The key question (as posed by the NRC):

- - D.5 *Will the effective use of dispersants reduce the impacts of the spill to shoreline and water surface resources <u>without significantly increasing impacts to water column and benthic resources</u>?*

How to estimate “impacts”?

The (most) basic risk equation…

Chemical Exposure ⟷ Toxicological Response

[EXPOSURE] [RESPONSE]

The NRC's research priorities to support dispersant use decisionmaking:

Oil trajectory and fate models used to predict the behavior of dispersed oil should be improved, verified, and then validated in an appropriately designed experimental setting or during an actual spill. These models should meet the needs of both planning and real-time decisionmaking in complex nearshore settings.

[EXPOSURE, go do something very specific]

Relevant state and federal agencies, industry, and appropriate international partners should develop and fund a focused series of experiments to quantify the weathering rates and final fate of chemically dispersed oil droplets compared to undispersed oil.

[EXPOSURE, go do something very specific]

The NRC's research priorities to support dispersant use decisionmaking continued:

Relevant state and federal agencies, industry, and appropriate international partners should conduct a series of transport and fate modeling and associated biological assessments with and without dispersants, and develop operational dispersal envelopes (e.g., for what oil types and volumes; when, where, and for what types of water bodies) for planning prior to actual oil spills.

[EXPOSURE, go do something very specific]

Relevant state and federal agencies and industry should develop and implement detailed plans (including preposition of sufficient equipment and human resources) for rapid-deployment of a well-designed monitoring effort for actual dispersant applications in the United States.

[EXPOSURE, go do something very specific]

The NRC's research priorities to support dispersant use decisionmaking continued:

Relevant… should develop and implement a series of focused toxicity studies to:

1) *Provide data that can be used to parameterize models to predict photo-enhanced toxicity;*
   [RESPONSE, but only partially (marginally?) applicable]

2) *Estimate the relative contribution of dissolved and particulate oil phases to toxicity with representative species;*
   [EXPOSURE, go do something very specific]

3) Include an evaluation of delayed effects.
   [RESPONSE, vague]

The NRC's research priorities to support dispersant use decisionmaking continued:

To this end, every effort should be taken to ensure that the spill response research community continues to monitor developments in the broad field of ecotoxicology, as various applications of increased understanding of toxicological effects, on various timescales, at the population and community-level may be of significant value to dispersant decisionmaking.

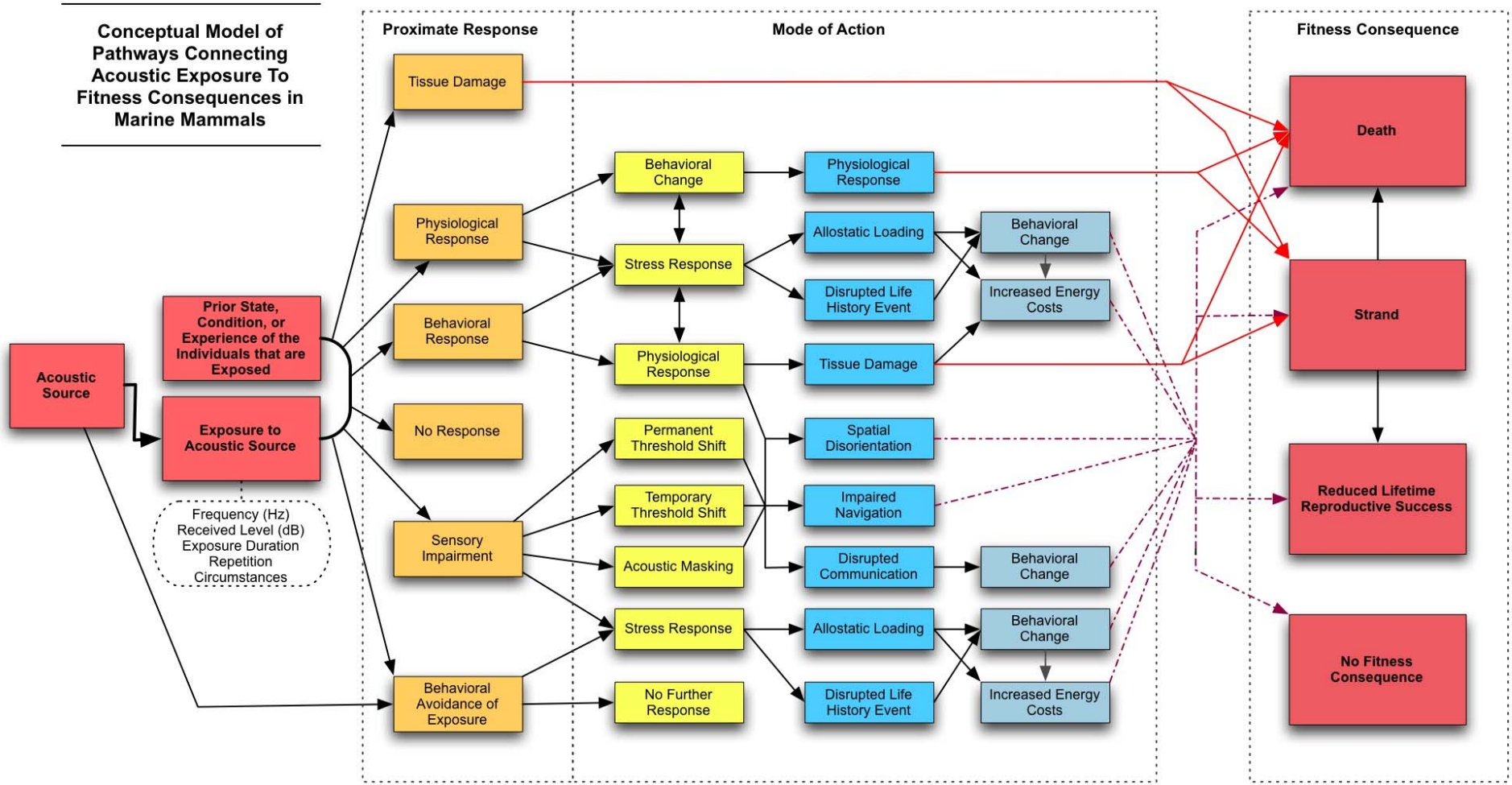
[RESPONSE, passive and vague]

Basically, sit back, cross your fingers, and hope that some day the toxicologists will come along and help you make sense of this mountain of exposure data you're generating.

The NRC's research priorities to support dispersant use decisionmaking continued:

The committee re-affirms the 1989 NRC recommendation that studies be undertaken to *"assess the ability of fur and feathers to maintain the water-repellency critical to thermal insulation under dispersed oil exposure conditions comparable to those expected in the field".*

[RESPONSE, but tangential to the key question of whether dispersants increase impacts to water column and benthic resources]


Conceptual Model of Pathways Connecting Acoustic Exposure To Fitness Consequences in Marine Mammals
Proximate Response
Mode of Action
Fitness Consequence
Acoustic Source
Prior State, Condition, or Experience of the Individuals that are Exposed
Exposure to Acoustic Source
Frequency (Hz)
Received Level (dB)
Exposure Duration
Repetition
Circumstances
Tissue Damage
Physiological Response
Behavioral Response
No Response
Sensory Impairment
Behavioral Avoidance of Exposure
Behavioral Change
Stress Response
Physiological Response
Permanent Threshold Shift
Temporary Threshold Shift
Acoustic Masking
Stress Response
No Further Response
Physiological Response
Allostatic Loading
Disrupted Life History Event
Tissue Damage
Spatial Disorientation
Impaired Navigation
Disrupted Communication
Allostatic Loading
Disrupted Life History Event
Behavioral Change
Increased Energy Costs
Behavioral Change
Behavioral Change
Increased Energy Costs
Death
Strand
Reduced Lifetime Reproductive Success
No Fitness Consequence

6 June 2006