

Water Extraction

Potential Phreatophytic Land Cover in the Great Basin: Evapotranspiration as a function of species composition, geomorphology, elevation, and hydrology

Decisions related to water extraction present major challenges to land managers in the Great Basin. Land managers must be able to understand the systems they manage, how they are interconnected to one another, what changes, if any, could and do occur, and to what scale and ability they are able to manage the environments and processes around them. This project involves creating a map of potential phreatophyte land cover of the Great Basin by categorizing evapotranspiration (ET) as a function of critical characteristics: geomorphology, vegetation species composition, elevation, and hydrology. The map functions as a “proof-of-concept” given the regional data currently available—producing is expected to provide an assessment of data availability and accuracy within the Great Basin. Accordingly, this map will act as a first step toward developing baseline datasets of ecological conditions and effects of water extraction across the Great Basin.

Key Management Questions Addressed by this Project

Where are potential phreatophyte communities and what are their baseline landscape characteristics?

How will water extraction impact these phreatophytic communities?

Assessment & Monitoring Questions

1. What are the effects of aquifer drawdown within the Great Basin ecosystem, especially on the phreatophyte communities?
2. How do ground-water systems operate and what is the natural envelope of variability?
3. How do anthropogenic impacts affect ground-water systems?
4. How are lower ground-water levels enabling invasive species?
5. How far away does ground-water extraction show effects?
6. How do lowered ground-water levels affect stream flow and water availability?
7. What processes are responsible for, or are indicators of, changes in spring discharge and ground-water levels?
8. Which ecosystems have already been impacted by ground-water extraction?

Project Approach

Phase 1: Potential Phreatophyte Landcover

We will create a map of the potential phreatophytic land cover of the Great Basin by categorizing ET as a function of critical characteristics: geomorphology, vegetation species composition, elevation, and hydrology. Shrubmap analysis data, a refined dataset of the SWReGAP, will be used as a source for the vegetation land cover. Geomorphic features will be derived from a landform dataset currently being created by Tom Owens and others which utilizes the Dikau method of automated landform extraction from elevation data. This geomorphology will help determine at a regional scale which plant communities, capable of both phreatophytic and non-phreatophytic behavior, are most likely drawing from ground-water sources in the Great Basin. Map scale will be based on

the Shrubmap data and is expected to be 1:100,000. As mentioned, this product will serve as a first step in addressing the key management question, recognized by the GBILM Water Extraction Group, of ascertaining the effects of aquifer drawdown to the phreatophyte community by determining the concentration and extent of phreatophytic plants in the Great Basin.

Phase 2: Depending on additional funding becoming available for all team members, the team would enhance the Great Basin phreatophytic land cover mapping effort and further address the question of aquifer drawdown by generating a map (or series of maps) of change in the Great Basin's ground-water levels. Time steps for the(se) map(s) will occur at least at a decadal scale, but we will attempt to capture a finer level of change detail in more recent years. Data utilized is expected to include USGS Ground Water Site Inventory (GWSI) well point data (including the MX wells), Regional Aquifer-System Analysis (RASA) Program data, and Aquifer Vulnerability data. We will pull information from the GWSI records for the carbonate aquifer and Great Basin flow systems in an attempt to detect temporal changes in water level within deep and shallow ground-water areas. Mapping the water level change on an annual versus seasonal basis will depend on data availability (measurement frequency over time) in the GWSI historical records. Lastly, we plan to overlay such data as geomorphology, surface hydrology (main channels), and land stewardship (i.e., public vs. private ownership boundaries) on the(se) map(s) for general spatial reference and to provide a better social context to any changes detected. Consequently, this FY07 deliverable will also address—by providing baseline data—the recognized critical question (#7) of which ecosystems have already been impacted by ground-water extraction.

Expected Products

Phase 1: A map of the potential phreatophytic land cover of the Great Basin.

Phase 2: A map (or series of maps) of change in the Great Basin's ground-water levels.

Project Milestones

<i>Month/Year</i>	<i>Tasks & Milestones</i>
Dec. 06- Feb. 07	Collect data layers: Geomorphology, SageMap, ReGAP Vegetation Species, Elevation Data, Hydrology, GB Boundary, Roads, Major Cities, Shaded Relief
Dec. 06- Feb. 07	Coordinate data & establish GIS data layers Develop & run spatial analysis model
Dec. 06- Feb.07	Generate map product for presentation to BPC
Feb. 07- Oct. 07	Conduct analyses to detect temporal changes in water level within deep and shallow ground-water areas.
Feb. 07- Oct. 07	Generate a map (or series of maps) of change in the Great Basin's ground-water levels
Feb. 07- Oct. 07	Identify and map which ecosystems have already been impacted by ground-water extraction.

Data Requirements

- SWReGAP,
- Landform dataset currently being created by Tom Owens and others in USGS
- USGS Ground Water Site Inventory (GWSI) well point data (including the MX wells)
- Regional Aquifer-System Analysis (RASA) Program data
- Aquifer Vulnerability data.
- Information from GWSI records for the carbonate aquifer and Great Basin flow systems

Research Team

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