CVEN 664 – Water Resources Planning and Management
Study Questions #4: Lectures 14b-15

U.S. Federal Legislation and Institutions (Part b)

1. How exactly does the Executive branch of the federal government carry out the laws enacted by the Legislative branch. What is the role of regulations in this process? How is a regulation different from a law? What is the process by which regulations are developed and finalized? What does a designation such as "40 CFR 122.26" mean?

2. What are the Executive branch departments that have jurisdiction and interest in water resources issues? Under each department, name the specific agencies and their responsibilities for water issues.

3. What is a "Special Master" in terms of water resources conflicts between individual U.S. states? Explain the process by which a conflict between states would be handled by the federal judiciary. How is this process different from how a lawsuit by an individual citizen against a federal agency would proceed?

International Water Law and Institutions

1. What is the fundamental difference between water law and institutions at the INTERnational level versus the INTRAnational level? Can doctrines of water law within the U.S. expected to be applicable for international water resources? Why or why not? What is the strength of international agreements of principle on international water resources such as the 1996 UN Convention on the Law of the Non-navigational Uses of International Watercourses? What is the strength of international agreements on specific water resources issues such as the 1963 Convention on the International Commission for the Protection of the Rhine against Pollution?

2. How has the issue of state sovereignty been treated in various international water law agreements? What is the current status of the issue as included in the 1996 UN Convention on the Law of the Non-navigational Uses of International Watercourses? How do these four principles form a continuum of thought on the subject: (1) principle of territorial sovereignty of a water course state; (2) principle of equitable utilization by all riparian states; (3) principle of common jurisdiction; and (4) principle of territorial integrity of a watercourse?

3. Describe the general history and current status of international agreement on the following international rivers: Rhine, Parana, Nile, and Euphrates.

Synthesis: Part I *{This is the example that was discussed in class, but new questions have been added}*

Given in the table below are the output levels for 4 objectives from a water resources system of dams, reservoirs, rivers, M&I supply systems, etc. The water resources system was evaluated under 15 different operational plans, and the average annual outputs were compiled for the table below. That is, each "alternative" represents one possible combination of the four outputs resulting from a specific management strategy.

Alternative	**M&I Water Supply** (1000 ac-ft)	**Hydropower** (1000 MWh)	**Recreation** ($ Million)	**Ecology** (thousands surviving individuals of endangered fish)
1	10	240	0.25	0
2	90	120	0.25	0
3	170	25	0.25	0
4	250	120	0.25	0
5	170	200	0.25	0
6	170	120	0.25	0
7	300	25	0.25	0
8	90	120	0.1	0
9	300	120	0.1	0
10	90	120	1.1	0
11	170	120	1.0	0
12	170	120	0.1	5
13	170	120	0.1	10
14	170	120	0.25	5
15	170	120	0.5	5

1. How can the tradeoff surface for these 4 objectives be visualized? Produce several 2-D tradeoff curves for pairs of the objectives with the other 2 objectives fixed at specific values. Three possibilities would be: hydropower versus water supply (ecology fixed at 0, recreation fixed at $0.25M), recreation versus water supply (hydropower fixed at 120,000 MWh, ecology fixed at 0), recreation versus ecology (water supply fixed at 170,000 ac-ft, hydropower fixed at 120,000 MWh).

2. Can any statements be made on the Pareto-optimality of the 15 alternatives? If a high-level decision-maker told you that she was considering Alternative 12 because it appeared to be the "best" one, how would you respond?

3. Based on what is known from these 15 scenarios, what can we say about the feasibility of producing the following 2 output combinations: (1) M&I=300, HP=35, Rec=0.15, Ecol=0; (2) M&I=300, HP=110, Rec=0.20, Ecol=0?

4. There is a potential to replace all the hydropower turbines in the system with more efficient ones. If that happens, how will each of the tradeoff curves that you've drawn thus far change?

5. The recreation values shown above were determined using the TCM. If a new regulation is finalized that CVM must be used, how will these tradeoff curves change? If it is found that the Endangered Species Act mandates that at least 5,000 of the endangered fish must be preserved, how will the tradeoff curves change? If a new hydropower contract is negotiated that doubles the price of each MWh of hydropower, how will the tradeoff curves change?

6. Can we use the information in the table to infer whether the water resources system is in a Riparian Rights (RR) or Prior Appropriations (PA) state? If the system is currently in a pure RR state, how would tradeoff curves change if the state moved to PA? What if the curves were notated differently?

Synthesis: Part II *{This was given as a test question in Fall 2002}*

You are working on a water resources plan for a single reservoir that is operated for the objectives of M&I water supply, hydropower, and the habitat of downstream fish. The team of people working for you has produced quantitative assessments of the three objectives for 12 operational alternatives. The results are shown below:

Alternative	**Hydropower (GWh/yr)**	**M&I Supply (mgd)**	**Spawning Season Habitat (WUA ft^2/ft stream length)**
1	50	45	5
2	50	35	20
3	50	20	30
4	50	5	36
5	100	14	5
6	100	33	10
7	100	10	14
8	100	5	15
9	150	15	5
10	150	14	10
11	150	12	15
12	150	5	20

1. Visualize the tradeoff surface among the three objectives by a set of 2-D graphs. (*Hint:* The alternatives have been ordered to suggest how three graphs might be drawn).

2. Look closely at the results for Alternatives 5-8. Is there anything noteworthy about these results?

3. After learning that results for Alternatives 5-8 were prepared by a t.u. alumnus, you re-assign these Alternatives to an Aggie and a University (sic) of Georgia alumnus. Their results are shown in the table below. Review their results and draw conclusions about their reliability.

Alternative	**Hydropower (GWh/yr)**	**M&I Supply (mgd)**	**Spawning Season Habitat (WUA ft^2/ft stream length)**
Aggie results:			
5	100	35	5
6	100	30	20
7	100	20	25
8	100	5	30
U. (sic) of Georgia alumnus results:			
5	100	40	25
6	100	30	40
7	100	20	55
8	100	5	0

4. The M&I supply from this reservoir will actually go to a new community still being constructed, and the water withdrawal is a new one with no historical precedent. The community's wastewater return will be located several miles downriver. It is anticipated that the community will withdraw as much water as legally possible. Other withdrawals have not been considered in the above assessments, but significant withdrawals have occurred for the past 80 years at another location on the river.

a. If the reservoir and river are in a Riparian Rights state, what is the likely long-term effect of the new community on downstream ecology?
b. If the reservoir and river are in a Prior Appropriations state and the senior water rights holders are downstream of the reservoir, what is the likely long-term effect of the new community on downstream ecology?
c. If the reservoir and river are in a Prior Appropriations state and the senior water rights holders are upstream of the reservoir, what is the likely long-term effect of the new community on downstream ecology?
d. If the reservoir and river are in a Regulated Riparian state, what is the likely long-term effect of the new community on downstream ecology?

Synthesis: Part III *{This was given on the Spring 2004 test}*

You are working on a water resources plan for a large river basin that is includes the objectives of M&I water supply, irrigation of cotton, and hydropower. The planning committee (composed of political appointments) has proposed 13 planning alternatives for the basin, and you and your technical staff have assessed the material benefits expected in each objective under each plan. Those results are shown below:

Alternative	**Hydropower (GWh/yr)**	**M&I Supply (mgd)**	**Irrigated Agriculture (bales of cotton produced)**
1	0	500	0
2	250	400	0
3	360	50	0
4	0	400	5000
5	150	375	5000
6	150	300	5000
7	290	50	5000
8	250	300	5000
9	0	200	9000
10	50	175	9000
11	95	135	9000
12	50	135	9000
13	150	50	9000

1. Determine the tradeoff relationship (PPF) among the 3 objectives. Do this by drawing three pareto-optimal tradeoff curves in a 2-D coordinate system where Hydropower and M&I Supply are the two axes. Each of your three curves will be for a fixed amount of cotton production.

2. Are any of these planning alternatives sub-optimal? If so, how would you explain the meaning of sub-optimality to a planning committee member who strongly favored one of these alternatives? Even after your brilliant explanation, what reasons might this decision-maker have for still favoring the alternative? (You may not answer the last part negatively: e.g., "He is dumb" or "She is dishonest" are not acceptable answers).

3. The governor of the state holds a campaign rally and says, "We're going to put our noses to the grindstone, give 110%, think outside the box, take it to the next level, and hustle our way out of the perpetual drought in which we live. I guarantee that this river can provide the water for at least 350 mgd of municipal supply, 350 GWh of hydro-energy per year, and 10,000 bales of cotton grown by our hardworking family farmers." What is your response to this statement?