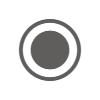
**Invitation to OWRD's Statewide ET Project Update-20250127\_140022-Meeting Recording**

January 27, 2025, 10:00PM

1h 39m 15s

 **RAY Linda K \* WRD** started transcription

 **RAY Linda K \* WRD** 0:06  
All right. We are going to wait just a couple more minutes before we get started.  
Thank you all for joining and for being on time.  
Just wanna make sure we give everybody an opportunity to get.  
To become.  
Present.  
OK.  
Good afternoon.  
I'll be go ahead and get started, please.  
Recording. Thank you.  
We are recording this meeting and we are going to start with introductions.  
So I am Annette Lieben.  
I am the Technical Services division administrator here at the Oregon Water Resources Department, and we're going to start with introductions from the Oregon Water Resources Department and then our other presenter on the agenda today.  
So Rachel, please.  
Yeah. Thanks, Annette. Good afternoon.  
My name is Rachel Lovellford.  
I'm the manager for the surface Water Hydrology section and I'm really honored to be honored to get to work with Jordan and Aaron on this.  
Project over to you turn.

 **BEAMER Jordan P \* WRD** 1:40  
Hi everyone.  
My name is Jordan Beemer.  
I'm assistant manager in our Surface Water section and I've been working on this project for several years now, so I'm excited to get to present on it and.  
Get feedback.  
Thanks.

 **RAY Linda K \* WRD** 2:02  
Hey, Aaron. Hi. My name's Aaron fellows.  
I am the I support the ET evaporation and transpiration and water use program at Oregon.  
Thank you. And in the room here, we also have Linda.  
Hi, I'm Linda Ray, and I'm the administrative specialist for technical services division, Maria.  
Hi everyone. I'm Maria Maria.  
I'm an assistant professor at Oregon State University and I do a lot of extension.  
I've been collaborating with Rippon for a couple years now.  
Kim, can everybody hear everyone in the room?  
OK. Justin, if you could please introduce yourself.

 **Justin Huntington** 2:45  
Yeah, sure.  
Hi everybody.  
My name is Justin Huntington.  
I'm a research professor at the Desert Research Institute and the lead on this ET report that we published with OW.

 **RAY Linda K \* WRD** 2:58  
Thank you.  
So I'm just gonna go through all of our guests today and the order that I see them here listed. So if we could please start with Anton.

 **Anton Chiono** 3:12  
Reduce myself, sorry.

 **RAY Linda K \* WRD** 3:14  
Is.

 **Anton Chiono** 3:17  
And that's on Kyoto.  
I work for the Department of Resource.

 **RAY Linda K \* WRD** 3:27  
Who did everybody hear, Anton?

 **Justin Huntington** 3:33  
Hard to hear.

 **Rachel O'Connor** 3:33  
Was a little quiet.

 **RAY Linda K \* WRD** 3:38  
Did you try again? Anton, please.

 **Anton Chiono** 3:42  
Well, I'm sorry my microphone's not very good on this laptop.  
I'm Anton kiano.  
I work for the Umatilla tribes.

 **RAY Linda K \* WRD** 3:50  
Thank you.  
That was much better.  
Blake.

 **Blake Minor** 3:57  
Hi everyone.  
I'm Blake miner.  
I'm a research scientist at DRI and was helping out with this report ET report. We've been working on with Owrd.

 **RAY Linda K \* WRD** 4:08  
Thank you.  
Welcome Representative Owens.  
Please introduce yourself.  
That bones.  
We can't hear you.

 **Rep Owens** 4:22  
Take myself off mute.  
Good afternoon, mark.  
House District 60. Thank you.

 **RAY Linda K \* WRD** 4:28  
Thank you for joining us.  
John.

 **Bolte, John** 4:34  
I'll see.  
That's me, John Bolte and professor in biology. Engineering at Oregon State University.

 **RAY Linda K \* WRD** 4:41  
Thank you, harmony.

 **Burright Harmony** 4:48  
Hi everyone.  
I'm harmony bright.  
I am the chief of staff of the Water Caucus at the state legislature.  
Glad to see some familiar faces here and excited to hear about this work.  
Thanks for thanks for hosting us.

 **RAY Linda K \* WRD** 5:04  
Thank you, Chris Pearson.

 **Chris Pearson** 5:12  
Hi Gran.  
I'm Chris Pearson.  
I supported some of the reservoir of aberration modeling on this work.  
I'm with Desert Research Institute.  
That's it.

 **RAY Linda K \* WRD** 5:22  
Christopher Hall.

 **Christopher Hall, Water League** 5:29  
Good afternoon, everybody.  
My name is Christopher Hall, executive director with Waterleigh.

 **RAY Linda K \* WRD** 5:35  
Thank you, Claire.

 **Claire Ruffing** 5:39  
Hi everyone.  
My name is Claire Ruffin and I am the water scientist for The Nature Conservancy in Oregon.

 **RAY Linda K \* WRD** 5:45  
Thank you, Jeff.

 **Jeff Stone** 5:50  
Good afternoon. Jeff Stone, executive director of the Oregon Association of Nurseries.

 **RAY Linda K \* WRD** 5:55  
Thank you, John.

 **Jon H** 6:00  
Afternoon, everybody.  
My name is John Hart.  
I'm a special ecologist and I'm with the Wild Salmon Center.

 **RAY Linda K \* WRD** 6:08  
Thank you.  
Matt.

 **Matt Bromley** 6:12  
Good afternoon, Matt Bromley from the Desert Research Institute. And I'm one of the collaborators on this report.

 **RAY Linda K \* WRD** 6:19  
Thank you, Nicholas.

 **Nicolas, Floyid** 6:24  
I everyone. My name is Floyd Nicholas.  
I'm an assistant professor in Aguada management at the agency university.  
I'm located in Central Oregon.

 **Rachel O'Connor** 6:37  
Hi there, Rachel O'Connor. I am with Environmental Defense Fund and part of the Open at consortium.

 **RAY Linda K \* WRD** 6:45  
Thank you, Sarah.

 **Sara** 6:51  
Good afternoon, everyone.  
My name is Sarah Larson.  
I'm the CEO of Open ET and looking forward to working with you all on this project and many more to come.  
More to come.  
Still getting familiar with it, so I'm really excited about today's presentation.

 **RAY Linda K \* WRD** 7:06  
Thank you, Zach.

 **Zach Freed** 7:10  
Thanks, Annette.  
Hi everybody.  
Zach freed.  
I am the water program director for the Conservancy in Oregon.

 **RAY Linda K \* WRD** 7:18  
Thank you.  
Is there anybody who is joining us online that I missed?  
Abu no.

 **April Snell** 7:25  
Hi, April Snell Oregon Water Resources Congress.

 **RAY Linda K \* WRD** 7:29  
Thank you.  
Anybody else online that I missed?  
OK. And in the room here, we've been joined by. Hi, I'm maluna.  
I'm a new US assistant professor.  
I was you at the biological and ecommerce college. Welcome.  
And I also wanna note for everyone that it appears someone has activated AI meeting notes. So just know that that's in the meeting as well.  
So our.  
Purpose today really is to share the results of this work with all of you, not only the work of getting the data, but the peer review report that was led by the Desert Research Institute.  
We also have drafted a memo to share with you the department's thinking on how we intend to use this data, and we want to share that with you today and give an opportunity for people to provide feedback.  
And so the way that we have organized this agenda is that we will have first a presentation from Jordan that kind of gives background on the project and how we got here. Then Justin Huntington will provide an overview of the peer reviewed Oregon report and then Aaron Fe.  
Will provide information on the department's thinking of how we intend to use this data.  
And we've got ample time for next steps and discussion.  
We will take questions at the end of each of the agenda items, so if you could please hold your questions until the presenters are done, that would be helpful.  
And with that, I guess I also want to acknowledge the partnership not only with the Desert Research Institute and all the other partners who are working on open ET, but also here in Oregon, the department's partnership with Oregon State University.  
So I'm glad that everybody could be here to join us today and as we.  
We share this information and have this conversation.  
So with that, I'm going to turn it over to Jordan Beamer, please.

 **BEAMER Jordan P \* WRD** 9:45  
Fixing that, sure, my screen here.  
Good afternoon.  
Good to see everyone.  
1.  
Everyone hear me OK?  
Great.

 **Bolte, John** 10:15  
Yes.

 **Rep Owens** 10:16  
Yes.

 **BEAMER Jordan P \* WRD** 10:20  
So my name is Jordan Beemer, assistant manager in our Surface Water section, and I'm providing a an update on our statewide ET project.  
So that kinda already went through the overview, but basically I'm gonna provide a more of a project update and then we'll get more information about the report and use cases and next steps from Justin and Erin.  
So really, the purpose of this project is to address a longstanding challenge in the state of Oregon and across the western US, and this is how to quantify water use from irrigated agriculture.  
And really try to capture how it varies across space and time.  
So in Oregon, we have really limited.  
Records of direct measurements of irrigation water use.  
Typically less than about 10% of all the irrigation water rights have this water use reporting requirement and so.  
Really, there's a need for.  
This up to date accurate information on irrigation, water use and one of the big motivations for.  
Both our project as well as the the larger open ET project.  
Is to develop this comprehensive data set.  
And you know, really capture all of the use and make it available to the public.  
So what you'll hear today is about this project and you know some of our output that we have.  
An example here is a map of watershed summaries of.  
Total of apapo transpiration in.  
Sort of a volume.  
Across the whole Oregon study area, and this is for for primarily irrigated areas.  
And this is that.  
This has direct applications for.  
Applications like water, develop, refining water budgets and also planning purposes.  
So this is a list that shows sort of the ways that owrd uses evapotranspiration data today, kind of in practice.  
So we've got.  
The hospital 2018 water budgets, which we'll talk more about which are statewide. We use ET data for groundwater basin studies such as the Harney Basin as well as the ongoing basin study in Walla Walla Basin and future basins studies in 15 mile.  
It's used in place based planning and then and these are all places where we are actively applying this satellite based ET. We have other cases such as water availability, demand forecasts and transfers which currently use sort of older methodologies primarily from older OSU extension reports by.  
Doctor Cuenca.  
As well as data from Agri met stations.  
So with hospital 2018.  
Owd was directed to complete. This peer reviewed report on statewide consumtive water use for quantifying both the.  
Historical and current estimates of the actual crop of epoch, transpiration and consumptive use.  
So this is how much water crops are actually using from irrigated fields, as well as estimates of open water evaporation from major reservoirs in the state between 1984.  
In 2020.  
So with this project, we really wanted to utilize methods that provide data statewide.  
Across time, you know where we can make the data publicly available.  
So this slide really provides sort of a kind of a little bit of a history of the ET funding and program development at Water Resources Department. So we started out.  
'Cause this project really builds on work and partnerships that have been built over the last.  
5-6 years.  
So Odebird was involved early on with the open ET project and I was one of the kind of beta testers for the open E cheap platform.  
And this really wouldn't have been possible with folks such as Justin Huntington, Matt Folk, Blake folks down at DRI.  
And so this we got the initial funding from the USGS.  
The Wooder grant that really helped us start developing agricultural field boundaries.  
Across the state and then we're able to successfully partner with.  
Washington, Idaho, Oregon State and Open ET and DRI on this Columbia River et mapping tool in 2021.  
And during this we were able to work with folks like Maria Abigail Tomasek and Derek from Oregon State Extension on some train the trainer workshops, which is really exciting opportunity.  
So and we're really excited as the this partnership kind of continues on with our House Bill 2010 funding.  
The so with the 2018 and the policy option package 110 provided this.  
Kind of funding for the historic satellite base ET data production consumptive use summaries. This is work from Desert Research Institute as well as as staff, which is really important for.  
Oregon Water Resources Department so funded my position, and now that I've moved into the assistant manager, Aaron has the opportunity to really be the point person for this data going forward at the department.  
So here's a list of the new data sets that we've been working on with partners at DRI and open ET.  
And so this kind of provides information about the data set.  
Who did the work and then kind of the funding, as you can see on the right, we've completed all of the major tasks.  
Around the development of the agricultural field boundaries, all the field attributes, so this is over like 250,000 fields across the state of Oregon and in some of the neighboring states.  
And then we've got our weather based.  
Et modeling open water evaporation modeling the DRI completed and then this production of satellite based ET from 1985 through 2022 across the whole state of Oregon that was developed with our partnership through the Open ET Inc.  
And then, you know, taking all of that information and creating these.  
Et and and water use summaries at the field scale and the watershed scale. For this period 1985 to 2022 is a massive effort undertone by our partners at Desert Research Institute.  
And then pulling it all together in a big report and project Web page which just just got wrapped up this month.  
So this just sort of highlights a couple of major milestones this updated statewide ET report and data sets that were delivered by the Desert Research Institute.  
And you can see the number of co-authors on this report. All the the team that contributed to this work over the last few years.  
And then this historical review of the open ET data that was completed by our partners at.  
Open et ink with significant input from the individual science team's of all the models that go into open et. And so this is this was also a really important part of our of the overall project was going through and reviewing all of the satellite based ET data.  
For the state of Oregon, so that was completed in November.  
Another big milestone over the last year has been this expansion of the agricultural weather network in the state of Oregon.  
So these agricult stations are foundational data for applying satellite based ET and so for future.  
Kind of future applications of open et.  
And local.  
Local ET estimation in some of these basins across the state that didn't historically have an agricultural weather station.  
This will really provide that data and this was an effort that was that leveraged both funding that Owrd had as well as this. The House Bill 2010 funding that Oregon State University received.  
So we partnered up with Oregon State University on.  
Identifying these 30 locations, working with land owners.  
And getting these stations installed before the beginning of last growing season, which is a a big, big effort.  
So that's a quick update on the project and I will pass it up to Justin.

 **RAY Linda K \* WRD** 20:57  
Hold on.  
Let's see. Does anybody have any questions for Jordan?  
I am not seeing any hands.  
So in the absence of questions, thank you very much, Jordan.  
Great overview and we really appreciate the partnership, not only with OSU but with the Bureau on the AGRAR stations and we will turn it over to Justin Huntington.  
Now go ahead, Justin.

 **Justin Huntington** 21:30  
Great. Thanks so much.  
Anything set up here?  
OK.  
Yeah. Thanks. Thanks so much.  
My name's Justin Huntington, research professor at the Desert Research Institute.  
My focus is hydrology and remote sensing.  
And yeah, it's really a pleasure to to talk about this project that we've worked so hard on.  
100 page roughly 100 page report that's been years in the making and just wanna give a shout out to Jordan and Owrd.  
And also Mark Owens for really seeing the vision and and leading the way on this.  
So the objectives of the study were really to develop the satellite based field scale as well as watershed scale, agricultural water use, database using best available science and also develop open water evaporation estimates for water bodies of interest. There's roughly eighty of those.  
We wanted also to compare the satellite based DT and open water evaporation numbers that were coming up with the INSITUATION measurements where we where we have those in Oregon.  
And of course document publish and and enable efficient updates in of the database in the future, right? That that's a big deal.  
This isn't, you know, kind of A1 and done kind of thing.  
There's a lot of things in room for improvement and this database can very much easily be updated as we get more information and I'll talk about that and ultimately all these objectives meet the requirements of House Bill 2018.  
So the overall approach really the bulk of the work was all around the agricultural et and consumptive use database through time, so that.  
As Jordan mentioned, really started out with developing agricultural field boundaries developed through, funded through USGS Water.  
And then also attributing those fields but before we attribute the fields.  
With.  
We have to develop those ET maps and of course that's where open ET comes in and spent the last 20 years of my career to get to that spot to to create monthly rasters of ETS based on satellite data.  
That's field scale, OK.  
Great. We have twenty 30-40 years of of raster 30m resolution ET data.  
But now I argue the hard part begins.  
Now we have to actually use those data.  
And take those next steps.  
Like calculating effective precipitation, figuring out irrigation status.  
What fields are irrigated or not know what kind of water source those fields receive, like surface, water, groundwater or both, where you may have surface water rights but you have supplemental groundwater rights, and so that's a mixed-use field. Identify irrigation system type and efficiencies and then use.  
Those efficiencies.  
To ultimately calculate application rates.  
Based on the net ET or the, the actually T from the satellite minus affect the preset divided by inefficiency to calculate the applied water and then compare all that information to in situ data.  
Both the ETA Eddy, covariance, ETA stations as well as comparing the application rates to pumping.  
And then develop the field and watershed databases and then document publish the report.  
So you know the ET data.  
It's a huge, huge thing.  
It's something that people have spent their careers developing. The raster et data, but really it's this whole package that is really needed by state and federal and other water agencies.  
So the overall approach here developed the field boundary database and this includes irrigation status, system type, water source type, soil crop type, use. Those fields are those features.  
With the open ET data, the Rasters also use a model called ET demands to calculate effective precipitation as well as net irrigation, water requirements and potential crop water use.  
That I'll talk about here in a little bit.  
Merge these two data sets and calculate the actually T the crop or the potential crop, et the effective precip which is precipitation residing in the root zone prz.  
Of irrigation water, which is the open at actually T minus effective preset.  
Some people call it net ET the net irrigation water requirement. The applied water of surface water and groundwater.  
So we're partitioning and then summarize these field level values to watersheds so that you could click on a huck and then get the.  
Average or the total volume of irrigation consumptive use.  
Irrigation water per watershed just based on the fields, not you know, including the forest or the sagebrush, et cetera.  
So that's a that's a mouthful.  
And then also the open water piece, so you know identify all the open water bodies.  
Use grid weather data through time, solar tent, humidity, wind.  
Run our evaporation models and then create a Geo database for all the different open water polygons for.  
Monthly evaporation as well as net evaporation. So we're subtracting precipitation up because from a water budget modeling perspective, we need net evaporation just like we need net et and consumptive use of irrigation water.  
OK.  
So we started out developing the agricultural field boundaries. This is an effort that Matt Bromley on the call led with feels like an army of AGIS technicians, undergrads, high school students.  
Professionals all trained all.  
Reviewing information and we we have pretty stringent QA QC.  
So we keep keep consistency. As Jordan mentioned, we have over 250,000 features or fields.  
They represent the maximum irrigated extent where it changes through time are accounted for by digitizing changes in separate features.  
So like center pivots have corners where the center pivot used to be a square.  
Say we align irrigated field and then turn to a a a center pivot. Those corners are separate features so we can track whether those corners are irrigated or not through time. As I'll talk about here in a second we digitize these based on water right places of use.  
Or water right boundaries, often following the public Land survey system, common land unit CLUGIS polygons. The USDA developed back in the 90s.  
And then.  
The nape or agricultural imagery program by USDA really high resolution 1M aerials as well as Max growing season in DVI from Landsat to we use climate engine to develop.  
So the satellite based crop ET, as I mentioned, we've spent you know, 30-40 years.  
In really awesome science and you know, hats off to many, many people on the open ET team as well as others like Rick Allen and Forest Melton and others on, you know, really having the vision and seeing this through.  
To develop over 30 years of 30m resolution ET data.  
So we have these ET data now.  
Then we can spatially average and summarize the fields.  
It's based on an ensemble of six widely used models.  
We we remove outliers.  
And we have done extensive comparisons to in situ data all across the West and in fact all including areas in the East as well and that's published in this nature, water paper and the take home here is that open ET performs quite well for irrigated crop lands and.  
Just croplands in general.  
Also, rainfall rainfall, croplands.  
We use a model called ET demands to calculate the net irrigation water requirement and affect the precipitation so.  
Just for review, actually T is is is the is the water that leaves the field surface.  
It's the actual transpiration where it's the potential ETS, the potential for a well watered stress free crop.  
So a potential crop ET is used a lot for irrigation.  
Design it's used a lot for.  
Water rights for, you know, specifying duty, how much water right is needed to grow healthy crop in a certain location.  
And similarly, we want to know what the net irrigation water requirement is. Just like we want to know what the concept of use the actual concept of use of irrigation water is.  
We want to know how much irrigation water is required to grow that perfectly healthy crop of, say, alfalfa or corn.  
So we have kind of two things going on here we have.  
The consumptive use of irrigation water, which was the actual ET minus effective precip that's coming from open ET and et demands, whereas the net irrigation water requirement is coming from ET demands.  
And that's the potential crop ET for a well water crop minus effective precip.  
So that's, that's the amount of water that you'd have to put on a field to to grow a perfectly healthy crop, often used for for irrigation, scheduling and design.  
So I'm gonna show several.  
Plots here talking about consumptive use in net irrigation water requirement later.  
This graph here is a is an output of the crop. The simulated crop coefficient from et demands for an alfalfa crop and the black line is the simulated et demands of where we're simulating cuttings for alfalfa based on cumulative growing degree days and thresholds that we use to.  
Specify when cuttings occur and then the the ndvi line. Here the green line is coming from.  
Through time and you can see that we cature the cuttings the observed cuttings from the from the satellite retty well in our simulated model.  
So irrigation status for every single field we specify, whether that field is irrigated or not through time.  
So from 1985 to 2022 in the Geo database for every year we have, if that field is irrigated or not the flag and we we use a model called ear mapper to do this.  
It was published by David Kestenbaum, 2020.  
And here's just a little animation of how irrigation has changed from, say, wheel line to center, pivot and expanded through time and on the right. Here. Here's the blue or the irrigated pixels, and then down below is the Max in DVI for the growing season, and you can.  
Clearly. See you know what?  
What fields are being irrigated or not?  
So we essentially just calculate the mode or the median.  
Or the sorry, the majority value for for each of these.  
Polygons and and assign the the Polygon or the field that fits irrigated or not.  
So for efficiencies, this is another task that Matt Bromley led with a whole team of people. We by hand basically. And also this was done in collaboration with our WRD taken their lead on how to do this well with high resolution imagery from Oregon.  
But we we basically assigned every single field an irrigation efficiency based on the irrigation system.  
O we have.  
Really five types here, whether it is center, pivot, sprinkler, pivot, linear wheel, line, flood uncontrolled like wild flood.  
Controlled flood.  
And then drip in Minecraft.  
So every single field has a irrigation system type that then were assigned irrigation efficiency values based on some well known publications like the Hal 2003.  
And also what's been used by Washington State Department of Ecology.  
OK, so to partition the consumptive use of irrigation water and actually tea.  
By surface water or groundwater, this is really important for developing groundwater budgets and also.  
Just being able to to know how much water is being consumed from surface water versus groundwater.  
Obviously this is needed for for many things.  
So we took the organ water rights, place of use database.  
They had information on water source, whether it's surface water, groundwater or mixed.  
We assigned those raster classes to fields using again a majority or mode calculation.  
You know this data is not perfect.  
The the water rights database.  
Is is great.  
It's it's really detailed, but there are some gaps and this is an area where things can be improved in the future.  
Geo database. If we know that certain fields are surface water or groundwater or we know the artitioning is not 5050 where we have a mixed-use field then we can we can override this and specify that hey in a wet year actually this field is mostly using.  
Surface water and less so groundwater in a dry year.  
Maybe it's more groundwater and less surface water.  
These are improvements that we can make, but for a start we use a 5050 ratio.  
For mixed areas and then areas that are 100% or the majority surface water, 100% surface water and and similarly with groundwater.  
So every single field has a water source type.  
There are fields that do not have water source information.  
And in those for those fields, we did not partition the the weather, surface, water, groundwater. But we did include those fields in our total consumptive use volume summaries for, for for the hucks.  
You're just not able to partition.  
So the irrigation water use and application rates.  
So again, the consumptive use of irrigation waters.  
The open et actually T minus affective preset.  
The effective preset derived from ET demands really varied across the state. You know, anywhere from from 30% effective to over 90, you know .3 in the, you know, West of the Cascades where it's really rainy and then a lot of water runs off where.  
Whereas in the more air parts of the state, the in the SE like in the Harney Basin it's it's almost 90% effective.  
So apply water was calculated using the consumptive use of irrigation water.  
Derived from open ET less effective preset divided by the field efficiency.  
Which range between really .5 and .9, and again the efficiencies were derived from irrigation system type that were attributed for every single field we partition between surface and groundwater based on the water source information and attributes. And then we have the agricultural field boundary areas that.  
Are used to compute the field scale volumes of ET consent abuse and applied water, and then finally we have this field scale Geo database of volumes of volumes and areas used to compute base and scale total volumes.  
Area rated wait meaning that we take the total volume for the basin and we divide it by the total area of irrigated areas.  
So this figure on the top is just a a cool figure that I always find fascinating from opening T where you can clearly see differences between years.  
It's really nice that we have the volumes as well as the taps that can be summarized cumulatively for each year.  
So the idea here is that we have this Geo database now within owrd.  
Which he could make figures like this at the top, the opt opening team has on their website.  
So this is an example of Appendix 1.  
Here the field attributes you can see there's a whole slew of attributes in our field database.  
And I'm not gonna go into everyone, but it's it's really detailed.  
The readme is. Is is really well documented and we have the source of the information, the scale. This is the field database.  
We have one similar to this that even has more attributes for the hucks.  
Let's see here.  
What else did I wanna say about this?  
Just that we have all this information precipitations in here.  
Effective precipitation, the evaporative demand, or the ETO from Pema Monteith.  
The fraction of reference ET or the crop coefficient every month.  
So this is a monthly database I should say.  
Irrigated area.  
The Huck 12 name.  
The Huck eight name.  
Yeah, there there's a there's a whole lot of stuff in here.  
So how do we do when we compare to the in situ data so.  
We put a station out on Marc Owens Field.  
That was.  
It was not funded.  
It was something that I really felt strong about.  
I used some of my Pi funds to to pay for the city covariance station.  
Put it out on marks field and thank you Mark so much for for hosting us on your field and for really being a champion for ET.  
And seeing the value in what we're doing.  
Your leadership has really made waves through the West.  
And yeah, pleased to show these results that open ET compares well to your field to the station in your field, that those are all the exas there. We also recently put a few stations out in Nevada and alfalfa and those numbers are coming out to looking pretty good.  
To when compared to open ET, there are very few edit Co variant stations in irrigated agriculture in Nevada and Oregon.  
These are the three that I know of that and you know, we need more of these to to build more trust and.  
Understand uncertainties in open et.  
Also, we compared the pumping data.  
This isn't summarized in this report, but Jordan has a nice report on this and also we just published this paper.  
In Ag water management, where we looked at the.  
Estimated volume of pumping using open ET versus the the the, the the meter pumping using magnetic flow meters in Diamond Valley.  
That's on the left. This is actually net ET. So we haven't divided it by the field efficiency.  
So this is just the consumptive use of irrigation water and you can see here that these volumes compare really well to the metered volumes.  
The Y axis and the slope of this line is 1.1.  
Which 1 / 1.1 is around .9, meaning that we're about 90% efficient.  
There's a lot of lipa or low energy precision application center, pivots sprinkler packages out here in Diamond Valley.  
So this makes a lot of good sense in the Harney Basin. We have much less pumping data.  
And also it's not magnetic flow meter data. They're totalizing meters.  
With propellers. And so, you know, there's a lot more scatter there.  
They aren't.  
Leapa systems.  
It's kind of a mix between Mesa and mid elevation and high pressure, high elevation, as well as some Lipa.  
So the efficiencies are not what they are in Diamond Valley, but the point is is this makes good sense.  
This is a good check for open ET.  
This is the ensemble, by the way, and it it just makes good sense.  
So this is really.  
Great to see and encourage you to check out this paper.  
So here's some stories to tell. I need to speed up. Sorry for going long.  
There's so many stories to tell now that we have this database, this field level database, so for example.  
This is the summer lake area and kind of the center, more arid part of the state. And in the wet year you can see here that.  
A lot of Bluefields and in the dry year, these fields that are irregularly shaped.  
These are surface water fed fields and you can see how the ET goes down on the dryer when we don't have surface water available, but the the center pivots, they stay pretty steady in. In fact, a lot of these center pivots increase their water use or their E.  
Consumptive use of irrigation water in the dryer because, well, the evaporative demand is higher because it's a dry year.  
And, you know, temperatures are higher, vapor pressure is lower.  
And.  
Yeah. So you see this, this slight increase in in some areas through time. Now that we have this database at the watershed level, when we look at the the total volume of all these fields through time, we can see an increase in the consumptive use of irrigation of.  
Groundwater. That's this. This kind of purpley line. And then this blue line.  
We're dividing it by that field efficiencies for every field and then summing over the base, and you can see that's increasing through.  
Two. And that's because the irrigated areas been expanding. Mostly the rates have also been increasing slightly.  
So this is the total volume divided by the total area and you can see these these rates of the groundwater fields are slightly increasing. The surface water areas are are going down slightly and the rates are also slightly going down.  
So on the top here, this is the month and then.  
Colored by the the the rate that irrigate or sorry the volume.  
Through time and then this is the the breakthrough time and you can see that the rates are fairly steady, but the volume's increasing through time because of that change in area.  
So we have figures like this for every single huck in the state of Oregon in the appendices.  
So this is this is really neat to see, and there's just so many stories to tell, like I said.  
Here are some other figures that we have we have.  
Histograms shown here on the right for every single hue in the state.  
And here's just a A an example for the lower the chutes and the wet gear dryer, and then the wet year. You can see that we that we have more shades of blue here, more ET, and then the dryer we have more shades of orange lower et this.  
Is a a very much very much a a surface water fed system up top and then groundwater system kind of mixed.  
On the bottom so that you do see some some reductions in, in ET in in these dry areas.  
I can.  
Kind of see it in this histogram.  
We have more acreage.  
Let me back up.  
Yeah. So.  
Less acreage below 2 1/2 in the dry year, and more acreage approaching and even over 2 1/2 in the wetter.  
So we have summaries like this summarizing the total volumes in areas and and rates.  
For all, for all hucks.  
OK.  
So the the statewide kinda summaries.  
Here we have the average again, the area weighted rate or the average, the total volume divided by the total area for consumptive use of irrigation water as well as actual crop yield for every hook in the state.  
And then this is the total volume.  
So you know, we got the rate on the left and the volume on the right. Obviously where we have a lot of irrigation acreage, we're going to have high volumes.  
So how does this study compare to the Cuenca study?  
So this is the the net irrigation water requirement, the ET demand modeling domain where every cells 4 kilometers. We're calculating the potential crop ETA using Pema Monte and dual crop coefficients. And then we're also calculating the net irrigation water requirement, Cuenca back in 92 developed a really.  
Foundational report for Oregon.  
On consumptive use and irrigation water requirements, we wanted to know how our numbers compared to quantities.  
So we digitized the KOIN tables and he broke his numbers out by region. And so we did head to head comparisons between the regions where we took all our fields within each region or the fields that we developed as part of this study and open ET.  
And, well, let me back up. Not opening EET demands potential crop ET and net irrigation water requirement. We compared that to the kloinka numbers.  
And in general.  
And it was expected that our numbers are higher than the coincidence, mainly because coincidences, a temperature based blank critical model which is known to be low in the Western US and.  
You know it.  
It made a lot of sense.  
It was expected the alfalfa potential cropping T ratio here so.  
Values over one mean that ET demand is higher than Cuenca and so pretty much across the board.  
Umm, we're higher than the numbers.  
It's a temperature based method, whereas the pemimon teeth is solar temp, humidity, wind.  
And you know it's it's just a more physically robust, physically based, robust, robust method adopted and and really standardized by the American Society of Civil Engineers.  
There are a couple places where the quake and numbers are are higher, and that's for pasture. And in these regions here I'm kind of showing that.  
Where our our numbers are higher in the summer, but cuenca's numbers are a little bit higher in the shoulder months and so that's why we get these these changes but but we're higher where it makes sense that we would be higher.  
OK.  
So here's an interesting piece. And so we always like to compare.  
Opening T actual crop ET numbers to the potential crop et, right, because in a really well irrigated system of actually T should be approaching the potential or that theoretical potential crop et well, water stress free.  
Pema Monte. Ace method, right?  
And sure enough, we do.  
So here's the Harney Basin.  
There are a lot of fields that are.  
Quite high in open et, that's.  
Shown in this top whisker here.  
So basically what this is is the box plot of actual crop et for all fields in each base and the X is the mean.  
The line's the median and then the the upper box and the lower box pieces the the inner quartile range 25th and 75th percentile.  
The extreme so fields that are really well watered, they're approaching this potential crop et diamond.  
And triangle here.  
So this is alfalfa, the diamond and then the area average crop BT crop weighted based on the crop type.  
You know we have corn, we got, we got pasture grass, we got alfalfa.  
So this is crop area weighted potential crop ET but alfalfa is kind of the the the high number usually but in in basins that are well irrigated that we know we have some really well irrigated fields we do see that the open et is in fact approaching that.  
Theoretical well watered grape, which is really good to see the take home though, is that you know there are a lot of fields and these basins that are just not perfect.  
They are perfectly well watered right and and that's expected and we need to know that we can't use potential crappy teeth for managing water like we used to.  
We really want to use the actual historical long term or even, you know, just five year actual ET to start managing water.  
But we we like to compare these two.  
And then here's the same kind of graph with the consumptive use of irrigation water compared to the net irrigation water requirement.  
That's kind of the.  
The similar thing is what we're doing on the last slide. So these are apples to apples in terms of.  
Actual historical crop et from from open et minus effective precipit compared to the Pemma Monte dual crop coefficient minus effective preset. The net irrigation water requirement and you can see that the open et.  
Derived values are are coming in line with the theoretical facts, which is really nice to see.  
OK.  
Operation and net evaporation.  
I'm just gonna kinda zip through this.  
These are all the reservoirs where we calculated long term evaporation, monthly time steps and daily time steps for the dlem. This CRL is the complementary relationship lake evaporation model on dlem is the Daily Lake evaporation model that we recently published in water resources research.  
Yeah, similar kind of distribution. The DLEM has higher evaporation rates.  
And you know, daily time steps, better accounts for extremes like wind speed and and and really dry periods.  
And you know, just more generally, compared as well within situ data that we found and then this is the net evaporation.  
So you can see even some negatives here, where it's really rainy. This is important for us to know and consider in a in our water budgets.  
So we have the database of evaporation and that evaporation as well.  
The comparisons to in situ data, you know we have very limited over water measurements of evaporation.  
We have the Klamath Marsh. This is actually open ET satellite based ET compared to the Klamath Marsh data collected by USGS Dave Standard and then also Dave Standard had a floating platform out on a Proclamation lake.  
And then this is dlem compared to the upper claim Athletic Eddy Co variance.  
So really good.  
Correspondence there, so that was good to see.  
So in conclusions we have actually T consumed use irrigation water, applied water, potential crop, ET net irrigation water requirements as well as other variables developed for all fields in Oregon Field and.  
Hut 12 watershed summaries we have both.  
We did comparisons, insituated results look good for what we have field level and watershed database is developed and documented.  
We got the report developed peer review published this month.  
Uncertainties are generally within 10 to 20%.  
And we've met the requirements of hospital 2018.  
So here's the website that you can click on this or you know, go to this link to remember and download the report and all these appendices.  
Appendix 6 is really big, so it might take 30 minutes to download that.  
That's the big Geo database for the fields as well as the watersheds.  
Yeah. Thanks a lot.  
That was a big that was years of work to do in 20 minutes.  
So appreciate.  
Listening and sorry for the the speed.

 **RAY Linda K \* WRD** 54:34  
Thank you.  
Thank you.  
So really appreciate the presentation. Great information. I want to acknowledge that we will be linking as well to the DRI website through the Oregon Water Resources Department website.  
So soon people will be able to access that link through our website and we will be sending out both Justin's presentation and Aaron's presentation after this meeting. So people can refer to that.  
So questions for Justin.  
Or as I understand, you hate to be called Doctor Huntington.

 **Justin Huntington** 55:13  
Oh please, no.

 **RAY Linda K \* WRD** 55:15  
Alright, let's see questions for Justin.  
They've got their hands up.  
Zack, please go ahead.

 **Zach Freed** 55:26  
Yeah. Thanks, Justin.  
That was a lot to cover.  
I really appreciate it.  
One thing that you skimmed over quickly, but I'd like just like maybe one or two sentences more on is how the open water et comparison or how the open water ET model outputs compared to in situ measurements.  
What? What kind of error are we talking about with the open water et?

 **Justin Huntington** 55:48  
Yeah, well, that's a good question.  
So we we had very limited.  
Measurements of over water evaporation we had.  
Two and both sites compared really well.  
But you know it's it's one of those things where.  
When you only have two sites and you're modeling all reservoirs, you gotta be careful, right?  
And the big thing here is that where you have reservoirs where you have a lot of inflow and outflow and the temperature of the inflow and the temperature of the outflow is really different.  
We need to be careful in those situations, right?  
Because that's the that we call that affected heat or affected energy and our models don't account for that.  
So you know when you have you know, more shallow systems where you don't have large volumes of water coming in at different temperatures.  
Our numbers are probably going to be pretty good, but where you have deep systems.  
Where you have large volumes coming in and out different temperatures, that's when things start to get sideways and you know, we'd love to know more about that by installing some buoys, measuring some things over the water.

 **Zach Freed** 57:17  
OK. Thanks.

 **Justin Huntington** 57:40  
That Zach, that the limitations section in the report is lengthy and goes over.  
The open water piece pretty well. So yeah, I encourage you to check that out.

 **RAY Linda K \* WRD** 57:58  
All right.  
Thank you.  
There is a question in the chat Lloyd, would you like to to ask your question?

 **Justin Huntington** 58:08  
Yeah, I see it.  
Is there any added covariance network that was used to validate the opening team models?

 **RAY Linda K \* WRD** 58:11  
No.

 **Justin Huntington** 58:15  
If so, what is the accuracy where most crops grown in the state considered happiness tech be tailored to provide recommendations? Local farmers?  
So the that nature water paper that I highlighted by volcano.  
BOLK you just search Google Nature Water Volk open et.  
It should come right up.  
He took pretty much every edit caverne station we could get our hands on, did post processing of those edit courses data to close what we call closed energy balance.  
So you know we we we think Eddie covariance is measurements, but they're really not.  
They're they're they're estimates. In fact, EC stands for Eddy Cobra's.  
But I like to say stands for enough corrections, right? Because.  
We're correcting that data quite a bit.  
But regardless, it's our best.  
Estimate of you know it's the best direct number we have besides the lisinop.  
RIL, The thing is, is we don't have a lot of the edit covet in Oregon.  
We have just a few and I know OSU is creating.  
You know.  
A network or kind of a mini network of stations, you know, putting out a a few.  
And then combined with ours.  
I don't know what classifieds as a network, but but you know now we're starting to collect some data which is awesome and and right now very few crops. But in the VOLCK study we did cover a lot of different crops across the US to get a good handle.  
On how accurate is open et in crop lands over a variety of different crops?  
And in general it works quite well for alfalfa and pasture grass specialty crops. It has a harder time.  
It seems like orchards that sort of stuff.  
But you know.  
I argue that our opening team numbers are probably is it that they have?  
Probably just as much uncertainty as the institute measurements themselves.  
We're we're we're getting to that that level where our numbers.  
Are are just as uncertain, if not less than, than Eddie Coburn's end.  
And and hetero genius to rank, you know, mixed terrain?  
Complex surfaces, et cetera.

 **RAY Linda K \* WRD** 1:00:55  
Thank you.  
And Justin, you're going to stay for the rest of the meeting, right?  
So we can circle back to you should additional questions come up after we hear from Erin.  
I think we're also going to touch on use of this data as part of the next steps conversation.  
So thank you again.  
I don't see any additional questions, so we are going to go on to Erin Fellows to share the department's thinking on how we're going to use this data. Thank you.

 **Sara** 1:01:46  
Aaron, you're mute.  
Sorry.

 **RAY Linda K \* WRD** 1:01:50  
That's my bad. Sorry, go ahead.  
Aaron, is this working better?

 **Sara** 1:01:57  
No, you sound great.

 **RAY Linda K \* WRD** 1:01:57  
Can you hear?

 **Sara** 1:01:59  
Oh.

 **RAY Linda K \* WRD** 1:01:59  
Oh, great. Thanks so much. Yeah.  
Thank you for the opportunity to talk a little bit about how.  
Oregon intends to use these data.  
This is a great opportunity for us.  
Working with staff at.  
OWRD and and talking with Justin and others, we we've identified many applications for these these data at OWRD ranging from scientific applications to better understanding water use and water budgets and also informing our our our policies and programs that we that we.  
Support.  
The statewide ET project.  
That data set that Justin described has some really helpful properties for Oregon. This new combination of data, parameters and forms a wide range of hydrological questions.  
The focus on large spatial scales and long time scales give us a great perspective on how hydrology changes across the state and over time.  
The work that these scientists have done to consistently process these data.  
I'm it.  
Gives it a uniformity that allows us to to work with the data set in more easy fashions, so we can leverage computer programming tools.  
Spatial analyst software.  
And other types of tools to to work with these data fairly easily.  
And then importantly, a lot of this work has been documented in peer reviewed, which gives us a lot of.  
Faith in and and it builds strength in these data.  
So in in this effort to identify our applications, we pulled together a draft document and sent that out. With this meeting was called applications for statewide ET project and remotely since ET data at the Oregon Water Resources Department and this presentation.  
Largely follows that document.  
And if you have an opportunity to read that, we're also taking feedback on that.  
So when we talk about app, the applications of these data at owrd, we thought we looked at a past use of Ariel and satellite imagery.  
We considered the data availability parameters in this new statewide.  
Yeah, ET data set.  
We thought about this data's accuracy and then how this data would be applied.  
So what was its purpose of use?  
And I'm gonna kind of go through a few of those.  
Of those items to give us better context for our use.  
For the applications that we've identified here, so or wrd has a history of using satellite and aerial imagery in its work.  
Here we've identified a few of the key applications.  
We use aerial and satellite imagery to identify agricultural fields and infrastructure.  
In infrastructure such as diversions and canals.  
We use these imagery to assess possible irrigation patterns.  
You'll find these data commonly in reports and scientific studies that OUTWRD produces.  
This these imagery and satellite imagery in particular, such as the normalized difference of vegetation index or NDDI.  
Is is used in our water rights transfer?  
Work and we and we use aerial imagery and and DVI to support evidence of use in in those types of regular regulatory activities.  
Yeah. Justin touched on some of the, the the strategies that Oregon uses for quantifying water budgets and that is the 1992 coincidence.  
In that report, it describes a method for calculating net irrigation, water requirements and Justin talked about that.  
So we'll use that information for constructing water budgets.  
We'll use duty or rates on from water rights.  
And float and flow meter measurements.  
Collectively, those are due to inform water and mounting applications in our budgets.  
So you can start to see that the data set that.  
That Justin, and collectively, these scientists.  
Blake and Matt have and Jordan have really pulled together here and form a lot of these needs.  
So kind of synthesizing some of the items that Justin described in his presentation.  
This is kind of a quicker rundown of some of the key pieces that are going to help us in our analysis, so.  
Obviously the agricultural fields in their attributes are very important for understanding.  
Agricultural irrigation across the state these fields.  
Have evaporranspiration consumptive use of irrigation, applied water and net irrigation requirements for for all of these fields. So.  
That becomes readily acceptable and usable for a lot of applications.  
At Owrd and then we talked already talked a little bit about the open water evaporation data sets that that DRI produced.  
I'll call out here. That one thing that we didn't carefully mention was an approach to estimate shallow water evaporation across the state.  
This can be helpful.  
Where where there's ponds or bulges to support irrigation practices.  
Justin also gave us a rundown, a little bit of data accuracy here is just that, can summarize in some quick.  
Quicker bullet points of vapo transpiration in this data sets, estimated to be within 10 to 20% consumptive use of irrigation.  
So this is the fraction of ET that is coming from irrigated water.  
That's estimated to be 10.  
To be.  
Accurate within 10 to 30%, but it's not fully quantified.  
Not all aspects of of that number have been had been fully quantified and then.  
The applied water from irrigation is gonna have an uncertainty that's likely larger than that consumptive use from irrigation, and it is not fully quantified.  
Now, the way that Oregon wants to use this data sometimes will take subsets.  
Of different parts of the state Jordan mentioned.  
They need to do water budgets for particular watersheds, for example, so we need to be cognizant about how this uncertainty varies across different parts of the state.  
So in in the different factors, the impact the data quality.  
So these are things like how are how do owr de water rights mapping the number of fields that were including these analysis this season and in in the time period, meaning like historic data before 2000 or after 2000.  
How do these different factors?  
Impact the uncertainty.  
Data accuracy.  
So Justin really kinda gave us put this in perspective. The importance, the scientific importance of of this information.  
And and that really bears out in Oregon's interests in understanding water budgets at large spatial scales.  
Large regions and trends and reservoirs, we need that for a wide range of both scientific and policy based understanding of of the hydrology in Oregon.  
So these are two figures pulled out of the DRI report.  
On the left you can see a map of consumptive usage across the state, and this is the long term average that DRI.  
Ves calculated for that report.  
You know this this map already.  
Can you can see some interesting patterns here?  
Along the coast, there's lower.  
Consumptive use.  
From irrigation compared to the eastern part of the state, and it's broken down by different hydrological units and then on the right are the is a map including.  
The key reservoir.  
So there's there's about 84 reservoirs, I think maps here.  
And the annual evaporation for each of those reservoirs so you know across the state, we're seeing a range of around 31 to 47 inches.  
We set out to identify applications and we broke them into ones that we're currently using, ones that are under consideration and.  
Ones that were were not pursuing at this time.  
So here's our list of current applications that we identified.  
So, as described in the previous slide, water digits at large spatial scales.  
We intend to use these data for groundwater basin studies. Jordan mentioned that with a Harney and in the Walla Walla.  
Build work and planning.  
So we intend to use these data to help support field work and planning and identifying regions with agricultural activities.  
These data inform water budgets for scientific and queries.  
So this is thinking a little differently than these water budgets at large spatial scales. But thinking a little more about things like canal seepage, maybe in the deserts or something like that of that nature.  
Placed these data have a role in planning and development projects.  
And as we talked about reservoir evaporation.  
So again.  
Talking about applications at watershed scales.  
Here we're we're currently working on a study in the wall to Walla River basin with our partners are the United States Geological Survey in the State of Washington.  
We're trying to understand groundwater, pumpage and water budgets in the Walla Walla.  
So we'll we'll.  
Subset the statewide ET project.  
Et data set consumptive use applied water and apply it for for this study.  
We're currently using this data to for the Dischute storage report.  
Now this is the dischute storage report is a biweekly.  
Report that's used for counting, accounting for water in the in the disputes the water master uses the.  
Report for allocating water and and understanding water budgets.  
So we're using the modeled reservoir evaporation from the statewide ET project.  
In this figure on the right shows the historical patterns of evaporation from three key reservoirs in the districts.  
We identified applications that are under consideration or in development.  
So we're looking into using these data.  
In an upcoming update to the water Availability reporting System, this is a pretty big project for OWRD.  
We're looking at how these data plug into our water rights transfers.  
Team.  
Already this group uses ndvi and satellite imagery, and these data may support that type of use there.  
We're looking into how this.  
This data supports evidence of use in non use, especially in conjunction with other data that OW already uses.  
We're considering using the state this data for the attorney crap and conservation programs, and for pond evaporation.  
So I wanted to expand on how we're thinking about how this fits into Harney crap or the Conservation Reserve enhancement program, right?  
This is a voluntary program administered by OWRD in the US Farm Services Agency.  
In this program, our leaders receive payments to convert groundwater irrigated fields into conserve land, so this remotely sensed ET will be used may be used to support evidence of irrigation use and also for compliance.  
Directions that we are not pursuing at this time.  
And really focus in on things where we're looking at applied water for one or only a few fields where where high accuracy is needed.  
Or not recommending using this as the primary or sole evidence for non use.  
At this time, we're not looking to use these data in place of water use reporting from, say, a meter.  
So this is this is not intended to meet a water use reporting requirement and we're not looking to this data for near real time or within season.  
Regulatory activities.  
So just to kinda see where this data fits into some of our roles, as in in regulation.  
We've really identified where.  
We don't see this data as supported at this time, so in particular we're not looking to use this data for a sole or direct comparison between applied water and the duty on a water rate during individual field in order sacred regulatory activities.  
We are looking at this data to support evidence of.  
Of use or non use.  
But where that is supported by other.  
Other evidence or other data?  
We see value in this data where it can help identify irrigation that's occurring outside of a place of use.  
So this could support.  
Field teams, for example, trying to identify.  
Unregulated irrigation.  
And then generally, we captured some other conditions that may be specified by water, right? We really didn't.  
Dive into a particular case there, but.  
There may be instances where this data helps us better understand.  
Better understand information and provide better data for certain specific conditions.  
Thank you for letting me describe some of the applications we thought about here.  
Rachel. Yeah. Thank you. Before we go to Rachel, I just wanna see.  
Nice job, Aaron.  
Any questions for Erin?  
OK.  
And apologize if we're running just a little behind schedule, but I think we'll still adjourn fairly close to the originally scheduled time.  
And with that, Rachel, thank you and hopefully we stop the screen share. Aaron, I think you might have. Thanks.  
Thank you.  
All right.  
Well, thank you to all of our speakers and I want to thank everyone for taking time to attend.  
Today we will be, as I put in a chat, accepting written comments on the draft applications memo through the end of the month.  
We know it's busy time of year here in Salem and so we want to give you all the chance to weigh in there.  
We will work with Erin to review and respond to those.  
We will be continuing our work on these data currently.  
We'll be working to refine these cases and establish different procedures for applying the data to those uses in the department.  
We will also be continuing to work with OSU. They have picked up and established a contract for continuing development of much of this data into the future.  
And finally, I will be partnering on other.  
Data sets and analysis and conversations with 0.  
SU under the Hustle 2010 work that was funded last session.  
Will be supporting working with Maria and other people at OSI.  
Maria, is there anything you wanted to add there about a conversation?  
Yeah, just a quick few notes. Part of this bill that one of the hires and Floyd was on call too is one of the hires that we able to accomplish with that.  
We're also trying to create more visibility, so we're now.  
Conversations with Washington State University with Jema with the girl in the state trying to figure out ways in which we can collaborate and sync.  
Instead of, you know, giving intern efforts or creating a a website and also calculators and information that will be available directly to producers, but also anybody that will be interested in at water management and.  
And we are also forming a group as the Ag tab or the.  
Agricultural water technical assistance and that is.  
So I really hope to connect hopefully like.  
With Hartley, I don't know if she's still on the call, but I think that would be a great way to start interacting and developing an Advisory Board that.  
And and ways that we can still communicate part of this work.  
And engaging with different stakeholders across the state to try to tackle different challenges and and needs, and the ways that we can use, put that work together.  
Thanks. Thank you.  
Any questions for the for any of our speakers or on what we just shared?  
April.

 **April Snell** 1:24:29  
Thank you, Mike, I didn't.

 **RAY Linda K \* WRD** 1:24:29  
I had it booked, yeah.

 **April Snell** 1:24:30  
I didn't think I was first. April Snow, Oregon Water Resource Congress. We work with irrigation districts and similar agencies around the state.  
Appreciate the the update.  
Lot of information I'm going to look through that and hopefully give you guys some comments.  
Two two thoughts.  
One, I guess the question I think I heard correctly, but just wanted to verify there are only three.  
Open at ground stations in the state.  
I'm not sure if that's the right vernacular, but basically the equipment that is used to validate all the wonderful things we get from from satellite, so that would be.  
One one question and then the second question would be, are there any items in the legislative arena that relate to this effort, either funding for the department that might support open ET?  
Or other initiatives.  
And I do know there's a lot out there. So I don't expect you to know the universe, but from the department, if there's any budget or policy concepts that would relate to that. And with that, I will stop and leave some time for other folks.

 **RAY Linda K \* WRD** 1:25:46  
Great. So I'm gonna ask Justin to please answer the first question.

 **Justin Huntington** 1:25:51  
Yeah, sure.

 **RAY Linda K \* WRD** 1:25:52  
Regarding ground trotting of the data.

 **Justin Huntington** 1:25:53  
So yeah. Yeah. So I think with.  
Maria's with Osu's stations that were recently installed.  
They have two and then we're continuing to collect ET data at Mark Owens Field.  
So that's three. I think those are the only three active Eddie covariance stations in Oregon right now.  
Over croplands there there may there there may be.  
One or two from the Miraflux network.  
It's called out over forest and save brush and that sort of thing. But in terms of crop lands, I I believe there's only three right now and we we use those data to Intercompare quote, UN quote, validate, open et data and the more of those we have the.  
Better I know Idaho's thinking about putting out a couple are in the process of putting out some.  
I think they just put out a couple and I'll file some potatoes.  
Also be useful we have.  
2IN alpha in Nevada, so that'll also be useful, you know, similar kind of climate and that that sort of thing.  
So certainly you know any kind of initiative at the legislative level to get more validation stations and resources, financial and and people at OSU to to enable this kind of thing would be awesome.

 **RAY Linda K \* WRD** 1:27:24  
And kind of to your second question and to Justin's point, the governor's recommended budget did include $114,000 reduction for the department to contract on the validation of work.  
So we would have $100,000 left and this biennium we had 214. I think is is what I'm seeing so.  
That relates to your second question, April and other than that, we haven't seen any.  
Draft bills.  
That where this data has been.  
Included in in in the language or in the concept.  
Yet so not to say there aren't any, but you know there's still more coming harmony.

 **Burright Harmony** 1:28:16  
Hey, yeah, just briefly to April's second question regarding legislative proposals.  
So last session there was House Bill 2010 which made the investment in Oregon State University standing up. The Agricultural Technical Assistance Program that's funding for an ongoing program.  
So so far as I know, we don't need to do anything legislatively to continue to support that work.  
Through OSU.  
Continue to track progress and there will be reports coming out from that eventually.  
That I'm talking about.  
That the impact of that work. So I'm looking forward to seeing what comes of that and how it gets brought back to the legislature.  
There is a bill forthcoming.  
For water data that would seek to restore cuts from the 2023 session.  
Under studies and public outreach.  
And then there is a included in that bill funding to kind of offset the proposed cuts in data for the department.  
So anything that was in the governor's recommended budget for proposed cuts to data, there's a bill proposing to, like, basically offset those cuts and that's all that I'm aware of so far.

 **RAY Linda K \* WRD** 1:29:46  
Thank you, harmony Claire.

 **Claire Ruffing** 1:29:50  
Hi thanks to all the speakers. I have a question about ground truthing Erin's presentation got me thinking.  
Given the importance of ground truthing, what are what do you see as the biggest priorities in terms of where the the need is for future stations? And I guess this is a question for either Justin or Aaron, but you know is it are you hoping to see more?  
Platforms and for open water.  
Estimation. Is it certain agricultural settings?  
Yeah. What are your thoughts about that?

 **Justin Huntington** 1:30:29  
I'd like to hear Marie's thoughts on this.  
Too, but mine.  
Kinda tend to focus on where there's conflict, right?  
So if we are really needing to build trust and validate our products.  
In a.  
In a in a contentious area, that's probably where we should be putting up a station.  
Yeah.

 **RAY Linda K \* WRD** 1:31:03  
Maria, anything to add?  
Oh yeah, I agree.  
With you.  
I would say that as an alternative, so Eddie, Kobe are extremely expensive. And I think if there is a need to add certain equipment that can validate and and serve as a valid proof.  
It could be.  
So we're exploring the idea of using.  
80 centers, like where we can like develop these new?  
Centered however they but like stand alone, they do not work.  
Like Justin and his team have validated and had found that they're underestimating the like. When you do close entity balance. However, I think if you add other components to correct that and some other sensors like nobody on there are like so sensors that might be like say A.  
Cheaper version of an aircraft that could help.  
Funded.  
And can be placed around.  
So we're currently investing into some of those funds and we don't have the funding to actually add these other components. But if that needs of interest, we're putting these ones in different provinces and potatoes and.  
Other ones in like across the states or creating these network and.  
And that could start maybe a comparison versus?  
The like the very expensive equipment that requires a lot of people to maintain and to actually.  
Get it going.  
So that could be a, let's say, a cheaper alternative that can be an investment in the state and then you took a person who did converse that we have.  
Used to correct it and maybe get get more data, but yeah. Thank you.  
Justin, I was curious if I know we all had some conversations about.  
Those et centres in needing to do essentially exactly what you're saying the validation studies.  
I was curious if drives anything in the works right now.  
That's and we can connect outside this meeting to about that, but oh, sorry that we're over time. So I I'll stop.  
Go ahead, Justin.  
And then I wanna I do want to get us to the wrap up. Go ahead.

 **Justin Huntington** 1:33:45  
Yeah, yeah, yeah.  
So far, so we we do have, we do have a licor 710 that's this less expensive $6000 sensor that it's called the ET sensor.  
That Maria was talking about. We do have one of those deployed on Marc's field right next to the Eddie Cove Range station, and we also have one deployed in.  
Well, actually two deployed over next to Eddie Covey and stations in Nevada.  
And so far the results.  
Look pretty pretty promising actually. When we compare the two.  
We have one full growing season of data so far.  
We also have one out in Lake Powell on a floating platform and those values look good as well to the uncorrected or unenergy balanced closed Eddy, Cabarrus et.  
So, as as Maria was suggesting, you know, we can go, we can buy a 5000 to $6000 cheap EC or, you know, ET sensor.  
But we also need.  
Probably I would say $10,000 worth of other gear to make the appropriate corrections.  
That would be kinda equivalent to a full blown any covariance, but again, we're just now doing these comparisons and lycor and USGS is funding us and partnering with us to do that.  
And our site in Oregon is one of EM. As part of that work.  
So we're learning more. It looks pretty good, but it's it's it's kind of black, boxy and you know, we gotta build trust.  
Yeah, I would say before we get too far off topic of funding and and legislative actions and and that sort of thing and and proposals and thinking ahead right, we have funding from H, the hospital 2010, I think it is.  
Yeah. How's bill? 2010, Section 12 of HB2010.

 **RAY Linda K \* WRD** 1:35:51  
Yeah.

 **Justin Huntington** 1:35:56  
To update this database through 2025 S, add 20232425 and we have a subwoo to open ET Inc.  
To support that effort and provide that data, but really we need, you know we we need to be putting in bill draft requests every session to keep this going, you know and keep money going to opening T Inc and.  
And others to keep updating this database, and there's a lot of there's a lot of works in the database in terms of just, you know, not not worse, but just gaps, you know, like, yeah, we need, we need to better attribute what fields are surface water. Groundwater. You.  
Know we gotta improve our groundwater or the water rights database so we can update this. That factor of surface water, groundwater of just 5050. You know that could be improved greatly. There's a lot.  
Lot of work still to do that's gonna require financial and people resources.  
And it's not just about going and collecting more data cuz that's one place that's one data point.  
We need to start.  
Actually, you know operationally updating this database and using it and and and enhancing it.  
So yeah, I'll just stop there.

 **RAY Linda K \* WRD** 1:37:16  
Justin, I think that's a a great place for for us to close.  
Actually, there is a question in the chat that I think we may want to get to as well, and that's about are there any expectations or plans to incorporate AI to study the vast quantities of data that's from Christopher Hall in the chat.  
That's something you might be able to speak to.

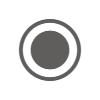
 **Justin Huntington** 1:37:42  
Yeah, in fact.  
We we we use machine learning in the agricultural water management paper where we are predicting groundwater pumping based on open et data.  
And it it worked pretty good. It it didn't. The simple regression was on par with fancy machine learning, so that was kind of an interesting finding.  
But I think there is opportunity there.  
For.  
Machine learning.  
But we, you know, like it needs to be physics based or physics informed machine learning.  
It's gotta be constrained and you know, we we don't wanna just go full black box.  
So yeah, I think I think that that is gonna be, you know something we'll be seeing more of.

 **RAY Linda K \* WRD** 1:38:38  
Thank you. And I just wanna again acknowledge all the partnerships that led to this really important work product and I wanna thank everyone who made time today to join us and we look forward to any any comments and feedback that you have on the department's memo descri.  
Use cases.  
So with that, thank you very much and we hope you all have a great afternoon.

 **Justin Huntington** 1:39:04  
Thank you so much.  
That's up to you guys.

 **RAY Linda K \* WRD** 1:39:06  
But.

 **Sara** 1:39:07  
Thank you.

 **RAY Linda K \* WRD** stopped transcription