An AHPS Verification System for Ensemble Streamflow Forecasts

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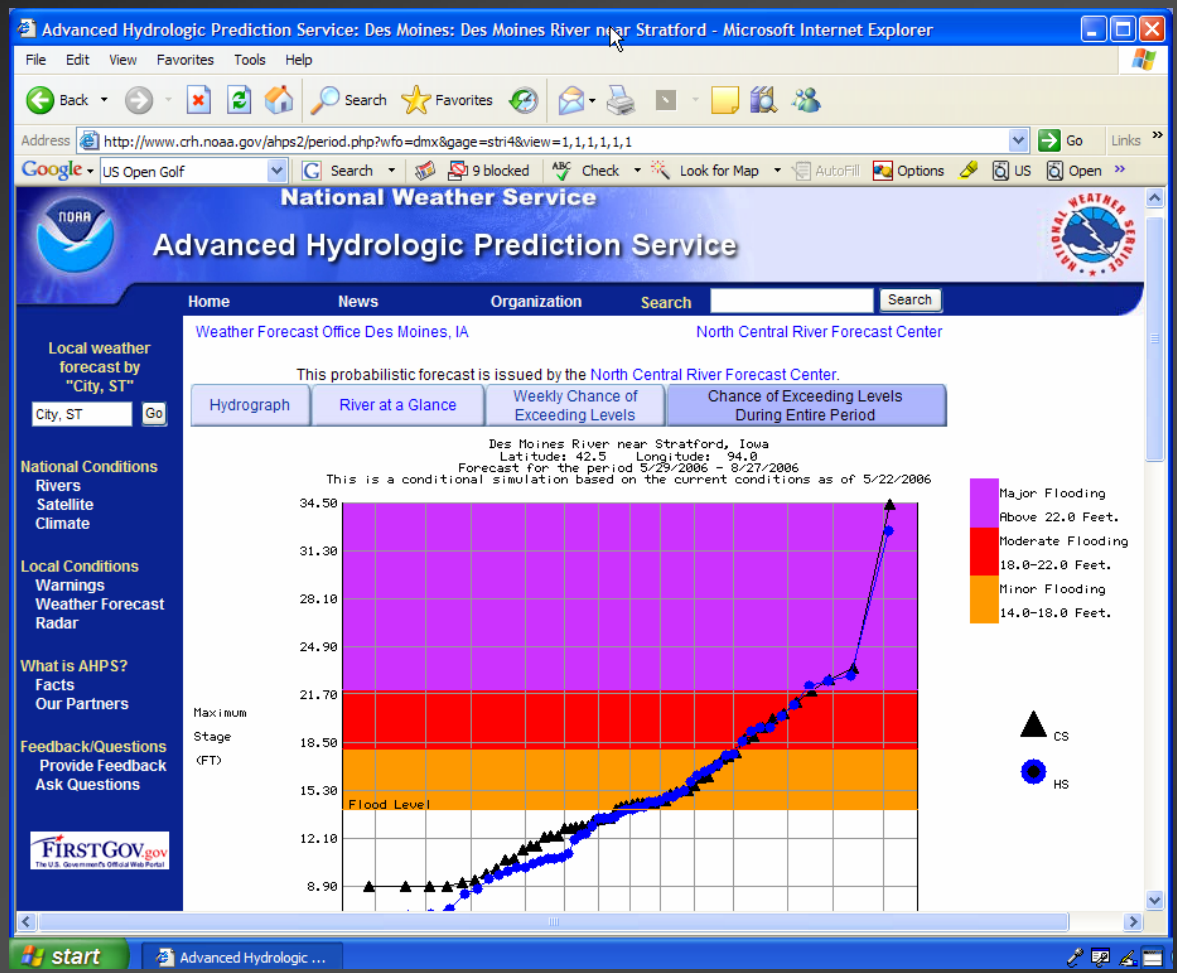
UMBC

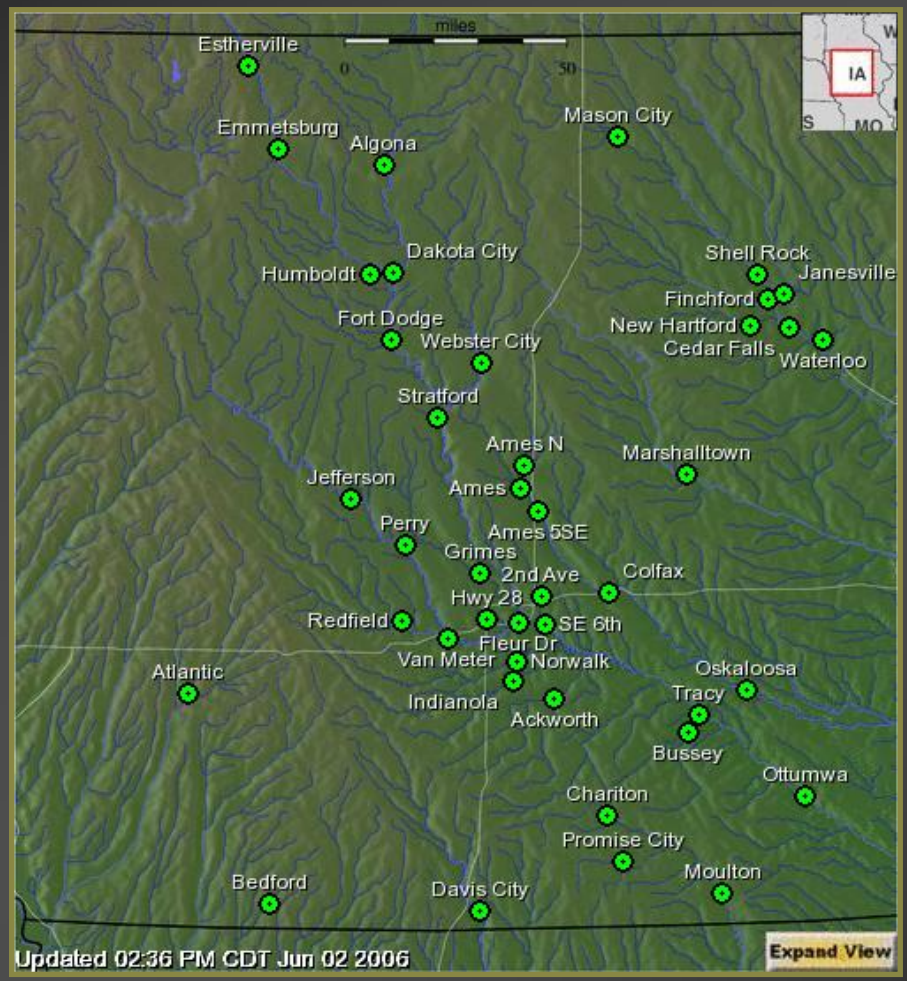
Support provided by the
NWS Office of Hydrologic Development

Advanced Hydrologic Prediction Service



- Ensemble streamflow forecasts

Advanced Hydrologic Prediction Service



- Ensemble streamflow forecasts
- Multiple forecast locations

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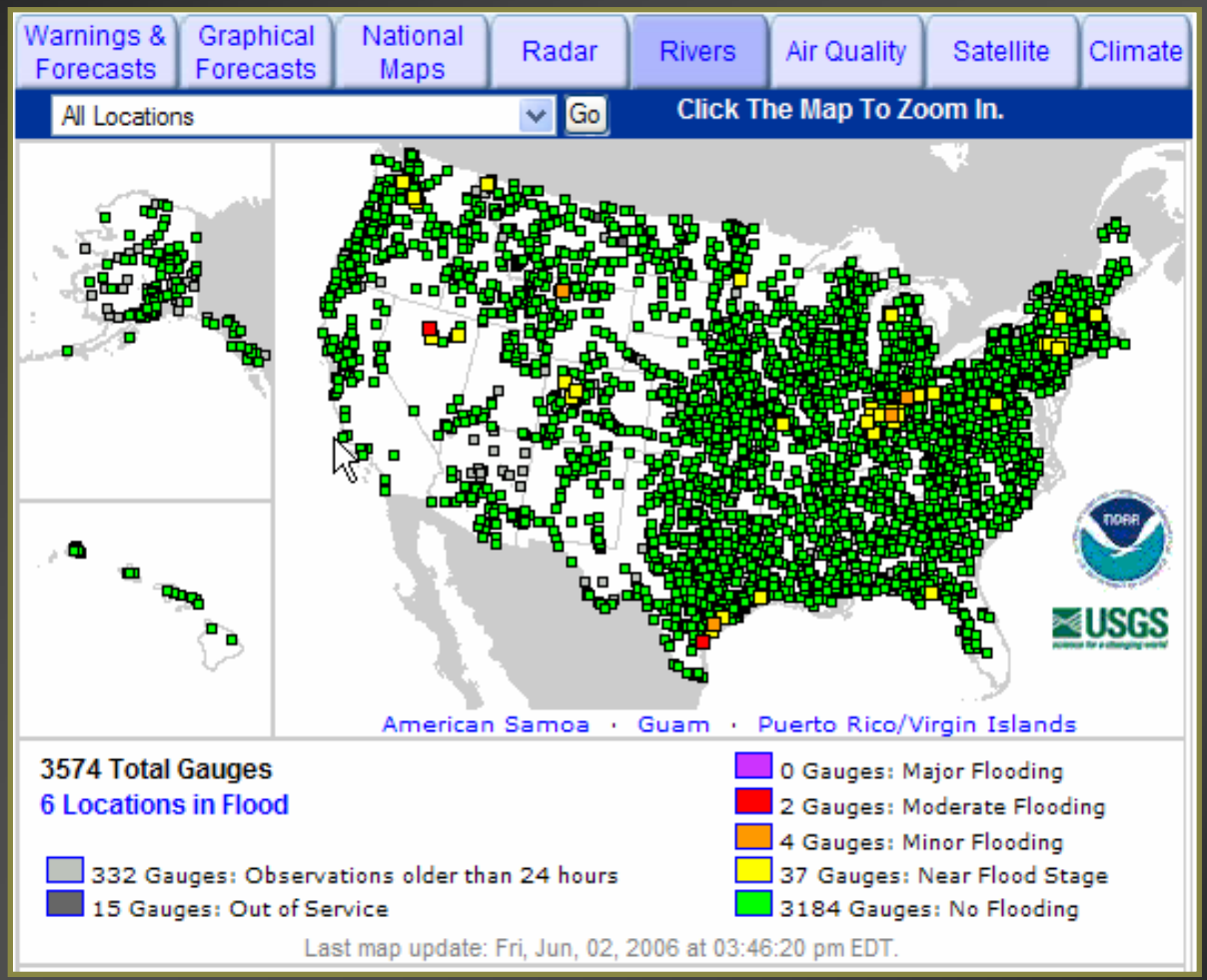
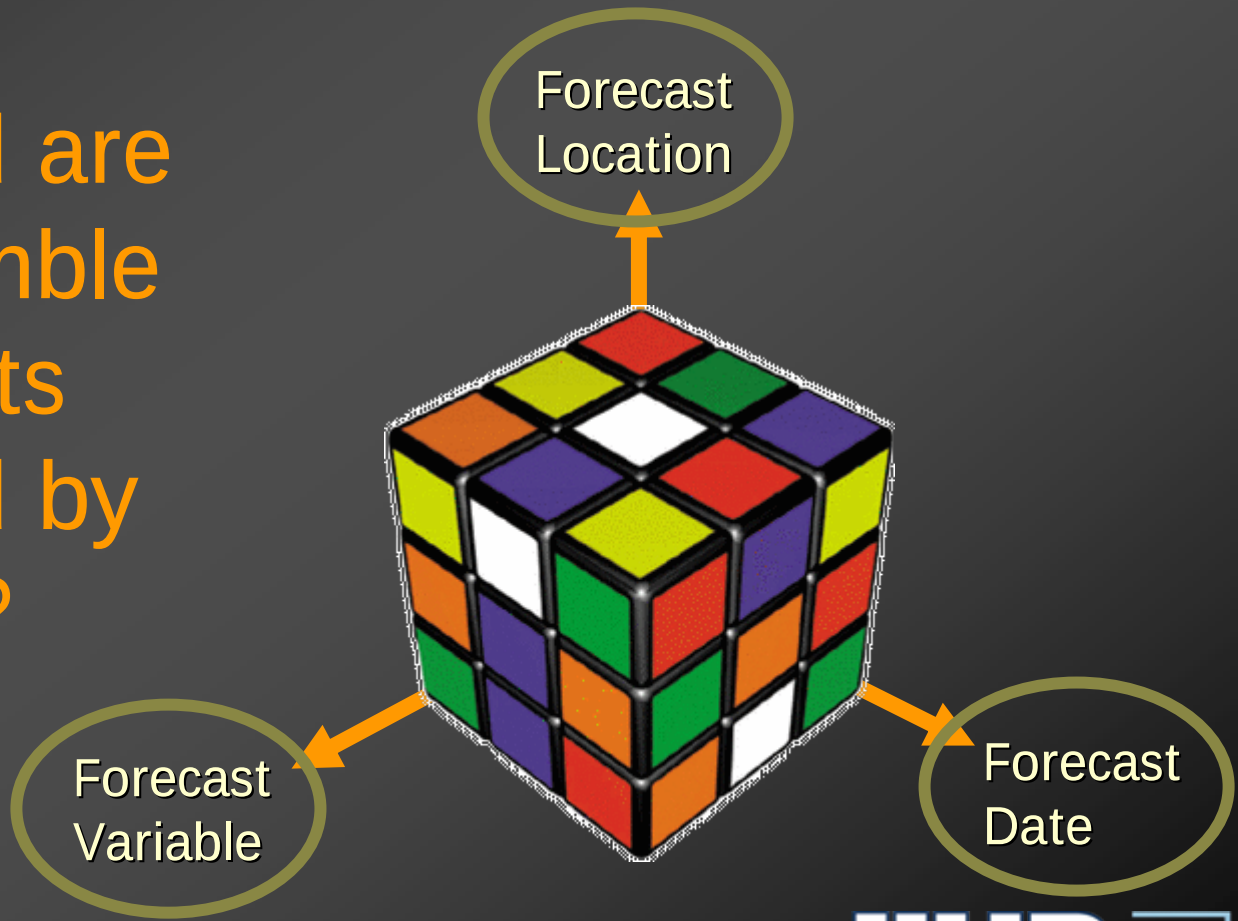


- Ensemble streamflow forecasts
- Multiple forecast locations
- Throughout the United States

AHPS Verification

How good are the ensemble forecasts produced by AHPS?



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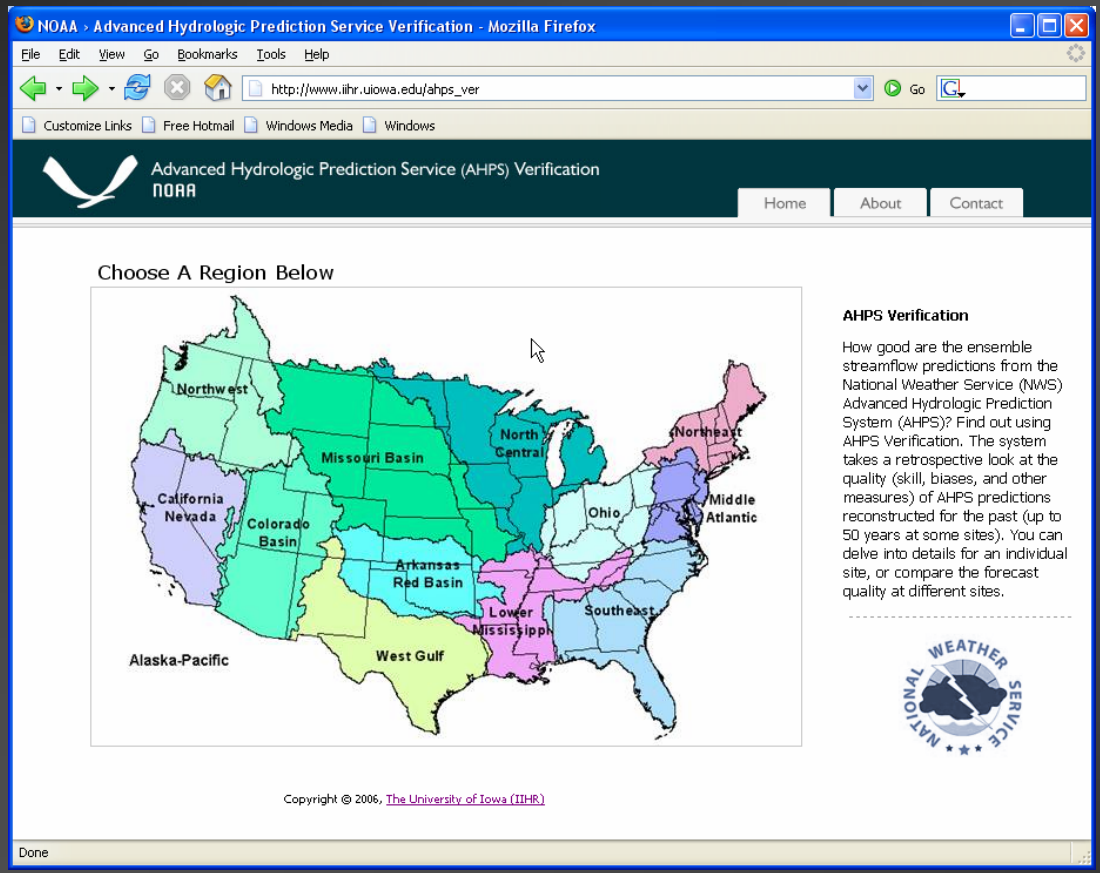
AHPS Verification System



http://www.iihr.uiowa.edu/ahps_ver

Web-based tools for online access, analysis, and comparison of retrospective AHPS forecasts for River Forecast Centers (RFCs)

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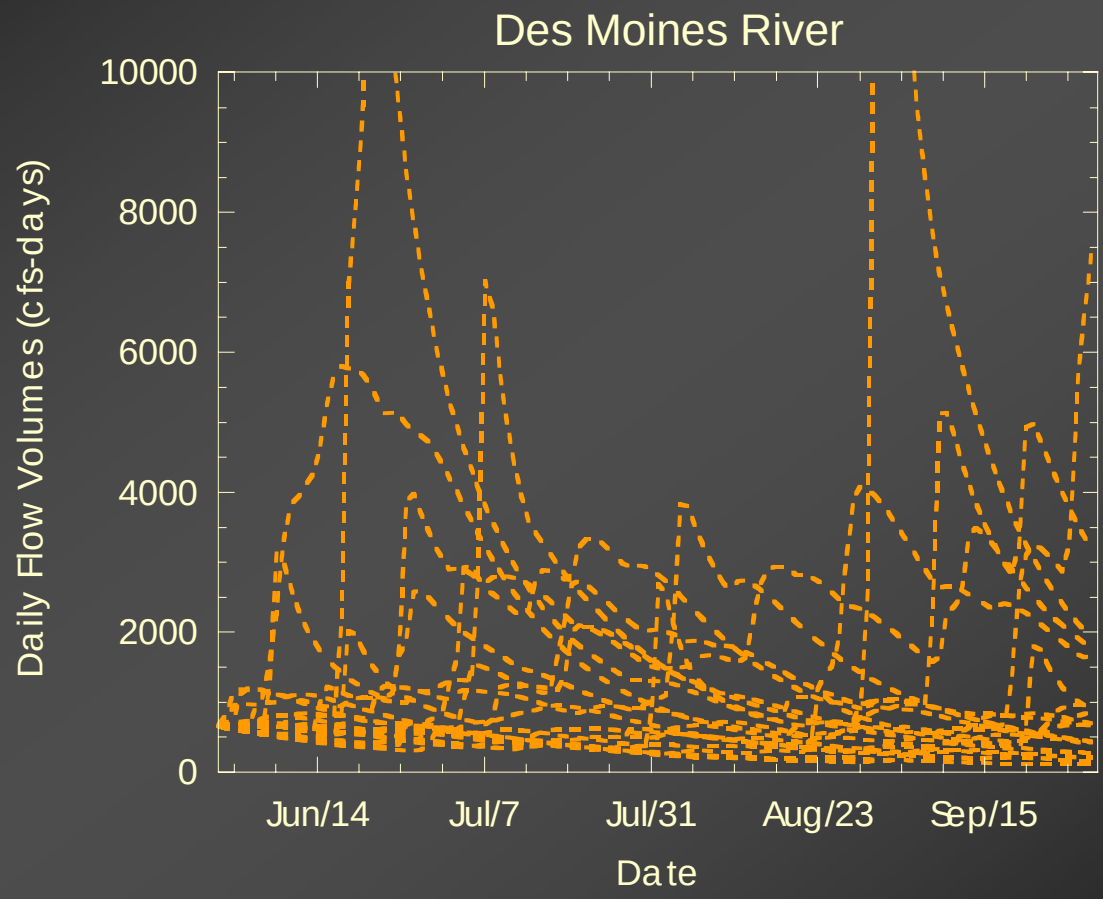
Verification Data Archive

Verification Data Archive

Ensemble Streamflow Predictions



- Retrospective forecasts for a 50-year period

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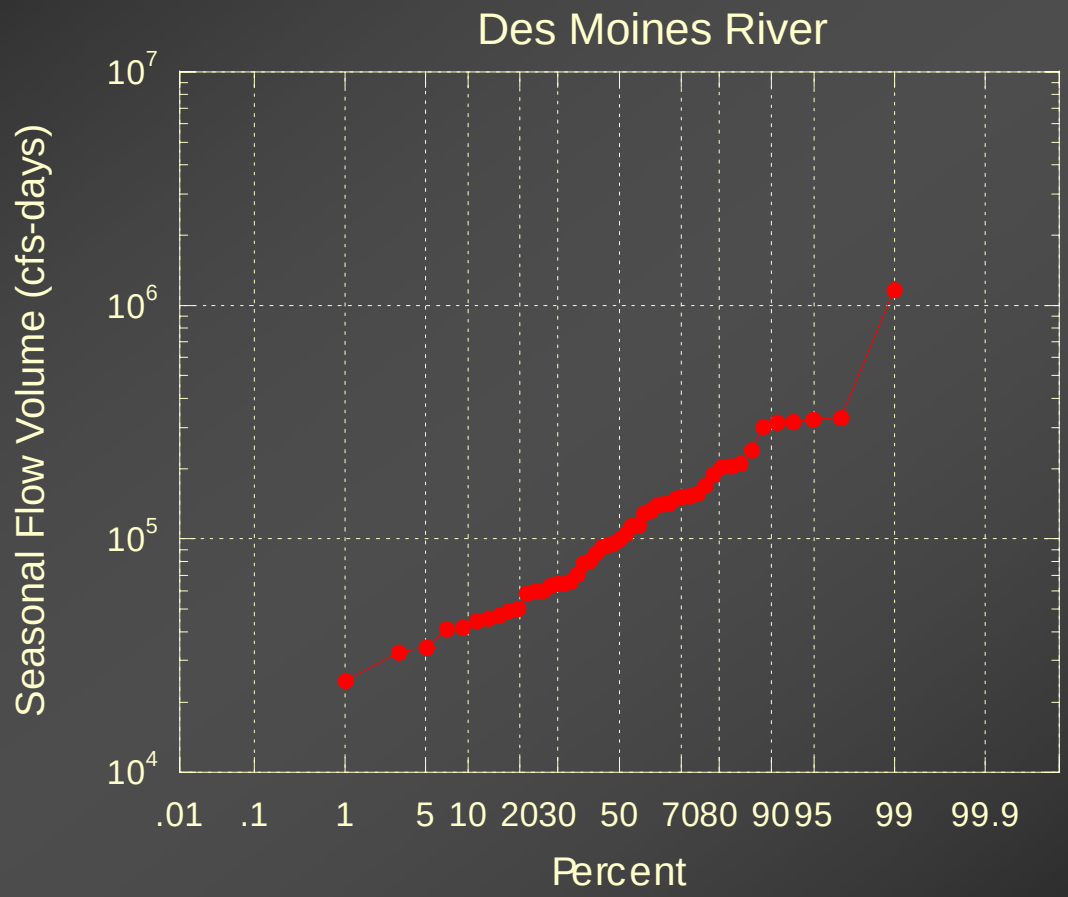
Conditional Distribution Forecast



- Retrospective forecasts for a 50-year period
- Processed ensemble forecasts & observations

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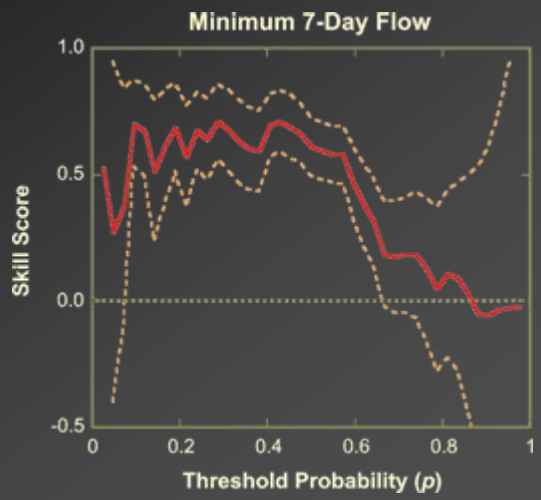
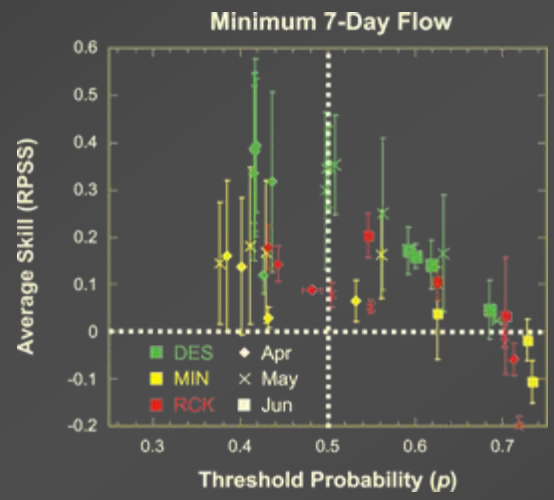
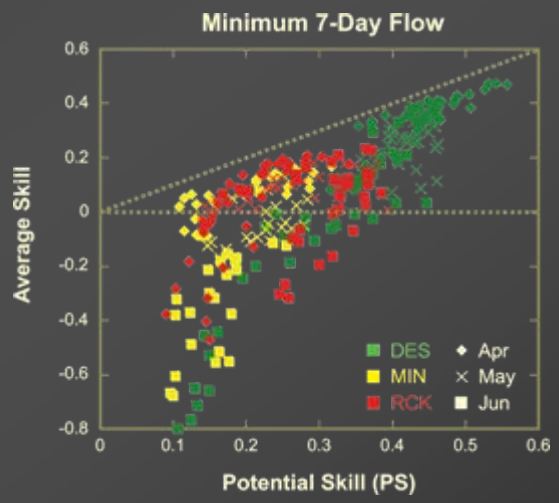
Verification Data Archive







- Retrospective forecasts for a 50-year period
- Processed ensemble forecasts & observations
- Verification results

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Forecasts Users (Water Managers)

- Evaluate the quality of forecasts at a particular location and specific forecast dates
- Download retrospective forecasts to examine their use in decision-making

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http://cho.iihr.uiowa.edu/gui03.php?fg=DES&rfc=NCRFC

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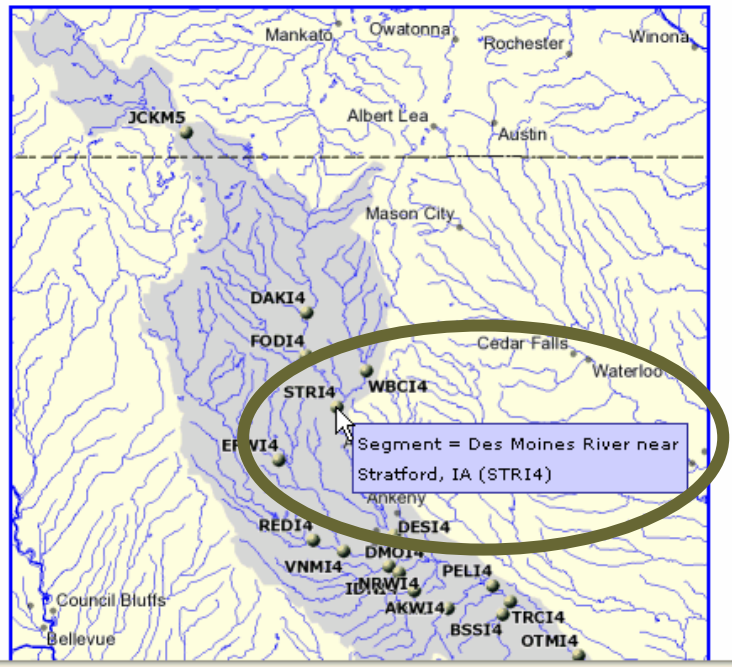
RFC > Forecast Group > **Forecast Segment** > Options > Images

Des Moines

Please select a forecast segment.
You may select more than one forecast segment.

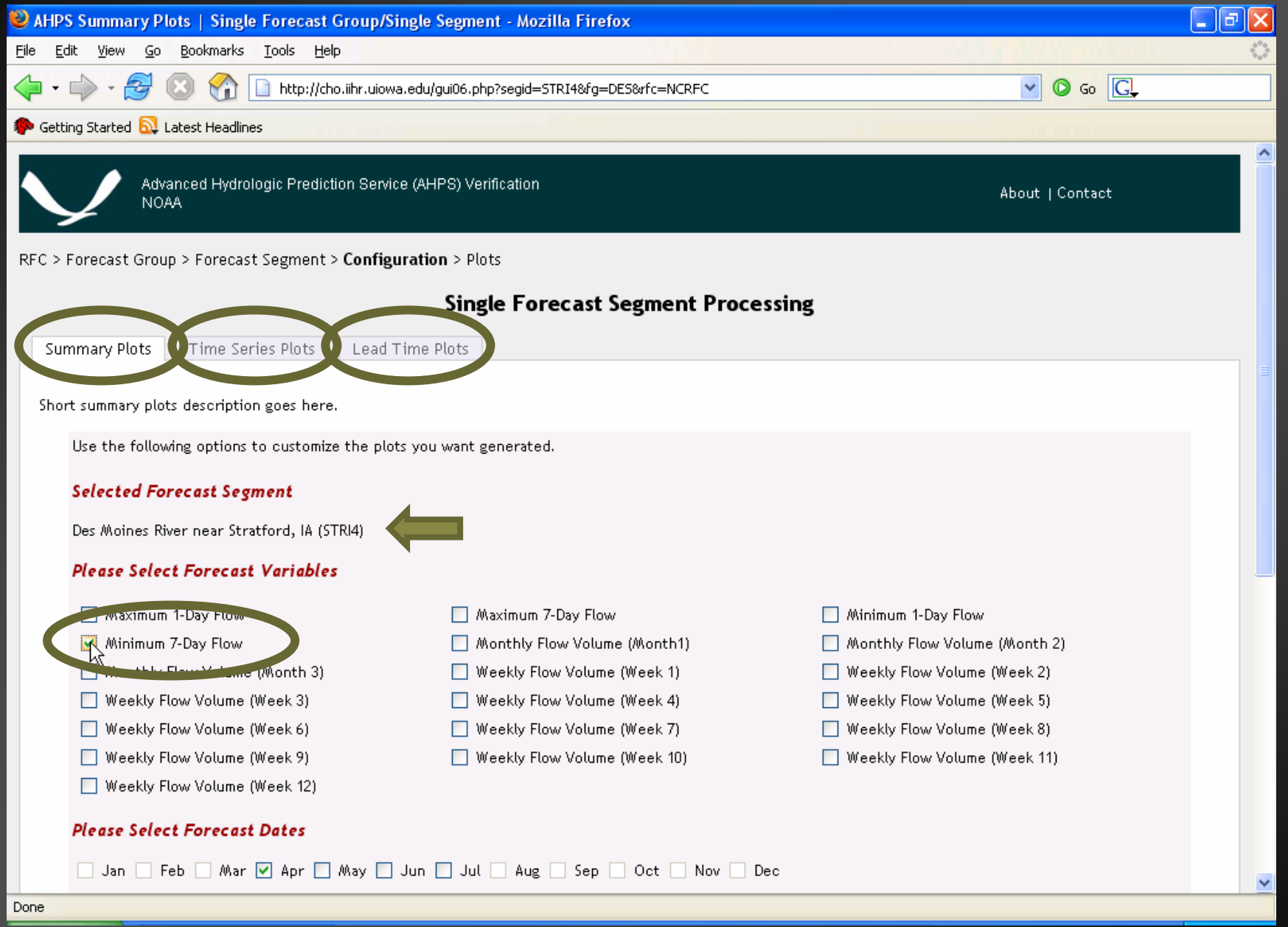


Selected Forecast Segments

STRI4

Submit Clear List

Done


AHPS Summary Plots | Single Forecast Group/Single Segment - Mozilla Firefox
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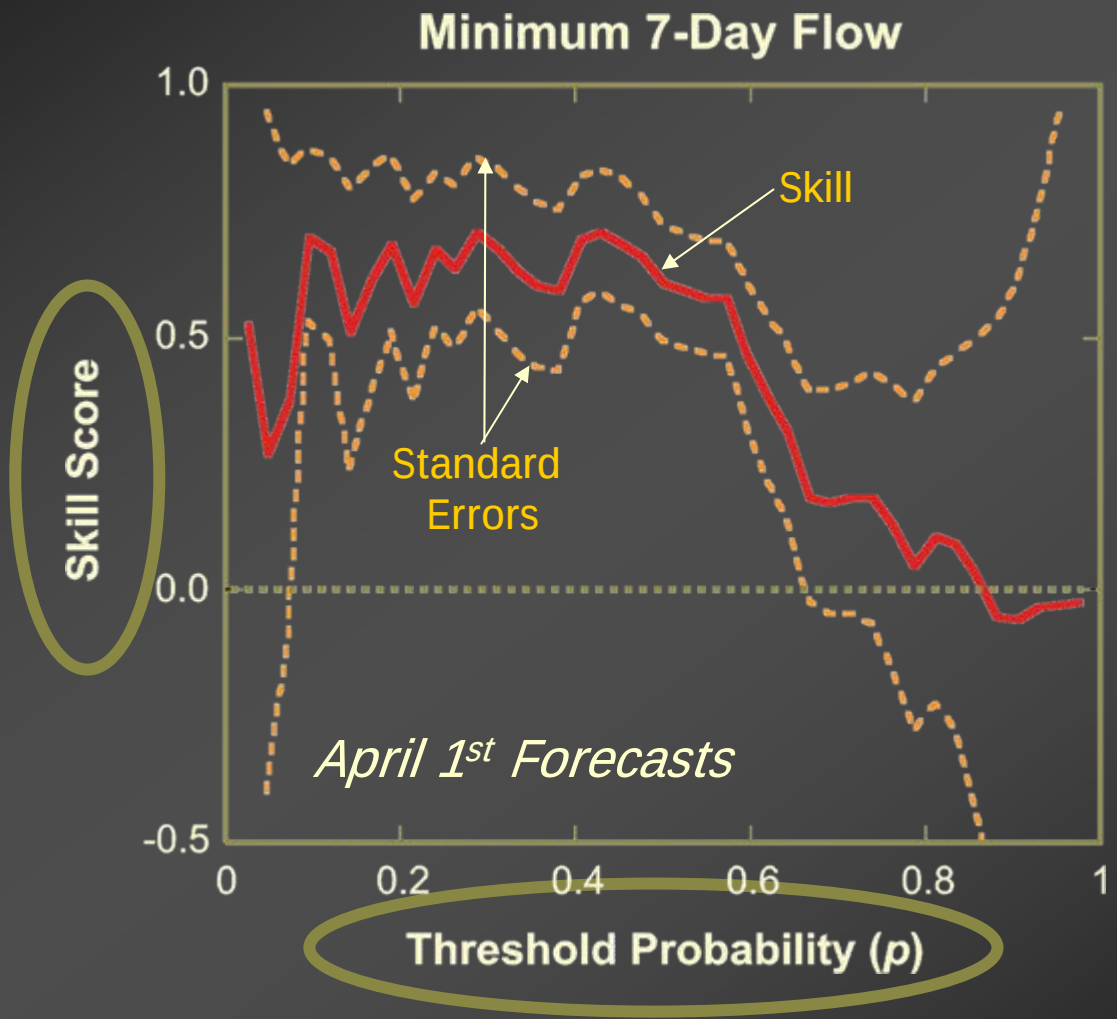
RFC > Forecast Group > Forecast Segment > Configuration > Plots
Single Forecast Segment Processing
Summary Plots
Time Series Plots
Lead Time Plots
Short summary plots description goes here.
Use the following options to customize the plots you want generated.
Selected Forecast Segment
Des Moines River near Stratford, IA (STRI4)
Please Select Forecast Variables
Minimum 7-Day Flow
Maximum 7-Day Flow
Minimum 1-Day Flow
Monthly Flow Volume (Month1)
Monthly Flow Volume (Month 2)
Weekly Flow Volume (Week 1)
Weekly Flow Volume (Week 2)
Weekly Flow Volume (Week 3)
Weekly Flow Volume (Week 4)
Weekly Flow Volume (Week 5)
Weekly Flow Volume (Week 6)
Weekly Flow Volume (Week 7)
Weekly Flow Volume (Week 8)
Weekly Flow Volume (Week 9)
Weekly Flow Volume (Week 10)
Weekly Flow Volume (Week 11)
Weekly Flow Volume (Week 12)
Please Select Forecast Dates
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Done

Des Moines River near Stratford



- Skill depends on the threshold
- Uncertainty is greater for extremes

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NWS Forecasters at an RFC

- Compare forecast quality at multiple locations within the RFC domain
- Diagnose attributes (e.g., biases) limiting forecast skill

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http://cho.iihr.uiowa.edu/gui03.php?fg=DES&rfc=NCRFC

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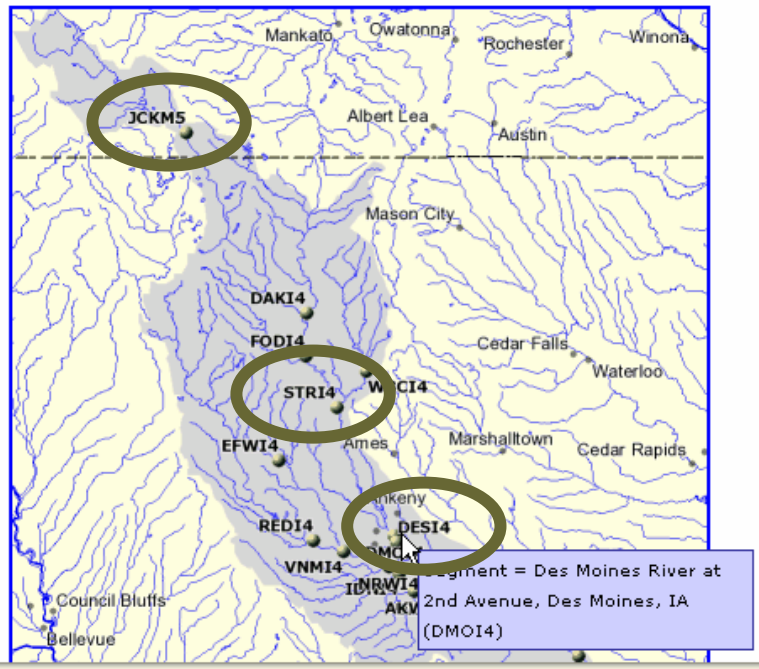
RFC > Forecast Group > **Forecast Segment** > Options > Images

Des Moines

Please select a forecast segment.
You may select more than one forecast segment.

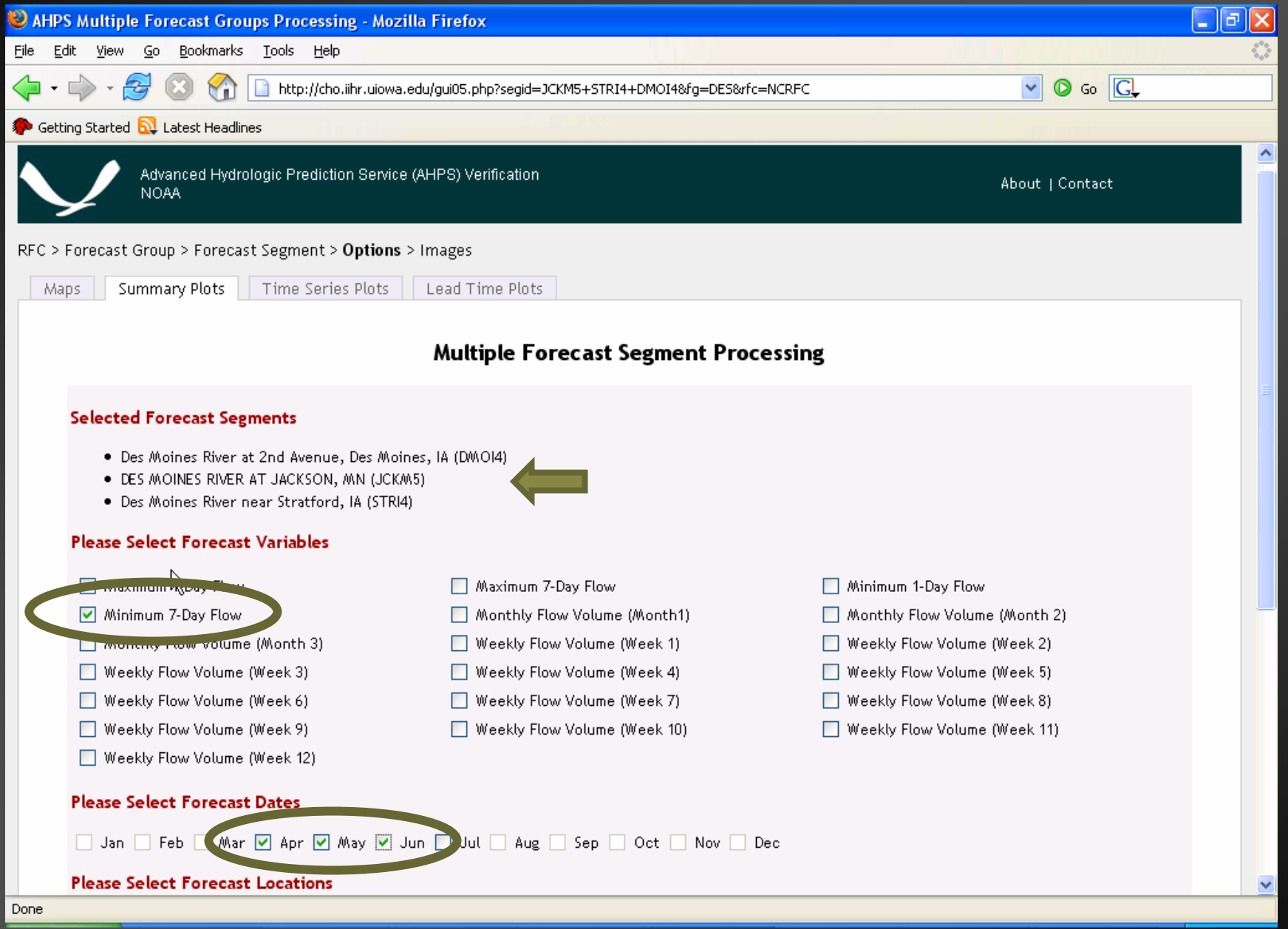


Selected Forecast Segments

JCKM5 + STRI4 + DMOI4

Submit | Clear List

Done


AHPS Multiple Forecast Groups Processing - Mozilla Firefox
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RFC > Forecast Group > Forecast Segment > Options > Images
Maps
Summary Plots
Time Series Plots
Lead Time Plots
Multiple Forecast Segment Processing
Selected Forecast Segments
Des Moines River at 2nd Avenue, Des Moines, IA (DMOI4)
DES MOINES RIVER AT JACKSON, MN (JCKM5)
Des Moines River near Stratford, IA (STRI4)
Please Select Forecast Variables
Maximum 7-Day Flow
Minimum 1-Day Flow
Minimum 7-Day Flow
Monthly Flow Volume (Month1)
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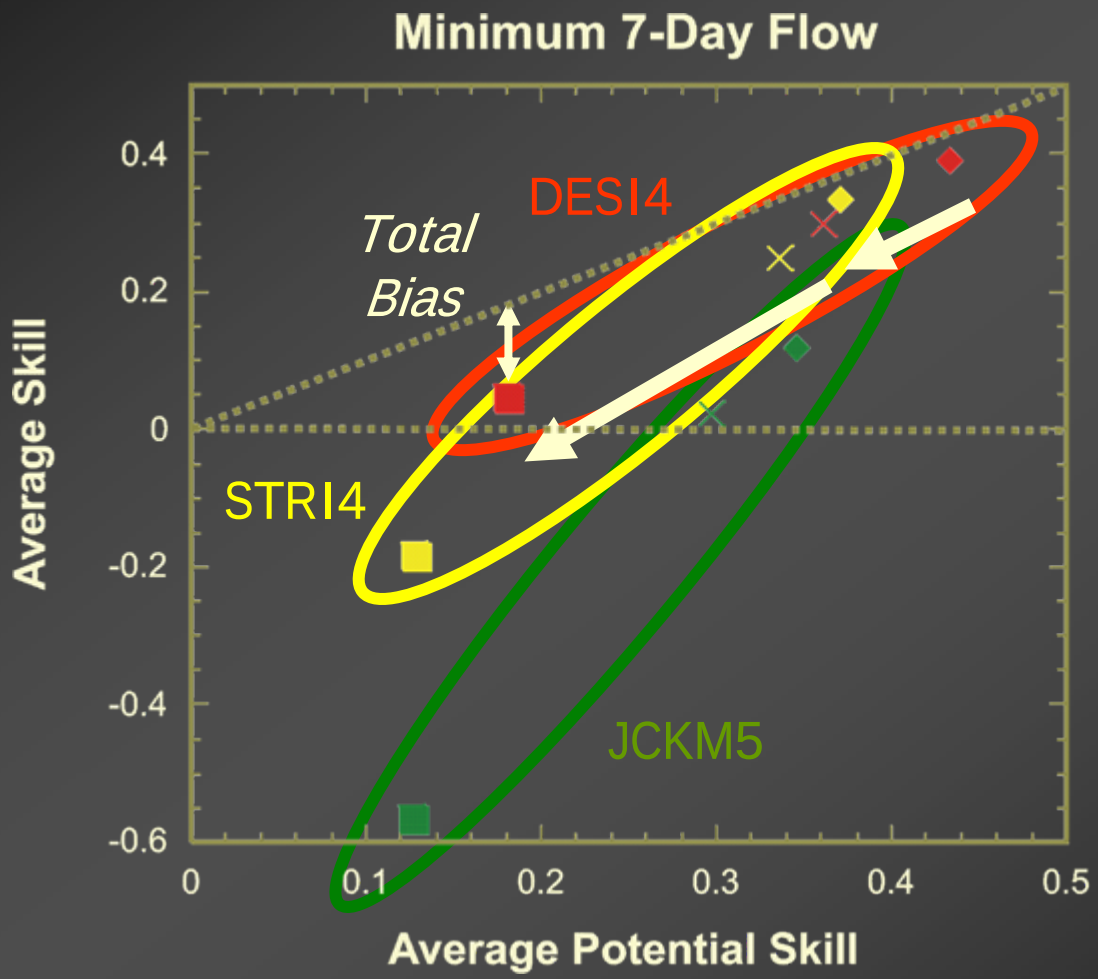
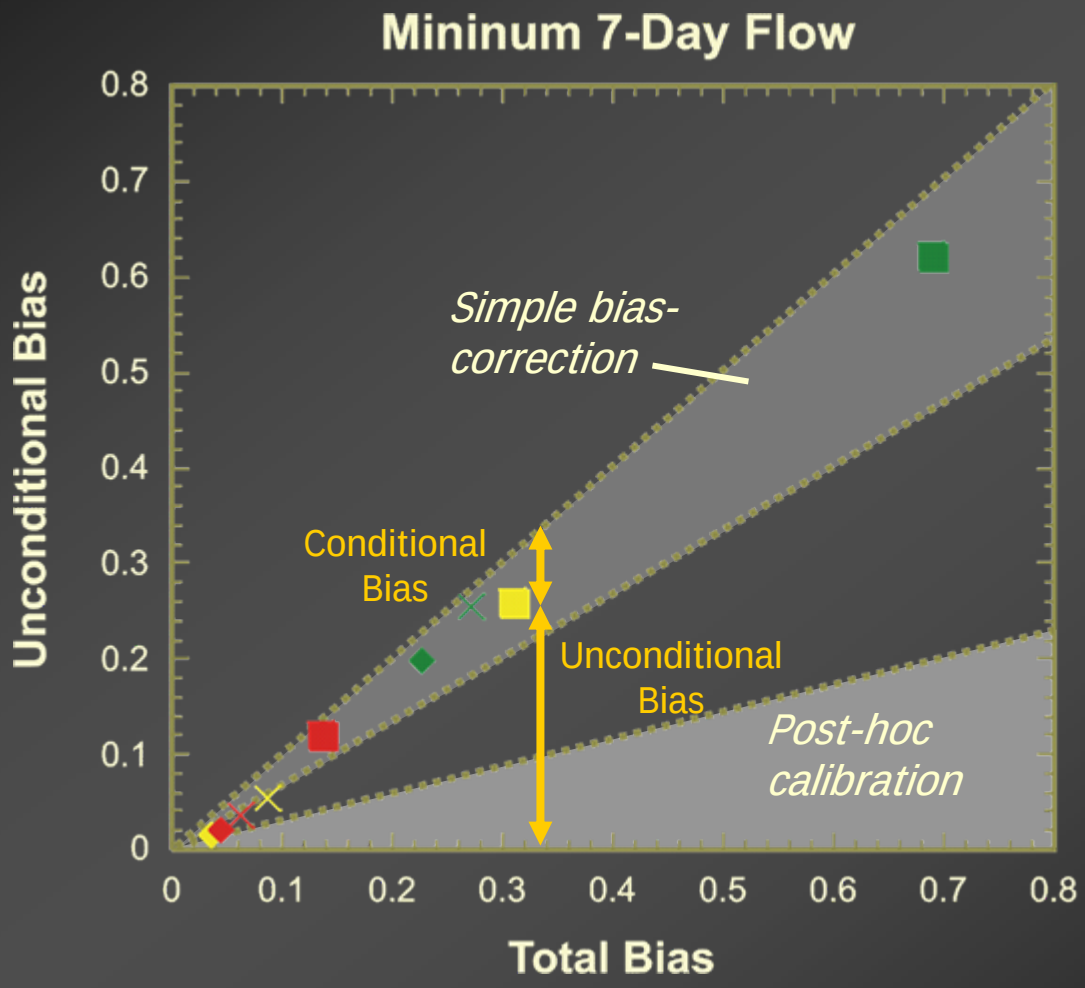
Weekly Flow Volume (Week 8)
Weekly Flow Volume (Week 9)
Weekly Flow Volume (Week 10)
Weekly Flow Volume (Week 11)
Weekly Flow Volume (Week 12)
Please Select Forecast Dates
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Please Select Forecast Locations
Done

Des Moines Forecast Skill



- Skill is higher (lower) downstream (upstream)
- Skill decline from April to June

Des Moines Forecast Biases



- Unconditional bias is dominate
- Simple bias-correction can significantly improve forecasts

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Conclusions

- An AHPS Verification System:
  - Instant access to retrospective ensemble forecasts and verification measures at sites
  - A diagnostic “report card” for sites within an RFC through interactive exploration of verification results
  - A framework for improving operational forecasts and enabling their use in decision-making

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Data Storage Requirements

Elements	1 Location (MB)	600 Locations (GB)
Ensemble traces	70	42
Ensemble forecasts/obs	66	40
Verification measures	64	39
Total Disk Usage	200	121

- One ensemble forecast per week (52 per year)
- All forecast locations have 50 years observed record

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