



INVENTORY AND MONITORING OF GROUNDWATER-DEPENDENT ECOSYSTEMS: PROTOCOL IMPLEMENTATION AND RESULTS FOR NATIONAL FORESTS AND GRASSLANDS

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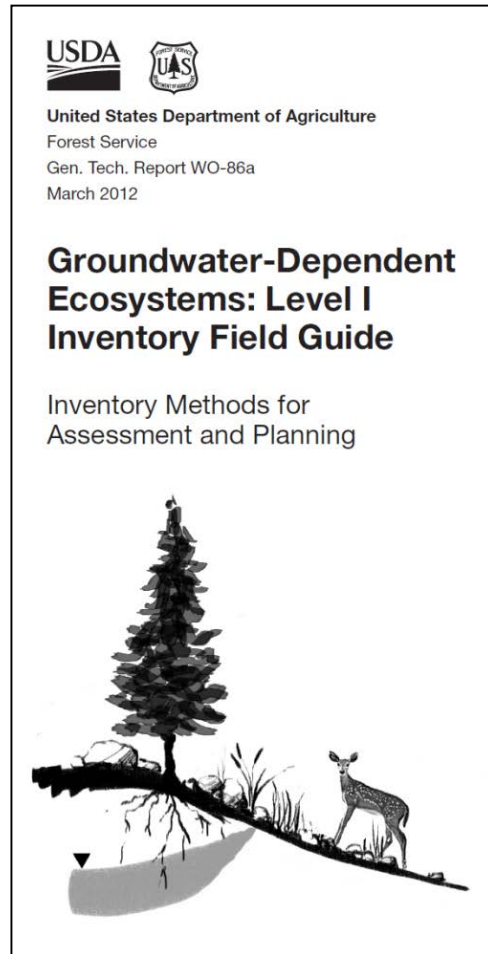


Kate Dwire

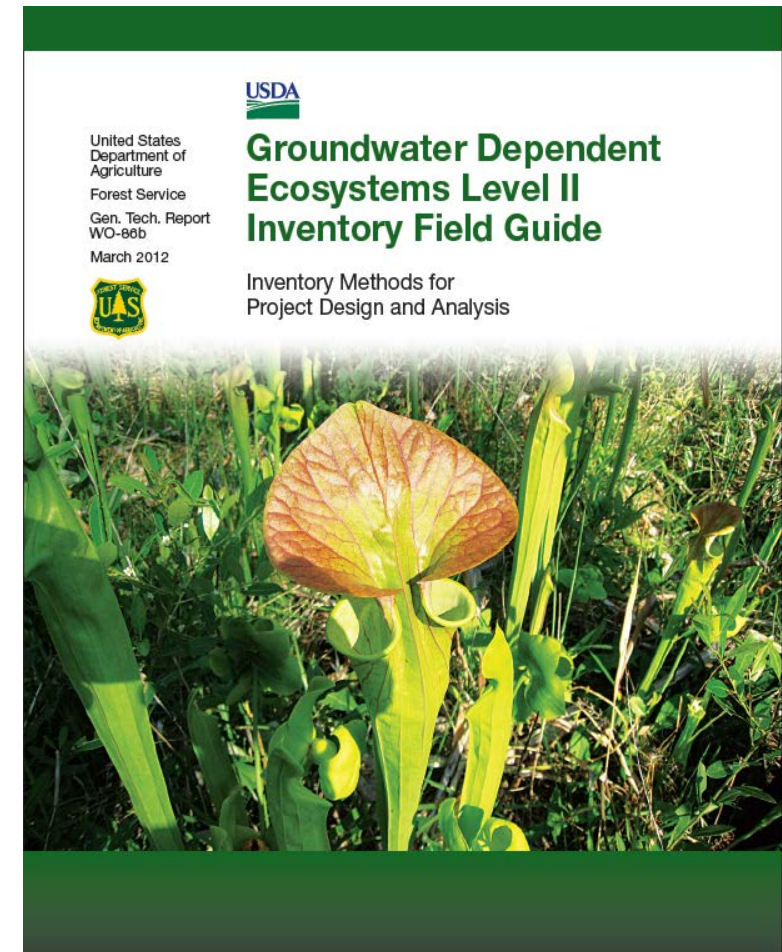
USDA Forest Service

Rocky Mountain Research Station, Ft. Collins, CO

Field Guides Published in 2012



Level I - Qualitatively locate and characterize GDEs



Level II - Quantitatively describe major ecosystem attributes

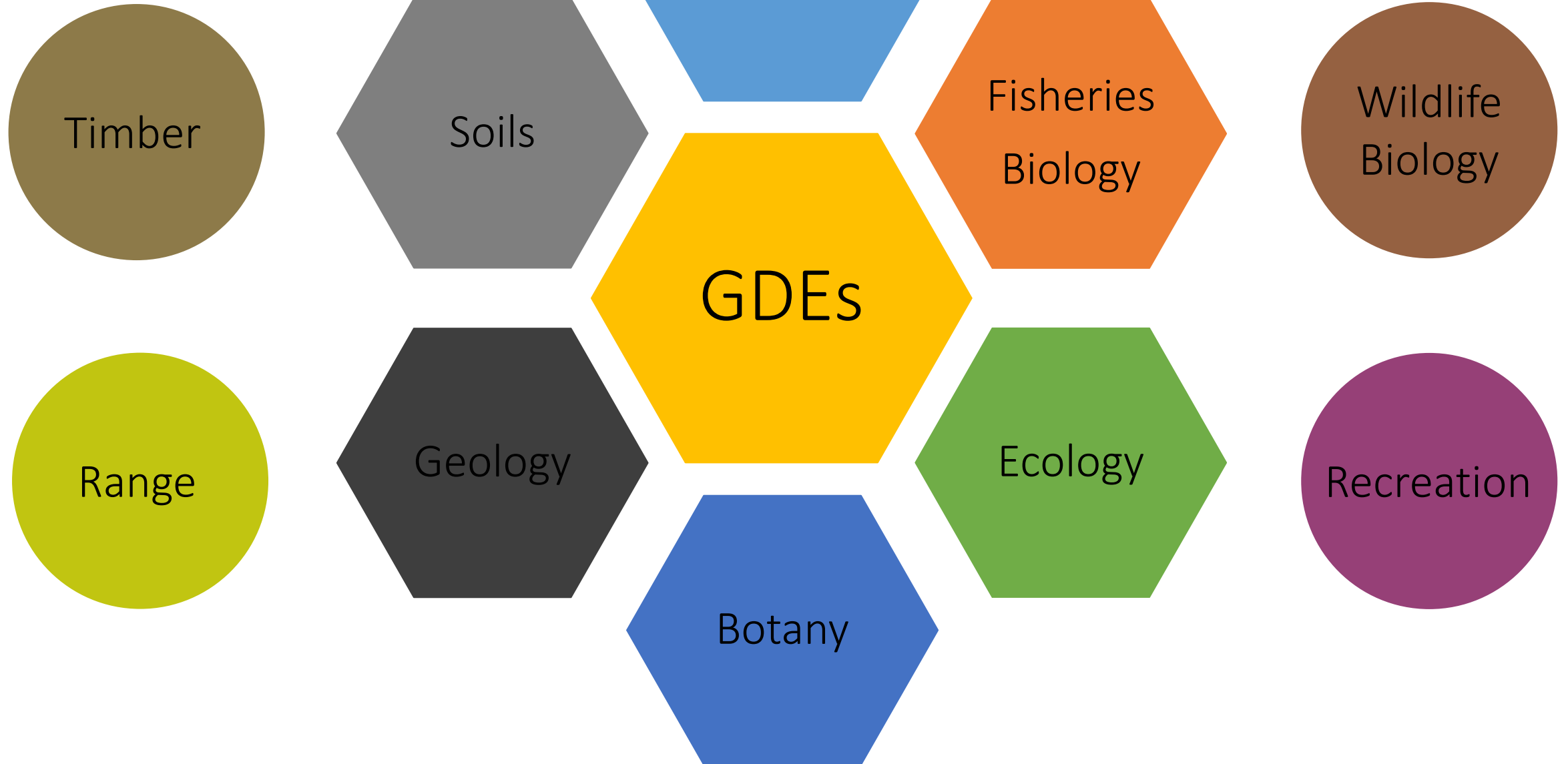
Consistent Approach to Inventory and Monitoring

- Location
- Species: presence/absence
- Baseline conditions
- Alteration
- Decision Making
- Protection or restoration
- Monitoring



Multidisciplinary

Approach

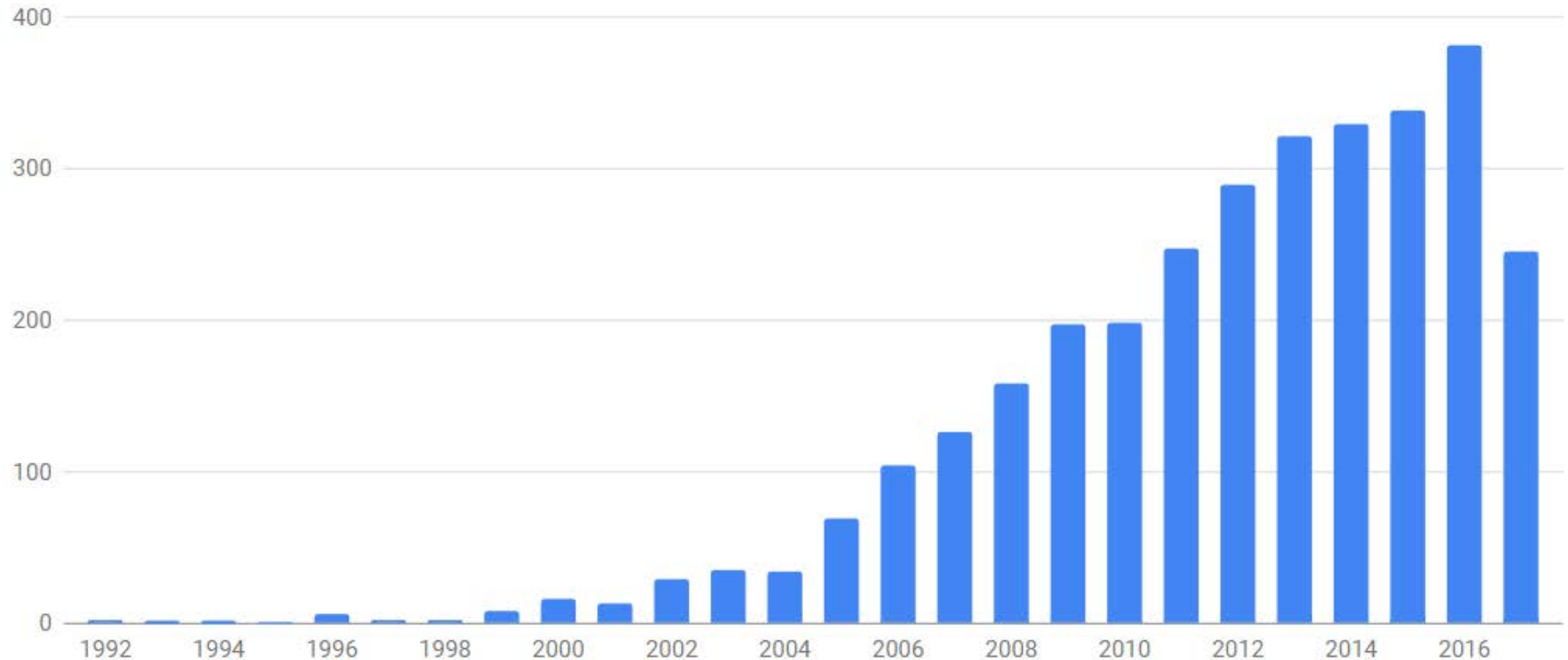


Field Survey - Overview

- Personnel with skills in botany, soils, hydrology, geology
 - Level I: 2-3 people
 - Level II: 3-5 people
- Survey time:
 - Level I: less than 2 hours/site
 - Level II: 3-6 hours/site



Google Scholar Results for “groundwater dependent ecosystems”



1992 – 2012

1558

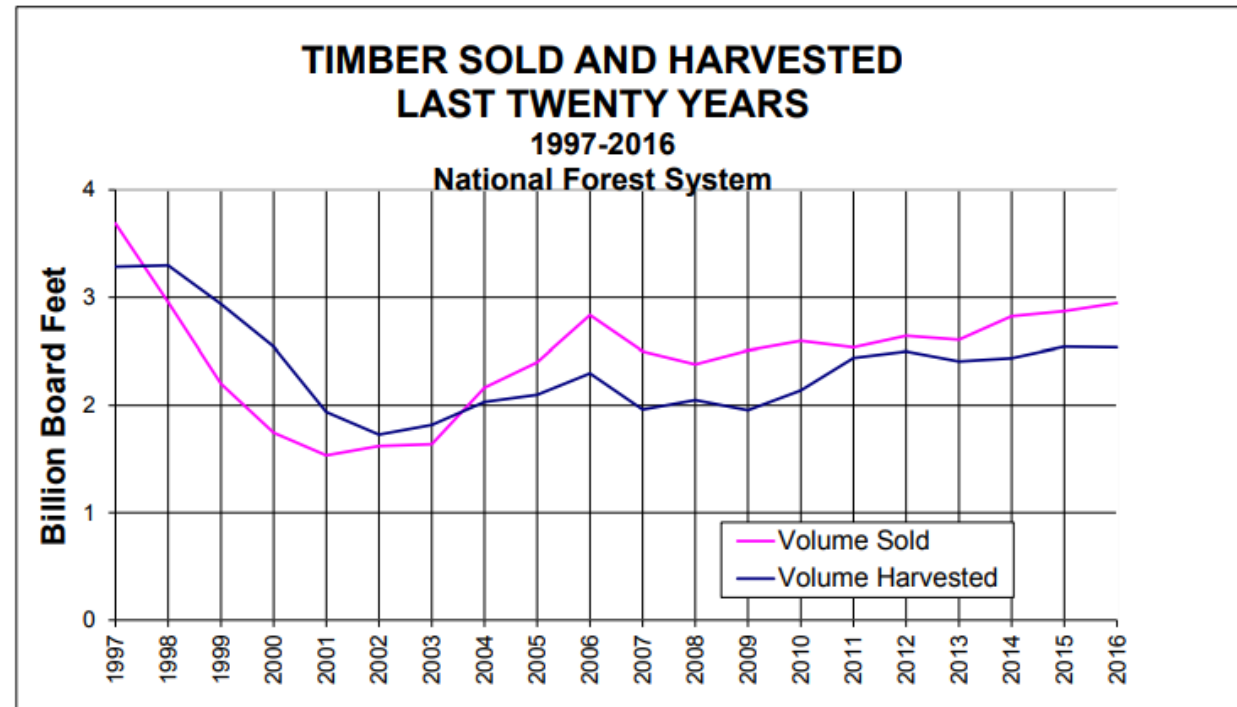
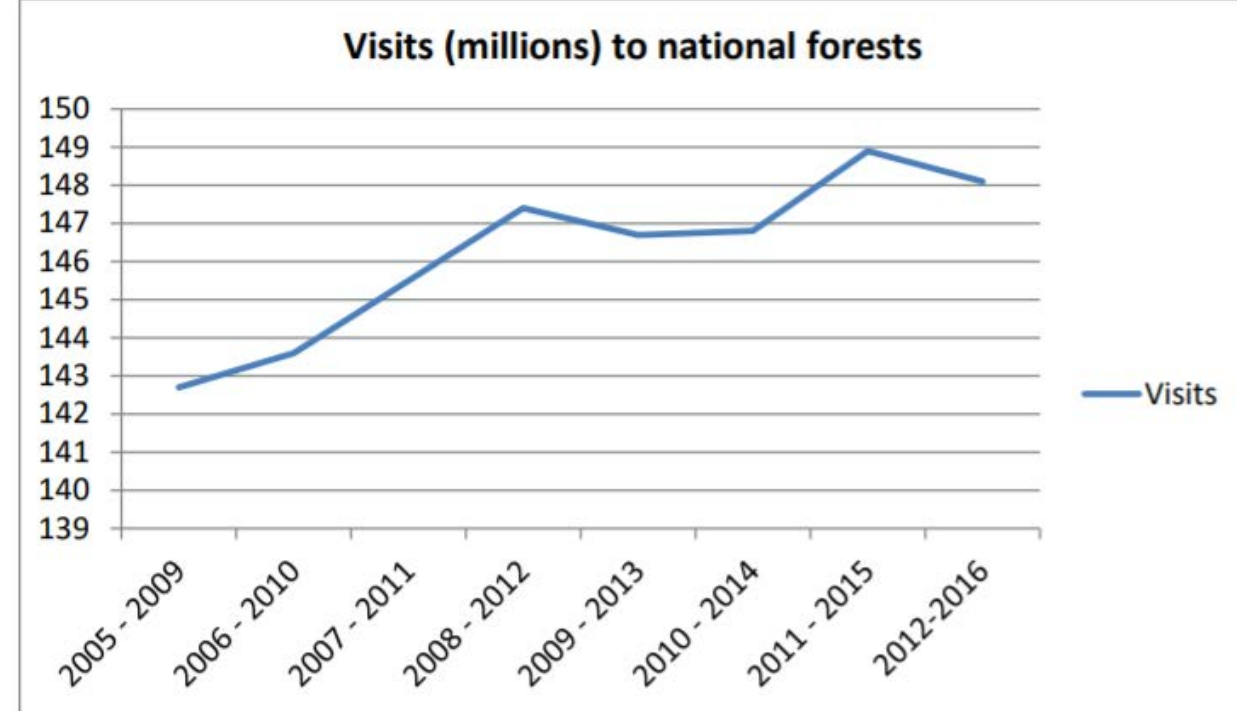
2013 - present

1619

Source:
SCHOLAR
PLOT^R

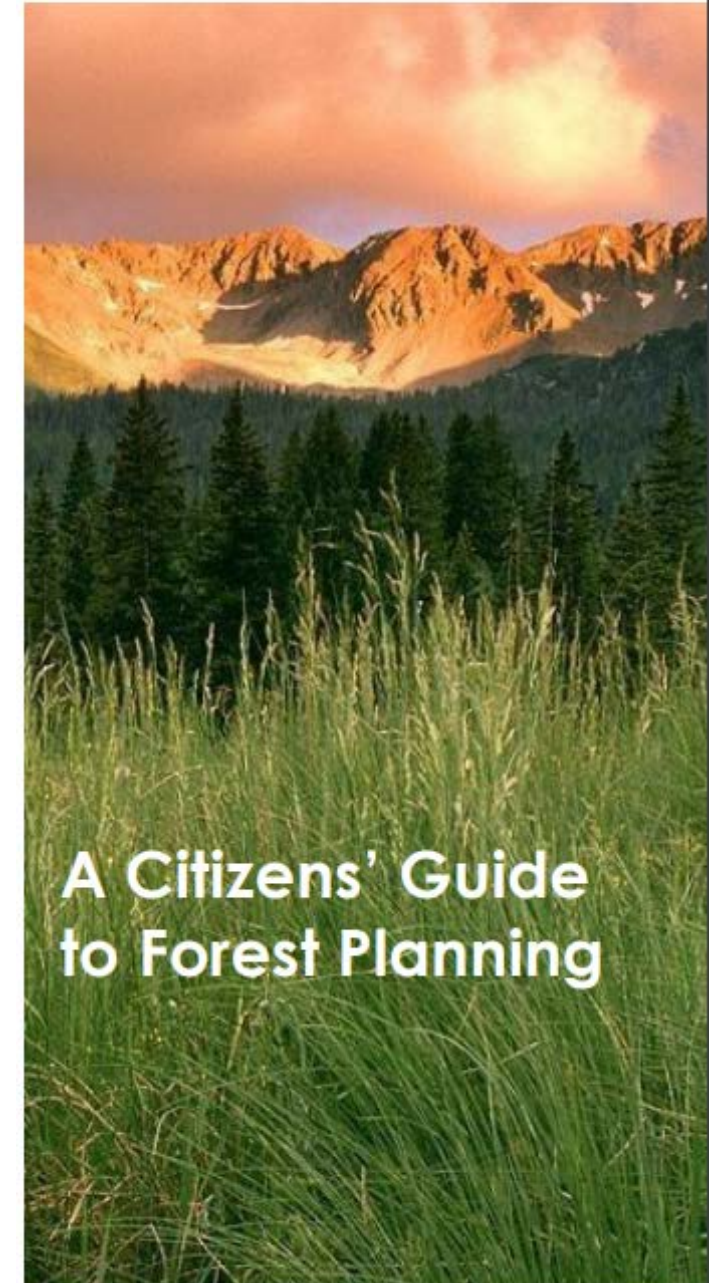
Demands on Groundwater

- Multiple-Use agency
- Recreation, resource extraction, grazing
- >3,000 communities get drinking water from watersheds on NFS lands
 - Atlanta, Denver, Seattle, Los Angeles



2012 Planning Rule

- Updated for the first time in 30 years
- Assessment Phase
- Plan development Phase
- Monitoring Phase
- Rule specifically states that a forest plan must include plan components, including standards or guidelines, to maintain or restore water resources, including GDEs



Montanore Mine

- Kootenai National Forest, MT
- Underground silver/copper mine
- Base line data collection
 - GDE surveys 2009-2013
 - Continued monitoring 2010-2014
- Level I and partial Level II
 - Surveys contracted
- Determine source of water
- Identified and characterized GDEs in three drainages

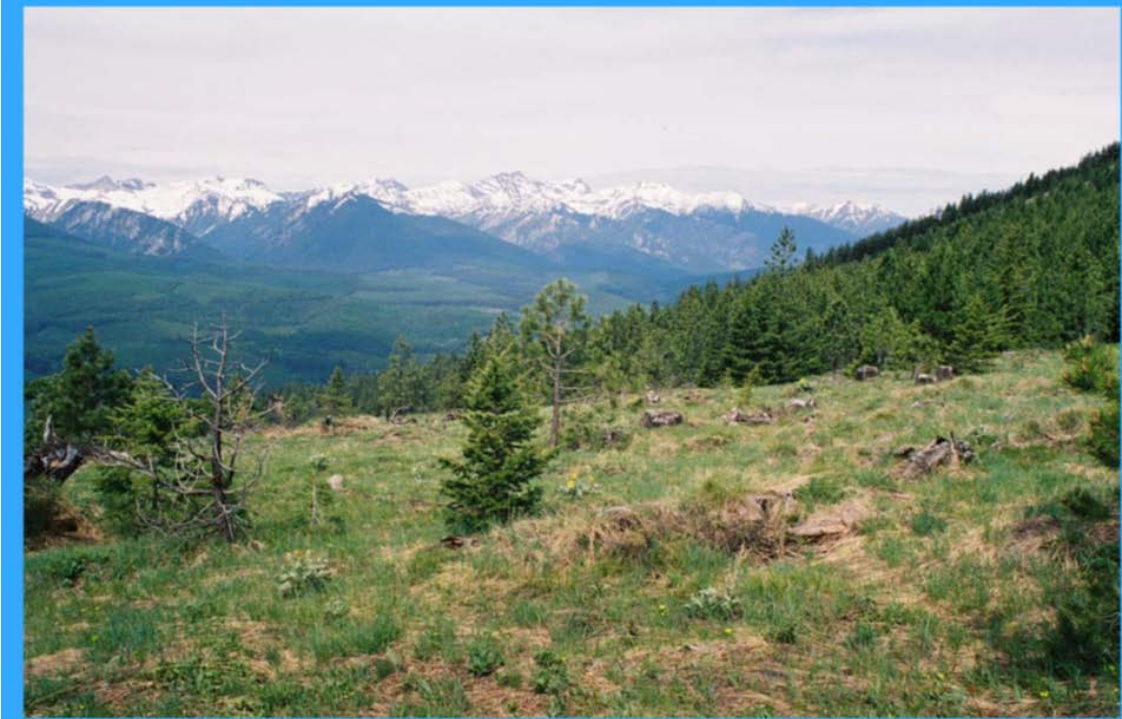


Table 97. Flow Measurements and Elevations for Identified Springs in the CMW.

Spring ID	Elevation (feet)	Flow Rate (gpm)	Number of Measurements	Date Range of Measurements
SP-1R	4,900	<0.01-20	10	10/98 – 10/13
SP-2R	4,850	4	1	10/98
SP-4R	6,490	5	1	9/05
SP-05/3R	4,200	5, 22	2	8/98 – 10/98
SP-16	4,600	40-50 (estimated)	1	Unknown
SP-41	5,625	27	4	9/07 - 9/13
SP-42	5,400	22	1	8/21/13
Spring 8	4,360	22	3	9/10 – 9/12
Spring 13	4,520	1-2	1	Unknown
GDE-1	6,588-6,708 (four seeps)	No measurable flow	1	8/13
GDE-2	6,747-6,825 (five seeps)	<2	1	8/13
GDE-3	5,703	<10	1	8/13

gpm = gallons per minute.

Source: Geomatrix 2006b, 2006d, 2009a, 2010b, 2011c; NewFields 2013a; MMC 2014d; Klepfer Mining Services 2015a; McKay, pers. comm. 2007; September 2007 agencies' field review of Rock Lake area.

Blue Mountains Climate Assessment

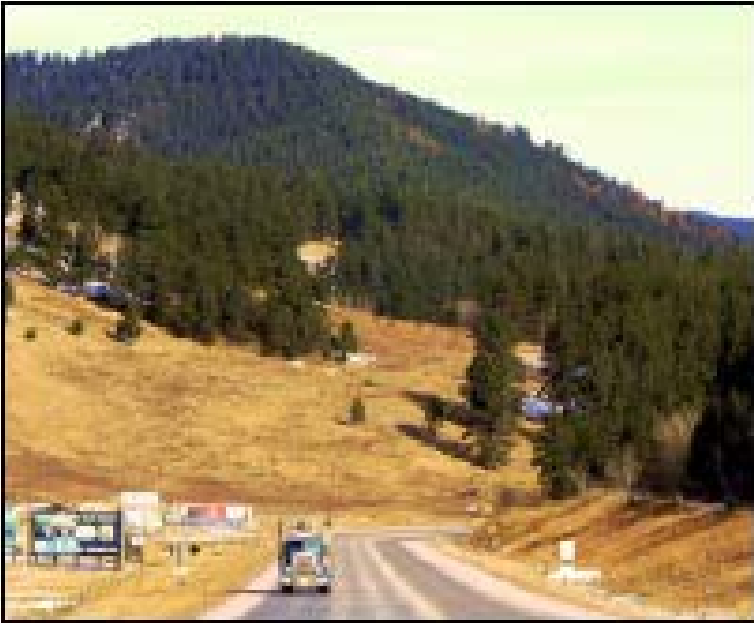
- Umatilla, Malheur and Wallowa-Whiteman NFs, OR
- Develop restoration priorities and identify more vulnerable GDEs
- Blue Mountains Resiliency Project and Blue Mountains Forest Plan Revision in process
- Opportunity for “complete” Level I inventories?



Courtesy of Forestfoundation.org

- 133 GDEs inventoried using Level I since 2008
- Umatilla NF: Targeted portions of grazing allotments and watersheds with specific management concerns
- 56% of GDEs had reduced aquifer functionality
- 24% of GDEs had soil alteration
- 18% of GDEs had higher than expected upland species cover
- Many water diversions
 - On average 93% of available water diverted
- Malheur and Wallowa-Whiteman had similar patterns

Black Hills NF Resilient Landscapes Project



- 4,014 springs and 25 fens inventoried on NFS lands in the BHRL project area (>1.3 million acres)
- Intensive field surveys have not occurred in all areas
 - Partial Level I
 - Figures may be low

Manti-La Sal Forest Plan Revision Assessment

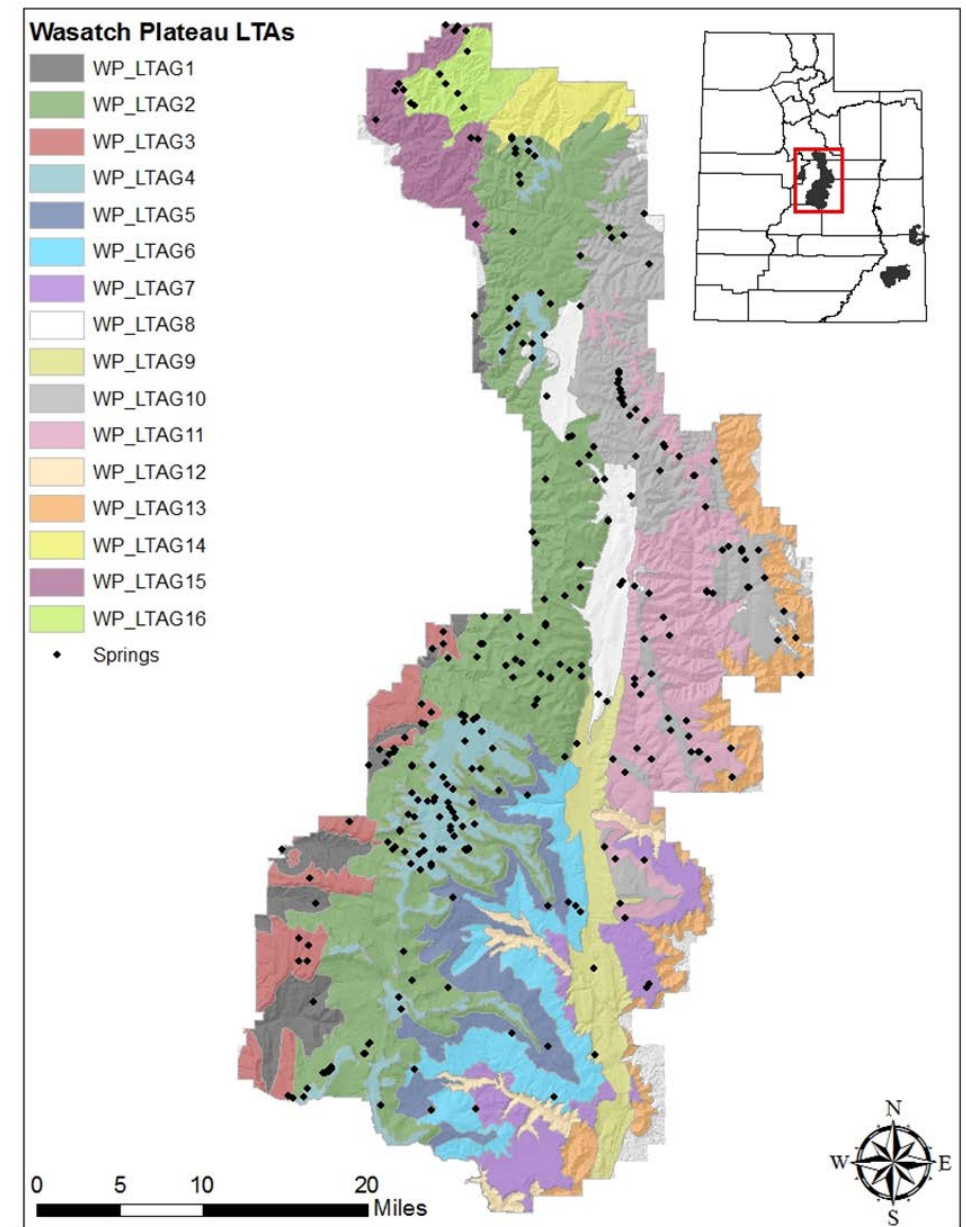
- Level I inventory
- Targeted grazing allotments and watersheds with specific management concerns
 - Watering of livestock
 - Water rights adjudication issues
 - Potential impacts of subsurface coal mining activities
- Colorado Natural Heritage Program (CNHP) developing a wetland map of the forest to identify 'potential fens'



GRAND CANYON
TRUST

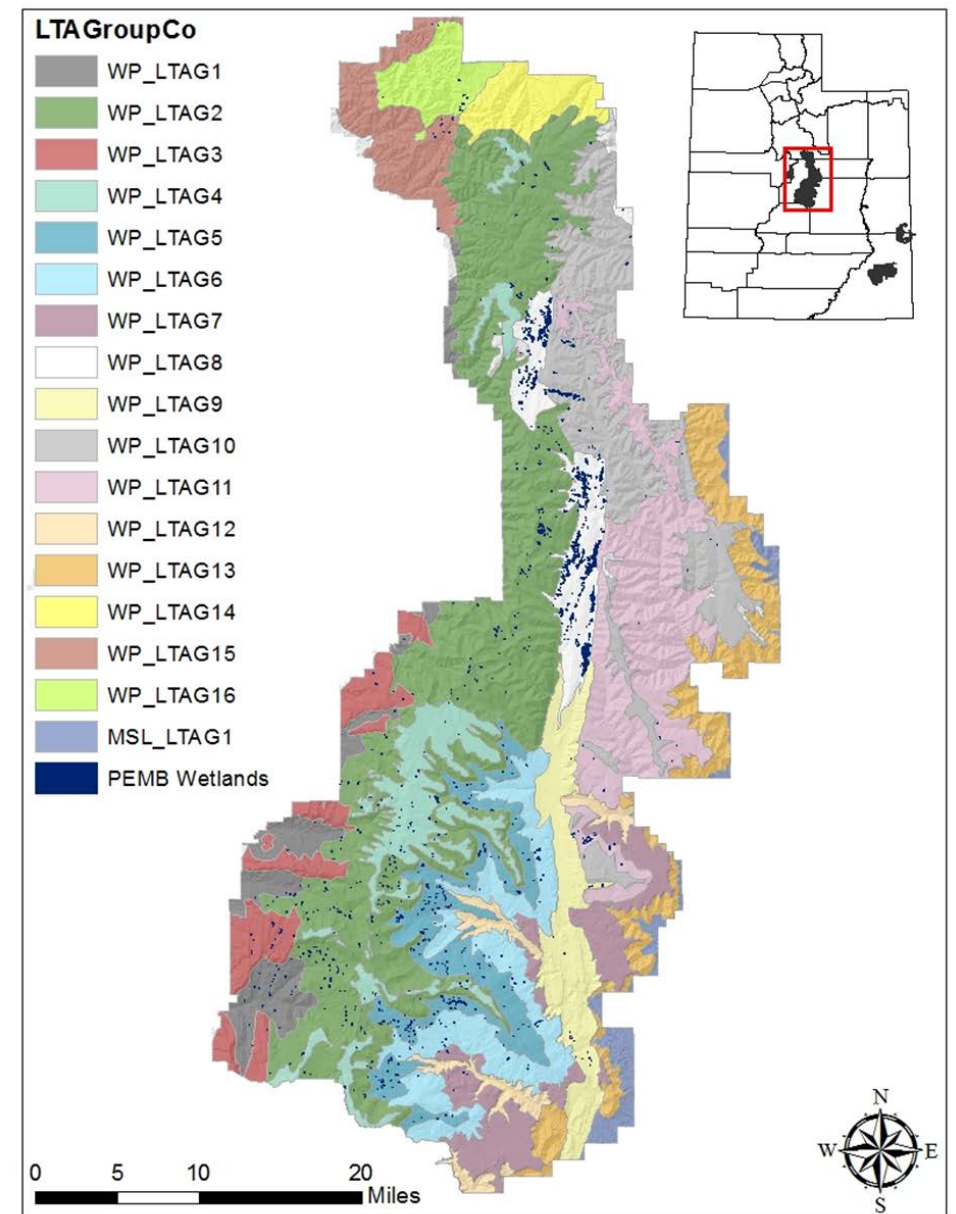


- Key ecosystem characteristics(KECs)
 - Distribution of spring and wetland GDEs
 - Composition of groundwater dependent biotic communities
 - Water quantity
 - Water quality
 - Condition of spring runout channel
 - Soil Quality and stability
- KECs align well with management indicators assessed during Level I



Distribution of documented springs occurring in the Wasatch Plateau Landscape Type Associations (LTAs).

- High densities of springs tend to occur in glaciated terrain, up to 0.004 springs/acre
- Condition of spring runout channel was outside NRV at many springs due to livestock use
- High densities of palustrine emergent wetlands occur in glaciated terrain and fault valleys
- No fens or peat-accumulating wetlands documented though likely present



Distribution of palustrine emergent wetlands (PEMBs; Cowardin et al. 1979) on the Wasatch Plateau portion of the Manti-La Sal National forest

Ashley National Forest Plan Revision Assessment

- 226 GDEs, mostly springs, have been characterized by forest staff since 2009 using Level I
- Targeted grazing allotments and watersheds with specific management concerns
- CNHP developing wetland map for Ashley NF
- Same KECs as Manti-La Sal
 - Also looked for fen indicator species



Conclusions

- Current information of GDEs on NFS lands is largely limited to targeted, fairly accessible sites
- Focused primarily on issues of pressing management concern
- More systematic inventories are needed
- Collected data often not entered into appropriate database(s)
- Forest Plan Revision efforts may offer best opportunities for forest-wide, comprehensive surveys

Questions

