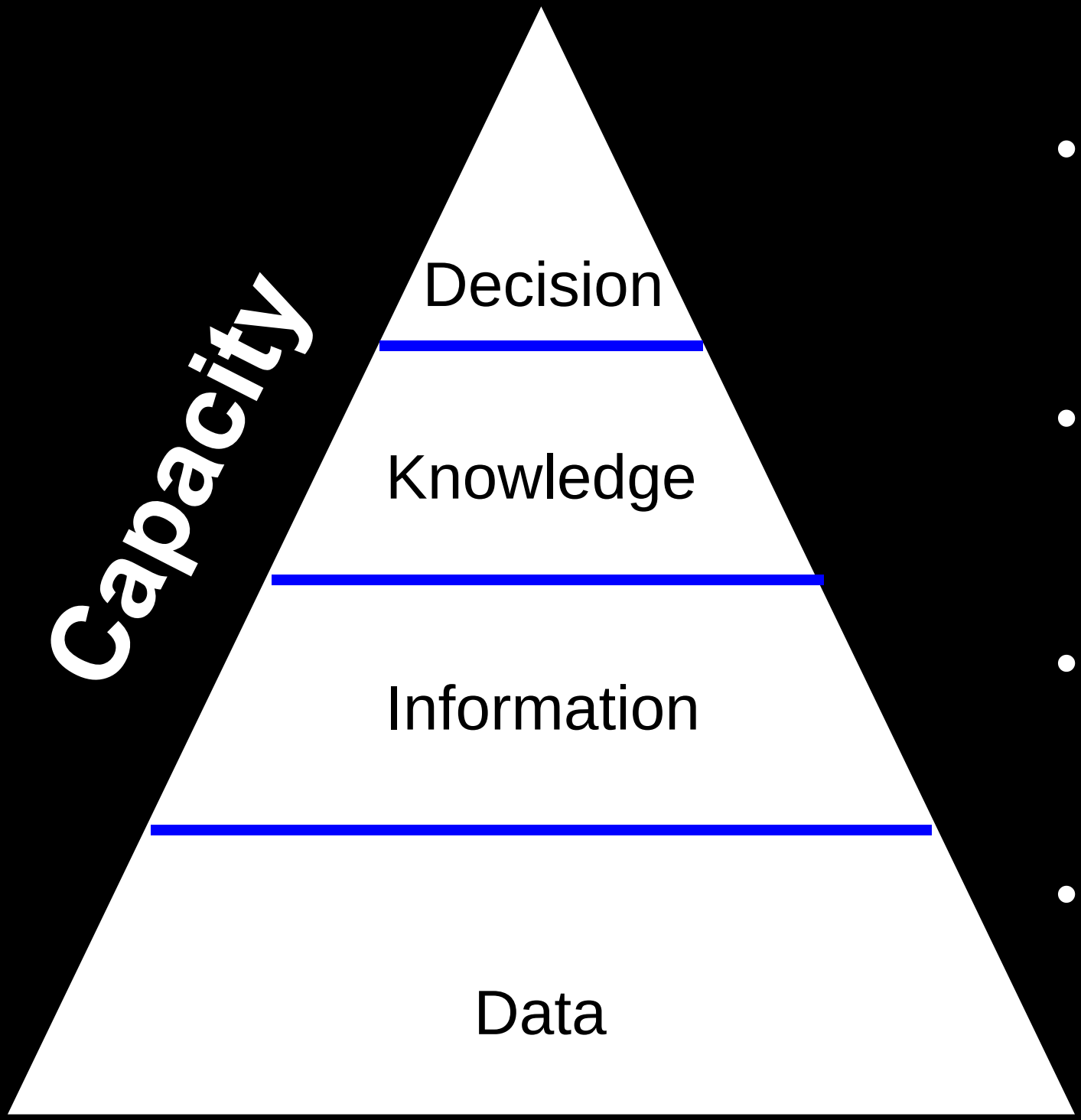
Binational Collaboration in the Rio Grande - Rio Bravo Basin: Climate Services

Rio Grande – Rio Bravo
Technical Scoping Workshop
El Paso, TX – 15 August 2012

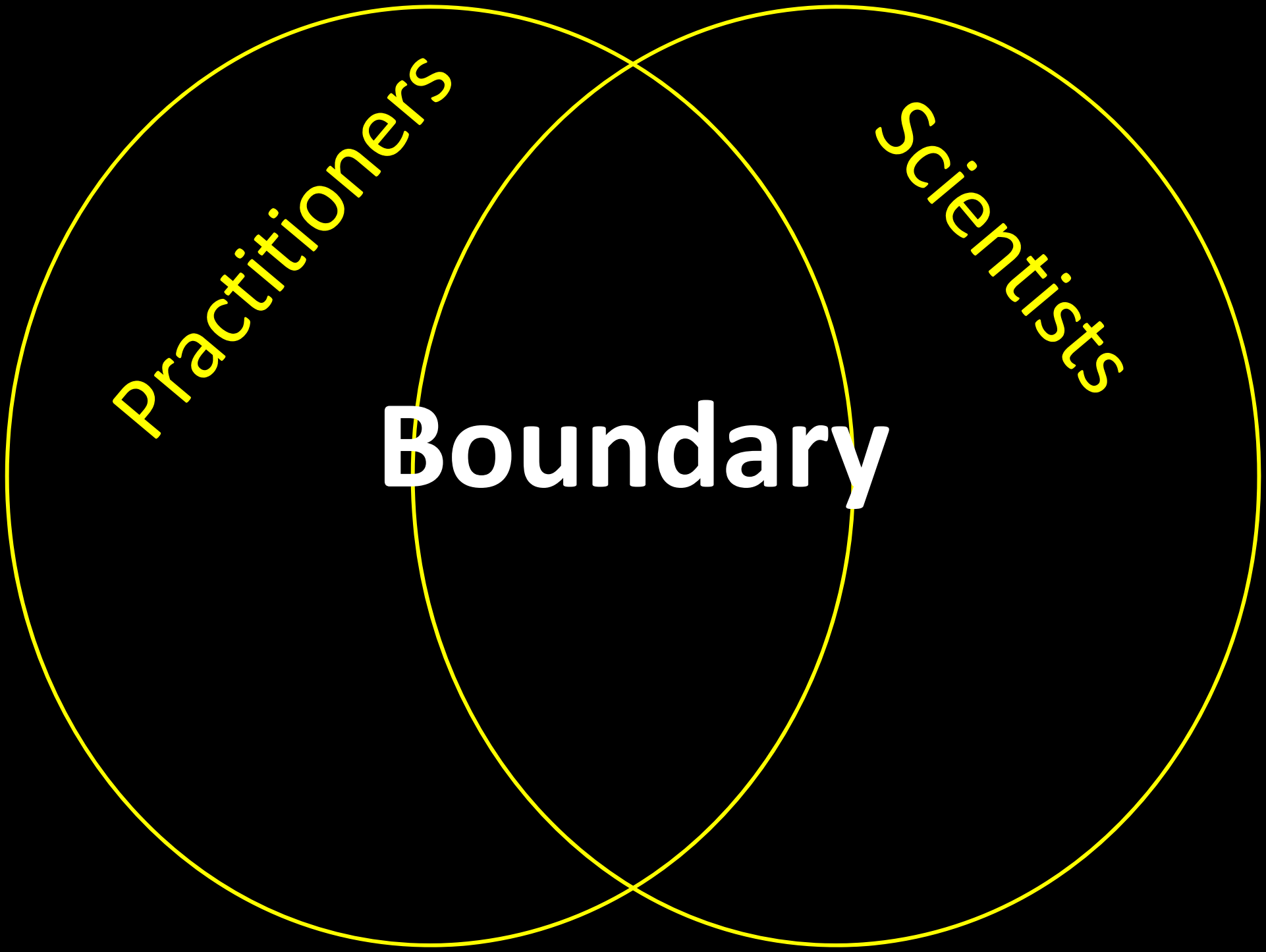
Gregg Garfin

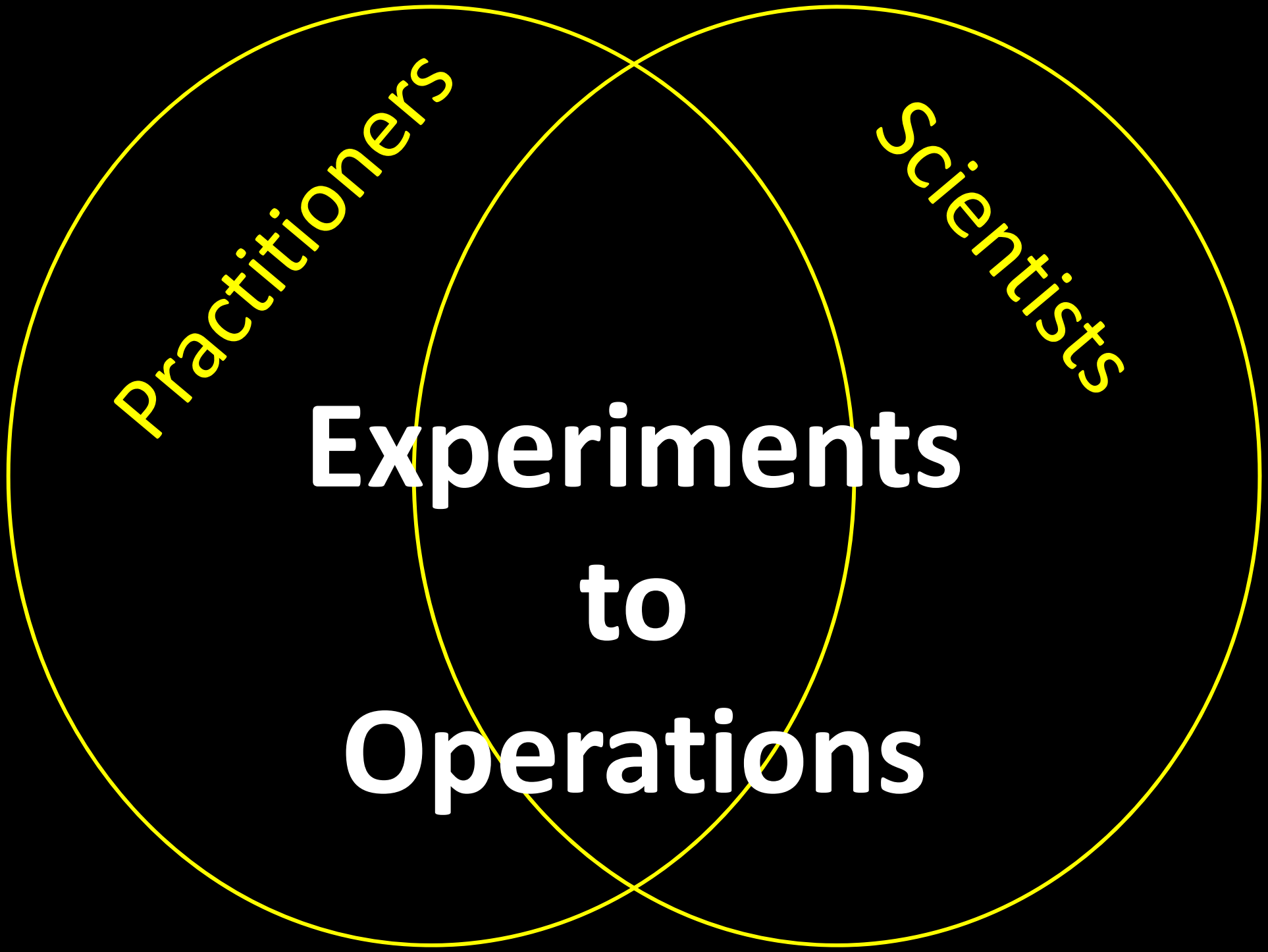
Institute of the Environment

CLIMAS
Climate Assessment for the Southwest

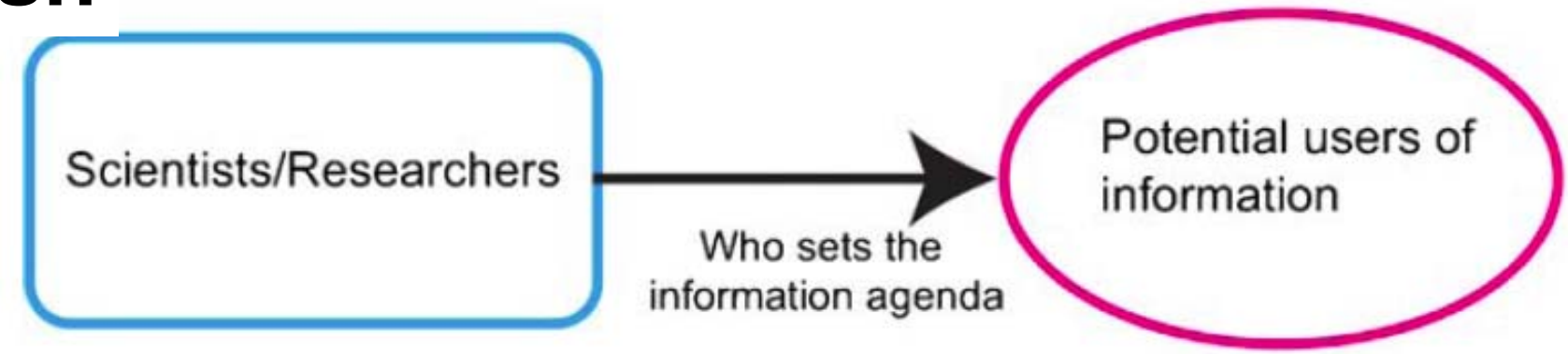


- Best practices, visualization
- Analysis, risk assessment
- Synthesis, communication
- Collection, QA/QC, processing


Practitioners
Scientists
Boundary


Practitioners
Scientists
Experiments
to
Operations

Push



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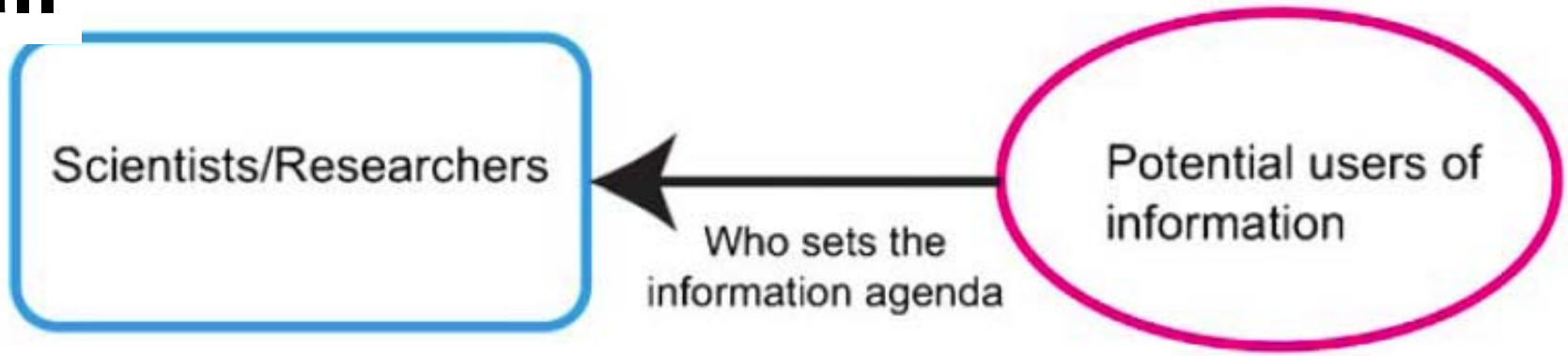
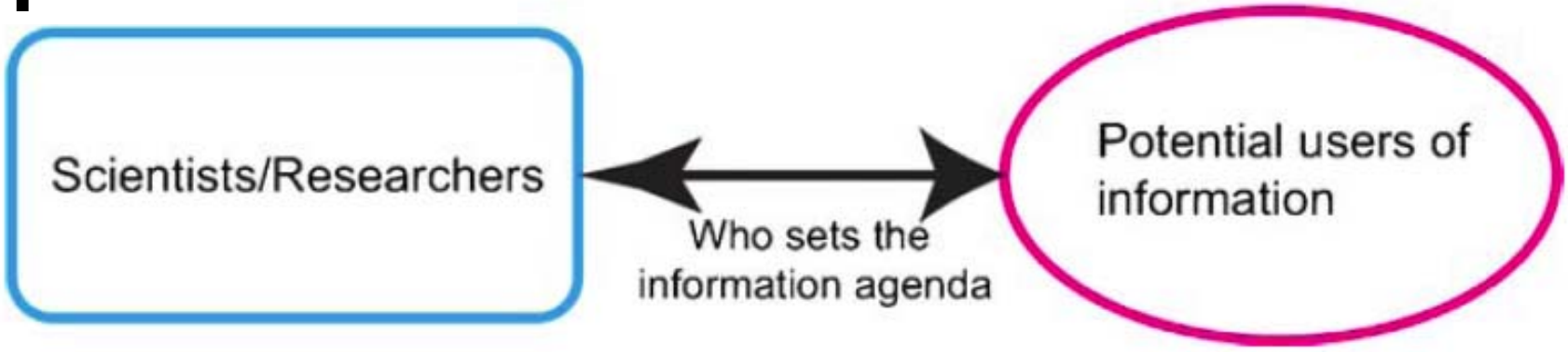
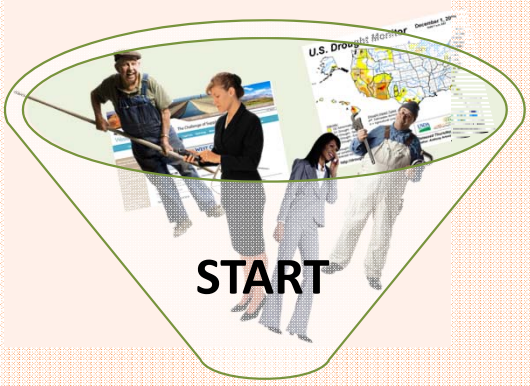


Co-production



Dilling and Lemos, 2011- *Global Environmental Change*

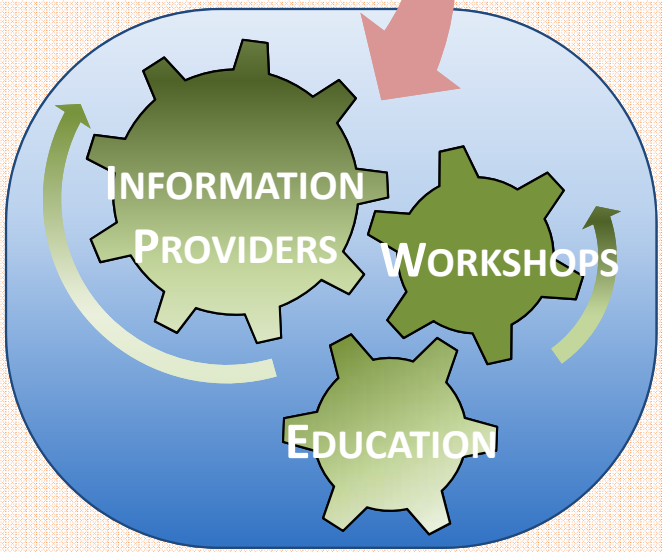
Climate Services: Integrated and Iterative



Users & Existing Climate Information

Climate Services Machine

Better Climate Information & Informed Users



Informed Users & Better Climate Information

Figure: Kristen Averyt, Western Water Assessment

CLIMAS
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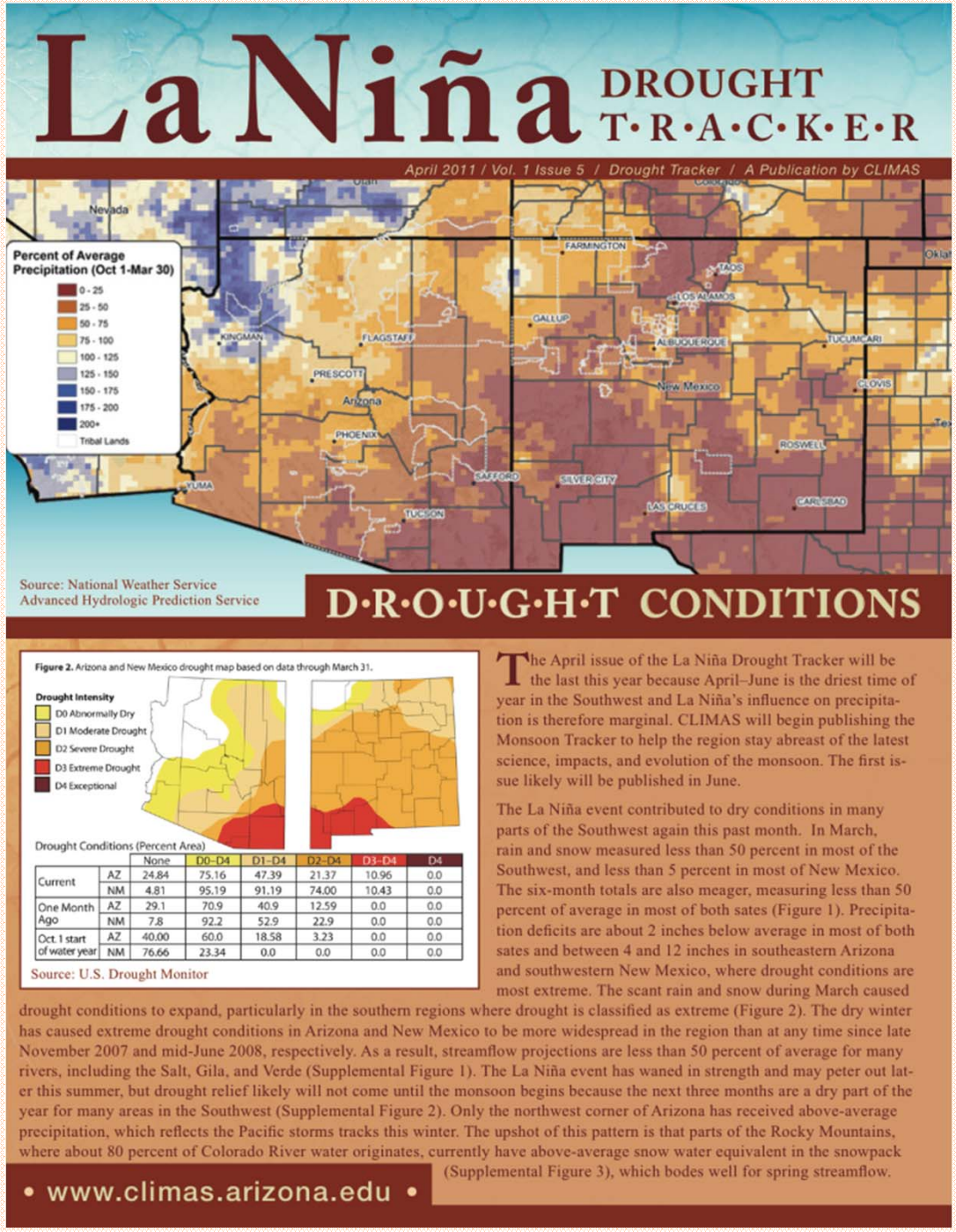

La Niña DROUGHT T·R·A·C·K·E·R

April 2011 / Vol. 1 Issue 5 / Drought Tracker / A Publication by CLIMAS

Percent of Average Precipitation (Oct 1-Mar 30)

0 - 25
25 - 50
50 - 75
75 - 100
100 - 125
125 - 150
150 - 175
175 - 200
200+
Tribal Lands

Nevada
Utah
Colorado
Oklahoma
Texas
Arizona
New Mexico
KINGMAN
FLAGSTAFF
PRESCOTT
PHOENIX
YUMA
SAFFORD
TUCSON
SILVER CITY
LAS CRUCES
GALLUP
FARMINGTON
TAOS
LOS ALAMOS
ALBUQUERQUE
TUCUMCARI
CLOVIS
ROSWELL
CARLSBAD

Source: National Weather Service
Advanced Hydrologic Prediction Service

D·R·O·U·G·H·T CONDITIONS

Figure 2. Arizona and New Mexico drought map based on data through March 31.

Drought Intensity
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional

Drought Conditions (Percent Area)

		None	D0–D4	D1–D4	D2–D4	D3–D4	D4
Current	AZ	24.84	75.16	47.39	21.37	10.96	0.0
	NM	4.81	95.19	91.19	74.00	10.43	0.0
One Month Ago	AZ	29.1	70.9	40.9	12.59	0.0	0.0
	NM	7.8	92.2	52.9	22.9	0.0	0.0
Oct. 1 start of water year	AZ	40.00	60.0	18.58	3.23	0.0	0.0
	NM	76.66	23.34	0.0	0.0	0.0	0.0

Source: U.S. Drought Monitor

The April issue of the La Niña Drought Tracker will be the last this year because April–June is the driest time of year in the Southwest and La Niña's influence on precipitation is therefore marginal. CLIMAS will begin publishing the Monsoon Tracker to help the region stay abreast of the latest science, impacts, and evolution of the monsoon. The first issue likely will be published in June.

The La Niña event contributed to dry conditions in many parts of the Southwest again this past month. In March, rain and snow measured less than 50 percent in most of the Southwest, and less than 5 percent in most of New Mexico. The six-month totals are also meager, measuring less than 50 percent of average in most of both sates (Figure 1). Precipitation deficits are about 2 inches below average in most of both sates and between 4 and 12 inches in southeastern Arizona and southwestern New Mexico, where drought conditions are most extreme. The scant rain and snow during March caused drought conditions to expand, particularly in the southern regions where drought is classified as extreme (Figure 2). The dry winter has caused extreme drought conditions in Arizona and New Mexico to be more widespread in the region than at any time since late November 2007 and mid-June 2008, respectively. As a result, streamflow projections are less than 50 percent of average for many rivers, including the Salt, Gila, and Verde (Supplemental Figure 1). The La Niña event has waned in strength and may peter out later this summer, but drought relief likely will not come until the monsoon begins because the next three months are a dry part of the year for many areas in the Southwest (Supplemental Figure 2). Only the northwest corner of Arizona has received above-average precipitation, which reflects the Pacific storms tracks this winter. The upshot of this pattern is that parts of the Rocky Mountains, where about 80 percent of Colorado River water originates, currently have above-average snow water equivalent in the snowpack (Supplemental Figure 3), which bodes well for spring streamflow.

• www.climas.arizona.edu •

- Understanding
- Preparedness
- Effectiveness

Zack Guido, CLIMAS, zguido@email.arizona.edu

What Was **Most Useful** About the Tracker?

Writing Style	Content	Format	Delivery
"**translation of very technical information** into formats that people can understand and visualize"	"The overview of climate, drivers and forecasts"	"It provides **a one-stop shop** experience for the latest information on current regional climate trends and projections."	"The regular updates; the consistent reminder of unfolding conditions"
"Easy to understand"	**"Discussion of causes and impacts"**	"Geospatial graphics to demonstrate key points."	"The ease of access by computer"
"**clear writing**, useful, easy-to-understand information"	"The region-wide perspective"	"…**Concise format** and summary. Easy to read and interpret at work without getting too sidetracked."	**"comes to my inbox"**

Zack Guido, CLIMAS

January 10, 2006 Hermosillo, Sonora

118°W
116°W
114°W
112°W
110°W
108°W
106°W
104°W
102°W
34°N
32°N
30°N
28°N
26°N
24°N
22°N
20°N
Arizona
New Mexico
Texas
Sonora
Chihuahua
Baja California
Sinaloa
Durango
Región de interés

Resumen del Clima de la Frontera

Border Climate Summary

Publicado: 21 de junio de 2010

Entrenamiento en los ciclones tropicales y su paso a través de la frontera

Por Luis M. Farfán, Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE), Graciela B. Raga, and Fernando Oropeza, Universidad Nacional Autónoma de México (UNAM)

Los ciclones tropicales son sistemas del tiempo importantes que se desarrollan sobre varias regiones del globo. Mientras que ocurren sobre océanos relativamente cálidos, la cuenca del Pacífico nororiental es una región notable prolífica, donde se desarrollan más sistemas por unidad de área que en cualquier otra región en el mundo. Su desarrollo tiene el potencial de afectar países en Centro y Norteamérica. Generalmente el acercamiento de ciclones tropicales trae cambios en contenido de humedad atmosférica en áreas relativamente grandes y se convierten en una fuente significativa de precipitación sobre el terreno montañoso.

Figura 1. Los participantes del curso del invierno del 2010 en La Paz, Sur de Baja California, México.

En promedio, 15 ciclones tropicales desarrollan cada estación, que se extiende de finales de mayo y hasta mediados de noviembre. La costa del oeste de México es especialmente vulnerable a estos sistemas y, aún más, a los ciclones que se muevan cerca de la línea de costa. La entrada a tierra se define como el paso del centro del sistema a través de la costa. Los ciclones tropicales que entran a tierra pueden estar acompañados por vientos fuertes, marea de tormenta costera, y precipitación intensa, con el potencial de daños materiales extensos e inundaciones en áreas costeras. El noroeste de México tiene la frecuencia más alta de entrada a tierra en toda la cuenca del Pacífico oriental. Esta región incluye los estados de Nayarit, Sinaloa, Sonora, y toda la península de Baja California. La mayoría de las entradas a tierra ocurren tardíamente en la temporada, entre agosto y octubre, y tienden para ocurrir sobre Baja California o sobre Sinaloa en la zona continental del país.

Cursos de entrenamiento

En comparación a los países desarrollados, en América Latina hay una falta de profesionales con un conocimiento adecuado de meteorología y climatología sobre ciclones tropicales, y se requieren de mejoras importantes para construir capacidad en estas disciplinas. Como parte de un proyecto de investigación internacional, financiado por el instituto Inter-Americano para la Investigación Global del Cambio (IAI por sus siglas en inglés, http://www.iai.int), diseñamos una serie de cursos cortos basados en el conocimiento actual de ciclones tropicales en el Pacífico oriental. Nuestra meta principal es entrenar a estudiantes de instituciones de educación superior en México, el Caribe, Centro y Sudamérica, donde la construcción de capacidad está en sus primeras etapas de desarrollo. Estos cursos son de 4-5 días y se han ofrecido durante tres años consecutivos en México (La Paz, Baja California Sur, en 2008 y 2010 y Acapulco, Guerrero, en 2009).

Nuestro método incluye una breve revisión de características climatológicas en la formación, intensificación, y disipación de ciclones tropicales. Los aspectos clave son las etapas de la formación e intensificación, con énfasis en el desarrollo en la costa occidental de

continuación página 4

Contenido:

1 Entrenamiento en los ciclones tropicales y su paso a través de la frontera
3 Pronósticos de Inundaciones en Ambos Nogales

Condiciones Recientes
6 Temperatura
7 Precipitación
8 Monitor de la Sequía de América del Norte
9 Presas de Sonora

Pronósticos
10 Pronóstico de Caída
11 Pronóstico de Precipitación
12 ENOS

Border Climate Summary

Resumen del Clima de la Frontera

Issued: June 21, 2010

Training on tropical cyclones and their passage across the border

By Luis M. Farfán, Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE), Graciela B. Raga, and Fernando Oropeza, Universidad Nacional Autónoma de México (UNAM)

Tropical cyclones are important weather systems that develop over several regions of the globe. While they occur over relatively warm oceans, the eastern North Pacific basin is a remarkably prolific region, where more systems develop per unit area than any other region in the world. Their development has the potential to affect countries in Central and North America. In general, the approach of tropical cyclones brings changes in moisture content over relatively large areas and they become a significant source of rainfall over mountainous terrain.

Figure 1. Participants from the spring 2010 training course in La Paz, Baja California Sur, Mexico.

On average, 15 tropical cyclones develop every season, which extends from late May until mid-November. The west coast of Mexico is especially vulnerable to these systems and, even more, to those that move close to the coastline. Landfall is defined as the passage of the system center across the coast. Tropical cyclones that make landfall are likely to be accompanied by strong winds, coastal storm surges, and heavy rainfall, with the potential for extensive property damage and flooding in coastal areas. Northwestern Mexico has the highest frequency of landfall in the entire eastern Pacific basin. This region includes the states of Nayarit, Sinaloa, Sonora, and the entire Baja California Peninsula. Most landfalls are late in the season, from August through October, and they tend to occur over Baja California, or over Sinaloa on the mainland.

Training courses

In comparison to developed countries, in Latin America there is a lack of meteorology and climatology professionals with adequate knowledge of tropical cyclones and major improvements are required to build capacity in these disciplines. As part of an international research project, funded by the Inter-American Institute for Global Change Research (IAI, http://www.iai.int), we designed a series of short courses based on the current understanding of tropical cyclones in the eastern Pacific. Our main goal is to train students from institutions of higher education in Mexico, the Caribbean, Central, and South America, where capacity building is in the early stages of development. These 4-5 day courses have been offered during the last three consecutive years in Mexico (La Paz, Baja California Sur, in 2008 and 2010 and Acapulco, Guerrero, in 2009).

Our approach includes a brief review of climatological features on formation, intensification, and dissipation of tropical

continued on page 4

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1 Training on tropical cyclones and their passage across the border
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8 North American Drought Monitor
9 Sonoran Reservoir Levels

Forecasts
10 Streamflow Forecast
11 Precipitation Forecast
12 ENSO

Español

Inglés

http://www.climas.arizona.edu/outlooks/bcs

Climate Science Topics

- Forecasts
- Data Access
- Climate Analysis and Projection
  - ENSO, drought, paleoclimate, seasonality
- Impacts
  - Economics, agriculture, forestry
- Water Governance
- Binational Research

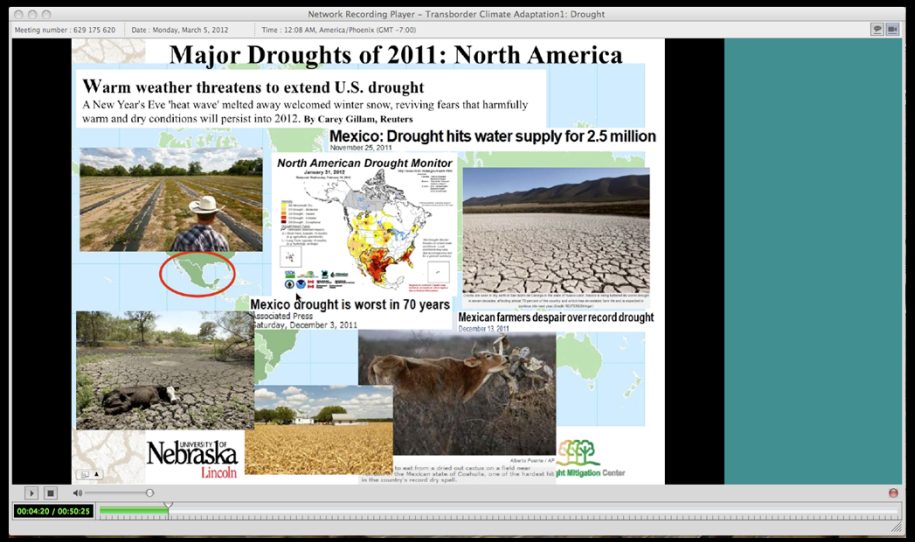
Learning about Media

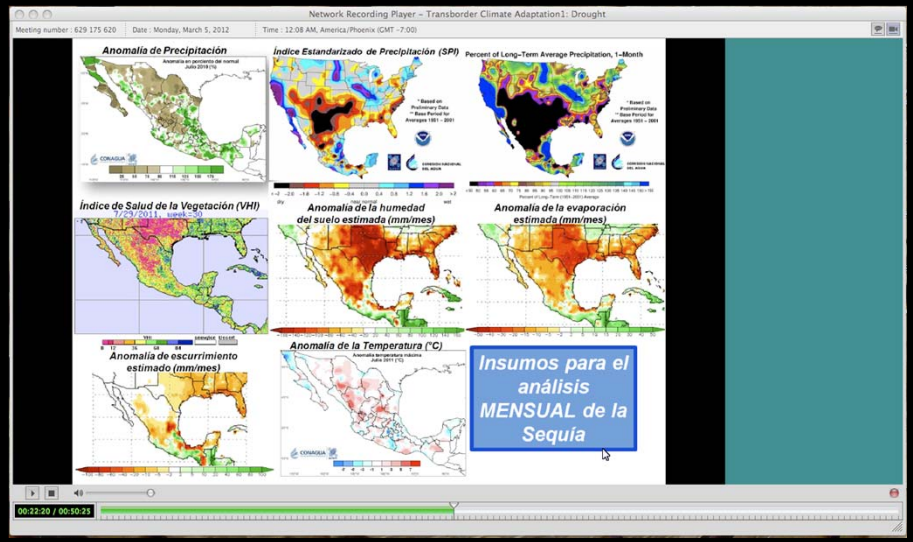
Media Experiments

- TRANSBORDER CLIMATE: Adaptation without Boundaries – PDF
- Webinars
  - Co-developed with advisory group
- twitter news of the week
- facebook discussion threads
- SurveyMonkey™

Transborder Webinars

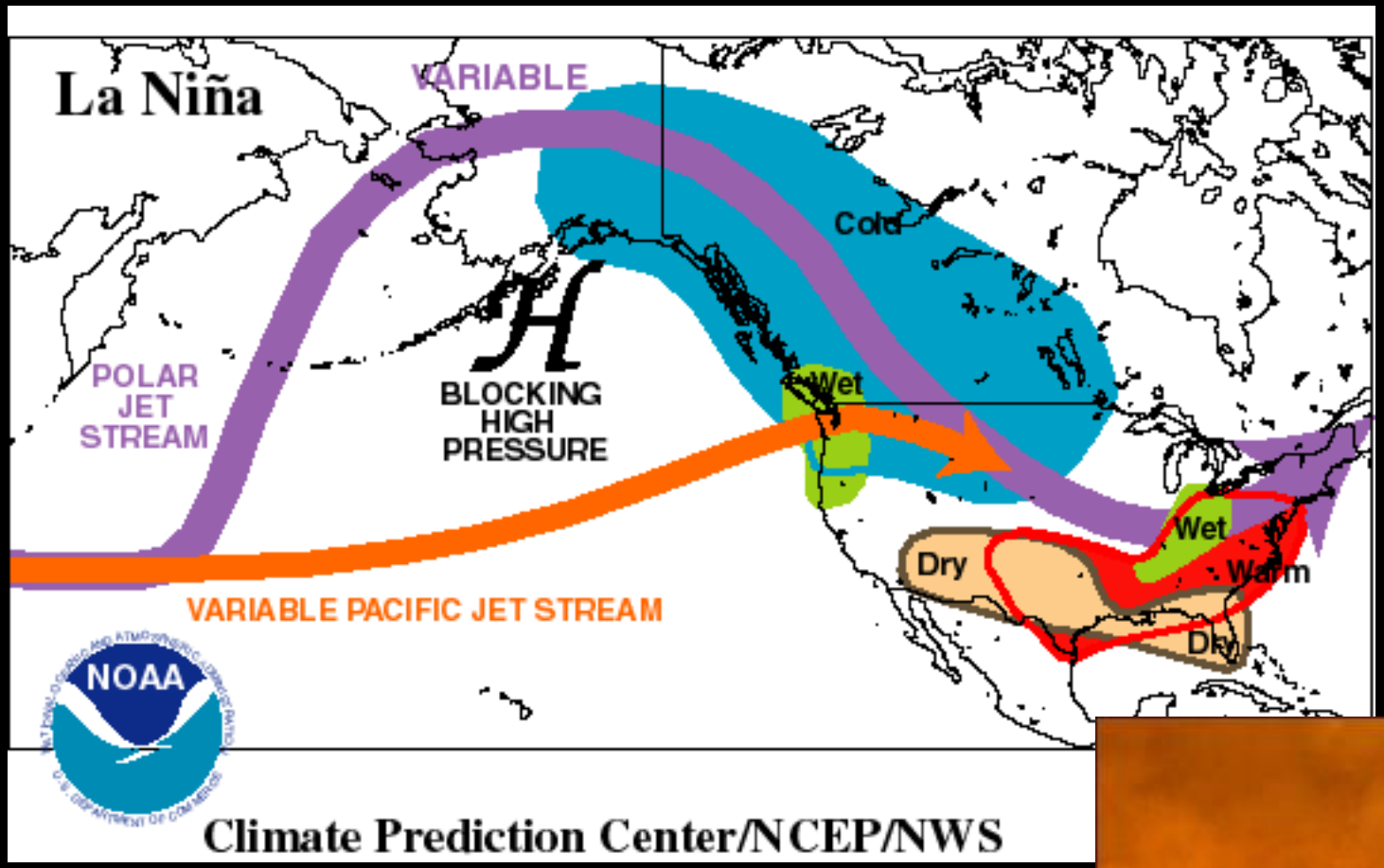
Date	Topic	México	U.S.
5-Mar	Drought	SMN	NDMC
30-Mar	Climate Services	CICESE	LCC
30-Apr	Monsoon	UNAM	NWS





Contact: Gregg Garfin, gmgarfin@email.arizona.edu

Fire-Climate Forecasts



National Seasonal Assessment Workshop

2003-2012

National Interagency Coordination Center

15 August 2012 – North American Climate Services Partnership – El Paso, TX

ECOSYSTEM CLIMATE FIRE APPLICATIONS

DRI Desert Research Institute

CLIMAS Climate Assessment for the Southwest

National Seasonal Assessment Workshop

Eastern & Southern Geographic Areas

Shepherdstown, WV
January 29-30, 2008

For more information, contact:

Robyn Hefferman
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Desert Research Institute
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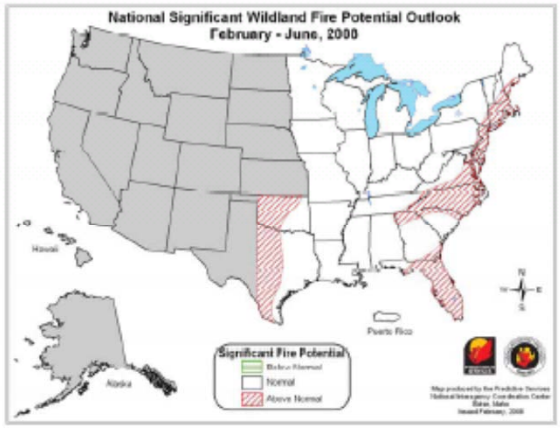
2008 National Seasonal Assessment Workshop for the Eastern & Southern Geographic Areas

On January 29-30, 2008, wildland fire, weather, and climate specialists convened at the U.S. Fish and Wildlife Service National Conservation Training Center in Shepherdstown, West Virginia for the fifth annual National Seasonal Assessment Workshop for the eastern United States. A fire potential forecast for the Eastern and Southern Geographic Areas was produced. This briefing document includes a description of existing climate forecasts, fuels conditions, and potential resource impacts.

Significant Fire Potential Forecast (February – June 2008)

The map below shows the significant fire potential forecast for the Eastern and Southern Geographic Areas. Significant fire potential is defined as the likelihood that a wildland fire event will require mobilization of additional resources from outside the area in which the fire situation originates. Areas highlighted as "Above Normal" are likely to require resources mobilized to augment local capability at some point during the forecast period of February through June, 2008.



The results of the workshop indicate there is above normal significant fire potential in portions of Texas and Oklahoma, much of Florida, southeast Georgia, and from the southern Appalachian Mountains up the East Coast. The critical factors influencing fire potential for this outlook period are:

- **La Niña is expected to persist into summer and bring dry conditions and associated above-normal fire potential to south-central and southeastern portions of the country into spring.**
- **Current severe drought conditions across the Southeast and Florida are expected to elevate fire potential leading to a second consecutive active spring fire season in Georgia and Florida.**
- **Dry conditions will likely expand across western and central Texas and Oklahoma increasing the likelihood of rapid fire spread, spotting and higher difficulty of control especially during high wind events.**
- **The combination of unseasonably warm and dry weather, along with insect infestation and associated defoliation will lead to above normal fire potential along the Eastern Seaboard.**

National Wildland Significant Fire Potential Outlook

National Interagency Fire Center
Predictive Services

Issued: February 4, 2008

Next Issue: March 3, 2008

Wildland Fire Outlook – February 2008 through May 2008

Above normal significant fire potential is expected across western Texas, eastern New Mexico, western Oklahoma and portions of Colorado and Kansas in February. During the extended outlook period, above normal fire potential is forecast to persist or expand across much of the area described above as well as develop across much of Florida and southern Georgia. Another area of increasing fire potential is expected to occur over northern Georgia and extend as far north as Maine. The main factors influencing fire potential this outlook period are:

- La Niña is expected to persist into summer and bring dry conditions and associated above-normal fire potential to south-central and southeastern portions of the country into spring.
- Current severe drought conditions across the Southeast and Florida are expected to elevate fire potential leading to a second consecutive active spring fire season in the Southern Geographic Area.
- Dry conditions will likely expand across western Texas and Oklahoma increasing the likelihood of rapid fire spread, spotting and higher difficulty of control especially during high wind events.
- Unseasonably warm temperatures and below normal precipitation forecast for the eastern seaboard in spring along with numerous insect infestations and associated defoliation will lead to above normal fire potential.

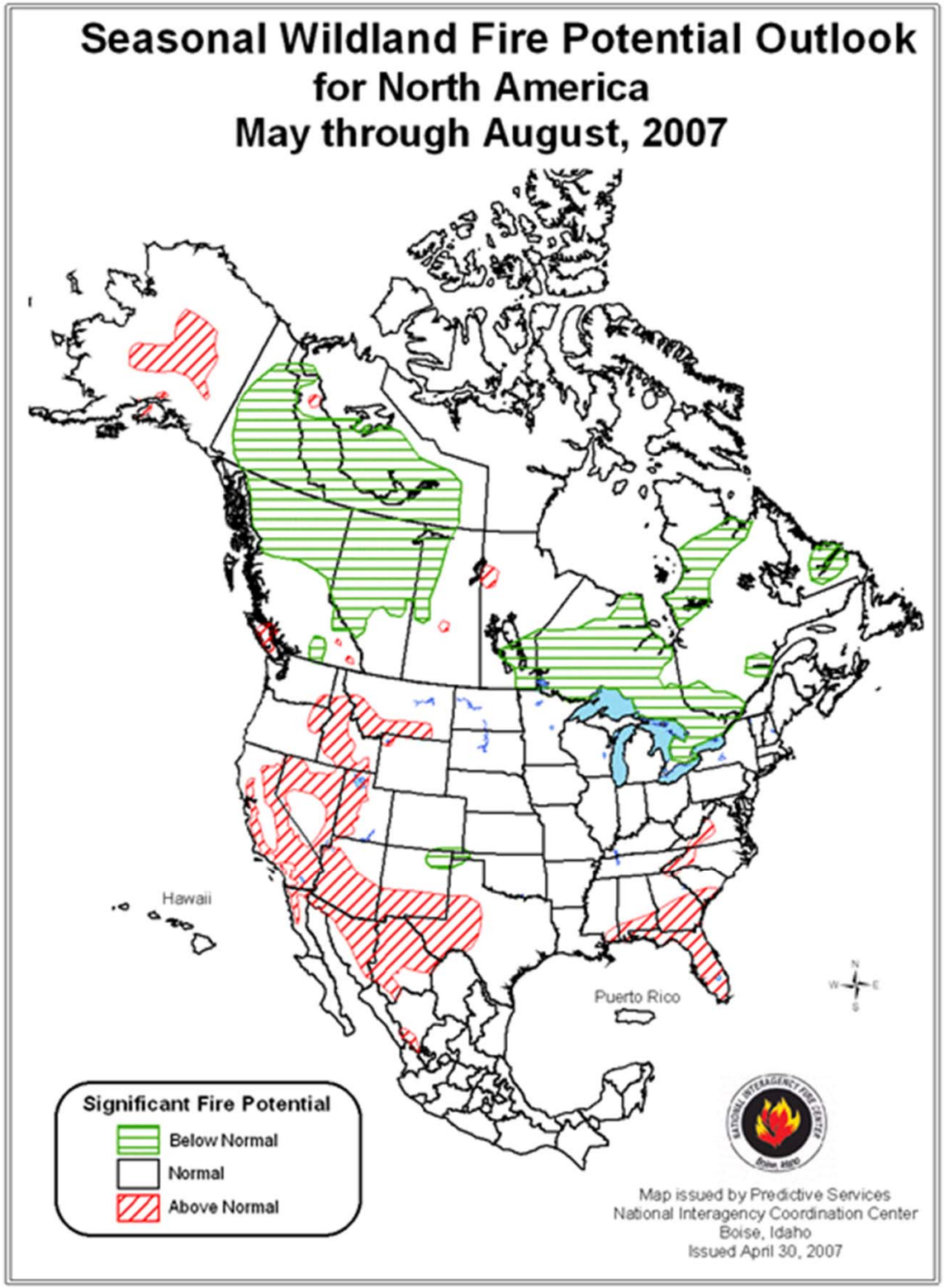
Note: Significant fire potential is defined as the likelihood that a wildland fire event will require mobilization of additional resources from outside the area in which the fire situation originates.

Seasonal

Monthly

http://www.nifc.gov/nicc/predictive/outlooks/outlooks.htm

Contact: Ed Delgado, edelgado@blm.gov



Since 2006: North American Outlooks

Contributors include:

- Canadian Forest Service
- Canadian Interagency Forest Fire Center
- Servicio Meteorológico Nacional
- INIFAP

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Desert Landscape Conservation Cooperative

- Land management
- Climate change
- Effect of long-term drought on the abundance and distribution of species
- Effect of reduced water availability on vegetation, wildlife and humans

Contact: Carol Beardmore, Carol_Beardmore@fws.gov

WWF – NOAA SARP

- Biodiversity, ecosystem health
- Drought, low flows, floods
- Seasonal forecasts, Climate changes
- Best practices
- Climate services

CONAGUA
Comisión Nacional del Agua

SEMARNAT
SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES

15 August 2012 – North American Climate Services Partnership – El Paso, TX

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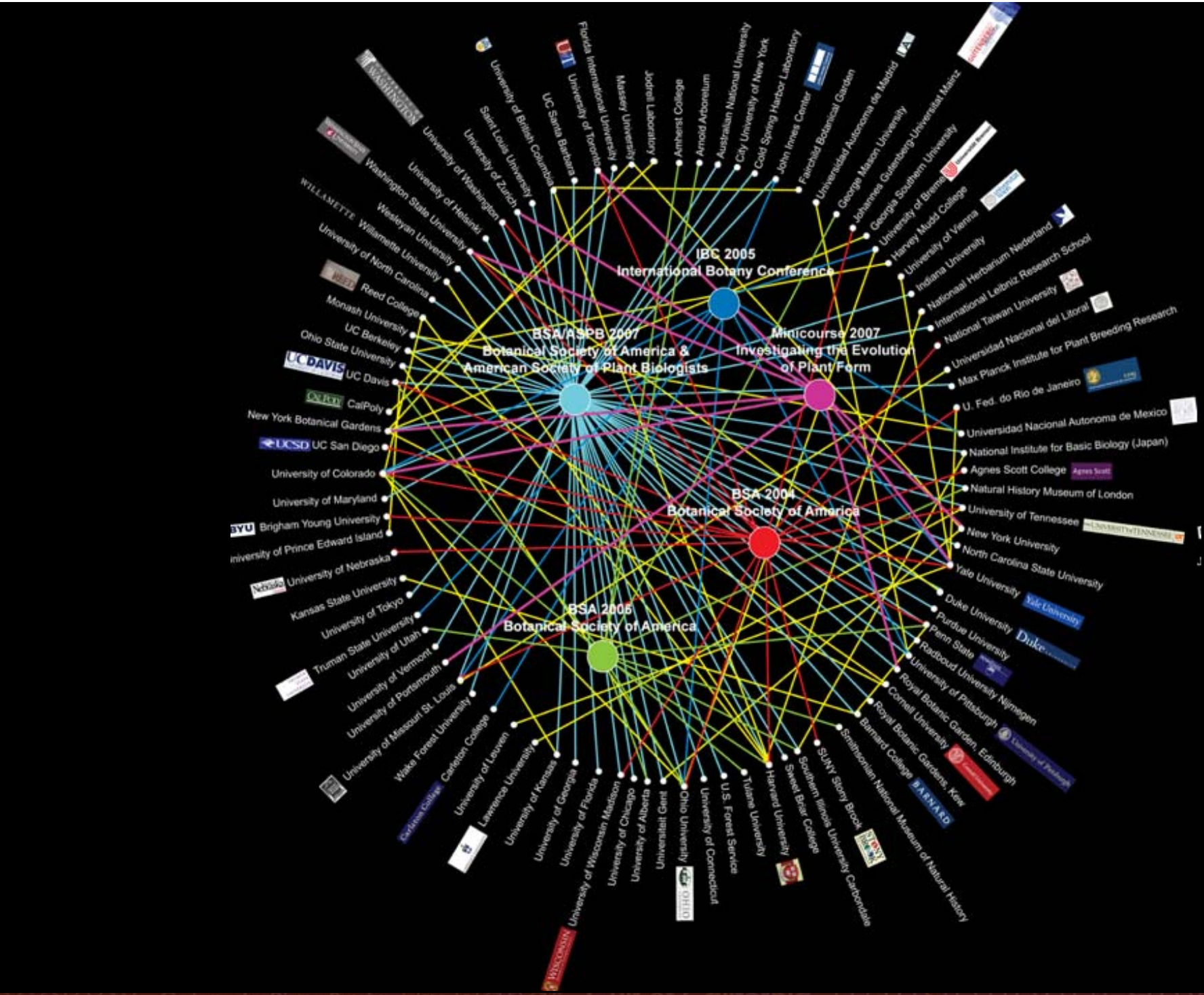

Molecular and Organismic Research in Plant History
http://www.colorado.edu/eeb/MORPH/MORPH/MORPH_Homepage.html

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