CYHWRMS Environmental Conditions Assessment

Alternative Analysis and Planning Area Mapping Tool

Water Advisory Committee, April 16, 2014
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Purpose of Environmental Analysis

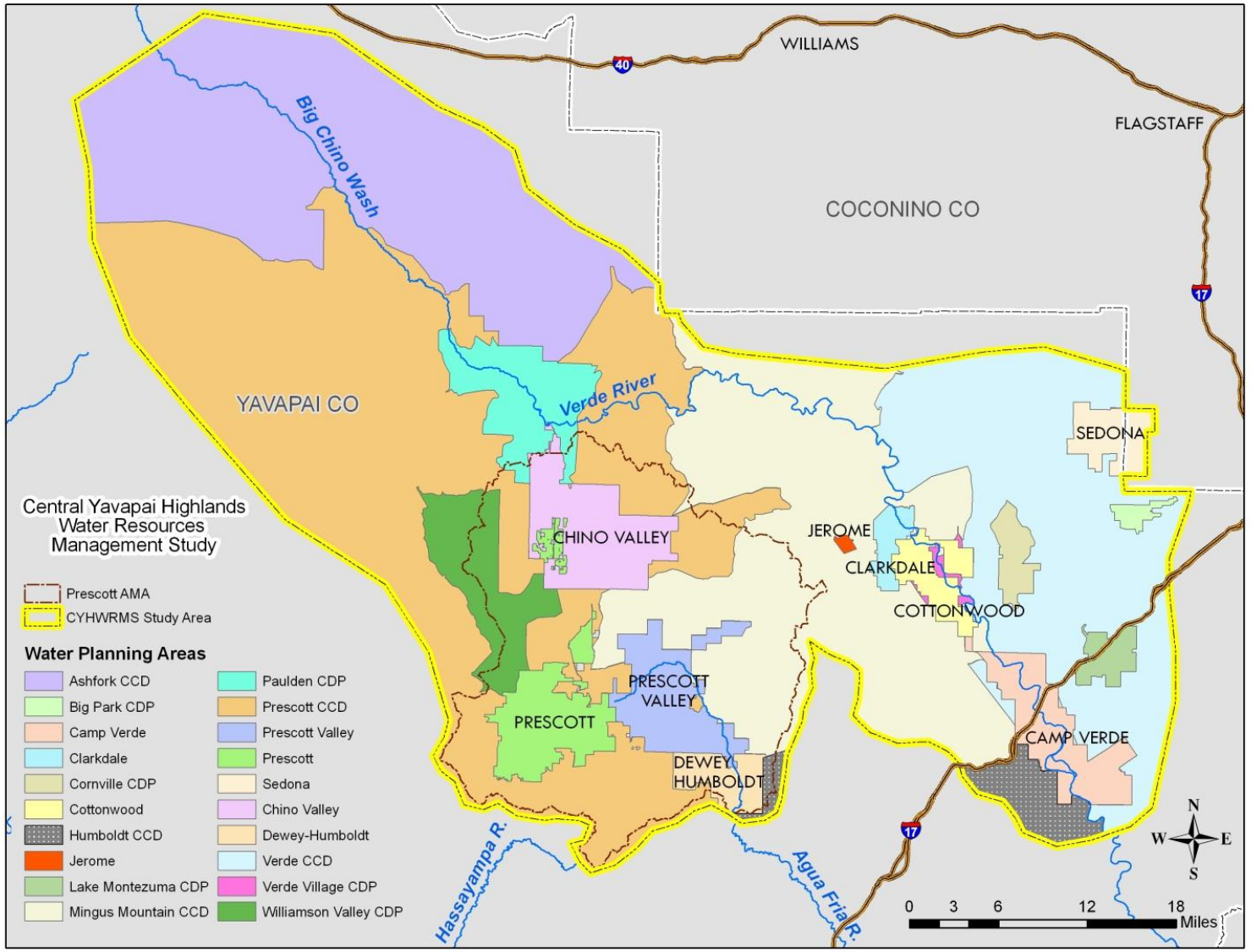
- **Purpose**: (1) Identify potential environmental impacts to water-dependent natural resources associated with each alternative; and (2) Incorporate into the alternative evaluation process.

- The key requirement is to identify issues which could potentially eliminate an alternative plan based upon its effect on a specific resource, or that would significantly increase overall project costs by excessively increasing mitigation costs.

- It's an "acceptability" issue and the affect on choice of alternative may be subjective.

- May identify where mitigation of an impact will be desired.

CYHWRMS - Study Area



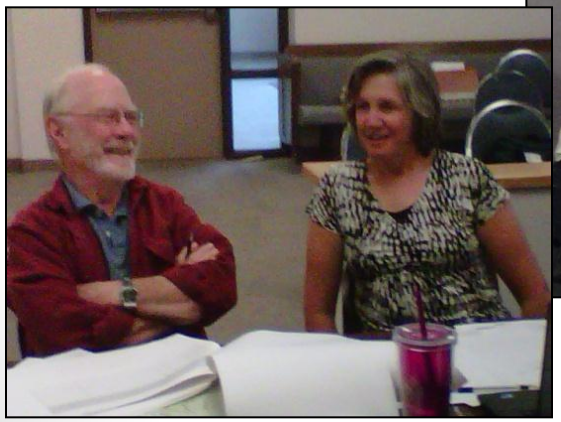
- **STUDY AREA: Big Chino, PrAMA, and Verde Valley; High Potential Growth Areas; With increased water demands**

CYHWRMS Alternatives Considered

Water Supply	Alternative	Alternative Description
Groundwater	1	Local Groundwater Development within the WPA (Inside and outside PRAMA)
	2	Regional Groundwater Development – Big Chino Pipelines (PRAMA and Verde Valley)
	3	Regional Groundwater Development Outside Study Area - Bill Williams Sub-basin and Big Sandy Sub-basin
Effluent	4	Conversion of Existing Systems - Urban
	5	Conversion of Existing Systems - Rural
	6	Additional Effluent from Increased Population
Flood Water	7	Capture and Store Un-appropriated Verde River or tributary water
Storm Water	8	Rainwater Harvesting – Aquifer Storage
*Conservation**	*9*	Implement Conservation (e.g. low flow toilets, turf restrictions, educational programs, etc.)*
Surface Water	10	Alamo Lake
	11	Colorado River via (a) Alamo Lake, (b) Diamond Creek, (c) Lake Mead, (d) Lake Havasu, (e) Lake Mohave, and (f) Lake Powell
*Other**	~~12~~	~~Weather Modification – Cloud Seeding~~
	13	Watershed Management*

Developing an Approach

- Brainstorm Categories of Potential Environmental Impacts
- Synthesize Criteria (document)
- Analyze Alternatives (document)
- Planning Area Index (table)
- Map Important Resources (maps)



Ranking Criteria

- Hydrologic Categories
  - Water Quality
  - Streamflow
  - Depth to Groundwater
- Biological Categories
  - Vegetation
  - Riparian-Obligate Species
  - Fish/Aquatic Species
- Landscape
  - Watersheds

- Document: “List of Potential Impacts…”

Alternative Evaluation

- Technical Working Group divided into sub-groups
- Evaluated the effect of each alternative on the Rankling Criteria
- **Ranked effect on each category as either:**
  - **Positive (+)**
  - **Negative (-)**
  - **Neutral (0)**
- Only looked at effects within Study Area
- Document: "…Environmental Considerations related to Water Supply Alternatives")

Consider Environmental Issues

Alternative 1. Local Groundwater Development (within each WPA)

Environmental Issues	(+) or (-) Affect, or Minimal (0)	Notes
Hydrologic		
Impact to Water Quality	0/-	Diminished flow reduces mixing and oxygen levels which affects fish and aquatic species. Possible site specific consideration to quality parameters, including temperature.
Impact to Streamflow	-	Eventual reduction of base flow where there is a GW-SW connection
Impact to Groundwater Availability	-	Lowers water table, reduces amount of recoverable groundwater in areas of pumping
Biologic		
Impact to Vegetation	-	Eventual reduction of riparian habitat, and may include other vegetative communities (phreatophytes).
Impact to Wildlife (Riparian-Obligate)	-	Habitat loss to riparian species
Impact to Fish/Aquatic Species	-	Habitat loss to aquatic species from changes in base-flow, stream flow magnitude, duration and flooding events
Watershed		
Impact to Watersheds	0	Potential increase in ephemeral & intermittent stream segments. Land subsidence (minimal)

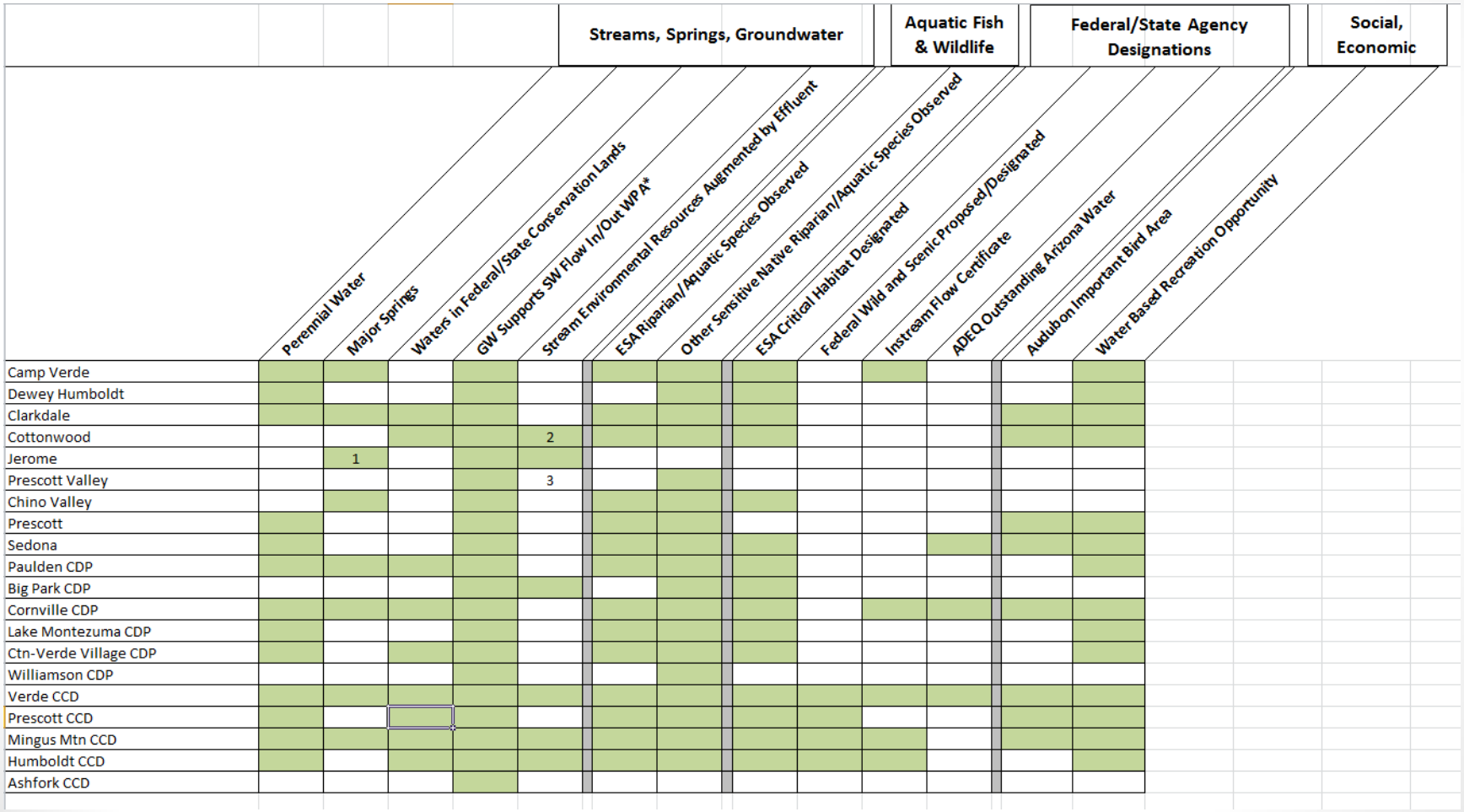
Alternative 2. Regional Groundwater Development within the Study Area

Environmental Issues (+) or (-) Affect, or Minimal (0)	Assumes Mitigation* for Maintaining Base flow	Assumes NO Mitigation and Pumping Impacts Stream	Notes
Hydrologic			
Impact to Water Quality	0/-	-	Diminished flow reduces mixing and oxygen levels which affects fish and aquatic species. In lieu mitigation water may be of lower quality than GW supported springs.
Impact to Streamflow	0	-	Eventual reduction of base flow where there is a GW-SW connection
Impact to Groundwater Availability	-	-	Within the sub-basin where pumping occurs, and down-gradient sub-basin if GW underflow exists.
Biologic			
Impact to Vegetation	0	-	Reductions in GW may affect SW flows, and eventual reduction of riparian habitat, and may include other vegetative communities (phreatophytes).
Impact to Wildlife (Riparian-Obligate)	0	-	Negative effects with loss of riparian vegetation
Impact to Fish/Aquatic Species	0/-	-	Habitat loss to aquatic species from changes in base-flow, stream flow magnitude, duration and flooding events Also depends if mitigation impacts water quality. Mitigated water supplies may include water of lower quality than what is being lost (replaced).
Watershed			
Impact to Watersheds	0	0	Impact dependent on level/type of mitigation. Positive or negative effects are very difficult to discern at this level. Expect benefits to basin where water is transported; sustains groundwater contribution to streams, helps reach safe-yield, provides alternative to exempt wells.

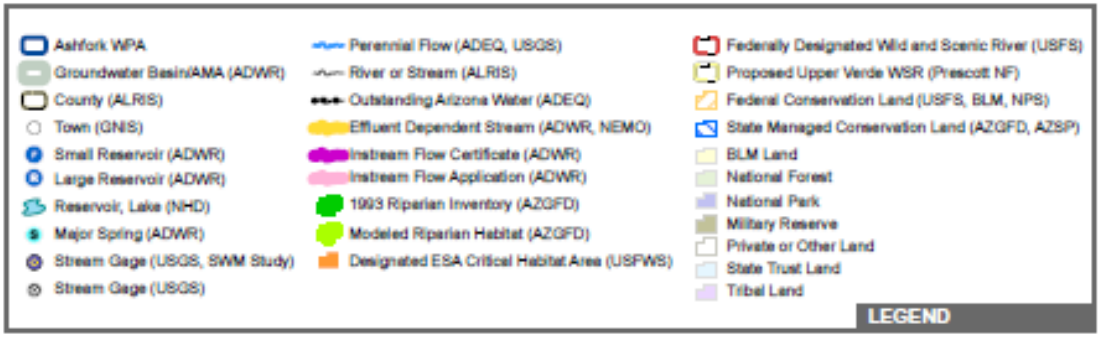
Alternative 3. Regional Groundwater Development outside the Study Area - Impacts assessed to watershed within study area

Environmental Issues	(+) or (-) Affect, or Minimal (0)	Notes
Hydrologic		
Impact to Water Quality	0/-	Assume imported water will be treated but concerns with greater mineral content from outside sources.
Impact to Streamflow	+	This alternative assumes import of the total 2050 projected water supply deficit. Benefits anticipated from a decreased need to utilize water supplies from within Study Area.
Impact to Groundwater Availability	+	Same
Biologic		
Impact to Vegetation	+	Same
Impact to Wildlife (Riparian-Obligate)	+	Same
Impact to Fish/Aquatic Species	+	Same
Watershed		
Impact to Watersheds	+	Same

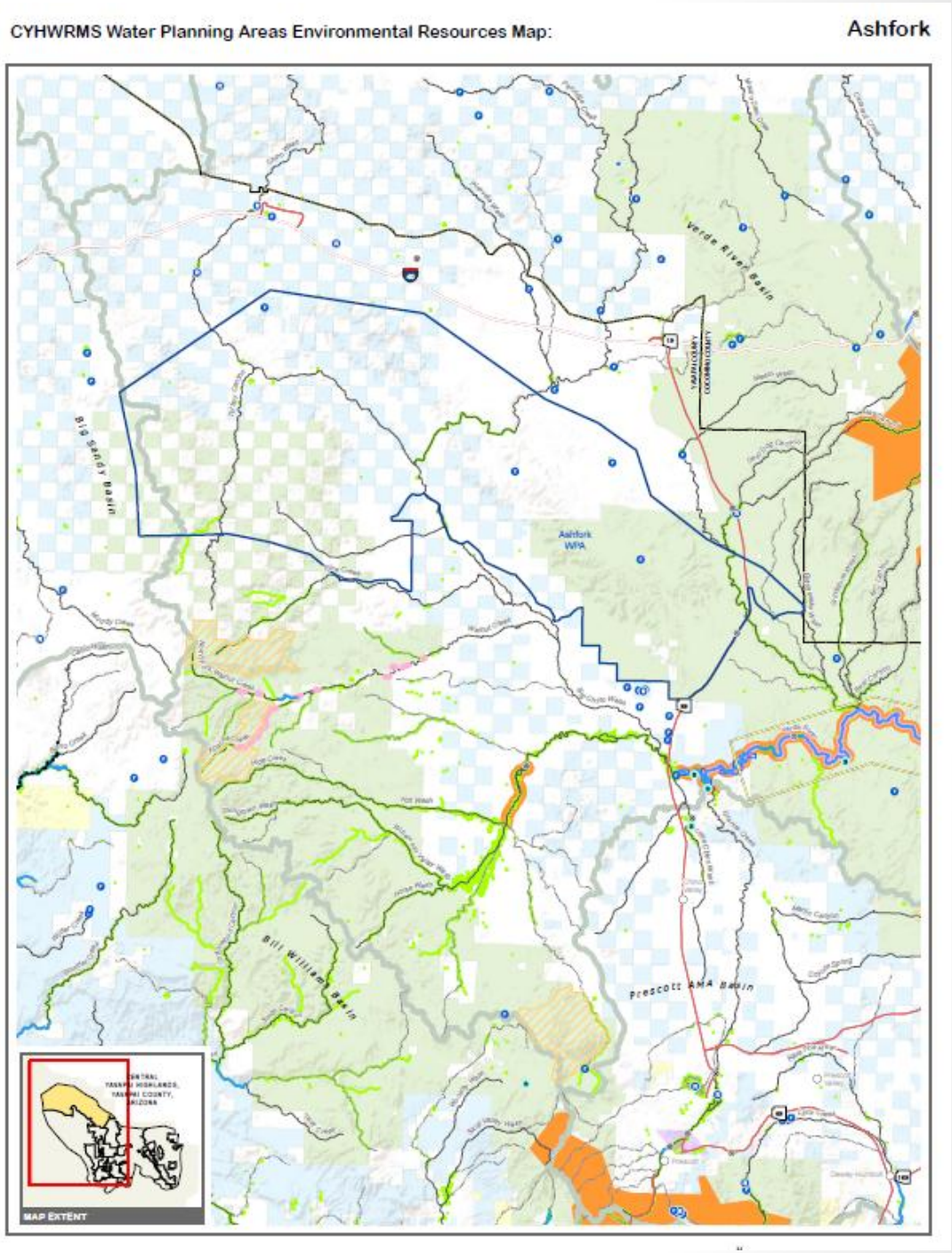
Natural Resources Index



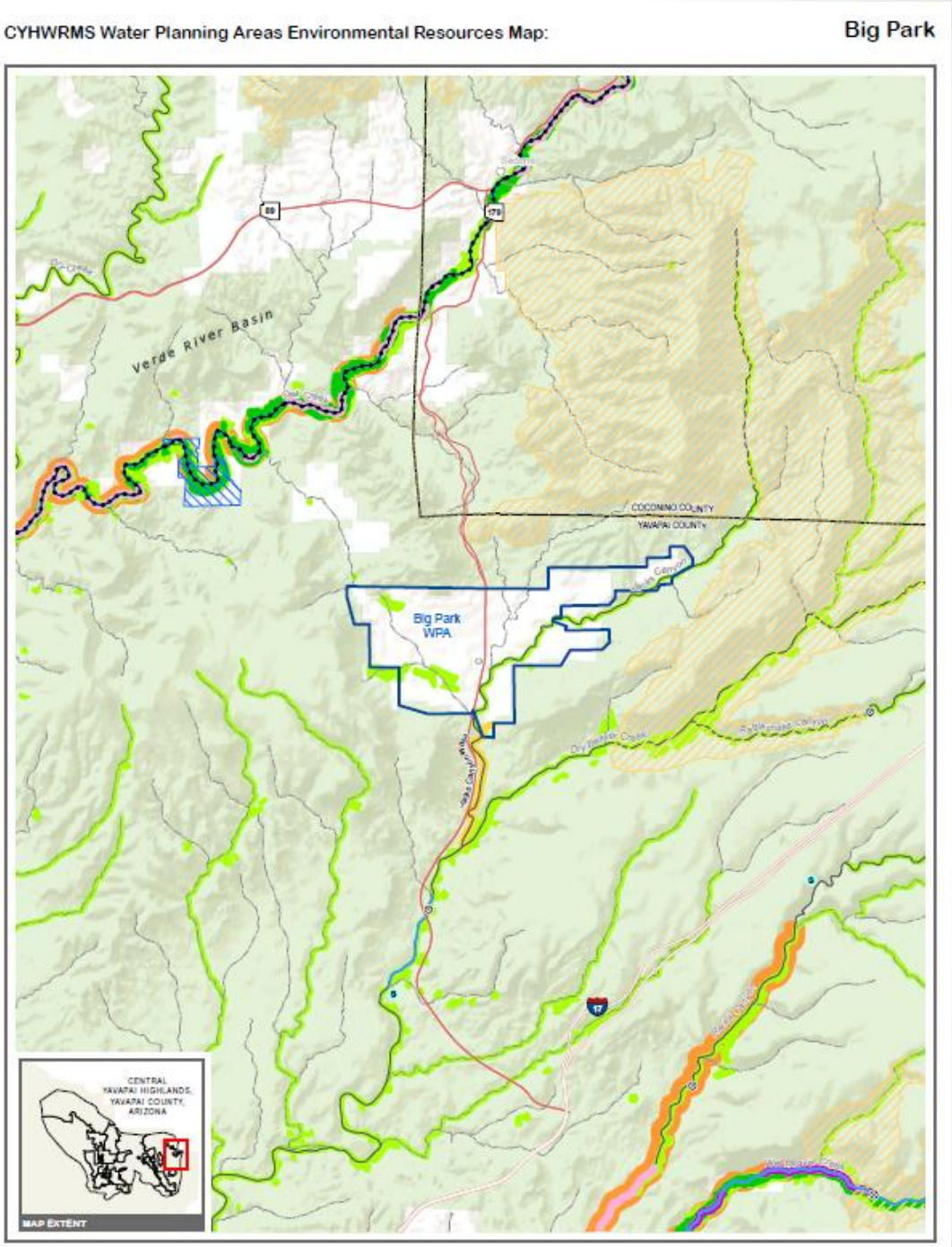
Planning Area Mapping



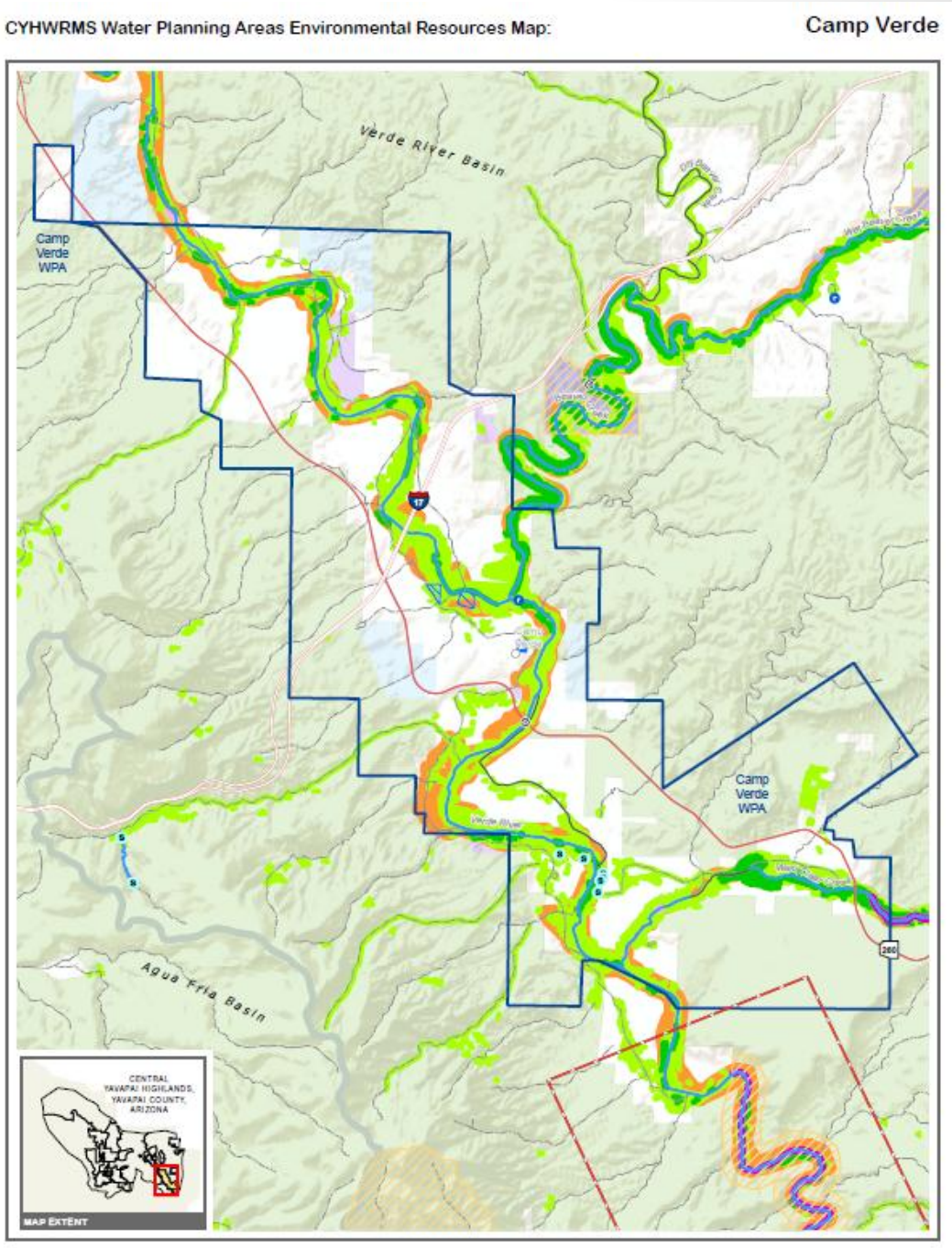
Ashfork


CYHWRMS Water Planning Areas Environmental Resources Map:
Ashfork
Verde River Basin
Big Sandy Basin
Ashfork WPA
Bill Williams Basin
Prescott AMA Basin
MAP EXTENT

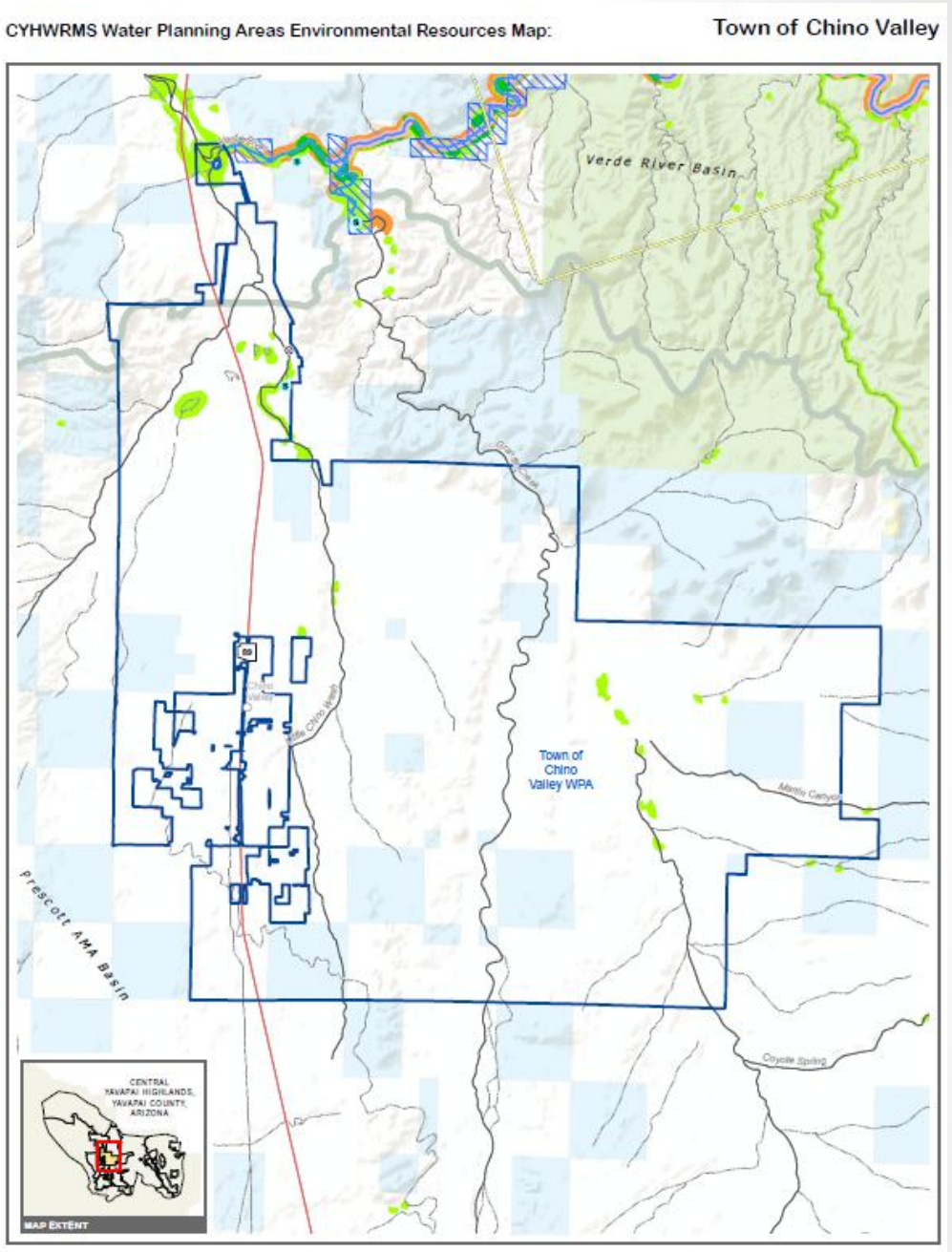
Big Park


CYHWRMS Water Planning Areas Environmental Resources Map:
Big Park
Verde River Basin
COCONINO COUNTY
YAVAPAI COUNTY
Big Park WPA
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT

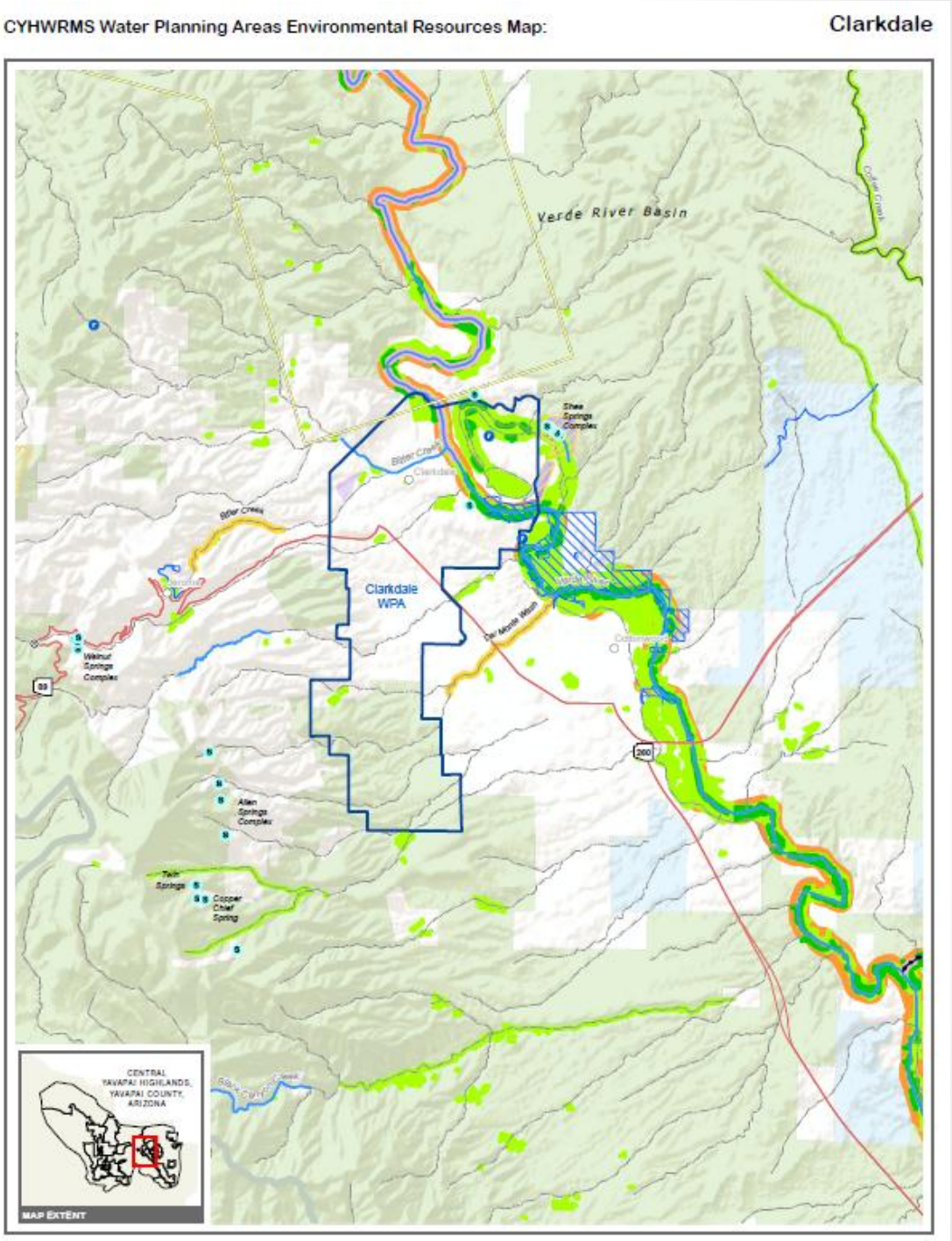
Camp Verde


CYHWRMS Water Planning Areas Environmental Resources Map:
Camp Verde
Verde River Basin
Camp Verde WPA
Camp Verde WPA
Agua Fria Basin
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT

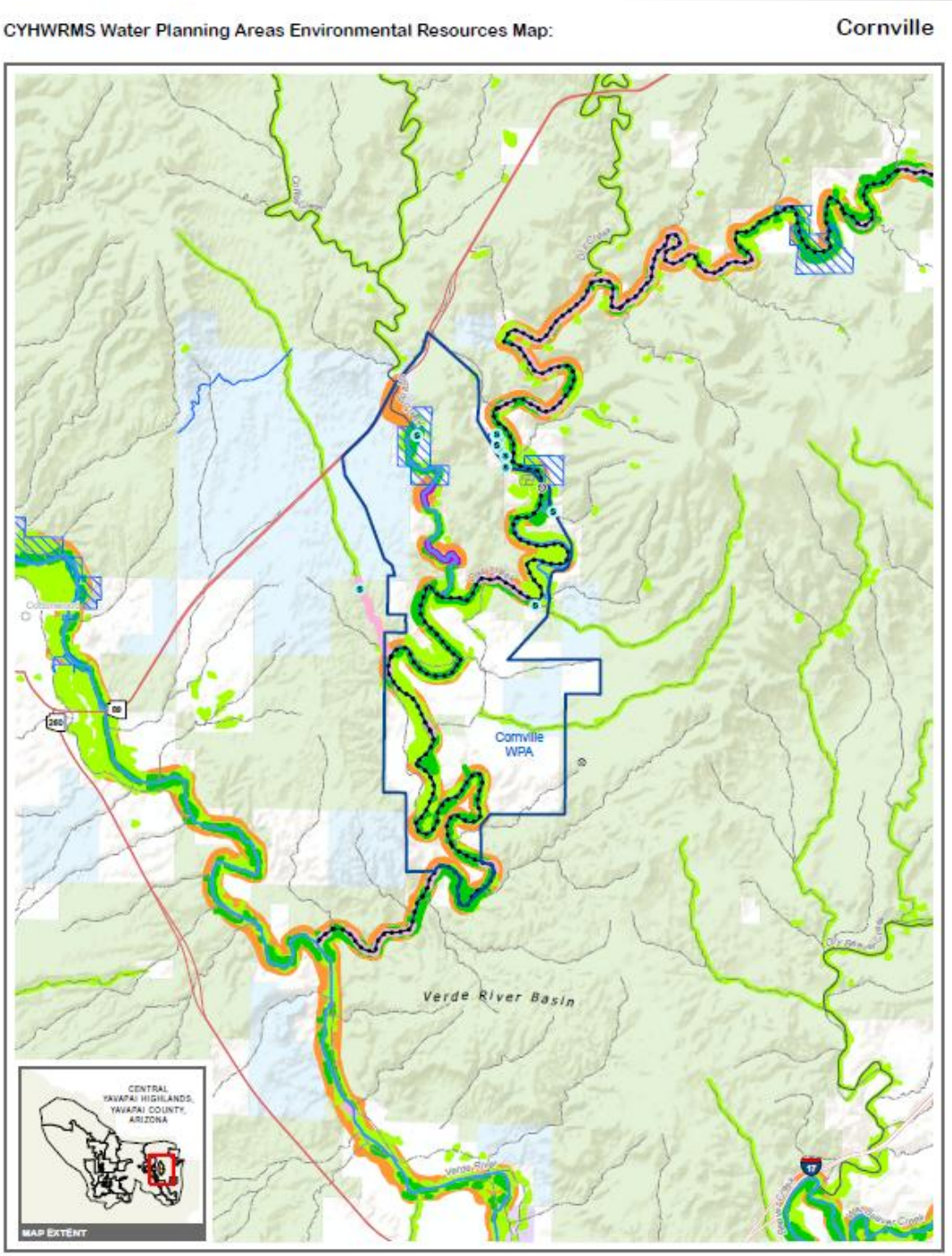
Chino Valley



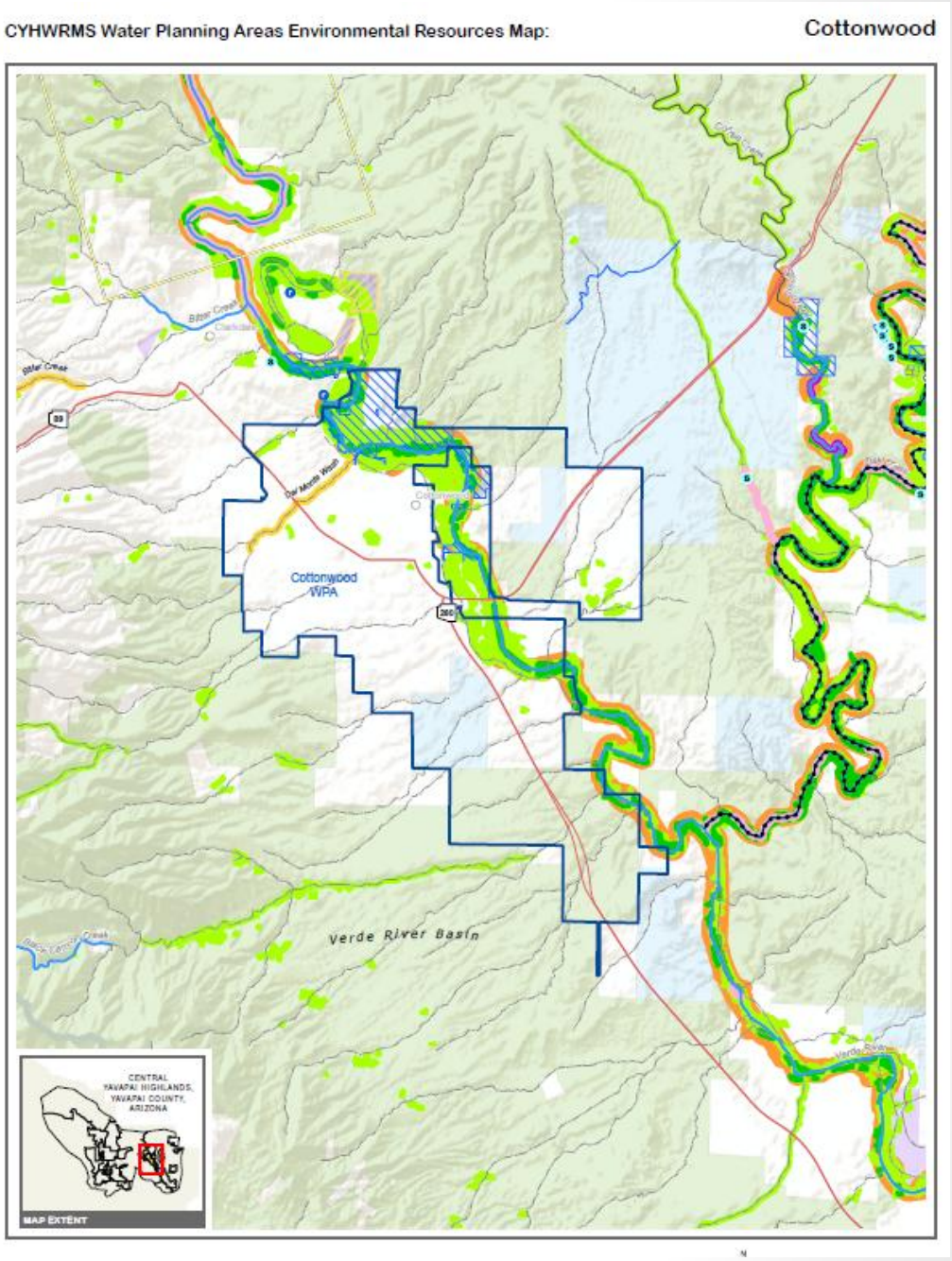
Clarkdale


CYHWRMS Water Planning Areas Environmental Resources Map:
Clarkdale
Verde River Basin
Clarkdale WPA
Walnut Springs Complex
Shea Springs Complex
Alien Springs Complex
Twin Springs
Copper Chief Spring
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT

Cornville


CYHWRMS Water Planning Areas Environmental Resources Map:
Cornville
Cornville WPA
Verde River Basin
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT

Cottonwood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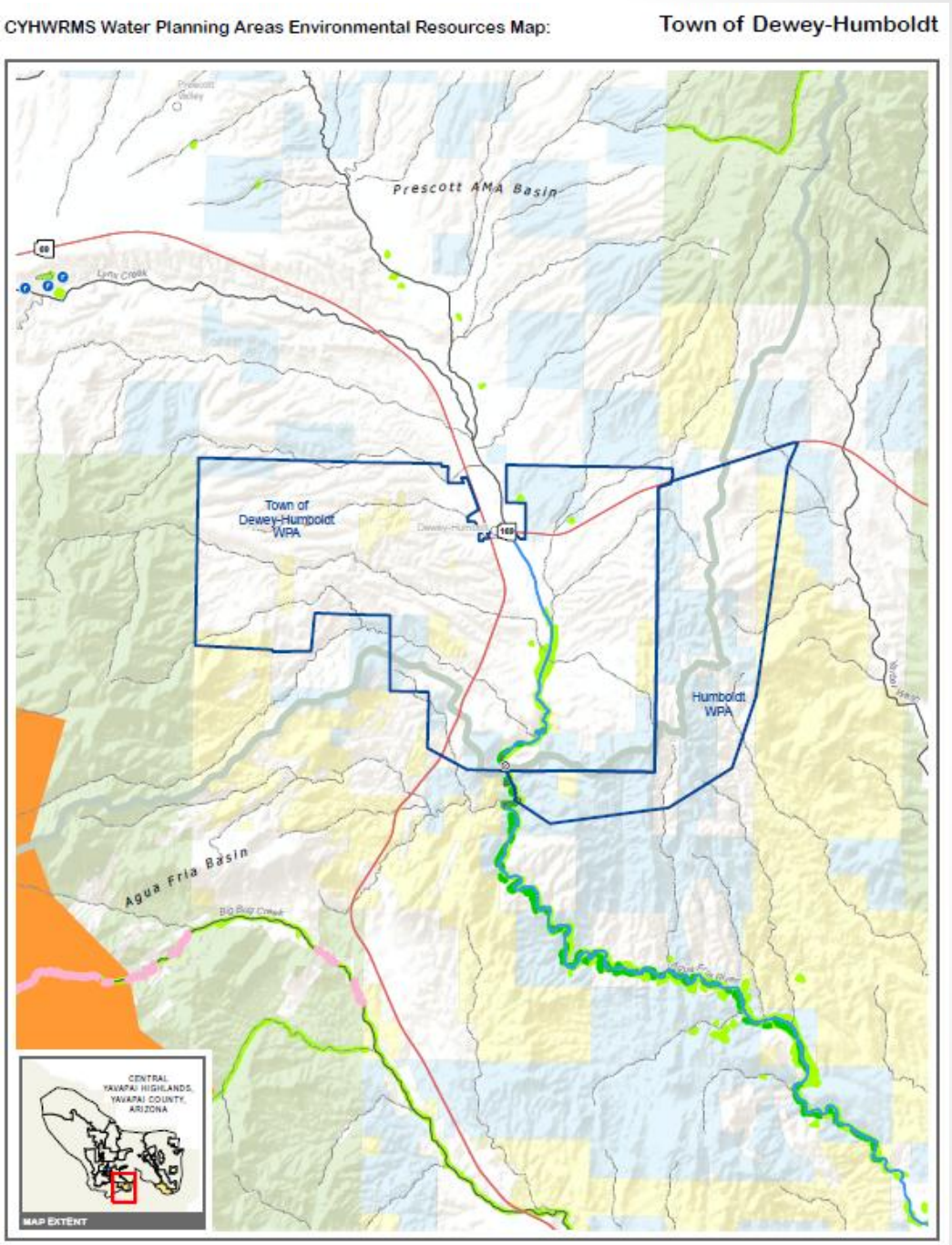
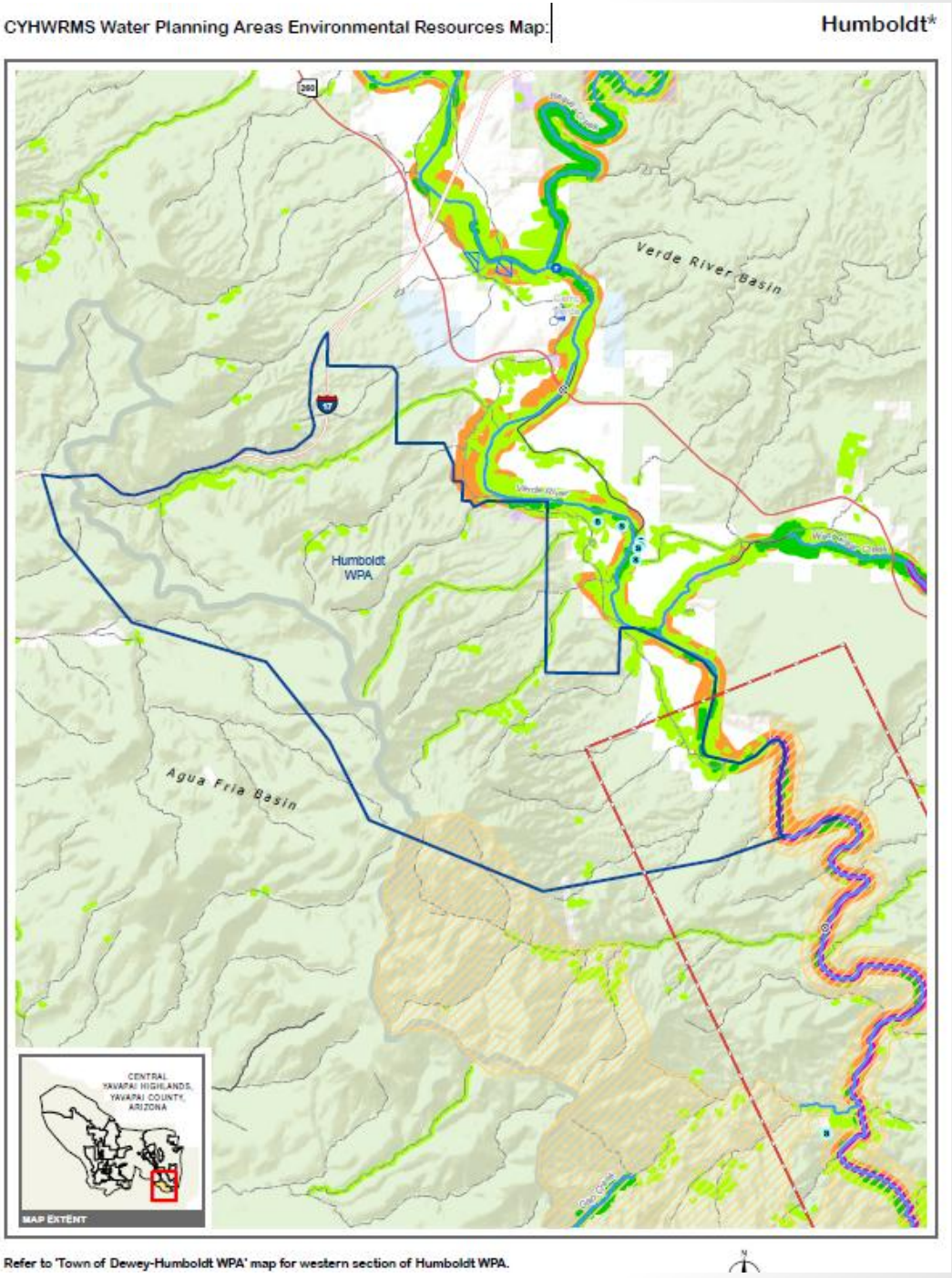
Cottonwood
Cottonwood WPA
Verde River Basin
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT

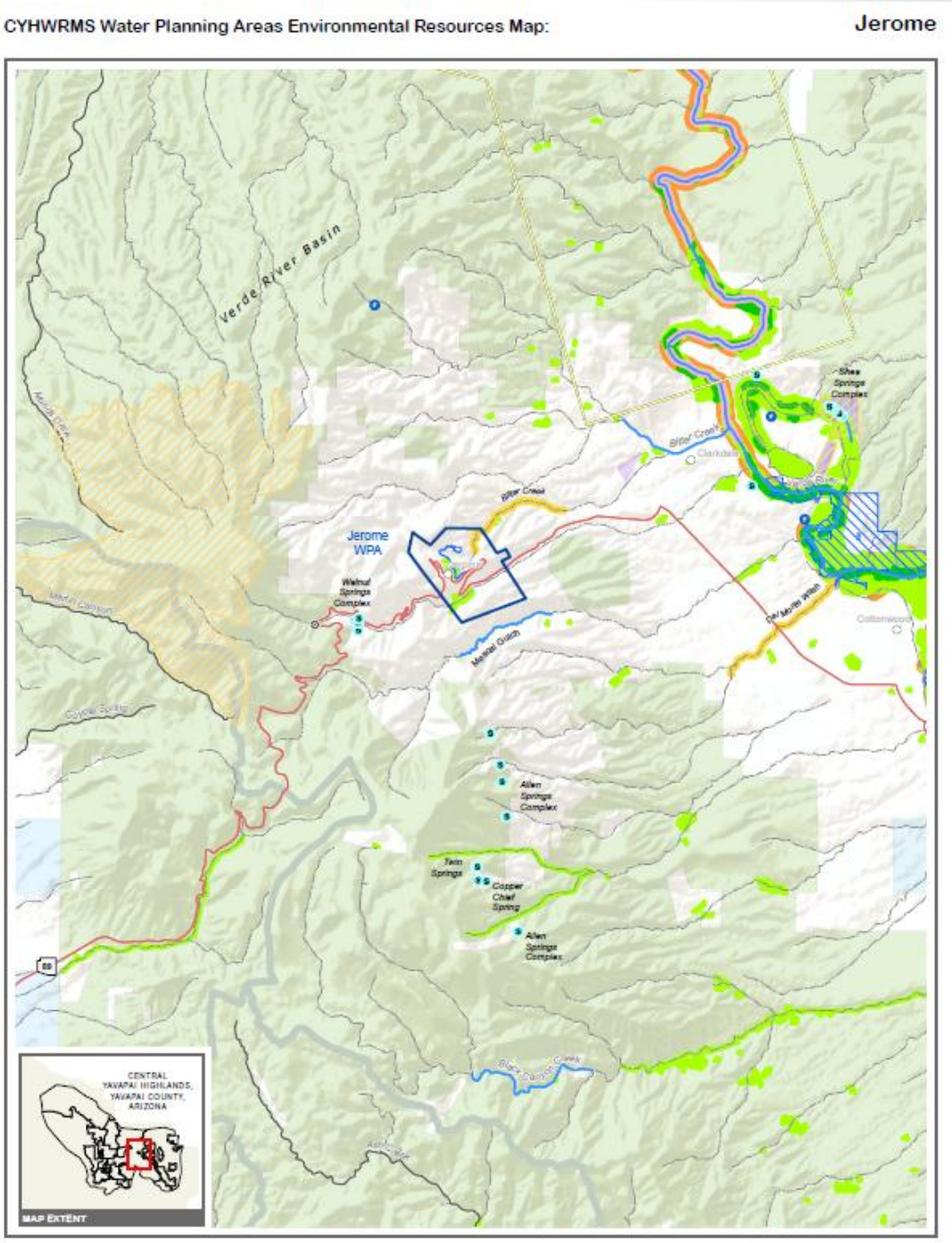
Dewey-Humboldt



Humboldt


CYHWRMS Water Planning Areas Environmental Resources Map:
Humboldt*
Verde River Basin
Humboldt WPA
Agua Fria Basin
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT
Refer to 'Town of Dewey-Humboldt WPA' map for western section of Humboldt WPA.

Jerome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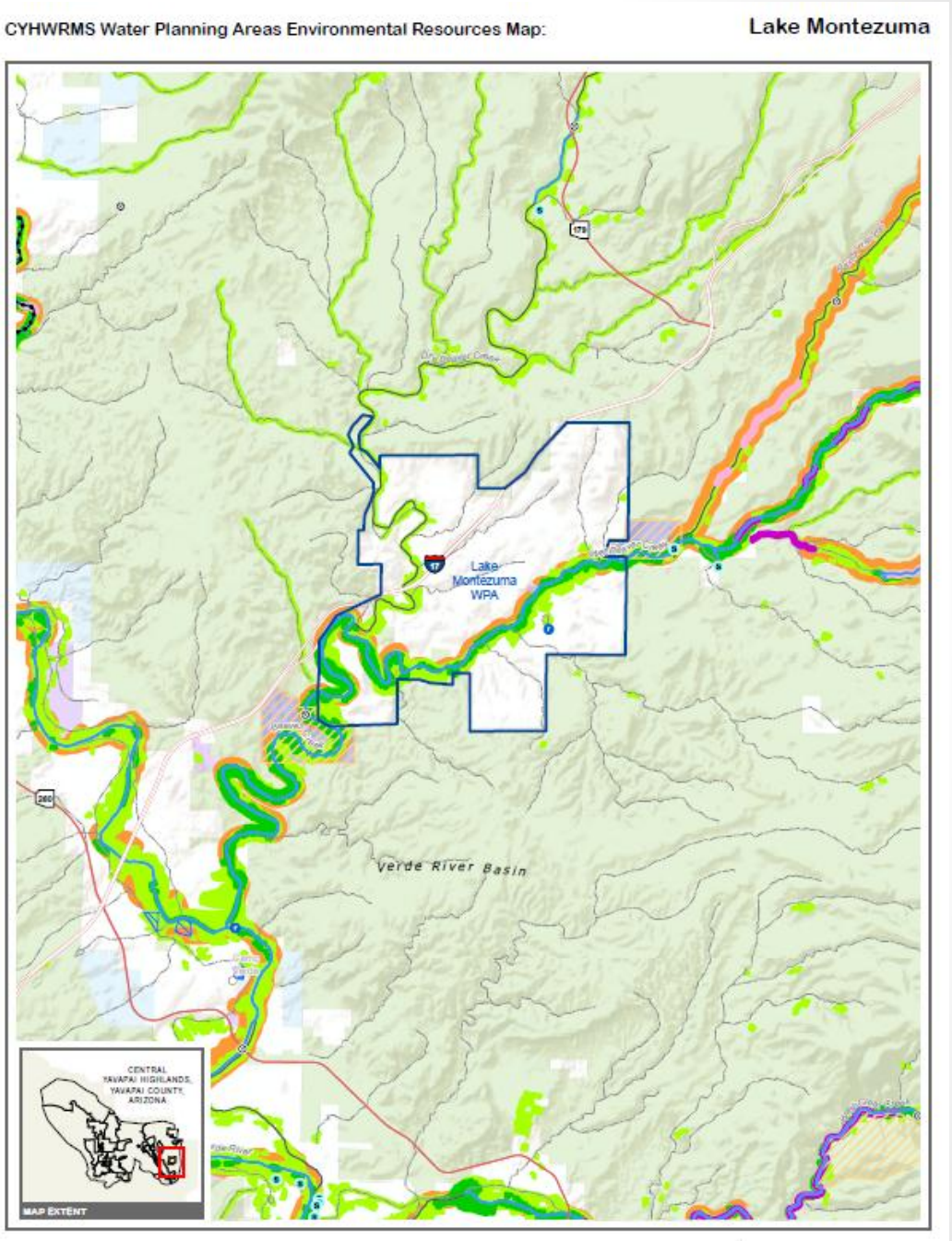
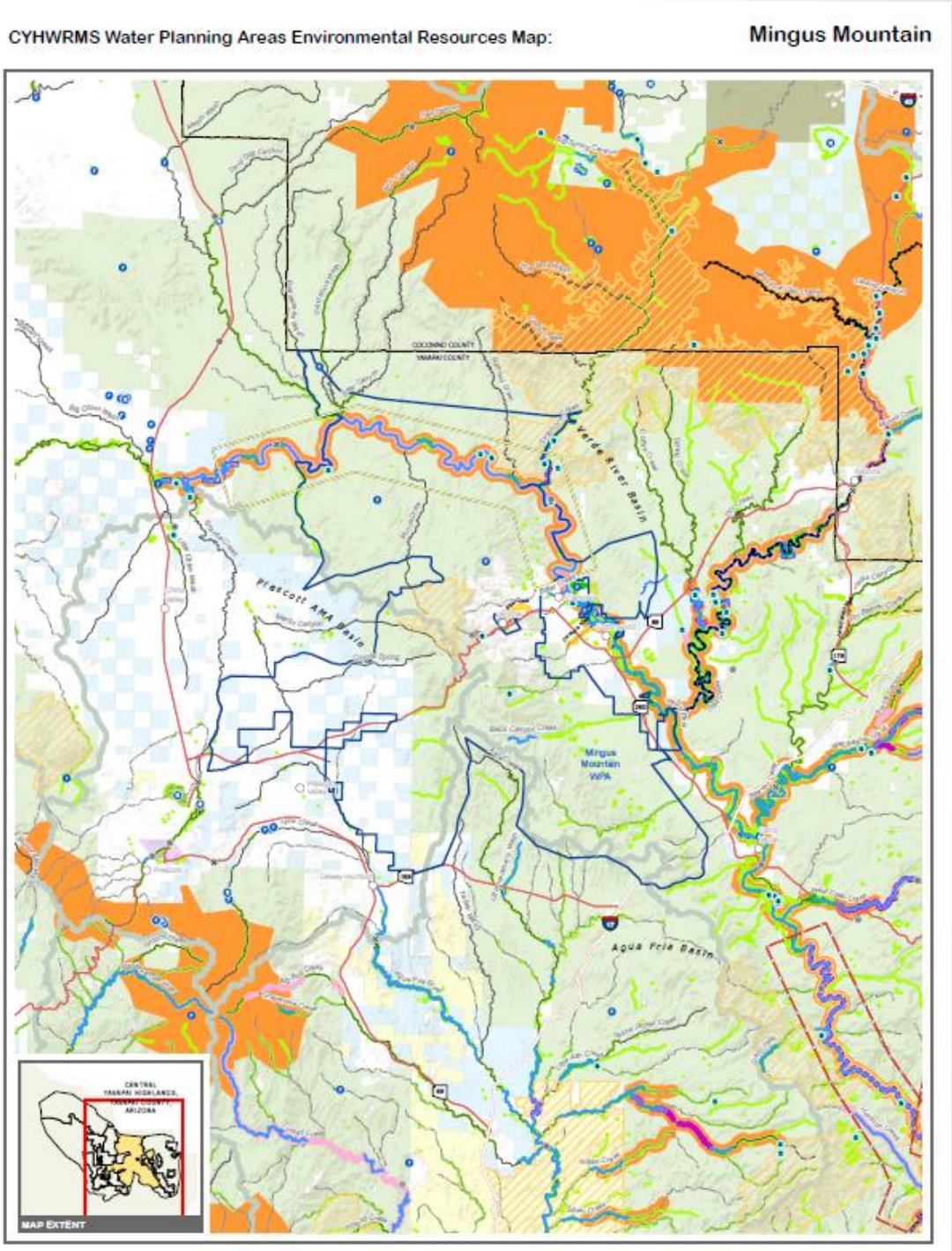
Jerome
Verde River Basin
Jerome WPA
Walnut Springs Complex
Allen Springs Complex
Twin Springs
Copper Chief Spring
Allen Springs Complex
Shea Springs Complex
Clarkdale
Cottonwood
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT

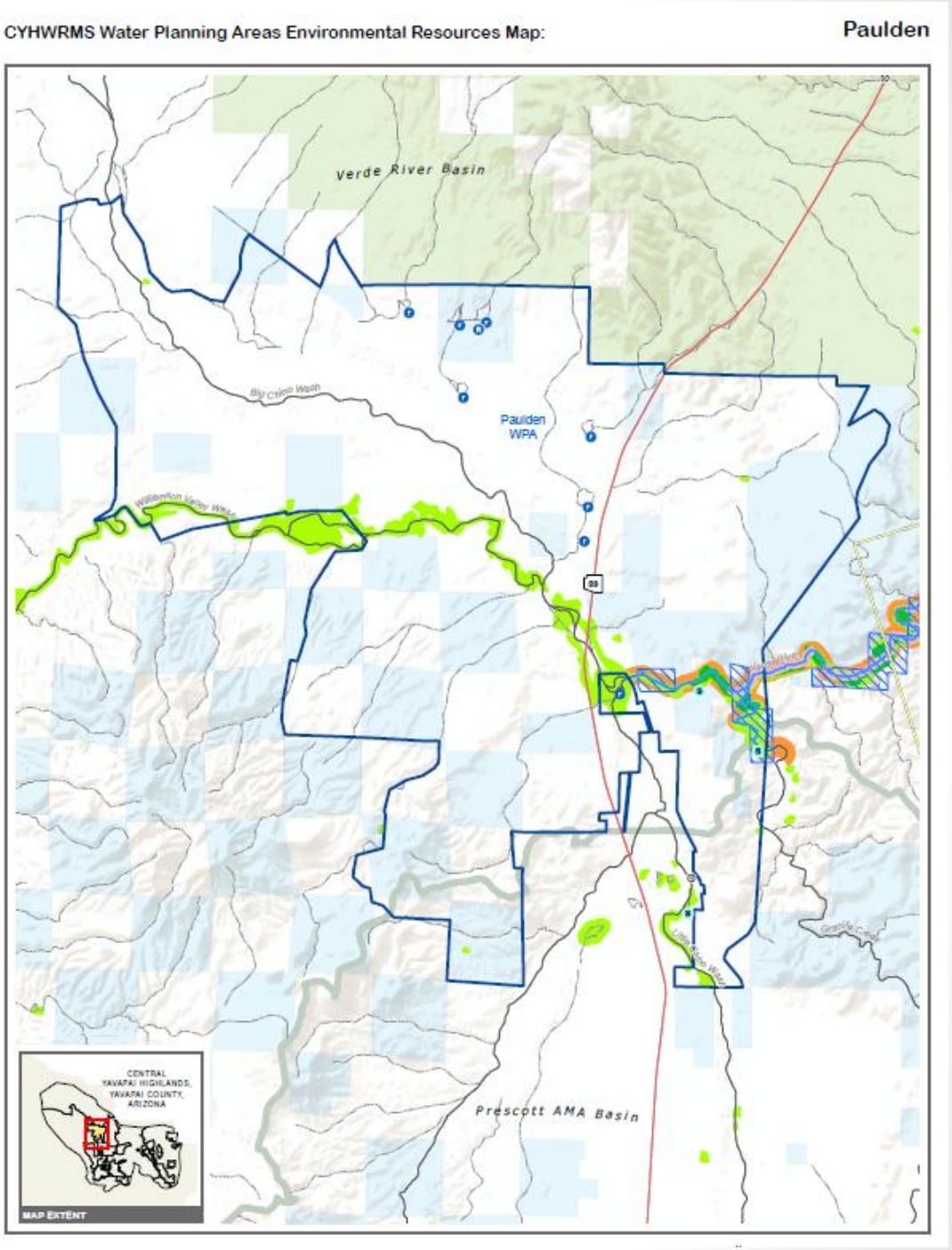
Lake Montezuma



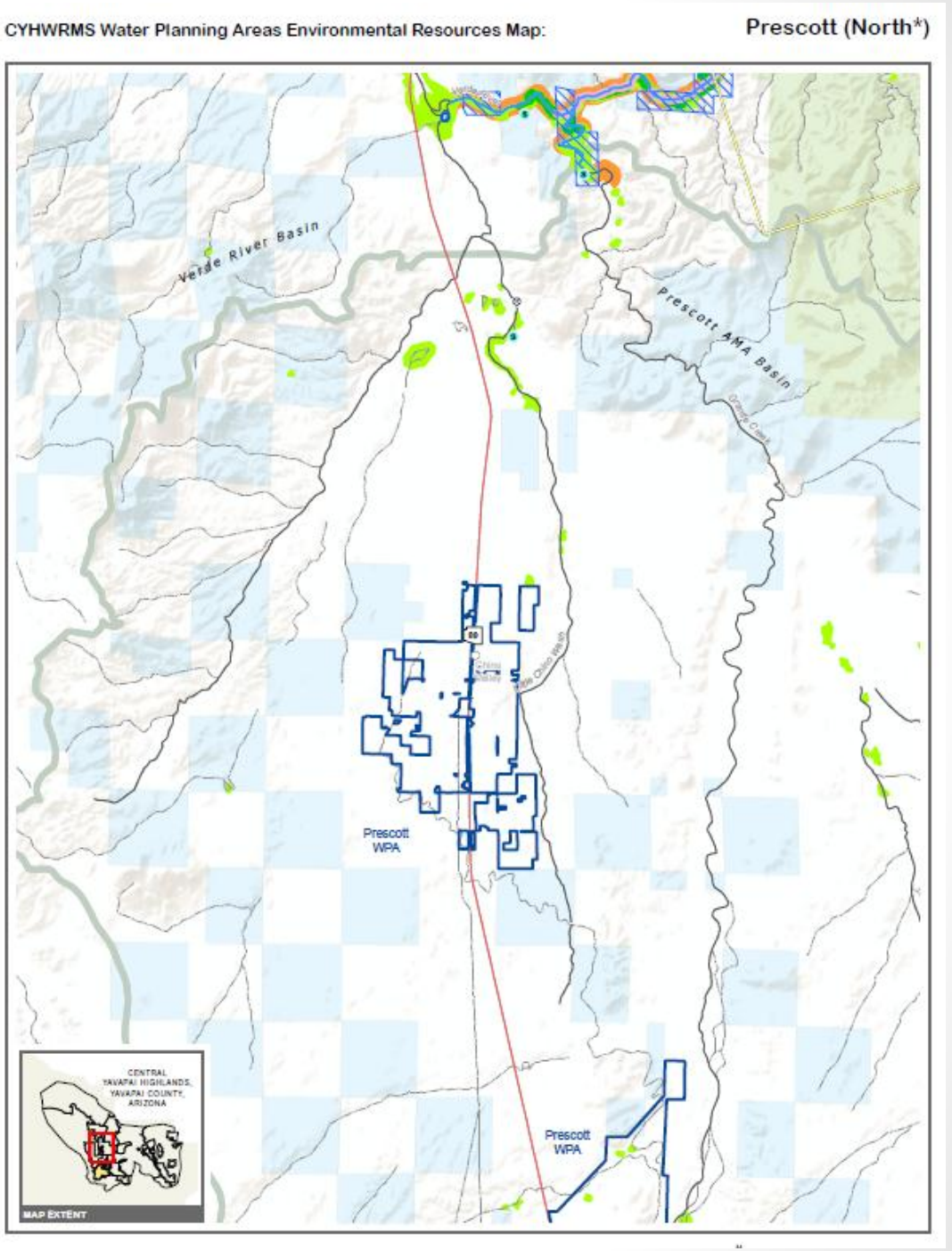
Mingus Mountain



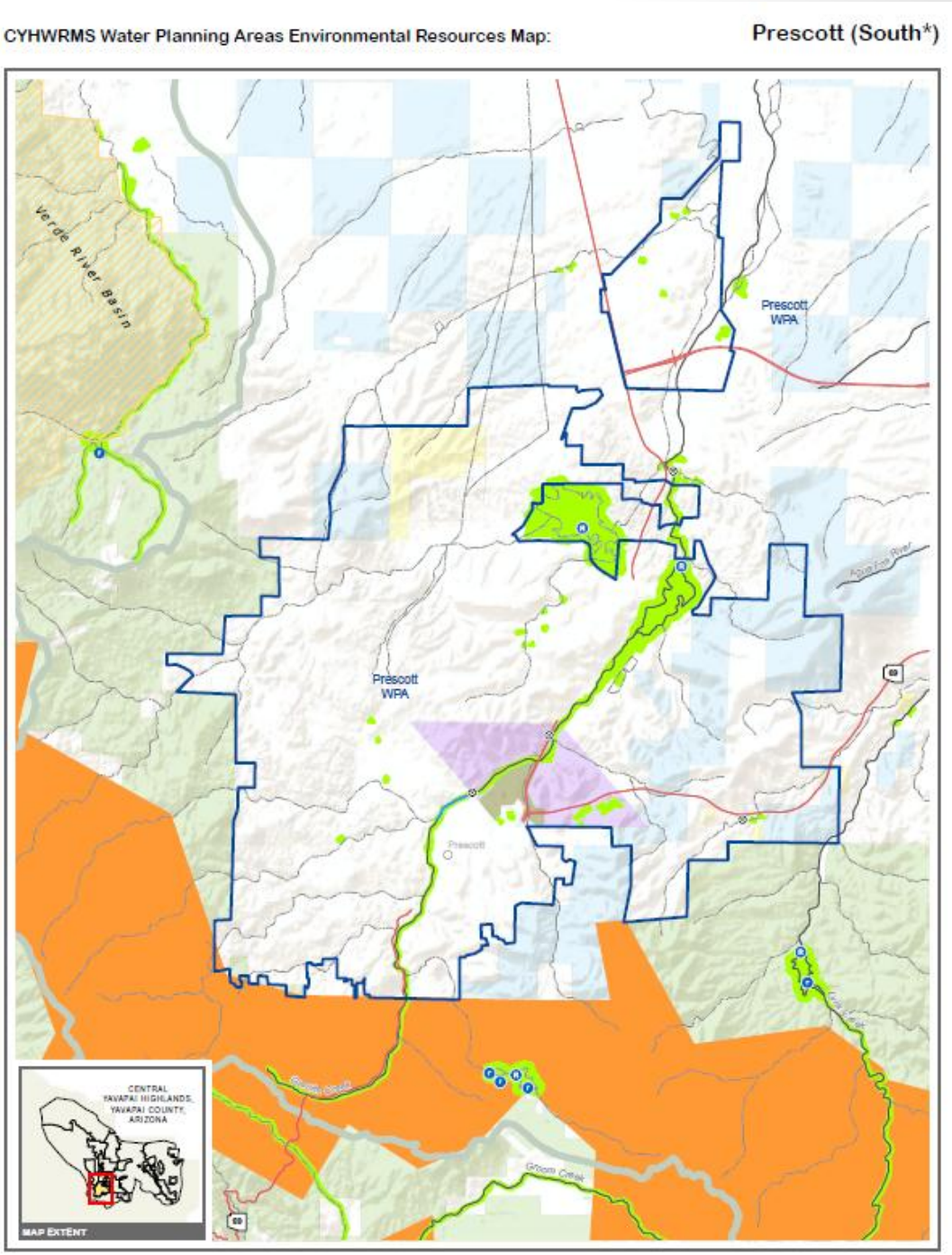
Paulden


CYHWRMS Water Planning Areas Environmental Resources Map:
Paulden
Verde River Basin
Big Chino Wash
Paulden WPA
Prescott AMA Basin
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT

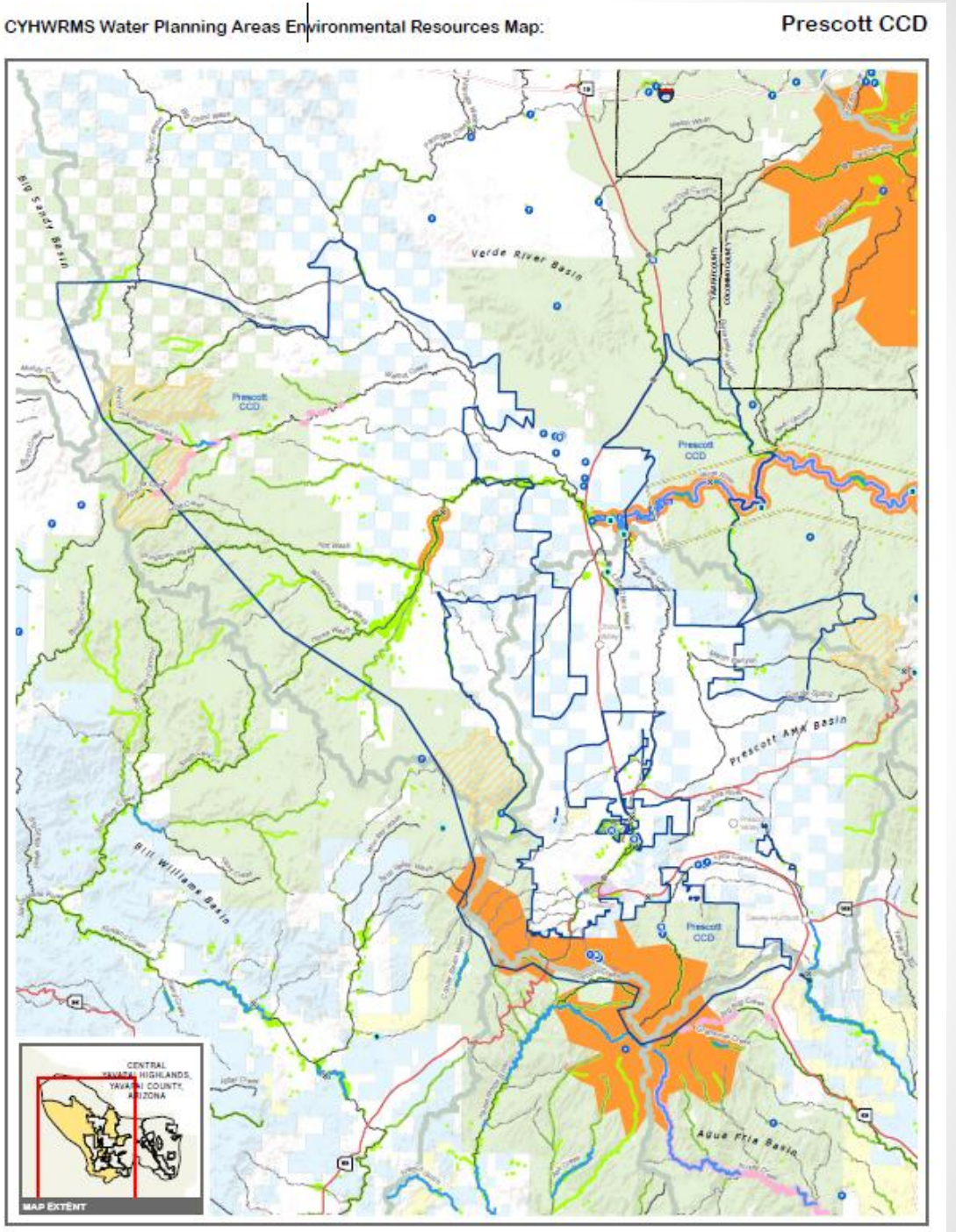
Prescott North



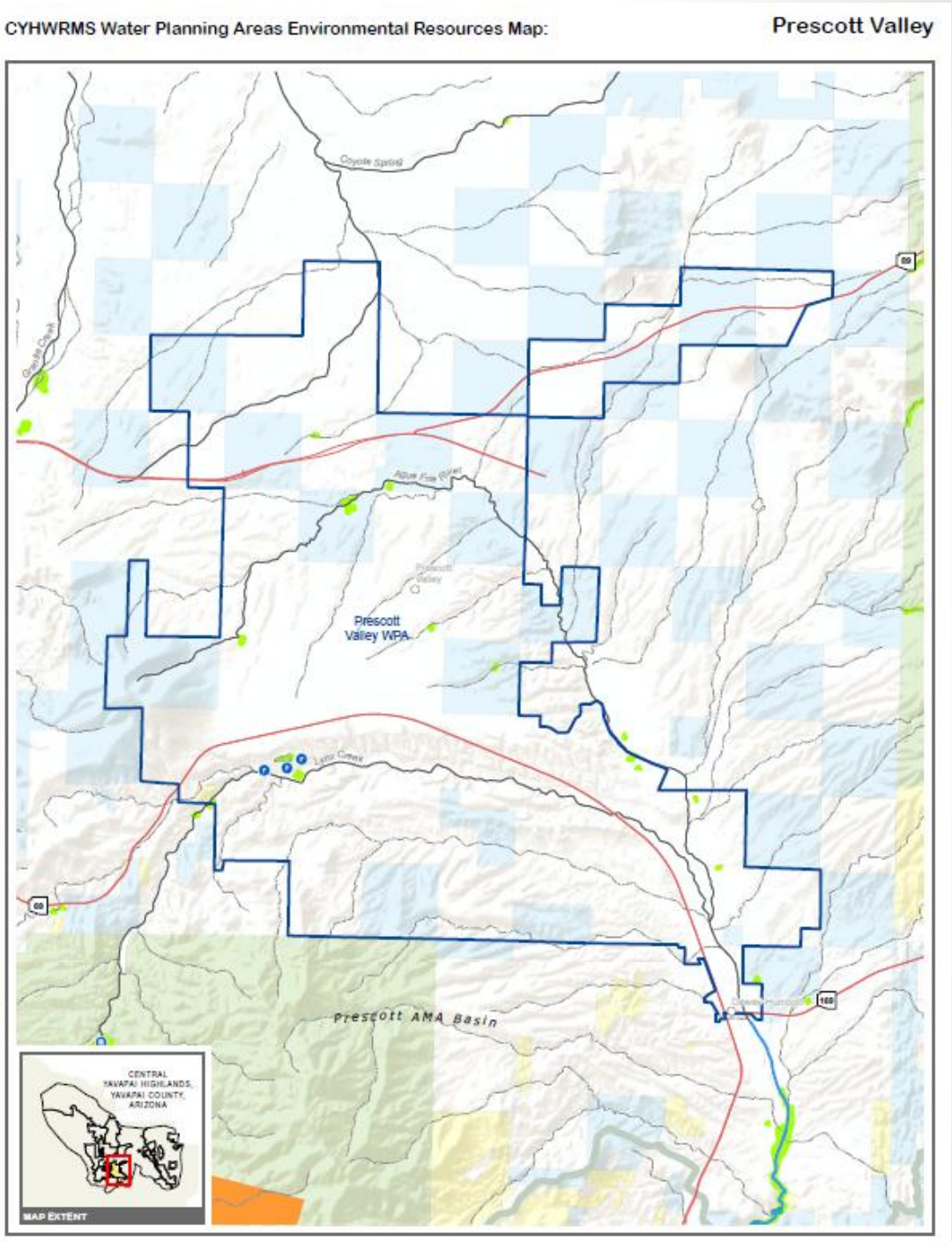
Prescott South



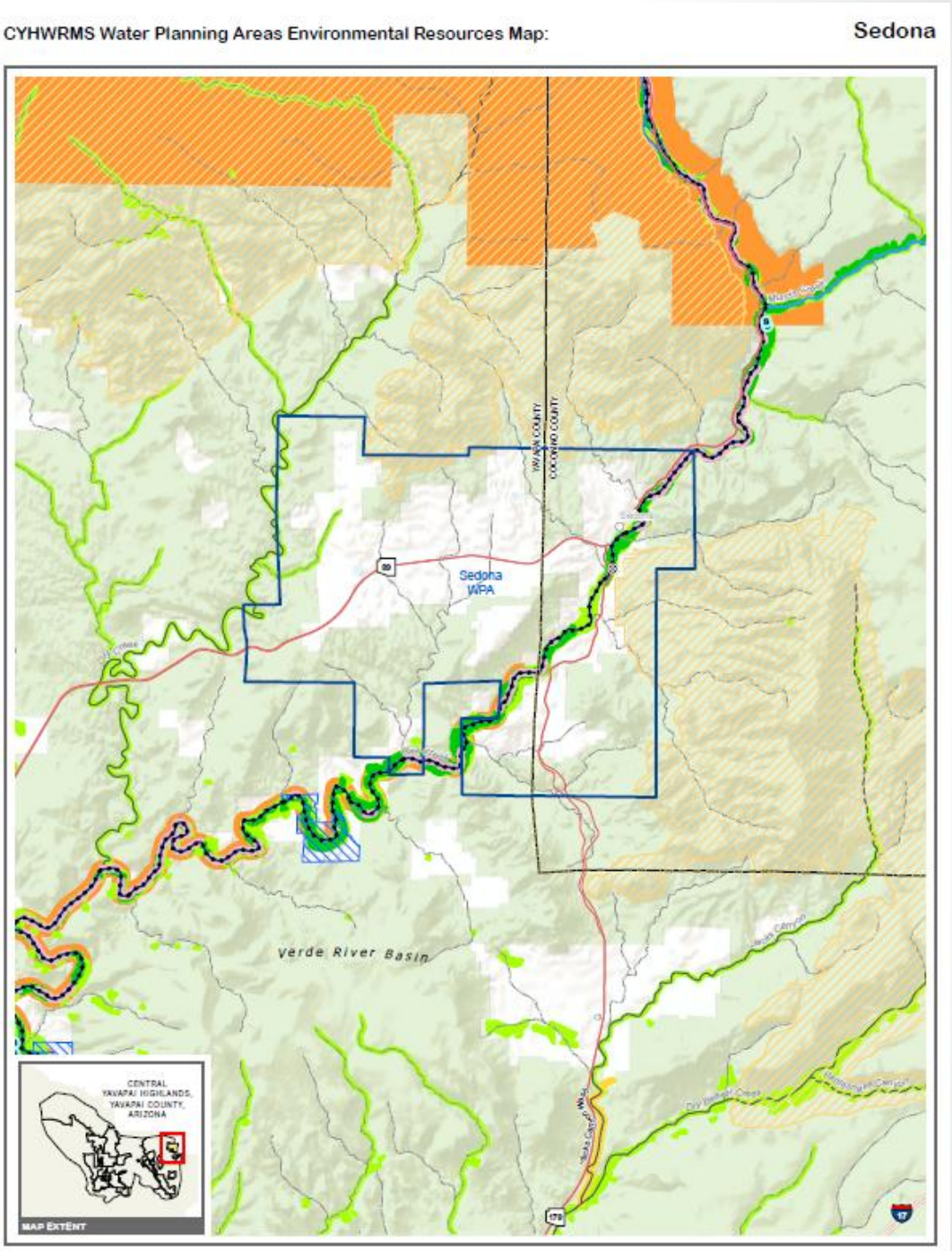
Prescott CCD



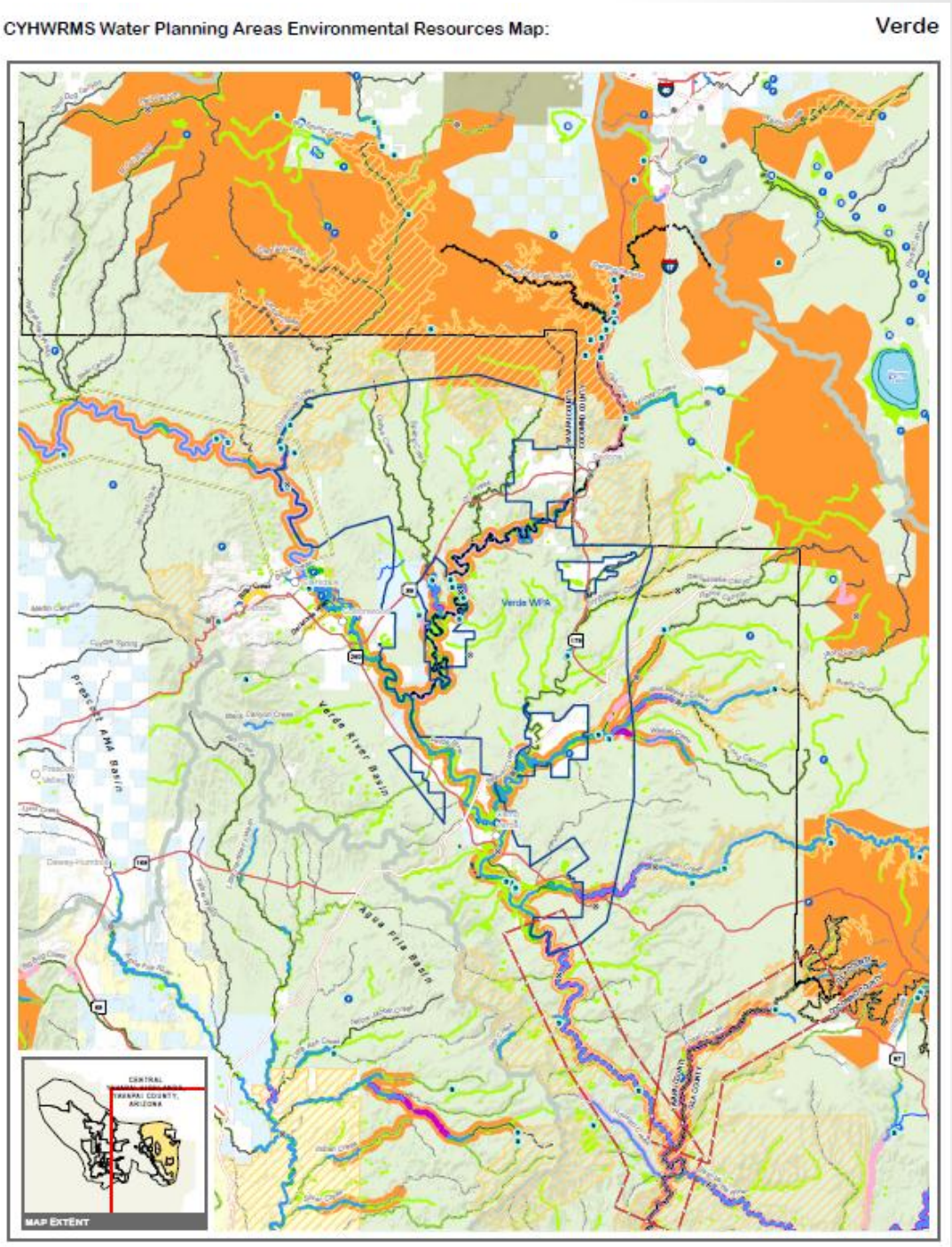
Prescott Valley



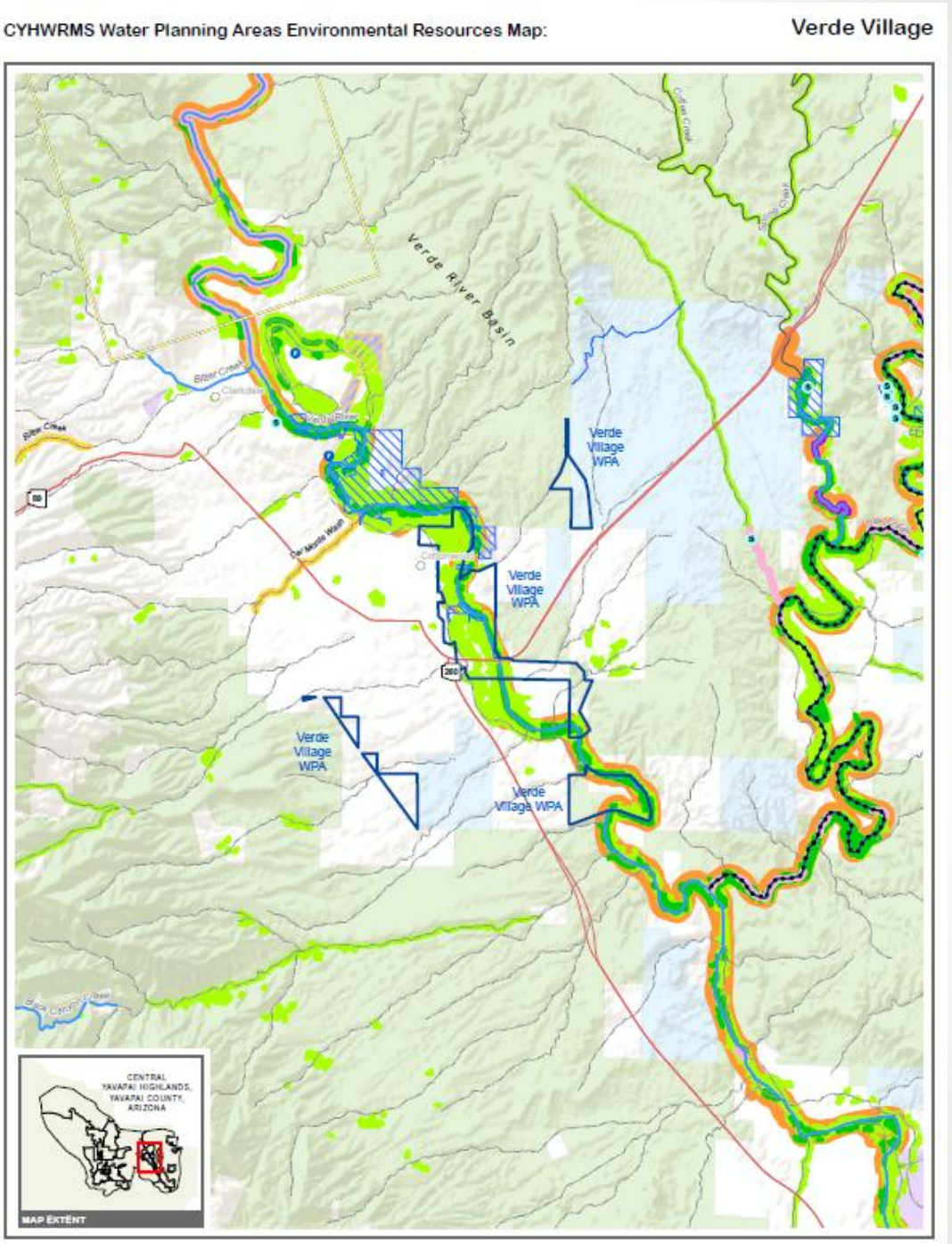
Sedona


CYHWRMS Water Planning Areas Environmental Resources Map:
Sedona
YAVAPAI COUNTY
COCONINO COUNTY
Sedona WPA
Verde River Basin
CENTRAL YAVAPAI HIGHLANDS, YAVAPAI COUNTY, ARIZONA
MAP EXTENT

Verde


CYHWRMS Water Planning Areas Environmental Resources Map:
Verde
Verde River Basin
Agua Fria Basin
Verde WPA
MAP EXTENT

Verde Village



Conclusions

- Considered effects to Environmental resources: Hydrologic (stream flow, water quality, groundwater), Biologic Vegetation, Riparian Obligates, Aquatic) and Landscape (“watersheds”).
- Ranked effects of alternative on Environmental resources (0, + -) Recommend reading brief explanation attached to the rank.
- Only considered effects to resources within the study area (e.g. importation has positive effects to in-area resources)
- Results fairly intuitive: Conservation is all positive; Watershed Management mostly positive; Others mixed depending on conditions; negatives when surface flow is reduced.
- Documents and Maps can be found on WAC website: http://www.yavapai.us/bc-wac/cyhwrms/