Salt Lake City WFO PoP/QPF Verification

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RFC Verification Workshop

Outline

- Brief review of regime-based PoP verification

- QPF verification

- Verification Issues

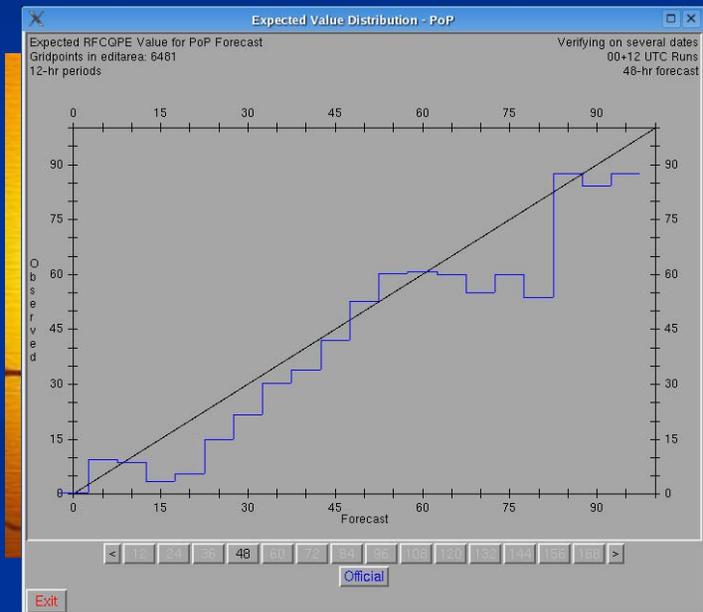Washington County Flooding – January 2005

Regime Based PoP/QPF Verification - Overview

- Examine seasonal PoP and QPF performance by CWA segment
  - Five regions utilized
    - 2 Mountain regions
    - 3 Valley regions

- Ascertain if we have significant PoP/QPF biases based on regime
  - Northwest flow – 13 days
  - Troughs – 16 days
  - Southwest flow – 13 days
  - Split-flow/Cut-off Low – 6 days
  - Ridge – 33 days

- PoP and QPF compared to NPVU QPE analysis
  - Considered the best available analysis at this time
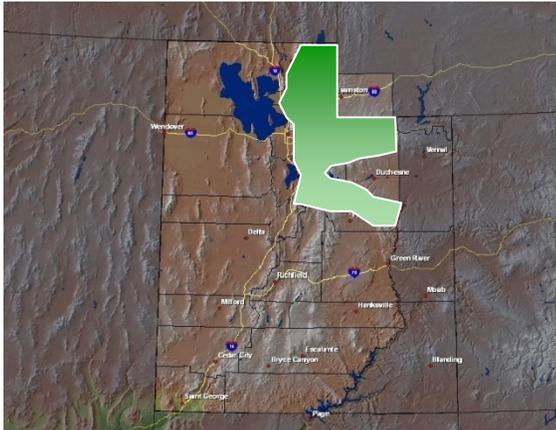 - Quality dependent upon RFC QC of gauge data
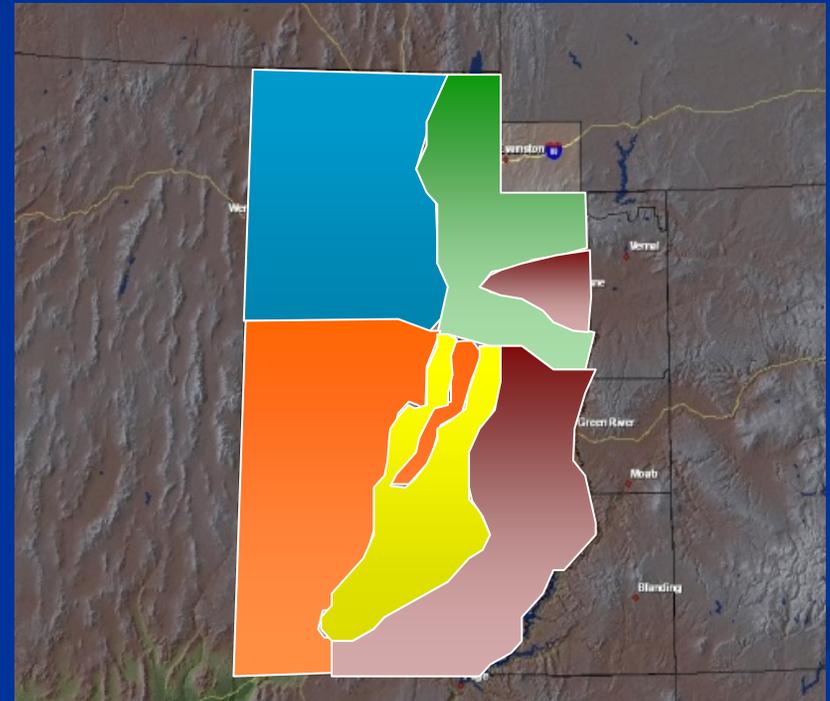
Does 40% mean 40%?

- Overall, our forecasts demonstrated very good PoP reliability for most regions and pattern types.

- Seasonal PoP reliability was generally quite good
  - Differentiating by pattern type revealed biases

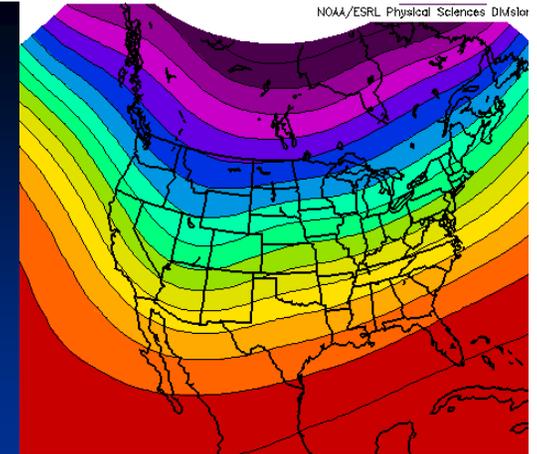- Presentation will focus on areas where we may be able to improve

Expected Value Distribution - PoP
Expected RFCQPE Value for PoP Forecast
Gridpoints in editarea: 6481
12-hr periods
Verifying on several dates
00+12 UTC Runs
48-hr forecast

Northwest Valleys – Trough Events at 48 hours
Southwest Valleys – Trough Events at 36 hours
Northwest Mountains – Trough Events at 48 hours

"Many a good newspaper story has been ruined by over **verification**" - James Gordon Bennett

Northern Mountains

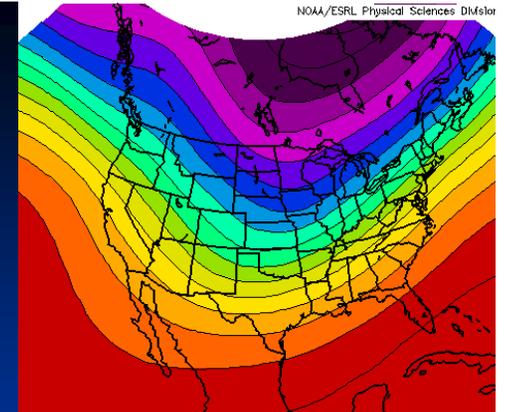- Short term PoP reliability was very good
- In the medium range we had a tendency to be underdone on likely or greater categorical (true for all times beyond first period).

- Right in the first 60 hours if high then less likely greater percentage first period.
- Tended to under do the PoP at 84 hours. QPE occurrence tended to run above our forecast for chance and practical (PoP for all times beyond first period).
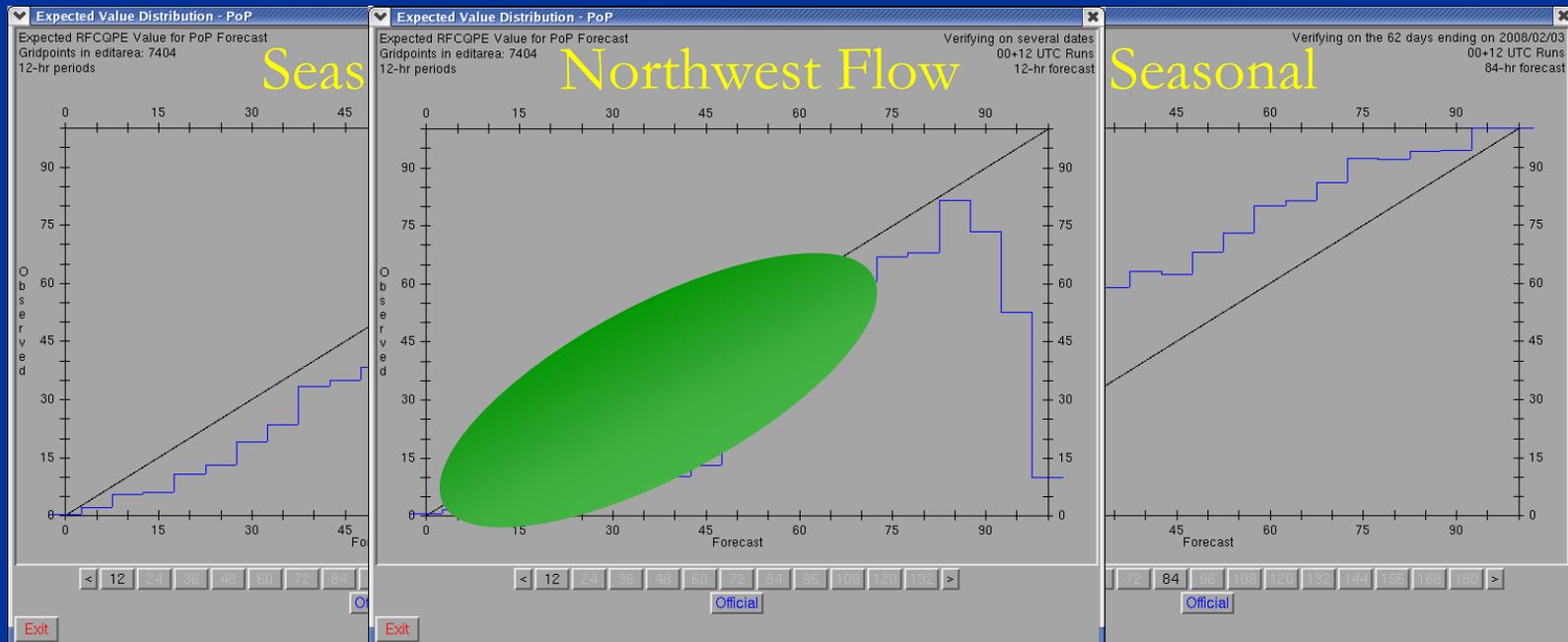
Troughs

Troughs
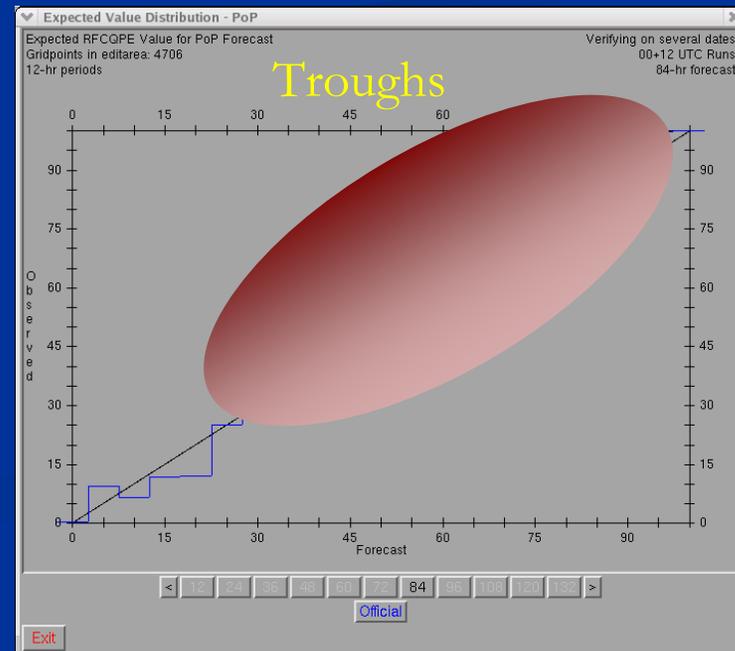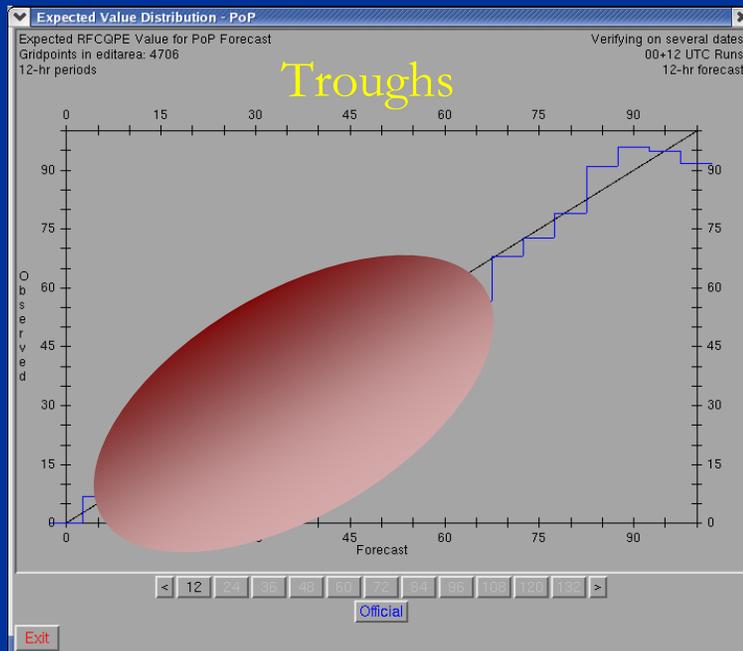
Northwest Valleys

- Tend to overdo chance PoPs in the short term on northwest flow.
- Very high PoPs tend to occur much less frequently than they should by this time. First period is usually too high. Significant cool/wet surface bias?
- Chance PoP's yielded likely QPE for trough events from 84 hours on out. Could possibly be more aggressive for these events.

- Consistent trend beginning about 60 hours out.
- Seasonal shows significant cool/wet surface bias through first 48 hours.
- Hang onto PoPs too long. If not confident in likely PoPs we tend to over do it.
- Better to be conservative in northwest flow, aggressive in southwest flow since bias?

Seasonal   Northwest Flow   Seasonal

Interim Summary

- Good seasonal PoP reliability in the short term

- Low PoP bias in the medium range

- Consistent PoP biases for specific regimes
  - *Mountain zones* – 'Under did' PoPs for Trough events
  - *Northwest Valleys* – 'Under did' PoPs for Trough and Southwest Flow events. Overused chance PoPs for Northwest Flow events

- Good job hitting the big events hard

ClimoPoPs and Tools

- Consider heavily utilizing climoPoPs in low confidence situations in the extended (populate or nudge)

- If 'reasonable' confidence in a trough moving through we should definitely be above climoPoPs

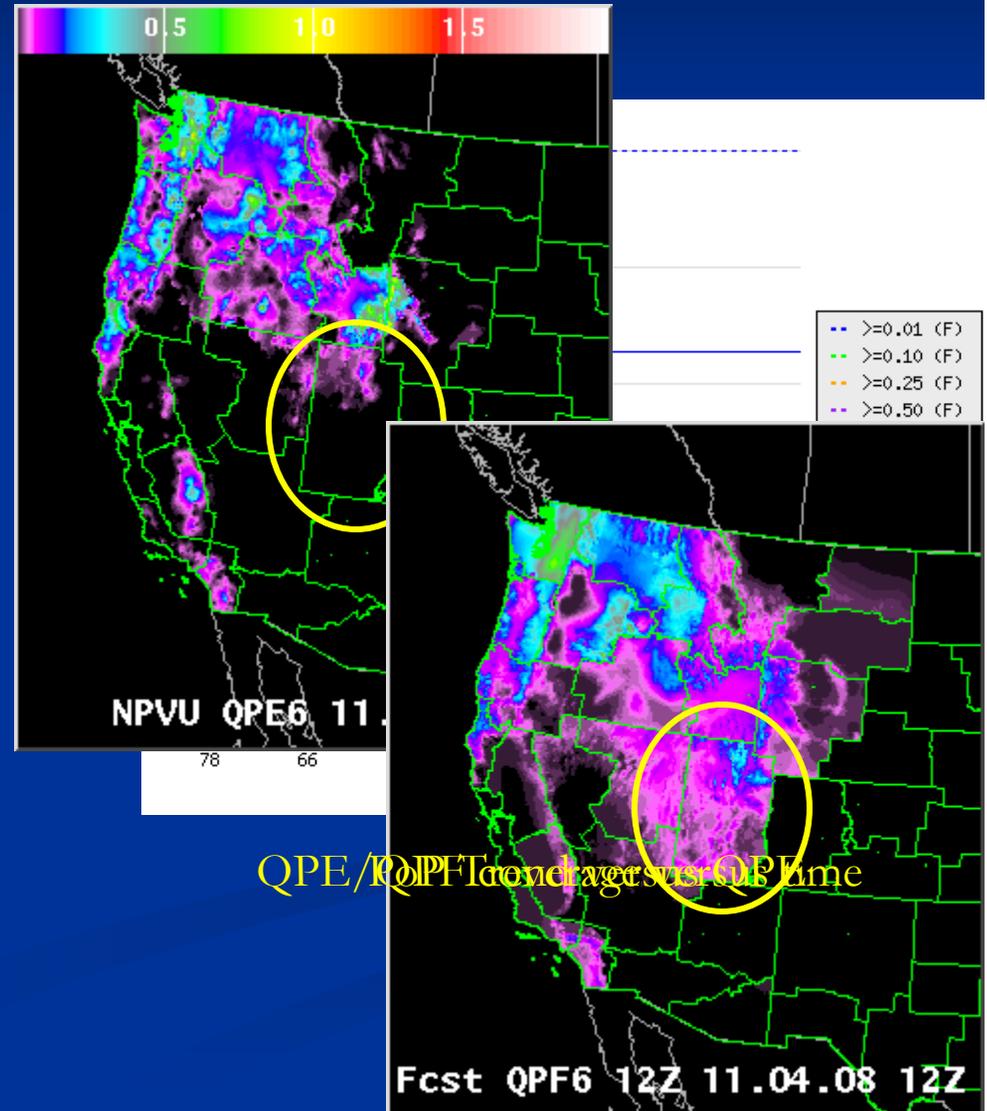- May be able to be a bit more aggressive with medium range PoPs
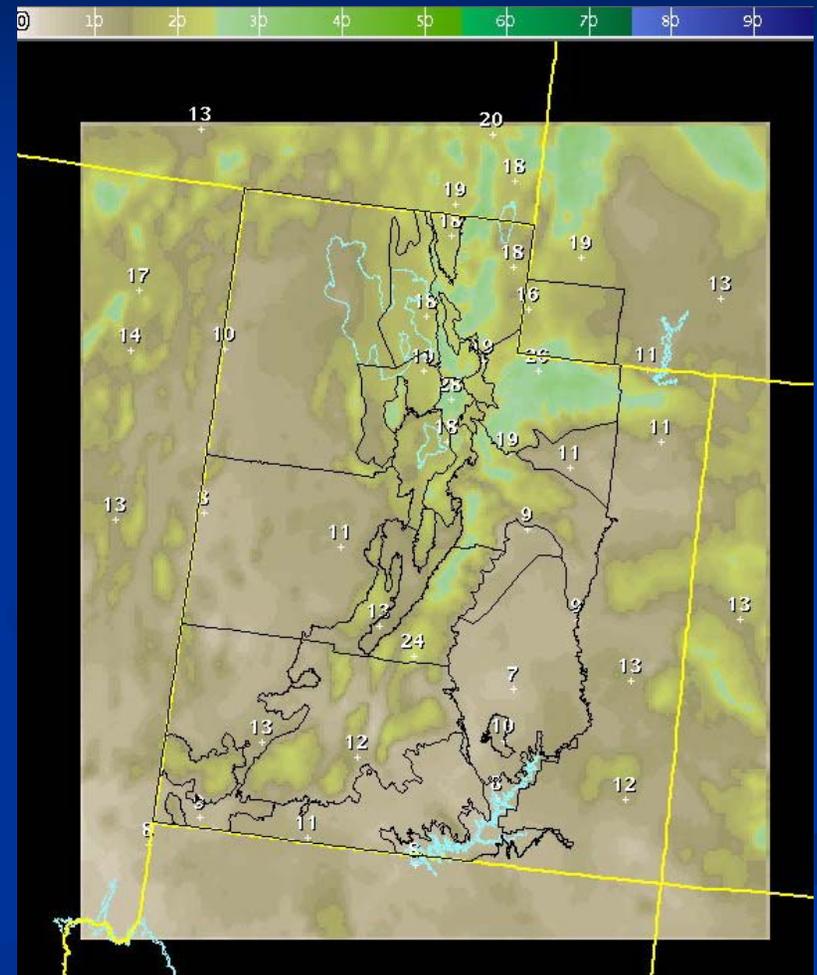
QPF Trends

- **QPF verification indicated a wet bias across all forecast areas and in all regimes through 60 hours.**
  - Light QPF for low chance PoPs
  - Also tend to over forecast areal extent of precipitation 'bullseyes'

- **Did not correlate with PoP bias (i.e., low PoP vs. High QPF)**
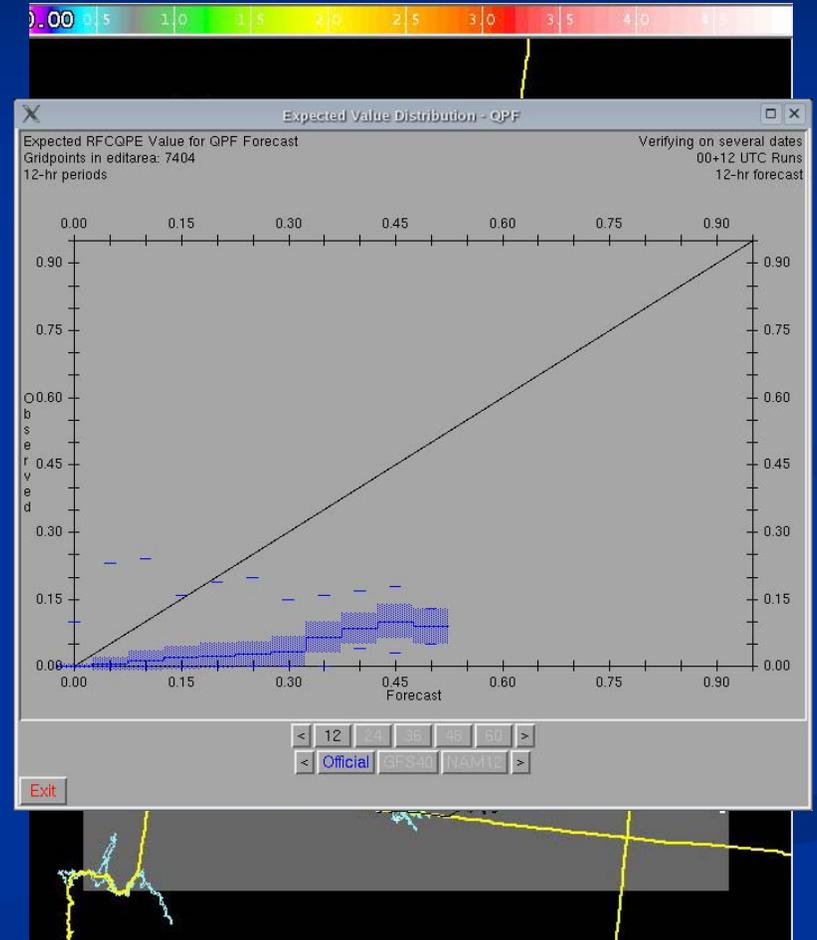
WFO Trends

- WFO frequently does a good job 'ramping up' PoPs well ahead of an event

- QPF consistently overdone
  - Higher amounts have a footprint that is too large
  - Carry light QPF with low PoPs
  - Begin onset too early
  - QPF x snow ratio = snow amount…often easier to modify QPF than snow ratio

NPVU QPE6 11.

Fcst QPF6 12Z 11.04.08 12Z

>=0.01 (F)
>=0.10 (F)
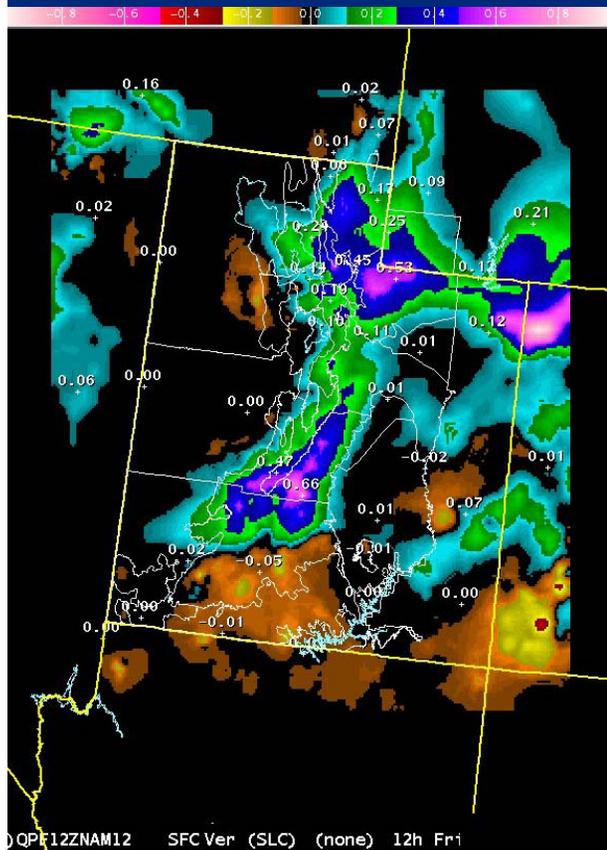>=0.25 (F)
>=0.50 (F)

QPE/QPF coverage versus QPF time

Garbage in…Garbage out…

- WFO
  - Clear tendency to 'overdo' QPF independent of regime

- GFS
  - 'Socialist' QPF
  - Greatly underestimates precip maxima
  - Resolution issue limits totals

- NAM
  - Generally does a better job depicting the max than GFS
  - Occasionally too aggressive with QPE bullseyes.
  - Typically should not be higher than the highest NAM value in the short term
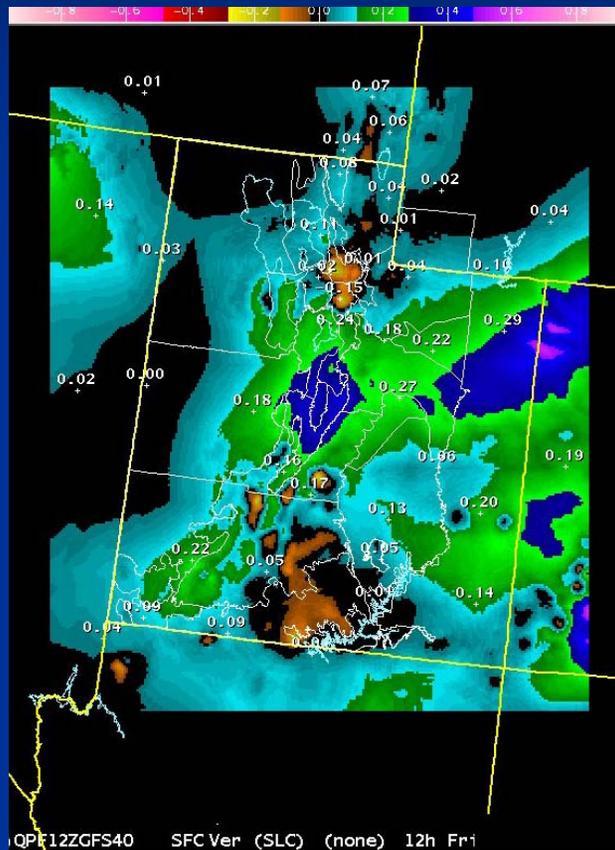 - Wild swings in QPF maxima location

Expected Value Distribution - QPF

Expected RFCQPE Value for QPF Forecast
Gridpoints in editarea: 4937
12-hr periods

Verifying on several dates
00+12 UTC Runs
36-hr forecast

GFS   NAM   WFO

Exit

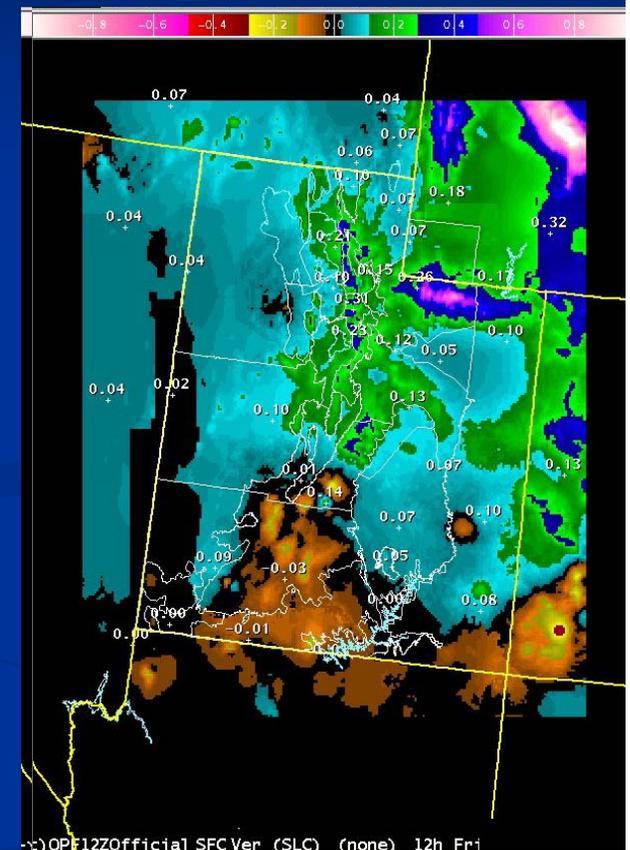Northern Mountains – NWS 36 hour
Northwest Flow events

Water…water….everywhere


NAM day 2 QPF Bias –
November 3rd-5th event

GFS day 2 QPF Bias –
November 3rd-5th event

WFO day 2 QPF Bias –
November 3rd-5th event

QPFHelper

- Great tool to create realistic looking QPF grids

- Limited number of data points
  - Coincide with traditional obs points

- Reliant on PRISM climo
  - Events in the Great Basin are less spatially coherent (Serreze et al 2001)
  - Could benefit greatly from Smart PRISM
  - Non-standard QPE distribution a grid issue
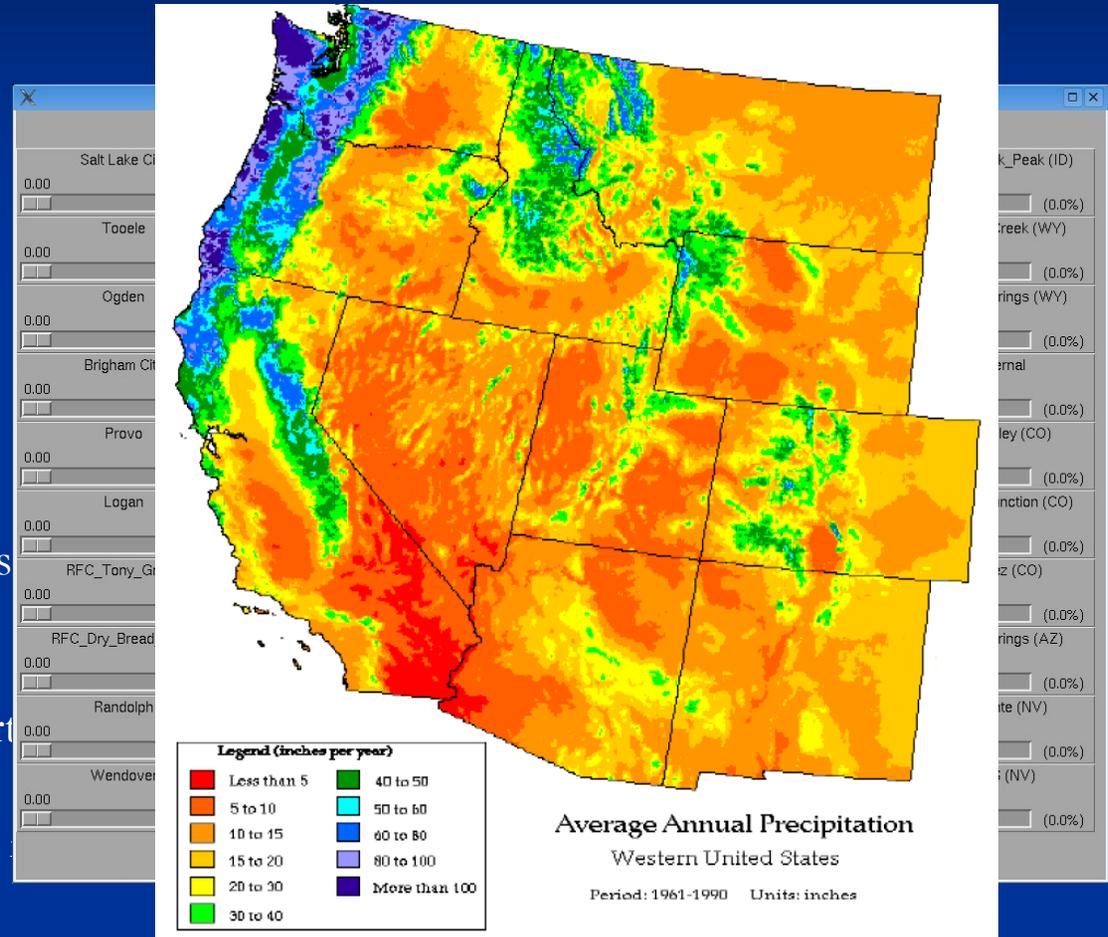
PRISM Ave Annual Precip Image – Oregon State University

Future?

- Improved verification methodology
  - Timing issues
  - Spatial coherence

- Probabilistic QPFs
  - Eliminate QPF bias at low PoPs
  - Additional information for user

- Smart PRISM
  - Could yield more realistic grids

- Improved grid editing techniques
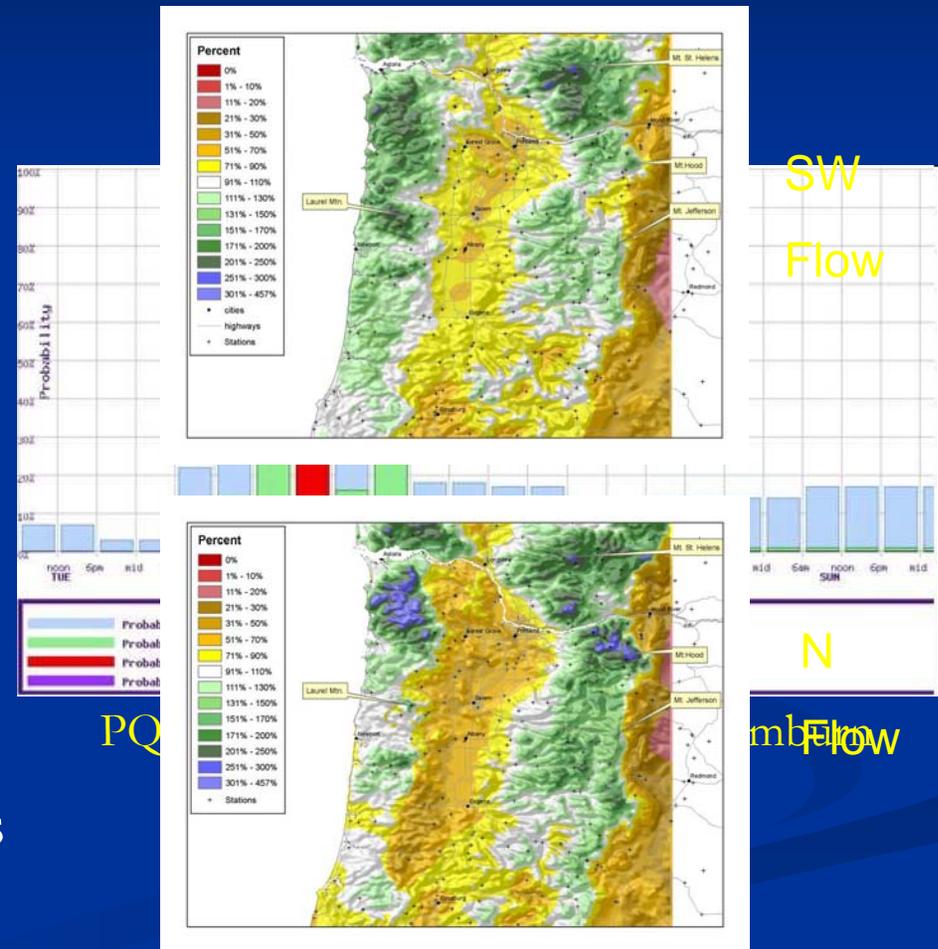
Images from presentation by Kevin Werner (CBRFC)

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