

Uses of Natural Resources Conservation Service Snow Survey Data and Products

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USDA NRCS Snow Survey
Boise, Idaho

75th Western Snow Survey Conference
Kona, Hawaii April 2007

Idaho's and the West's Frozen Liquid Gold

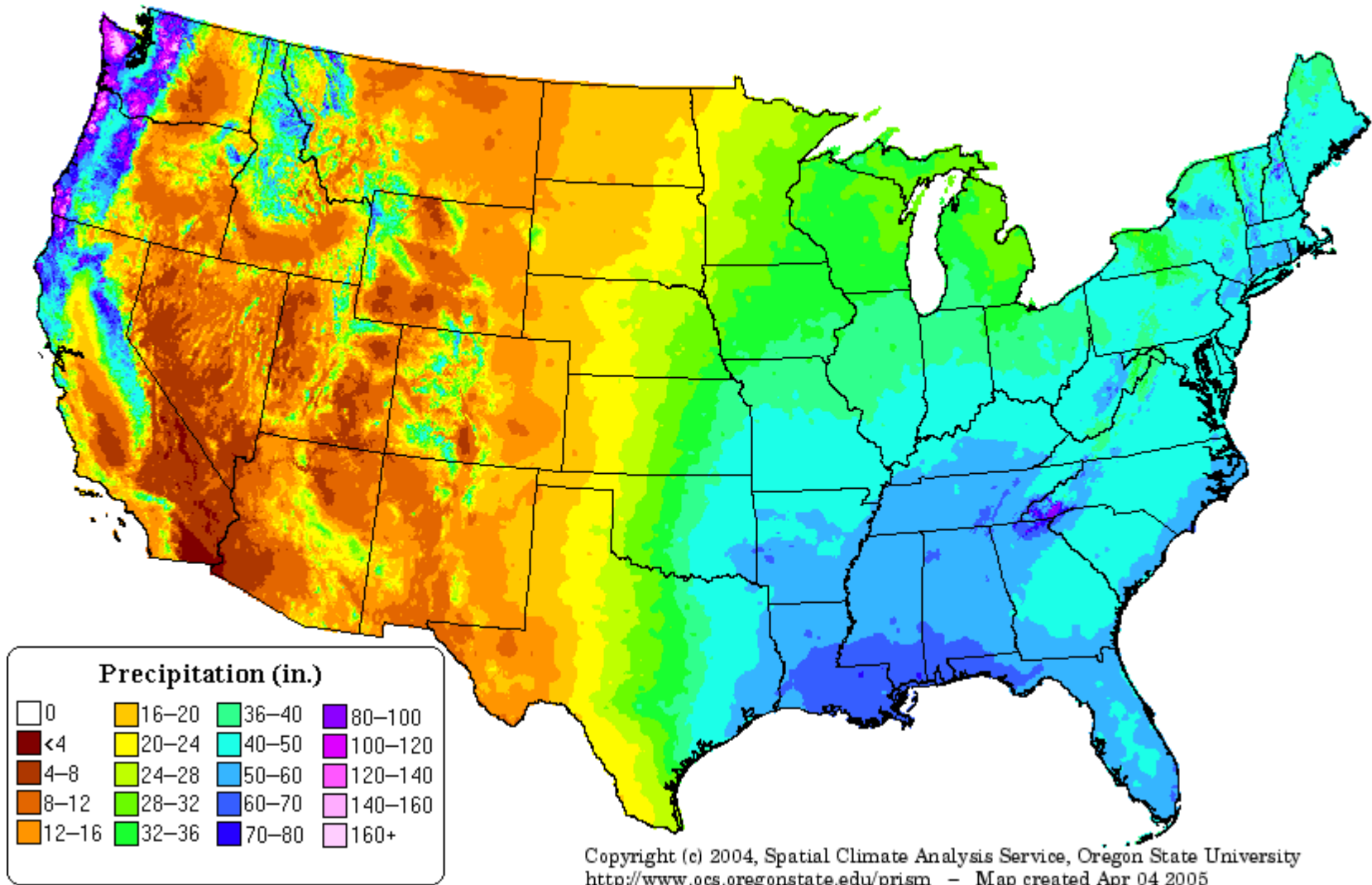
When it Melts

Becomes the Lifeblood



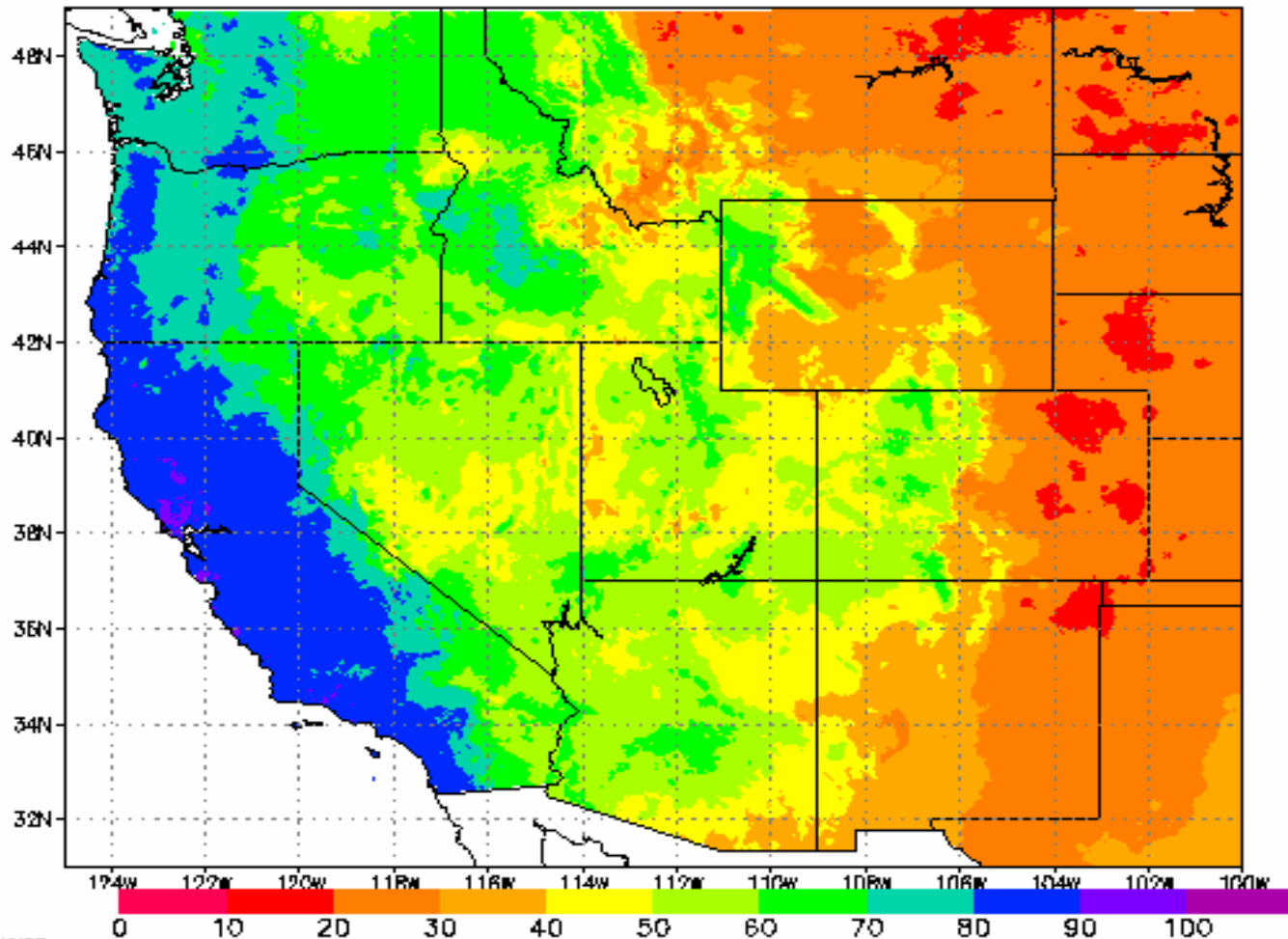
**Key Factor is how much snow
and where for water users to
speculate and plan accordingly**

Precipitation: Annual Climatology (1971-2000)



Copyright (c) 2004, Spatial Climate Analysis Service, Oregon State University
<http://www.ocs.oregonstate.edu/prism> - Map created Apr 04 2005

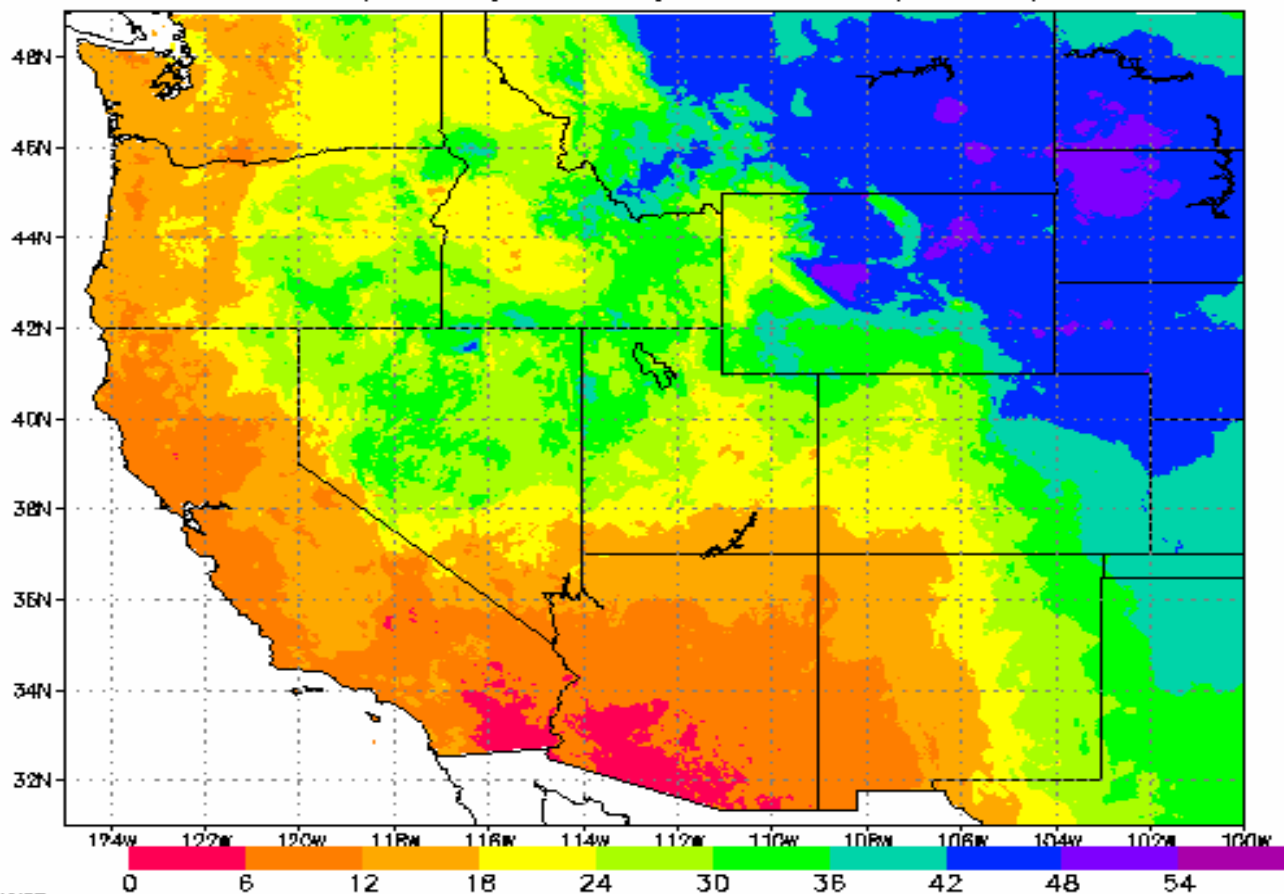
Percent of Average Annual Precip
in Oct-Mar (PRISM OSU/WRCC)



40 - 80%

Oct - Mar

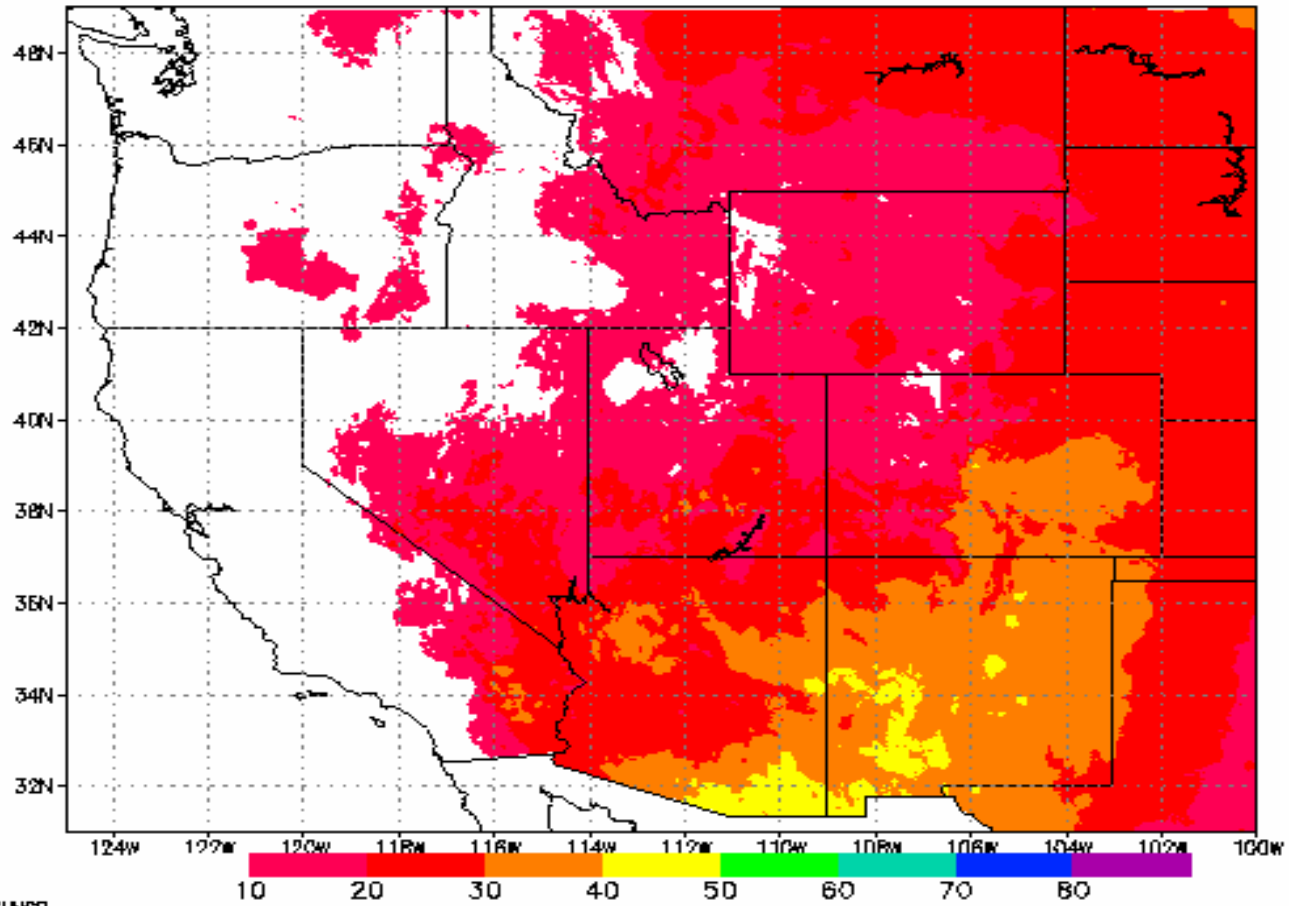
Percent of Average Annual Precip
in Apr-May-Jun (PRISM OSU/WRCC)



| 10 - 40% |

Apr - Jun

Percent of Average Annual Precip
in Jul-Aug (PRISM OSU/WRCC)



GrADS: OOLA/UMCP



0 – 10%

Jul - Aug



Irrigation is critical to agriculture in the U.S. as nearly half of the value of all crops sold comes from the 16% of harvested cropland that is irrigated.

Bonneville Power Administration provides 40% of their region's power with 90% coming from hydropower dams on the Columbia and Snake rivers.

Water User Needs Timeline

Preparation

Planning

Operations

Preparation

Critical Threshold Forecasts

Timing of Snowmelt

Peak Streamflows

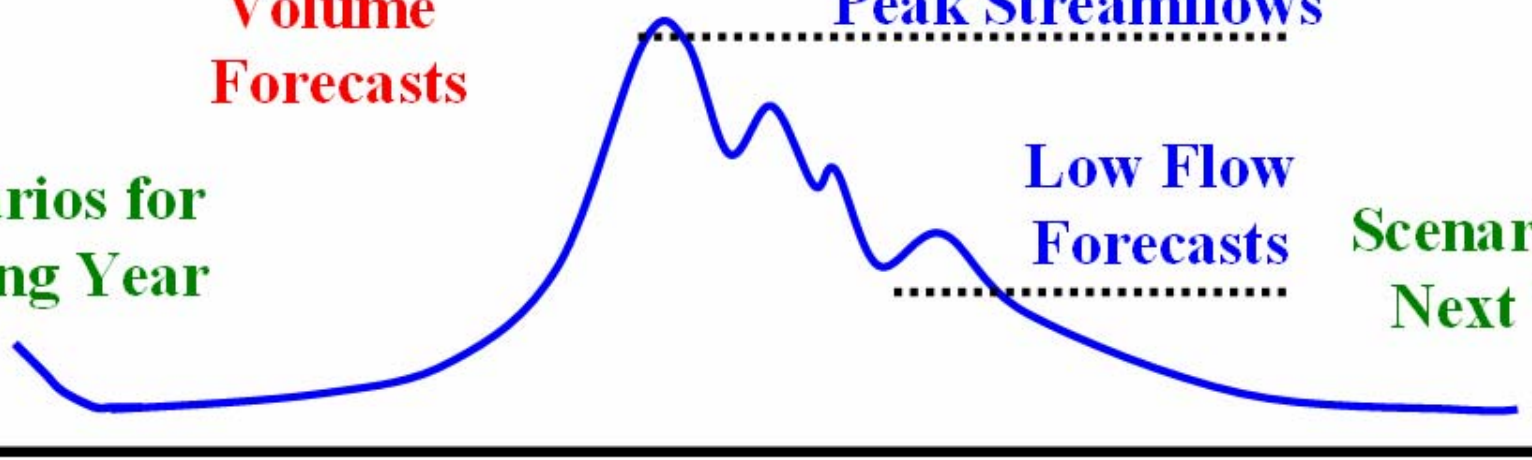
Volume Forecasts

Low Flow Forecasts

Scenarios for Coming Year

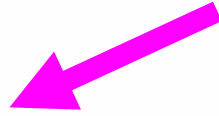
Scenarios for Next Year

Aug Oct Jan Apr May Jun Jul Sep Jan



Water User Needs Timeline

Preparation



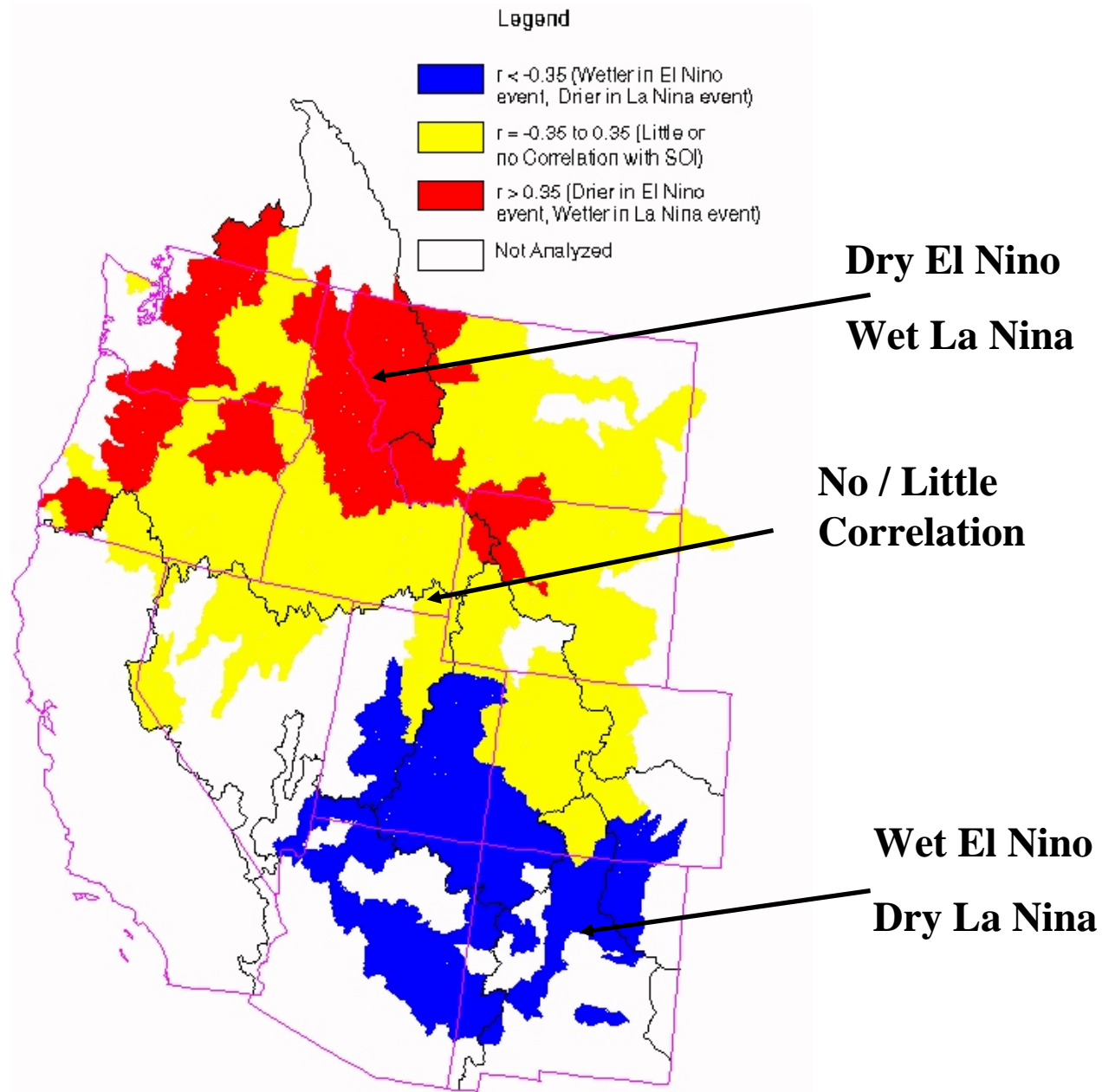
Scenarios for
Coming Year



Aug Oct Jan Apr May Jun Jul Sep Jan

Even before last year's snow melts, the phone is ringing with questions about next year --- will it be an El Nino or La Nina....

Multi- Million dollar question for planning purposes, but don't put all your eggs in one basket

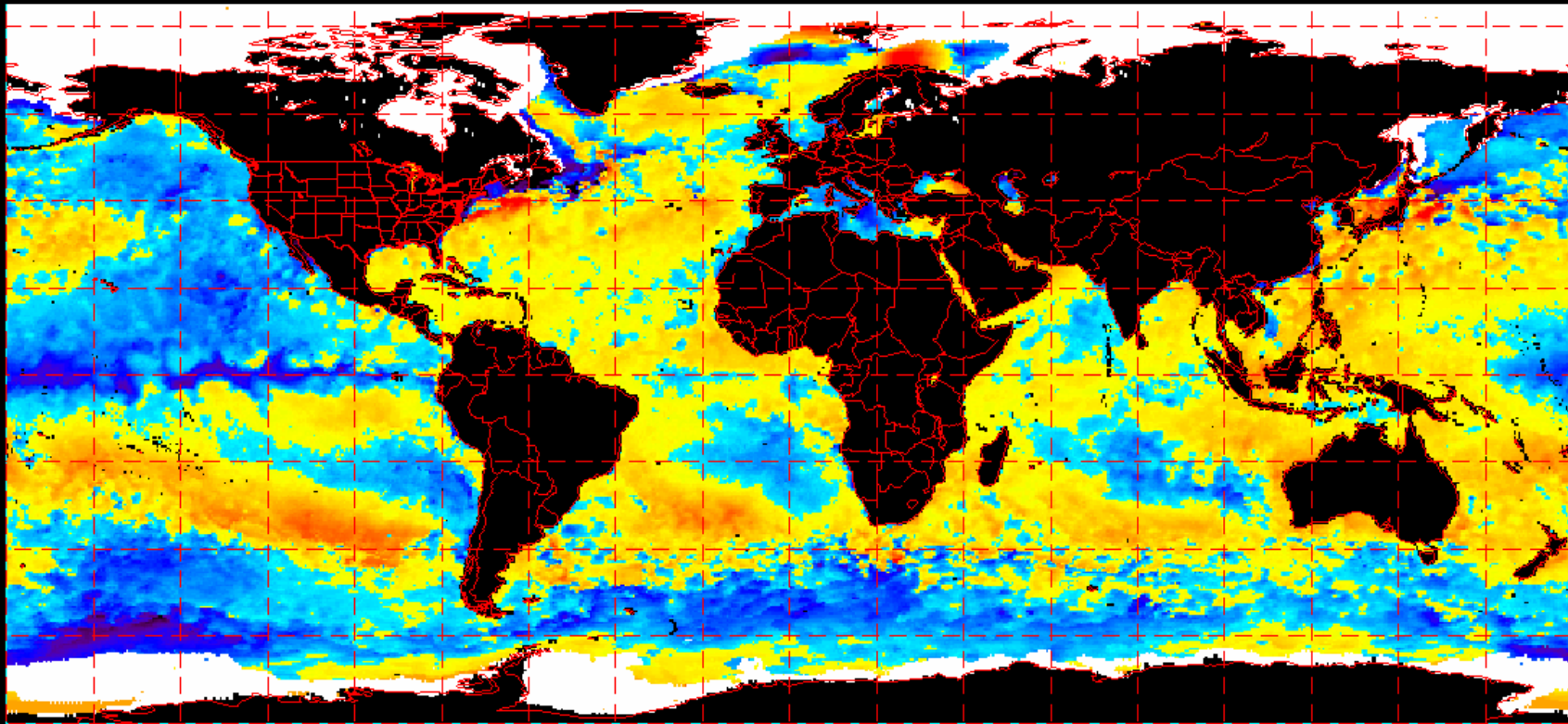


Those interested include:

- Water managers and their customers
- Farmers

La Nina Year 1-2-99

NOAA/NESDIS 50KM GLOBAL ANALYSIS: SST - Climatology (C), 1/2/1999
(white regions indicate sea-ice)

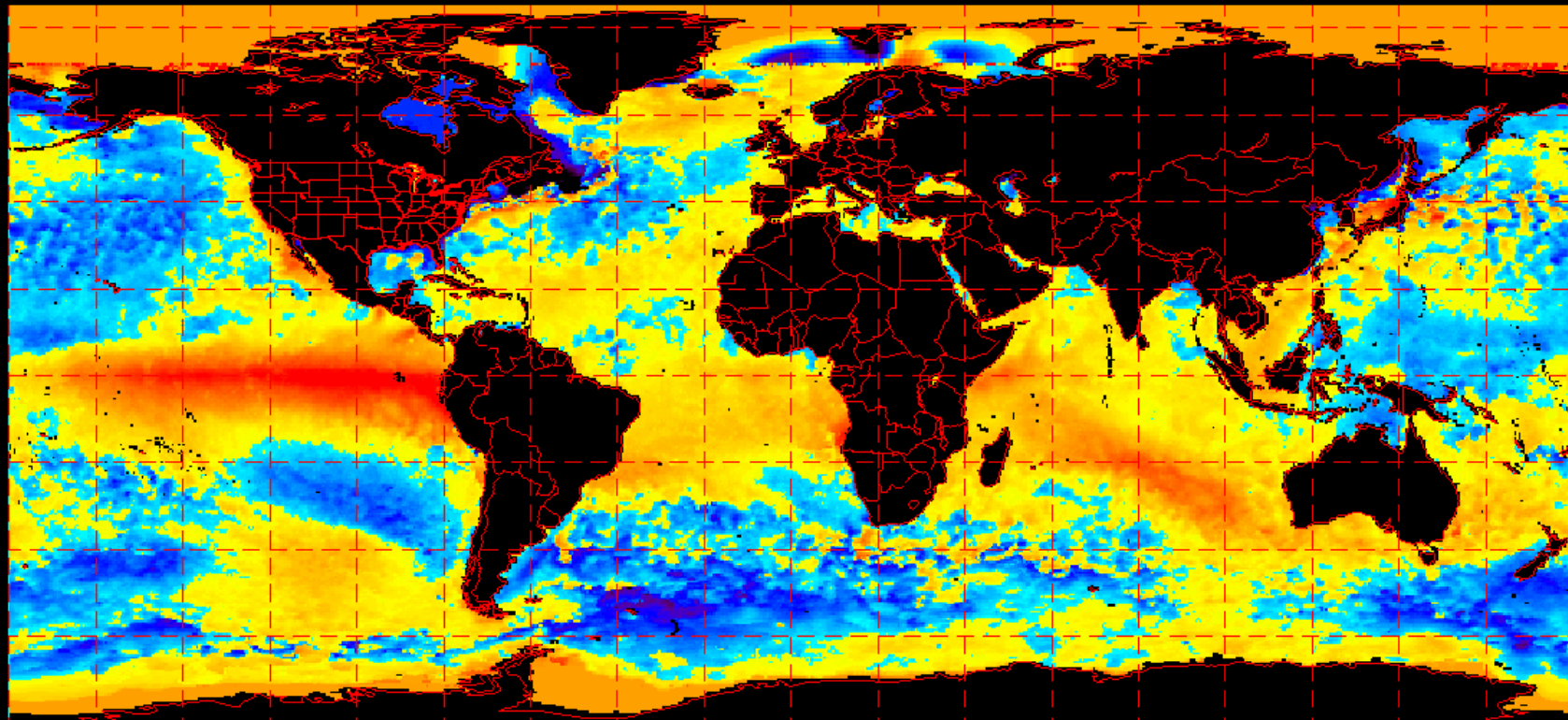


Those interested include:

- Water managers and their customers
- Farmers
- Stock Brokers
- Power Producers
- Natural Gas / Coal Suppliers

Severe El Nino 1998

NOAA/NESDIS 50KM GLOBAL ANALYSIS: SST - Climatology (C), 1/10/1998



-5.0 -4.5 -4.0 -3.5 -3.0 -2.5 -2.0 -1.5 -1.0 -0.5 0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00 4.50 5.00

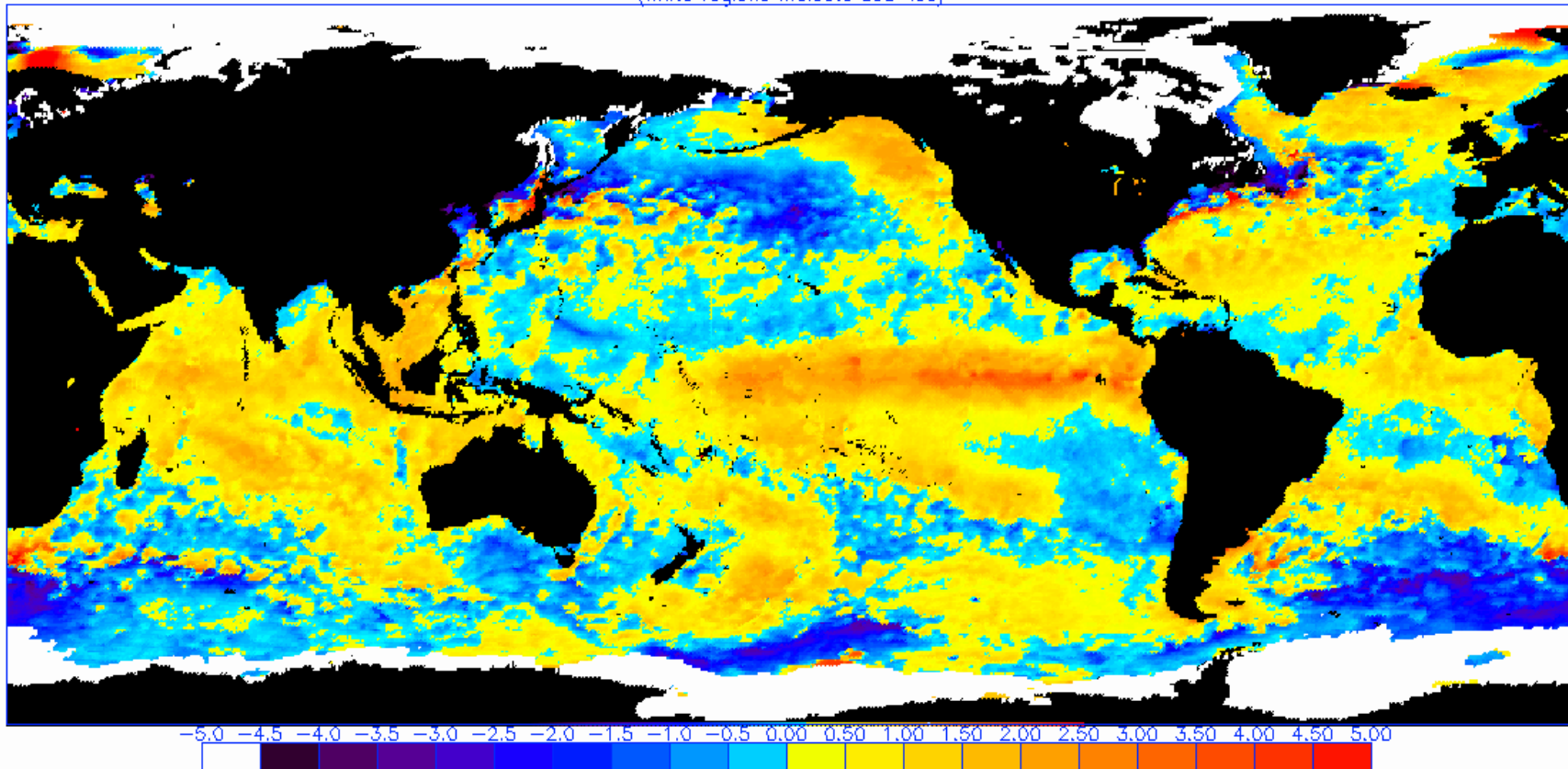
Others:

- SCUBA Divers - Local District Conservationist
- Softball Game Schedulers for # of Make-up Games – Local Field Office

How can you use El Nino / La Nina in your planning process?

Mild/Moderate El Nino Water Year 2003

NOAA/NESDIS 50 KM GLOBAL ANALYSIS: SST – Climatology (C), 12/14/2002
(white regions indicate sea-ice)

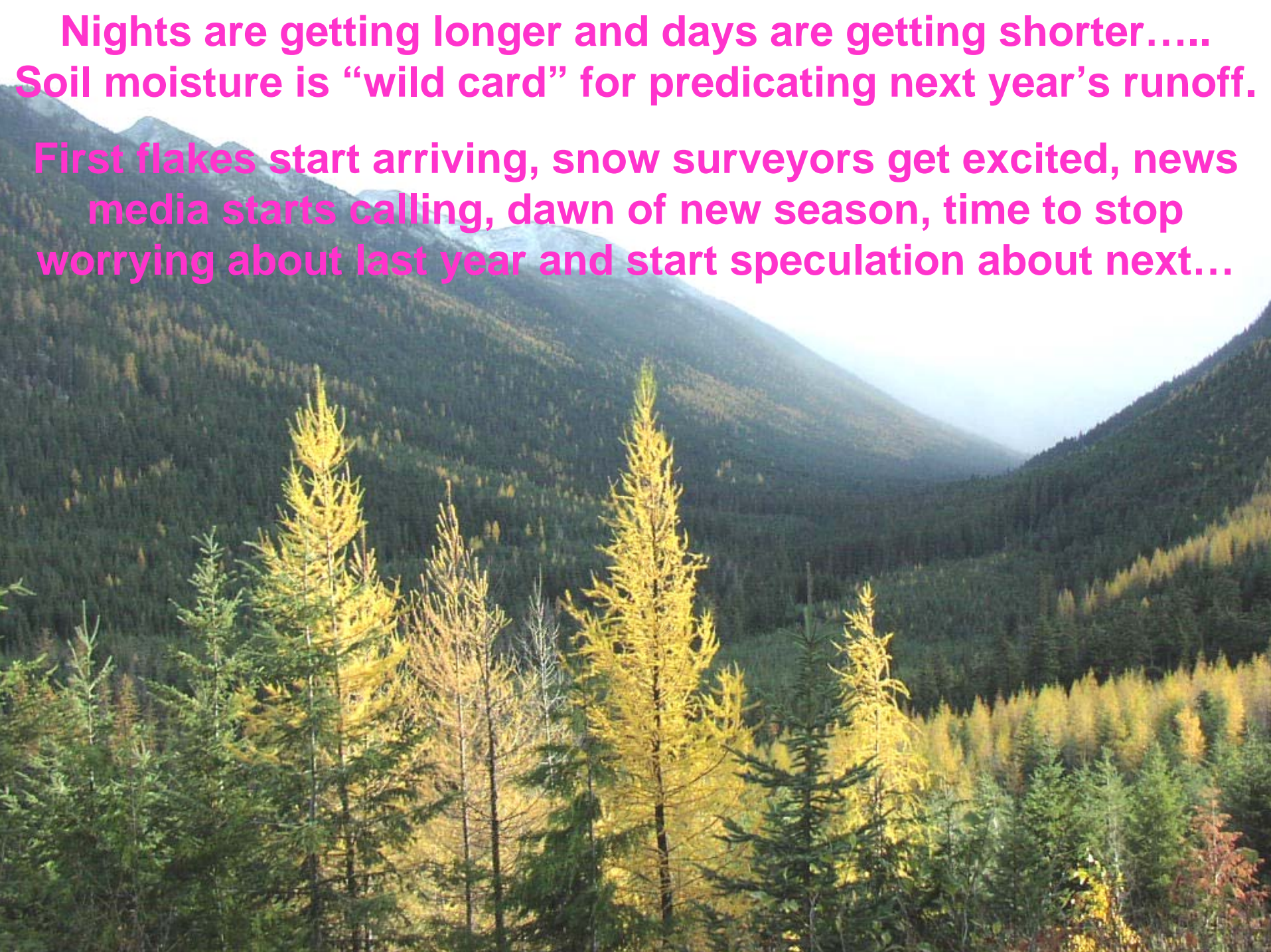


Hydropower Use of Data and Products

- **Bonneville Power Administration provides 40%** of their region's power with 90% coming from hydropower dams on the Columbia and Snake rivers.
- **Washington Water Power, (Avista) generates 40%** of its hydropower from the Clark Fork plant alone.
- In an average runoff year, **Idaho Power can produce 60%** of its electricity needs from hydropower.
- Each spring, Idaho Power requests power cost adjustments through **Public Utilities Commission** based on the April 1 water supply forecasts, contracts, and 'true up' which is based on our forecast accuracy or inaccuracy from previous year.
- This year -- As of April 13 – rate hike increase is for 11-14 percent!
- **1” of rain or snow to fall in April in Snake River basin, at 5 cents a KW = \$30 million to Idaho Power.**
- **Enron spin-off company** day traders - buying and selling stocks on the flashy side of peak streamflows.

**Nights are getting longer and days are getting shorter.....
Soil moisture is “wild card” for predicating next year’s runoff.**

**First flakes start arriving, snow surveyors get excited, news
media starts calling, dawn of new season, time to stop
worrying about last year and start speculation about next...**



**The News Media starts
calling again, and again,
and again, again,....**

**It is time to train New
Reporters and
Information
Specialists....**

Idaho provides about **100** interviews each year, times that by 10 and you have a good ballpark figure how many interviews NRCS Snow Survey folks provide each year.



Multiple Choice: We have learned:

The News Media is:

- A. Interested in what we do,**
- B. Likes going snowshoeing with big, heavy, cameras,**
- C. Sometimes get lost with snow experts, and spends the night out,**
- D. Can get the 'word out' about current and ever changing water supply conditions better than we can.**

Correct Answer: All of them

Dan Murray after spending a night out.....



Correct Answer D, All of them.

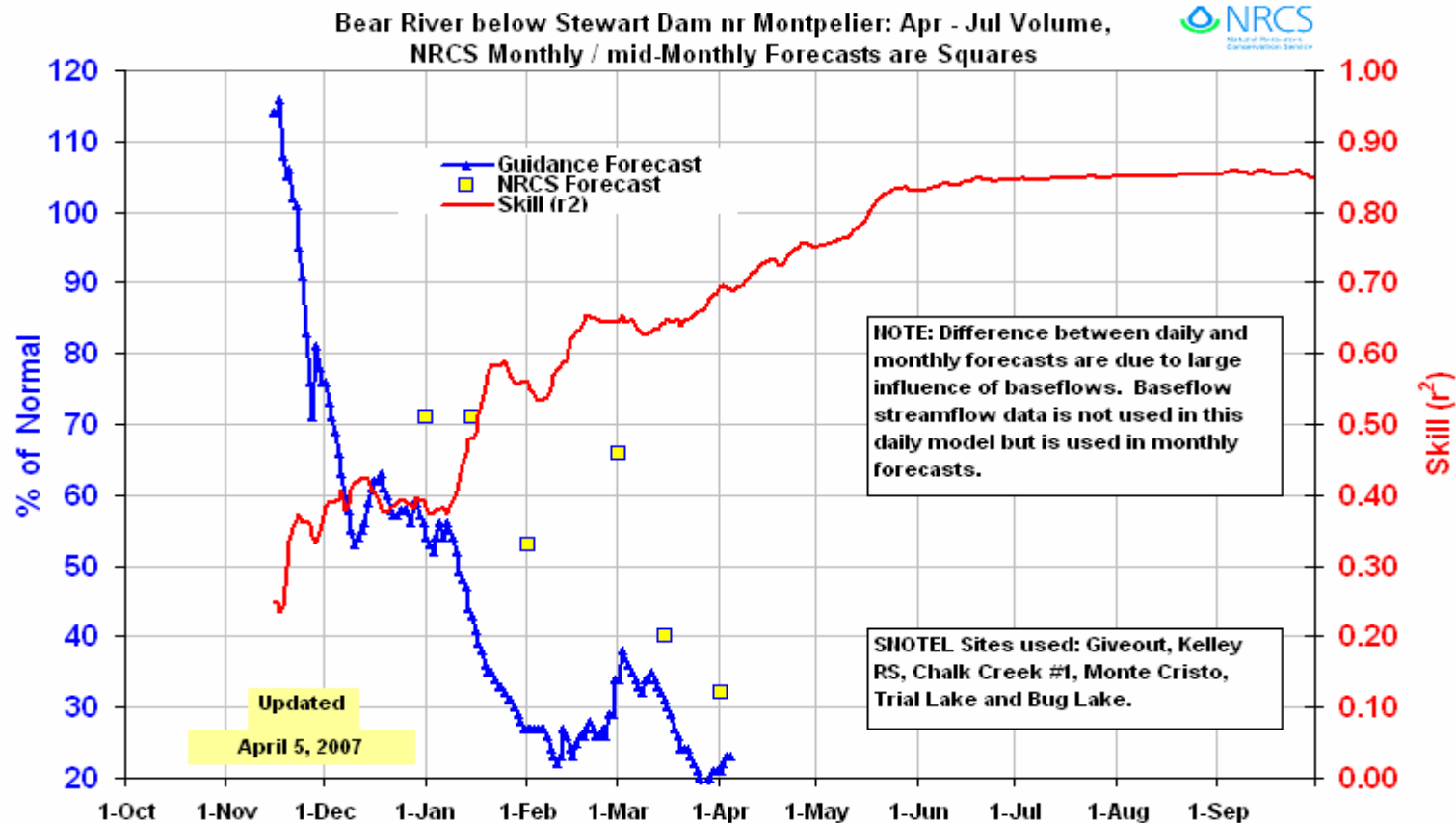
Dan Murray after spending a night out.....



In fall, some states provide a Fall Report Summarizing Streamflow Forecast Accuracy and the Outlook for next year.

Fall 2006, we started providing Daily Streamflow Forecasts based on 20+ years of SNOTEL data!

This is better than watching The Weather Channel, we plug in yesterday's weather to see how your forecast changes.



Water User Needs Timeline

Preparation



Planning



**Volume
Forecasts**

**Scenarios for
Coming Year**



Aug **Oct** **Jan** **Apr** **May** **Jun** **Jul** **Sep** **Jan**

It is now January, 40 percent of the way through winter. Volume Forecasts allow users to start Planning and thinking ahead about their [financial decisions](#).

From January-March, [water managers use our forecasts for Planning and to shape their reservoir storage](#) and releases by passing more or less water depending on our SNOTEL sites and streamflow forecasts.

[Farmers start making decisions and signing contracts](#) using our Volume Forecasts to guide their decision. It may be too early for some producers to tell if they will have a full water supply or not, if they need to factor in additional costs for groundwater pumping or use a secondary irrigation source.

[Some producers are lucky](#), and can [put their decisions off until May](#) to decide to plant higher money producing crops rather than grains in a low water year.

In consecutive drought years, some farmers decided to (or had to) get a [secondary job](#) since they knew they would be out of irrigation water by mid-summer. [Department of Labor](#) uses our water supply outlook reports to gauge [migrant worker employment needs](#).

[You can bet that if a farmer is looking for a second job, then they wont need as many hired hands.](#)

- Let's change snow hats Winter Recreation use of SNOTEL data has grown over the years, especially with the invention and deployment of automated **Snow Depth Sensor...**
- **Everyone likes to hear about big dumps, snow depths in the 100s of inches. Some snow stories are like the 'big fish' that got away.**
- **A good snowpack means more tourist and travel dollars for the local economy, talk positively about droughts and rafting in low snow years... Lets talk about some of these other uses...**



Snow depth and snowfall is used for determining animal migration, when Sandhill Cranes return, avalanche forecasting, snow loads, and more.



**Resort
& Backcountry
Skiing**

Snowmobiling

Digging Out

Have you ever tried sampling snow on groomed ski trails?

- We did to determine if there was enough snow to host a ski race and where a Snowcat could cut-n-fill to make jumps.
- Moving the race means loss of revenue for the ski club, ski area, and local economy.



Signs of a Snow Drought??? --- Moving ski races to locations with better snow are the early signs of a Snow Drought.... This happened this year, Winter of 2007....



Signs of a Snow Drought

Estimate for 100 ski racers and one adult to attend 3 day race:

~ \$70,000 ---- travel, lodging, tickets

Local Ski Club may loss \$4,000 - \$5,000 for NOT hosting event



We have:

- **Assisted Forest Service to determine if plowed snow would end up in the river and [affect salmon habitat](#).**
- **Helped an elderly lady determine how much snow was at scenic Redfish Lake in Idaho so she could [spread her husband's ashes](#).... our advice was to wait till spring....**
- **Loaned snow tubes to determine how much snow and water may have to be removed because of a high elevation [petroleum leak](#).**

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- Loaned snow tubes to determine how much snow and water may have to be removed because of a high elevation [petroleum leak](#).
- Assisted law enforcement officials about how much snow was at the scene of the crime and if the road was passable where a body was found.
[CSI Miami \(Crime Scene Investigation\)](#)
[would be impressed](#)



Using SNOTEL Data to Estimate Snow Load

$$\frac{(1 \text{ US gallon})}{(0.1337 \text{ ft}^3)} \times \frac{(1 \text{ ft}^3)}{(7.48 \text{ gallons})} \times \frac{(62.418 \text{ lbs})}{(1 \text{ ft}^3 \text{ of water})} \times \frac{(1 \text{ ft})}{(12 \text{ in})} \times \text{SWE (in)} = \text{Snow Load (lbs/ft}^2\text{)}$$

Or just remember 5 to multiply by SWE
SWE (inches) X 5.2 = Snow Load (pounds/square-foot)



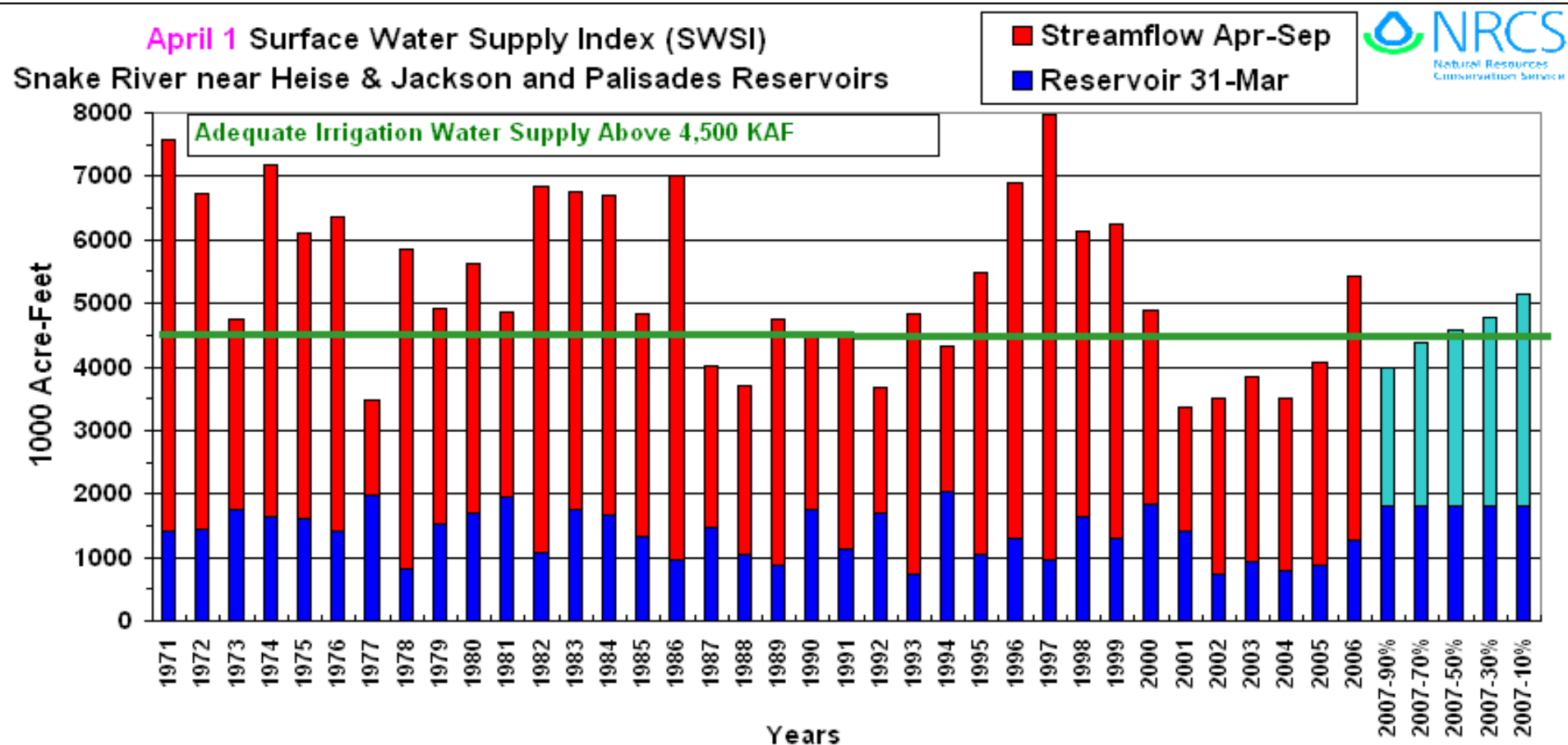
**Studying
Snow
Loads**

**Properly
Designed
Roof**

**Snow Load
and
Gravity Wins**

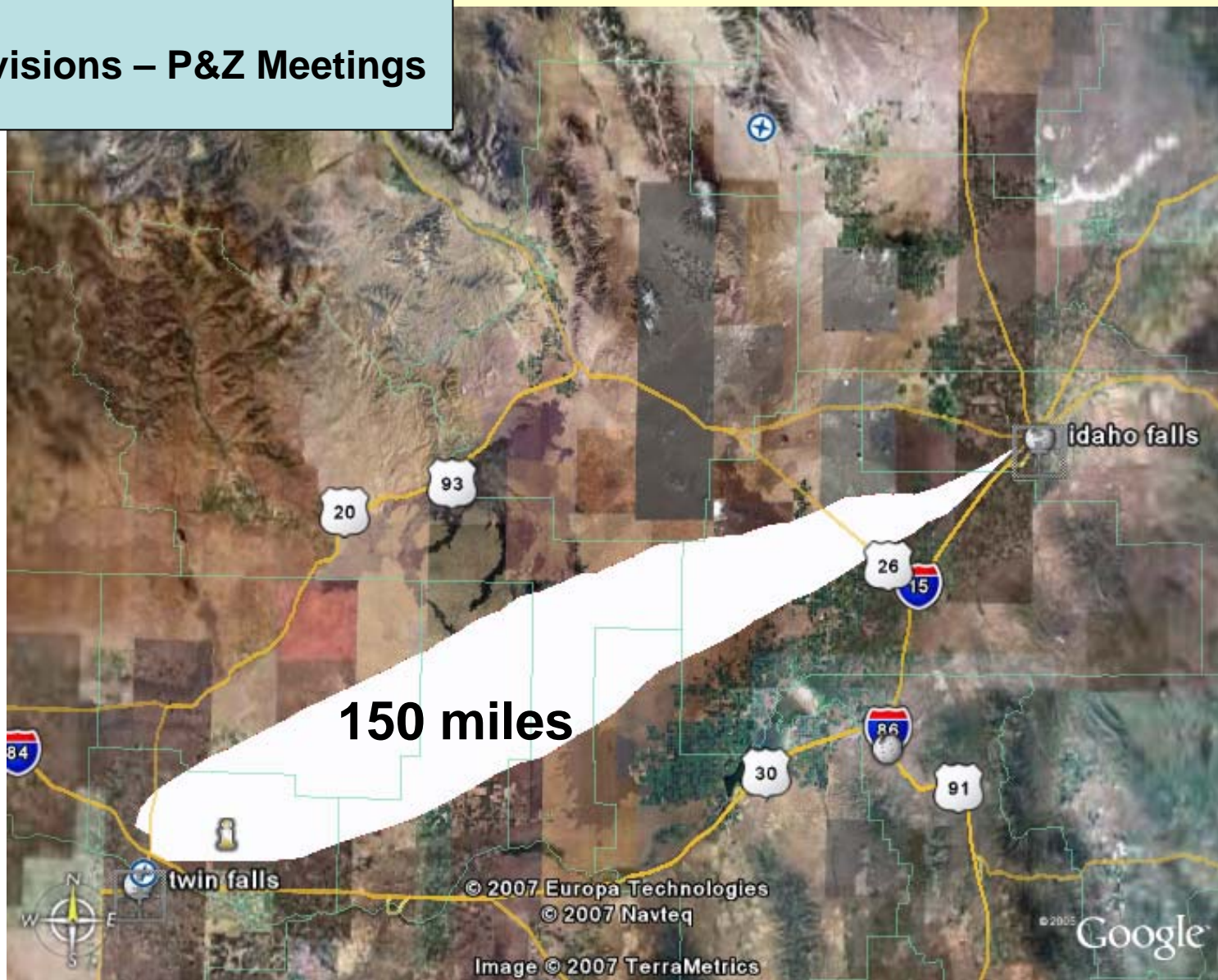
Other users of NRCS snow data, Planning - Volume Forecasts, and Surface Water Supply Index include:

- USDA Risk Management for Crop Insurance
- Bank Loan Officers
- Mint Contractors
- Water Bank Pricing

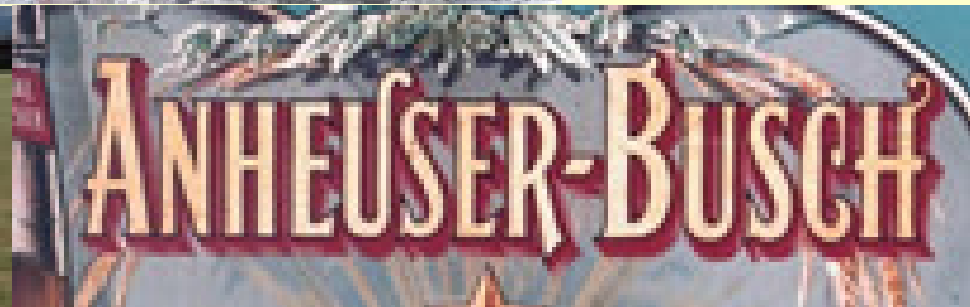


Federal Reserve Board and Natural Gas Company to gauge the economy and population growth in Idaho where water availability may influence or limit future residential growth.

Sub Divisions – P&Z Meetings



Breweries.....



SNOTEL Data & Water Supplies are NOT just a Western issue...

- SNOTEL data is available 24/7**
- Updated hourly on the Internet**
- Available to you no matter where you live**
- Program officials have provided advice or helped install weather stations in Iraq, South Africa, China and Antarctica, and develop SWSIs in Iran. Maybe SRM models in Iraq.**

As long as our data and products are available on the Internet in a timely manner, we don't usually hear from customers nor do we know all the details on how they are using the data.

.... unless the data or products are not available.

For these numerous and different reasons, this is why the SNOTEL system is the only aspect of the USDA NRCS program that is listed as a 'mission critical' program for USDA.

Water User Needs Timeline

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Operations

Critical Threshold Forecasts

**Timing of Snowmelt
Peak Streamflows**

**Volume
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Aug **Oct** **Jan** **Apr** **May** **Jun** **Jul** **Sep** **Jan**

It is now early April; the snowpack is reaching its peak water content

Planning Volume Forecasts have been useful, but now, let the fun begin, as we shift gears and enter the **Operations – Critical Threshold Forecasts** period. This is when the snow starts melting, streams start rising and we'll soon see how accurate our forecasts are and their usefulness for our customers.

The **extreme years are the critical years to get right.**

We have lots of excuses about what went wrong, like "**spring precipitation can make or break our forecasts**".

As a result, **greater climatic variability** is encouraging users to ask more specific questions about **Timing of Snowmelt Peak and Low Flow Forecasts**. Now, we can accurately answer them because of 20+ years of high elevation data that Congress has invested in, known as the SNOTEL Network. The entire annual Snow Survey and Water Supply Forecasting Program budget was \$10.5 million dollars in 2006.

Up until April, everyone wants to know how much snow is in the mountains and what the water supply outlook looks like to **hedge one way or another about** their future decisions.....

How a person uses water, USUALLY determines how they want the snow to melt. There are strong feelings on how the snow should melt.

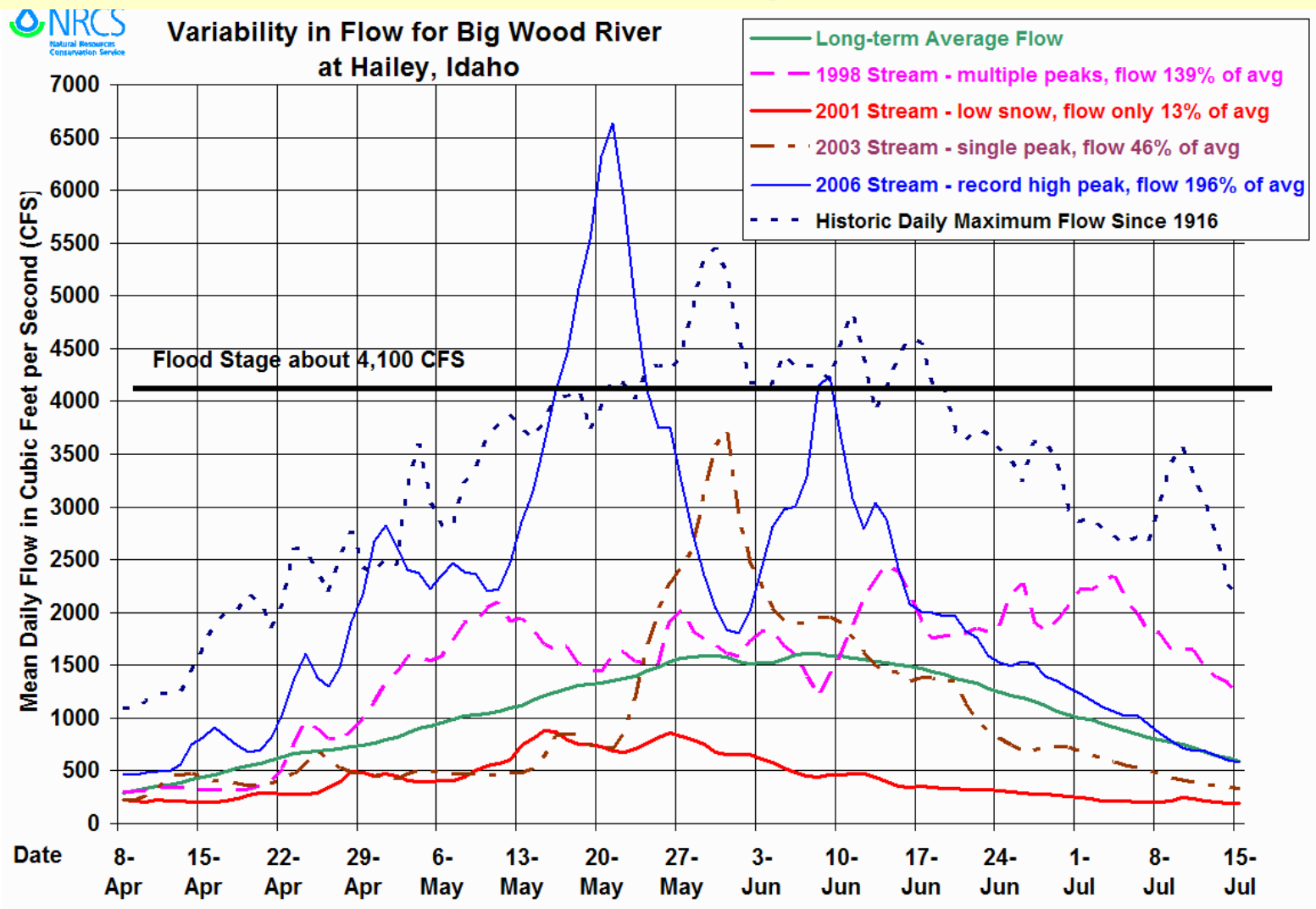
Reservoir water right holders prefer a **quick melt** to flush the water out of the mountains to fill reservoirs and their water right, while **natural stream flow water users would rather see a gradual melt** to maintain their water supply through the dry summer months.

In some small towns, neighbors gather at the **local worship place** and have their **unofficial assigned seats**. Groundwater users sit on the left and surface water users on the right, because you think the other guy is stealing your water.

But after a series of drought years, it is amazing how a good snowpack can bring out smiles, change your attitude about life and bring joy to you and your neighbor. How do you put a dollar value on this?

It is now May --- things are heating up, snowmelt is in full swing. Rivers have peaked once, and the questions that NRCS Water Supply Specialists get each and every spring are:

Is that all there is? Have the streams peaked?
 Is there enough snow up there to produce one more peak?
 Will the next peak be higher than the last?
 Can we close the gates on the reservoir and do final fill?
 Is it safe for whitewater river runners to put their boats on the river?



Who is interested in the peak flow?

Everyone from river runners, dam operators, hydropower operators, fish management and more are interested in not only peak flows, but also **magnitude and duration** of the high stream flows.

Farmers and irrigators are **not as interested in peak flows** as they are in their total water supply.

Lets discuss some of those interested that have used our services in the past.

Hard-core whitewater river runners want to know if the river has peaked or if there is potential for higher flows which may be more dangerous. Boy Scout Troop leaders want to know if flows will be above their level of confidence before taking troops on a raft trip.

Epic - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites

Address http://epic.weather.com/epicTV.html?cm_ven=epic&cm_ite=home_showlink

EarthLink Search ScamBlocker ON/OFF Pop-Up Blocker ON/OFF Web Mail Protection Control Center S&P500 1,424.55

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APR. 1, 2007
VIEW PREVIEW

WELCOME TO THE ONLY PLACE TO SEE AMAZING OUTDOOR LOCATIONS, PERFECT WEATHER CONDITIONS AND INCREDIBLE EPIC ADVENTURE!
After you catch your breath, tell us what you think!

MY EPIC...
Now it's your turn. Send us your Epic video and photos.

STEAMBOAT EXTREME SKIING
VIEW PREVIEW

HAWAII BIG WAVE SURFING
VIEW PREVIEW

EPIC MASH-UP!
You're the editor! Create & publish an Epic video highlight.

**Whitewater Rafting at
Lochsa Falls Rapid on
Lochsa River, Idaho for
The Weather Channel
June 8, 2006**



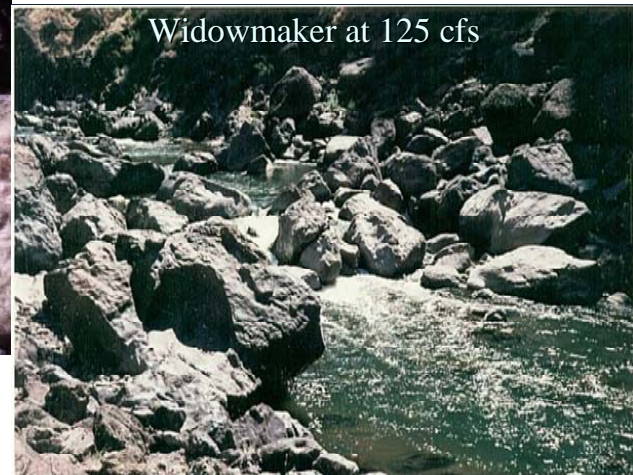
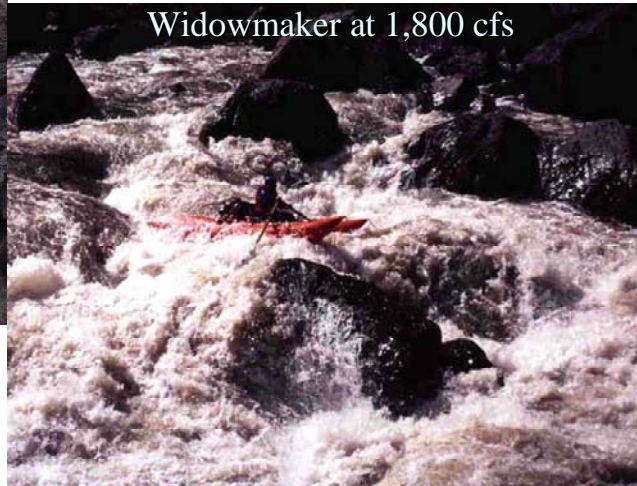
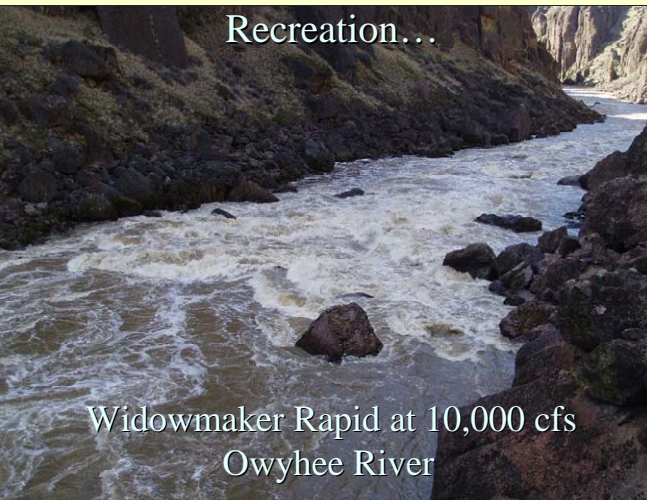
**Family Boating
on Main Salmon River in
Idaho's Frank Church –
River of No Return
Wilderness Area, July
2005**



River runners and land management agencies monitor the melting snow to determine when mountain forest roads will open for river runners access and when to or not to turn cattle out.

Others river runners may have to cancel their 'once in a life time trip' if rivers are too high or too low, or pay additional expense for over snow vehicles or airplanes to fly gear in.

Likewise in the late summer, if rivers are too low to launch from the normal put-in. It pays to plan ahead. **The SNOTEL Network can help with these decisions.**



Be careful where you park your vehicle, streams can rise quickly, even in years with below normal snow

In 2003, a delayed snowmelt in May gave way to record high temperatures, melting two inches of snow water per day.



Boat Launch at Heller Bar on Snake River, May 31, 2003. The river rose quickly from hot temperatures producing rapid snowmelt in the Salmon River basin.

Dam operators and hydropower producers are interested and aware of consequences of maintaining a full reservoir to produce power verse not planning properly and flooding if Mother Nature throws curveballs in the winter or spring, producing inflows too big to manage.



Lower Enterprise Dam in southern Utah January 12, 2005 after heavy winter precipitation events.

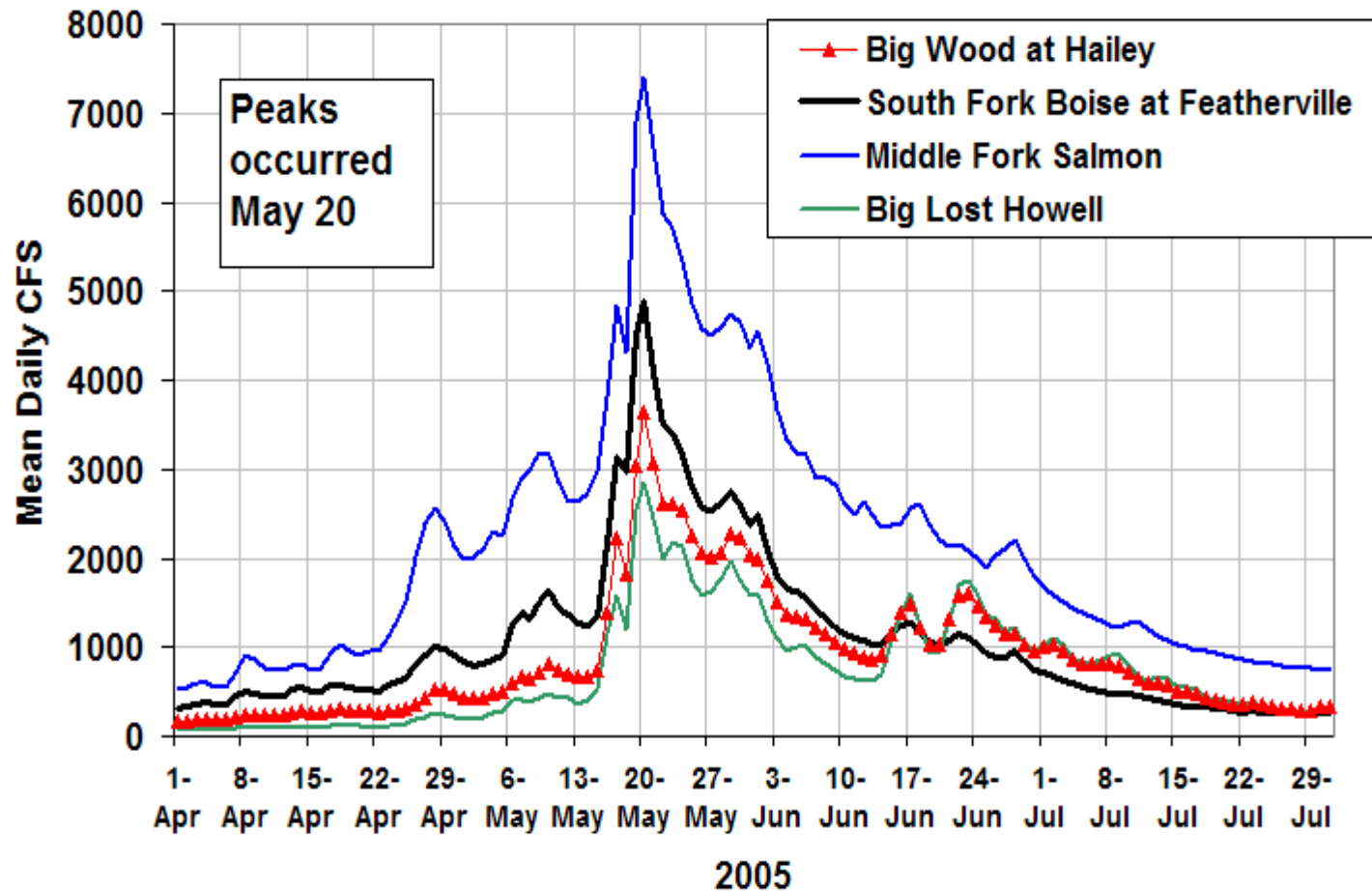


Little Wood Reservoir spillway in central Idaho May 18, 2005 after two inches of rain fell in one day on top of a ripe snowpack.

We developed a peak flow forecast for Big Wood River for private reservoir operation.

- Big Lost River wants one for management of nation's nuclear storage
- Middle Fork Salmon River for whitewater rafting
- SF Boise River for reservoir management & flood mitigation above Boise

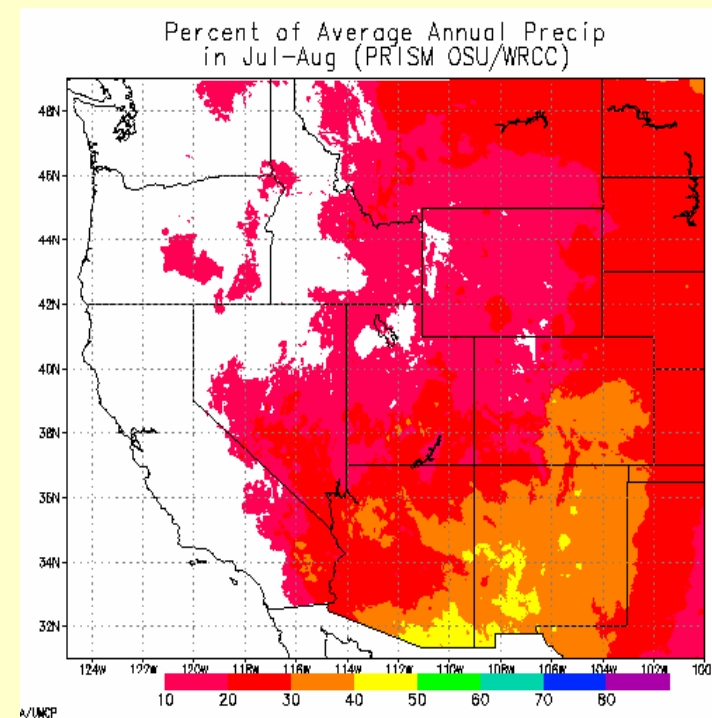
2005 April - July Streamflow



It is now July; streams have receded from the snowmelt.

Monthly precipitation amounts are less than an inch in the valleys and an inch or two in the mountains.
This is enough for dryland farming to squeeze by in some western states, but not enough for growing irrigated crops.

The lack of summer precipitation is the reason why our winter snowfall is so crucial for meeting summer water supply needs.



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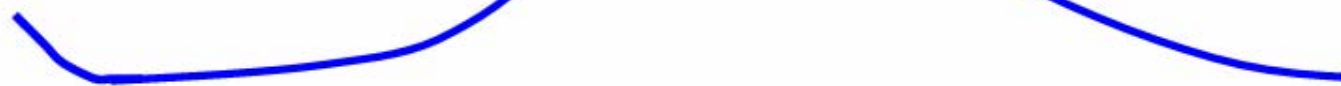
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Fish Managers use peak and low flow forecasts to determine if, when and where they should plant hatchery fish in the spring or if the streams may dry-up and reduce fish habitat.

Late summer, low flow forecasts are used to determine if the fishing season should be curtailed due to low flows and warm water temperatures that stress the fish. Or open for salvage fishing as some streams dry-up in low snow years.

Water supply information is also used as guidance for passing salmon flow water, 427,000 acre-feet, from upstream reservoirs in Idaho and Wyoming through the Snake River to the Columbia River.

It is now late summer, fall is coming, and because of our streamflow forecasts Reservoir Operators have learned it is financially better to rent excess water during the summer season, or flush excess water down river in the fall.

Or gradually release water to produce hydropower in the summer when the price of electricity is higher.

This also provides minimum streamflow levels where streams may have dried up.

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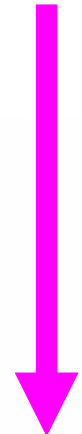
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Now, lets see who did we miss.....

- Hunters
- Tire Sales
- Windshield Repair Businesses
- School Bus Drivers and Highway Departments - SNOW DAY!
- Teachers and School Children – Adopt-a-SNOTEL Program
- Ski Rental Stores
- Homeowners
- Fire Weather Forecasters
- Range Managers
- Pizza Sales

- Power Boat Sales – can correlate boat sales to snowfall

Take Me To the Water

Take me boating.
Because I'm growing up too fast.

Take me water skiing.
Because our boat's cooler than any video game.

Take me on the water.
Before I discover girls.

Take me fishing.
And I promise to clean my room.

Bayliner 185 \$19,895⁰⁰ 3 only	Sea Ray 200 Sundeck \$38,980⁰⁰ 1 only	Lund WC-14 w/15hp Merc & Trailer \$5,746⁰⁰ 1 Red — 1 Blue
Bayliner 205 \$23,985⁰⁰ 3 only	Sea Ray 205 Sport \$30,533⁰⁰ 1 only	Lund 1775 Classic \$22,478⁰⁰ 2 only

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Who else?

- Navigation on the Columbia and Missouri Rivers
- Global Warming Research Scientists
- Lake Water Quality Studies
- Leaky Sewer Lines
- Sizing Evaporation Ponds
- Weekly Updates for: US Drought Monitor and Mount St. Helens
- Glacier Recession
- Others.....?????



What a Difference a Year Makes!

2003

2004  Natural Resources Conservation Service

