UNCERTAINTY/TRANSPARENCY IN VA

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ORIGINS OF UNCERTAINTY IN VA

1. Uncertainty in climate models
2. Uncertainty in future emissions assumptions
3. Uncertainty in ecological response models
4. Uncertainty in geohydrological processes
5. Uncertainty in societal responses

ORIGINS OF UNCERTAINTY IN VA

- GCMs:
  - 26 different models
  - Differ in sensitivities from high (Hadley) to low (PCM)
  - Predictions vary from: much warmer and wetter (Hadley) to warmer and drier (PCM)

VARIATION IN GCM PREDICTIONS

Massachusetts, B1 emissions scenario

- Hadley3: +5-7F; +10-15%precip
- GFDL: +2.5-5F; +2-10%precip
- PCM: +2-3F; <+10%precip

VARIATION IN GCM PREDICTIONS

Downscaling analyses have addressed GCM variability by:

- "Bounding" based on model sensitivities
- Means of two or more models
- Percentiles

UNCERTAINTIES IN DOWNSCALING

- Availability of ground-station data for statistical downscaling
- Beware spurious accuracy and precision

FUTURE EMISSIONS RATES

B1: doubling of GHGs by 2100
A1FI: tripling of GHGs by 2100

Massachusetts Hadley3 model:
B1: +5-7F by 2100
A2: +6-8F by 2100

FUTURE EMISSIONS RATES

Most analyses "bound" using optimistic and less optimistic scenarios (B1, AIF1/A2)

UNCERTAINTY IN RESPONSE MODELS

- How ecosystems/species will respond to cc uncertain (physiological tolerances, resilience, adaptive capacity, management potential)
- Uncertainty in aquatic/wetland systems
  - Future precipitation patterns
  - Geohydrologic changes
  - ecoresponses

UNCERTAINTY IN SOCIETAL RESPONSES

- Beneficial responses?
- Maladaptive responses (sea walls, fire control, responses to invasives)?

SOURCES OF UNCERTAINTY - SUNMMARY

- Uncertainty for every component (climate and eco modeling)
- Will not go away! (tightening up the climate models would be terrific, but not a silver bullet)
- We need to move forward despite uncertainties

OPTIONS FOR HANDLING UNCERTAINTY IN VA

Range from quantitative to rank-based:

Simulation (Monte-Carlo) analysis

- Assumptions about probability distributions in variables
- Not all variables have amenable distributions (e.g., management potential)
- We just don't know!
- Spurious accuracy and precision?

OPTIONS FOR HANDLING UNCERTAINTY IN VA

- Scenario planning (if this, then that)
- Monitoring is critical

T&S SPECIES AND NEAFWA APPROACH

Uncertainty ranking based on IPCC approach

Variable scores assigned one of three certainty scores (high, medium, low)

High - >70%
Medium – 30-70%
Low - <30%

T&E FRAMEWORK

Two methods used:

- Certainty of each variable scored and total combined into Total Certainty Score (H,M,L)
- Alternative certainty scores for each variable and 3 TCS:
- Best estimate is Vulnerable, but could (though less likely) range from Highly Vulnerable to Vulnerable.

NEAFWA MODEL

- Each variable scored (H,M,L)
- Variable scores combined into Total Certainty Score.

Benefits of T&E/NEAFWA approaches:

- Allow us to identify where greatest sources of uncertainty lie
- Allow regulators/planners to assess likely effectiveness of specific actions.

TRANSPARENCY IN VA

- Reviewers/users of VA need to be able to "connect the dots"
- How scores arrived at must be made transparent
- Uncertainties and how they were handled must be acknowledged
- Different VA models vary in their transparencies
- Narratives