Managing for Wetlands Resilience at the US Fish & Wildlife Service

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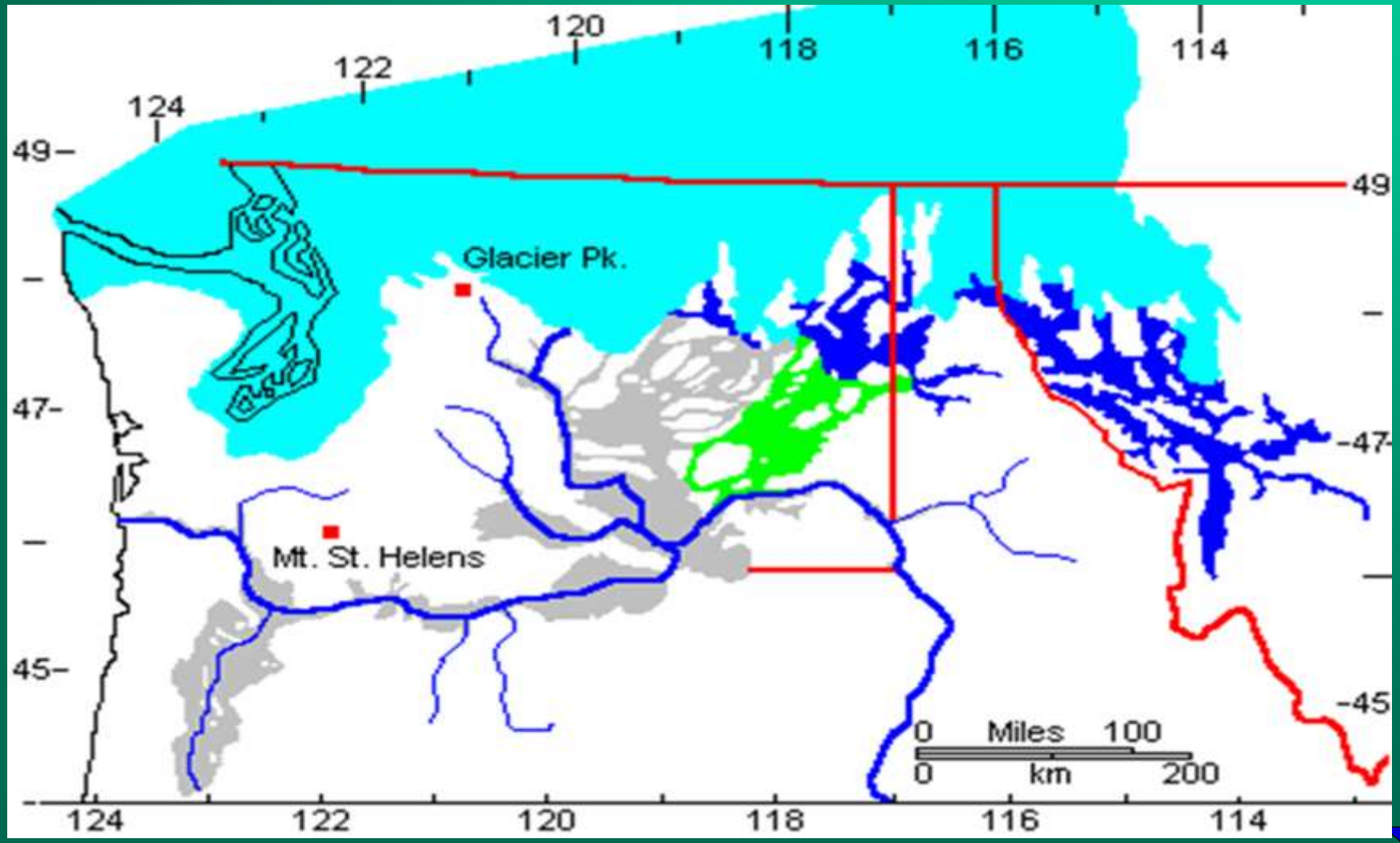
Turnbull National Wildlife Refuge

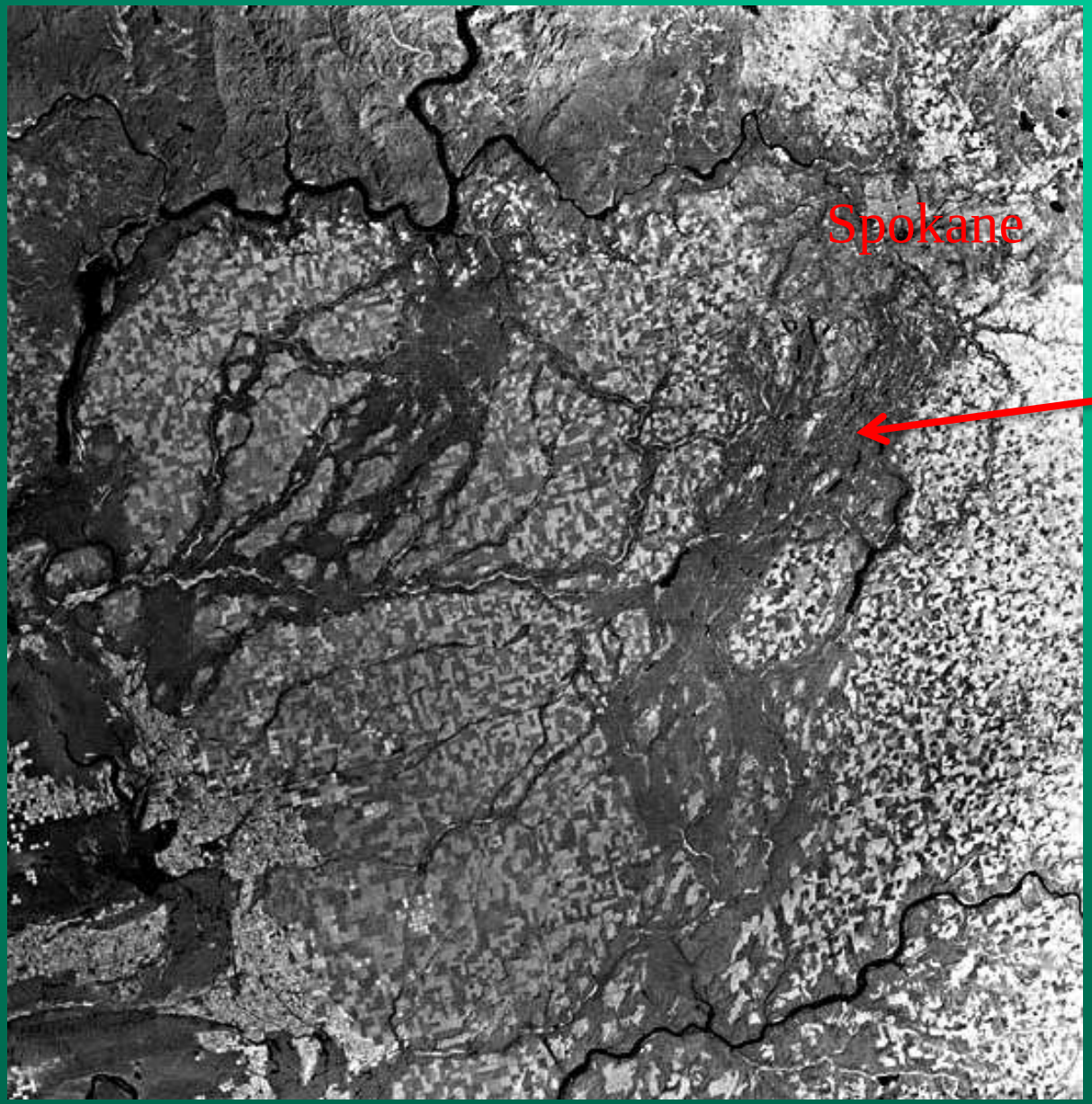
Climate Resiliency

- The capacity for an ecological system to:
  - (1) absorb stresses and maintain function in the face of external stresses imposed upon it by climate change and
  - (2) adapt, reorganize, and evolve into more desirable configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts.

The Channeled Scablands

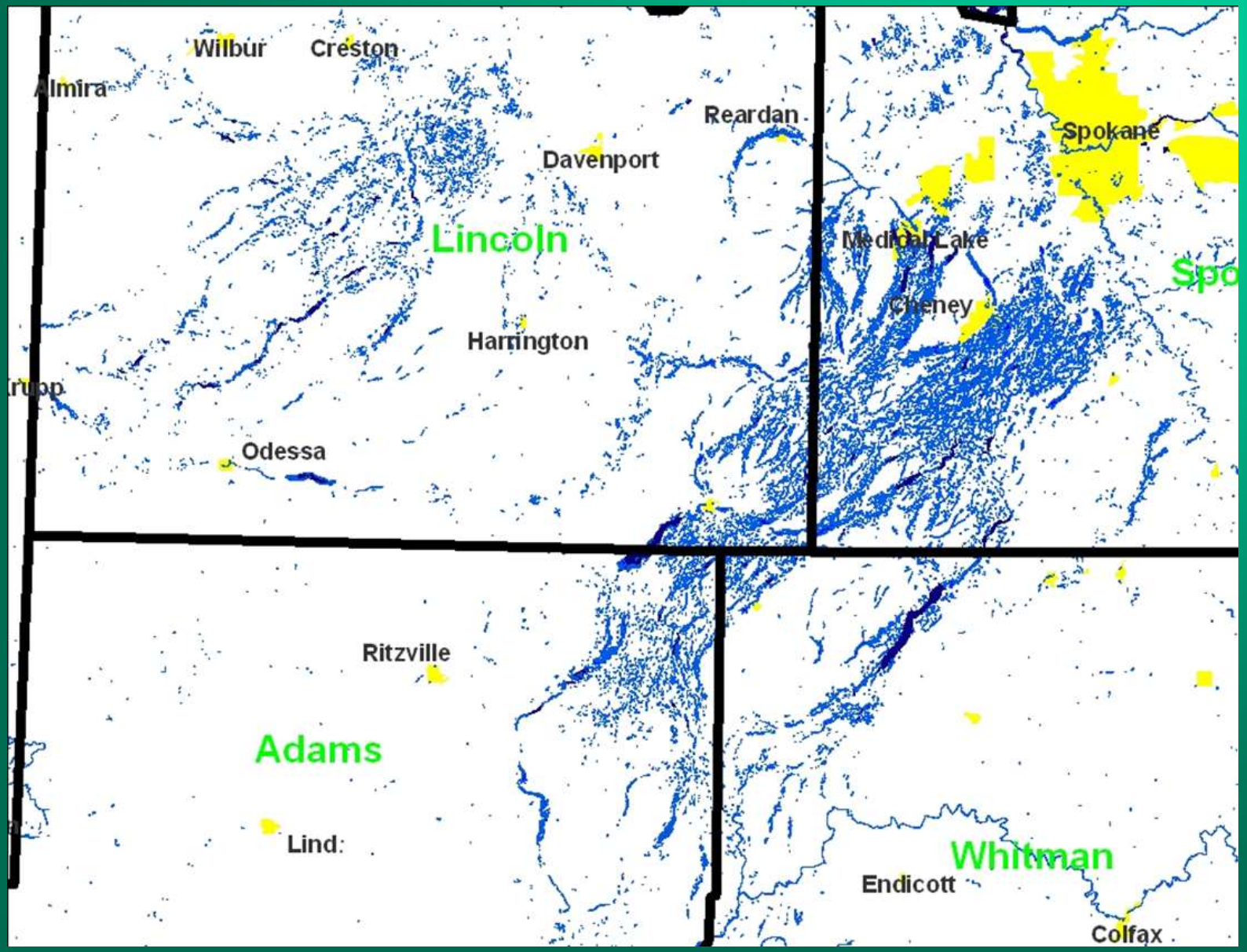
Ice Age Floods

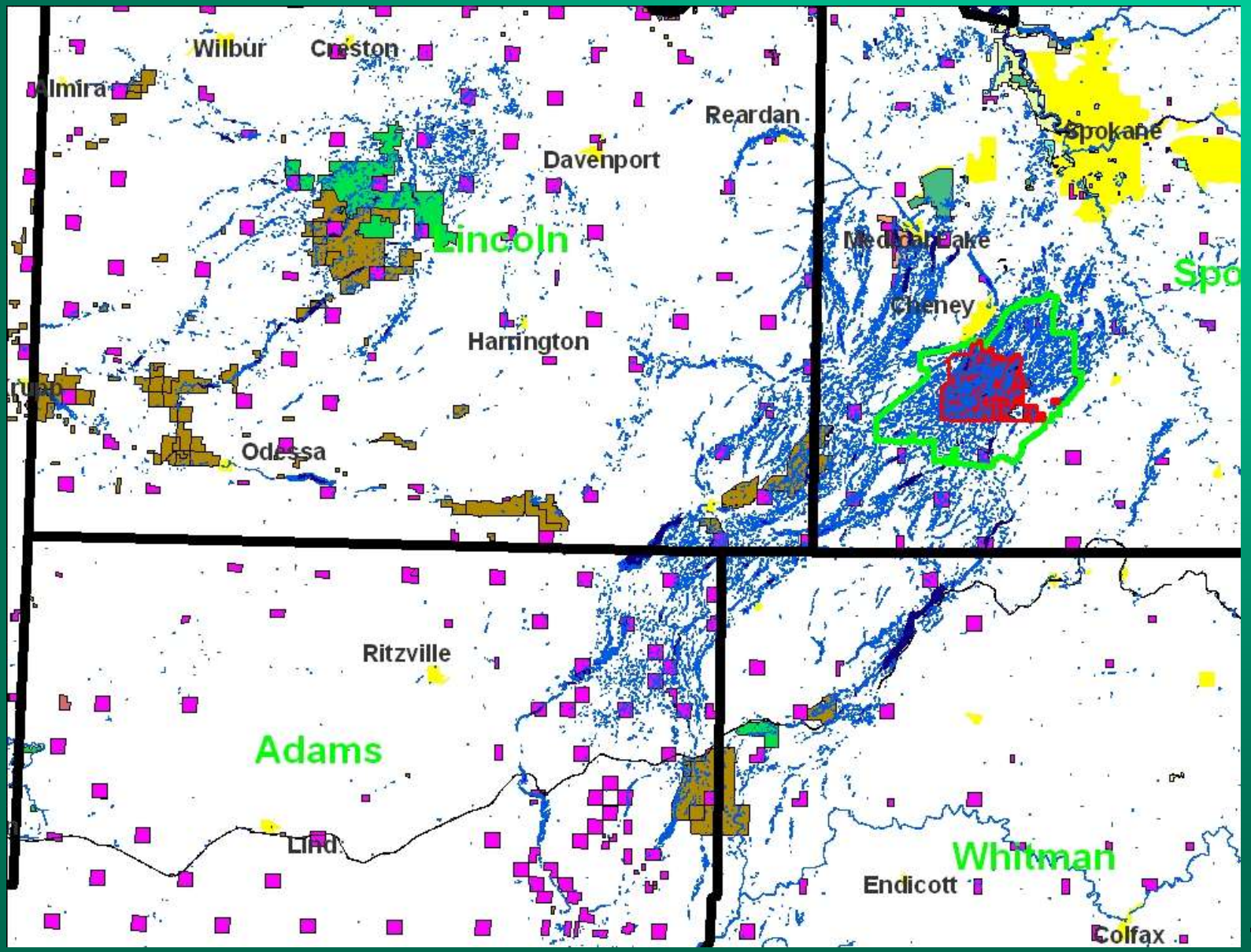



Spokane
TNWR

U.S. Fish & Wildlife Service

National Wildlife Refuge System


Wilbur
Creston
Almira
Reardan
Davenport
Lincoln
Spokane
Medical Lake
Cheney
Harrington
Odessa
Ritzville
Adams
Lind
Whitman
Endicott
Colfax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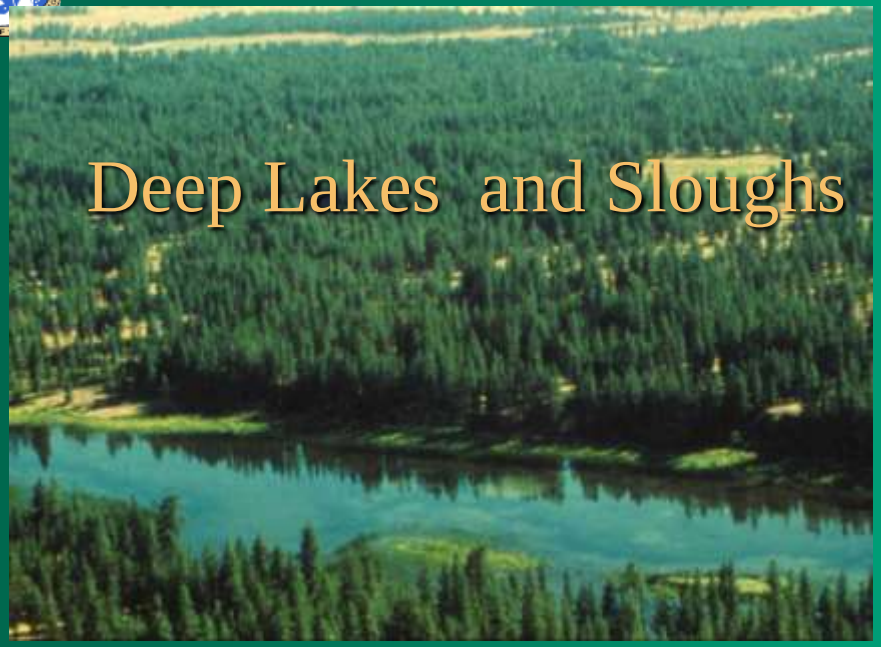
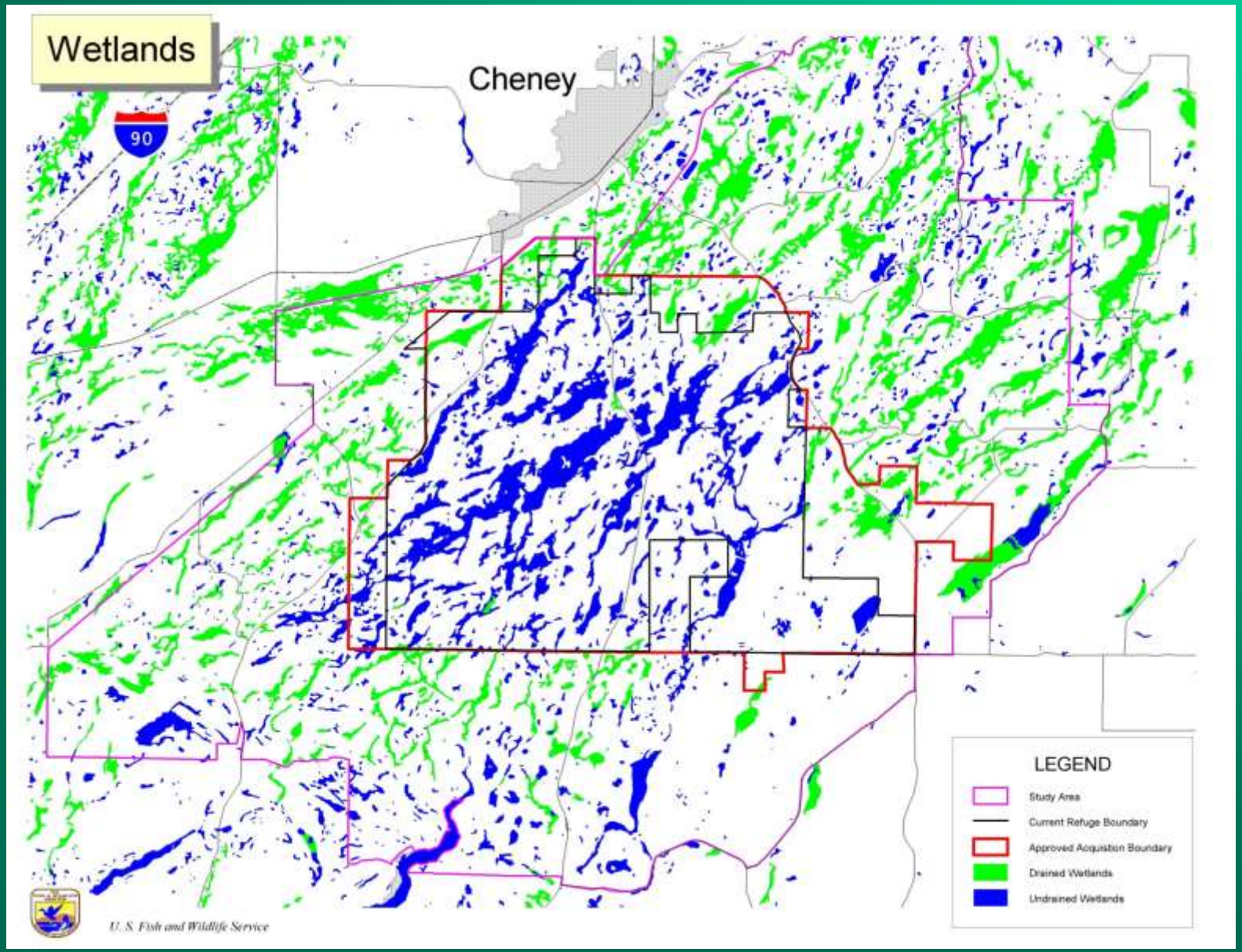
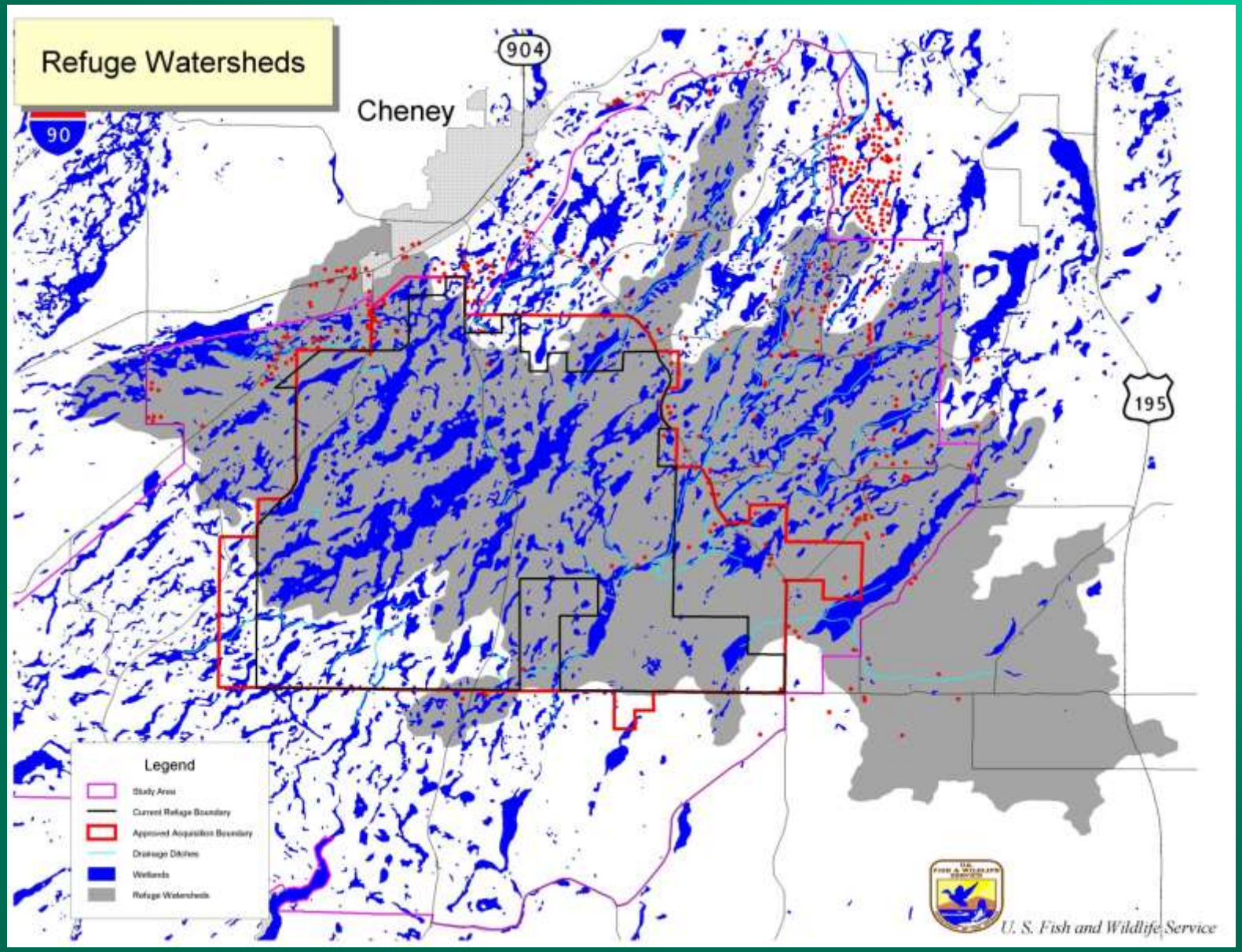

Deep Lakes and Sloughs


Potholes


Vernal Pools


Altered Wetlands


Wetlands
Cheney
90
LEGEND
Study Area
Current Refuge Boundary
Approved Acquisition Boundary
Drained Wetlands
Undrained Wetlands
U.S. Fish and Wildlife Service


Refuge Watersheds
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195
Legend
Study Area
Current Refuge Boundary
Approved Acquisition Boundary
Drainage Ditches
Wetlands
Refuge Watersheds
U. S. Fish and Wildlife Service

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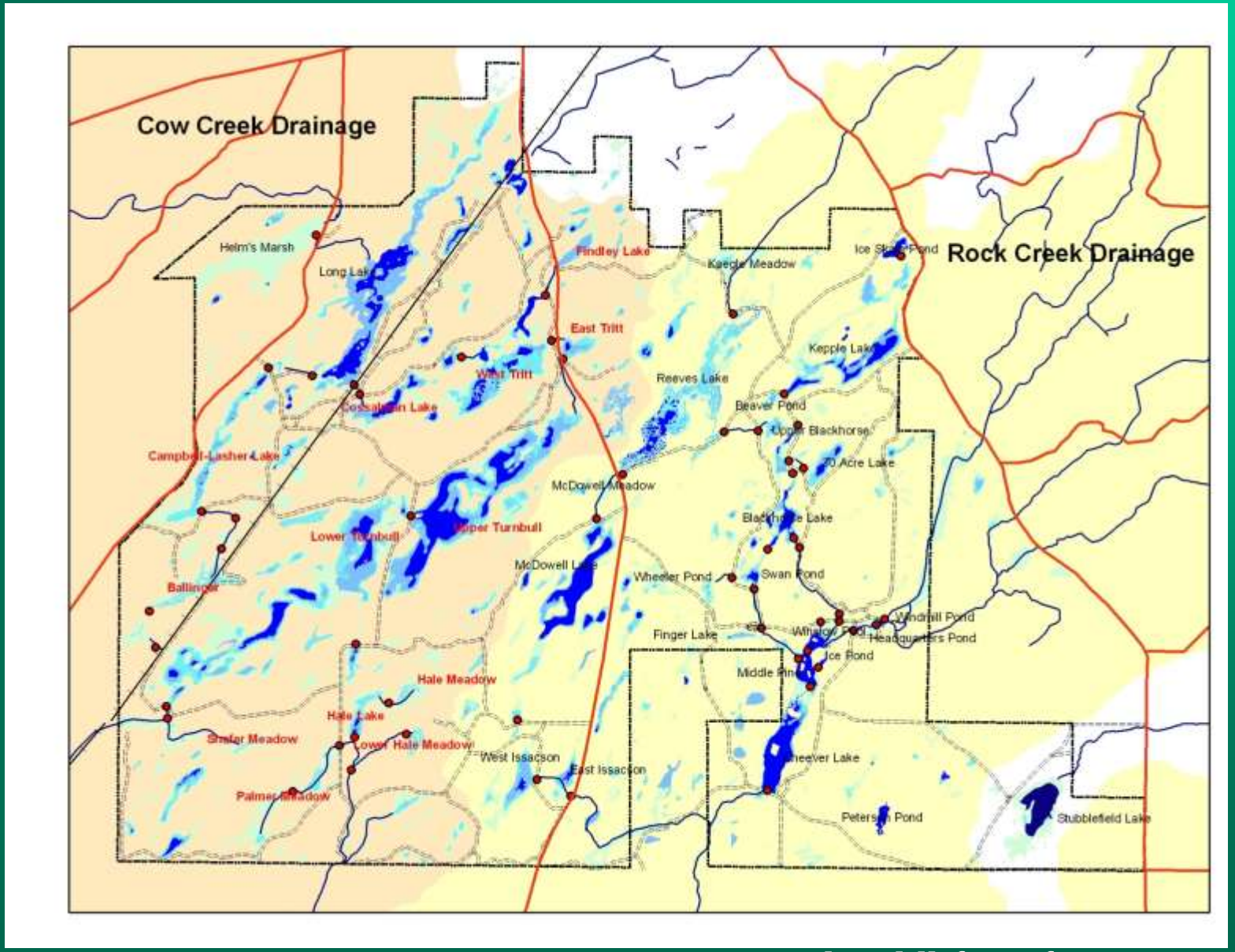
Wetland Management

National Wildlife Refuge System


Cow Creek Drainage
Rock Creek Drainage
Helm's Marsh
Long Lake
Findley Lake
East Tritt
West Tritt
Reeves Lake
Keepie Meadow
Ice Skate Pond
Kepple Lake
Beaver Pond
Upper Blackhorse
20 Acre Lake
Campbell-Lasher Lake
McDowell Meadow
Upper Turnbull
Lower Turnbull
Blackhorse Lake
McDowell Lake
Wheeler Pond
Swan Pond
Windmill Pond
Finger Lake
Headquarters Pond
Ice Pond
Middle Pond
Hale Meadow
Hale Lake
Lower Hale Meadow
West Issacson
East Issacson
Peterson Pond
Stubblefield Lake

Wetland Goals

Goal 1. Provide habitat conditions essential to the conservation of migratory birds and other wildlife within a variety of wetland complexes.

Goal 2. Protect and restore water quality and quantity sufficient to maintain native wetland flora and fauna.

Wetland Dependent Wildlife

Current Management

- Optimize water level management to meet current wetland habitat objectives based on key wild speceis needs.
- Reduce non-climate stressors.
- Acquire and restore additional wetland habitat within refuge watersheds.
- Encourage voluntary land and water stewardship and conservation on private land within refuge watersheds.

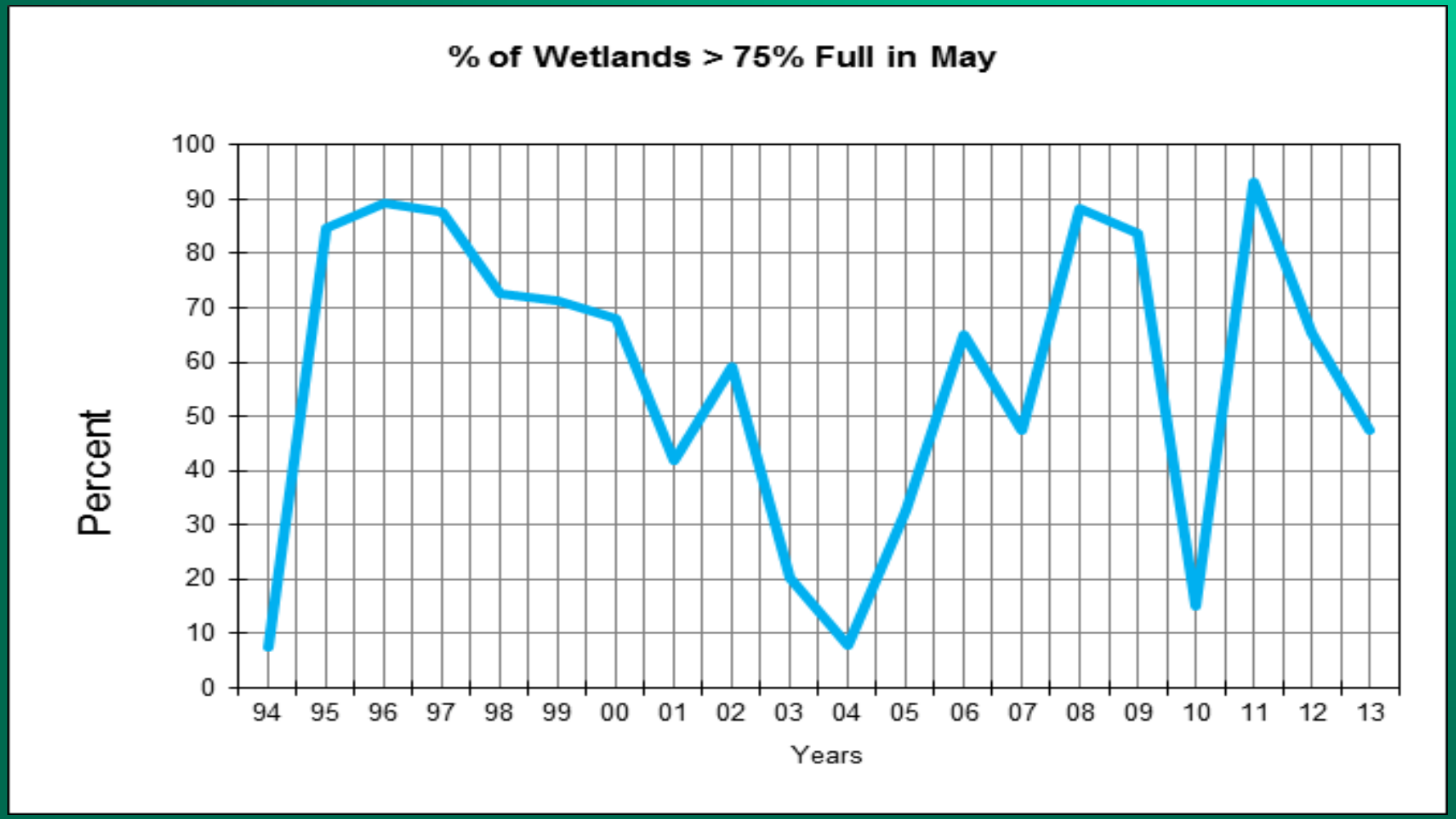
Non-climate Stressors

- Non-point sources of pollution
- Invasion by exotic plant and animal species
- Reduced watershed yield as a result of greater conifer forest cover
- Total and partial drainage of wetlands
- Diversion of ground and surface water for domestic and agricultural uses.

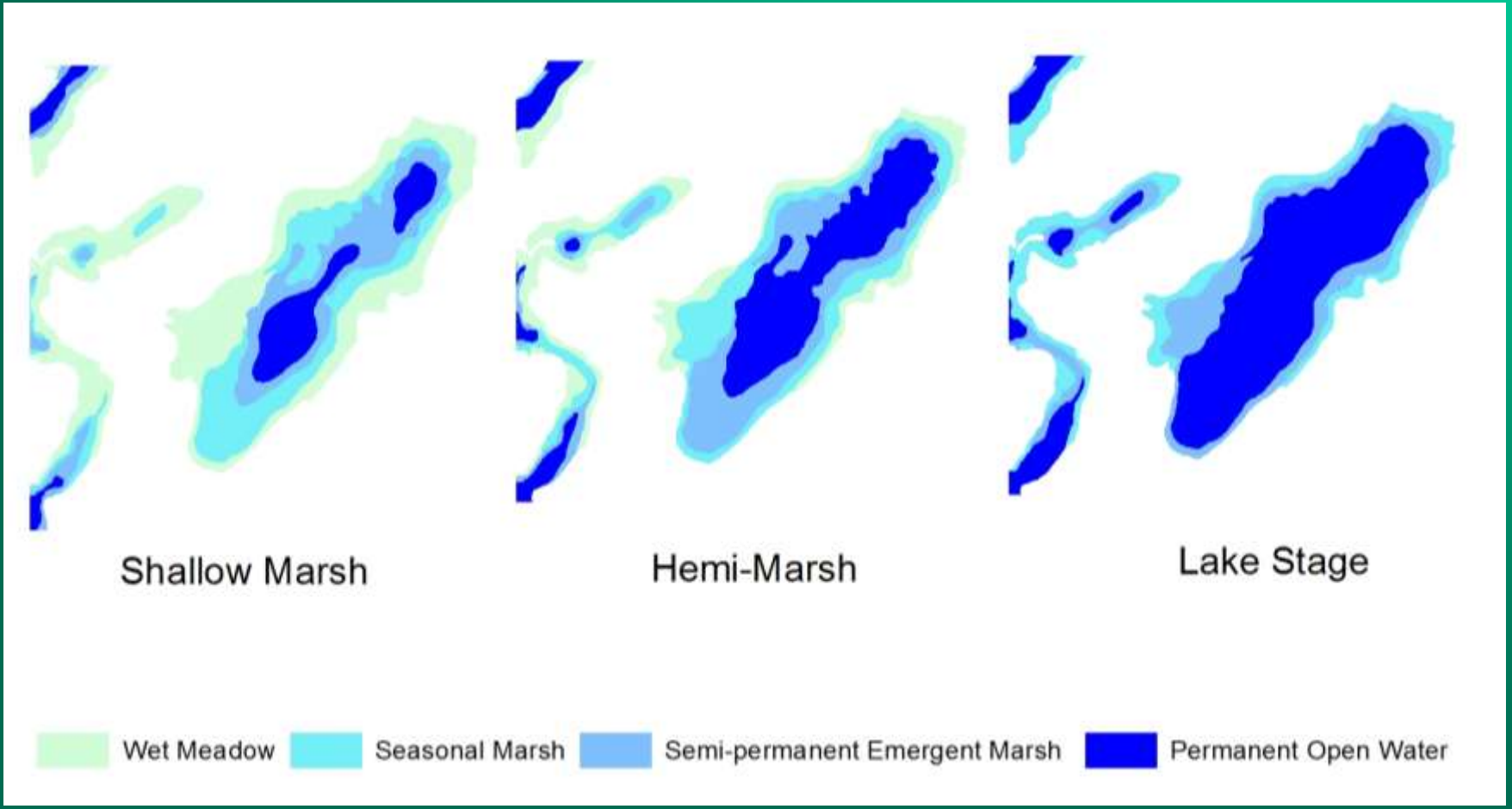
Managing for Expected Climate Change

- Increase in temperature
  - Increase in evapotranspiration resulting in more rapid summer drawdown
- Little change in annual precipitation, but precipitation likely to come mostly in the form of rainfall with less snowpack
  - Snowfall accumulation especially in late winter is a significant source wetland recharge

Expected Climate Impacts



Expected Climate Impacts



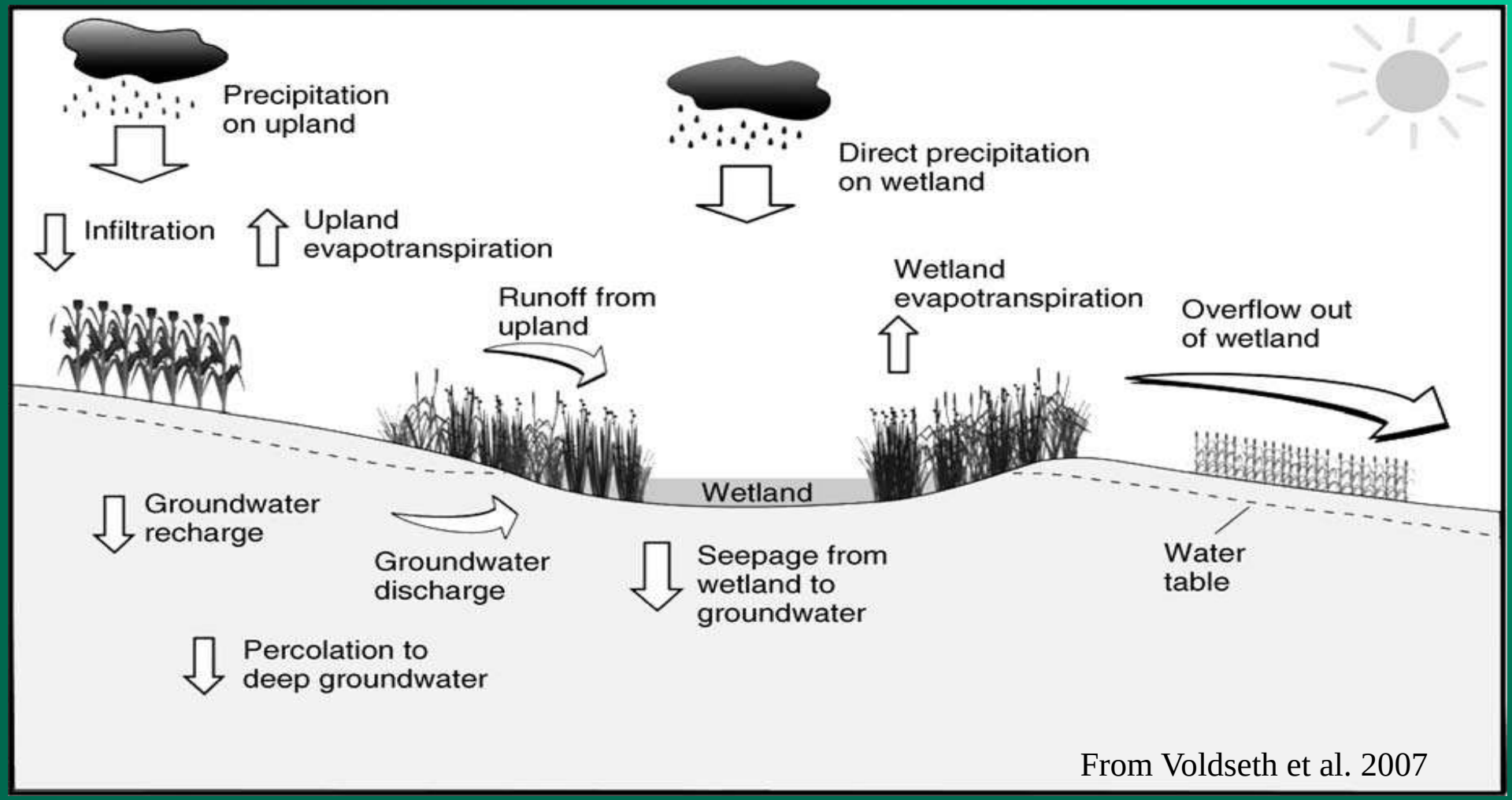
Long-term Adaptation Strategies

- Prioritize wetland management
  - Pass run-off through to priority wetlands
- Augment natural wetland inputs
  - Groundwater pumping
  - Tertiary treated wastewater
- Facilitate wetland transition to more xeric habitat type that provides important ecosystem functions
  - Aspen and Deciduous Shrub Communities

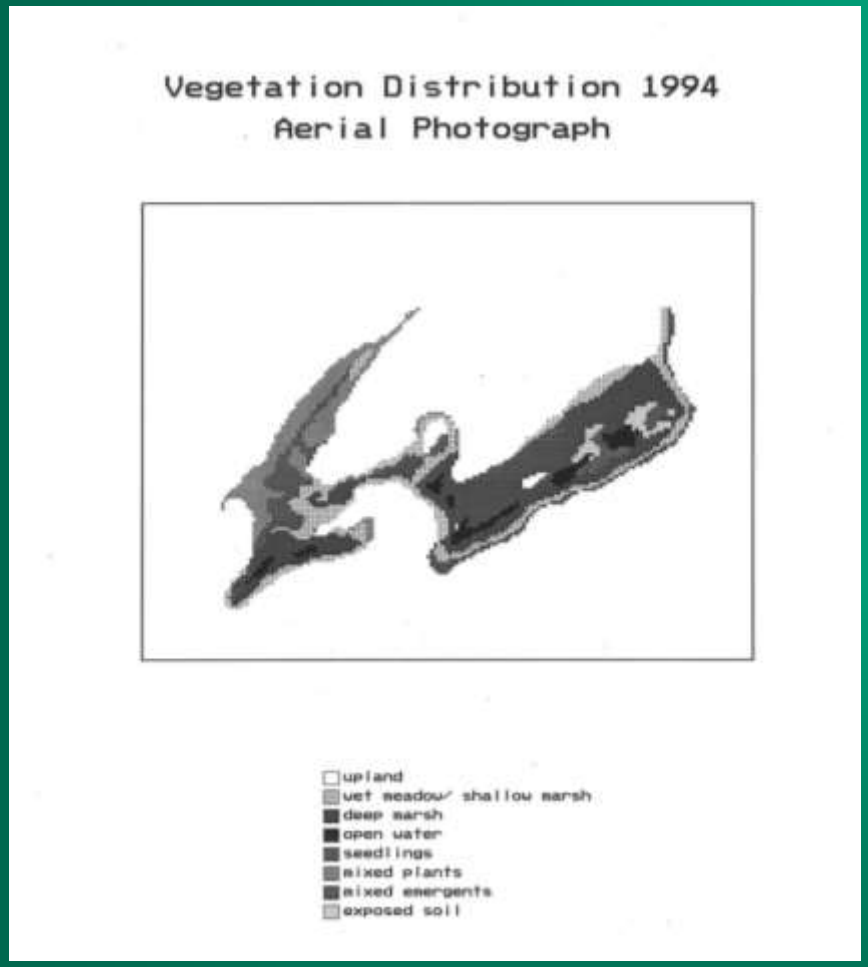
Evaluating Adaptation Strategies

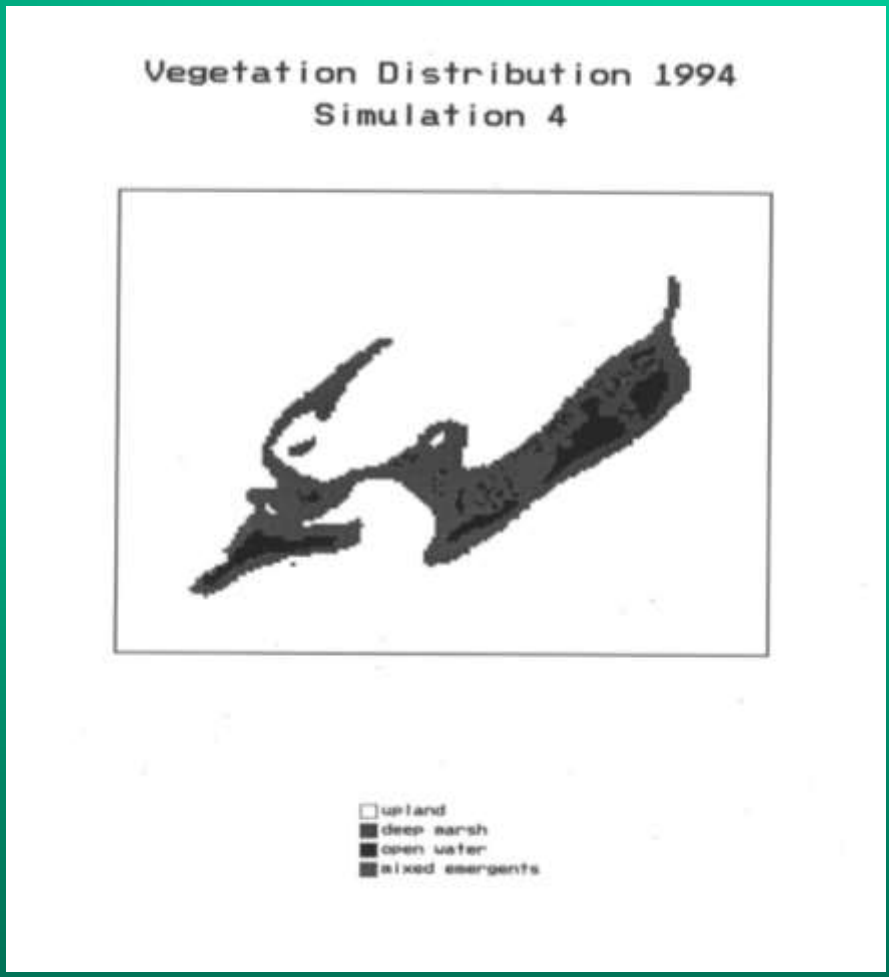
Utilize existing or modified models to evaluate the ability of current water management and future climate change adaptation alternatives to meet refuge habitat objectives.

WetSim 3.2 Inputs and Outputs



From Voldseth et al. 2007





Actual vs simulated distribution of wetland cover types Kepple Lake Turnbull NWR

Next Steps

- Collect Bathymetric Data for managed wetlands
- Code historic water level data and wetland veg cover for model validation.
- Collaborate on potential interfacing of UW RSGAL work and the WetSim Model developers