FEDERAL LAND MANAGERS' Activities and Issues
EPA Region 5 State Modelers Workshop
December 6, 2007

Disclaimer

- The following presentation represents the current views and ideas of the federal land management agencies' staff and does not necessarily represent the official position of the Department of the Interior, the Department of Agriculture, or the agencies or bureaus of these departments.
- Editorial comments are those of the presenter and do not necessarily reflect the views or opinions of anyone else.

TOPICS COVERED

- PERMIT ACTIVITIES
- FLAG
- BART
- REGIONAL HAZE SIPs

THE CLEAN AIR ACT

- Established the Prevention of Significant Deterioration (PSD) Program

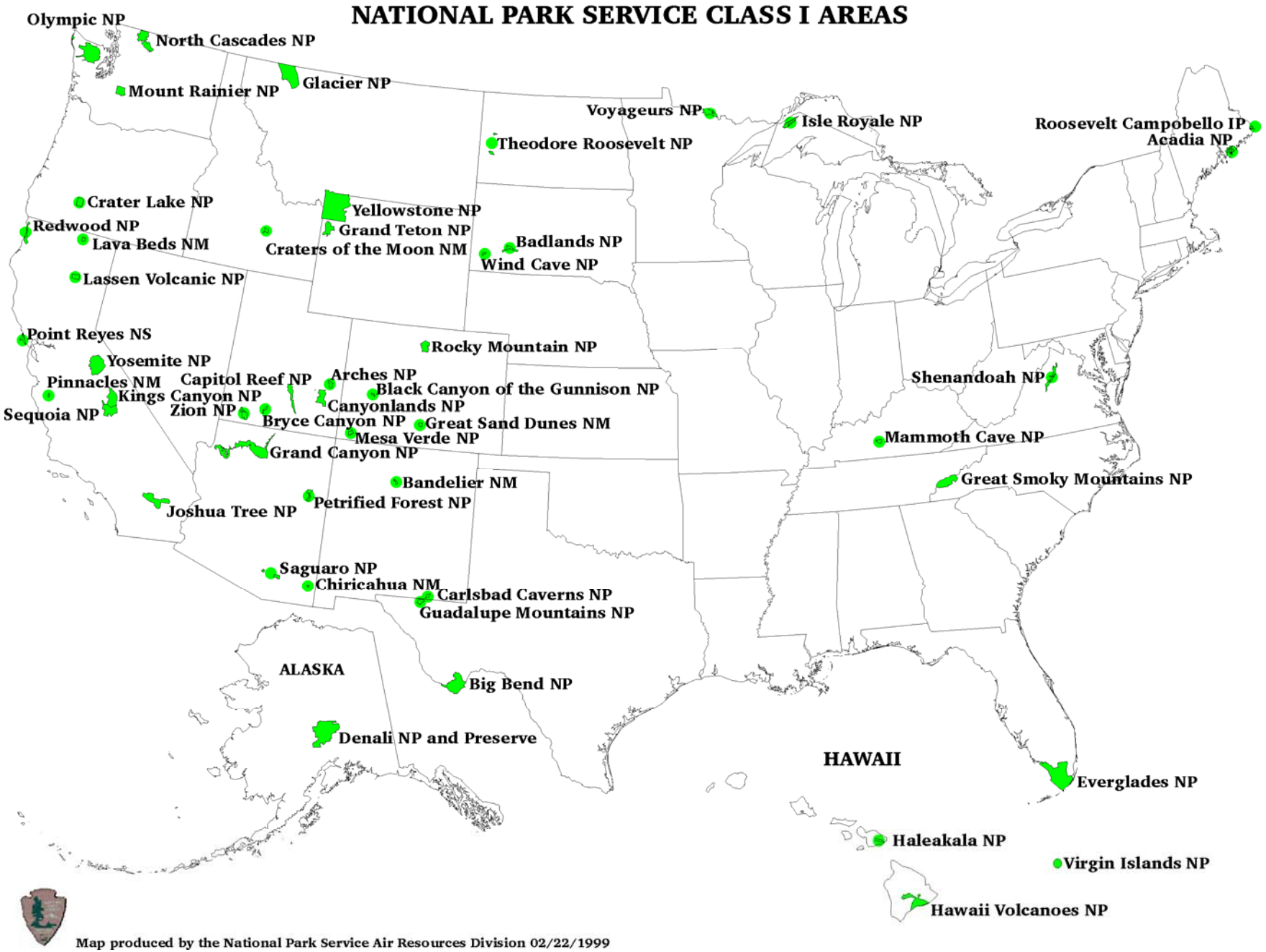
- One purpose of PSD is to:
  - **preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, and other areas of special value**
  - FLMs and Class I area managers are given an **"affirmative responsibility"** to protect air quality related values (AQRVs), including visibility, of Class I areas. (Section 165(d)(2))

FISH AND WILDLIFE SERVICE CLASS I AREAS

Map produced by the Fish and Wildlife Service Air Quality Branch 2/27/1998

FOREST SERVICE CLASS 1 WILDERNESS AREAS

Map produced by the National Park Service Air Resources Division 01/04/1999

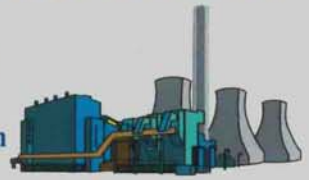

NATIONAL PARK SERVICE CLASS I AREAS
Olympic NP
North Cascades NP
Mount Rainier NP
Glacier NP
Voyageurs NP
Isle Royale NP
Roosevelt Campobello IP
Acadia NP
Theodore Roosevelt NP
Crater Lake NP
Yellowstone NP
Redwood NP
Grand Teton NP
Lava Beds NM
Craters of the Moon NM
Badlands NP
Wind Cave NP
Lassen Volcanic NP
Point Reyes NS
Rocky Mountain NP
Yosemite NP
Arches NP
Pinnacles NM
Capitol Reef NP
Black Canyon of the Gunnison NP
Kings Canyon NP
Canyonlands NP
Sequoia NP
Zion NP
Bryce Canyon NP
Great Sand Dunes NM
Mesa Verde NP
Grand Canyon NP
Bandelier NM
Petrified Forest NP
Joshua Tree NP
Saguaro NP
Chiricahua NM
Carlsbad Caverns NP
Guadalupe Mountains NP
ALASKA
Big Bend NP
Denali NP and Preserve
HAWAII
Everglades NP
Haleakala NP
Virgin Islands NP
Hawaii Volcanoes NP
Shenandoah NP
Mammoth Cave NP
Great Smoky Mountains NP
Map produced by the National Park Service Air Resources Division 02/22/1999

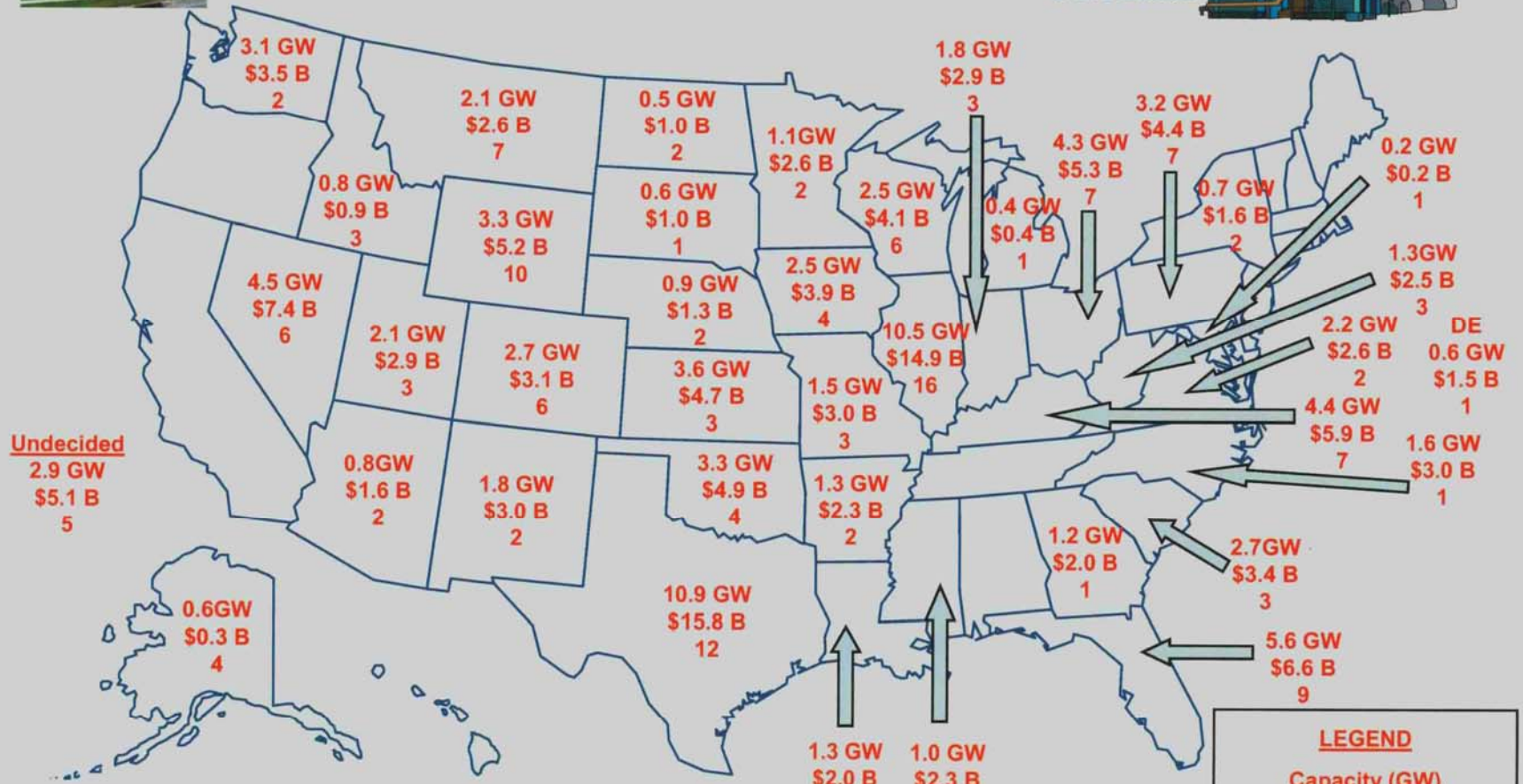
Coal's Resurgence in Electric Power Generation

Proposed New Plants

Equivalent Power
for
96 Million Homes

159 Plants
96GW
$ 141 Billion





NETL Contacts: Scott Klara, klara@netl.doe.gov

NPS / FWS / USFS PERMIT ACTIVITIES

- Previous slide shows 150 coal fired power plants on the drawing boards to be built by 2030.(DOE)
- NPS had some 62 power plant permits in house at various stages during the last 3 years. (most are coal fired)
- FWS had 14 power plant permits in house at various stages.
- Only 6 are IGCC plants
- For PSD permits FLMs ONLY accepting the EPA Guideline version of the CALPUFF system;
- Now it is CALPUFF 5.8 **SUITE** of the CALPUFF system (CALMET = 5.8; CALPOST=5.6394)

REGION 5 PERMIT ISSUES

- American Municipal Power 960 MW coal
  - Written notification of all affected Federal Land Managers of any proposed new major stationary source or major modification that may affect visibility in any Federal Class I area. Such notification must be made in writing and include a copy of all information relevant to the permit application within 30 days of receipt of and at least 60 days prior to public hearing by the State on the application for permit to construct. Such notification must include an analysis of the anticipated impacts on visibility in any Federal Class I area…
- EXCELSIOR ENERGY IGCC 1200 MW proposes ½ BACT
- MN STEEL Taconite / Integrated Steel Mill
- US Steel MINNTAC major mod (first into NPS 11/1/1991)
  - 20,000 TPY NOx unpermitted emission increase

ONGOING REVIEWS

- Sithe-Desert Rock
  - 1500 MW coal-fired power plant
  - Located in Four Corners area of NM
  - Near **15 Class I areas** (9 administered by NPS)
  - Adverse visibility impacts if not for mitigation agreement (Offsets)
  - Waiting for EPA to issue final permit that makes offsets enforceable
- Westmoreland Power-Gascoyne
  - 500 MW lignite-fired power plant
  - Located near THRO
  - Adverse visibility impact at the park
  - State wants to treat THRO as 3 separate parks (North Unit, South Unit, Elkhorn ranch)
  - Latest Company proposal is to reduce SO2 by 25% and NOx by 10%--we still need more
  - Waiting to hear back from State/Company on further mitigation

- White Pine Energy/Ely Energy Center
  - Two, 1500 MW coal-fired power plants
  - Located near GRBA and ZION
  - Severe visibility impacts at GRBA (WP max 32.5%; 146 days >5%; 57 days >10%); possible adverse impacts at ZION
  - Class I vs. Class II issue
  - Reviews in progress; unlikely that both will be built
  - Breaking news- - - Ely Energy Center goes to Natural Gas for 1st phase
- Duke-Cliffsides
  - New 800 MW unit near GRSM
  - State allowing Company to “net out” of SO2/NOx review
  - Netting may be illegal due to EPA enforcement action
  - New unit alone may have adverse impacts at GRSM
- Others (Dominion Power-VA, 600 MW coal USFS just appealed)

FLAG 2000

- A screening tool to assess potential impacts on AQRVs
- Provides certainty (i.e., “bright lines”) for those sources with impacts **BELOW** established significant impact levels (i.e., no adverse impact)
- Does not establish “bright lines” for adverse impact decisions
- Maintains and recognizes the role of the “FLM” in making project-specific adverse impact decisions

Reasons for Revisions

- FLAG 2000—A useful tool; intended to be a working document and revised as necessary
- FLMs have gained knowledge on how to better assess impacts on AQRVs
- New regulatory developments over past seven years (e.g., BART rule)
- Input from applicants and permitting authorities suggest both technical and policy changes are warranted
- Not a “comprehensive” revision, but instead we focus on the visibility analysis, the deposition levels, and the factors FLMs will consider in their decision-making process.

Existing FLAG Haze-like Analysis

- Run CALPUFF (3 years of met. data)
- Concentrations of $SO_{4;}$ $NO_{3;}$PMF; PMC;EC;OC
- Calculate a visibility index – b_{ext}
  - 24-hour average
  - Hour-by-hour b_{ext} using hourly f(RH) concentration (95% rollback)
- Compare change in b_{ext} against annual average natural conditions
- Use maximum modeled values

Potential FLAG Visibility Changes

- Use monthly average f(RH) (MVISBK=6)
- 98th percentile 5% Δb_{ext} (i.e. 8th high)
  - Any 1 year fails test
- Two tiered test
  - First against 20% best natural conditions
  - Second against annual average natural conditions
- If fail test look at context and mitigation, then refined analysis (if necessary)
- Adverse impact determination process more explicit; considers regulatory and contextual factors

Default Average Natural Conditions for the East

Component	Average Concentration, $\mu g/m^3$	Error Factor	Dry Extinction Efficiency,* m^2/g	Dry Extinction,* $Mm^{Š1}$
Ammonium sulfate	0.23	2	3	0.69
Ammonium nitrate	0.1	2	3	0.3
POM	1.4	2	4	5.6
Elemental carbon	0.02	2-3	10	0.2
Fine soil	0.5	1.5-2	1	0.5
Coarse matter	3.0	1.5-2	0.6	1.8
Sum	Fine = 2.25 Coarse = 3.0			9.09

* “Official” IMPROVE Algorithm

IMPROVE Algorithms

- **FLAG 2000**
  - $b_{ext} = 3f(RH)[sulfates] \quad +3f(RH)[nitrates]$
    $+4[organics] \; +10[elemental\ carbon]$
    $+1[fine\ soil] \; +0.6[coarse\ matter] \; + 10$
- **New** (changes in blue)
  - $b_{ext} = 2.2f_S(RH)[small\ sulfates] + 4.8f_L(RH)[large\ sulfates] \quad +2.4f_S(RH)[small\ nitrates] + 5.1f_L(RH)[large\ nitrates]$
    $+2.8[small\ organics] + 6.1[large\ organics]$
    $+10[elemental\ carbon] \; +1[fine\ soil]$
    $+1.7f_{SS}(RH)[sea\ salt] \; +0.6[coarse\ matter]$
    $+Rayleigh\ scattering\ (site\ specific)$
    $+0.33[NO_2(ppb)]$

Extinction Efficiency (1/Mm per ug/m**3)

MODELED particulate species:

PM COARSE (EEPMC) -- Default: 0.6 ! EEPMC = 0.6 !

PM FINE (EEPMF) -- Default: 1.0 ! EEPMF = 1.0 !

BACKGROUND particulate species:

PM COARSE (EEPMCBK) -- Default: 0.6 ! EEPMCBK = 0.6 !

Other species:

LARGE AMMONIUM SULFATE (EESO4) -- Default: 4.8 ! EESO4 = 4.8 !

SMALL AMMONIUM SULFATE (EESO4) -- Default: 2.2 ! EESO4 = 2.2 !

LARGE AMMONIUM NITRATE (EENO3) -- Default: 5.1 ! EENO3 = 5.1 !

SMALL AMMONIUM NITRATE (EENO3) -- Default: 2.4 ! EENO3 = 2.4 !

LARGE ORGANIC CARBON (EEOC) -- Default: 6.1 ! EEOC = 6.1 !

SMALL ORGANIC CARBON (EEOC) -- Default: 2.8 ! EEOC = 2.8 !

SOIL (EESOIL)-- Default: 1.0 ! EESOIL = 1.0 !

ELEMENTAL CARBON (EEEC) -- Default: 10. ! EEEC = 10.0 !

Table V.1-2. Annual Average Natural Conditions - Concentrations and Rayleigh Scattering By Class I Area

Class I Area	$(NH_4)_2SO_4$ $\mu g/m^3$	NH_4NO_3 $\mu g/m^3$	OM $\mu g/m^3$	EC $\mu g/m^3$	Soil $\mu g/m^3$	CM $\mu g/m^3$	Sea Salt $\mu g/m^3$	Rayleigh Mm^{-1}	**Type**
Acadia NP	0.23	0.10	1.67	0.02	0.24	2.14	0.14	12	Annual
Agua Tibia Wilderness	0.12	0.10	0.60	0.02	0.50	3.00	0.14	11	Annual
Alpine Lakes Wilderness	0.12	0.10	0.60	0.02	0.23	1.30	0.06	11	Annual
Anaconda Pintler Wilderness	0.12	0.10	0.60	0.02	0.38	1.79	0.01	10	Annual
Ansel Adams Wilderness	0.12	0.10	0.60	0.02	0.44	2.82	0.03	9	Annual
Arches NP	0.12	0.10	0.60	0.02	0.50	2.92	0.01	9	Annual
Badlands NP	0.12	0.10	0.60	0.02	0.50	3.00	0.01	11	Annual
Bandelier NM	0.12	0.10	0.60	0.02	0.50	2.87	0.02	9	Annual
Bering Sea Wilderness									Annual
Big Bend NP	0.12	0.10	0.60	0.02	0.50	3.00	0.03	10	Annual
Black Canyon of the Gunnison NP	0.12	0.10	0.60	0.02	0.49	2.60	0.01	9	Annual
Bob Marshall Wilderness	0.12	0.10	0.60	0.02	0.44	2.34	0.00	10	Annual
Bosque del Apache Wilderness	0.12	0.10	0.60	0.02	0.50	3.00	0.04	10	Annual
Boundary Waters Canoe Area Wilderness	0.23	0.10	1.72	0.02	0.34	2.82	0.02	11	Annual
Breton Wilderness[1]	0.23	0.10	1.80	0.02	0.50	3.00	0.04	11	Annual
Bridger Wilderness	0.12	0.10	0.60	0.02	0.44	1.88	0.01	9	Annual
Brigantine Wilderness	0.23	0.10	1.80	0.02	0.47	3.00	0.22	12	Annual

[1] There were no data available for Breton Wilderness concentrations; Saint Marks Wilderness data were substituted.

Table V.1-4. Monthly $f_S(RH)$ – Small $(NH_4)_2SO_4$ and NH_4NO_3 Relative Humidity Adjustment Factor

Class I Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acadia NP	3.80	3.28	3.30	3.71	3.72	3.81	4.28	4.34	4.58	4.10	4.06	4.19
Agua Tibia Wilderness	2.68	2.61	2.63	2.42	2.40	2.33	2.33	2.45	2.49	2.46	2.29	2.42
Alpine Lakes Wilderness	5.87	5.35	4.34	4.13	4.30	3.50	3.61	3.69	4.27	5.43	6.15	6.08
Anaconda Pintler Wilderness	3.72	3.23	2.87	2.62	2.60	2.52	2.14	2.07	2.33	2.87	3.60	3.71
Ansel Adams Wilderness	3.51	3.11	2.87	2.34	2.18	1.86	1.75	1.76	1.88	2.05	2.55	3.12
Arches NP	2.96	2.70	2.09	1.84	1.75	1.40	1.49	1.69	1.76	1.83	2.33	2.69
Badlands NP	2.94	2.96	3.01	2.87	3.10	2.91	2.64	2.59	2.56	2.58	3.11	2.98
Bandelier NM	2.66	2.36	2.10	1.77	1.80	1.55	1.93	2.30	2.21	1.87	2.32	2.60
Bering Sea Wilderness	4.16	4.48	4.52	4.50	4.64	4.86	5.71	6.43	5.40	4.52	4.36	4.37
Big Bend NP	2.11	1.92	1.65	1.56	1.67	1.67	1.83	2.07	2.22	1.92	1.92	2.04
Black Canyon of the Gunnison NP	2.71	2.56	2.23	2.12	2.12	1.75	1.87	2.17	2.21	2.00	2.42	2.57
Bob Marshall Wilderness	3.84	3.35	3.06	2.86	2.86	2.84	2.49	2.39	2.77	3.22	3.81	3.83
Bosque del Apache Wilderness	2.56	2.23	1.83	1.54	1.54	1.39	1.90	2.16	2.09	1.79	2.09	2.53
Boundary Waters Canoe Area Wilderness	3.23	2.81	2.93	2.63	2.89	3.22	3.44	3.71	3.83	3.08	3.49	3.49
Breton Wilderness	4.08	3.82	3.79	3.74	3.94	4.12	4.41	4.37	4.18	3.92	3.93	4.06
Bridger Wilderness	2.78	2.60	2.55	2.43	2.45	1.99	1.65	1.63	2.03	2.25	2.78	2.68
Brigantine Wilderness	3.34	3.07	3.17	2.99	3.37	3.45	3.68	3.90	3.91	3.73	3.27	3.36

Method used for the 24h-average of percent change of light extinction:
Hourly ratio of source light extinction / background light extinction
is averaged? (LAVER) -- Default: F ! LAVER = F !
Method used for background light extinction
(MVISBK) -- Default: 2 ! MVISBK = 8 !

1 = Supply single light extinction and hygroscopic fraction
- Hourly F(RH) adjustment applied to hygroscopic background and modeled sulfate and nitrate

2 = Compute extinction from speciated PM measurements (A)
- Hourly F(RH) adjustment applied to observed and modeled sulfate and nitrate
- F(RH) factor is capped at F(RHMAX)

6 = Compute extinction from speciated PM measurements
- FLAG monthly RH adjustment factor applied to observed and modeled sulfate and nitrate

7 = Use observed weather or prognostic weather information for background extinction during weather events; otherwise, use Method 2
- Hourly F(RH) adjustment applied to modeled sulfate and nitrate
- F(RH) factor is capped at F(RHMAX)
- During observed weather events, compute Bext from visual range if using an observed weather data file, or
- During prognostic weather events, use Bext from the prognostic weather file
- Use Method 2 for hours without a weather event

8 = Compute extinction from speciated PM measurements using the IMPROVE (2006) variable extinction efficiency formulation (MFRH must be set to 4)

- Split between small and large particle concentrations of SULFATES, NITRATES, and ORGANICS is a function of concentration and different extinction efficiencies are used for each
- Source-induced change in visibility includes the increase in extinction of the background aerosol due to the change in the extinction efficiency that now depends on total concentration.
- Fsmall(RH) and Flarge(RH) adjustments for small and large particles are applied to observed and modeled sulfate and nitrate concentrations
- Fsalt(RH) adjustment for sea salt is applied to background sea salt concentrations
- F(RH) factors are capped at F(RHMAX)
- RH for F(RH) may be obtained from hourly data as in Method 2 or from the FLAG monthly RH adjustment factor as in Method 6 where EPA F(RH) tabulation is used to infer RH. Furthermore, the monthly RH factor may be applied to hourly concentrations or daily concentrations to obtain the 24-hour extinction. These choices are made using the M8_MODE selection.

Extinction Efficiency (1/Mm per ug/m**3)

MODELED particulate species:

PM COARSE (EEPMC) -- Default: 0.6 ! EEPMC = 0.6 !

PM FINE (EEPMF) -- Default: 1.0 ! EEPMF = 1.0 !

BACKGROUND particulate species:

PM COARSE (EEPMCBK) -- Default: 0.6 ! EEPMCBK = 0.6 !

Other species:

AMMONIUM SULFATE (EESO4) -- Default: 3.0 ! EESO4 = 3.0 !

AMMONIUM NITRATE (EENO3) -- Default: 3.0 ! EENO3 = 3.0 !

ORGANIC CARBON (EEOC) -- Default: 4.0 ! EEOC = 4.0 !

SOIL (EESOIL)-- Default: 1.0 ! EESOIL = 1.0 !

ELEMENTAL CARBON (EEEC) -- Default: 10. ! EEEC = 10.0 !

NO2 GAS (EENO2) -- Default: .17 ! EENO2 = .17 !

Visibility Method 8:

AMMONIUM SULFATE (EESO4S) Set Internally (small)

AMMONIUM SULFATE (EESO4L) Set Internally (large)

AMMONIUM NITRATE (EENO3S) Set Internally (small)

AMMONIUM NITRATE (EENO3L) Set Internally (large)

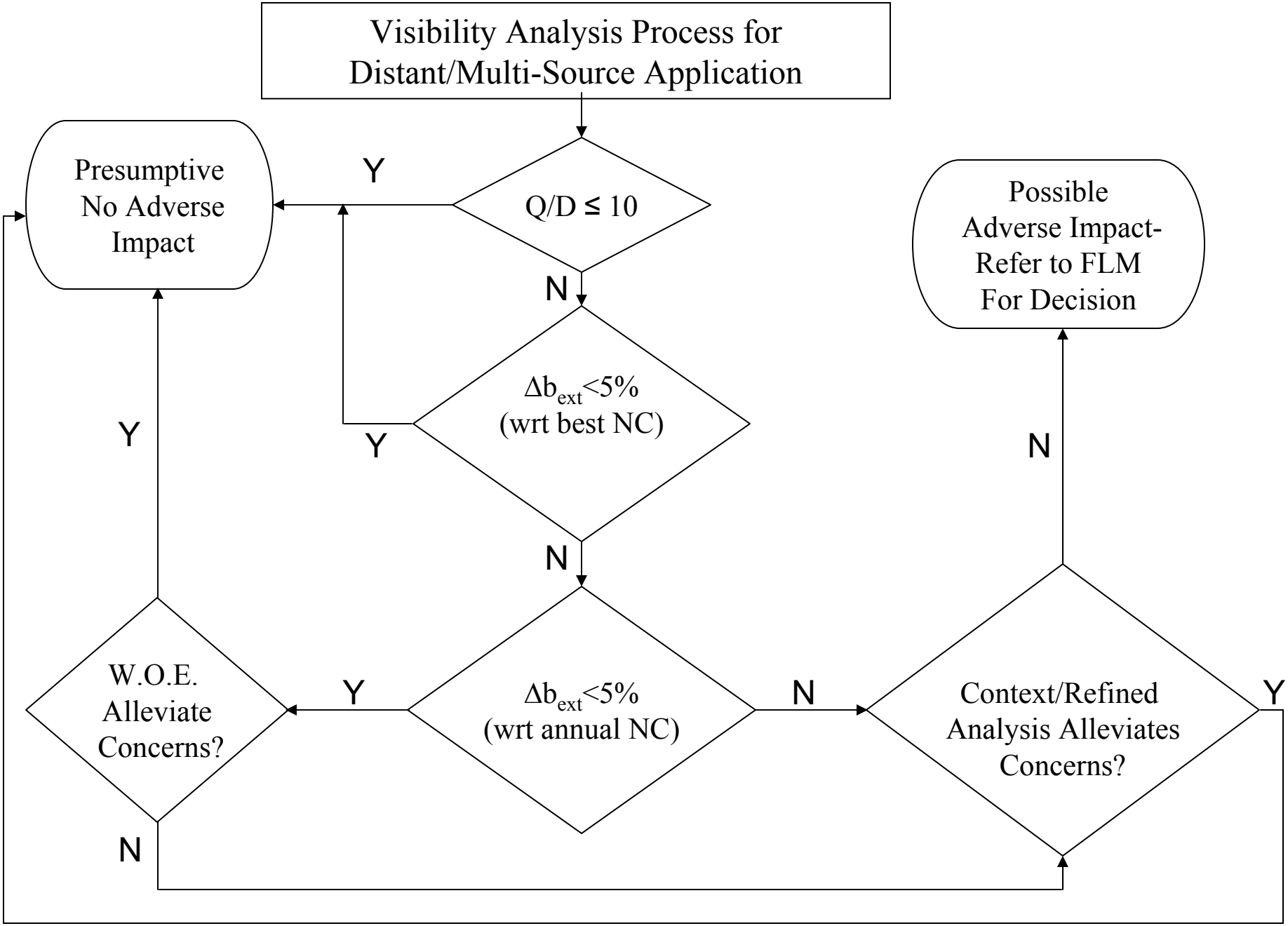
ORGANIC CARBON (EEOCS) Set Internally (small)

ORGANIC CARBON (EEOCL) Set Internally (large)

SEA SALT (EESALT) Set Internally

Auxiliary Formulas for Applying New IMPROVE Algorithm

- Could use the VISTAS spread sheet to apply new IMPROVE algorithm
- VISTAS spread sheet has been reviewed by EPA and the FLMs
- **FLMs DO NOT accept the "CALPOST *weather event* Method 7"**
- **Presently the FLMs DO NOT accept the "CALPOST Method 8"**
- "CALPOST METHOD 8" has not yet been reviewed by EPA or FLMs


Visibility Analysis Process for Distant/Multi-Source Application
Q/D ≤ 10
Y
Presumptive No Adverse Impact
N
Δb_ext<5% (wrt best NC)
Y
Y
N
Possible Adverse Impact- Refer to FLM For Decision
Δb_ext<5% (wrt annual NC)
Y
W.O.E. Alleviate Concerns?
N
Y
N
Context/Refined Analysis Alleviates Concerns?
Y
N

FLM Adverse Impact Determination

- Made on a project-specific basis
- Based on air quality impact modeling performed by the applicant and verified by the FLM
- Considers magnitude, frequency, duration, location, geographic extent, timing of expected impacts (and other factors)

It should be based on a demonstration that the current or predicted deterioration of air quality will cause or contribute to a diminishment of the area's national significance, impairment of the structure and functioning of the area's ecosystem, or impairment of the quality of the visitor experience in the area.

What Does "Weight of Evidence" (W.O.E.) Mean?

- If here you have failed the 20% best natural condition test, but passed the annual natural condition test
- If BACT in question, or multiple Class I areas impacted, or if State using 20% best background in its BART analysis, may jump to context, mitigation, further analysis
- In many cases, with resolution of BACT, probably pass without further analysis

Further Considerations

- Regulatory Factors
  - Geographic extent, intensity, duration, frequency, time of visitor use, natural conditions that affect visibility
- Contextual Considerations
  - Current pollutant concentrations and AQRV impacts in the Class I area
  - Air Quality trends in the Class I area
  - Emission offsets obtained or other mitigation offered by the permit applicant-monitoring IS NOT mitigation
  - Enforceable emission changes that have occurred or would occur before source operation date
  - Whether there are approved SIPs that account for new source growth and demonstrate “reasonable progress” toward visibility goals
  - Expected life of the source
  - Stringency of proposed emission limits (BACT?)
  - Ancillary environmental benefits proposed by applicant (e.g., reduced toxics emissions, pollution prevention investments, CO2 sequestration, purchase of “green” power
  - Comments from the public and other agencies

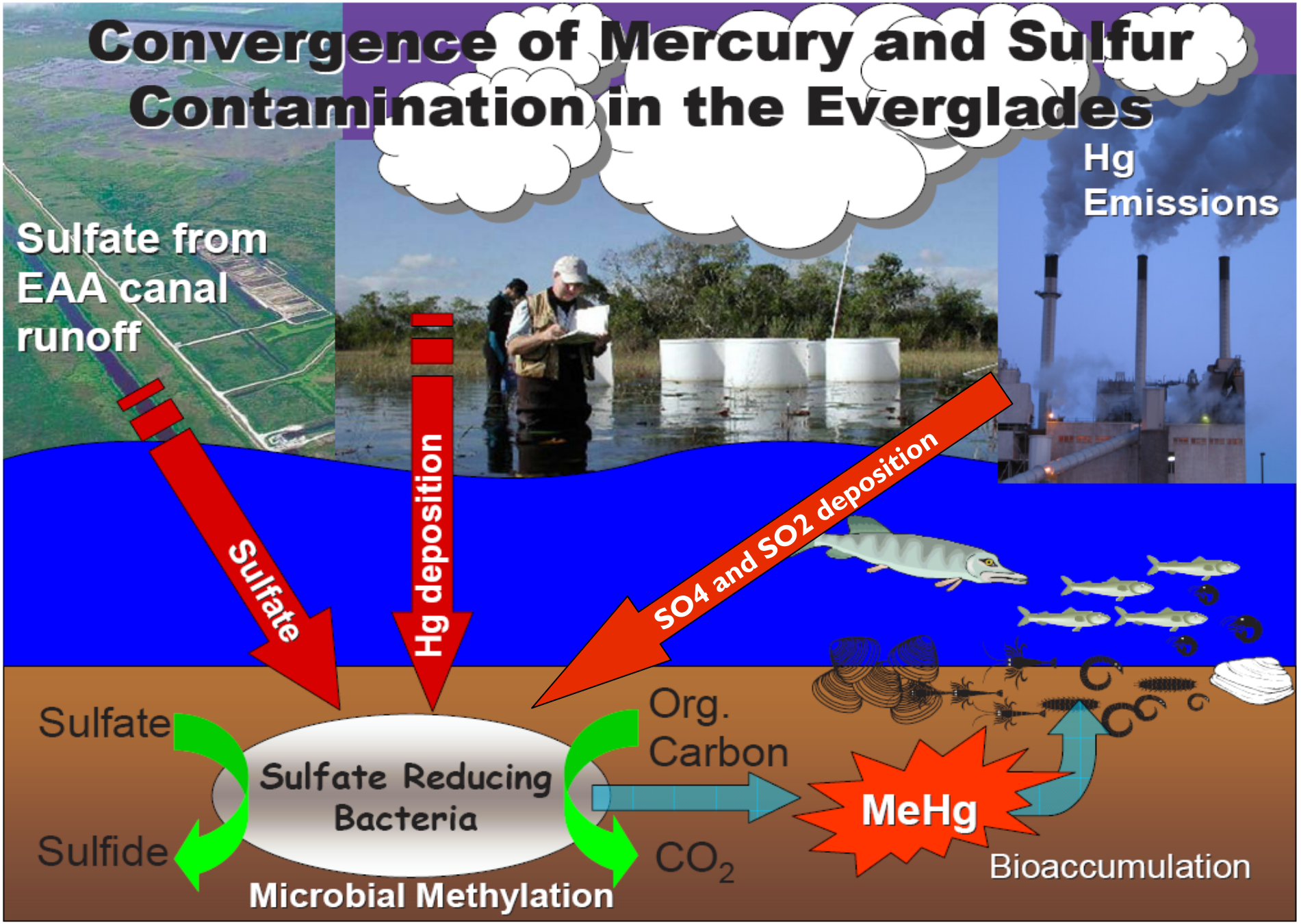
Deposition & O3 Analysis

- Included concern thresholds, pollutant exposures, and deposition analysis thresholds (DATs) for sulfur and nitrogen deposition
- EAST-Total Sulfur; Total Nitrogen=0.01 Kg/HA/Yr
- WEST-Total Sulfur; Total Nitrogen=0.005 Kg/HA/Yr
- Expanded discussion of “Critical Loads” to reflect developments since FLAG 2000
- Replaced dated deposition maps with reference to NADP website for current trends data
- Replaced old deposition data with links to agency websites

- Updated ozone sensitive species lists, but replaced the lists with links to agency websites to help keep info more current
- Deleted old/outdated ozone effects data

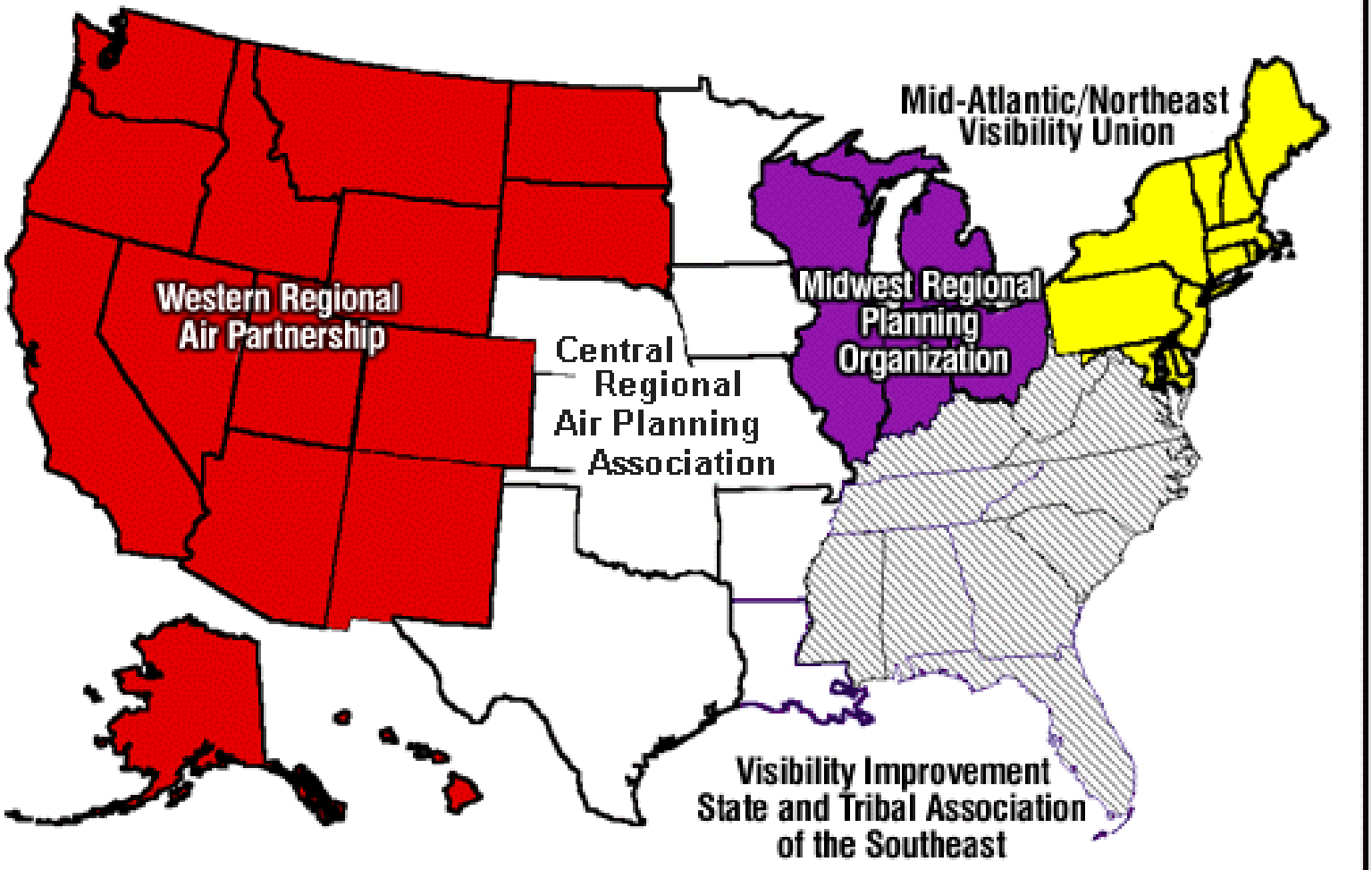
Sulfur & Nitrogen Deposition

- *Sulfate promotes the conversion of mercury to its most toxic and bioaccumulative form, methylmercury (MeHg)*
- *Sulfate concentrations in surface waters are low and limit MeHg production; additional sulfate will increase MeHg production.*
- *Either additional mercury or sulfur deposition will increase methylation and bioaccumulation of mercury.*
- Nitrogen is a fertilizer, which is GOOD for crops, BAD for natural ecosystems
- Nitrogen can lead to acidification of waters and soils
- Nitrogen can cause changes in both aquatic and terrestrial ecosystems (encourages weedy species, grasses, exotic plants)



Modified from Dave Krabbenhoft

Regional Planning Organizations



Five Steps of a BART Analysis

- 1- Identify all available retrofit control technology
- 2- Eliminate technically infeasible options
- 3- Rank remaining control technologies by control effectiveness
- 4- Conduct Impact Analysis
- 5- Evaluate visibility impacts

FLAG INFORMATION/QUESTIONS?

- Contact: Tim Allen (FWS)
  - Tim_Allen@fws.gov
  - (303) 914-3802
- Contact: John Notar

  John_Notar@nps.gov

  (303) 969-2079
- Websites:

  http://www2.nature.nps.gov/air/permits/flag/index.cfm

  http://www.nature.nps.gov/air

  http://www.fws.gov/refuges/habitats/airQuality.html

  http://fs.fed.us/air

FLM Regional Haze Clearing House

- Iowa SIP has arrived! It has been posted in the Clearinghouse. 11/26/07
- Louisiana SIP has arrived! It has been posted in the Clearinghouse. 11/21/07
- Alabama SIP has arrived! It has been posted in the Clearinghouse. 11/20/07
- The Draft TSD from LADCO has been posted in the Clearinghouse under the MWRPO Folder. 11/19/07
- Texas SIP has arrived! It has been posted in the Clearinghouse. 11/16/07
- Comment Letter Templates have been posted in the References section. 11/19/07
- Draft review comments have been posted for West Virginia. 11/13/07
- Draft review comments have been posted for Virginia. 11/8/07
- FS and FWS preliminary draft comments have been posted for MI. 11/7/07
- Michigan has postponed their public hearing. 11/7/07
- Kansas SIP has arrived! It has been posted in the Clearinghouse. 11/1/07
- A briefing statement template has been put in the Clearinghouse in the References folder. The template is titled "Briefing Paper Handbook March 2007". This is the format that must be used by FWS for all future briefing documents. 10/24/07