Resource Management and Climate Change Adaptation Strategies

USDA Forest Service, Region 1

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Summary and Assumptions of Trends

In the Northern Rockies

- Increase air temperature
- Increase precipitation *(for all periods except summer decrease)*
- Decrease snow accumulation and earlier spring melt
- Decline in summer soil moisture *(earlier snowmelt and increased summer evapotranspiration)*
- Mixed rain and snow watersheds become rain dominant
- Snow dominant watersheds transition to mixed rain and snow

  - *Snover, 2013 – UW – CIG – R1 Climate Primer*

Summary and Assumptions of Trends related to vegetation

In the Northern Rockies

- expect warmer temperatures, similar precipitation, with dryer summers, resulting in **increasing moisture deficits** *(Snover 2013, Littell 2009)*
- Expect **increase in fire** severity, amount and size *(Dillon 2011, Littell 2010, Keane 2012, Keeling and Sala 2012 Turner 2012)*
- Expect **increasing bark beetle activity** *(Bentz 2013)*
- Expect **intolerant** to shade tree **species to cope more effectively** with possible future climate compare to tolerant species *(Chmura et al. 2011)*
- **Potential for persistent shifts in vegetation** composition, structure, and functional type *(Loehman et al. 2011, Westerling et al. 2011, Marlon et al. 2012)*

Restoration Tactic Assumptions to increase Resiliency

- Restoring a higher percentage of intolerant tree species such as **ponderosa pine, larch, western white pine,** should enable the forests to cope more effectively with climate and increasing disturbance
  - However, fire in **ponderosa pine forests may have lethal effects more frequently** if physiological stress occurs as a result of increasing winter **drought** *(Keeling and Sala 2012)*

- **Reducing forest density** should help the forest cope with increasing moisture deficits and severe fire

- **Restoring** size and age class diversity of forest patches and the **pattern** of those conditions should assist in limiting disturbance in any one time step and encourage forest regeneration *(Turner 2012)*

- Expect more the drought resistant species to increase in extent

Vegetation Treatment Considerations

- Dry Forest Ponderosa Pine
  - PCT, commercial thinning, and where feasible, understory prescribed fire, reduce forest density in all successional stages to reduce moisture deficits, effects from bark beetles and extreme fire behavior
  - Planting on dry Eco tones may not be advisable
- White Pine and Larch Forest
  - Continue to aggressively plant rust resistant western white pine and larch on appropriate sites while increasing reforestation of ponderosa on current grand fir and Douglas-fir sites
  - Use silvicultural prescriptions to reduce forest density through thinning reducing moisture stress
  - Prune young white pine stands to reduce blister rust
  - Carefully consider larch planting regarding potential future soil moisture deficits
- Whitebark Pine
  - Thinning mixed conifer stands to maintain WBP and reduce density and stocking
  - Manage Wildfire and prescribed burning to increase spatial heterogeneity
  - Regenerate sites having remnant levels of whitebark pine and regeneration via natural regeneration or planting rust resistant stock if access is reasonable
- Lodgepole Pine and Aspen
  - Restore lodgepole pine landscape spatial heterogeneity through a combination of regeneration harvests, prescribed fire and managed wildfire for resource benefits
  - Restore aspen as part of within stand diversity

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Hydrological Considerations

- Harding roads
  - *increasing culvert size, paving, larger ditches*
- Road Improvements
- Prescribed fire
- Riparian plantings

R1 Adaption Strategy Initiatives

- Integrated Restoration Strategy (IRPS)
- Adaptive Management Research Framework (AMRF)
- Northern Rockies Adaption Partnership (NRAP)
- R1 broadscale monitoring strategy

Integrated Restoration Strategy (IRPS)
(2011)

Goal

- Manage priority fire-adapted watersheds and landscapes in an integrated fashion to **promote resiliency and sustainability** of natural and social resources consistent with Forest and Grassland Plans.
- It provides resource information on **values that may be vulnerable or at risk to specific agents of change**, including disturbance hazards, to help units develop integrated projects.

Objectives

- Develop a scalable Ecosystem Management assessment and decision support system
- Systematically assess vulnerability of Key Elements to stressors throughout the Region
- Set the stage for identification of multiple restoration and protection opportunities,
- By 6th code watershed reporting units

Integrated Restoration and Protection Strategy Framework: 19 Key Elements (Scenarios) Associated With 6 Themes

- Theme 1 – Vegetation Resilience
- Theme 2 – Terrestrial Species Habitat
- Theme 3 – Watershed Management
- Theme 4 – Aquatic Species
- Theme 5 – Recreation Settings and Opportunities
- Theme 6 – Public Safety and Infrastructure Protection: Addressing Current MPB Outbreak and Fire Risks to Communities, Recreation Sites and Infrastructure.

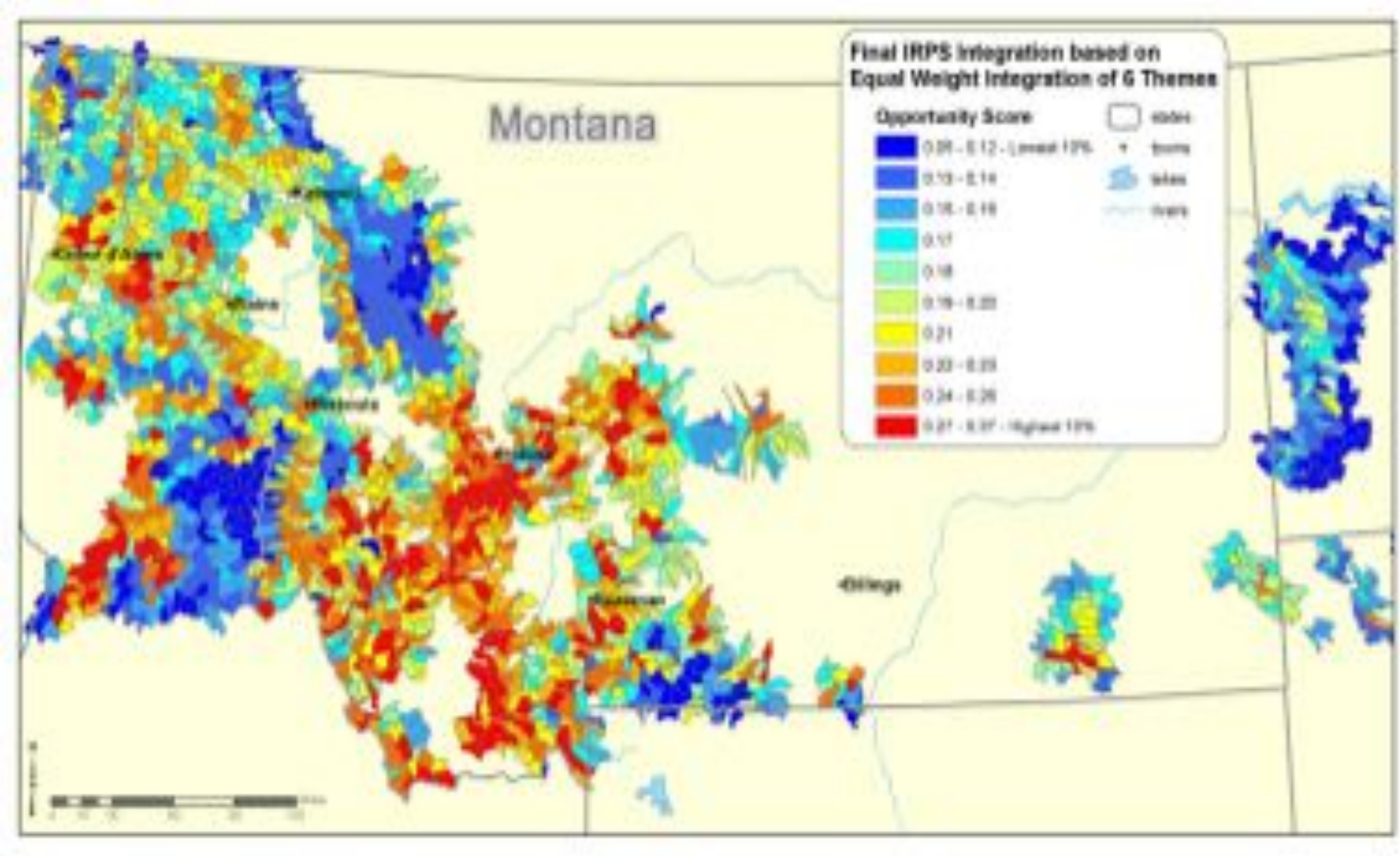
Integrated Restoration Protection Strategy

- Weighted important values/indicators and risk to create map of priority watersheds (using current and projected risk)
- HUCS scored for highest opportunities for management to improve resiliency for the 6 themes
- **Preliminary platform for climate change adaptation strategy**

19 Key Elements (Scenarios)

- **Theme 1 – Vegetation Resilience**
  - Scenario 1a*: Community Fire Resilience*
  - Scenario 1b*: Vegetation Resilience and Current Departure from Desired Conditions in Forested areas addressing resiliency and vulnerability*
  - Scenario 1c: *Vegetation Resilience and Vulnerability in non-forested areas*
- **Theme 2 – Terrestrial Species Habitat**
  - Scenario 2a: *Whitebark Pine*
  - Scenario 2b: *Low Elevation Dry Forest Communities*
  - Scenario 2c: *Dry Shrublands (Low Elevation Sagebrush)*
  - Scenario 2d: *Aspen*
  - Scenario 2e: *Woody Draws*
  - Scenario 2f: *Mixed Grass Prairie*
  - Scenario 2g: *Riparian, wetland and seeps*
  - Scenario 2h: *Big game Winter Range*
  - Scenario 2i: *T&E Core grizzly bear habitat*
- **Theme 3 – Watershed Management**
  - Scenario 3*: Watershed Quality (Sediment)*
- **Theme 4 – Aquatic Species**
  - Scenario4*: Threatened, Endangered, and Sensitive Fish Species*
- **Theme 5 – Recreation Settings and Opportunities**
  - Scenario 5a: *Safety*
  - Scenario 5b: *Investment Protection*
  - Scenario 5c: *Recreation Setting Restoration*
  - Scenario 5d: *Scenic Integrity Restoration*
  - Scenario 5e: *Scenic Integrity Protection*
- **Theme 6 – Public Safety and Infrastructure Protection: Addressing Current MPB Outbreak and Fire Risks to Communities, Recreation Sites and Infrastructure.**
  - Scenario 6a*: Community Fire Resilience*
  - Scenario 6b: *Recreation site Safety*

Integrated Restoration Protection Strategy



Adaptive Management Research Framework (AMRF)

- Platform for discussing opportunities to identify, promote, and pursue funding for basic and applied monitoring/research
- Format to assess management action outcomes, quantitatively reviewed to adapt or continue management actions
- **Design and build monitoring programs testing assumptions – including effectiveness of climate change adaptation tactics.**

R1 vulnerability assessment pilots and climate change primers

- Vulnerability, Exposure, and Sensitivity in Restoring and Maintaining the Adaptive Capacity of **Forest Landscapes** in the Northern Region of the Northern Rocky Mountains
- Incorporating Climate Change Impacts into **Reforestation and Revegetation** Prescriptions
- Climate Change **Watershed Vulnerability** Assessment (Gallatin and Helena NF)
- The Lolo National Forest **Watershed Vulnerability** Assessment
- Region 1 **Fire-**Climate Synthesis

Northern Rockies Adaptation Partnership

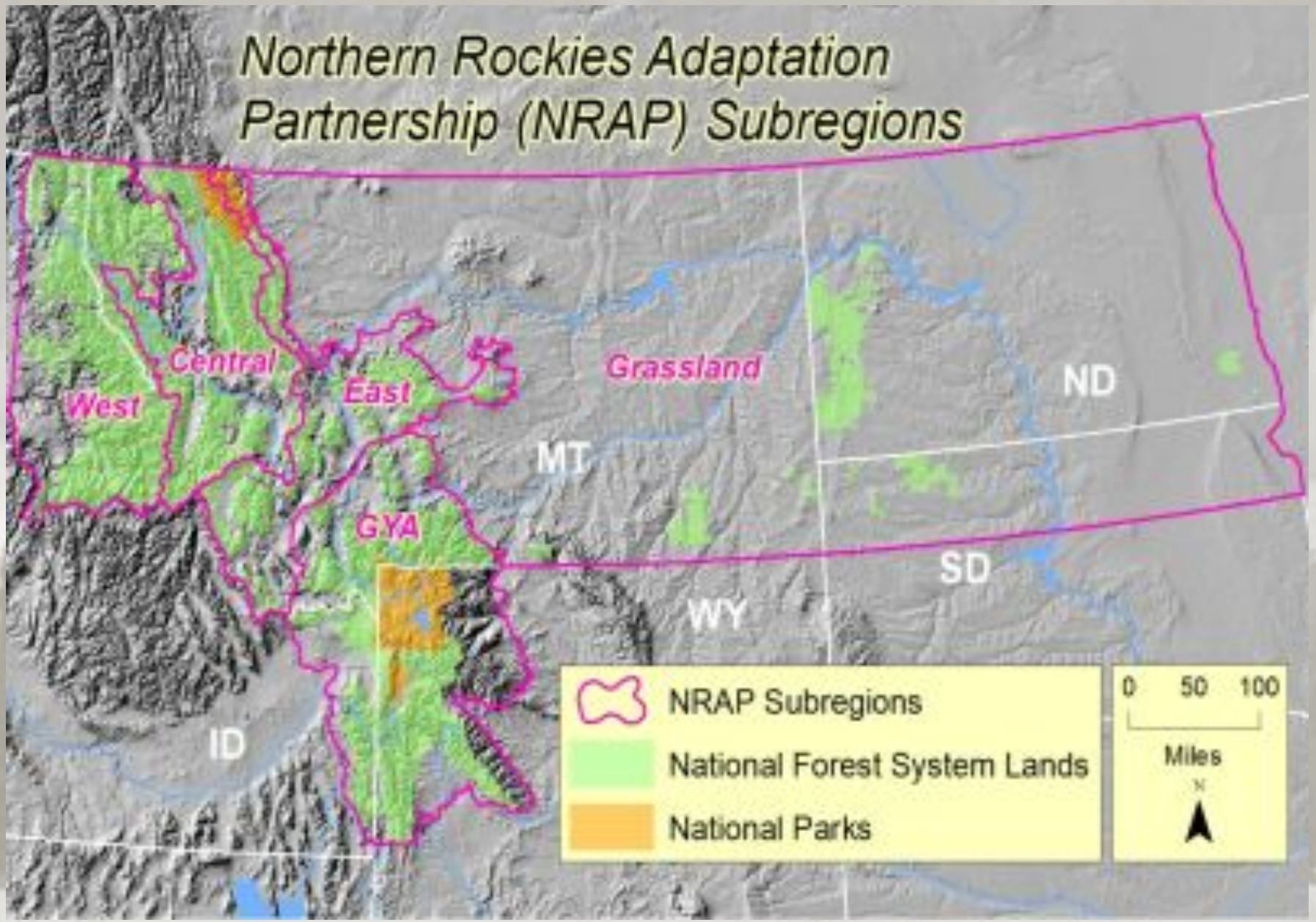
Objective:

- Provide the **framework and tools for agency and non-agency resource managers to incorporate the best available science** into landscape/planning assessments, FS land management and NPS general management planning components, broad scale monitoring efforts, project level design, NEPA analysis, conservations strategies, and State Wildlife Action Plan updates.
- Provide a synthesis of best available scientific information to **assess climate change vulnerability** and **develop adaption options** for the five NRAP subregions that can be used to understand and mitigate potentially adverse effects of climate change on natural resources and ecosystem services.

Northern Rockies Adaptation Partnership

Objective:

- Conduct a landscape-scale vulnerability assessment
- Develop associated adaptation strategies
- Educate and engage
- Conduct workshops for each subregion


Northern Rockies Adaptation Partnership (NRAP) Subregions
West
Central
East
Grassland
GYA
MT
ND
SD
WY
ID
NRAP Subregions
National Forest System Lands
National Parks
0 50 100
Miles
N

Key Resources

Resource chapters:

climate trends

Hydrology

Fisheries

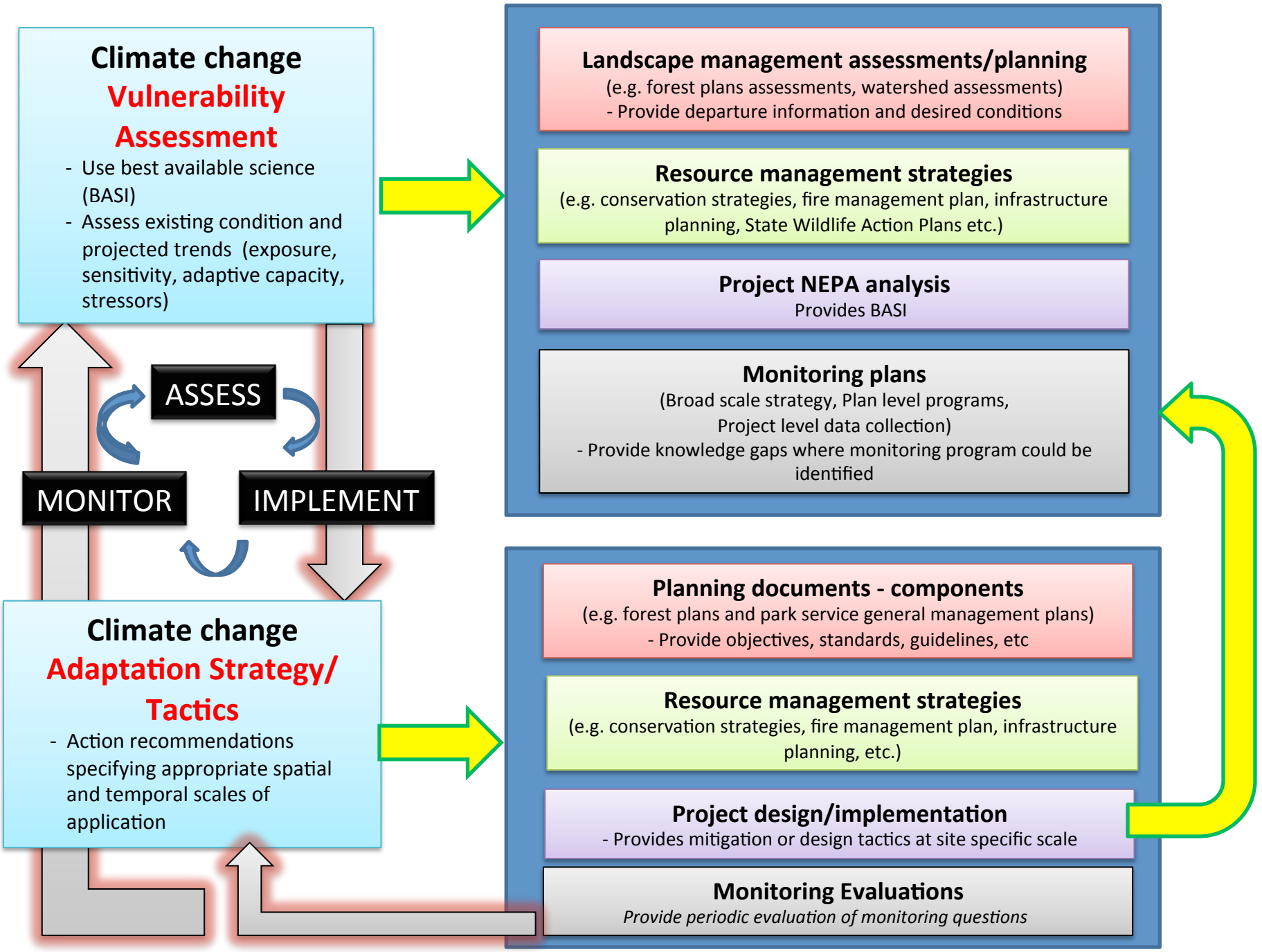
Wildlife

Forested and non-forested vegetation

Disturbance regime

Recreation

Ecosystem Services


Climate change
Vulnerability Assessment
- Use best available science (BASI)
- Assess existing condition and projected trends (exposure, sensitivity, adaptive capacity, stressors)
ASSESS
MONITOR
IMPLEMENT
Climate change
Adaptation Strategy/ Tactics
- Action recommendations specifying appropriate spatial and temporal scales of application
Landscape management assessments/planning
(e.g. forest plans assessments, watershed assessments)
- Provide departure information and desired conditions
Resource management strategies
(e.g. conservation strategies, fire management plan, infrastructure planning, State Wildlife Action Plans etc.)
Project NEPA analysis
Provides BASI
Monitoring plans
(Broad scale strategy, Plan level programs, Project level data collection)
- Provide knowledge gaps where monitoring program could be identified
Planning documents - components
(e.g. forest plans and park service general management plans)
- Provide objectives, standards, guidelines, etc
Resource management strategies
(e.g. conservation strategies, fire management plan, infrastructure planning, etc.)
Project design/implementation
- Provides mitigation or design tactics at site specific scale
Monitoring Evaluations
Provide periodic evaluation of monitoring questions

Broad scale monitoring strategy

Objective:

- **Provide framework to assess and detect changes from climate change effects to resources (selected indicators)**