Education and Diversity (ED) in CMMAP

Feeding the Pipe

- By middle school, if students aren't interested in science, we've lost them …
- Strengthen Earth System Science education at *all levels*
  - Science isn't a *body of knowledge*, it's *something you do!*
  - Curiosity, inquiry, real research
  - Teach new faculty how to teach
- Draw from the diversity of the whole population rather than only a portion

CMMAP

Reach for the sky.

Strategy for Education

- Provide opportunities for students at all levels to engage in active learning of Earth Science and Climate by experimentation.
- Work with successful and well-established partners in curriculum development, science communication, and multimedia for maximum impact
- Intervene early to draw from the whole range of our diverse population
- Link Education, Outreach, and Diversity elements of the Center

Strategy for Education (cont'd)

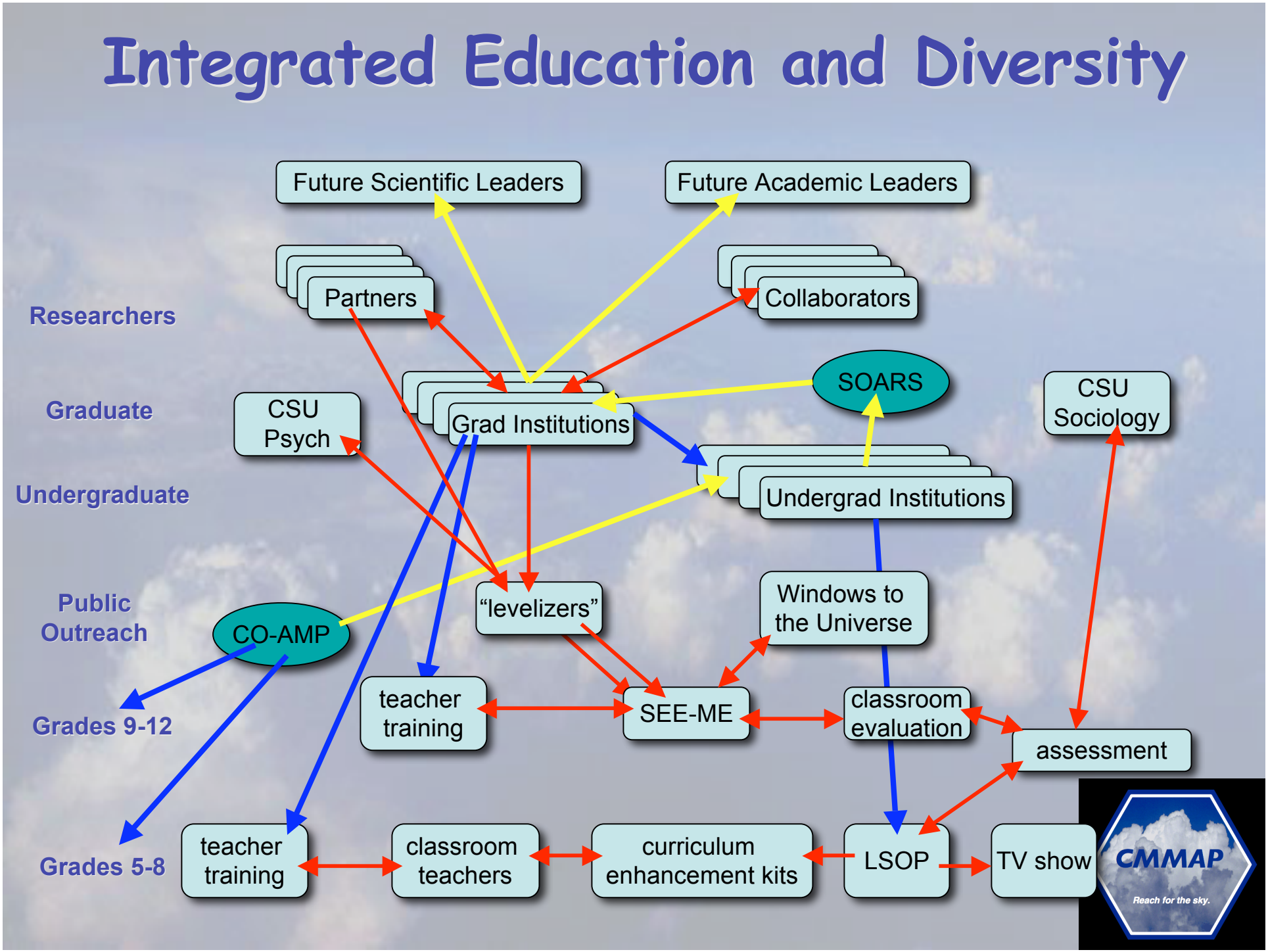
- Structured mentoring interactions to bring science content to all levels, to help future educators learn to be better teachers, and to provide strong role models of a motivated, diverse population of young scientists

- Provide opportunities for current and future leading scientists to learn to be better teachers, both formally (through pedagogical instruction) and informally (through mentoring)

Strategy for Education (cont'd)

- Combine curriculum development and implementation with classroom evaluation and formal assessment
- Maintain active communication across Center components through an ED Committee, summer institutes, and twice-yearly meetings

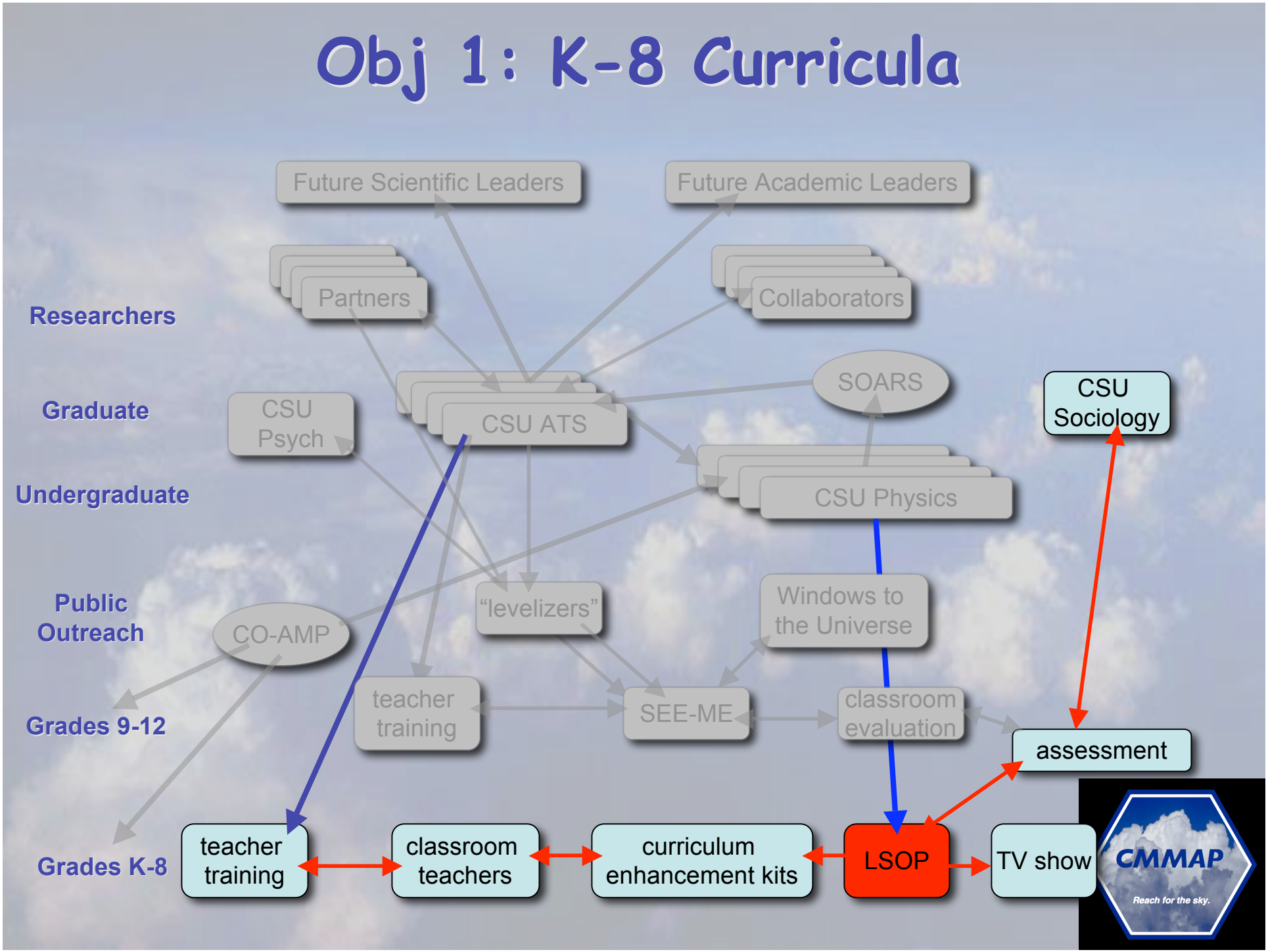
Integrated Education and Diversity



EDU Objectives (K-12)

1. **Elementary & Junior High/Middle School**
   (Team Leader: Brian Jones, CSU Physics)
   - Develop & test curriculum enhancement kits
   - Climate content for Little Shop of Physics
   - CSU Summer course for science teachers
   - Evaluation & Assessment
2. **High School Level**
   (Team Leader: Scott Denning, CSU)
   - Web-based modeling lab (SEE-ME)
   - UCAR "Levelizers"
   - Classroom evaluation
   - CSU Summer course for science teachers
   - Evaluation & Assessment

Obj 1: K-8 Curricula



Little Shop of Physics

Brian Jones (CSU Dept. of Physics)
Sheila Ferguson and Karen Hammann Poudre School District

CMMAP

Reach for the sky.

Hands-On School Programs: 1 Year=

- 50 schools / 15,000 K-12 students
- 150 CSU students
- Special emphasis on rural & underserved populations

On the Air: Everyday Science

- Poudre School District
- Rocky Mountain PBS
- DVD series

CMMAP

Reach for the sky.

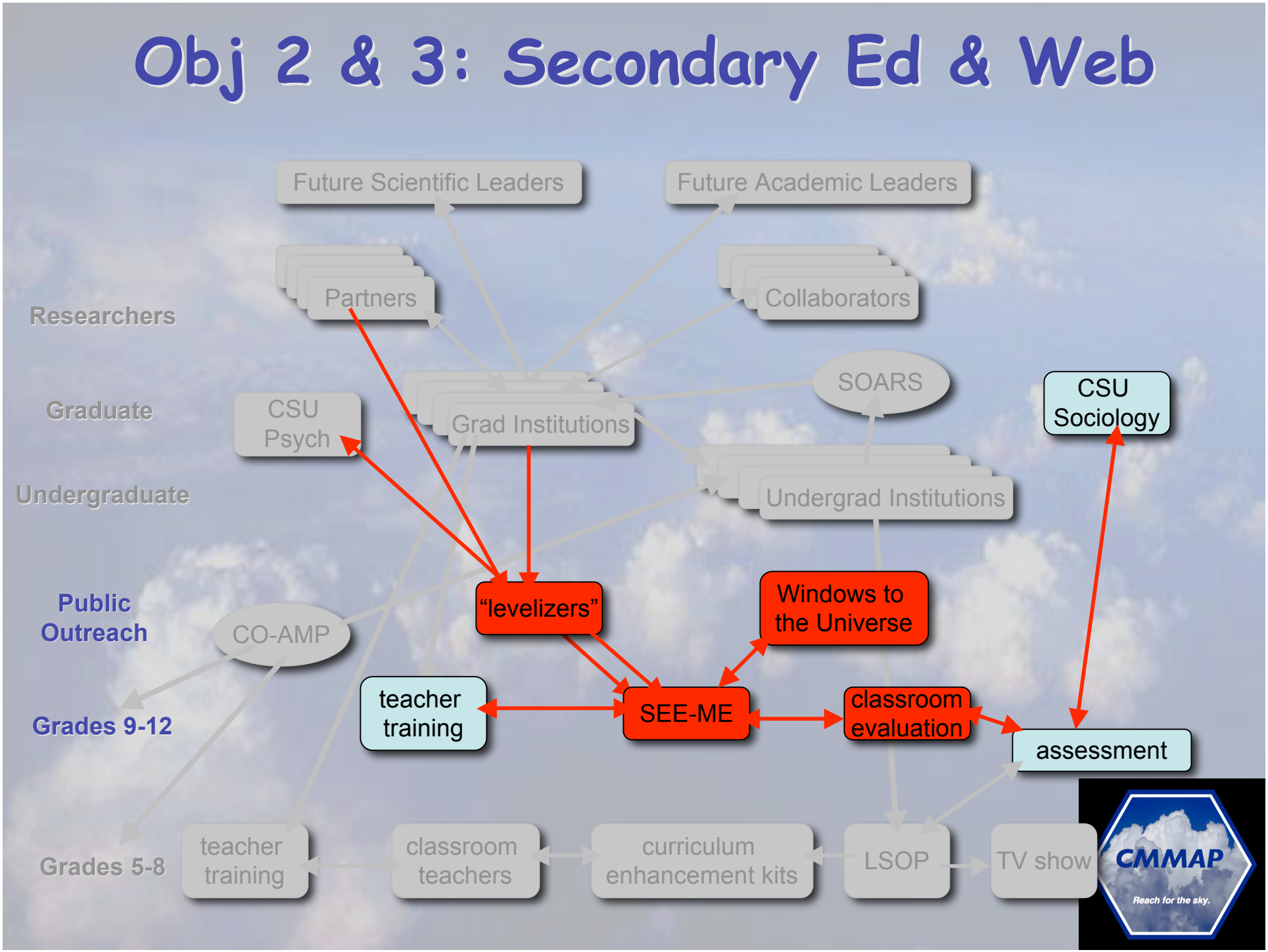
Teacher Workshops

- Current & Future Teachers
- 200+ Teachers Yearly
- International Connections

CMMAP

Reach for the sky.

Obj 2 & 3: Secondary Ed & Web



SEE-ME

A STEM Educational Experience in Modeling the Earth System

- A web-based, interactive educational tool and resources
- Exploring clouds, weather, climate, and modeling
- Targeting grades 9 – 12, teachers, and the public
- Informed by sound pedagogy and scientific research
- Disseminated on Windows to the Universe web site
- CMMAP providing a new focus for our EO mission

EDU Objectives
(Public Outreach, Stakeholders & Policymakers)

3. Public Outreach through Web
(Team Leader: Susan Foster, UCAR)

- "Windows to the Universe"
- Science Communication Analysis

4. Stakeholders & Policymakers
(Team Leader: Lyn Kathlene, CIPP)

- White papers for stakeholders
- Summer workshops
- Short course on policy for CMMAP grad students

WINDOWS TO THE UNIVERSE

www.windows.ucar.edu

- Spans the Earth and space sciences, with arts and humanities connections
- Integrated classroom activities, interactives, and models
- Largest education and outreach venue at NCAR/UCAR, with millions of visitors per year (~100 million page views)
  - ~65% K-12 students, 25% in Spanish

NASA Office of Space Science, Information Systems

NCAR

CMMAP Reach for the sky.

Obj 4: Climate Stakeholders and Policymakers

- Colorado Institute for Public Policy (CIPP), Dr. Lyn Kathlene,Director
- Convene 6-month working groups of scientists and stakeholders to produce "white papers" on climate and impacts with local-regional focus (e.g., water, farming)
- Conduct educational "hands-on" workshops for policy makers and the public
- Teach short course on policy process for CMMAP graduate students

EDU Objectives
(Undergraduate and Graduate Education)

5. **Undergraduate Climate Education**
   (Team Leader: Howard Drossman, CC)
   - New climate courses
   - Minority recruiting and retention

6. **Graduate Education**
   (Team Leader: Scott Denning, CSU)
   - Recruit excellent and diverse students
   - Improved climate coursework
   - Research at frontier of climate science

7. **Teaching future teachers**
   (Team Leader: Scott Denning, CSU)
   - Mentoring interactions
   - LSOP internships
   - Grad student involvement in teacher training
   - Pedagogical research and instruction

Obj 5: Undergraduate Education

- Academic content in climate courses developed and tested at Colorado College (Prof. H. Drossman)
- Internships for MMAP grad students to teach these courses (block structure)
- Evaluation in classroom and through student achievement
- Dissemination of results through national pedagogical media

Obj 6: Graduate Education & Research

- The core of ED in MMAP, supporting 19 grad students each year at 5 institutions
- Cutting edge climate research in leading universities
- A diverse pool (HU, SOARS, AGEP, scholarships), with 6 to 8 students each year from underrepresented groups
- A new focus on pedagogy for graduate students in top research programs
- Very strong record of placement on climate faculties worldwide

Obj 7: Scientists as Good Teachers

- Pedagogical study as part of CMMAP graduate study
- CMMAP students work work with Drossman to develop & teach at CC
- CMMAP students develop and teach content in teacher training courses
- CSU undergrads work as LSOP interns

Diversity Goals

- Support and matriculate graduate students whose gender and ethnic makeup reflect those of the US population
- Improve understanding of the structural barriers to gender and ethnic balance in science
- Encourage participation in science and engineering by women and minorities at all academic levels

Diversity Objectives

1. **Representative PhD Graduates to Climate Workforce**
   (Team Leader: Raj Pandja, UCAR)
   - 2 grad fellowships & 3 summer interns through SOARS
   - 2 PhD students at Hampton University
   - 3 Summer internships for Hampton undergrads at CMMAP
   - 2 minority scholarships at CSU ATS
2. **Minority Recruiting into Undergrad Science and Engineering**
   (Team Leader: Omnia El-Hakim, CSU)
   - Present climate science through CO-AMP to ~ 400 minority high-school students each year
   - Climate content at Catamount Institute (Colorado Springs)
3. **Women in Science Careers**
   (Team Leader: Scott Denning, CSU)
   - Mentoring program pairing women grad students with local high-school students
   - LSOP internships
4. **Study Diversity Problems & Solutions**
   (Team Leader: Silvia Canetto, CSU Psychology)
   - Media portrayal of women in science
   - "Longitudinal" study of women in science careers
   - Assessment of McNair mentoring program

CMMAP
Reach for the sky.

Obj 1 & 2: Academic Bridges

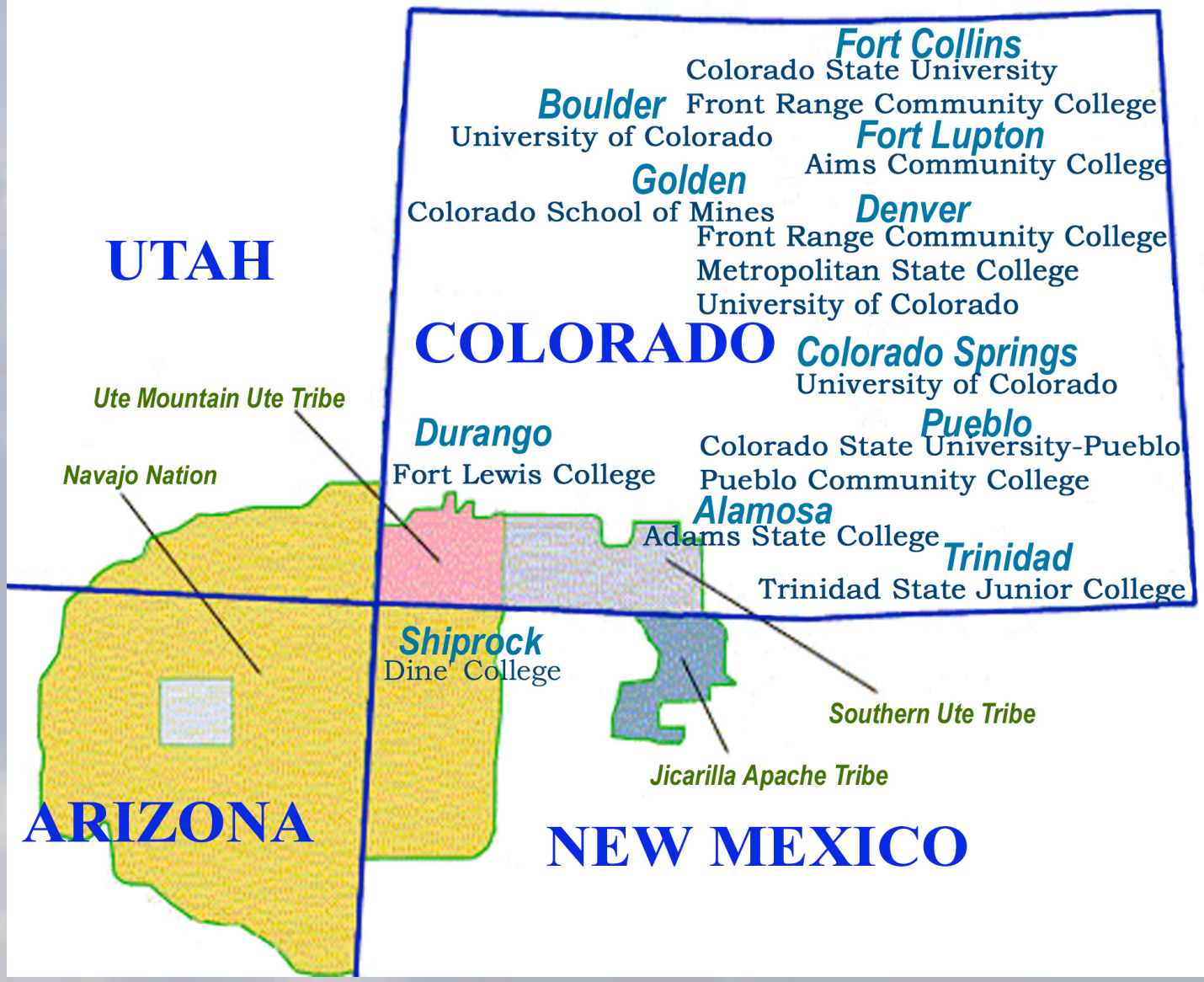
- High school to undergraduate bridge (CO-AMP, Catamount Institute)
  - Residential program recruits 400 students/year from underrepresented groups
  - Introduction to STEM opportunities and CSU community
  - Urban youth engaged in climate science as part of larger environmental program
- Undergraduate to graduate bridge (SOARS, AGEP)
  - Residential summer research internships
  - Community support
  - Graduate student research assistantships

CMMAP

Reach for the sky.

Louis Stokes Colorado Alliance for Minority Participation

Serving Colorado and the Four Corners Region



Young Environmental Stewards Programs

- Science
- Technology
- Leadership

CMMAP
Reach for the sky.

Obj 3: Women in Science Pipeline

- Mentoring program pairs women graduate students with female high school students, to model success
- Women as LSOP interns

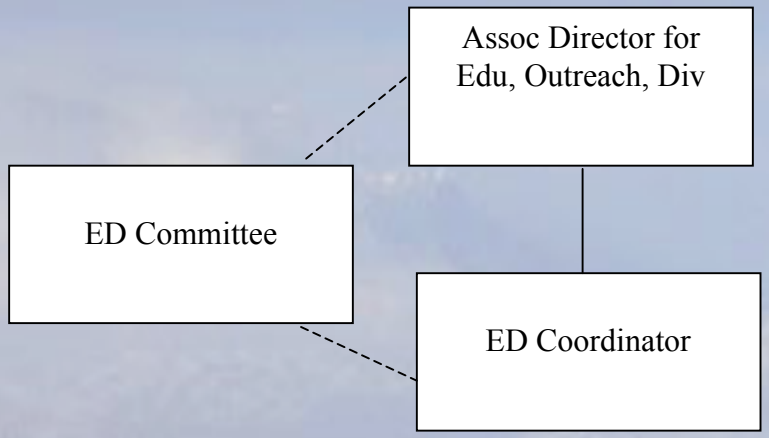
Obj 4: Understanding the Barriers

CMMAP Research on Diversity

- Gender and Science in Media (Canetto)
- Longitudinal study of barriers and successes for women in science careers (Canetto)
- Assessment of McNair mentoring program (McPhee)

CMMAP
Reach for the sky.

Management Structure in ED



Education and Diversity elements of STC are managed as a single package

- Assoc. Director for ED serves on Executive Committee
- Full-time ED Coordinator manages day-to-day operations in collaboration with other STC administrative staff
- ED Committee provides oversight, and engages scientific talent through rotation

ED Coordinator

- Works with the Center Administrative Director and ED partners to track performance of component activities
- Organizes twice yearly progress reports from EOD partners
- Manages communications among ED partners, and between CMMAP scientists and ED resources
- Organizes monthly telecoms among ED partners and management
- Organizes and schedules ED component of twice-annual CMMAP meetings

Research - ED Communication

- Involve scientists in ED Committee
- Create a "results repository" to be mined by ED professionals
  - Web interface, easy to use
  - Graphics, animations, explanations, text
  - Actively managed by ED Coordinator, with frequent solicitations from all
  - Storehouse of materials for interpretation and use in labs, lectures, instructional material, outreach, web sites

ED Breakout Sessions

- Today 2 to 3:30
  K-12, Public Outreach, Policymakers
- Tomorrow 10:30 to Noon
  Undergrad and Graduate Education
- Thursday 9 to 10:30
  Diversity

Preview of Breakout Sessions

- What will be done for each objective
- Who will do what
- Specific plans for the next 6 months
- Milestones and metrics
- Research and ED integration
- Communication, planning for telecons

Integrated Education and Diversity