

# Twinfield Hydro Project

We were concerned when ANR told us that our current proposal will harm Nasmith Brook's fisheries. We are looking forward to working with ANR to create a small environmentally-safe hydro.

We appreciate Secretary Crombie's meeting with us and offering us an engineer to help us.

Our Twinfield Hydro group is proposing to install a small damless hydro facility that would divert some of the water out of the Nasmith Brook and then, after running through a turbine, would return it to the Winooski at a lower point.

Benefits of a damless hydro on the Nasmith Brook and Winooski River are:

- Producing zero co2; this means Twinfield won't be contributing any electricity related global warming (greenhouse) gases to the atmosphere.
- Providing some of the power we use (it would produce around 300,000 KWH annually to our use of around 500,000 KWH/yr).
- Reducing the school's electricity bill. Right now we pay around \$58,000 every year for electricity.

- Stabilizing future electricity cost fluctuations. The Hydro Quebec/Vermont Yankee contracts are running out in 2012. Those two organizations produce 2/3 of Vermont's power. Whatever is done to resolve this problem the consensus is that the price of electricity will go up.
- Using net metering Twinfield will potentially be able to make back all of the estimated one-half million dollars we spend to build this hydro.
- Benefiting from a lower utility expenditure each year. A lower energy cost would mean fewer taxes for everybody in our area and.
- Our school already has budget problems (we have had to revote on two of the past four budgets to pass them) and would have trouble paying more for electricity.

To help in understanding our proposal, we had asked ANR and other state officials to visit Lowell to see a site that was permitted by ANR and has been operating successfully for years. Our invitation has not been accepted yet, so here are some pictures of our first visit.



**Small damless diversion like ours:** The penstock goes from Potter brook to Burgess Brook. It has been operating for a long time without problems. While the penstock is more than half the size, the watershed is about 1/3 of the size of Twinfield's.



**Here is a view looking upstream at the diversion structure by the culvert.**





**Looking downstream, here is the  
intake diversion structure and trash  
rack to keep out fish.**

A photograph showing several people in a basement or powerhouse setting. In the foreground, a large, ribbed metal component, possibly a pump or compressor, sits on a wooden platform. A young man in a dark jacket is leaning over it, inspecting it. Behind him, a woman with long blonde hair, seen from behind, wears a purple shirt. To the right, another person's head is visible, looking towards the equipment. The background features large pipes and wooden walls.

**Inside the  
powerhouse  
-it heats his  
house too.**

# How do we move forward?

## What are the options?

To start: we can't afford the high cost of expensive studies (fish and flow studies) that are estimated to be almost \$200,000. In Vermont most hydro projects cost \$100,000 to \$1,000,000 in consulting fees.

\* FERC-2001 Report on Hydroelectric Licensing Policies, Procedures and Regulations Comprehensive Review and Recommendations Pursuant to Section 603 of the Energy Act of 2000

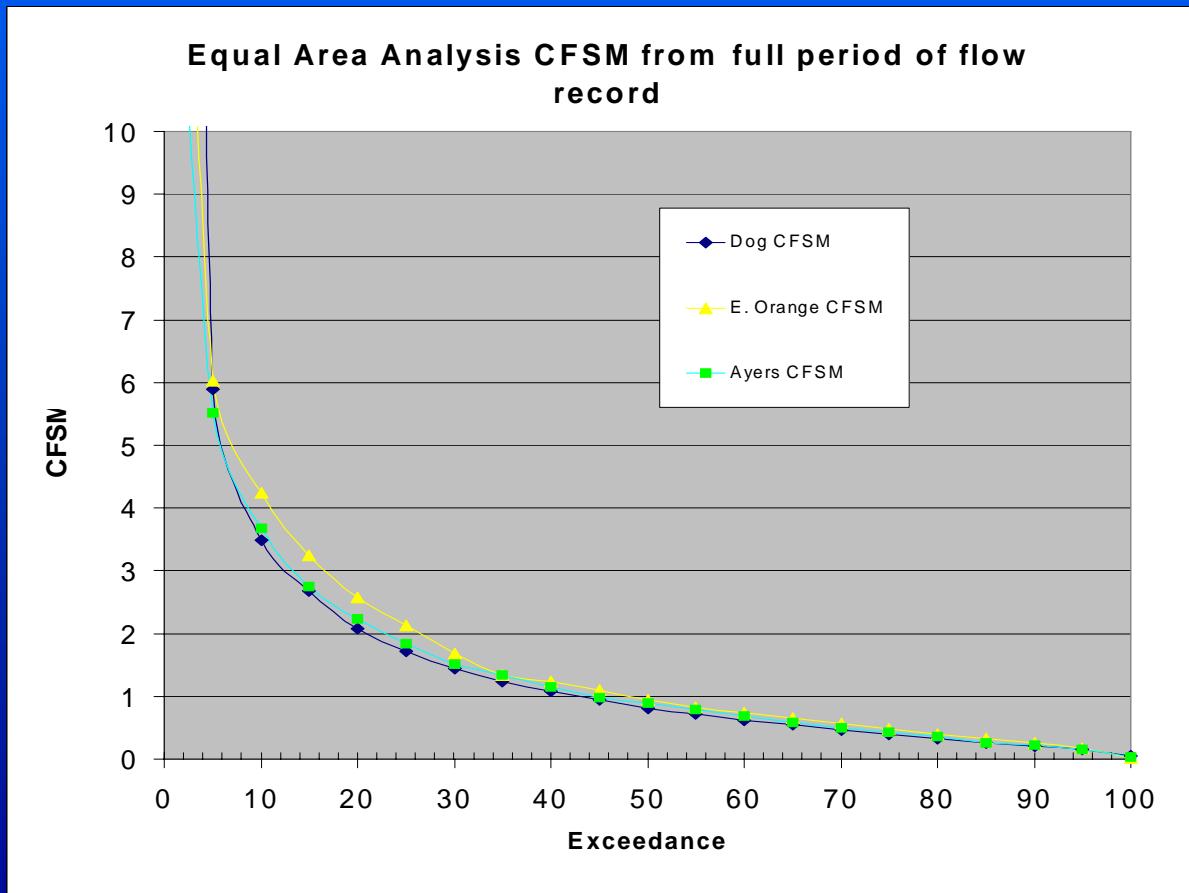
# Preferred Option: be consistent with Federal Policy

Section 3.a of Federal Fish and Wildlife Policy states:

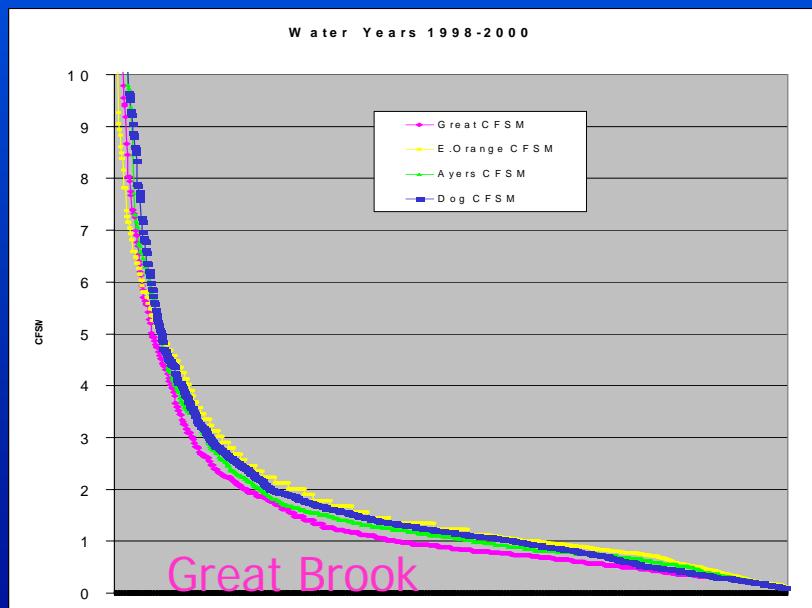
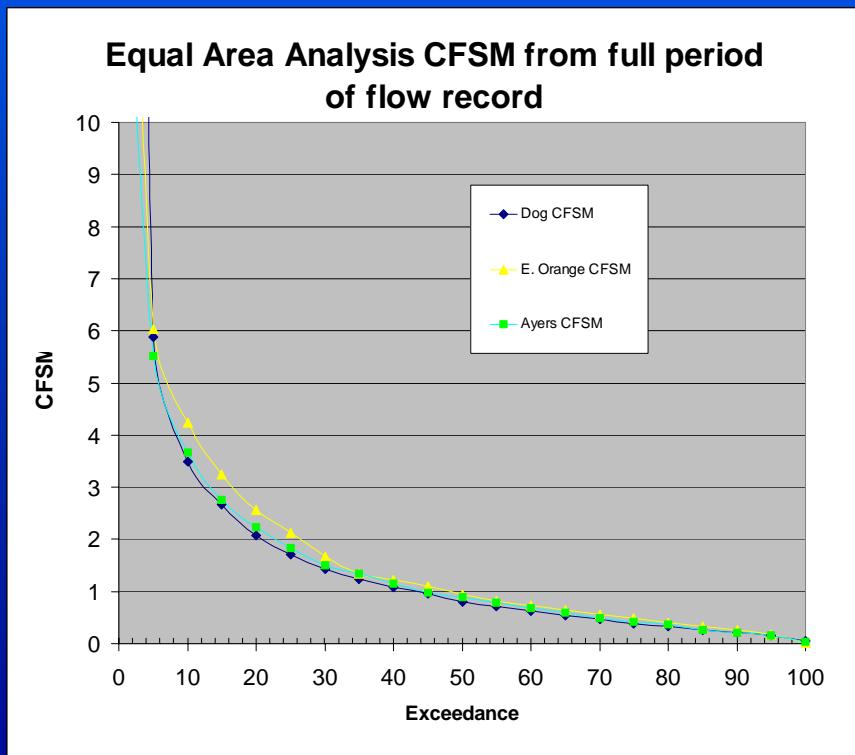
- “Where a minimum of 25 years of USGS gaging records **exist at or near a project site on a river that is basically free-flowing**, the USFWS shall recommend that the ABF release for all times of the year be equivalent to the median August flow for the period of record unless superceded by spawning and incubation flow recommendations...”

This uses local data,  
NOT a state-wide Vermont number.

**USGS data: The three nearby long-term gages have about the same flow. Would it be possible for us to rely on 3A of the USFW Federal public policy for our project?**



Here is data from a 3 year study on an adjacent watershed-Great Brook in Plainfield. The Great Brook and Nasmith Brook watersheds are the same size and drain the same side of Spruce Mountain. The flows in Great Brook are a little drier than the long-term USGS gages for the same 3 year period.



**ANR looks at median flows. The three selected watersheds have median flows that are almost exactly equal. This shows local runoff patterns are about the same.**

- Ayers Brook-August median-0.27 cfsm
- Dog River at Northfield Falls-August median-0.25 cfsm
- E Orange Branch-August median 0.29 cfsm

(August median flow data from Jeff Cueto-ANR)

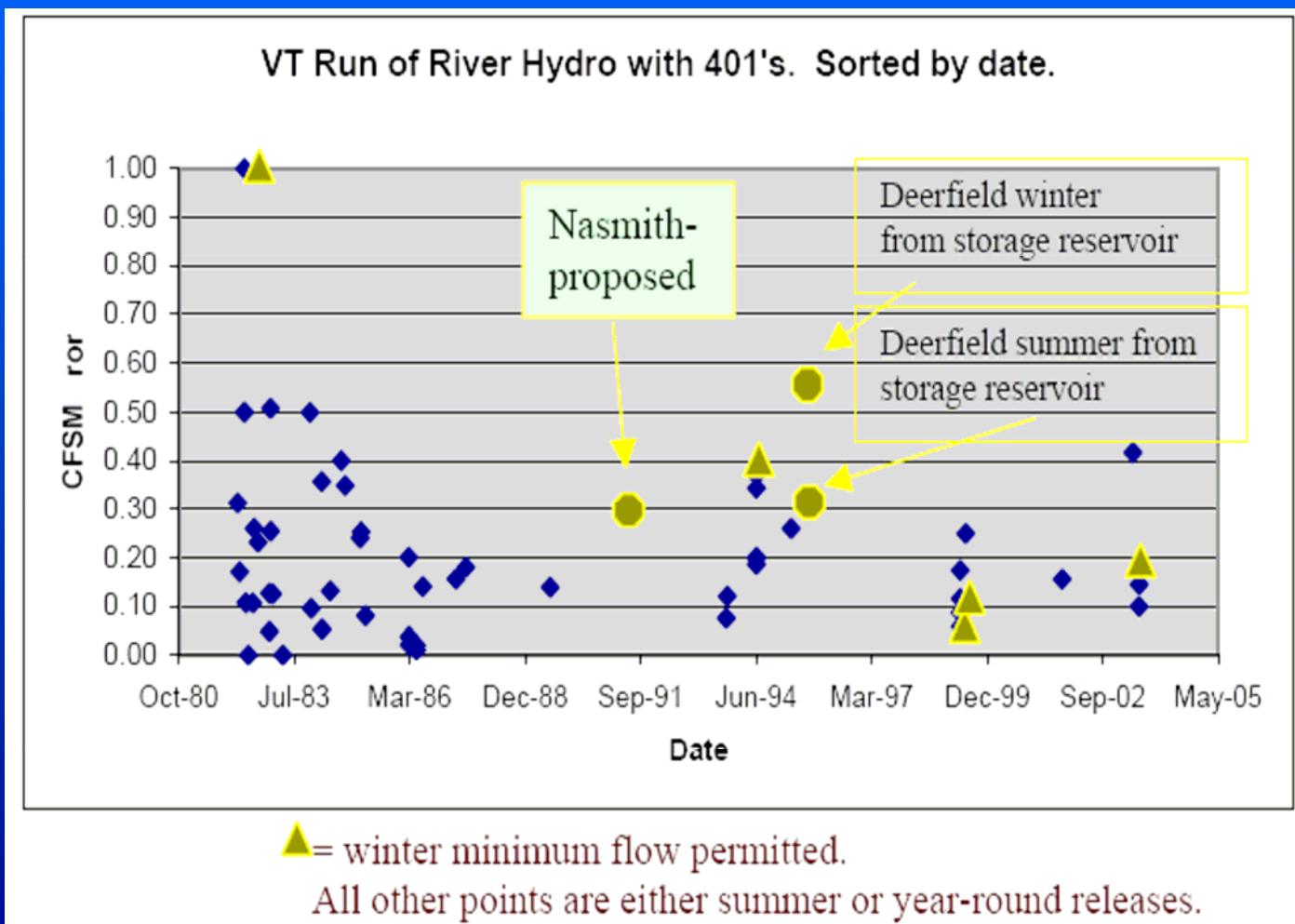
strong correlation between the two sets of data. Then the ABF re-estimation did not identify statistical relationship. Because of the high variability in the median flow values between streams, we do not accept ABF re-estimation using a simple drainage area proration even if the streams are physiographically and climatologically similar.

Steve Sease (July 12<sup>th</sup>):

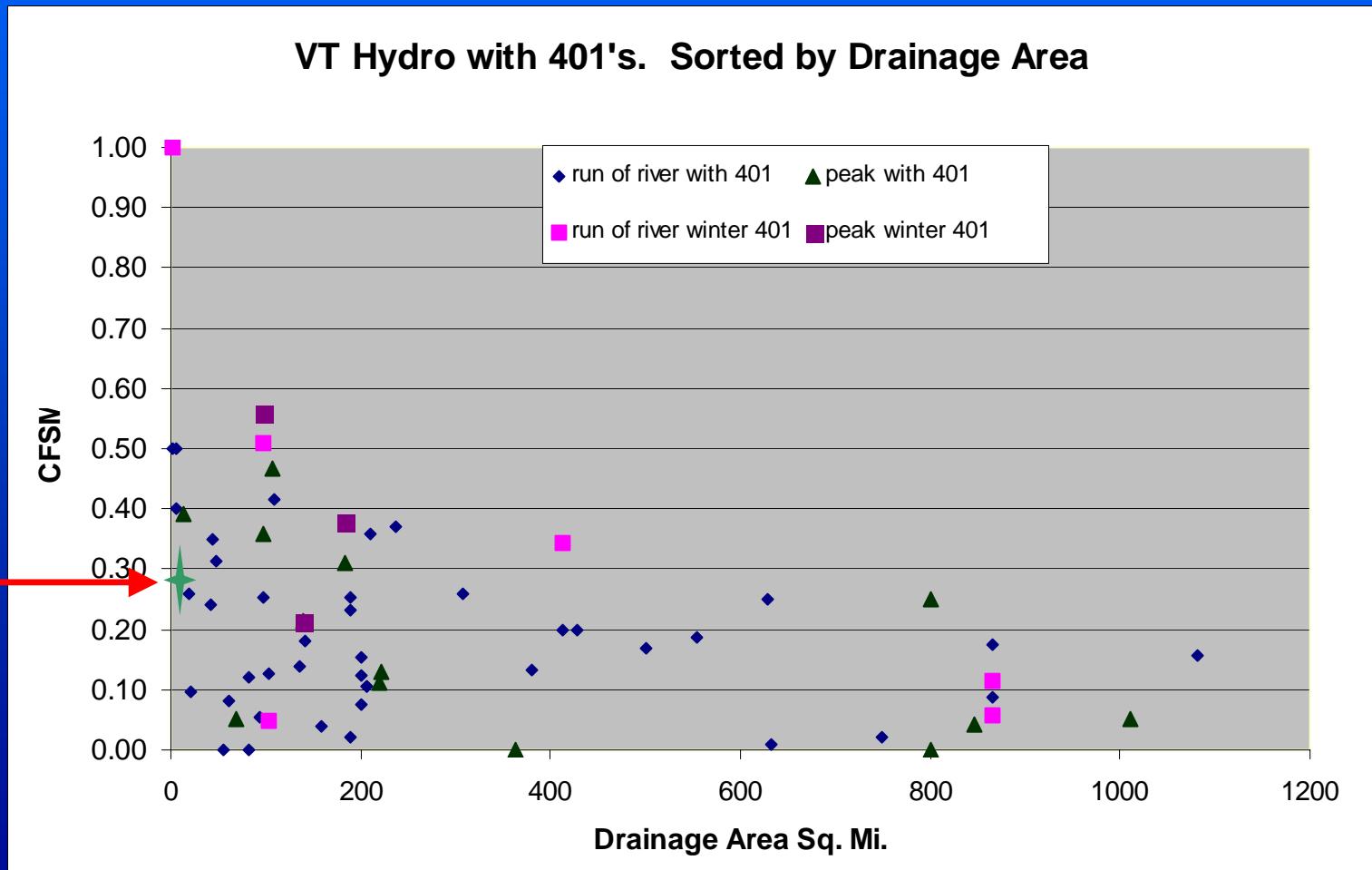
**Why can't we use the simple drainage area method when the medians do *not* have high variability?**

**Is there a statute that doesn't allow this?**

**Our proposal leaves more water in the river as a minimum than most of the sites that ANR has permitted in the last 15 years, even sites with good fisheries, fixed flows and long bypasses.**



This graph shows that bigger rivers with bigger drainage areas and flows have lower required minimum flows from ANR.



# More options under Flow Policy:

- Site specific Fish Studies-  
Can ANR provide us with the protocols to do this in September 2007?
- Site specific Flow Studies-  
Can ANR conduct a flow study with Twinfield, like they are doing for Greensboro?
- Expand on the United States Geological Survey's 2002 flow study by Scott Olson that was completed for the Vermont Agency of Transportation.

*What do you think about the idea of working with Scott Olsen (USGS) to expand his 2002 study on flow frequency in Vermont? We do not expect the effort would result in monthly median flow estimates with standard errors low enough to support the time and resources that would be required.*

Steve Sease (July 12<sup>th</sup>)

**Could ANR please provide us with their estimate on the time and resources required?**

the 1960s and 1970s. For the work he did previously, Mr. Olsen did a record extension for the small watershed gages, which was helpful, but all and the same, it is reasonable to project that estimates of median monthly flow statistics for ungaged streams using regression equations will not result in accurate values for small watersheds. If you want to explore that further, we would certainly be interested in your findings.

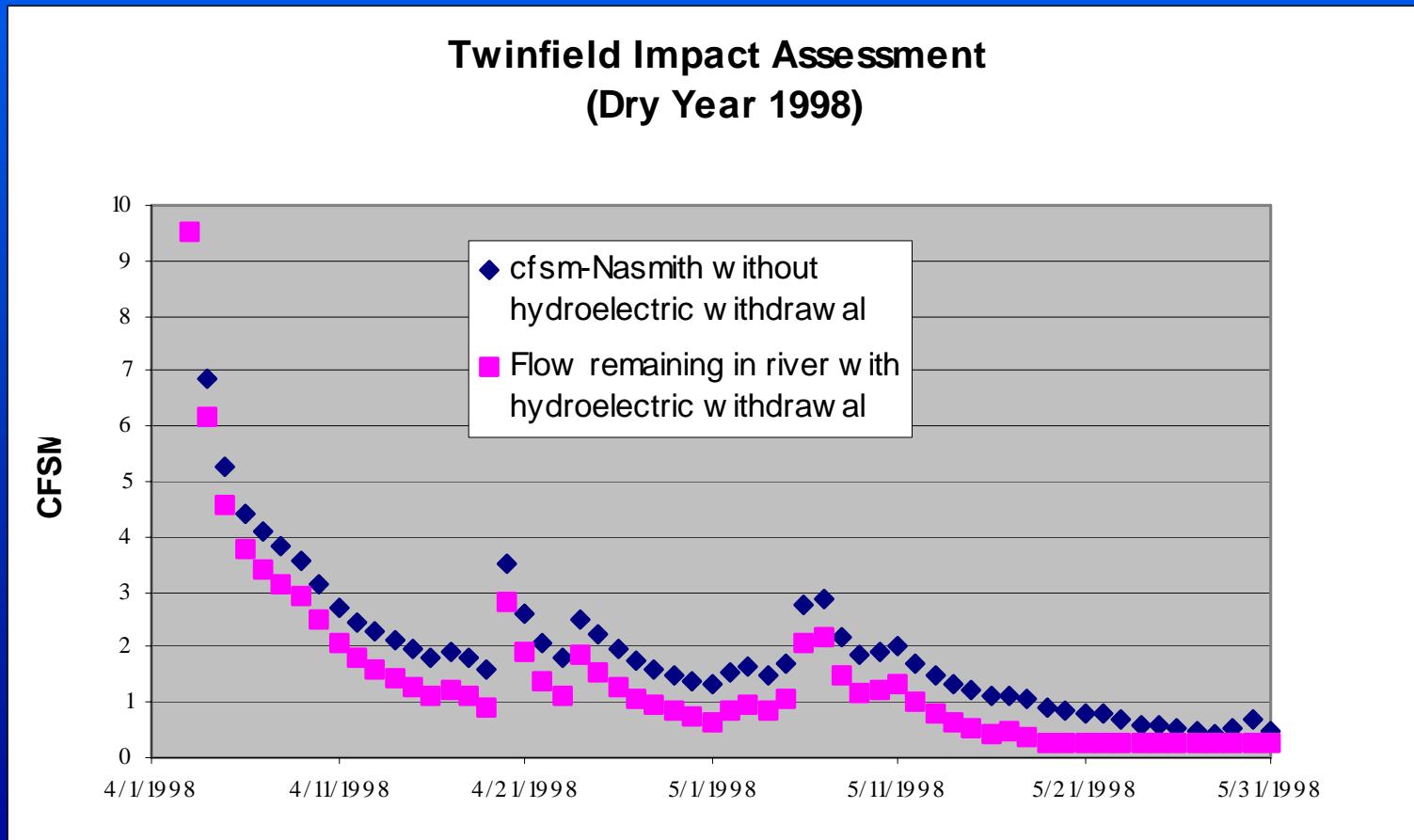
## **So we asked Scott Olson of the USGS what he thought about ANR's letter of July 12<sup>th</sup>. He wrote:**

- “ Thanks for the information. While error exists in stochastic approaches, it is defined. I would expect this to be more desirable than an undefined bias that would be generated by collecting data for your project during times when streamflows are above normal.

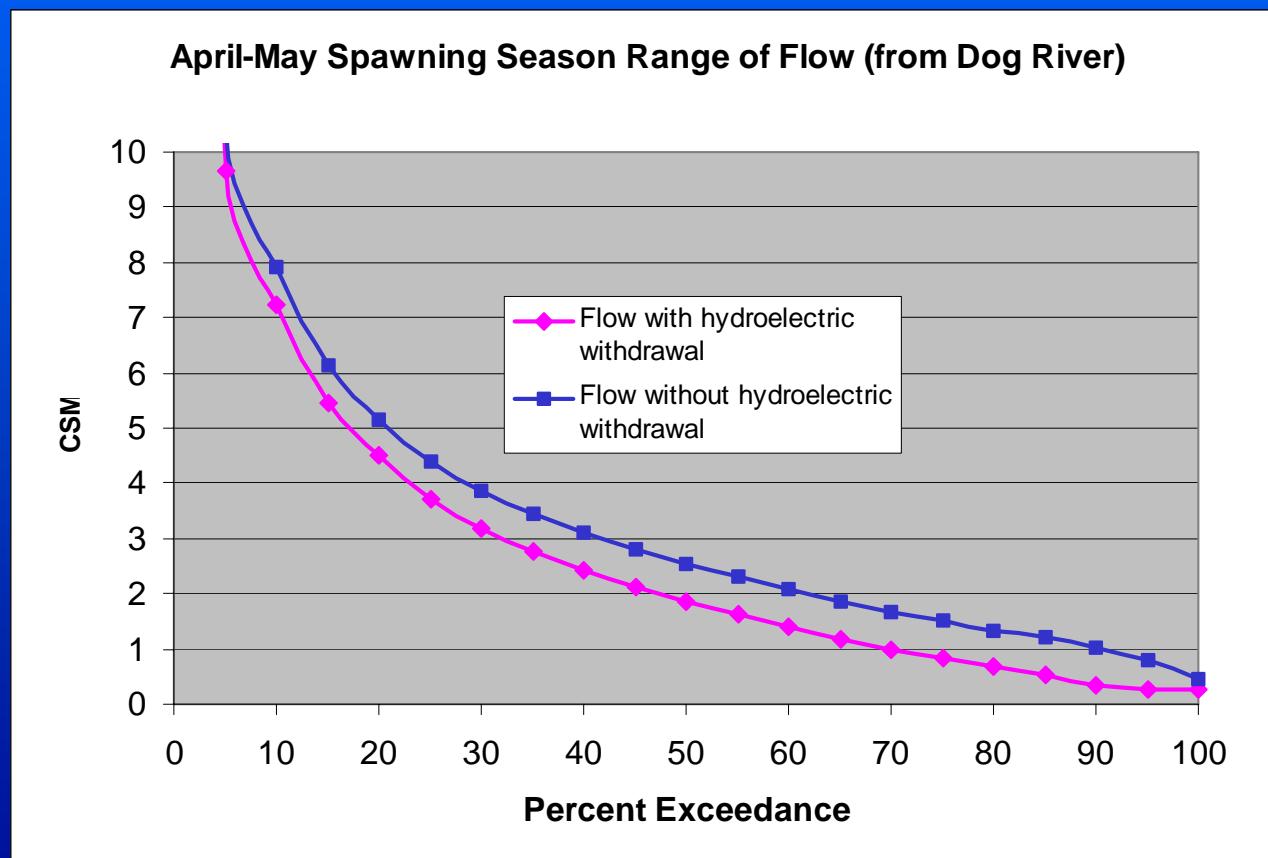
**Furthermore, the way USGS conducts low-flow investigations, even the smallest gage in the network does not limit the applicability of the equations. If ANR would like details, they are welcome to contact me.” –Scott Olson-USGS.**

**We propose a round table discussion with Agency of Transportation hydrologists, USGS, ANR, and private consultants, will ANR agree?**

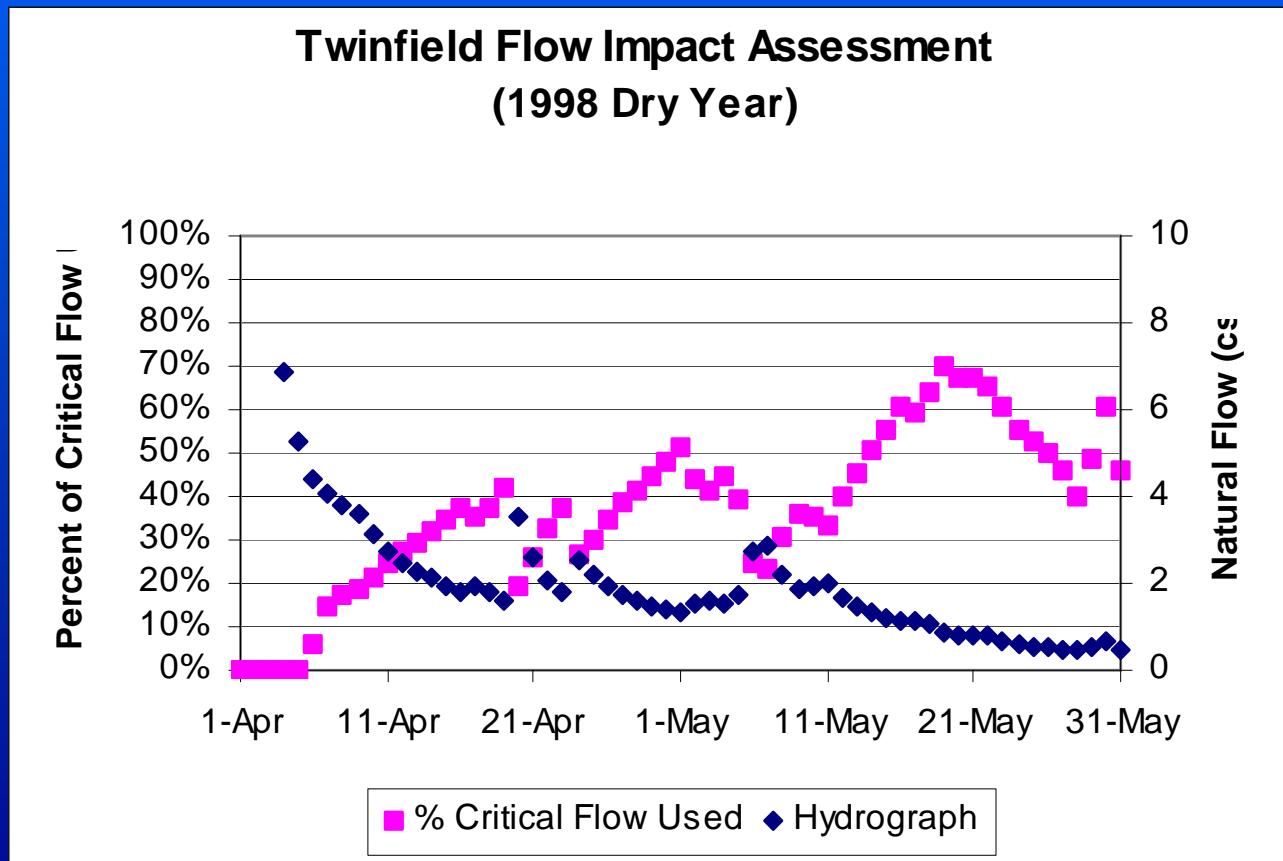
We agree with ANR that fish need a range of flow. We think our run of river project does this. The river will have more flow than the minimum (0.27 cfsm) most of the time—even in this dry year.



**30 years of data: Slide the pink line over and it just about matches the blue line. The Brook still get the full range of flow.**



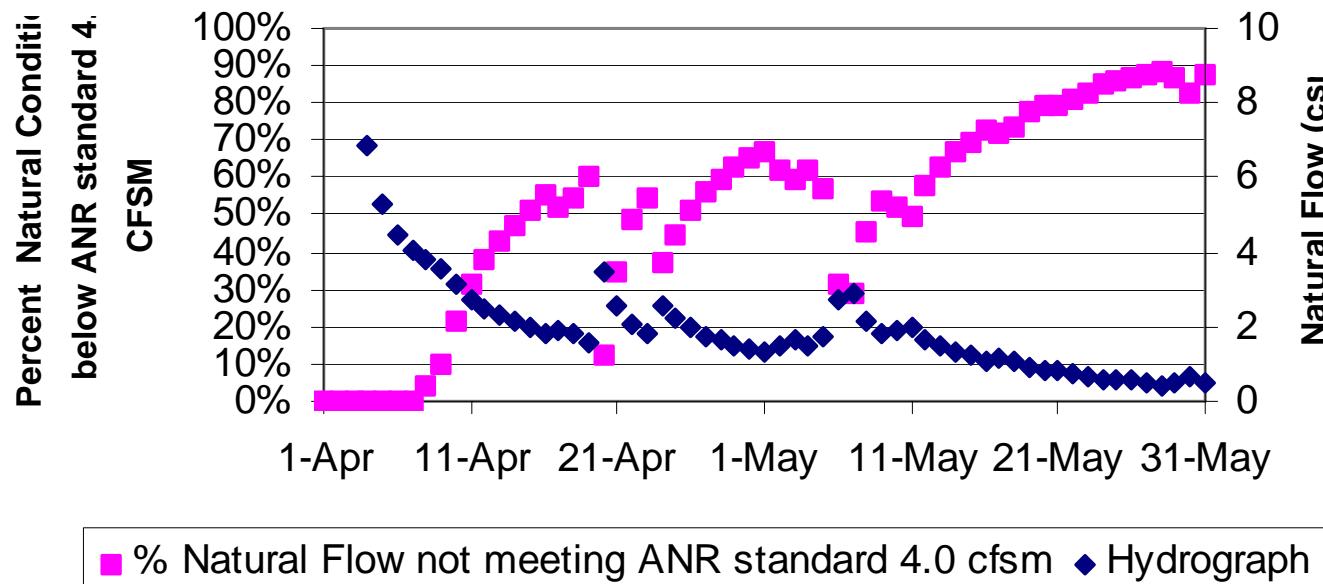
**ANR sent us this graph on July 12th. This graph shows that in this dry year there is one day where flows are 70% lower than ANR's critical flow. ANR says this shows our project is hard on the fish.**



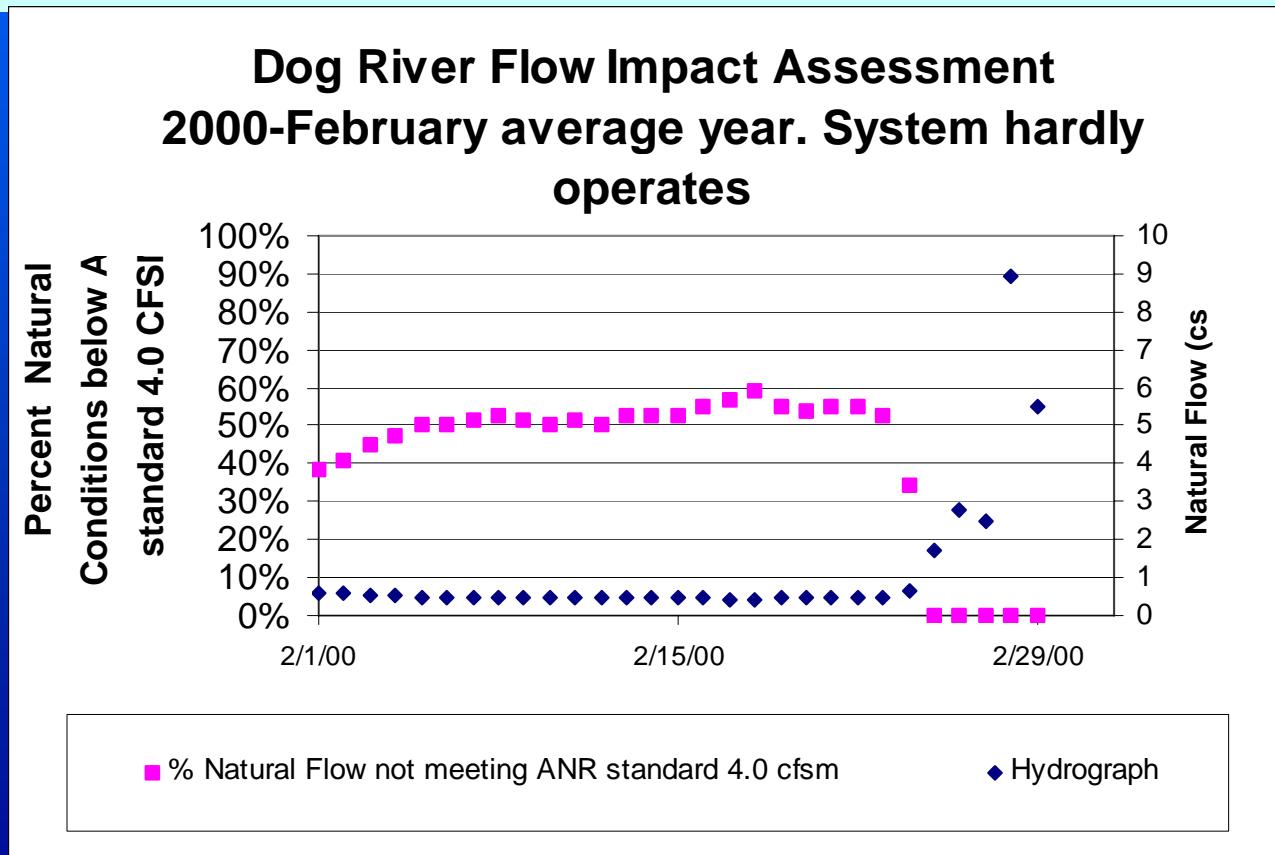
This graph shows natural conditions. It shows that almost 75% of the time ANR's default spring spawning requirement (4 cfsm) is not being met. Sometimes flows are 90% too low!

How does our project have a bad impact in this situation?

Twinfield Flow Impact Assessment  
(1998 Dry Year)

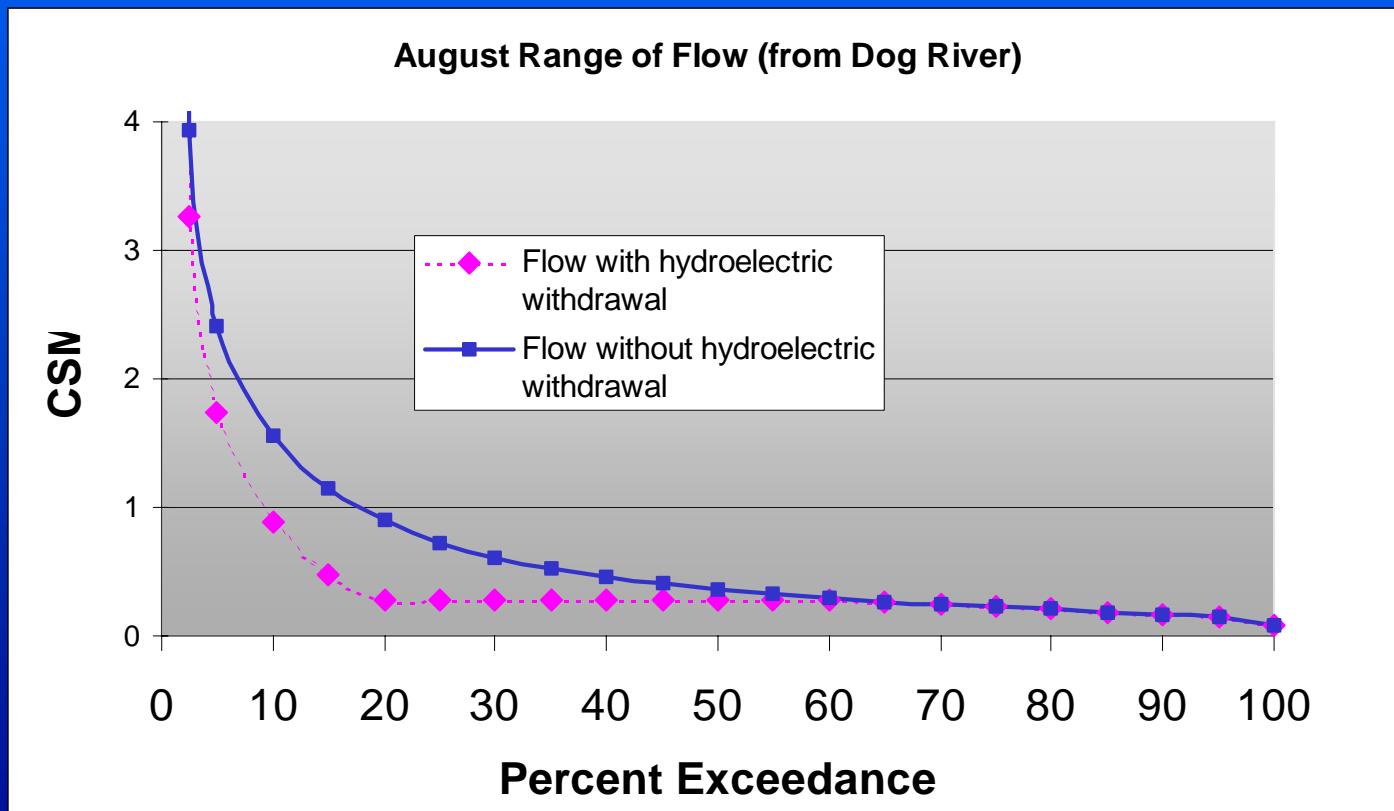


This graph shows natural conditions in a average flow year during February. It shows ANR's winter default requirement (1 cfsm) is not being met most of the time.

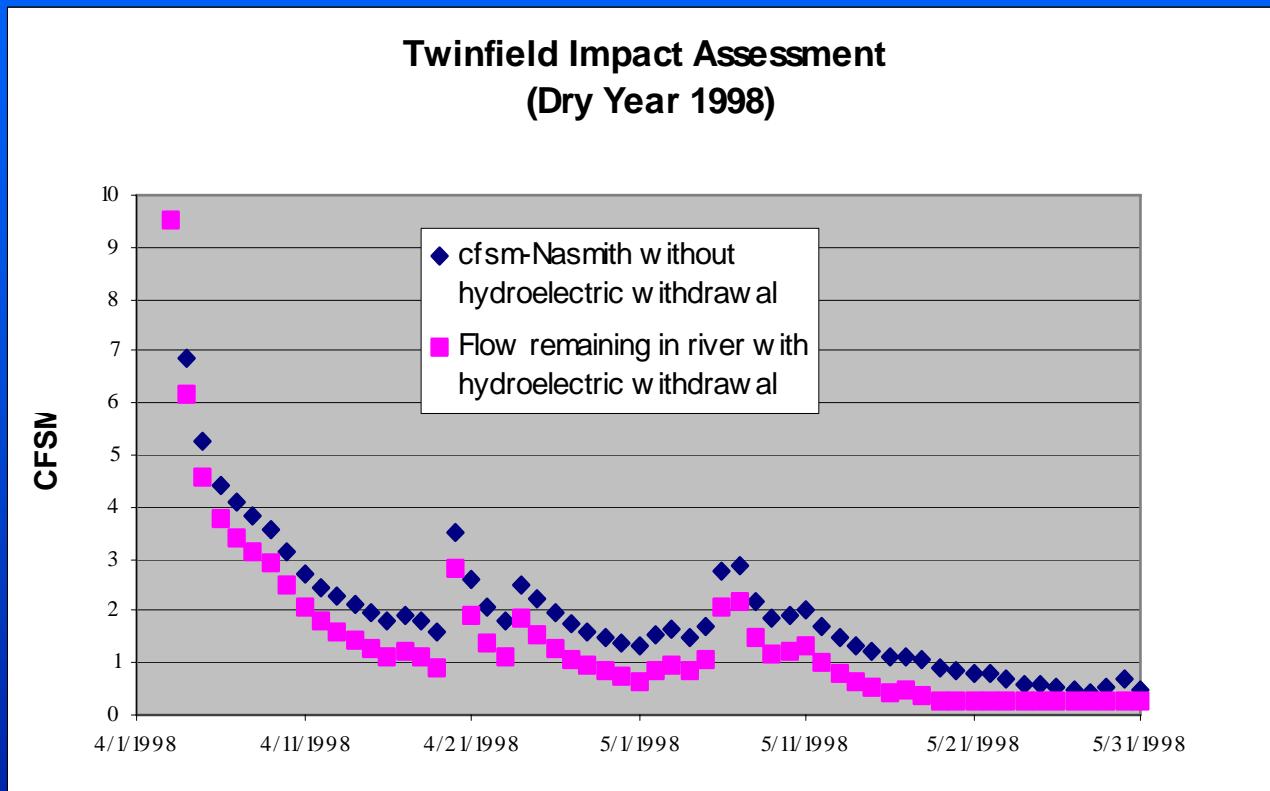


We agree with ANR's concern about a dry summer when low flows are hard on fish. Twinfield's July 9th proposal has the system not operating almost two months (54 days) a year (on average).

We understand that flow changes. The flows are sorted from high to low.

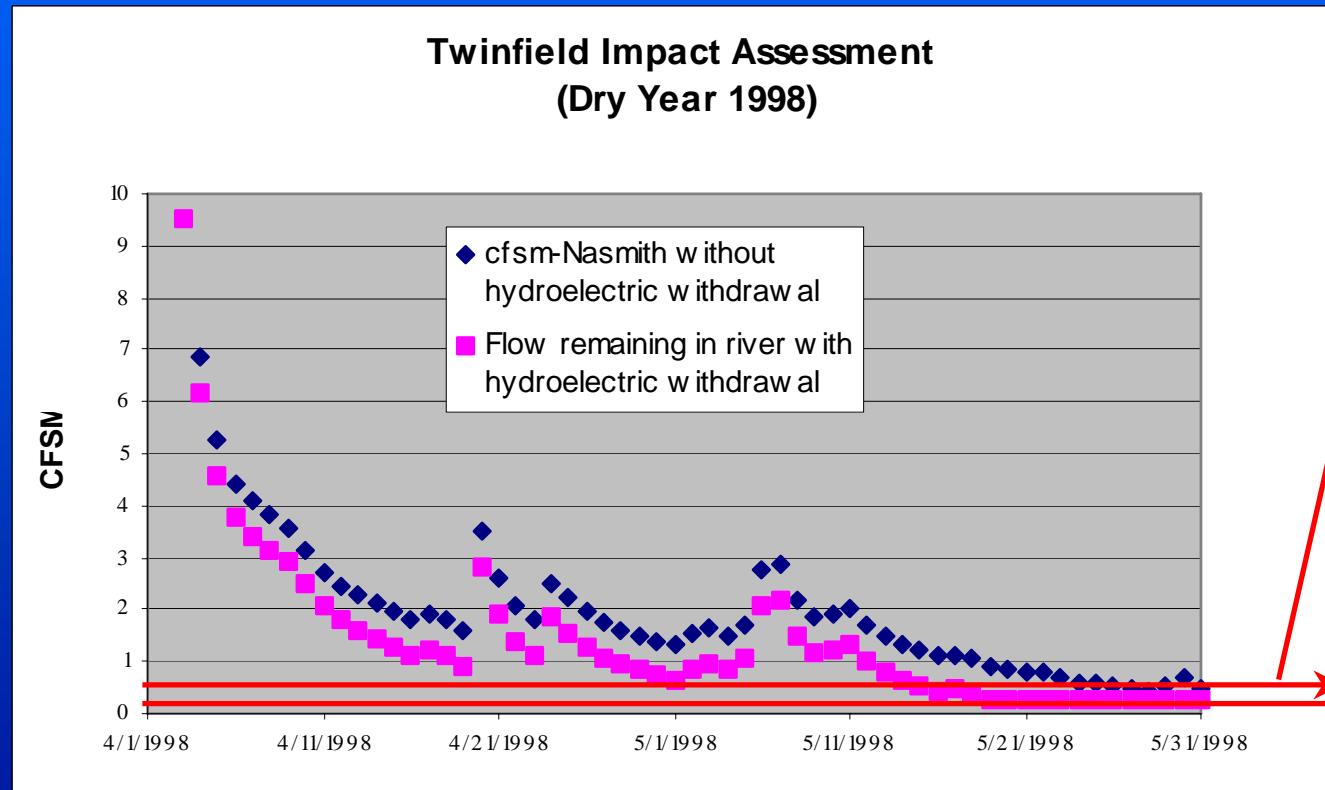


Our graph shows three things:



1. How much water is in the river (blue line);
2. How much water we use (between pink and blue line) and;
3. How much water is left in the river (below pink line)

The two lines at the bottom show winter flow levels at sites that received 401 WQC from ANR . The developers conducted expensive fish and flow studies on sites with long bypasses and good fisheries (like Nasmith Brook). However, these sites release a *fixed minimum flow* (unlike our proposal).



1) 6 mile long penstock at Deerfield. 0.56 csm

2) 2500 ft penstock at Clyde: 0.21 csm

2700 ft long penstock at Twinfield

Twinfield leaves much more water in river *even in dry year*.  
(Below the red lines is all the water in the river)

# **ANR has another concern: That we will dry up the Brook fairly often. We don't want this to happen either.**

it has a big appetite. It could divert the entire flow of Nasmith Brook fairly often if it were not for the limitations of the turbine.

**Jeff Cueto July 12th**

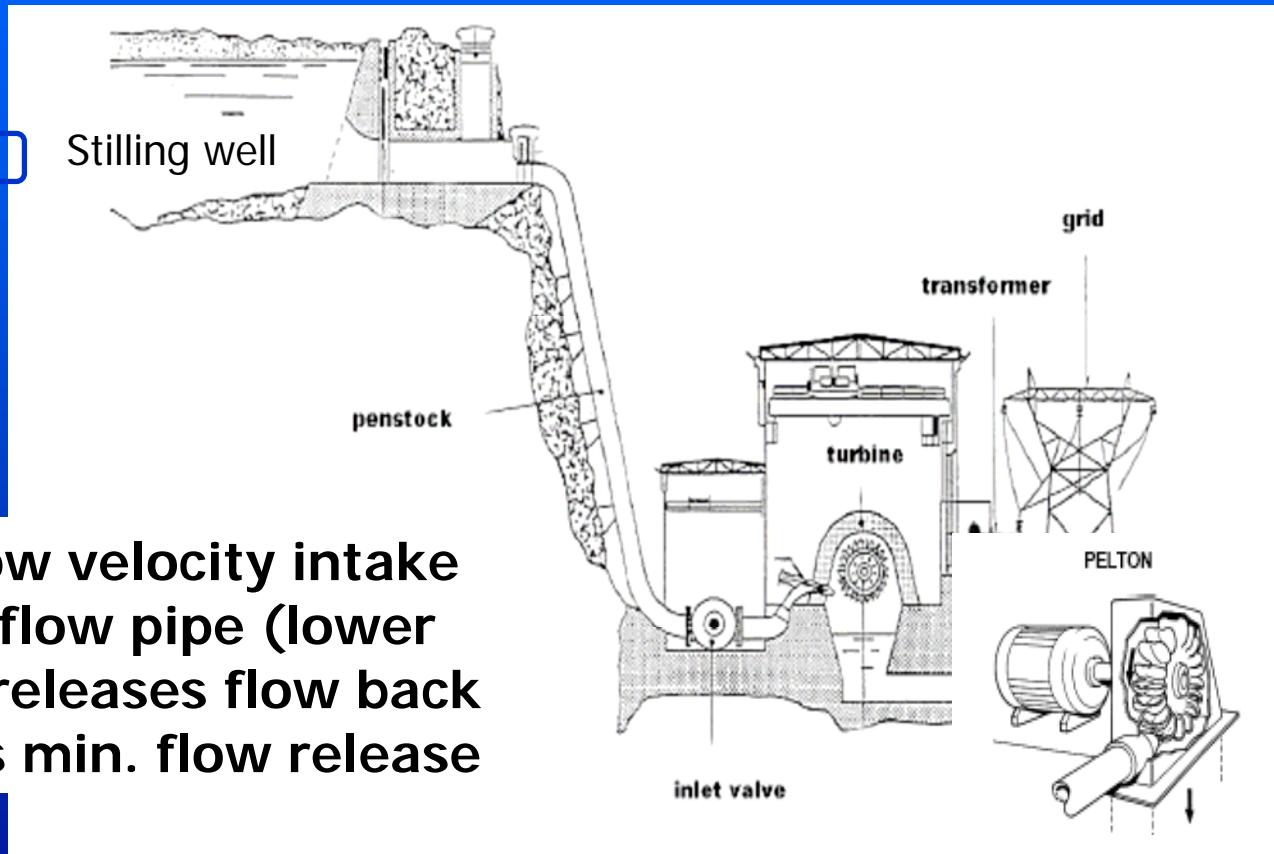
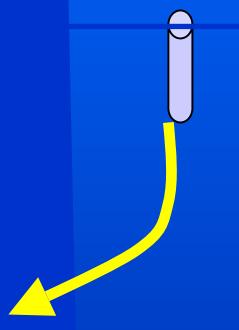
(Jeff Cueto calculated flows of 25 ft per second through our penstock)

- How? We spoke to our engineer.  
**Jim Sysko has many installations in Maine and one in Vermont with no problems in over 100 combined years of operation.**  
**(We checked with the Maine regulators).**

We would turn off the turbine if the brook is too dry. We have controls and a system designed to make sure we don't dry up the river.

# The design prevents the brook from being drained dry.

brook

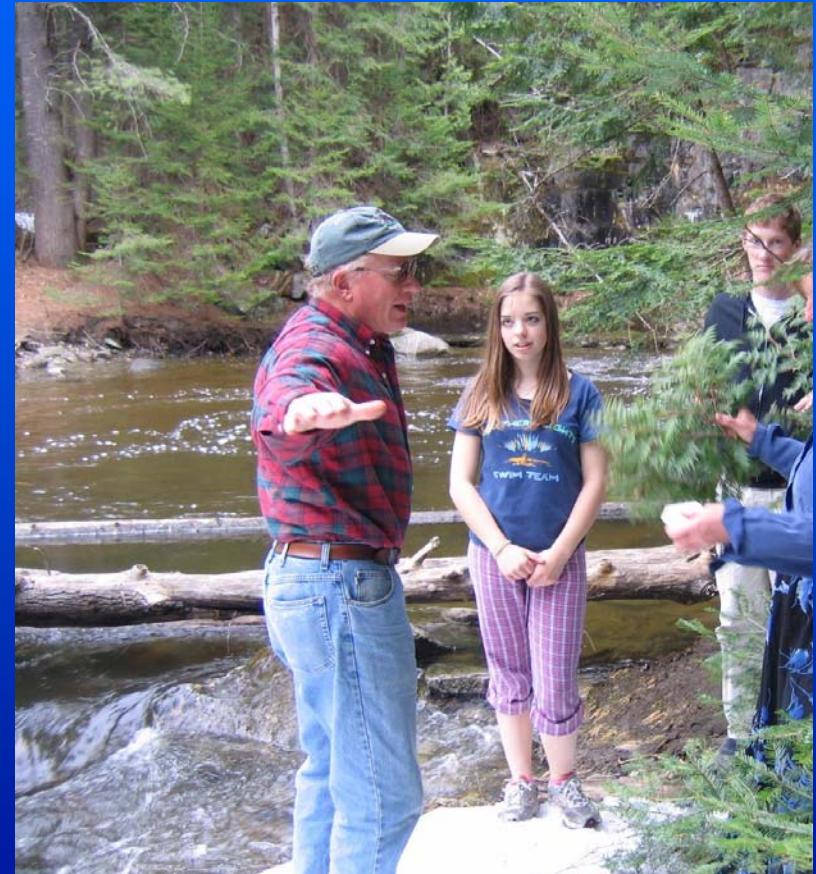


**Self-cleaning low velocity intake and minimum flow pipe (lower than penstock) releases flow back to river. Ensures min. flow release**

**Double safety: the position of the minimum flow pipe and electronic controls prevent the river from going dry.**

# Damless Diversions have less environmental impact.

- Allow fish passage
- Allow sediment passage
- High flows pass due to structural and mechanical design.
- No fixed flow in bypass, natural variability-fish get range of flow throughout year.
- Minor impact to river
- The design ensures minimum flow released to river at all times.



**Our goals are to learn; make policy change; address global warming; school budget; and develop environmentally sound small hydro.**

**Educational benefits: engineering, geology, hydrology, biology, permitting, process. We are prepared to go through whole process, but we can not spend \$200,000 on permitting. We want scientifically sound alternatives.**

**We would like a policy to consider multiple uses and impacts like ANR's mission statement allows.**

**We want to use nearby gage data like Federal policy allows.**

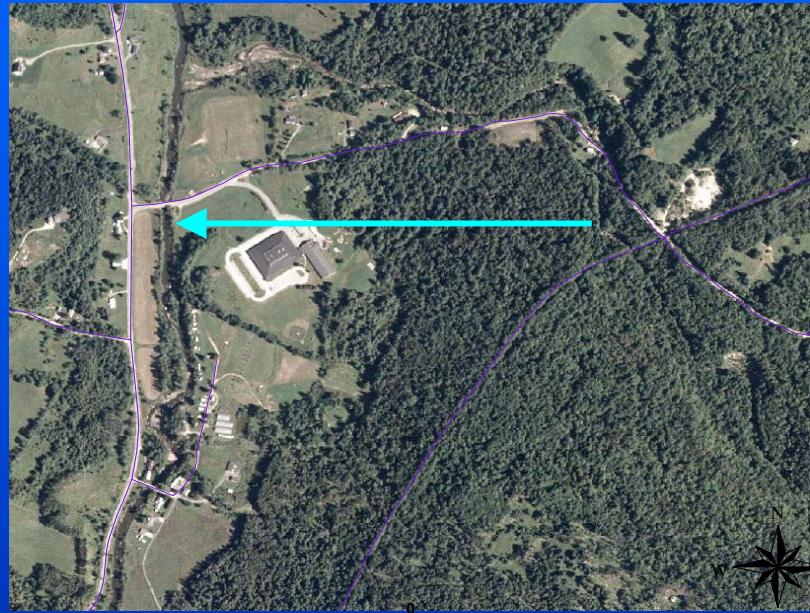
**Our goal also includes: simplify FERC permitting by receiving**

- a) preliminary approval from ANR and**
- b) ANR issuing "Potential Terms and Conditions" (like USFW does).**

# The project is all on school land

(We'll consult with downstream neighbors too)

## Twinfield School



We won't dry up the river.

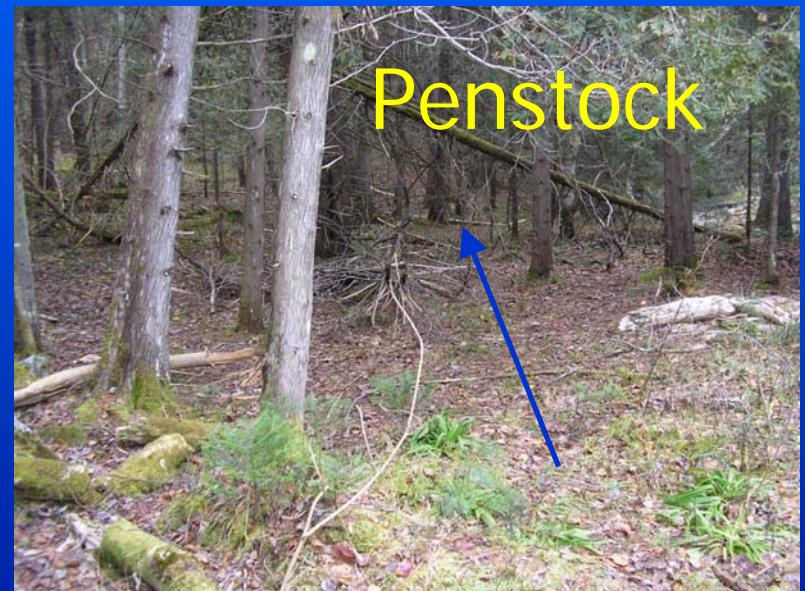
We don't even operate almost 2 months a year (on average).

We will enhance the swimming hole (if you let us)

We will have a range of flow variability for the fish, most of the time  
the flows in the bypass will be way over the minimum flow.

Two goals:

- 1) Global Warming-environmentally sound hydro
- 2) School Budget



500 MWH/yr = 833 barrels of oil = 35,000 gallons =  
385 tons of greenhouse gases not released

**Our proposal is consistent with DEC's Mission and principles. We like them all, but especially these:**

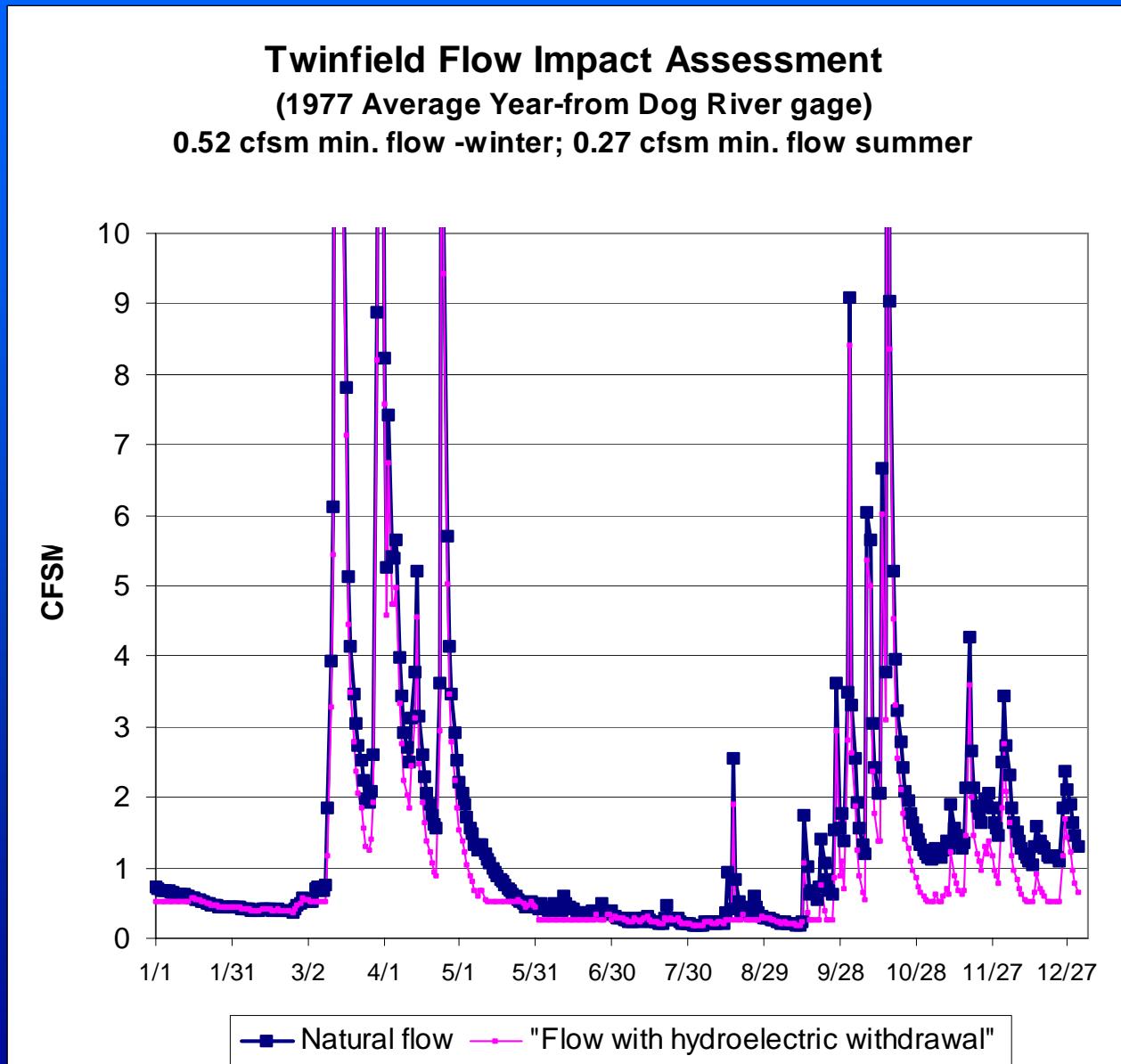
- **Involve the people of Vermont in making decisions that affect the state's natural resources.**
- **Provide clear, prompt, fair, and well-documented decisions and guidance.**
- **Wisely pursue innovative approaches to environmental problems to determine their effectiveness.**
- **Promptly adopt proven new solutions to environmental problems.**
- **Promote pollution prevention, recycling, and consideration of the cumulative impacts of activities.**
- **Consistently and fairly apply and enforce environmental laws and standards.**
- **Develop standards and requirements that consider both economic and environmental sustainability.**
- **Always consider the consequences of today's decisions for future generations.**
- **Recognize that all powers and authority to carry out the Department's Mission are derived from the people, and that Government works to the benefit of the public, not to our convenience as State employees.**

The intake will be similar  
to a dry hydrant



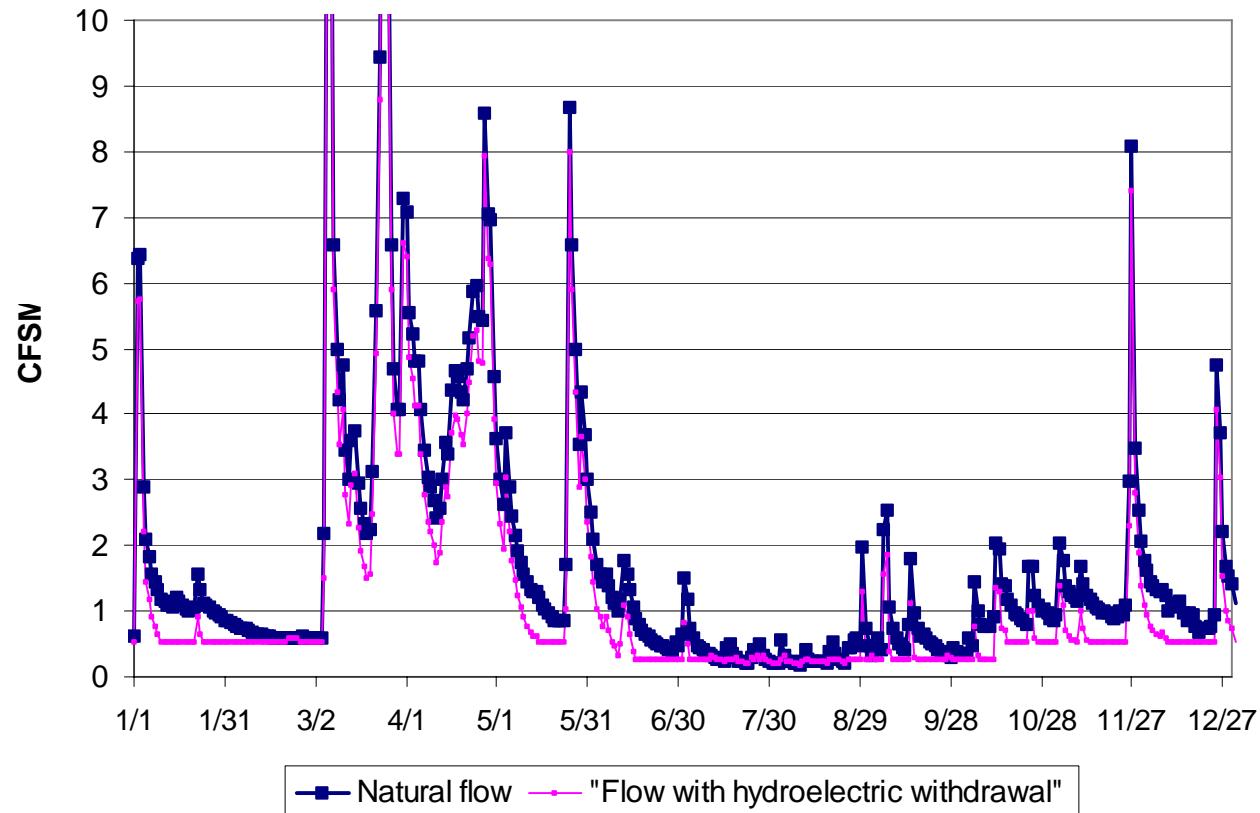
We hope that ANR will work with us to develop  
this small environmentally sound hydro.

# Average Year - 1977

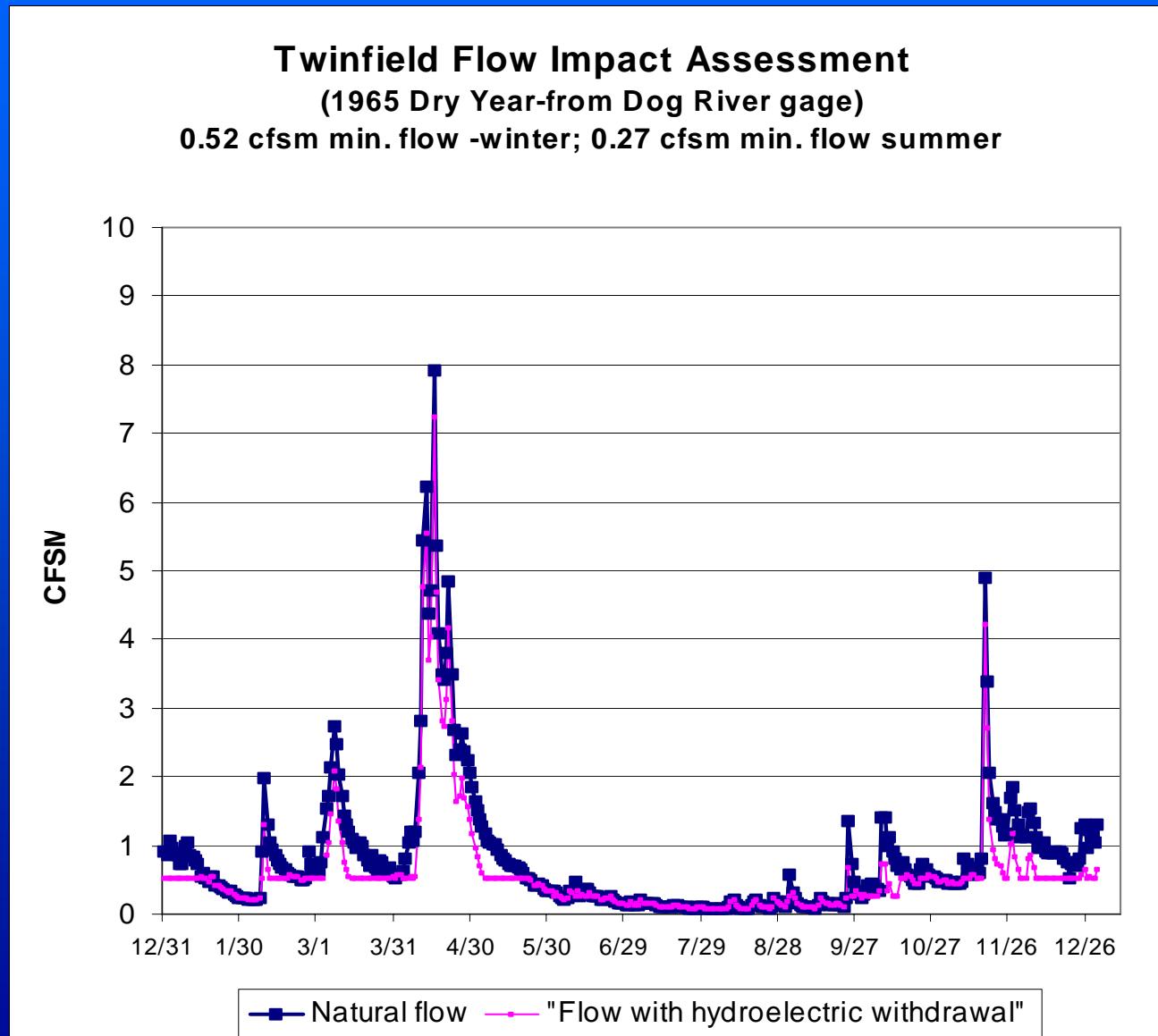


# Average Year-1979

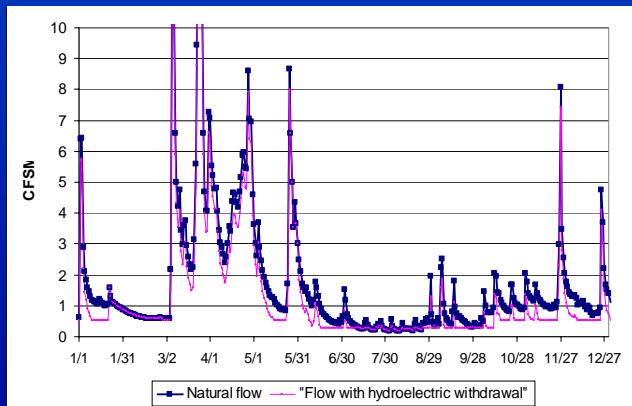
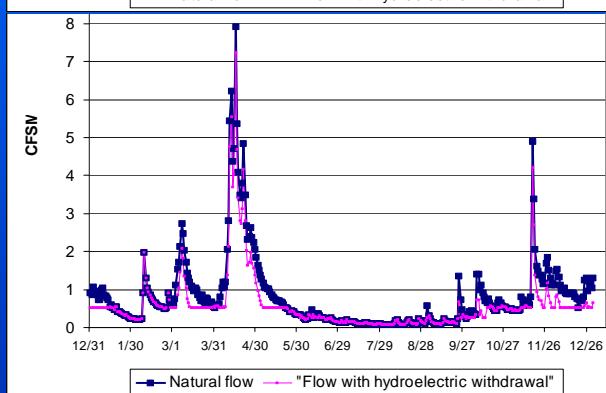
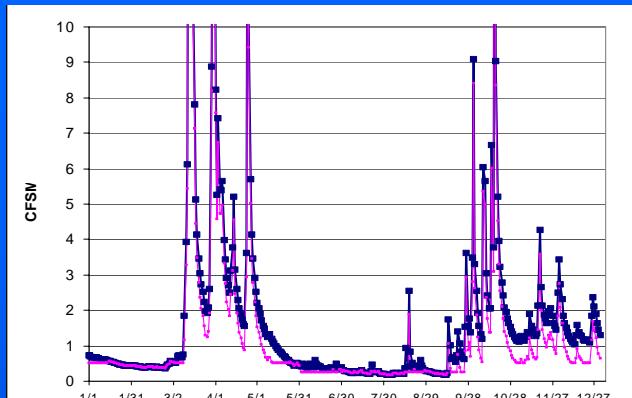
**Twinfield Flow Impact Assessment**  
**(1979 Average Year-from Dog River gage)**  
**0.52 cfsm min. flow -winter; 0.27 cfsm min. flow**  
**summer**



# Dry Year - 1965



Every  
year is  
different



But we  
always  
leave  
enough  
for the  
fish