**The Future of Dams Project**

- Supported in part by a $6 million, 4-year NSF EPSCoR grant
- A stakeholder-engaged, solutions-focused, interdisciplinary NEST research initiative
- Collaborators in NH, RI, and ME
- Empowering stakeholders to make complex decisions about dams by combining the best available science with diverse forms of community engagement

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**Team Expertise & Collaborations**

The Future of Dams team considers two primary systems: Social-Ecological Systems and Knowledge Systems. Each of these includes a number of disciplinary domains and a variety of research approaches and methodologies. (Prepared by Emily Vogler)

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**Dam Risk**

**What is dam risk?**

- Product of probability of failure and consequences of failure

**Hazard Class**

<table>
<thead>
<tr>
<th>Hazard Class</th>
<th>Failure Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Menace</td>
<td>No anticipated loss of property or life</td>
</tr>
<tr>
<td>Low</td>
<td>Property loss</td>
</tr>
<tr>
<td>Significant</td>
<td>Significant loss of property and possible impacts to occupied structures and roads</td>
</tr>
<tr>
<td>High</td>
<td>Loss of life</td>
</tr>
</tbody>
</table>

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**Dam Spillway Capacity as Risk Index**

- Maximum flood flow a spillway can pass
- Floods exceeding spillway capacity can cause damage to dam
- Most dam failures are caused by flows higher that spillway capacity
- Spillway capacity can be used as a risk index
- Spillway regulations are not identical everywhere

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**Dam Spillway Capacity Regulations**

<table>
<thead>
<tr>
<th>Hazard Class</th>
<th>Inflow Design Flood</th>
<th>NHDES Existing Dams</th>
<th>NHDES New Constructions</th>
<th>FERC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Menace</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Low</td>
<td>50-yr Flood</td>
<td>100-yr Flood</td>
<td>100-yr Flood</td>
<td>-</td>
</tr>
<tr>
<td>Significant</td>
<td>100-yr Flood</td>
<td>50% PMF</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>High</td>
<td>2.5x100-yr Flood</td>
<td>PMF</td>
<td>PMF</td>
<td>-</td>
</tr>
</tbody>
</table>

*NHDES existing dam regulations are based on Sec WM 393.11
NHDES new dam regulations are based on Sec WM 405.66
FERC regulations are based on Federal Emergency Management Agency’s guidelines

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**Dam Risk Key Impacting Factors**

- Climate Change will alter temperature & precipitation patterns
- Land use change will impact runoff coefficient and river flow peaks
- Aging of dams will make them more susceptible to floods

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**Current Focus: Hydrologic Modelling**

- Using a recent downscaled climate model future climate data in NE for river flow modelling at dam sites to assess the impacts of climate change
- Comparing past & future spillway performances

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**Near Future Work**

- USGS has measured & recorded river flow for over 115 years
- Measurements are performed at gauging stations along the rivers
- For dam risk assessment, flow at dam site is needed
- Majority of dams in NE are small ungauged dams
- The Water Balance Model (WBM) is being used for hydrologic modelling

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**Final Intended Outcome**

- Risk estimation for dams in NE considering different scenarios of climate change, land use change and aging infrastructure
- Zoning of risk prone regions in NE by dynamic dam risk assessment where the impacts of each dam failure will be assessed with respect to the risk of other upstream and downstream dams.