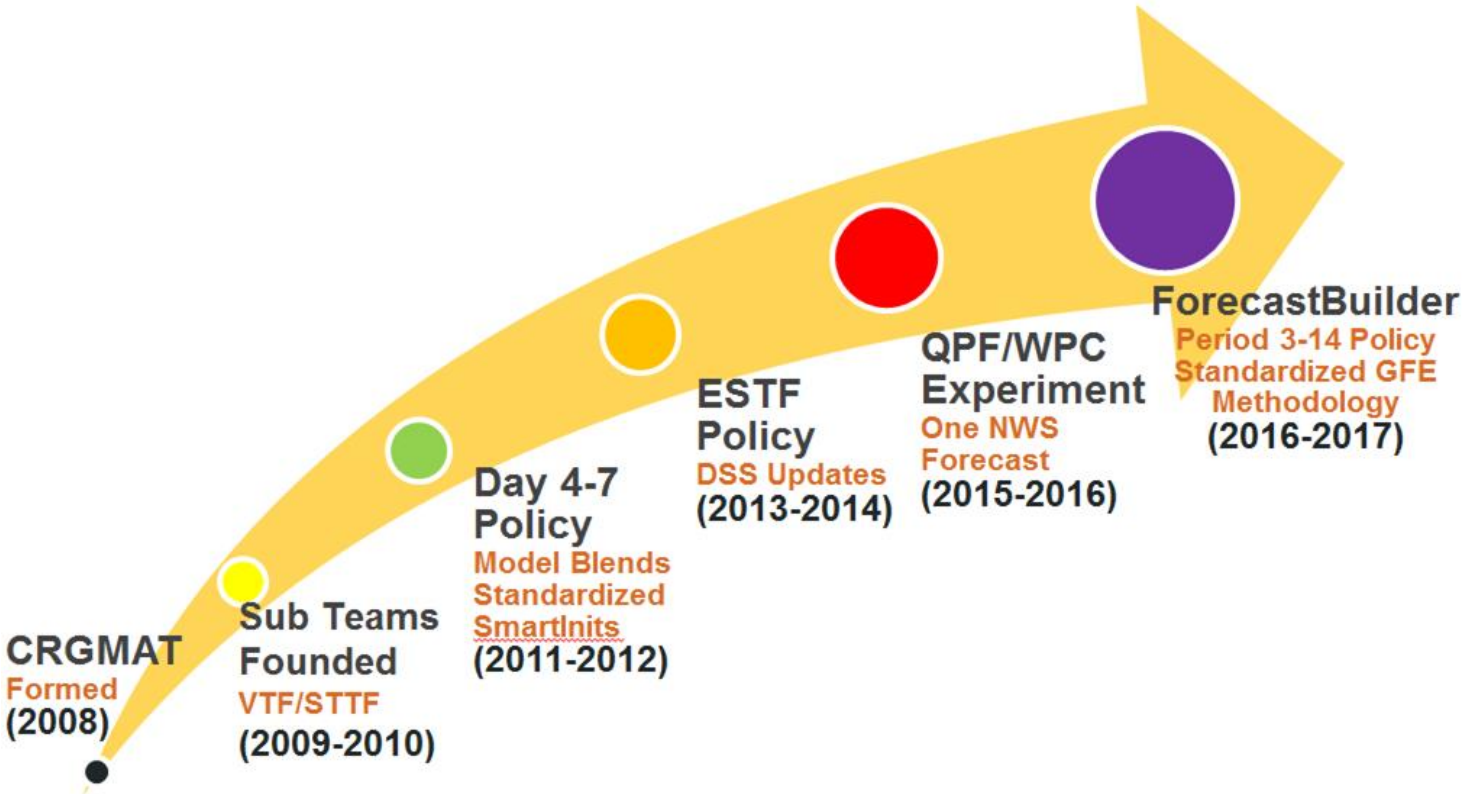
ForecastBuilder Experiment in Central Region

A Project From the CR-GMAT
(Central Region Grid Methodology Advisory Team)

GMAT (Grid Methodology Advisory Team)

- Formed in 8/2008 with an 80% to 20% mix of NWSEO forecasters and management team members (SOO/ITO)
- Answers to CR Headquarters through the SSD (Science Services Division)
- Goals/Charter
  - Promote the development of science-based techniques and tools for GFE
  - Review and recommend policy for creating gridded forecast for Central Region
- Team values:
  - Trust
  - Continuous communication with the field
    - Surveys
    - Webinars
    - Feedback forms
    - VLAB (lately)
  - Rapid responses to issues
  - Strong working relationships with CR SSD and CR NWSEO

CRGMAT Projects Timeline



The development of ForecastBuilder

Since the GMAT inception the team looked to standardize and improve the creation of the SnowAmt, IceAccum, and Wx grids. Surveys revealed that there were many disparate ways that offices were creating these grids - some with questionable science leading to consistency issues both **internally and externally**.

Late in 2015, based on our previous projects, the team felt that the time was right to fully take on these elements.

It quickly became clear that the SnowAmt, IceAccum, and Wx grids have major dependencies and connections with many other forecast elements. Accordingly, **producing consistent, quality forecast grids required a comprehensive, science based, approach**.

The GMAT saw a need to work together both regionally **and** nationally to produce a gridded forecasting approach that:

Is structured, systematic, and scientifically grounded

Replicable from Office to Office and Forecaster to Forecaster

Creates SnowAmt, IceAccum, and Wx grids in the same way

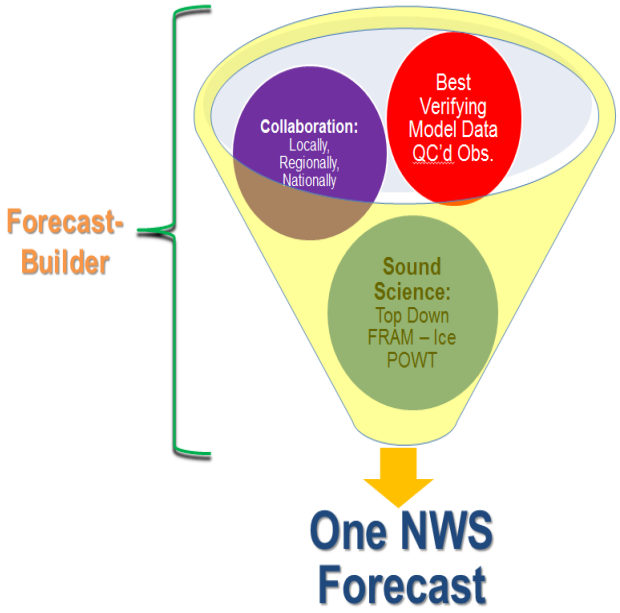
Fills the regional policy gap between the ESTF periods

Result

Accordingly, the CRGMAT, with support from CR SSD and CR NWSEO, developed a standard procedure for producing the Wx, Snow and Ice grids.

CRGMAT created the ForecastBuilder program, including its supporting components, to meet our team's goals for forecast grid creation in the region.

The GMAT strives to bolster the ForecastBuilder's effectiveness, use, and adoption throughout the region and now beyond.



CRGMAT's Answer - **ForecastBuilder** Procedure

A new GFE procedure which employs a **streamlined and systematic** methodology for developing the forecast

Provides a strong initialization scheme based on well verifying blended models. This also results in a **consistent, common starting point**

- Also incorporates observations
- CRON based version provided for the initialization

Employs **sound science** to derive SnowAmt, IceAccum, and Wx grids - ensuring **internal consistency**

Greatly facilitates creating the Wx grid

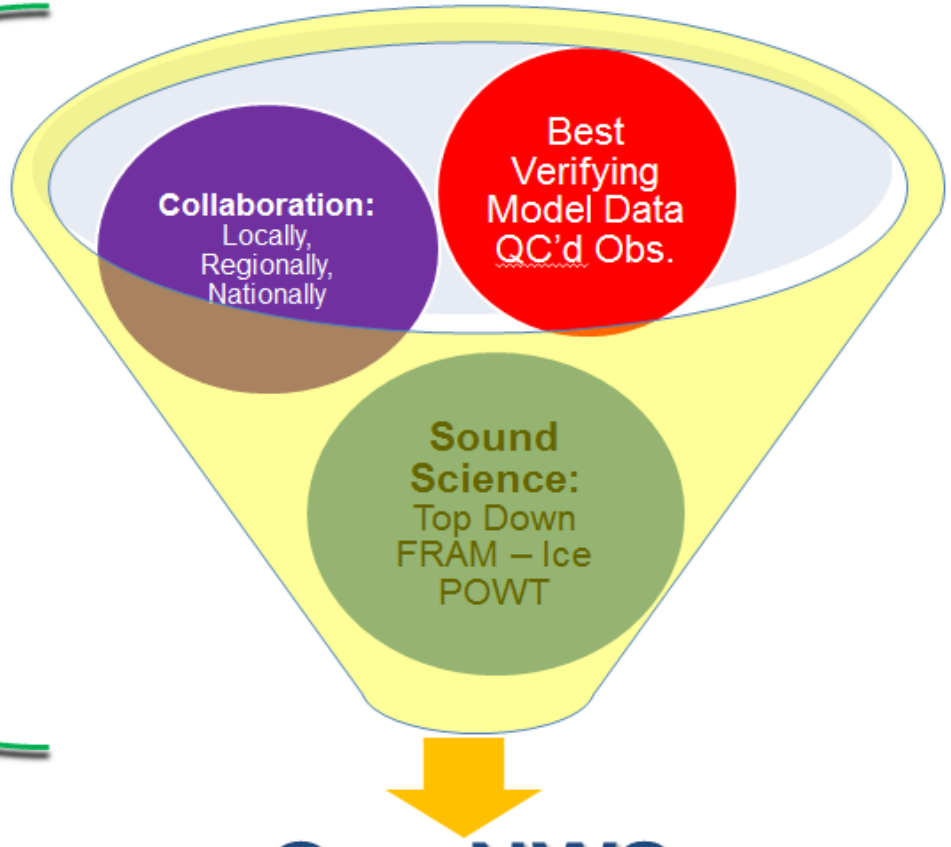
- Fast process

Developed and tested by the field forecasters - those on the "front lines"

Robust and flexible procedure with the support of regional developers **responsive** to the field

Ideally this approach would become the national delivery mechanism for the NBM - **maintaining the WFO forecaster as the 'driver'** of the official NWS forecast and its message

Forecast-Builder



One NWS Forecast

ForecastBuilder was developed in collaboration with:

Upper Mississippi Valley SOO community

National SmartInit Team

NBM Wx Grid Team

CR Consistency Team

CR NWSEO

CRH Management

Immediate Benefits For Forecasters

Allows forecasters to spend **more time** on:

- **IDSS - especially in high impact situations**
- **Situational Awareness / Meteorological Analysis**
- **The forecast problem(s) of the day**
- **Training / Professional Development**

Improved **grid consistency** by *starting* from a consistent and seamless database

Forecaster remains in **control** of grids (i.e. over the loop) and the message

Immediate Benefits For Forecasters (continued)

Future training is **focused and streamlined**

Automatically ensures the **meteorological forecast integrity** of the database

An approach which allows forecasters to **share experiences, science and techniques** to all offices

This process will allow for **improvements** to be instantly spread to all offices

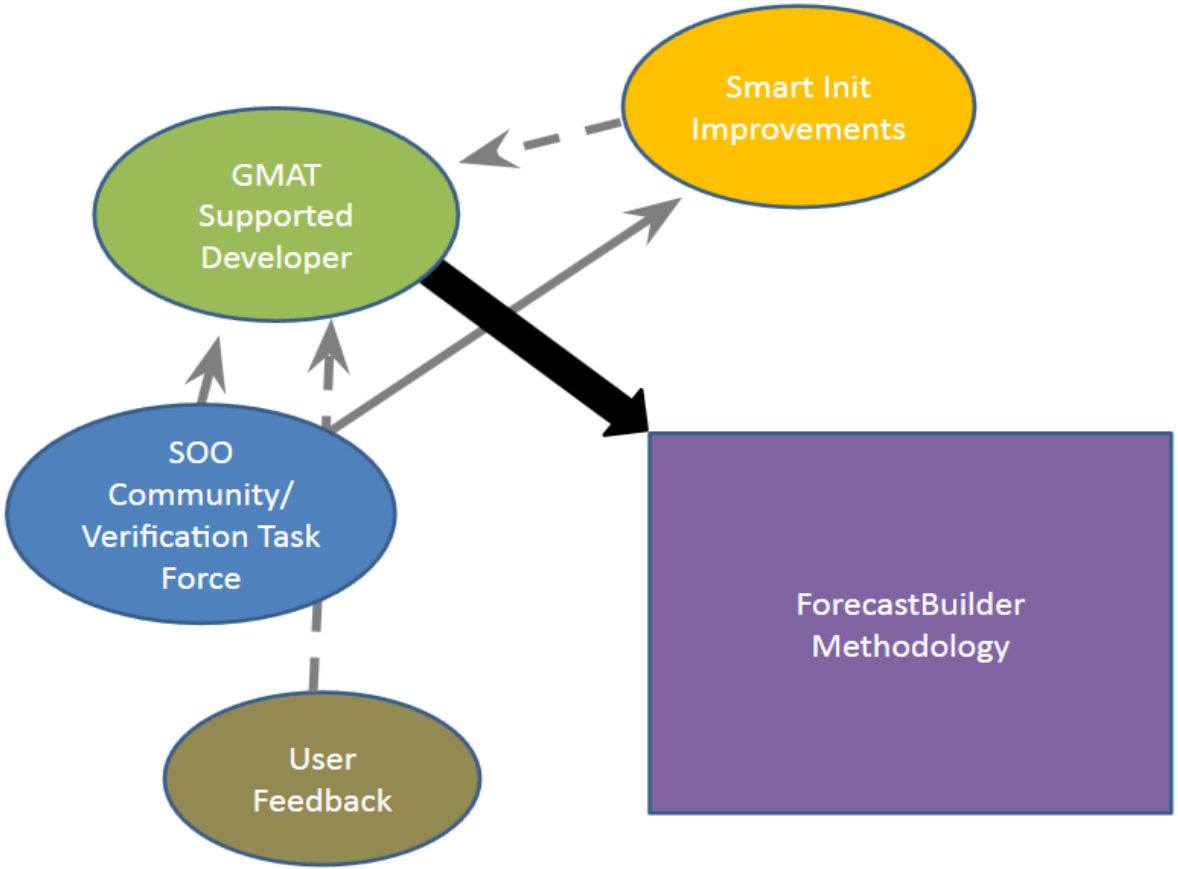
For grids - much **easier** to back up another office, or when settling into another office

GFE ForecastBuilder Evolution

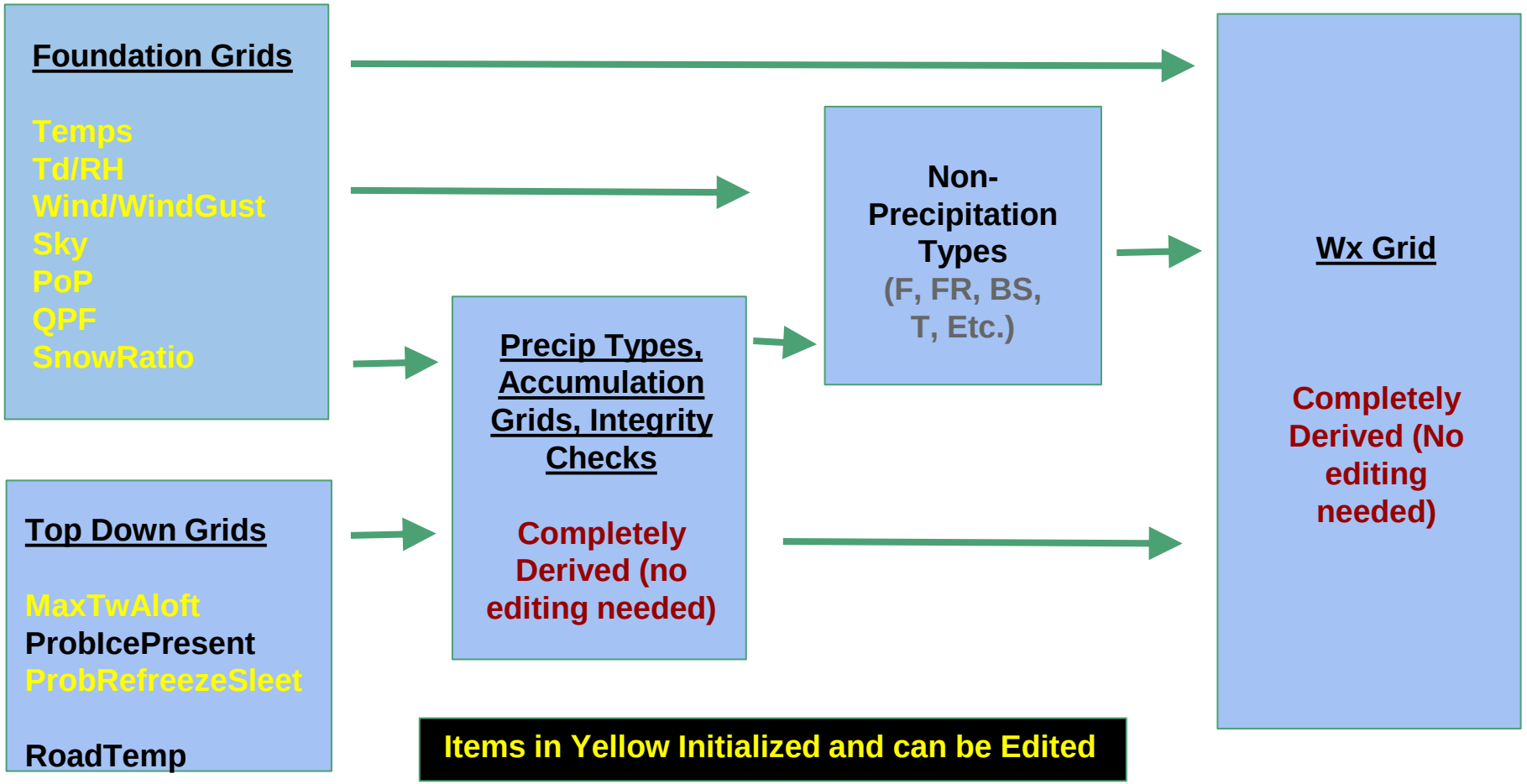
The ForecastBuilder Methodology is designed to evolve and improve with new techniques and scientific findings.

The developers will be responsive to all feedback and suggestions.

This will be maintained by the CRGMAT and become a means of science sharing resulting in a standard GFE methodology that 'grows'.



ForecastBuilder Methodology

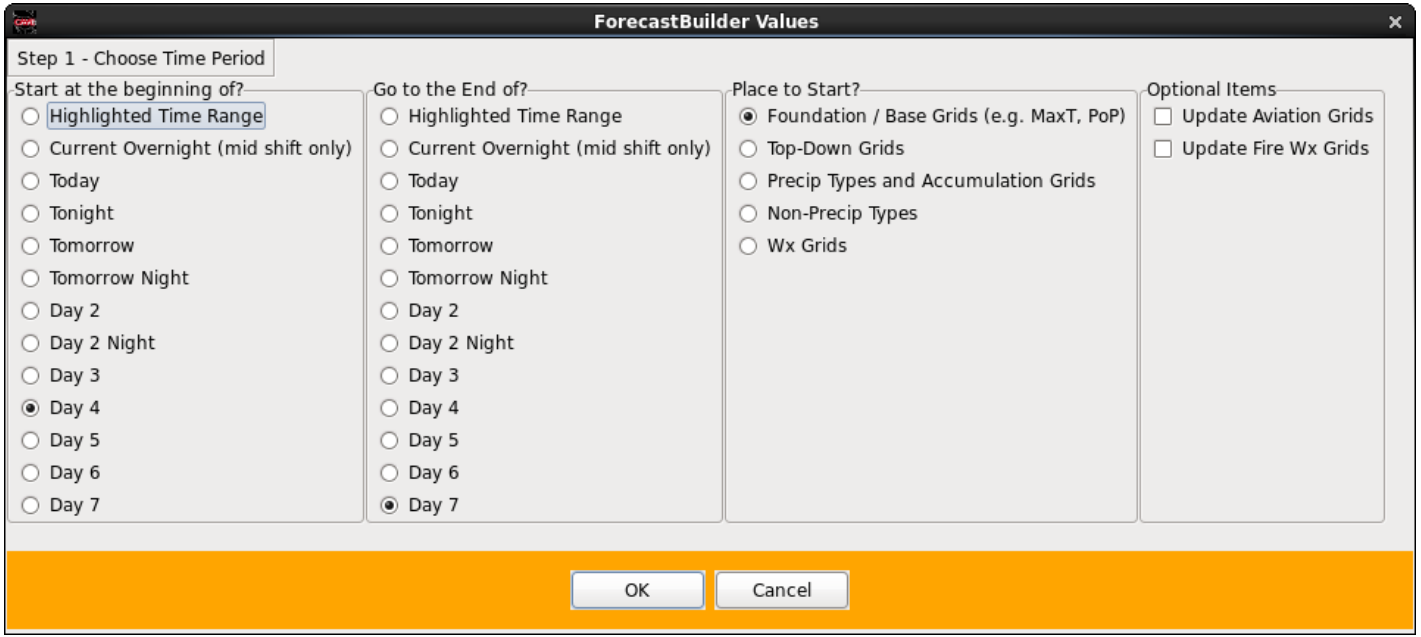


First Step - Choose A Time Period To Work On

Other options

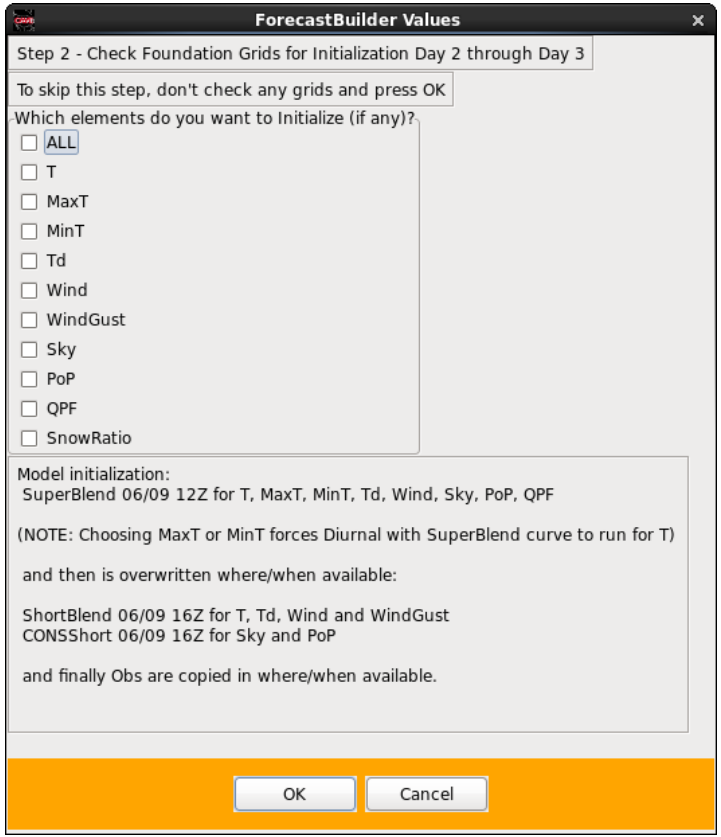
Jump ahead (e.g. happy with the foundation grids)

Can also update Aviation and/or FireWx Grids



Step 2 - **Most Important** - Update Foundation Grids

- Ability to initialize grids with best verifying data sets over the long term, and blend in the Obs
- Forecasters should spend 90-95% of their total grid editing and collaboration time with these key grids
- Seek “targets of opportunity” for modification, in a collaborative manner



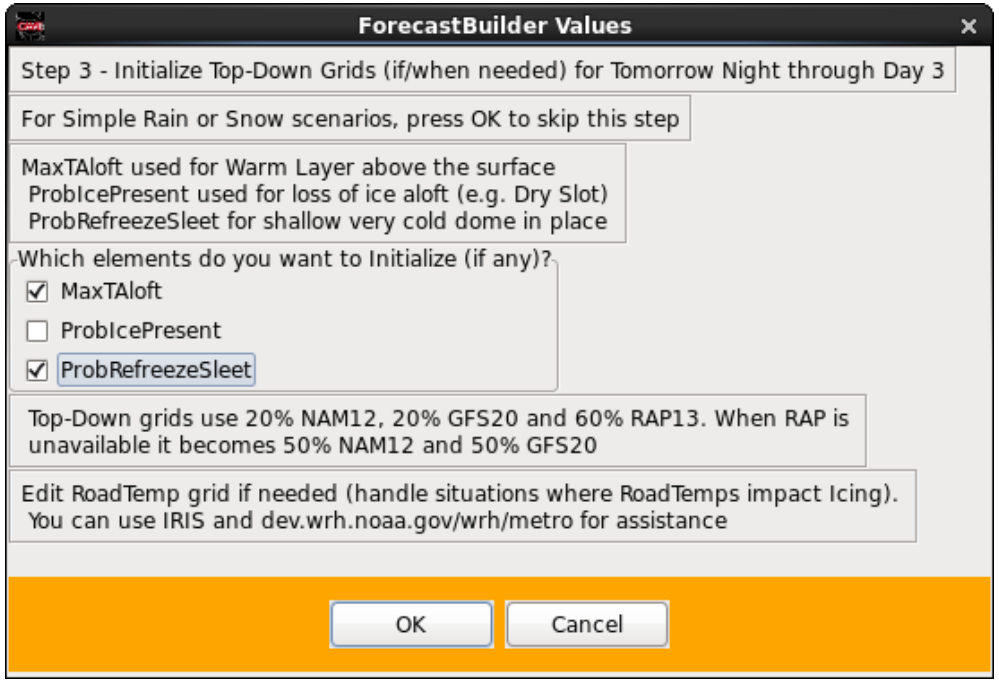
Step 3 - Update Top Down Grids

Only inspect for:

- Freezing Rain
- Sleet
- Rain with a deep cold isothermal layer (e.g. 1C up to 2000 ft).

This step will be skipped if coldest hourly temp in the forecast time range is > 40F

Models incorporated (those that have good vertical resolution in

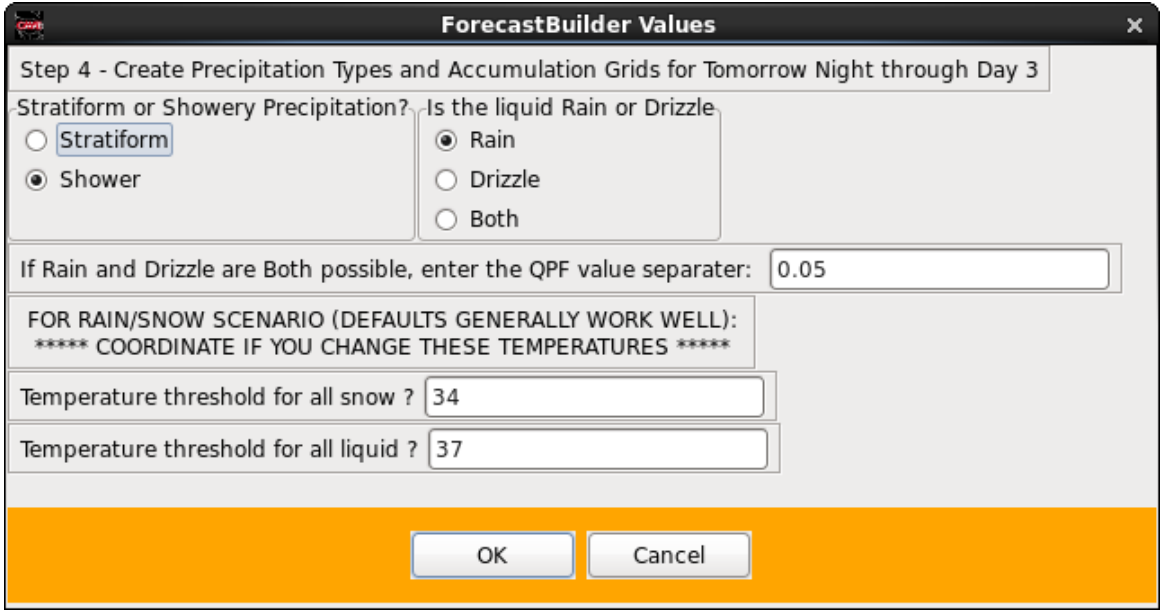


Step 4 - Precip Types, Snow/Ice and Integrity Checks

Background science and statistics will generate probabilities of precipitation types and the SnowAmt/ IceAccum grids

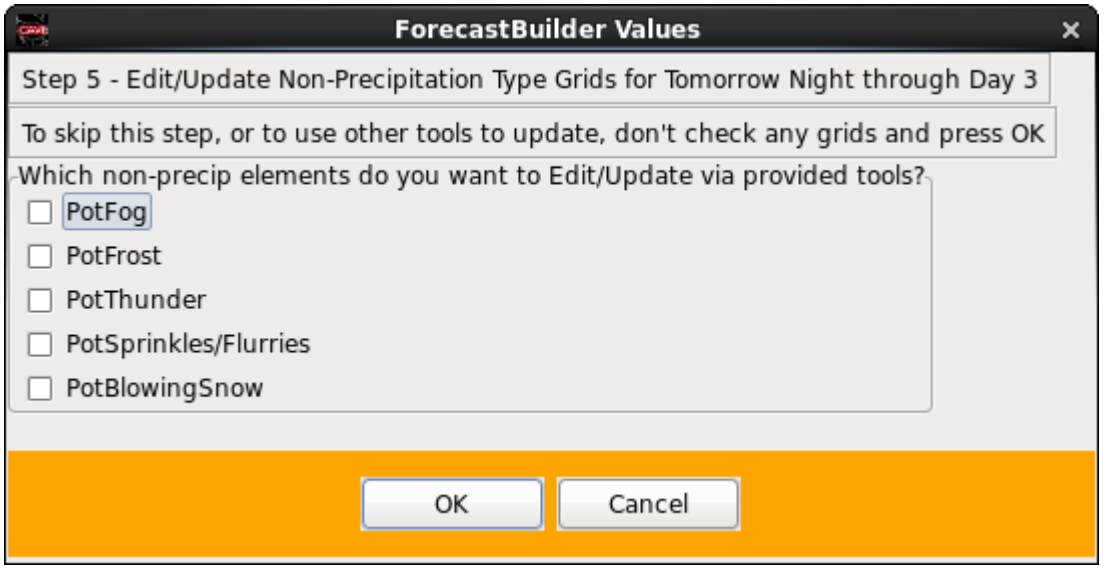
If you don't like the output, collaboratively change either Foundation or Top-Down grids. Remember this is the One NWS forecast

Integrity checks along with updates to ApparentT, Td/RH



Step 5 - Non-Precipitation Types

- Tools provided to help you produce non-precipitation types
  - Science-based study results incorporated - such as for BlowingSnow
- One area where field-driven improvements are anticipated through more science, technology and empirical infusion



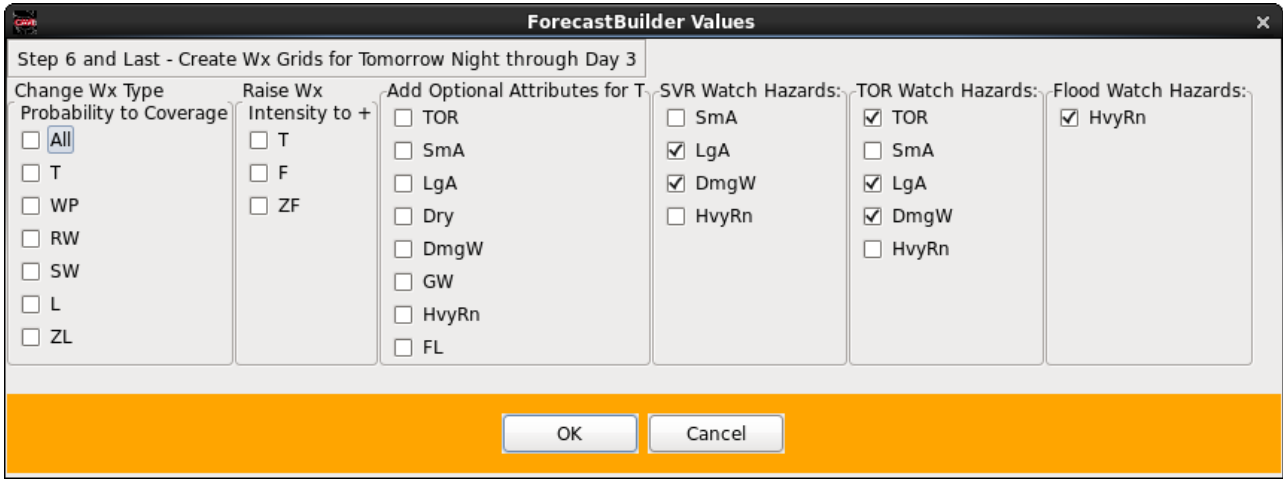
Step 6 - Update Wx Grids

95% or more of the time these defaults are fine

Automatically brings in convective watches to enhance the Wx grids

Wx intensities are derived from QPF/SnowAmt

Adds a level of flexibility/control before the Wx grid is created



Training and Support Provided

ForecastBuilder employs the most current peer-reviewed scientific techniques via:

- **SnowRatio**
- The **FRAM Ice Accumulation Model** (produced by Kris Sanders and Brian Barjenbruch @ TOP)
- The **Top-Down** approach for forecasting precipitation type

Operational deployment **videos** on:

- ForecastBuilder usage
- Ways to improve upon a consensus initialization

Winter weather training via:

- **Job sheets**

ForecastBuilder Process

Period 2 - day 7 initialized at 0530Z and 1730Z with SuperBlend by ForecastBuilder_CRON for the '**foundation grids**' T, MaxT, MinT, Td, Wind, Sky, PoP. Additionally: WindGust, QPF, SnowRatio, MaxTAloft, ProbRefreezeSleet, SnowAmt and IceAccum through day 3.

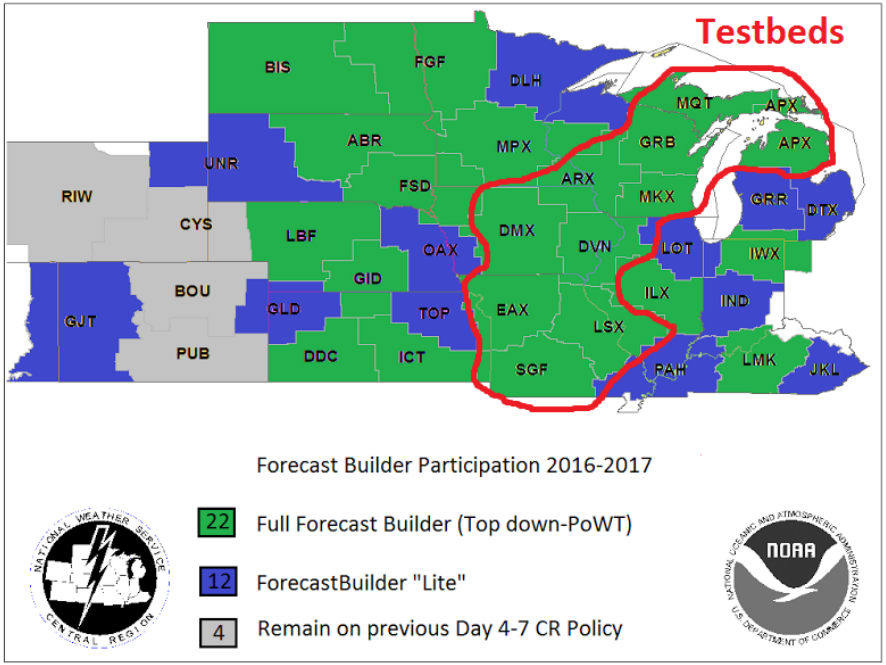
Collaborate and modify, as needed, all foundation grids

Use ForecastBuilder to produce SnowAmt and IceAccum, which incorporates the FRAM model for IceAccum

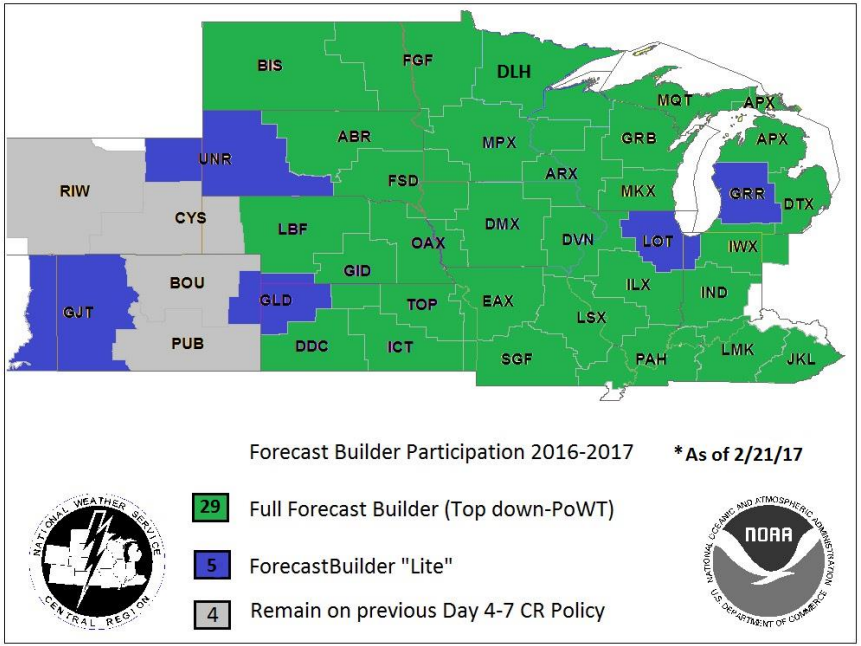
Testbed offices (a cluster of 10 WFOs) adjusted the Top Down grids and created the Wx grids via ForecastBuilder

Other WFOs joined in during the experiment

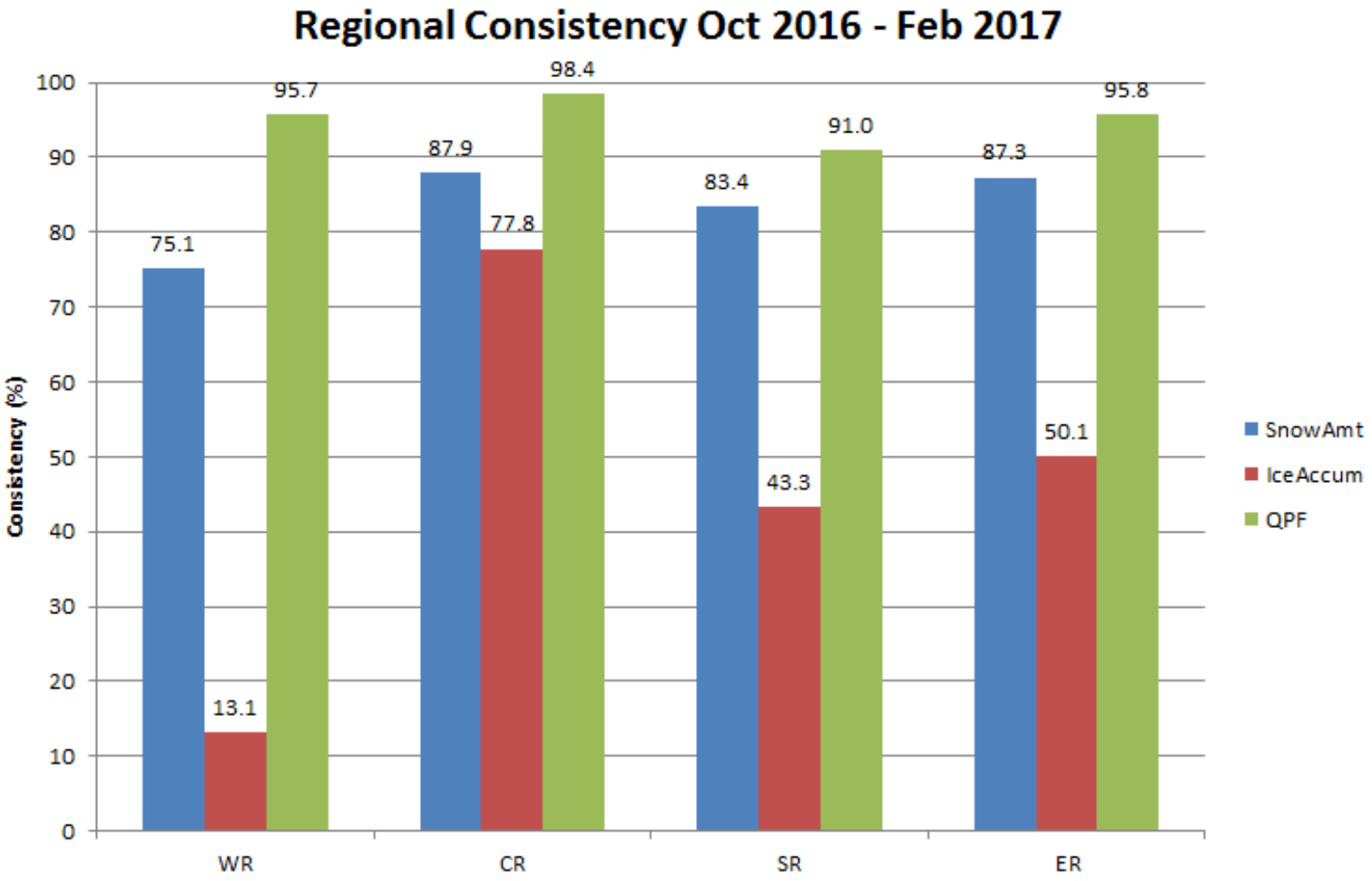
Testbed Offices - CR ForecastBuilder Usage



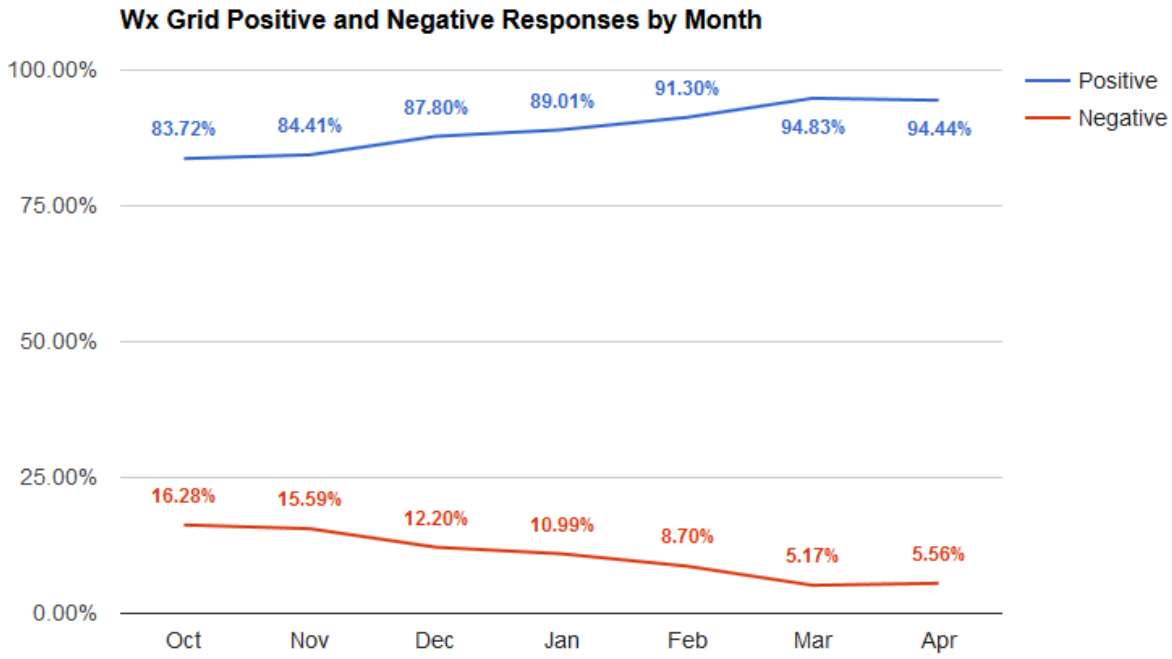
Late 2016



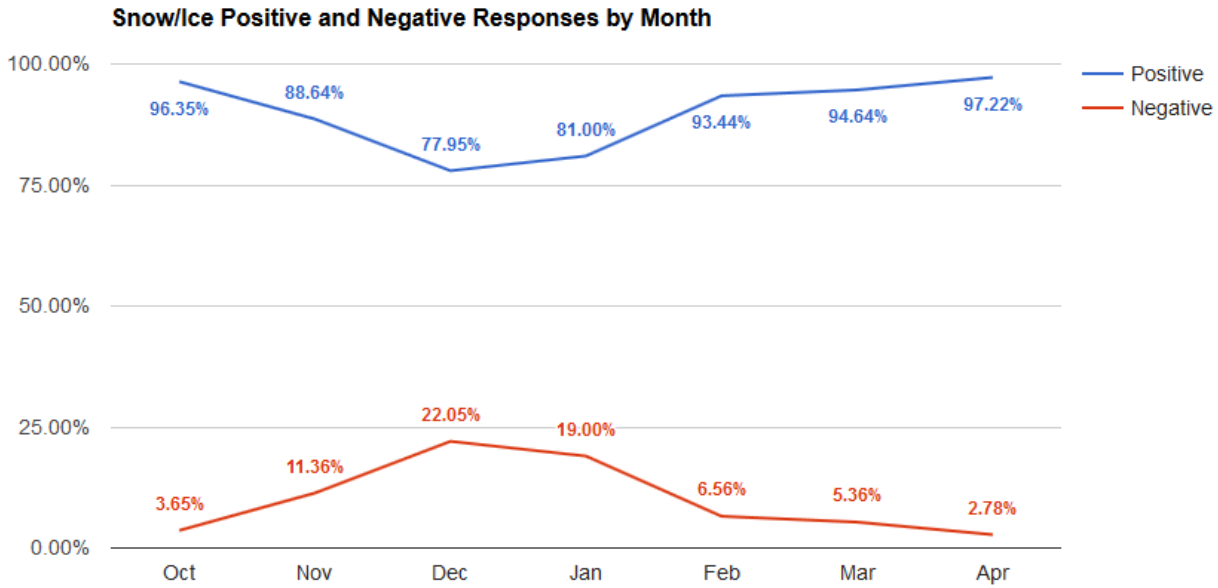
Spring 2017


Regional Consistency Oct 2016 - Feb 2017
Consistency (%)
100
90
80
70
60
50
40
30
20
10
0
75.1
13.1
95.7
87.9
77.8
98.4
83.4
43.3
91.0
87.3
50.1
95.8
WR
CR
SR
ER
SnowAmt
IceAccum
QPF

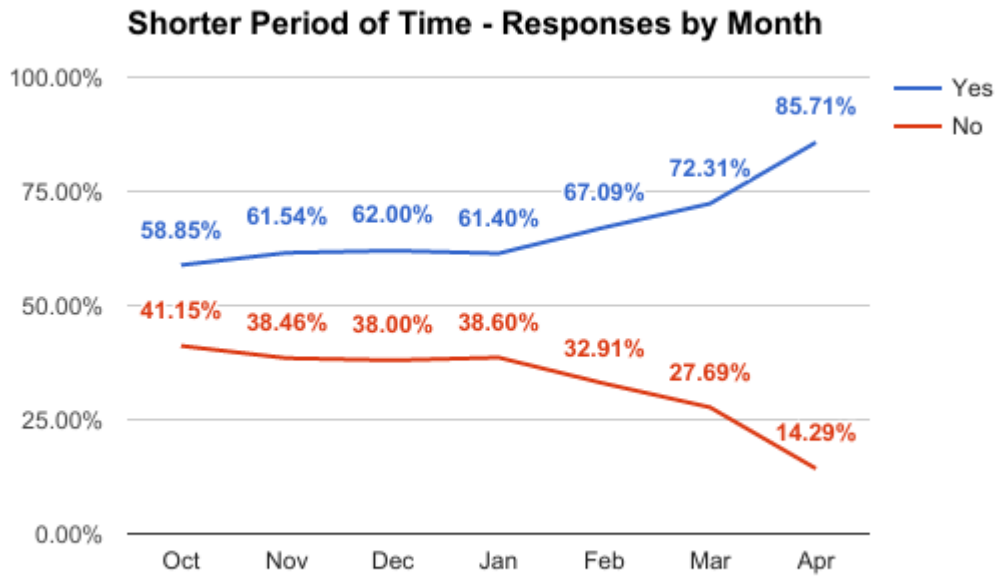
Wx Grids - Forecaster Satisfaction



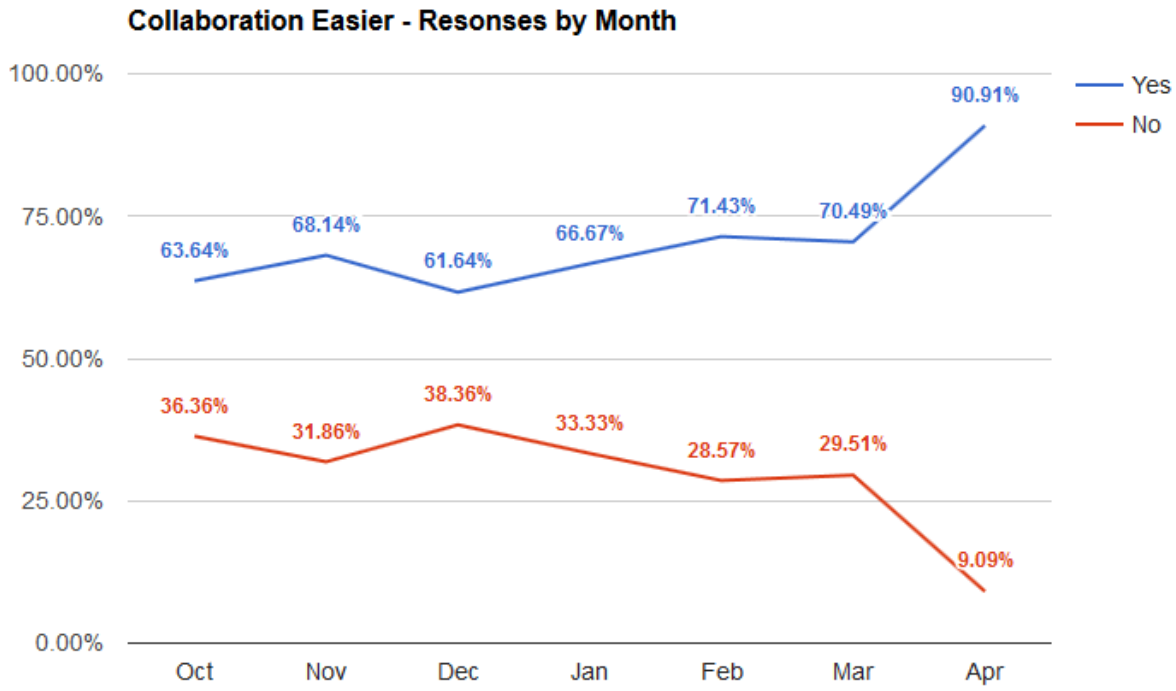
Snow/Ice Grids - Forecaster Satisfaction



Was the Forecast Created in a Shorter Amount of Time Using ForecastBuilder?



Was Collaboration Easier?



ForecastBuilder's Future

- CR to use NationalBlend as starting point in ForecastBuilder **Q4 FY17 - Q1 FY18**
  - Gradually roll back support of Regional Blends. **FY18**
    - Start with NBMRegBlend, CONSMOS, BCCONSMOS
  - Possibly incorporate WR Impact Grids idea
- ESTF (Enhanced Short Term Forecast) with ForecastBuilder **FY18**
  - Possible 6 hour Grid Population to align with TAF times.
- "Finalize" grid updater built into FB to smoothly and effortlessly update dependent grids across the Public/Fire Wx/Aviation/Marine realms **Q1 FY17 - Q1 FY18**

Where we are heading (cont)

Target of Opportunity “Finder” **Q3 - Q4 FY 17**

Fire Wx Grid Creation within ForecastBuilder **Q3 FY17 - Q1 FY18**

Ensure AutoWSW is running CR-wide **Q1 FY18**

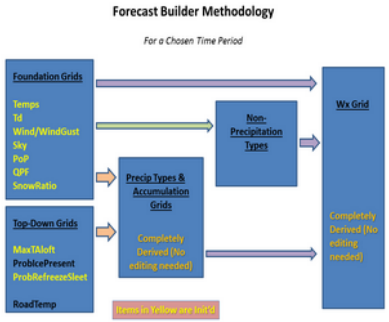
Encourage further expansion of ForecastBuilder beyond CR **Q2 FY17 - FY18**

Remove

WEB CONTENT DISPLAY

Forecast Builder

Producing accurate forecasts within a well-collaborated, science-based framework



- TRAINING
- FAQ
- Development Spreadsheet
- Feedback Form
- Proposal
- Full **and** Cron **Cheat Sheets**
- Quick Background Info.
- Introduction Presentation
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Hazard Builder Orientation Material

6/1/17 6:54 PM

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The latest version of Forecast Builder includes a new integrated component called Hazard Builder which automatically generates weather hazard risk grids. In this introductory phase, Hazard Builder will essentially run in the background as part of the Forecast Builder Wx production process although output will be visible. There is no requirement to interact with Hazard Builder output...

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Aviation Populate (Forecast Builder)	Waiting for an Answer	Kevin Sullivan	1	5	Date: 7/3/17 5:23 AM By: Kevin Sullivan	Actions
Request/Question regarding PotThunder	Waiting for an Answer	Joseph Moore	3	58	Date: 6/26/17 2:44 PM By: Andy Just	Actions
CYS Wind Verification	Waiting for an Answer	Zach Finch	2	30	Date: 6/19/17 2:01 AM By: David Barjenbruch	Actions