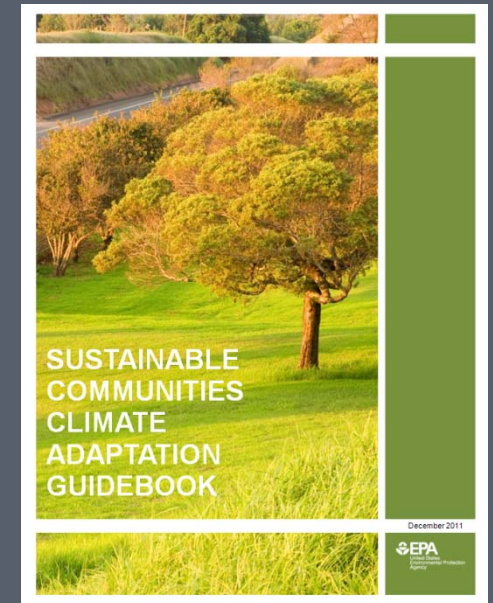


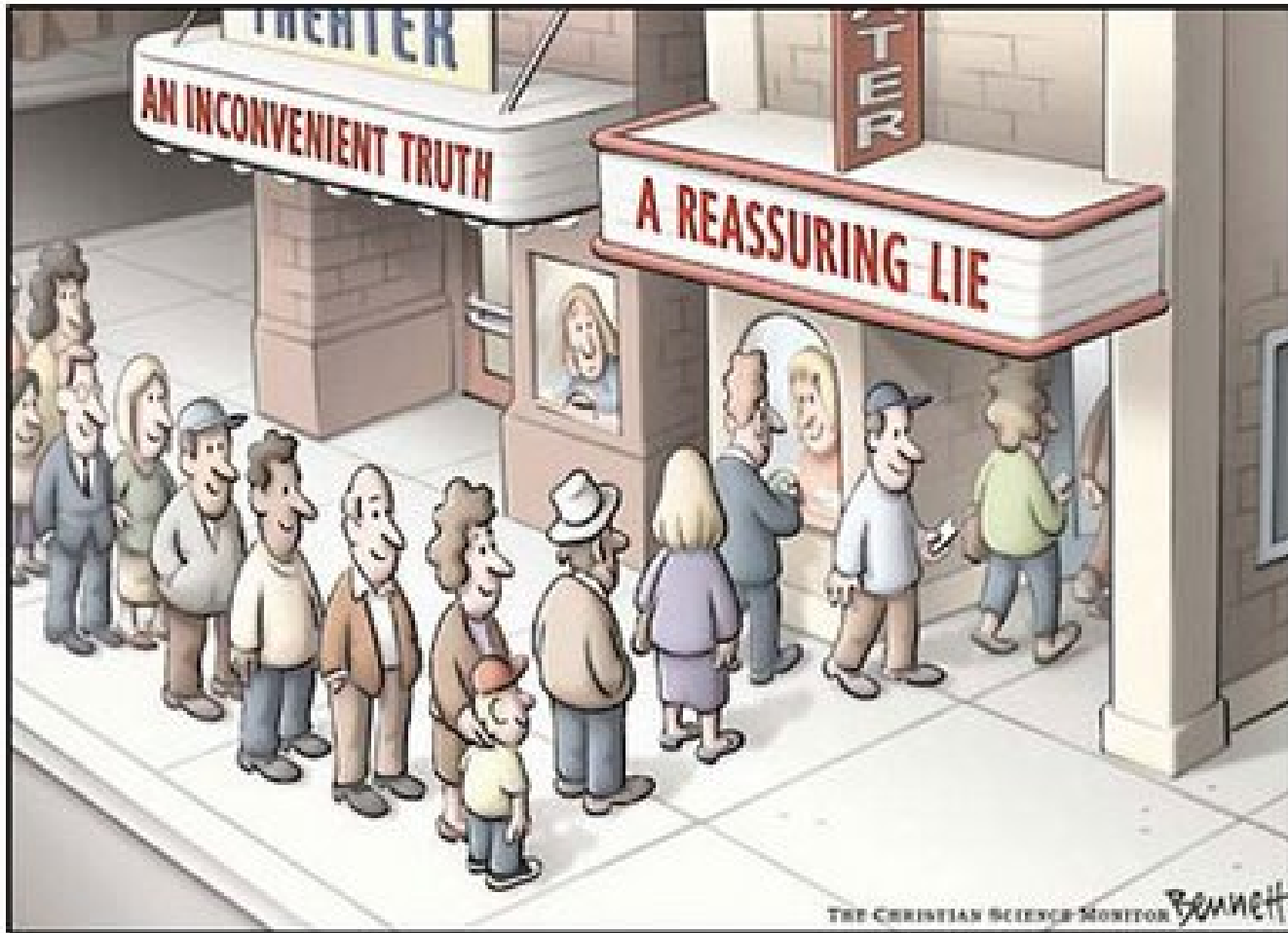
# APPROACHES: ADAPTATION PLANNING THROUGH SMART GROWTH

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# Understanding Climate Change



# Roadmap for Identifying Climate Change Vulnerabilities

## Getting Started

Define community goals and objectives and highlight priority issues and drivers for consideration throughout the assessment

### Hazards Profile

Explore relevant hazards, climate trends, and potential impacts as a starting point for considering community vulnerabilities

### Societal Profile

Evaluate strengths and vulnerabilities of the local population

### Infrastructure Profile

Identify the strengths and vulnerabilities of the built environment

### Ecosystem Profile

Consider the strengths and vulnerabilities of important natural resources

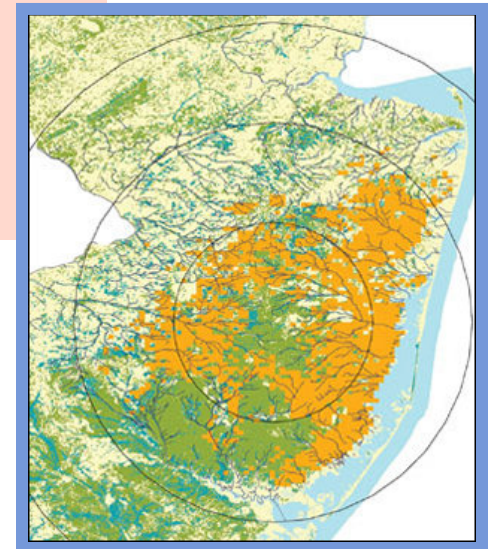
## Taking Action

Explore opportunities and challenges for risk reduction through education, planning, and regulatory processes

# Making Decisions with Imperfect Data

## Planning Areas that have...

	Low Vulnerability	High Vulnerability
High Risk	May be priority planning areas	Should be priority planning areas
Low Risk	Are unlikely to be priority planning areas	May be priority planning areas

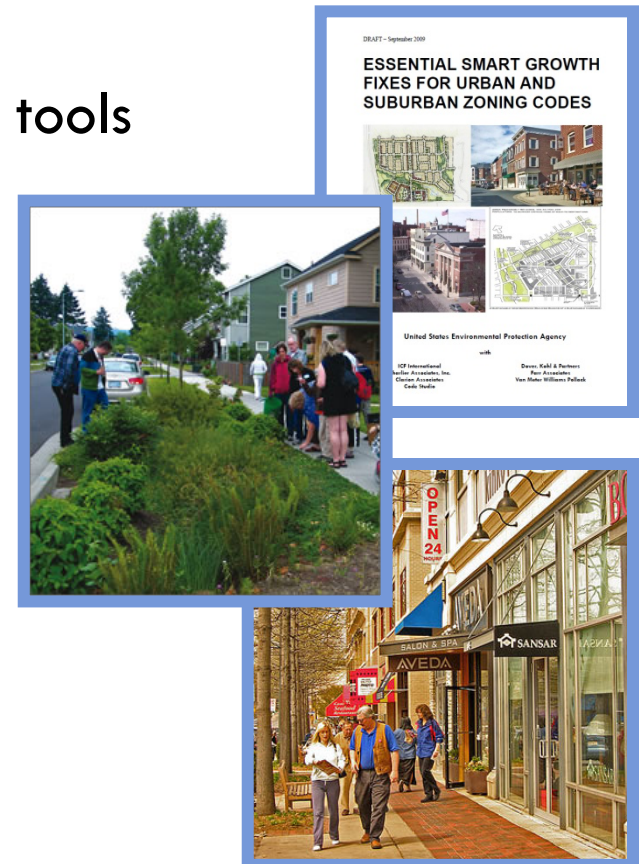


# Making the “climate connection”

- Climate adaptation planning is a natural extension of sustainable land use planning (e.g., smart growth)
- Focus on use of existing processes and tools for adaptation planning

## Three primary types of approaches:

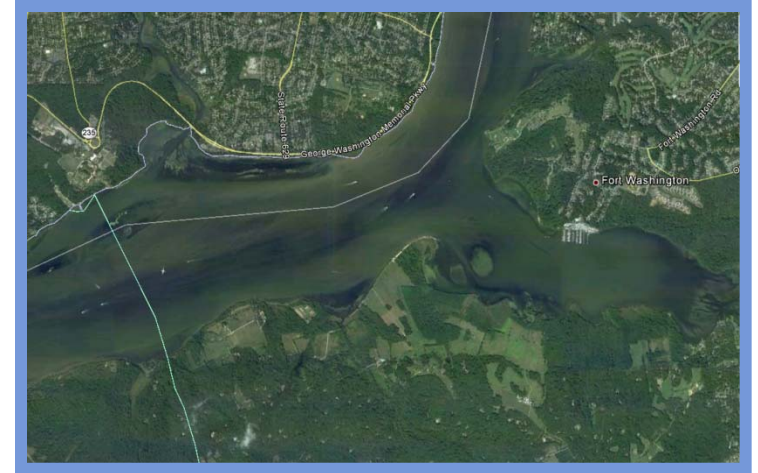
1. Protect vulnerable areas from development
2. Protect people and assets in vulnerable areas
3. Encourage sustainable development in appropriate, less-vulnerable areas



# Protect vulnerable areas from development

## Identify areas in the community that:

- Have limited or no development
- Have a higher vulnerability and risk to climate changes



## Protect these areas from future development

- Evaluate development incentives provided in vulnerable areas
- Adopt protective regulations for vulnerable areas
- Direct development away from vulnerable areas on large development sites
- Purchase and transfer of development rights
- Establish fund to purchase/acquire land in vulnerable areas

## Example Approach: Evaluate development incentives provided in vulnerable areas

- Review financial incentives and regulatory development policies
- Revise policies and incentives that inappropriately encourage development in vulnerable areas
- Make adjustments for future development
  - Link incentives to the comprehensive plan
  - Draft regulatory incentives to protect vulnerable areas (e.g., tie development bonuses to open space provision or TIF funds to rehabilitation of buffer areas)
  - Require an analysis of public funding dedicated to every project located in or encompassing a vulnerable area



# Protect people and assets in vulnerable areas

Identify vulnerable areas in the community

Traditional approaches:

- Engineered protective structures
- Retrofitting buildings
- Softer techniques to increase resiliency
- Relocating people or assets

Smart growth approaches:

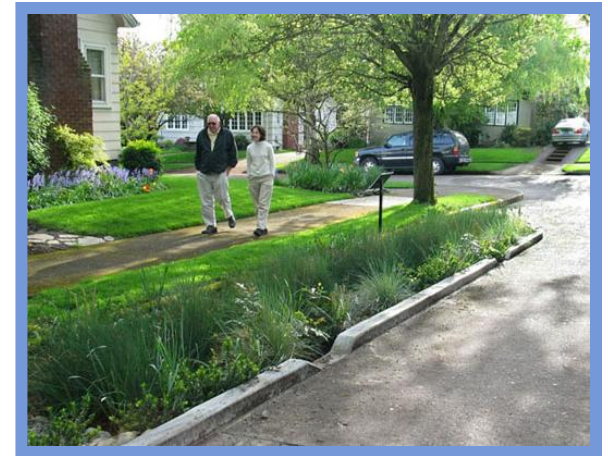
- Improve stormwater management approaches
- Adapt zoning and building codes to evolving risks
- Create special taxing and assessment districts to fund the protection of buildings and infrastructure
- Amend non-conforming use provisions to allow safer, sustainable redevelopment in vulnerable areas
- Identify transportation system vulnerabilities
- Implement integrated heat island and stormwater reduction strategies
- Use non-structural flood mitigation measures for buildings in floodprone sites





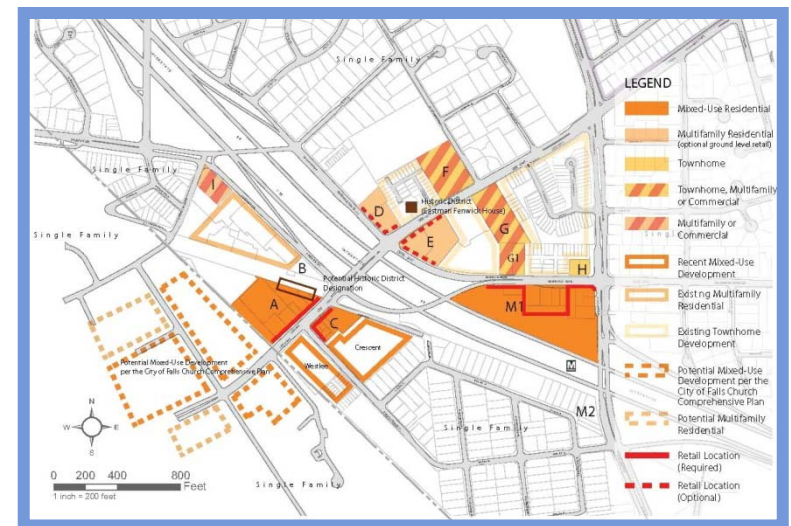
## Example Approach: Implement integrated heat island and stormwater reduction strategies

- Urban forestry
- Require cool technologies
  - Reflective roofing and green roofs
  - Pervious and light-colored pavement
- Green building standards
- Building codes
- Community involvement
- Improved street design
- Maintenance plans



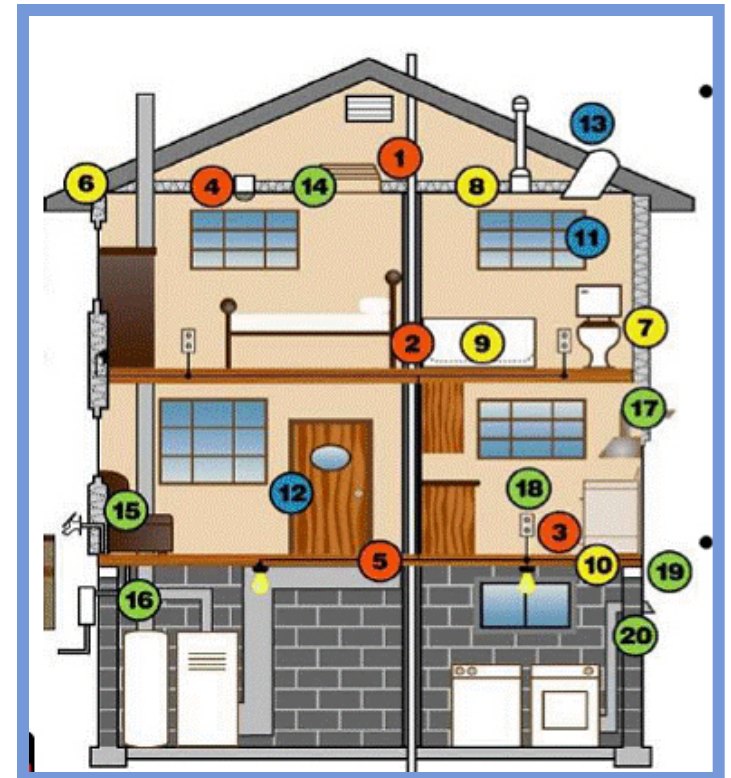
# Encourage sustainable development in appropriate, less-vulnerable areas

- Identify areas in the community expected to be less-vulnerable to climate change
- Compare less-vulnerable areas against areas prioritized for future development
- Determine whether any changes are required
- Encourage development in these areas
  - Promote infill development
  - Remove roadblocks to development in appropriate areas
  - Adopt complete streets design standards
  - Upgrade building code requirements
  - Incorporate passive survivability into new and existing projects



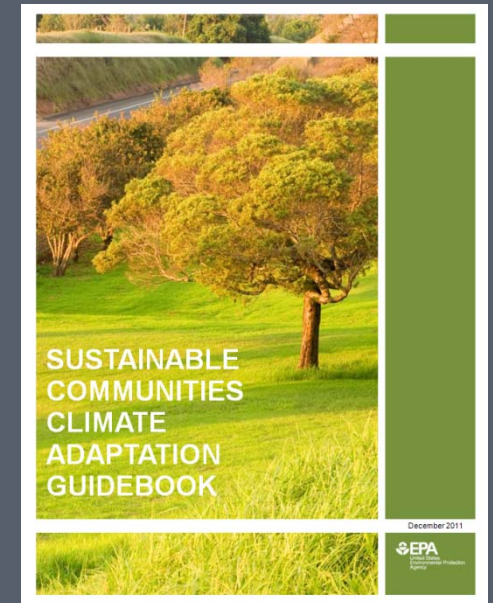
## Example Approach: Upgrade building code requirements

- Incorporate weather and climate vulnerable design criteria established in vulnerability assessment process
- Establish zoning areas with heightened building code requirements
- Create incentive programs tied to voluntary higher standards
- Consider adopting stretch or reach codes (International Green Construction Code)
- Adopt ordinances that give greater flexibility to building and zoning departments to approve projects certified under a third party system
- Incorporate passive survivability goals



# CONTACT INFORMATION

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# CITY OF FLAGSTAFF RESILIENCY STUDY



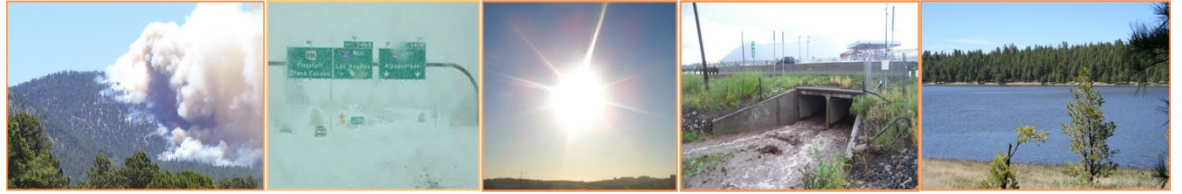
Stephanie Smith

Sustainability Specialist

City of Flagstaff, Arizona

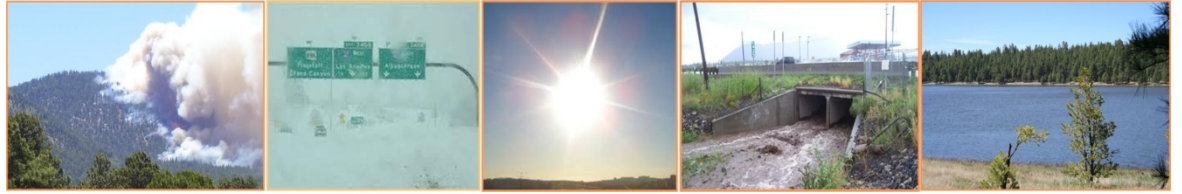
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# THE CITY OF FLAGSTAFF RESILIENCY STUDY

How can the City of Flagstaff reduce its vulnerability and build local resilience to climate variability and climate related disasters?



# CITY OF FLAGSTAFF RESILIENCY STUDY

City Manager assigned Core Team

Diverse perspectives and skills – Finance, Police, Utilities,  
Long-term Planning, etc.

Internal operations – focused

Consensus building process



# THE CITY OF FLAGSTAFF RESILIENCY STUDY

Time	Annual Average Temperature Projections	Other factors	Anticipated Impacts
2100	+ 5 °F to + 8 °F	Longer lasting heat waves ~ 2 weeks longer. Greater shifts in summer temperatures.	Longer growing season Fewer frost days More heat waves Increased forest fires Greater water shortages

Precipitation Projections	Anticipated Impacts
5 % decrease in annual average by 2100 compared to 1970 - 2000 for Northern Arizona.	Greater water shortages Increased flooding events

Snowpack and Streamflow Projections	Anticipated Impacts
Snowpack declines likely due to a shift in the jet stream and El-Nino patterns driving precipitation falls northward.	Greater water shortages Loss in winter recreation

# THE CITY OF FLAGSTAFF RESILIENCY STUDY

Primary System	Key Planning Areas
Emergency Services	Police and Fire Services, EMS, Disaster Response, Public Works
Energy	Energy Delivery and Assurance, Energy Demand and Cost
Forest Health	Forest Management, Wildlife and Vegetation, Public Infrastructure
Public Health	Public Health Infrastructure, People, Public Services
Stormwater	Buildings, Infrastructure
Transportation	Public Transportation, Transportation Infrastructure, Public Access, Rail, Airport
Water	Water Treatment Quality, Water Resources, Water Infrastructure



# THE CITY OF FLAGSTAFF RESILIENCY STUDY

## Vulnerability assessment methodology

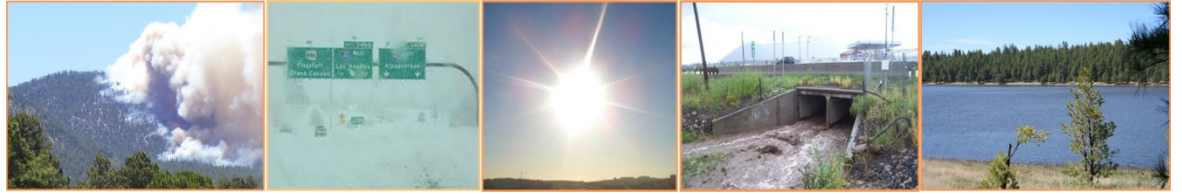
How climate variability could affect City operations?  
(Exposure and Sensitivity)

What City resources are available to respond? (Adaptive Capacity)

$$\text{Vulnerability} = \text{Sensitivity} + \text{Adaptive Capacity}$$

# THE CITY OF FLAGSTAFF RESILIENCY STUDY

		Sensitivity: Low → High				
		S0	S1	S2	S3	S4
Adaptive Capacity Low → High	AC0	V2	V3	V4	V5	V5
	AC1	V1	V2	V3	V4	V5
	AC2	V1	V1	V2	V3	V4
	AC3	PO	V1	V1	V2	V3
	AC4	PO	PO	PO	V1	V2



# THE CITY OF FLAGSTAFF RESILIENCY STUDY

## Risk assessment methodology

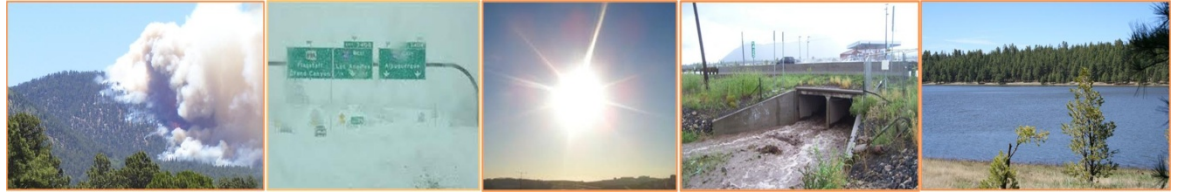
What is the function within City operations?

What is the degree of impacts? (Size of the population affected, life threatening, estimated costs)

What is the likelihood that the impacts will occur?

# THE CITY OF FLAGSTAFF RESILIENCY STUDY

Priorities/Risk	1 point	2 points	3 points
<b>A) Critical Function</b>	Maintain a non-critical function/ Improve a non-critical function	Improve a critical function/ Mend a non-critical function	Mend a critical function /Maintain a critical function
<b>B) Citizens Affected</b>	Few/ Less than half of Flagstaff's Population	Half Flagstaff's Population	Entire Flagstaff Population
<b>C) Life Threatening</b>	No	Uncertain	Yes
<b>D) Estimated Cost</b>	Low (up to \$1 Million)	Medium (~\$ 1 - \$7 Million)	High (~\$7 Million +)
<b>E) Probability</b>	Uncertain	Likely (>66%)	Very Likely (>90%)



# CITY OF FLAGSTAFF RESILIENCY STUDY

Prioritize risks and vulnerabilities of City operations

Leverage local and regional efforts

Develop a strategic policy that makes City operations more responsive to changes in climate



## QUESTIONS???

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