

# Sustaining Western Watersheds

## Forested Watersheds in a Hotter, Drier West: Meeting Adaptation Challenges

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# Objectives

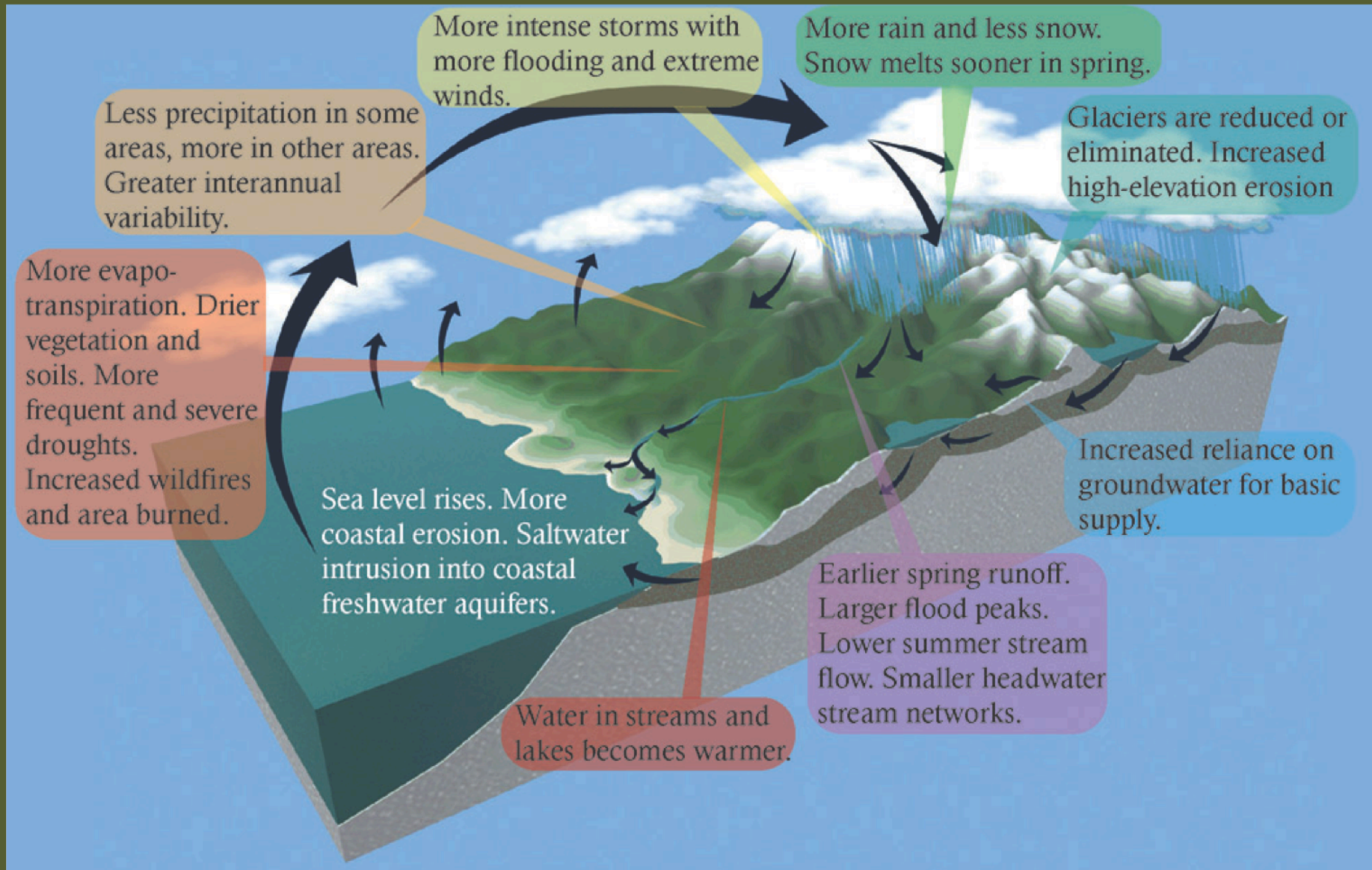
1. Review the status and future(s) of forested watersheds in the West
2. Describe
  - ▣ Major challenges for adaptation to climate-driven compound risks (drought-focused)
  - ▣ Examples of activities to address these challenges
3. Recommend some next steps – program delivery and policy support

# Western Watersheds – Where Adaptation and Conservation Must Come Together

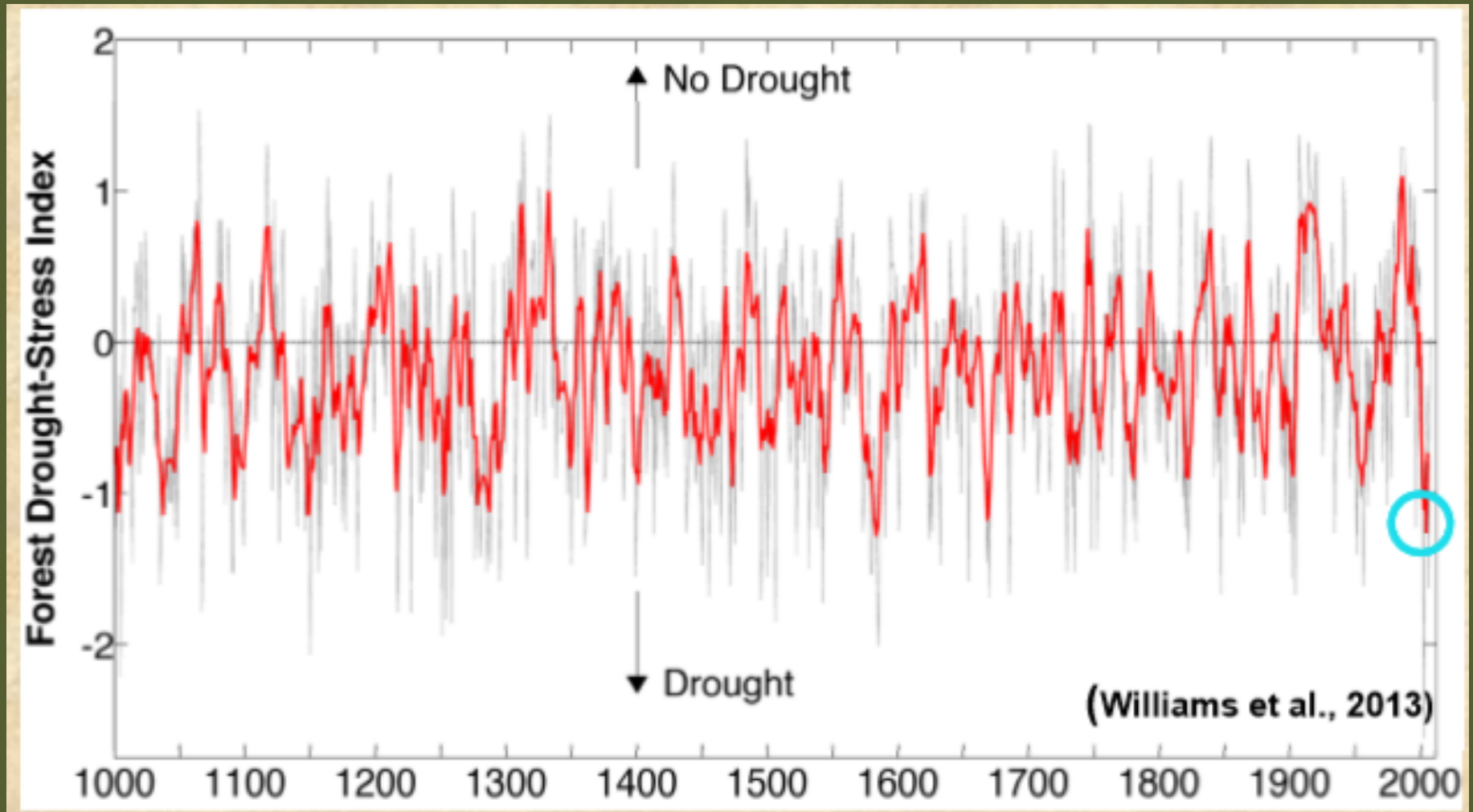
- Shape downstream options
- Multiple, connected stressors
- Multiple values and demands
- Intersections of important cycles: moisture, carbon, fire, other
- Present conditions vary



## Watersheds Part of an Even Bigger Picture...



# Drought – Major Driver and Forest Adaptation Challenge

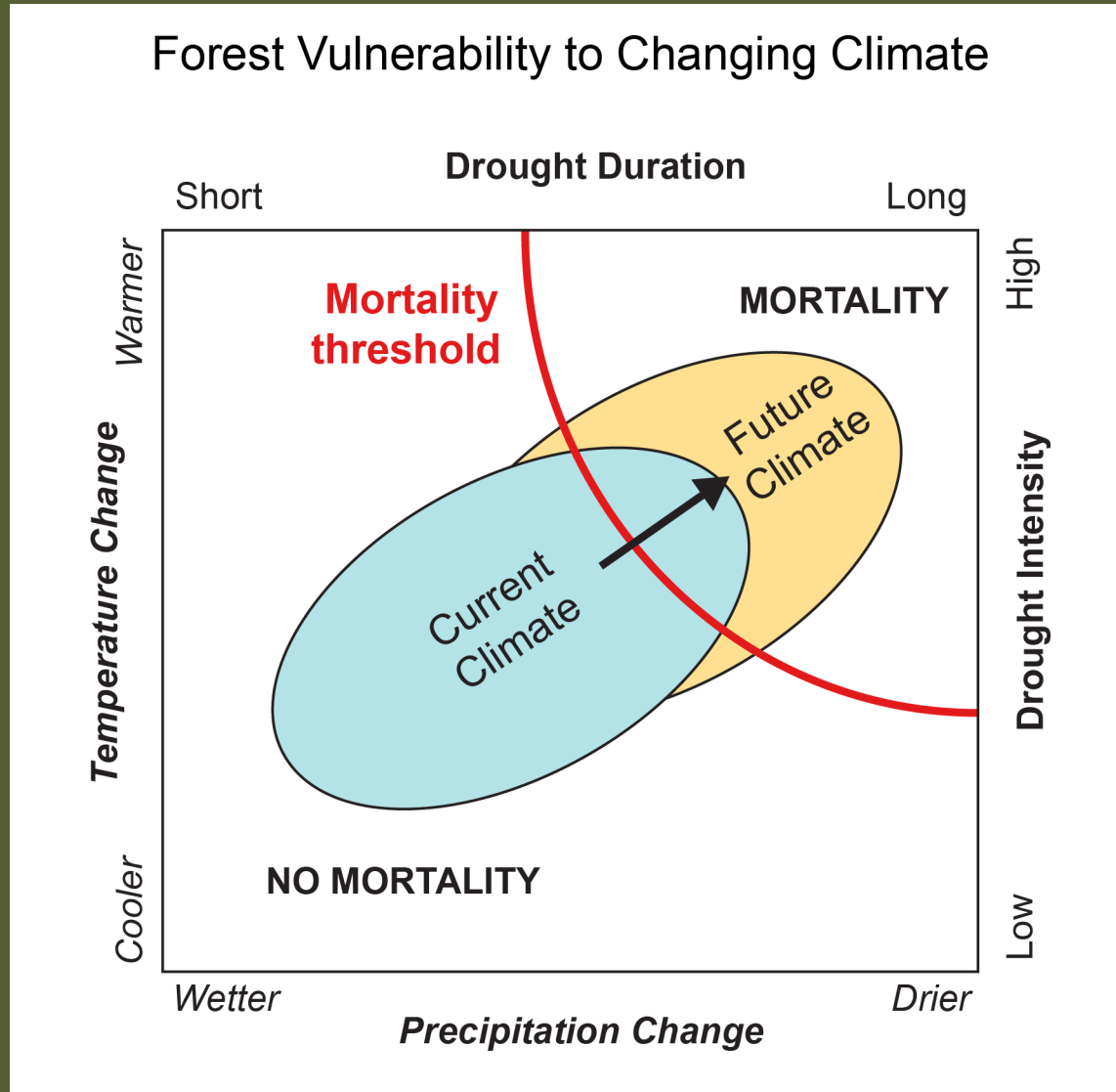


## Forested Watersheds in the West

- ❑ Forests are 23% land base. (23-30% by different estimates)
- ❑ Source for 58 % annual water supply. (58-75%)
- ❑ Federal lands (all land cover types) – 51% of land; 62% of water supply
- ❑ State and private lands – 49% of lands; 37% of water supply

Source: Brown et al. (2015). Update to 2010 RPA forthcoming

# Hot X Dry → Mortality



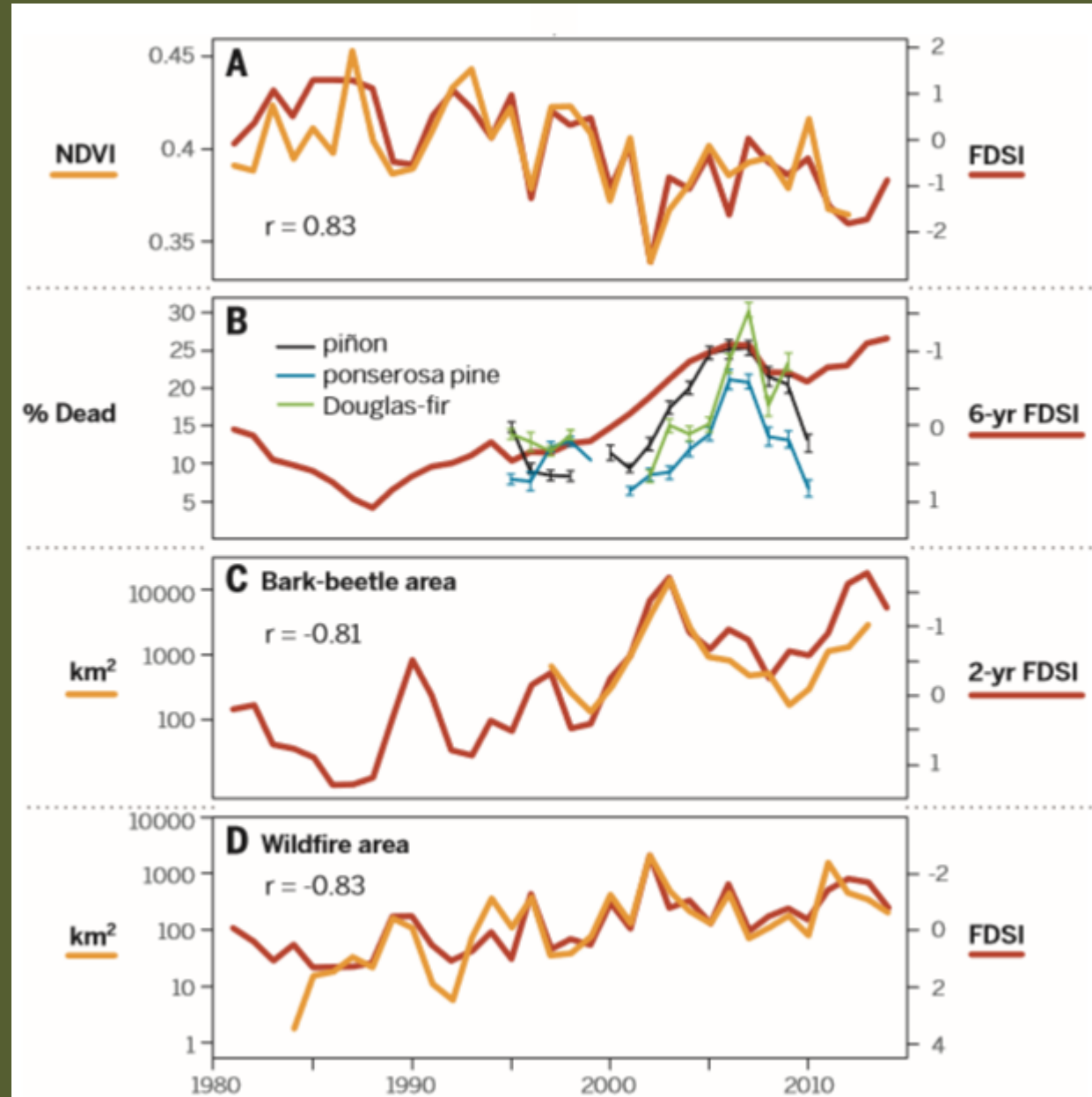
# Effects of Hotter Drought in Southwest Forests

Greenness

Mortality

Infestation

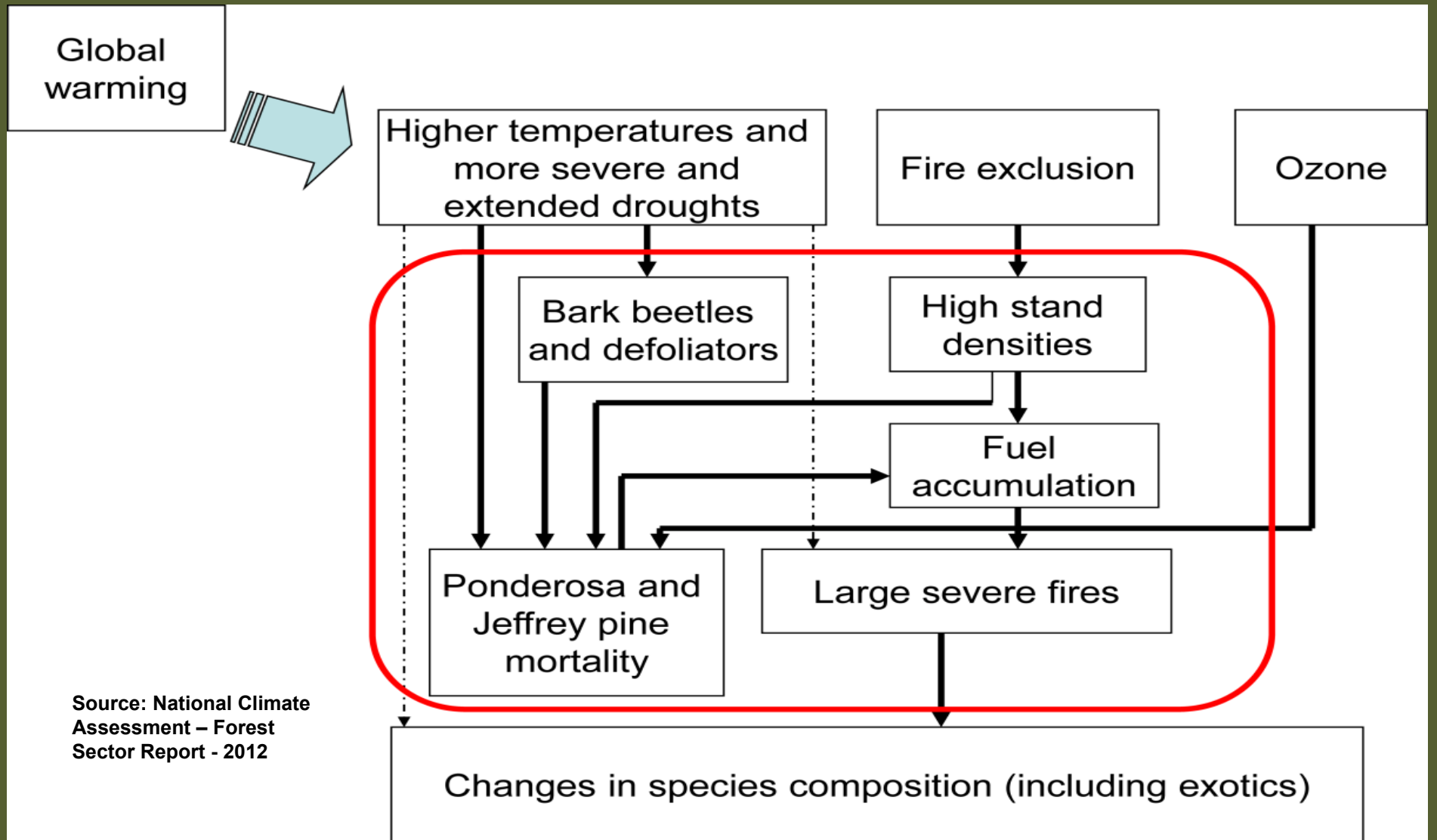
Burned Area



Source: A.P. Williams (2015)



# Stressor Complexes and System Changes



# Climate Change Impacts Forested Watersheds

## ❑ **Precipitation**

- ❑ Snow - quantity and persistence
- ❑ Rainfall – proportion of total and intensity in events

## ❑ **Long-term moisture stress**

- ❑ Regeneration conditions and ecosystem transitions
- ❑ Competitive advantage for invasive species
- ❑ Contributor to insect, disease, large-scale die offs

## ❑ **Wildfires**

- ❑ Length of fire season
- ❑ Fire Size
- ❑ Fire intensity and severity



# Federal Natural Resource Agencies- Adaptation Advances

President's Climate Action Plan - EO's: 13514, 13653, 13693

- ❑ **Vulnerability assessments/adaptation plans**
- ❑ **Employee education**
- ❑ **Science/management collaboration**
  - ❑ NIDIS (NOAA and partners)
  - ❑ CCAWWG – water resources science plan (USACE/BOR)
  - ❑ FS Planning Rule (USFS)
  - ❑ Regional science/management partnerships (All)
- ❑ **New institutional mechanisms**
  - ❑ LCC's (DOI)
  - ❑ Climate Science Centers (USGS)
  - ❑ Regional Hubs (USDA)
  - ❑ RISA's (NOAA)
- ❑ **Public/private partnerships**

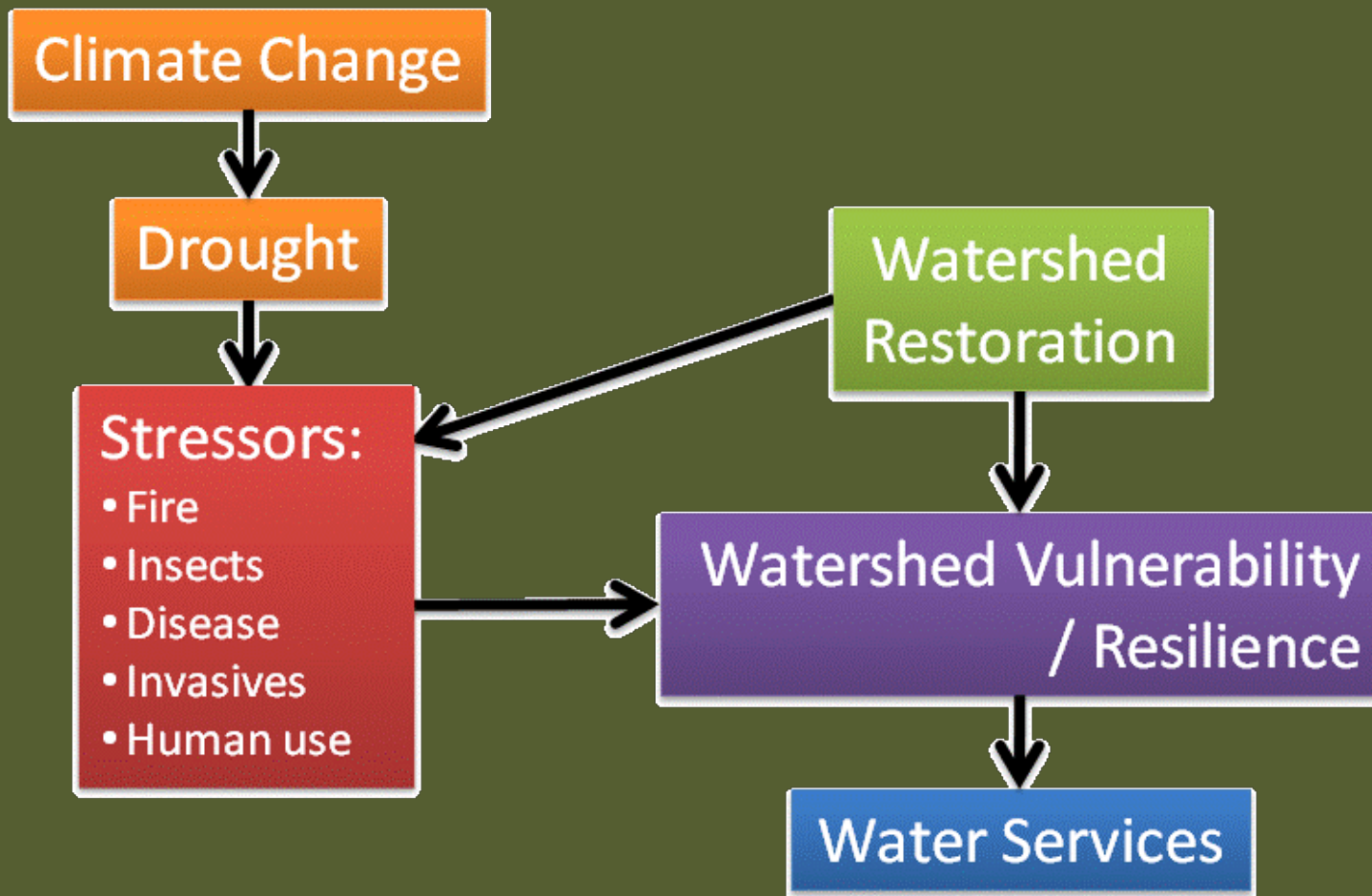
Source: Halofsky et al. 2014) USGCRP

# Ingredients for Success

## Watershed Restoration and Adaptation

- ❑ Risk-based priorities
- ❑ Risk management strategy
  - ❑ Connected and dynamic risks/opportunities
  - ❑ Adjustability
- ❑ Social and political ownership
  - ❑ Joint goals
  - ❑ Joint investment
  - ❑ Collaborative governance
- ❑ Capacity and will to implement

# Watershed Restoration as Risk Management



# Risk-Based Assessments of Western Watersheds

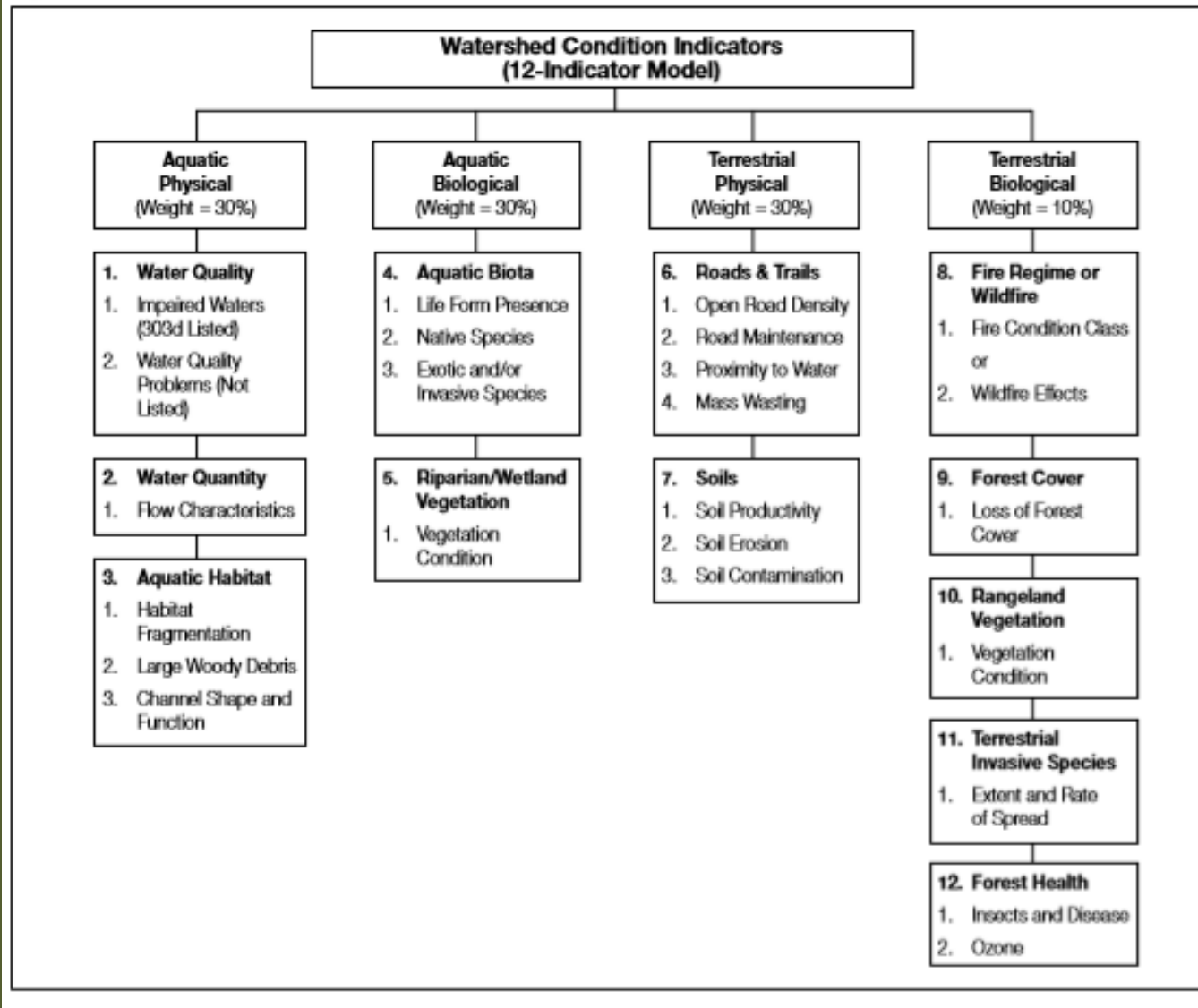
## Forest Service and Partners

Assessment	Scale	Stressors	Values
Forests-To- Faucets	HUC 12	Fire, Health, Development	Drinking Water
Resource Planning Act (RPA) 2010	ARS	Multiple with Climate Projections	Water Shortages
Water Shortage (Brown and Froemke 2012)	HUC 5	Multiple	Water Shortages
Watershed Condition Framework	HUC 6	Multiple	Ecological Conditions
Pilot Watershed Vulnerability Assessments	HUC 6	Multiple	Multiple
Western Water and Wildfire (AFF 2015)	HUC 12	Wildfire	Drinking Water

# Watershed Condition Framework

Source: USDA Forest Service (2011)

Figure 2.—Core national watershed condition indicators and attributes.



# Watershed Restoration – Goals for Building Resilience and Adaptive Capacity





# On-the-Ground Goals for Watershed Restoration

- Protect headwaters
- Manage disturbance patterns
- Connect fragmented parcels
- Discourage development in floodplains
- Direct grazing away from riparian areas
- Limit urban and agricultural pollution
- Keep rivers shaded by trees



# Actions to Meet Restoration Goals

## Examples:

- Treat fuels near communities

**Protect**

- Thin stands in watersheds

**Prepare**

- Reclaim roadbeds - **Repair**

- Relocate infrastructure

**Transform**

- Connect parcels - **Retain**



Source: USDA Forest Service

# Watershed Restoration Progress US Forest Service – 2011-2014

- ❑ Needs – fire and watershed – 65-82 million acres
- ❑ 300 priority watersheds (at risk)
  - ❑ 34 restored
  - ❑ 39 scheduled (2015-16)
  - ❑ 260 implementation plans
- ❑ Total treatment – 4.2 to 4.6 million acres/yr
  - ❑ 2.6 million acres aimed at watershed function
  - ❑ 1.7 million hazardous fuels
- ❑ Joint Chief's landscape program (FS/NRCS) – 26 projects

Source: USDA Forest Service 2015

# Barriers and Challenges in Pro-Active Adaptation



Mel Lewis, USFS, 1991

- ❑ *Opportunity **costs of** burgeoning demands for **responding** to fire and other events*
- ❑ *Managing **connected risks***
- ❑ *Building **collaborative capacity** for adaptive action*
- ❑ *Building **science** into mainstream, **dynamic** operations*

# Dealing with Fire:

## Impacts on FS Programs for Watersheds

- ❑ Fire management risen from 15% of agency budget (1995) to 52% (2014) projected to 67% (2030)
- ❑ Reductions in non-fire capacity – National Forests
  - ❑ Non-fire staff levels ↓ 44%
  - ❑ Vegetation management ↓ 24%
  - ❑ Roads ↓ 46%
  - ❑ Deferred maintenance ↓ 95%
  - ❑ Wildlife and fish habitat management ↓ 18%
  - ❑ Land management planning ↓ 64%
  - ❑ Inventory and monitoring ↓ 35%

# Watershed Restoration: Revising Policies for Coordinated Implementation

## 2014 Farm Bill implementation

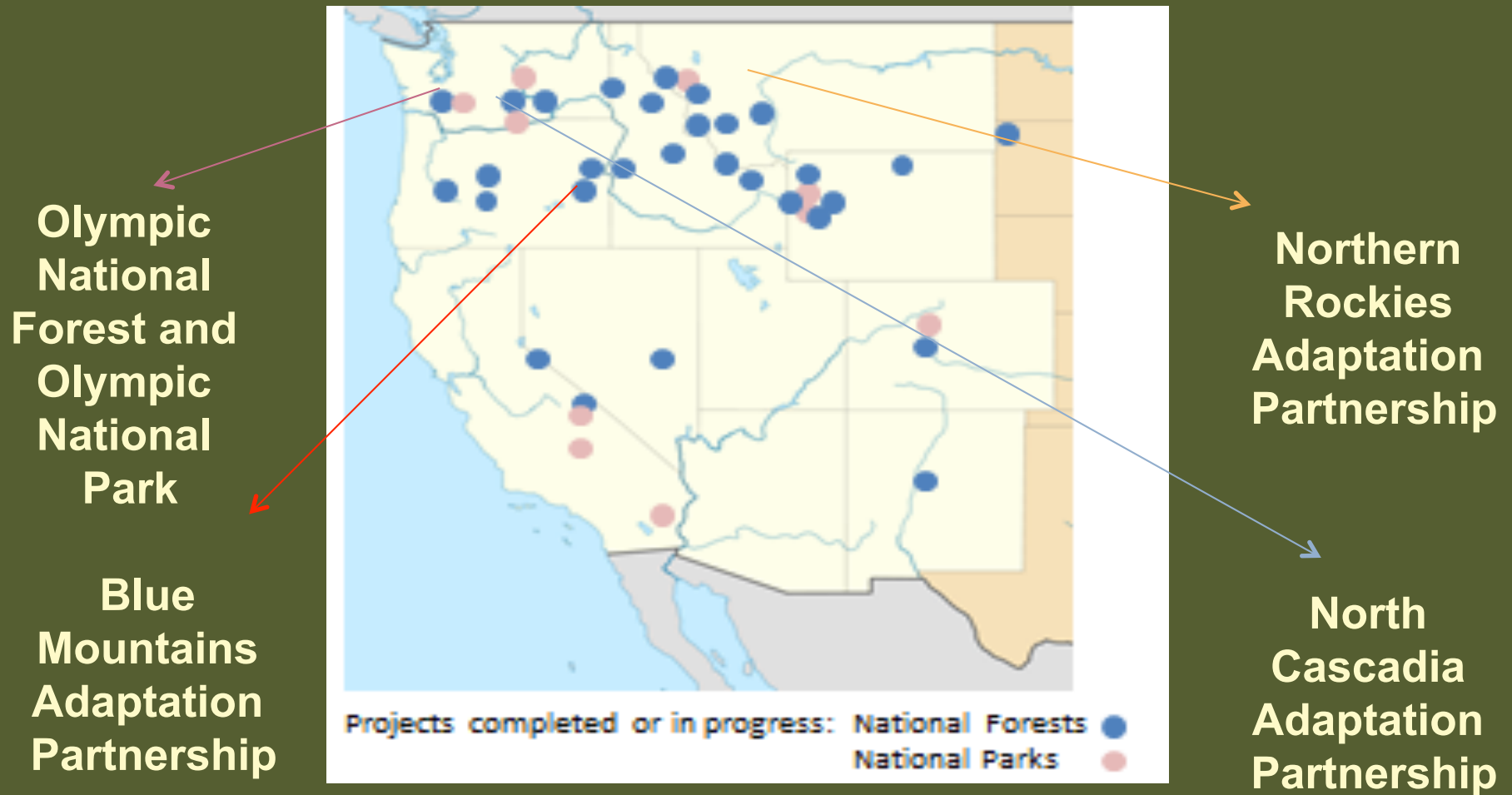
- ❑ Designations for **priority watersheds** – insect and disease (FS)
- ❑ Streamlining **conservation programs** (NRCS)
  - ❑ EQIP, Regional Conservation Partnership Program, Soil Health Initiative, and others
- ❑ **Budget integration**: new Integrated Resource Restoration (IRR) and Landscape Scale Restoration BLI's (FS)
- ❑ Good Neighbor and Stewardship Contracting authority – **states and private sector work on federal lands** (FS)
- ❑ Extension of Collaborative Forest Landscape Restoration Program (CFLRP) – 23 projects with expansion for **leveraged, large scale action**. (FS)

# Public/Private Partnerships for Implementing Watershed Restoration - Models for the Future

- Denver Water Board (CO)
- Flagstaff Watershed Protection Project (AZ)
- Santa Fe Municipal Watershed Program (NM)
- Sierra Nevada Restoration Project (CA)
- Ashland Forest Resiliency Stewardship Project (OR)
- Rio Grande Water Fund (AZ, NM)
- North Cascades Adaptation Partners (WA)
- Others...



# Research Management Partnerships Adaptation Partners (West)



Source: USDA Forest Service



# Aspirations for Policy/Program Change



## Enabling Adaptive Actions

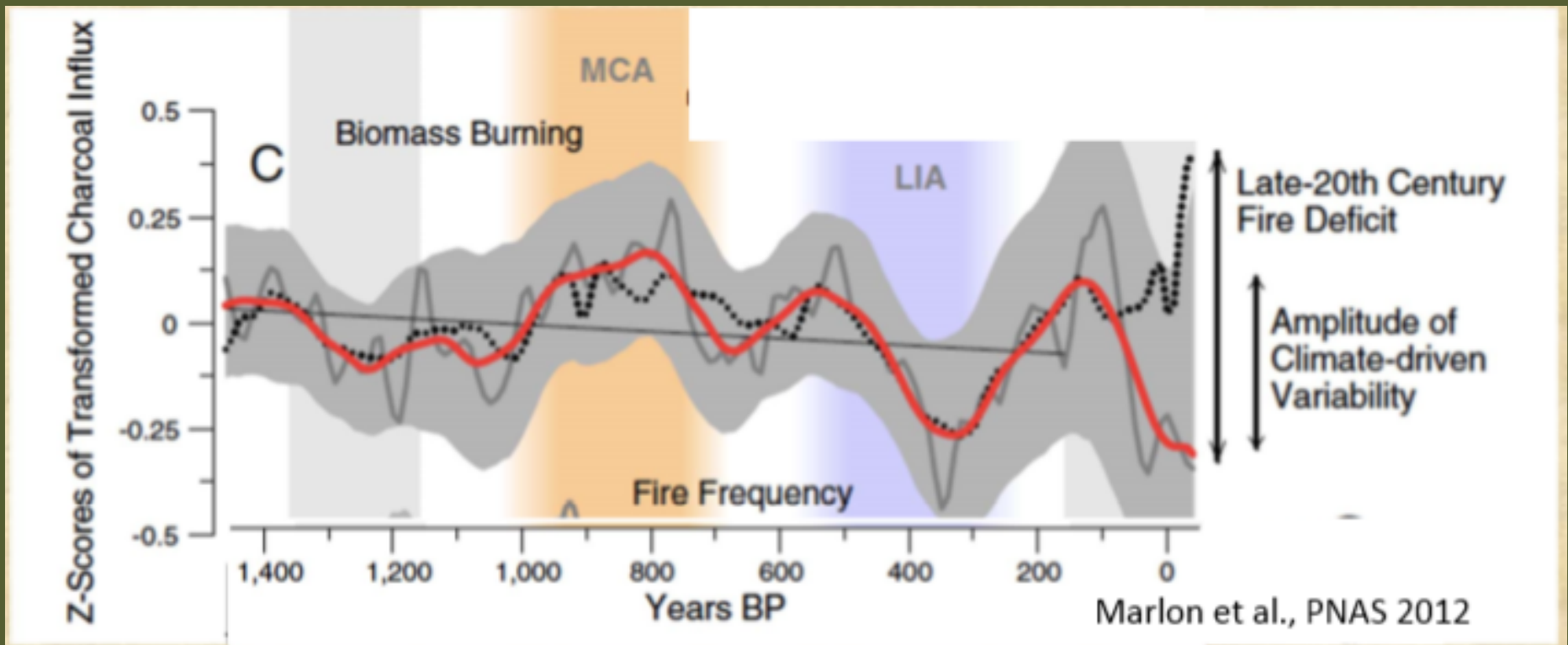
1. Mainstream **risk-based priority** setting
2. Finance collaborative ventures and **joint goals** for watershed resilience
3. Remove **barriers** to implementation, coordination, and experimentation
4. Rebalance funding mixes from response expense to **resilience investment**
5. “Rewire” **behavioral incentives** for sharing and mitigating climate-driven risks
6. Reward high performance in **science-based innovation** and delivery

**Thank You !**





# Along with Drought Comes Fire

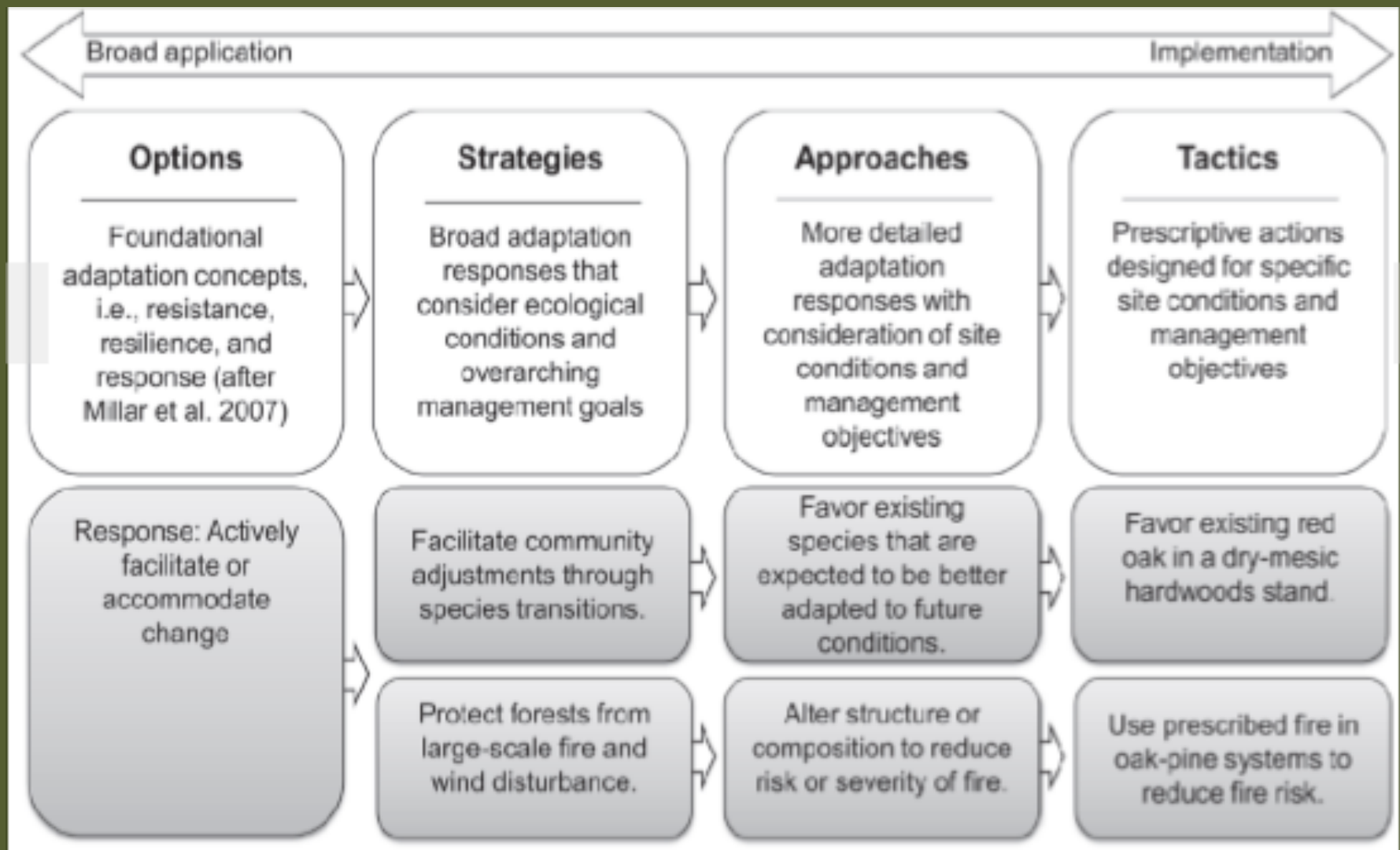


# Watershed Restoration Goals

**Retain and repair** logical/social/economic system functions to

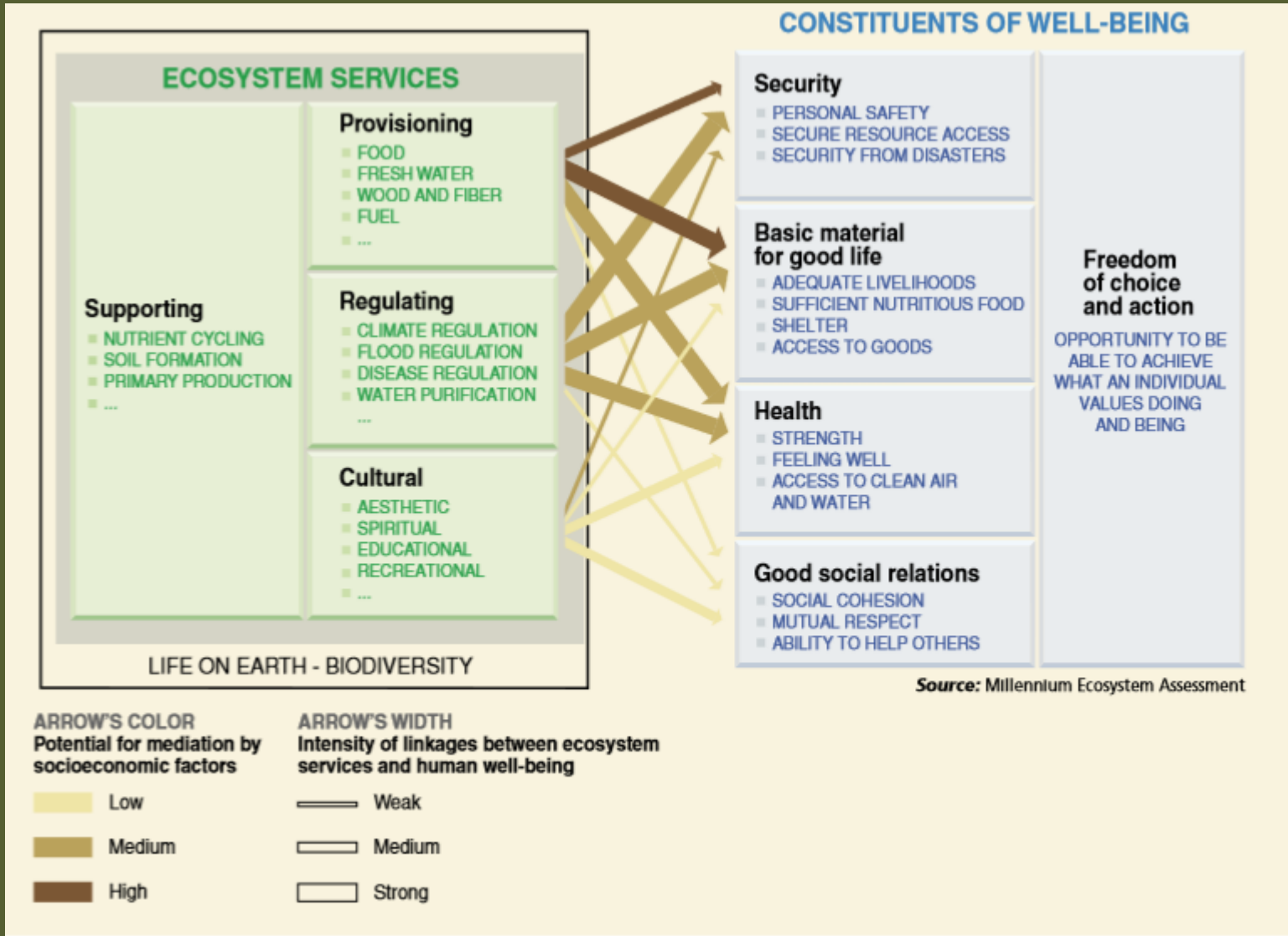
- Increase **resistance**
- Promote **resilience, and/or**
- Facilitate **transition**

in **preparation and/or response** to multiple, connected changes and stresses.



From Janowiak et al. (2011)

# Ecosystem Services and Forested Watersheds



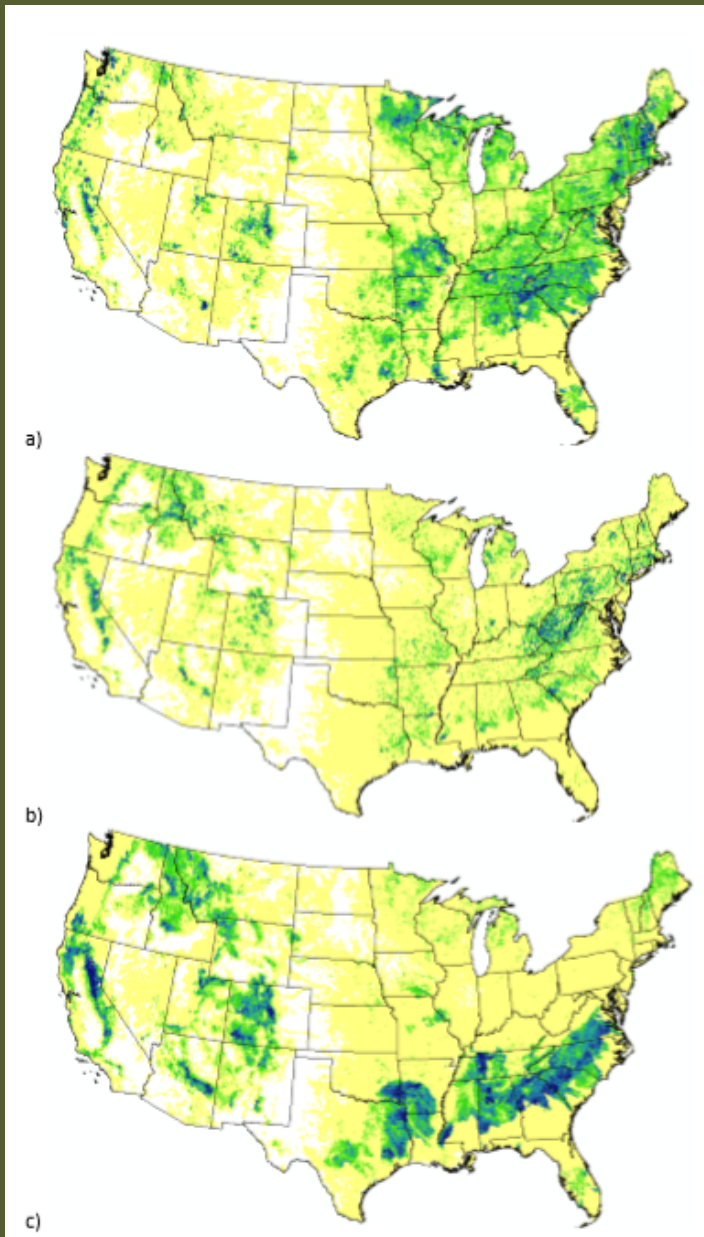
Source: World Resources Institute 2015

# Threats to Forest Watersheds for Drinking Water

**Development**

**Insects and Disease**

**Wildfire**



Source: USDA Forest Service (2015) Forests-to-Faucets  
Database  
[http://www.fs.fed.us/ecosystemservices/FS\\_Efforts/  
forests2faucets.shtml](http://www.fs.fed.us/ecosystemservices/FS_Efforts/forests2faucets.shtml)



# Watershed Vulnerability Assessments – National Forest Pilots



Source: Furniss et al. (2013)

# Wildfire – Watershed Costs

- ❑ Water treatment costs
- ❑ Infrastructure repair and replacement
  - ❑ Sediment clean out
  - ❑ Flood damage
- ❑ Loss of water-based recreation
- ❑ Water temperature increases – aquatic systems
- ❑ Water shortages
- ❑ Ground water depletion