay, I had come recently from my experience in India. So I had that to back me up. The Indians had told me… of course it is a big country ... they have places like Rajastan where it rains hardly at all, or places like Cherrapunji, which is the wettest spot on Earth, with 12,000 millimeters of rainfall per year, and so they have a wide variety of precipitation. So they told me they also have geology, varied geology, they have the Ganga plains, so they felt that they had to do different parameters for their hydrology. And they had told me that they had changed. And at this point in my memory doesn't help me. But they did tell me that they had changed the 0.2 to 0.1 and 0.3. They said: We've been using 0.1 here, and 0.3 there. I mean, we can go back and I could ask them again. I remain friends with those guys. But that was the first instance I had, where somebody had told me that the 0.2 was not the only one. I said, Okay, fine. So when I came back, then I had to ask, because don't forget, I was in India in 1991-1992. And I met with Mockus in 1996. It was that I have a good memory that has helped me throughout the years. So I had to ask Mockus about the 0.2, even though I had no direct knowledge on it. And I said, "What about the 0.2 in the record?" The record shows and describes the story of what he said. And I'm going to repeat it to you guys for this record.

Donald Woodward 51:14
Absolutely.

Victor Miguel Ponce 51:15
He was confused about it ... meaning, "I cannot find data to support it." And so he had decided that he was going to recommend that the Ia (initial abstraction) be taken out of the method, meaning you plot (P - Ia), and Ia is another person's problem. And he recommended that they do that. But I'm guessing here that he had a review committee, like everybody else, you know? And the review committee felt that that was not appropriate at the time. The review committee felt that the Ia was important, and that they had to put it in. So they overruled Mockus. That's what he told me: "They overruled me." They

decided to put it in. So Mockus, and I'm now throwing a little bit of story. My story: Mockus must have said to them, "Well, I mean, if you guys want to put it in, you tell me what the value should be." I'm just guessing that. He didn't say that. But I'm guessing. I would have done that. Right? So then they said, "Well, we're going to plot the data." And they plotted the data. And as you guys know very well, that's published in NEH4, now called 630, or something. And there was a lot of data points. And they drew a line, which is correlated to a value of 0.2. The correlation coefficient was not very high. And I don't know what the number is. But I would guess, just looking at the cloud, probably it was 50%, the correlation coefficient, but I'm guessing. You guys tell me what it is. Yeah, I've seen a lot of these correlation coefficients, they're probably at 50% correlation, because it was a trend, you know. If you have a circle, the correlation is zero. And if it is a line, the correlation is one. And this was kind of a long ellipsoid. Right? And the longer the ellipsoid, the more the data gets to a line. And so I would guess, 40 to 50%, would have been the correlation coefficient. And they went ahead, because once they won the argument, that they should put an Ia, they decided to put something in there. And they did. You know, at the time, 1950, they could not know that there were researchers like Pete Hawkins that 30 or 40 years later, had access to the data. He had a lot of students at Arizona who started to research the subject of whether the Ia was correct or not. And he found out, I'm sure through many, many years of research, that it should have been lower. And he came up with a value of 0.05. Now, my sense, having been in this business, if you could call it a business, for 41 years, because I was labeled a hydrologist by Professor Noorany in 1980. He said, "You teach hydrology." So after 41 years, my sense is that Pete must be in the right ballpark. Why? Because Pete is Pete. I mean, he's a researcher. He's a serious guy. I mean, this was 20 years. I mean, I'm sure that if he had made a mistake, he would have noticed that and corrected it. That's what I would have done. I have made, you know, a few mistakes, everybody does make mistakes. And when somebody points out to us that we have made a mistake, we quickly verify it, make sure, and correct it. Our reputation is on the line. So I'm going with Pete on this one. I think it should be 0.05.

Donald Woodward 55:14
I was curious because in my time in NRCS, I discovered a letter from the chief hydrologist, a personal letter, to Vic saying: "You will use an Ia."

Victor Miguel Ponce 55:48
Mockus telling those people that they will use an Ia? Or those people telling Mockus that he should use an Ia? It wasn't clear.

Donald Woodward 55:57
Yes, Mr. Ogronsky, Vic's boss, said, "You will use an Ia."

Victor Miguel Ponce 56:04
Okay, so then I am confirmed in what I said. So that means I'm just transcribing what Vic said, I have no reason to change his oral history, or his oral narrative. I had no stake on it.

Donald Woodward 56:14
No, I mean, because it's interesting that the original P versus Q curve that's in NEH4, the original version of that graph, done by Vic, has an Ia of zero.

Victor Miguel Ponce 56:50
... That's what he told me. He had originally intended to make it zero or out of the problem. But he was basically told to put something in there. And who came up with a value of 0.2, I do not know, that has to be found.

Donald Woodward 57:16
I can't find that either.

Victor Miguel Ponce 57:18
But the thing is, that thing is kind of serious. Because it's not just a matter of the 0.2. If you change the 0.2, you change the curve numbers. ... So you have to change the tables ... it's a wreck. It's really an earthquake. That's why you guys have dragged your feet, if I may say so, in changing it to make sure, make sure because you'll never change it again. Okay, you can change it, but only once. Right? I mean, it will be ridiculous to change the Ia every 10 years.

Donald Woodward 57:51
if you notice, there was somebody in this interview that was smiling and shaking his head. Because your two interviewers are working on a version of Chapter 9 (of NEH 630). And we have not finished. We've dragged our feet, because nobody will tell us what Ia, what value we should use to convert the curve numbers that are in NEH4 to the new ones.

Victor Miguel Ponce 58:20
Well, if you use an Ia that is different, which is point 0.05, according to Mockus, you'd have to change all the tables. Little bit, 72 would come out to be like 74. I don't know the sense of the direction, but it will be like two or three points will need to be adjusted. That's all there is to it.

Donald Woodward 58:45
Is that right Glenn?

Glenn Moglen 58:47
Well, it depends where you are in the CN range, but with the smaller Ia, say 0.05 for your Ia/S ratio, curve numbers revise downwards. So with 0.2, a curve number of 72 becomes, with 0.05, maybe a curve number in the mid-60s, if I recall. I don't know exactly. And it depends. There have been multiple formulas thrown out to convert between the two, and the formulas have themselves, you know, scatter. They're not perfect. It depends what you're trying to do. So your description of the whole thing as an earthquake is a good description.

Victor Miguel Ponce 59:41
It's an earthquake because it's not just the 0.2 to 0.05. It's changing the mindset of what the curve numbers should be. And a lot of practitioners out there have already settled on 72, for instance. "We know 72 is a good number here for some parts of San Diego," and so forth. So we're being asked now officially to change it to 65 or 68. That's hard. It's not impossible, but it's hard. You know, there are generations. ... The generation lives his time. That's what I have used as a phrase for many years.

Once a generation has gone, a new generation will take up something else, right? So, if it's a correction, it's a correction. When we find out that there was a mistake, or something that could be better, in my mind we should proceed. However long it is, we should proceed. Anybody can make a mistake, even the NRCS.

Donald Woodward 1:00:36
I have another question for you. And you mentioned that Vic used Hastings and Waco. What's interesting about that is that he spent four or five years at Coshocton.

Victor Miguel Ponce 1:01:02
That's what he said too, by the way, I'm looking at the stuff he said. He said that he spent considerable time in Coshocton in the 1930s. Look, at the 1930s, when he was young. Exactly when he was in his 20s or early 30s. He was very familiar with the data at that site. So those three names come up in our story: Coshocton, Waco, and Hastings.

Donald Woodward 1:01:25
I was just curious.

Victor Miguel Ponce 1:01:27
Coshocton is fine. First, he said "Coshocton," then he said, "Waco" and "Hastings."

Donald Woodward 1:01:39
I have to agree with you. Is there anything else you'd like to say about your wonderful meeting with Vic?

Victor Miguel Ponce 1:01:50
Well, you know, I was doing this for me, I just didn't know I was going to get famous. I was doing it because it had to be done. Otherwise, I was going to mess up in the closure, right? And I had people like... I don't want to mention names, that I had to kind of defend myself against. So I said to myself, I better use the best tools that I have. So I decided that I had to, as long as he was alive, that he could be talked into interviewing and, I used the right approach. And he did it. I was lucky. The profession was lucky that I was able to do this. To be honest with you, I didn't know that it was that big of a deal. Only until later, when you told me, and other people told me, that it was a big deal, I said, "Wow, I lucked out again, as usual."

Donald Woodward 1:02:42
Well, that's good. I'm glad you did. I met Vic over coffee a couple times. But that was just very social. I wasn't, how do you want to say...

Victor Miguel Ponce 1:02:57
I reiterate that it helped that I was in California. ... it is fortunate that it was like that.

Donald Woodward 1:03:11
I was an employee of the agency at the time. And that was just before he got mad and quit. And the reason he left was that they didn't give him a promotion he thought he should get.

Victor Miguel Ponce 1:03:28
A lot of people do that, I mean quit after a promotion was denied. That's standard stuff. I don't know the ins and outs, and I wouldn't get into the ins and outs. You told me that he had quit in disgust. I said, "Well, you know, that makes sense." It makes sense that if he was mad at that time, some people hold grudges, you know? You could be mad for 20 years, you know? So it's not uncommon that that should happen.

Donald Woodward 1:03:57
Well, I think the thing is, you're from California, and you were just going to talk to him. You weren't gonna push him.

Victor Miguel Ponce 1:04:09
Of course. Yeah. And that some time had passed, maybe 20 years. And maybe the hard feelings got somewhat attenuated. Like I said, I was lucky. He was 83 at the time. And I believe he died three or four years later. I'm not quite certain.

Donald Woodward 1:04:27
I think that's right.

Victor Miguel Ponce 1:04:29
Three or four years later, he passed away as all of us are going to eventually do. So it was fine. But the fact that we were able to get him on record, I think it's important. You wouldn't be talking to me today had I not done this. That's a fact. Okay, go ahead, please.

Donald Woodward 1:04:46
No, that's all I'm interested in.

Victor Miguel Ponce 1:04:56
But let me just fill in a couple more details on the method. I think this is something Glenn would be interested in. He did say that he had nothing to do with the soil types. But that hydrologic condition was his development, his invention. The hydrologic condition, which is another knob that we use to turn for the grazing, fire, and so forth. ... Let me give you my opinion of the method. Having used it for more than 40 years, and I wrote the paper, which I'm sure you guys have read, the paper on the curve number which I wrote with Pete Hawkins. And we said it was simple. It was simple for people to use. Because Victor told me that they wanted to use only one parameter. That's why he was intent on using just using the curve number, not the Ia. The Ia was an afterthought, and they fixed it so it was not a parameter. Although the Indians did vary that as a parameter, he wanted to use one parameter, because he said this method is going to be used by people in the field, and so forth. And we want it to be simple. And you guys know the acronym the KISS principle, right? (Keep It Simple, Stupid). I'm not going to repeat it. But the KISS principle is important. Because the more complex you do something, the less it is used. Because there's only a few people that could use it, because they had to be at a certain degree of smartness. So the method is simple; it can be used by anybody. Nevermind that using it does not mean understanding it. And we all know that understanding the curve number requires, first,

that you read Ponce's paper, because we kind of spelled it all out in there. And then to try it for a while and see how it works for you. But I go back to what I said earlier, that nobody is talking about the spatial rainfall distribution, which affects the results, affects the method itself. The larger the watershed, the more likely it is that problems are going to happen. Now, I questioned or queried Vic on the area because the area was important for me. And he did say that they were using areas from one to 10 square miles, actually much smaller than one, from a few acres to 10 square miles. He seemed to put a lid on 10 square miles. For me, 10 square miles was small. We have a classification of watersheds in our book. We started that. When I wrote my book ... I'm a classifier guy. I want to put everything in a box. So I said we're going to classify the watersheds into small, medium and large. The question is, what is a small basin? What is a medium basin? What is a large basin? And I had recently come up from working in the Santa Cruz basin, in Arizona, which was 3500 square miles, which we considered large, and it even spills into Mexico. Okay, Arizona, Mexico, Nogales, Sonora. So with the experience of having classified watersheds, we felt when I wrote my book that anything for which the rational method was applicable, could be considered small. And the rational method has a limit of about one square mile, although some people say only half a square mile, it varies. ... it varies between 0.5 square mile and one square mile. Then, after that, you get into the middle basin, where you could use, or you should use, the unit hydrograph. You have to give up the rational method. Like Sherman, who, as you guys know, was very well known engineer in the 1930s. He was responsible for the hydrologic design of many dams in the United States. And that's when the dams were built. Now we're not building any dams. Now, if I wanted to do Sherman, I couldn't do it. There are no dams to design. But at the time, the United States was busy building all kinds of dams. So Sherman must have been busy. And Sherman realized that he could not do much with the rational method. So he developed the unit hydrograph. I should tell you that Mockus told me something that I'm not sure I knew at the time: That Sherman did not developed the unit hydrograph. That he borrowed ideas from papers that had been written earlier. But whatever it is, Sherman is considered to be the developer of the unit hydrograph. He was number two, but ended up being number one. So the unit hydrograph was to be used when you could not, or should not, use the Rational Method. And then, you extend the 10 square miles to 100 square miles. But the wider issues don't end there. You have basins like the Santa Cruz, which is 3500 square miles. So then we had to come up with a large basin, and had to draw a limit between the mid size and the large. If people disagree… but the National Weather Service has a limit of 400 square miles as the limit between the midsize basin and the large basin. But nevermind, because Mockus never used anything more than 10 square miles. But you could stretch it for the midsize basins. I asked him that question. I said, "Well, what is the upper limit for the areawise applicability?" And he said that he didn't think there was any limit. And to be honest with you, and I'm going to try to correct him at this point. Yes, there is a limit. But that was not in his experience. Mockus was only working with small basins, very small basins. They had no business doing, like, what the Army Corps does, which is go to a very large basin, which is a different business altogether. So you can't be working for SCS, be told to do the small basin, and then do the middle-sized and large basin, you cannot do that. So I just queried to see what he would say. He said that he thought there was no limit. Actually, there should be a limit. As a matter of fact, in our book, we say that by the time you get into the large basin, you should be doing routing. We tried to push the routing. Why? Because we have all these beautiful computers, which in the last 20 years ended up multiplying themselves in capacity by 100 or 1000. So, for what are we going to use these computers if we don't do a good routing? And routing is computation, right? I mean, talk about, you know, I'm a router. ... We pushed the idea that when you get into the large

basins, you should be doing routing. So you have the rational method for the small basins, the unit hydrograph for the midsize basins, and the routing for the large basins. It's a kind of a stepwise process where you get more complex with size. In the unit hydrograph maybe you have a couple hundred. In the routing, you have 10, 20, 30,000. We did the routing of the Santa Cruz river in Arizona, and many others, where we had to go into the data, and so forth. And I'm going to say something that needs to be said, that the routing does not guarantee accuracy. It gives you a good feeling that you use your computer ... you did the best way you could do, given all the technology that has become available, you know. Cunge and others that worked on this, spent their lives doing the routing, Jean Cunge, out of France. And we're using his methodology, and we teach it. We teach it as if it were a big deal. We do not tell them that using the best method does not guarantee accuracy. The accuracy is the feeling, based on your experience, that what you did is the best way of doing it. So, and like I said, we have done verifications. And so we've done a lot of routing. And even in a routing, there's a whole lot of unknowns. Routing in itself is such a complex subject that very few people actually do it. Why do we teach it? Because we feel that is the present and the future, the near present and the future. Generations will move into different things. By the time I've passed, there will be other people that will be doing more and more routing, but routing itself is extremely complex. And then the issue is, so you've got the curve number, which is giving you the Q based on the P. But then you move into the unit hydrograph. And the unit hydrograph could have the curve number in there, right? And then you move into routing, and the routing could also have the curve number in there. So the curve number is not just for the small basins. That is why Mockus said, "Oh, well, I think it applies for any size basin." It does apply for large basins, but in my opinion, only if you subdivide it. And routing is there to subdivide it. You cannot do it in the unit hydrograph. The unit hydrograph is not a subdivision method. Everybody knows that. So the unit hydrograph has to be taken as a whole, it's one answer. What's the size? The size could be 10... 100 square miles. As a matter of fact, when Sherman did his original work, he was applying the unit hydrograph to 5000 square miles. So he could have done the entire Santa Cruz basin in one step. ... In two days, he got an answer that it took three months for us to do. Because we did it with routing, but he could not have done routing. He was working in the 1930s. Routing was developed in the 1970s, the 1980s, the 1990s. ... So every generation lives its time. We have better tools... not better, I should have said "more complex." I don't know if that means better. Definitely, it's more impressive. That's for sure.

Donald Woodward 1:16:15
As far as I'm personally concerned, this has been a fantastic interview. And I appreciate very, very much your contribution. It was enlightening... you kind of touched on some things I'd forgotten about. And I'm very glad that you were encouraged by my negativity, if you want to say that, and interviewed Vic Mockus. And I say: “Thank you. Thank you. Thank you.”

Victor Miguel Ponce 1:16:48
That's exactly the way it happened. If you had not told me that it was going to be difficult, I may not have done it. So you were a participant in this experience. Yeah. It was difficult. So I said, Well, you know, I've done difficult things in my life. How difficult could this be?

Donald Woodward 1:17:21
See, you've had your breakfast, now you're working on my lunchtime.

Victor Miguel Ponce 1:17:25
I didn't have breakfast yet. 10 o'clock is when my breakfast is. I'm trying to lose weight. So I only have two meals, 10 o'clock and 7 pm. Really, I mean, we have to lose weight; otherwise, we're not going to be here for too long.

Donald Woodward 1:17:48
You know, that's it. I have a doctor that tells me that all the time. I saw him a week or so ago. And he walked into the consulting room and said: “Don, you have a tremendous appetite.”

Victor Miguel Ponce 1:18:07
Yes, yes.

Donald Woodward 1:18:09
And then, as I left after talking to him, he said: ”You got to lose weight.”

Victor Miguel Ponce 1:18:13

Well, Gentlemen, thanks for the opportunity to retell the story. It is a great story. I have received many accolades throughout the world because of it. Like I said, when we got into it, we didn't think it was a big deal. But it turned out to be a bigger deal than we thought at the beginning, and we're glad for it, and the profession is glad for it. And now that we have singled out and clarified Don's role in it, it's even bigger and greater.

Donald Woodward 1:18:54
Well, thank you. I think, Glenn, we've come to an ideal quitting point, and should wrap it up.

Glenn Moglen 1:19:08
I agree. I've been mostly an observer, but it's been fun listening to you both go back and forth. So thank you for the opportunity. I have one small detail that I'm curious about. You said you came east and met with Vic Mockus. Where did that meeting take place exactly?

Victor Miguel Ponce 1:19:31
At his home.

Glenn Moglen 1:19:32
And that was in DC or in Maryland?

Victor Miguel Ponce 1:19:35
It was in...

Donald Woodward 1:19:39
I think it's in Maryland, but I don't remember.

Victor Miguel Ponce 1:19:42
I am positive that was in Maryland. Because... just because. I mean, had it been in Virginia, I would have had to go over a river and stuff. It would have been more difficult. I am 100% sure it was in Maryland. It was along the beltway, inside, I believe, if I remember correctly. So it was close to the beltway inside on the western part. But you know, not being from DC, I don't know too much about the geography, and I could be mistaken by a few miles. But that was it.

Glenn Moglen 1:20:19
Well, it's interesting, because what you've just described. I live in Maryland, inside the beltway, sort of to the north, more so than west of the city. I just was sort of curious where the meeting took place.

Victor Miguel Ponce 1:20:36
My recollection is that it was sort of to the west, let's say at 10 o'clock. 10 o'clock was my recollection. I mean 25 years have gone by.

Glenn Moglen 1:20:45
Yeah. So that's like Bethesda or...?

Victor Miguel Ponce 1:20:50
Right. Yeah, somewhere around that area.

Glenn Moglen 1:20:55
All right.

Victor Miguel Ponce 1:20:56
I should mention at the end of this meeting that I missed... I'm not a professional interviewer. I should have taken a picture of the gentleman. I have tried to get a picture of him. And I have failed. And I believe Don does not have a picture…

Donald Woodward 1:21:17
Oh, okay, I'll do it.

Victor Miguel Ponce 1:21:21
As I understand it ... it will just take a little digging, I figured out that there's about three or four Vic Mockus's in the United States. It's my guess that they will be related, you know, ... probably sons or even grandsons of the suspect. So it seems to me that if anybody, you know, doing detective secretarial work, will sit down and identify and touch base with all these four Vic Mockus's and inquire who is related. Maybe we will be able to find the “pot of gold at the end of the rainbow,” as they say. We would like to.

Donald Woodward 1:22:15
I had to take on that challenge. I will work on getting Vic's picture. I think I know how to do it.

Victor Miguel Ponce 1:23:55
Oh yeah, it's a little detective work. Thank you.

Glenn Moglen 1:24:03
Well, the beauty of zoom is we have your picture now, Miguel.

Donald Woodward 1:24:10
But I'm not sure of the background. Is that Hawaii?

Victor Miguel Ponce 1:24:16
The background is the background that we use, generally. I just did it this morning. I placed a background in the Zoom.

Glenn Moglen 1:24:29
Okay, with that, I'm going to stop recording.