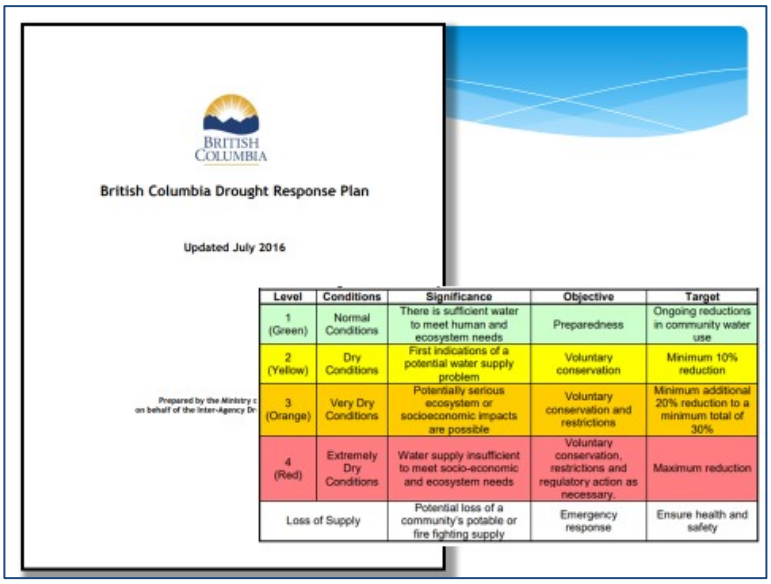
LAUREN MAKOWECKI REGION 5 (CANADA)

Hello everyone, my name is Lauren Makowecki. I'm from Alberta Fish and Wildlife. Alberta Environment Parks, region five, Canada. I just wanted to acknowledge, Rich McCreary, who is an aquatic biologist from British Columbia as he was able to provide me some great slides and information for today, so wherever you are, Rick, I don't see you, but you made the Title Slide. Oh, there you are, thank you.

We have Canada, probably the gaudiest slide I could find. Canada in full color. I will provide an update from east to west. I wasn't able to get much information back from the other provinces and territories. Unfortunately, there is not a lot of drought planning that had any kind of ecological aspects for fish or wildlife involved with it. Ontario does have quite a sophisticated drought plan, currently in draft, they're ready to launch. But again, not a lot of in stream flow. Quebec is actually quite up and coming with a lot of their in stream flow research but again, on the drought side, nothing really formulated.

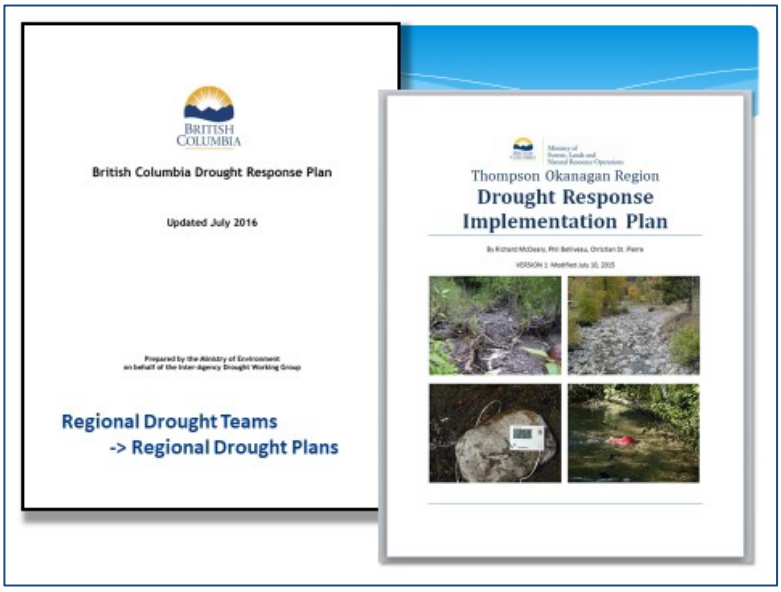
Today I'm going to focus on British Columbia and Alberta, the two western most provinces. British Columbia, because they've done some fantastic work in the last 10 years, really developing quite a sophisticated drought plan. They really are the gold standard in Canada and I'll talk about Alberta, just because that's where I'm from.



Level	Conditions	Significance	Objective	Target
1 (Green)	Normal Conditions	There is sufficient water to meet human and ecosystem needs	Preparedness	Ongoing reductions in community water use
2 (Yellow)	Dry Conditions	First indications of a potential water supply problem	Voluntary conservation	Minimum 10% reduction
3 (Orange)	Very Dry Conditions	Potentially serious ecosystem or socioeconomic impacts are possible	Voluntary conservation and restrictions	Minimum additional 20% reduction to a minimum total of 30%
4 (Red)	Extremely Dry Conditions	Water supply insufficient to meet socio-economic and ecosystem needs	Voluntary conservation, restrictions and regulatory action as necessary.	Maximum reduction
Loss of Supply		Potential loss of a community's potable or fire fighting supply	Emergency response	Ensure health and safety

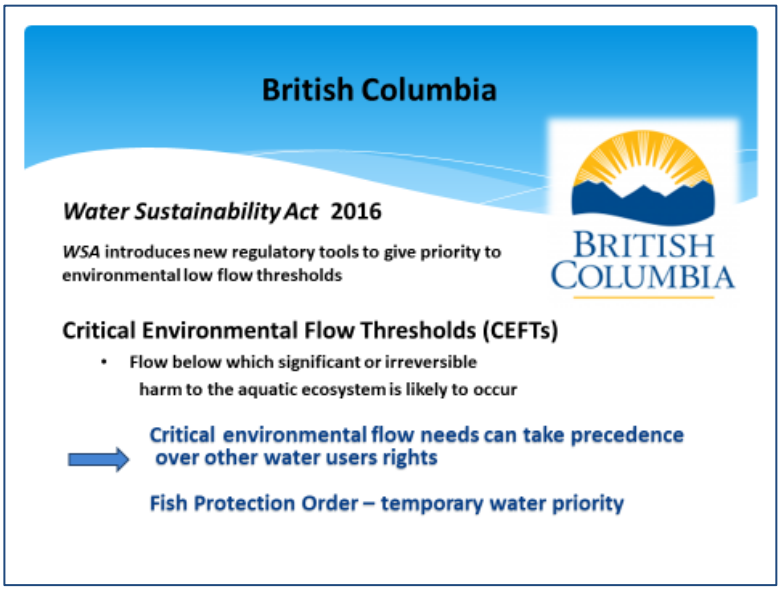
British Columbia has done a lot of work in the last 10 years. They have developed a sophisticated inter-agency organizational structure that has clearly defined roles and responsibilities within the agencies, at different levels of government that work together. They defined four levels of drought and I won't go into them in detail but this document is easy to find on the web. Level one is green. The objective there is preparedness and this is what Christopher was talking about, it's a very proactive plan. They've gotten away from a lot of the reactive situations.

Then you move into the yellow and the orange zones, and the objectives there are voluntary conservations. The % voluntary reduction targets increases from yellow to orange. Then, the red zone is an extremely dry condition. That's when some of the regulatory action kicks in and that's what I'm going to touch on today.



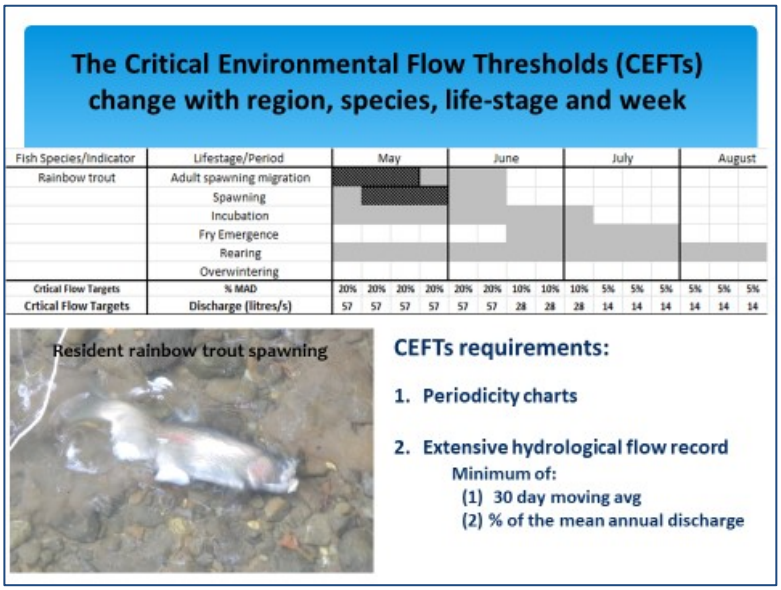
Under the umbrella of this provincial drought plan, there are regional drought teams with their regional drought plans. This is kind of a level that we get into where we can look at the ecological and in stream flow needs. Rich McCreary sent me this, Rich is from the Thompson/Okanogan region and he helped develop their regional plan and this is really relevant to this conference because Rich is from the Thompson/Okanogan region which is in south Central BC and they have the driest and warmest ecosystem in the country. It's one of our wine regions.

Also, it's home to critical rearing and spawning habitat of a lot of salmon populations. These are really international populations that are highly valued by everybody, especially the local first nations.



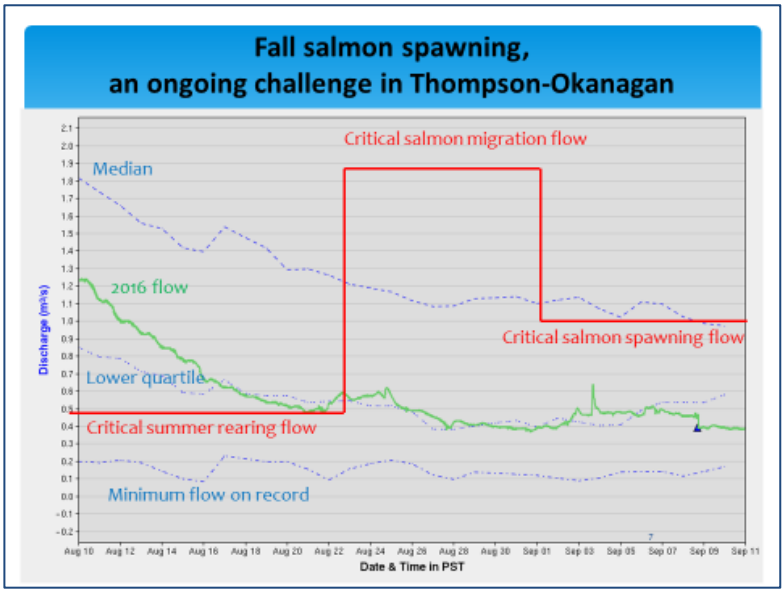
In 2016, British Columbia enacted the Water Sustainability Act, and among other things, it introduced some new regulatory tools that actually gives priority to environmental low flow thresholds during drought, really fantastic. There are some caveats there, the minister does have some discretion but there's always some trade-offs with moving these things forward. These low flow thresholds are formally called critical environmental flow thresholds, CEFTs and if the flows are below a CEFT, significant or irreversible harm to the aquatic ecosystem is likely to occur.

Notice, they use the words aquatic ecosystem, so it isn't just limited to fish. Two things have to happen here. One, a drought has to be declared for a region and two, you need to have these critical flow thresholds prepared and in place before you can make use of the powerful regulatory tools. During a drought, the environmental flow needs can take precedent over other water user rights. Regardless of first in time or first in right or junior/senior licenses, there's a temporary priority. One of the mechanisms is a Fish Protection Order, which provides temporary water priority for recovery species. It's pretty powerful stuff.



I don't have time to go into the development of CEFTs in much depth, but I just wanted to show how straightforward these flow thresholds are to calculate. The primary tool to determine these low thresholds are periodicity charts or your biologically significant periods. These are developed for each species, for each life stage, for each week. Of course, these would vary from region to region. The other thing you need is quite a good quality hydrologic flow record.

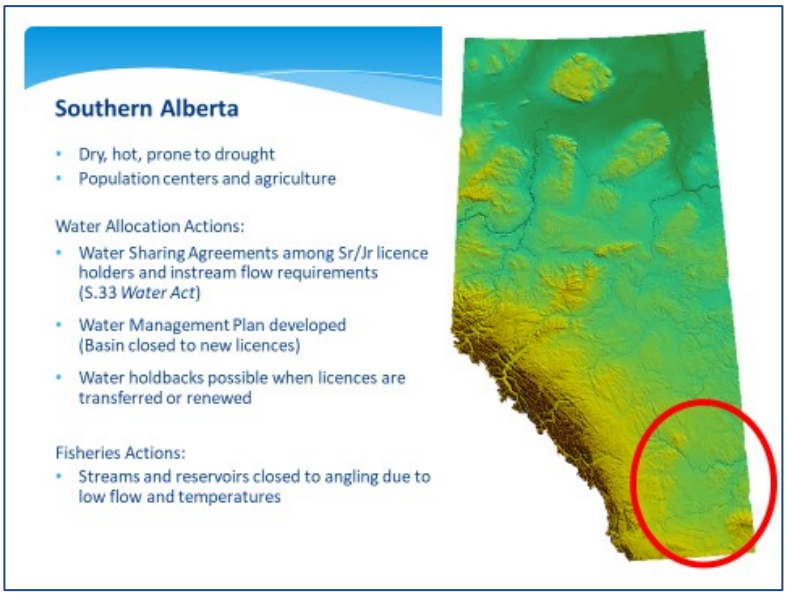
Basically, you're taking a 30 day moving average over your critical life period and you're comparing that to a bench mark flow of 20 or 5% depending on the life stage of your mean annual discharge and the minimum of that is your flow threshold. Of course, you develop these for each of the life stages for your species.



You put them together and you can see that there might be some overlap so during that week, you'd be taking the maximum requirement for that species. I think this is a really cool slide because it really shows the challenges the populations and the managers of those populations have in that area. As you can see, there's your median annual discharge there. It is quite a challenging situation.

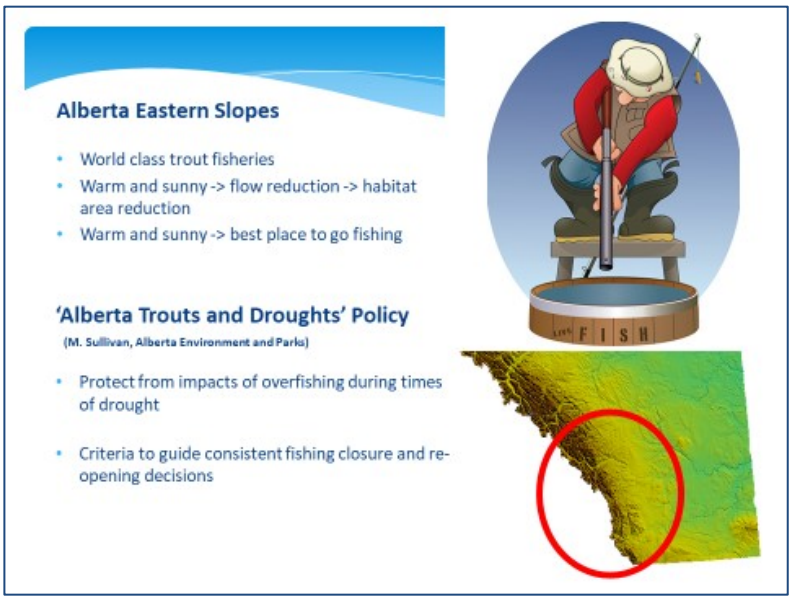
Rich was just telling me over lunch, they've done a lot of work in getting a handle on the water allocation and actual water use compared to what's actually allocated, so they've done a substantial amount of work so hopefully that helps a little with their challenges there. Yes, they've put in a lot of effort in the last few years to develop all these environmental flow thresholds to have them ready to go to make use of the tool. It's been a pretty impressive effort.

Okay, with my time, I just want to go on to Alberta.



Southern Alberta is very hot, dry, lots of agriculture, lots of intensive irrigation there. In 2001, there was a significant drought year so the irrigation districts and other users got together and actually formalized water sharing agreements that are in our water act and which did include some level of in stream flow requirements. As droughts do, another one followed the next couple of years, and everyone was, "Oh my god, we've got to do more," so they got together and a multi-stakeholder, multi-year process water management plan was developed for that area.

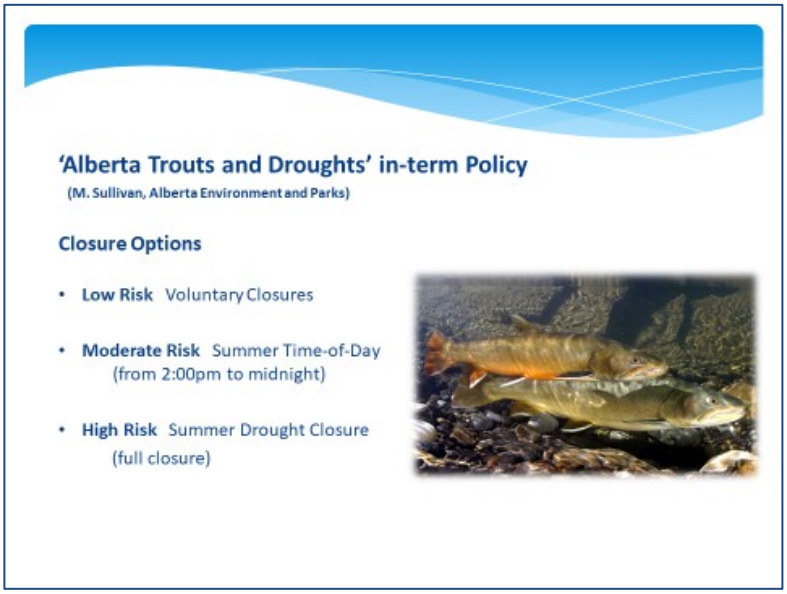
One thing that came out of that plan was that entire basin, the southern basin is closed to new allocations. Closed to new licenses. Another tool the province has is water hold backs so when licenses are transferred or renewed, we have the ability to hold water back. On the fishery side, we can close stream and reservoirs to angling when there's low flow, high temperatures and that's always received well.



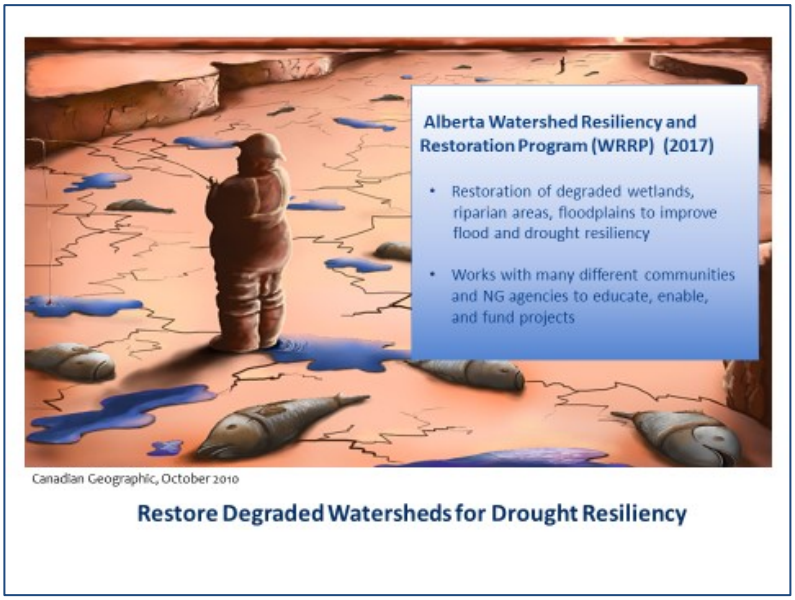
Going west a little bit to our eastern slopes, we've got some really great trout fishery streams there. Those are snow packed fed so when it gets warm and sunny at the end of summer, there's a real flow reduction and obviously with a flow reduction, there's a real habitat area reduction. We get a situation like that happening at the end of summer because when it's warm and sunny, the best place to go fishing are these areas, so they experience quite high angling pressure at the worst time for the fish.

We have a droughts and trout policy and to protect from the impacts from over fishing during times of drought.

The Trouts and Droughts policy provides a set of criteria to help guide consistent fishing closure and opening decisions. It consists of three inputs. We look at what the stream flows are, we look at the threshold temperatures for the most sensitive species of that stream. Many of these streams are naturally stressful with just those two sometimes. Then we try to determine the anticipated angler effort, which can include people coming up from North Dakota and coming from BC. Which is the third critical factor in unsustainable fishing mortality.



These fit into a risk matrix for closure options. We get three levels of risk. We get voluntary closures at the low risk, which is really an opportunity for outreach and education. At moderate risk, we get the summer time of day closure, which is like the hoot hour closures and then the high risk closures, which shuts down all sportfishing which has some serious social implications and blowback.



Just one last thing I wanted to talk about is in Alberta, we have a watershed resiliency and restoration program and it's an agency that works with communities, a non-government organization to fund and help set up projects for restoration of watersheds, to build that natural resiliency in watersheds to drought and to flood.

Thank you for your time.