6th SWAN Progress Meeting

OUTPUTS AND PERSPECTIVES OF THE TRANSATLANTIC DIALOGUE

MAPPING ECOSYSTEM SERVICES SUPPLY AND DEMAND FOR POLICY AND PRACTICE – QUALITATIVE ASSESSMENT IN PANTANO WASH WATERSHED (TUCSON BASIN, AZ)

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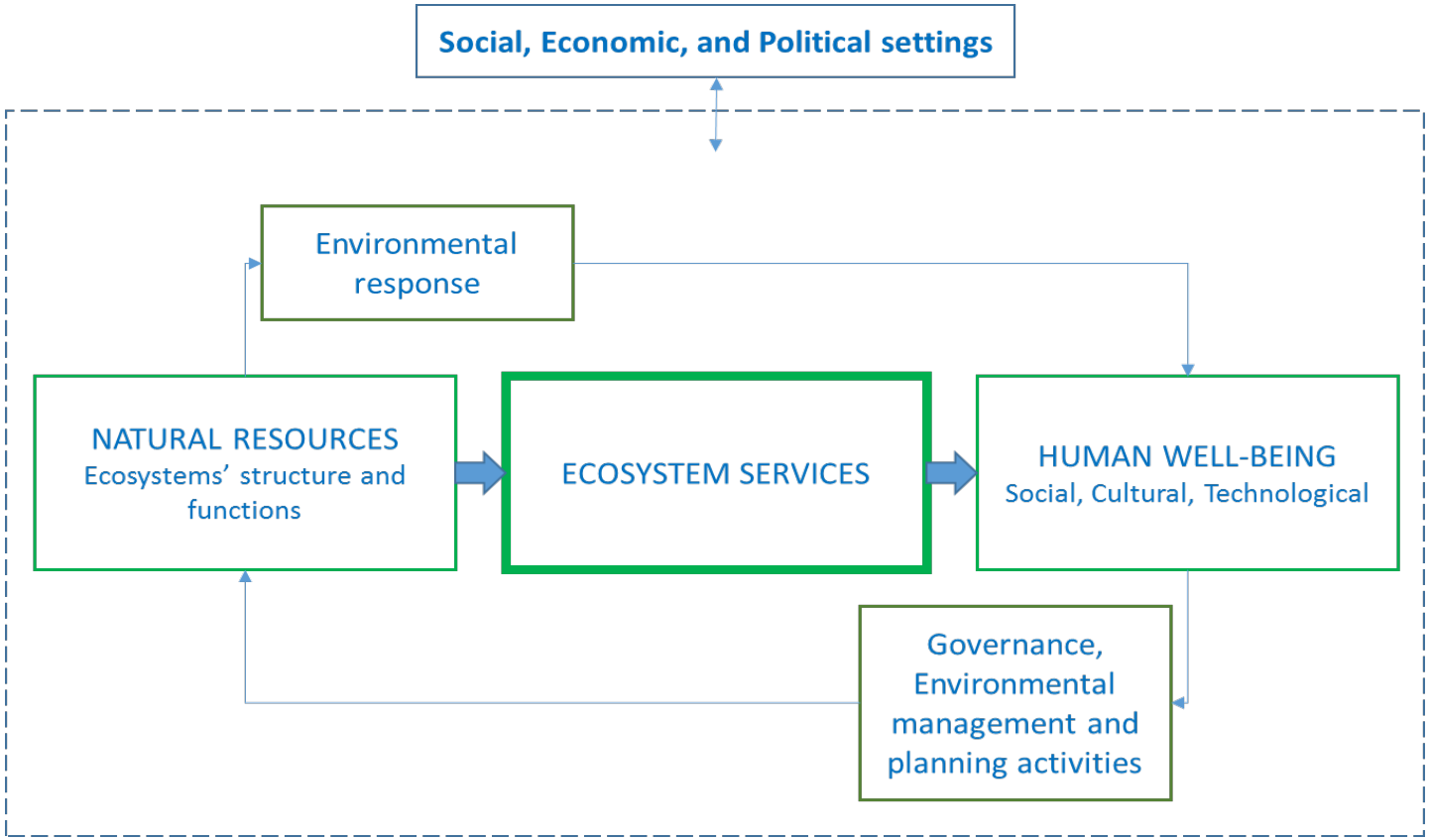
NIGGG – BAS

Background of the research

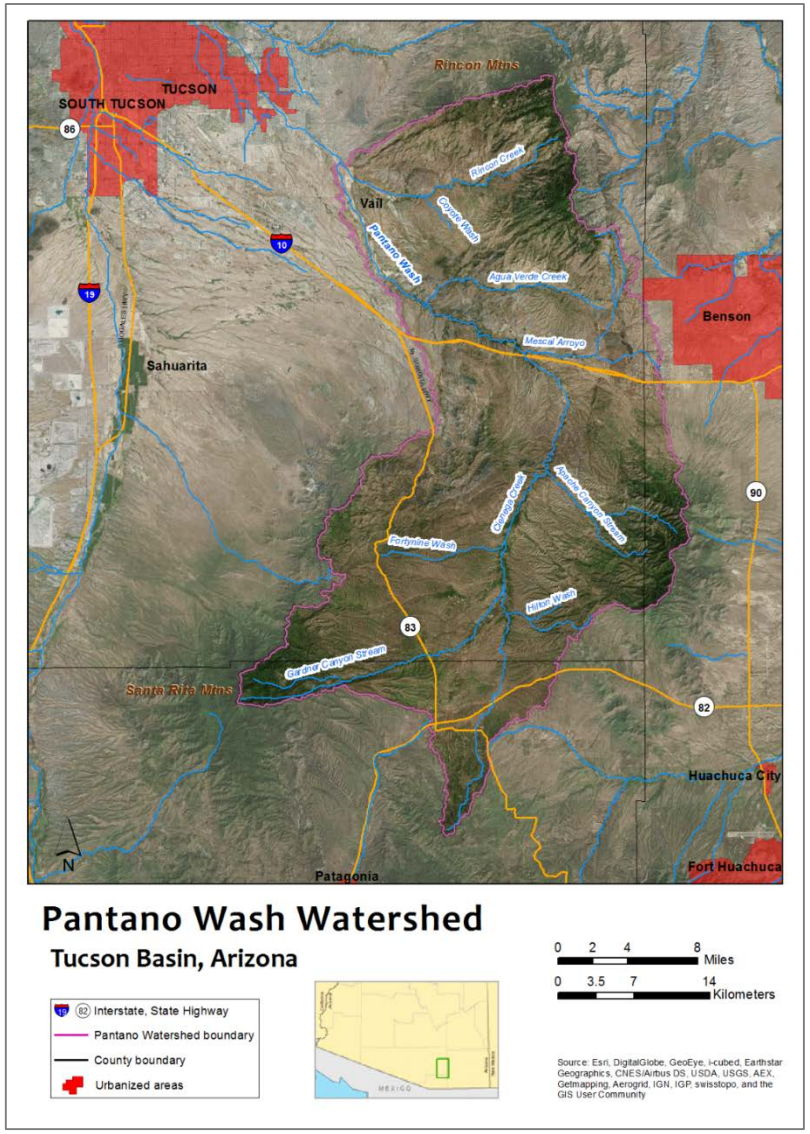


Human-environmental system as Ecosystem services (ES) core-based (SES) framework (based on DPSIR model and McGinnis & Ostrom, 2014)

Strategic decision-making process:

a) Undertaking new policies
b) Sustainable landscape development

Case Study



PANTANO WASH – RILLITO RIVER WATERSHED - Upper Cienega Creek watershed (Santa Cruz basin)

- total area 555 mi^2 (1437 km^2)
- mean elevation of 5905 ft/ 1800 m
- perennial water flow - “Unique Water of Arizona”
- 488 mi^2/ 1264 km^2 of scrubs and 5 mi^2/ 13 km^2 of herbaceous rangelands in the watershed
- evergreen forests - 50 mi^2/ 129.5 km^2

The riparian environment presents the original biodiversity in Tucson area before 1900.

<u>Resource concerns:</u> soil erosion, rangeland site stability, excessive runoff, excessive suspended sediment and turbidity in surface water, threatened or endangered plant and animal species, wildfire hazard, habitat fragmentation.

Data analysis

1st survey "IMPORTANCE OF ECOSYSTEM SERVICES IN TUCSON BASIN CASE STUDY (TBCS)"
55 participants out of 86 sent questionnaires

2nd survey "SUPPLY AND DEMAND OF ES IN PANTANO WASH WATERSHED"
18 responses (out of 57 approached stakeholders)

scale for assessing supply capacities	
0	= no relevant capacity
1	= low relevant capacity
2	= relevant capacity
3	= medium relevant capacity
4	= high relevant capacity
5	= very high relevant capacity

	regulating services								provisioning services				cultural services					
NLCD 2006	Local climate regulation	Air quality regulation	Water flow regulation	Water purification	Erosion regulation	Natural hazard protection	Pollination	Regulation of waste	Crops	Freshwater	Mineral resources	Abiotic energy sources	Recreation and tourism	Landscape aesthetic, amenity and inspiration	Knowledge systems	Cultural heritage and cultural diversity	Natural heritage and natural diversity
Open Water	3	2	4	2	1	3	2	3	1	3	1	2	4	4	4	3	4
Developed, Open Space	2	1	1	1	1	1	1	1	1	1	1	3	3	2	3	4	2
Developed, Low Intensity	2	1	1	1	1	1	1	1	1	1	1	3	3	2	3	4	2
Developed, Med. Intensity	2	1	1	1	1	1	1	1	1	1	1	3	3	2	3	4	2
Developed, High Intensity	2	1	1	1	1	1	1	1	1	1	1	3	3	2	3	4	2
Rock/Sand/Clay	1	1	1	1	1	1	1	1	0	1	3	2	2	3	3	1	3
Deciduous Forest	3	3	4	3	4	3	3	2	1	3	1	1	4	4	3	2	4
Evergreen Forest	4	4	3	3	4	3	3	3	1	3	1	1	4	4	3	3	4
Mixed Forest	3	4	4	3	4	3	3	3	1	3	1	1	4	4	3	3	4
Shrub/Scrub	2	2	2	2	3	2	3	2	1	2	1	1	2	3	3	2	3
Grassland/Herbaceous	2	2	3	2	3	2	3	2	2	2	1	1	3	3	3	2	3
Pasture/Hay	2	2	2	1	2	1	2	1	2	1	1	1	1	2	2	2	2
Cultivated Crops	2	1	2	1	2	1	2	1	4	1	1	1	1	1	3	2	1
Wetlands	3	2	4	4	3	3	3	4	1	4	1	2	4	4	4	3	4
Emergent Herbaceous Wetlands	3	2	4	4	3	3	3	4	1	4	1	2	4	4	4	3	4

Assessment matrix of the supply capacities of the different land cover classes to provide ecosystem services

Data analysis

scale for assessing demands
0 = no relevant demand
1 = low relevant demand
2 = relevant demand
3 = medium relevant demand
4 = high relevant demand
5 = very high relevant demand

	regulating services									provisioning services					cultural services					
NLCD 2006		Local climate regulation	Air quality regulation	Water flow regulation	Water purification	Erosion regulation	Natural hazard protection	Pollination	Regulation of waste		Crops	Freshwater	Mineral resources	Abiotic energy sources		Recreation and tourism	Landscape aesthetic, amenity and inspiration	Knowledge systems	Cultural heritage and cultural diversity	Natural heritage and natural diversity
Open Water		3	2	3	3	2	3	2	3		1	3	1	1		3	3	3	3	3
Developed, Open Space		3	3	3	3	3	3	2	3		2	3	2	4		3	2	3	3	2
Developed, Low Intensity		3	3	3	3	3	3	2	3		2	3	2	4		3	2	3	3	2
Developed, Med. Intensity		3	3	3	3	3	3	2	3		2	3	2	4		3	2	3	3	2
Developed, High Intensity		3	3	3	3	3	3	2	3		2	3	2	4		3	2	3	3	2
Rock/Sand/Clay		1	1	2	1	2	2	1	1		1	1	2	1		2	2	2	1	2
Deciduous Forest		3	3	3	3	3	3	3	2		1	3	1	1		3	3	3	2	3
Evergreen Forest		3	3	3	3	3	3	3	2		1	3	1	1		3	3	3	2	3
Mixed Forest		3	3	3	3	3	3	3	2		1	3	1	1		3	3	2	2	3
Shrub/Scrub		2	2	2	2	3	3	3	2		1	2	1	1		2	2	2	2	2
Grassland/Herbaceous		3	2	3	3	3	3	3	2		2	2	1	1		3	2	3	2	3
Pasture/Hay		2	2	2	2	3	2	3	2		2	2	1	1		1	2	2	1	2
Cultivated Crops		2	2	2	2	3	2	3	2		3	3	1	1		1	1	2	1	1
Wetlands		3	2	3	3	3	2	3	3		1	3	1	1		3	3	3	2	3
Emergent Herbaceous Wetlands		3	2	3	3	3	2	3	3		1	3	1	1		3	3	3	2	3

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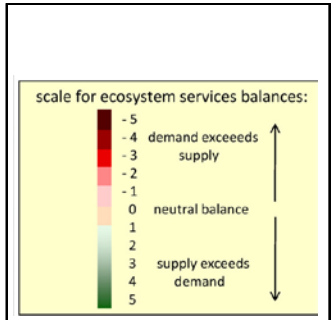
Assessment matrix of the demands of ecosystem services within the different land cover classes

Data analysis

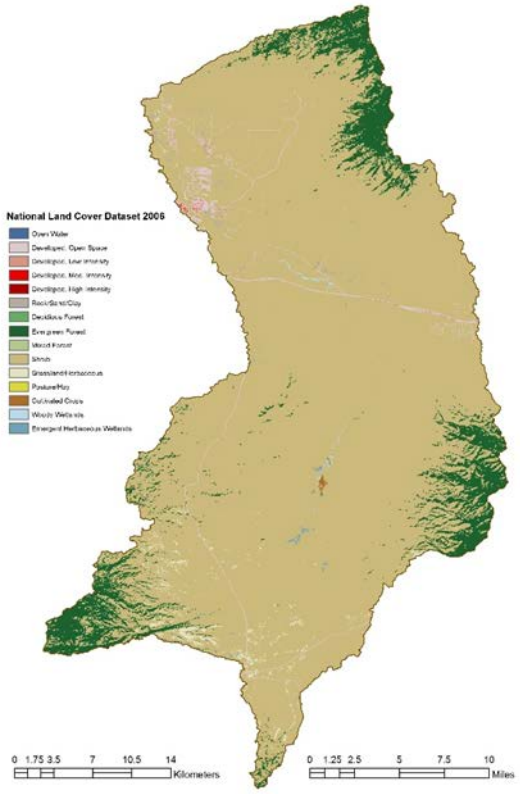
scale for ES balances (budgets) ranges from
-5=demand exceeds supply=strong undersupply
to
5 = supply exceeds demand=strong oversupply
0 values = neutral balance, the demand is equal to the supply

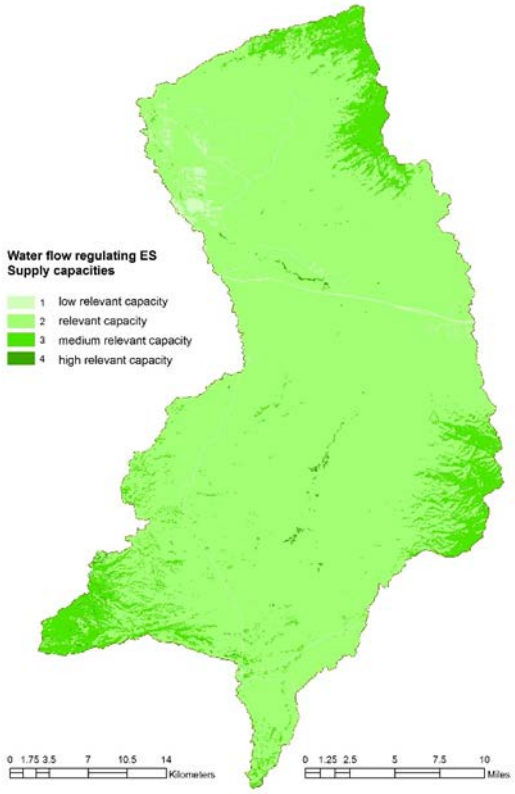


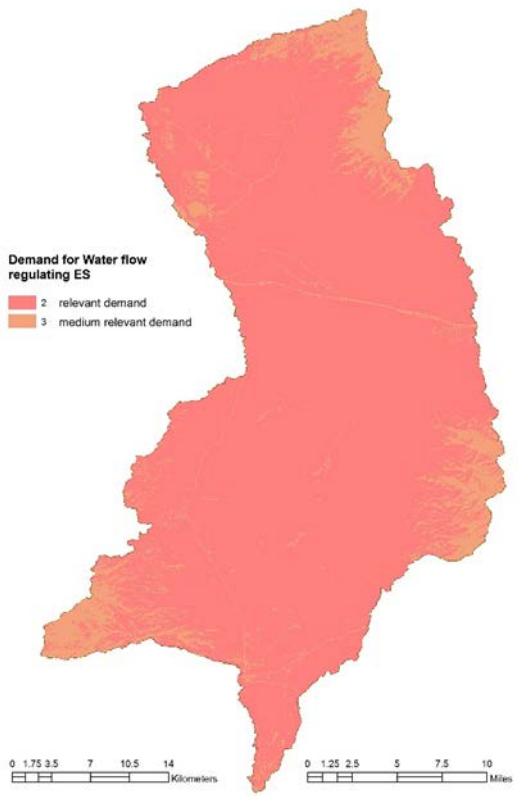
	regulating services								provisioning services				cultural services					
NLCD 2006	Local climate regulation	Air quality regulation	Water flow regulation	Water purification	Erosion regulation	Natural hazard protection	Pollination	Regulation of waste	Crops	Freshwater	Mineral resources	Abiotic energy sources	Recreation and tourism	Landscape aesthetic, amenity and inspiration	Knowledge systems	Cultural heritage and cultural diversity	Natural heritage and natural diversity
Open Water	0	0	1	-1	-1	0	0	0	-1	0	0	0	1	1	1	0	1
Developed, Open Space	-1	-1	-2	-2	-2	-2	-2	-2	0	-2	-1	-1	0	0	0	0	0
Developed, Low Intensity	-1	-1	-2	-2	-2	-2	-2	-2	0	-2	-1	-1	0	0	0	0	0
Developed, Med. Intensity	-1	-1	-2	-2	-2	-2	-2	-2	0	-2	-1	-1	0	0	0	0	0
Developed, High Intensity	-1	-1	-2	-2	-2	-2	-2	-2	0	-2	-1	-1	0	0	0	0	0
Rock/Sand/Clay	0	0	0	-1	-1	0	-1	-1	0	0	1	1	1	0	1	0	1
Deciduous Forest	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1
Evergreen Forest	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1
Mixed Forest	0	1	1	0	0	0	0	1	0	0	0	0	1	1	1	1	1
Shrub/Scrub	0	0	0	0	0	0	0	0	0	-1	0	0	0	0	1	0	1
Grassland/Herbaceous	-1	0	0	0	0	-1	0	0	0	-1	0	1	0	0	0	0	0
Pasture/Hay	-1	0	0	-1	0	-1	-1	-1	0	-1	0	1	0	0	1	1	0
Cultivated Crops	-1	-1	-1	-1	-1	-1	-1	-1	1	-2	0	0	0	0	1	0	0
Wetlands	0	0	1	1	0	1	0	1	0	1	0	1	1	1	0	1	1
Emergent Herbaceous Wetlands	0	0	1	1	0	1	0	1	0	1	0	1	1	1	0	1	1

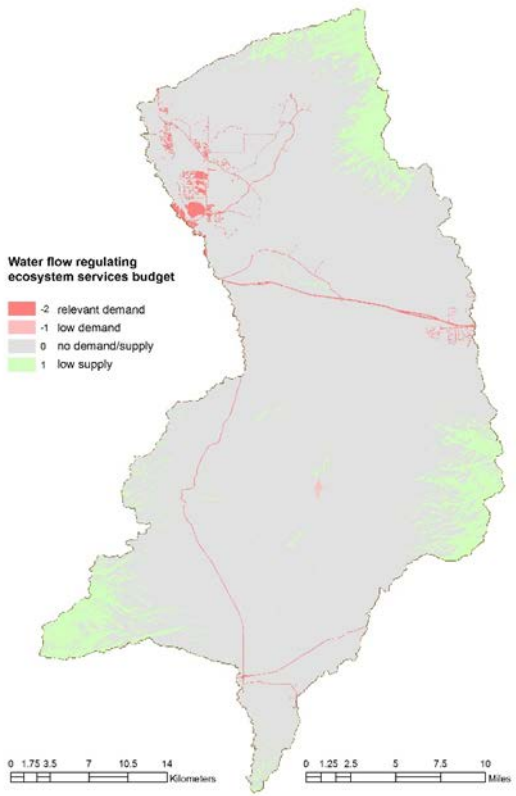
Assessment budget matrix of ES supply and demand within different NLCD classes

Results



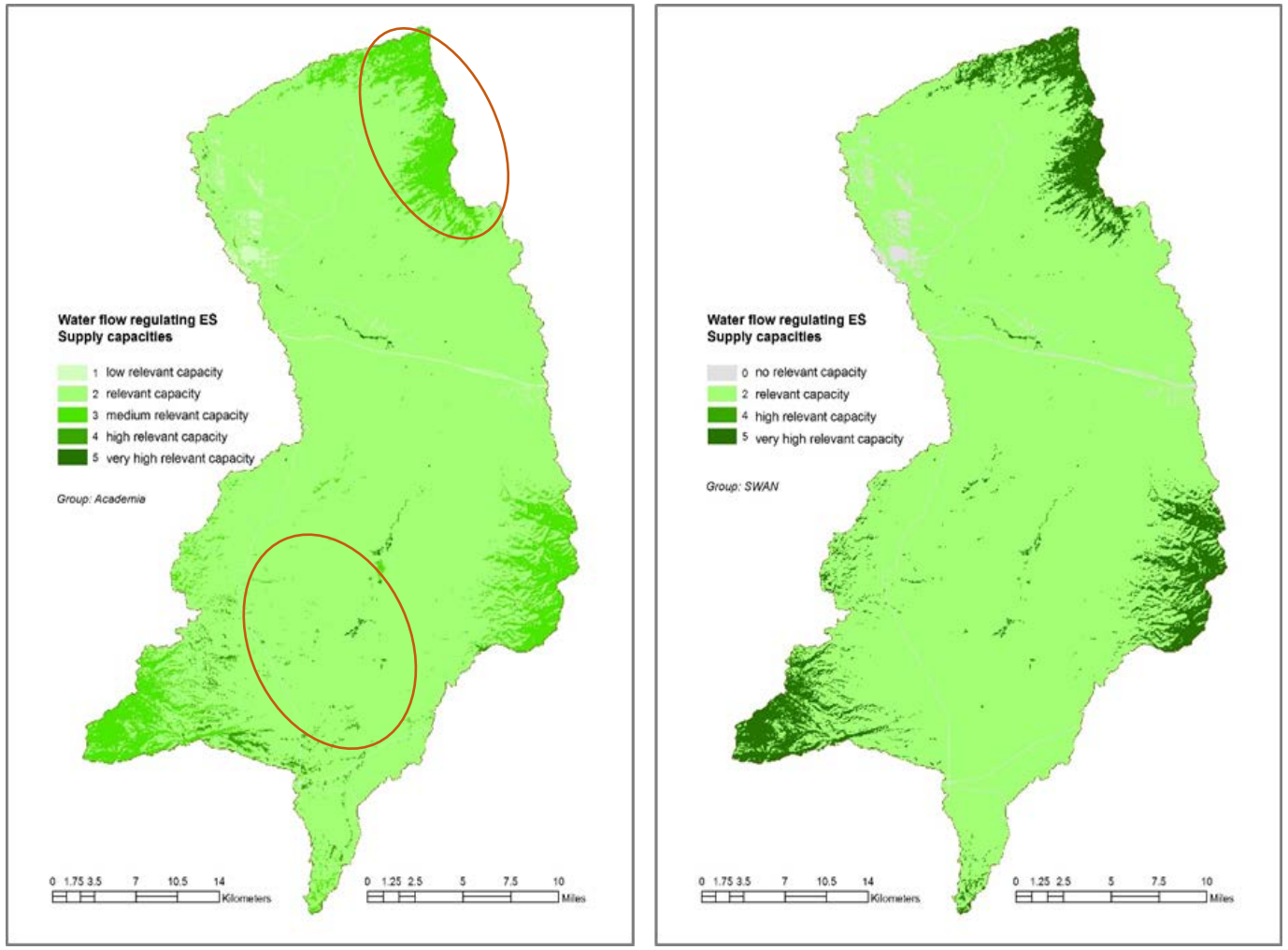






NLCD 2006 map; maps of water flow regulation supply capacities, demand; budget map of water flow regulating ES

Discussion



Maps of Water flow regulating ecosystem service supply based on Academia group (left) and SWAN group (right) evaluations

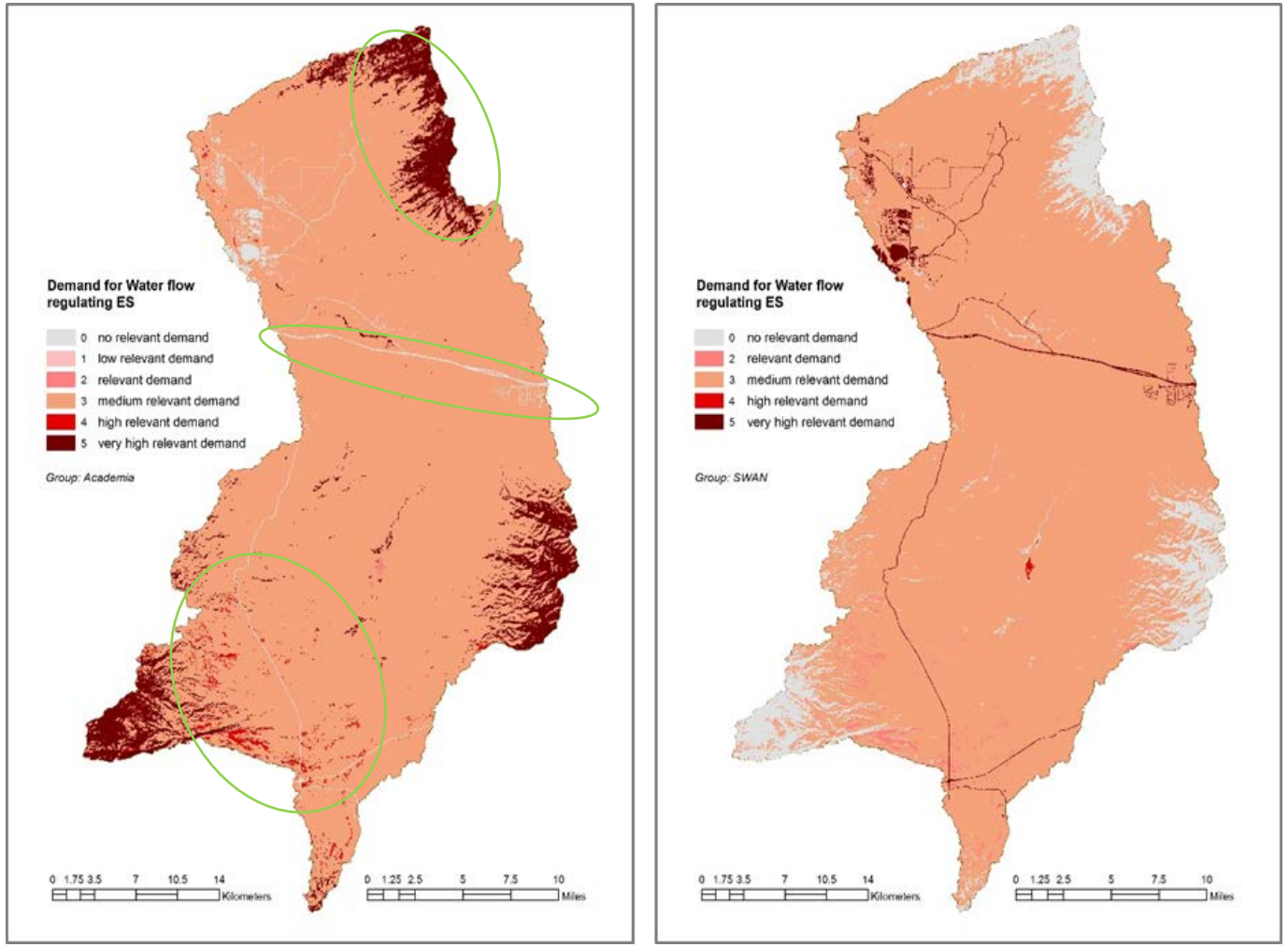
Evergreen forest - ACADEMIA: 3 SWAN: 5
Grasslands - ACADEMIA: 4 SWAN: 2

Discussion

Evergreen forest - ACADEMIA: 5 SWAN: 0
Urban/Developed - ACADEMIA: 0 SWAN: 5
Grasslands - ACADEMIA: 4 SWAN: 2

Reasons: Lack of sufficient information of the ecosystem integrity and the stakeholder groups' considerations and/or probable reluctances in the ES concept.

The variations in the scores could be also based on factors related by the process of acquiring expert knowledge, i. e. whether it is based on long term experience in the related topic or it is an object of study.



Water flow regulating ecosystem service demand maps based on Academia group (left) and SWAN group (right) evaluations

Conclusion

UNCERTAINTIES AND LIMITATION OF THE RESULTS

“under confidence” or “over confidence”

The expert-base assessments are strongly dependent on the respondents’ scientific and practical experience, but when the assessments lack quantitative data, these responses reflect the hypothetical judgements and personal perceptions.

Data availability

Additional quantitative information, trend indicators, and statistical data could bring more accurate temporal and spatial resolution to the study.

Landscape investigation, physical and socioeconomic characteristics, land cover validation.