Tool and Data Needs for Eutrophication Assessment and Management

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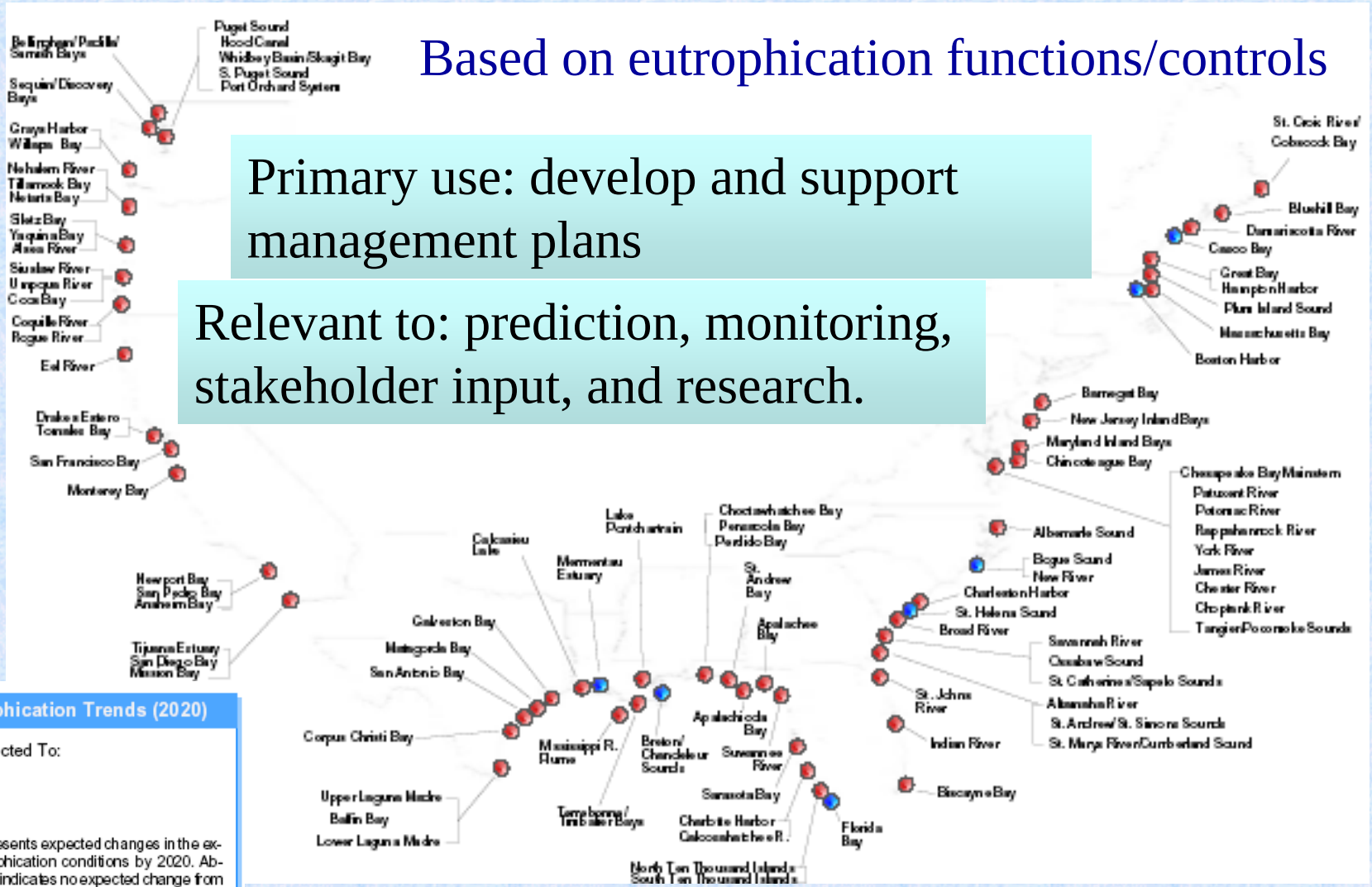
WANTED --- A classification system for US Estuaries

Preferably 5-6 categories, maximum 10

Based on eutrophication functions/controls

Primary use: develop and support management plans

Relevant to: prediction, monitoring, stakeholder input, and research.



Future Eutrophication Trends (2020)

Conditions Expected To:

- Worsen
- Improve

Each symbol represents expected changes in the expression of eutrophication conditions by 2020. Absence of a symbol indicates no expected change from current conditions. Predictions are based primarily on projected population growth, coupled with susceptibility to nutrient inputs.

Ingredients/Needs –

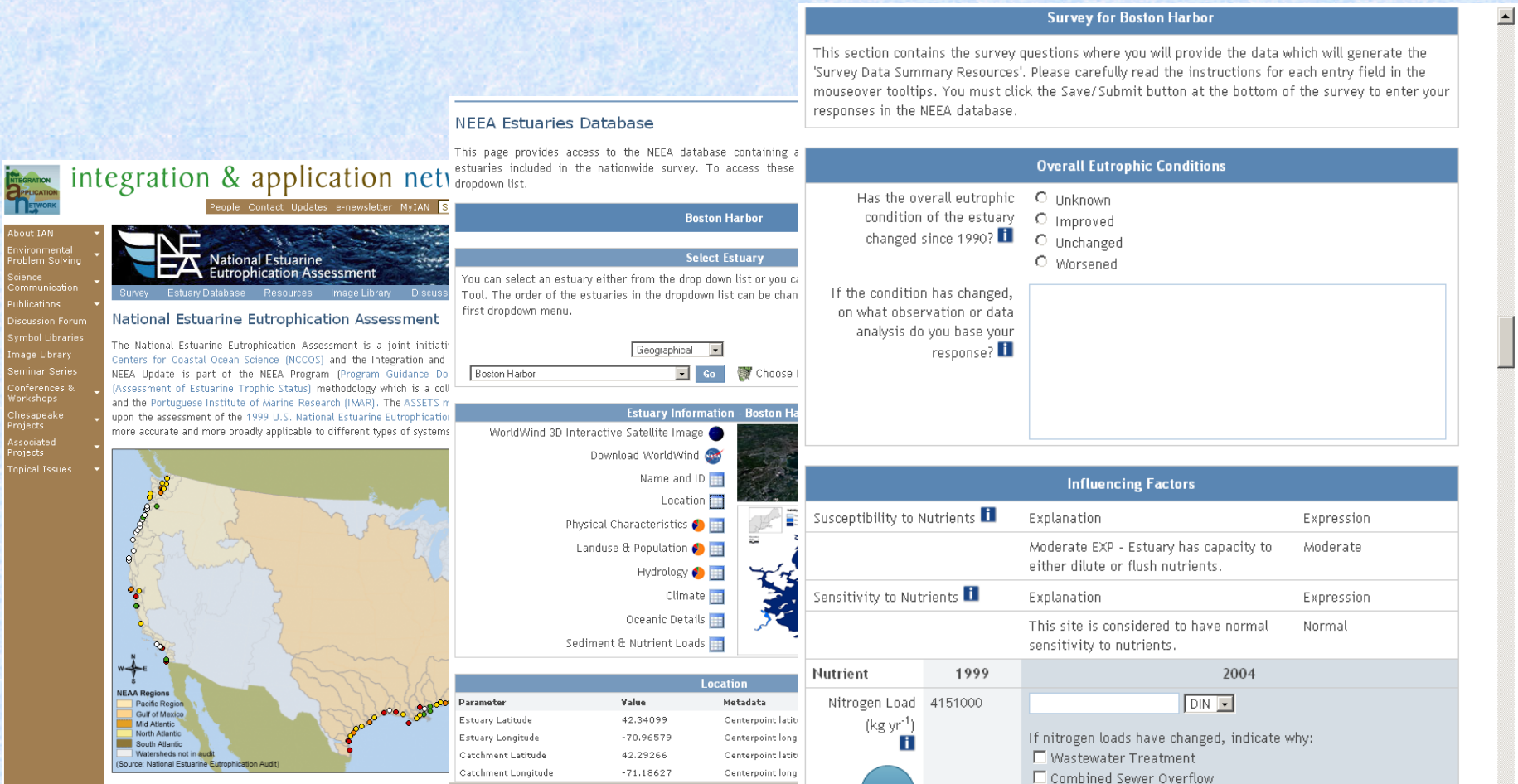
- A consistent, relevant dataset for ~ all estuaries
- A structure for assembling and accessing the data
- Tools for comparison, grouping, visualization
- Expert input

The Land-Ocean Interactions in the Coastal Zone (LOICZ) Project – an adaptable approach

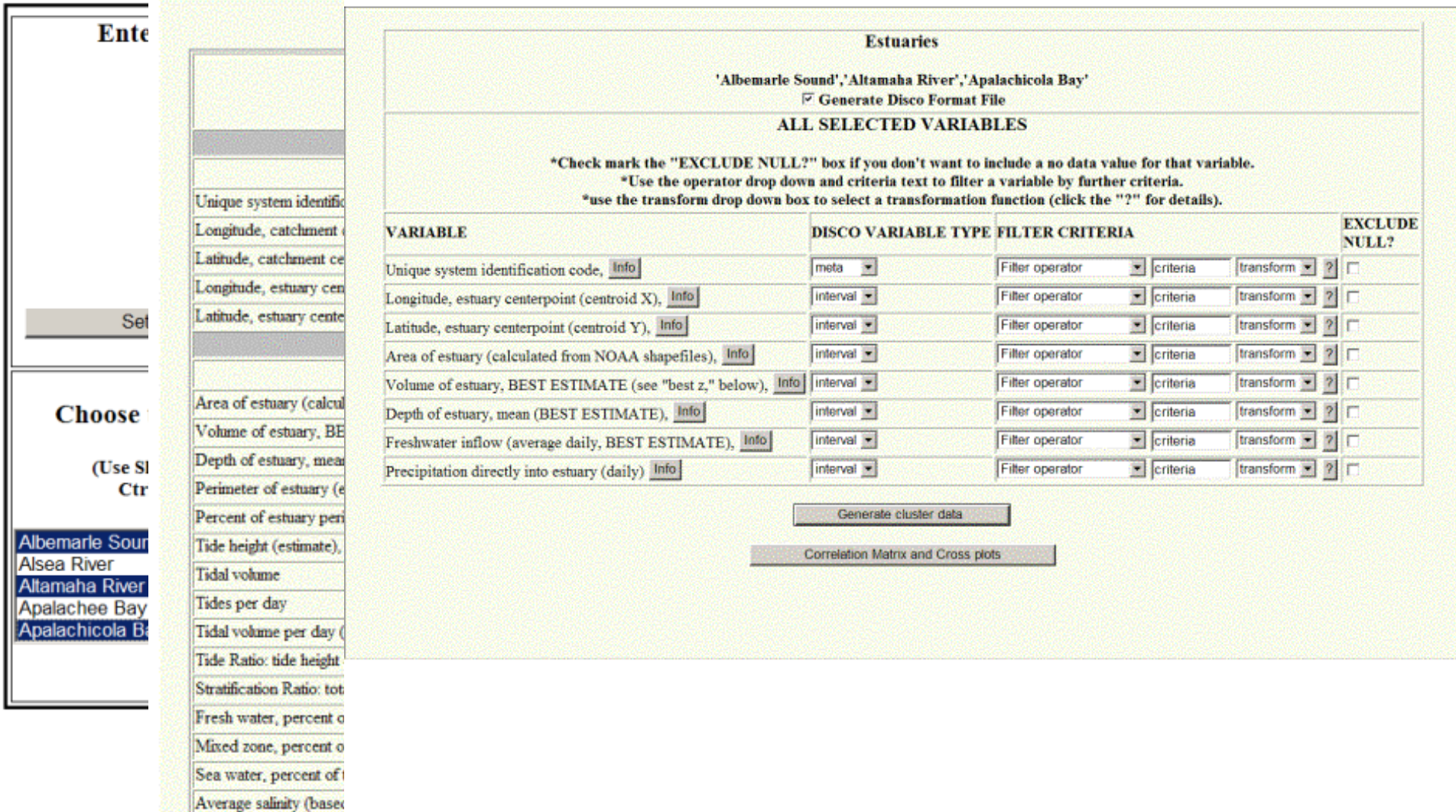
- Focus on biogeochemical fluxes (global and regional)
- Approx. 200 calibration budget sites – mostly estuaries
- An internet-accessible global 0.5^{o} environmental database
- A linked, on-line geospatial clustering tool
- Pathways and programs for community involvement

Following expert workshops to test concept and tools, assemble and refine data --- and an arduous search for funding --- the system is taking shape

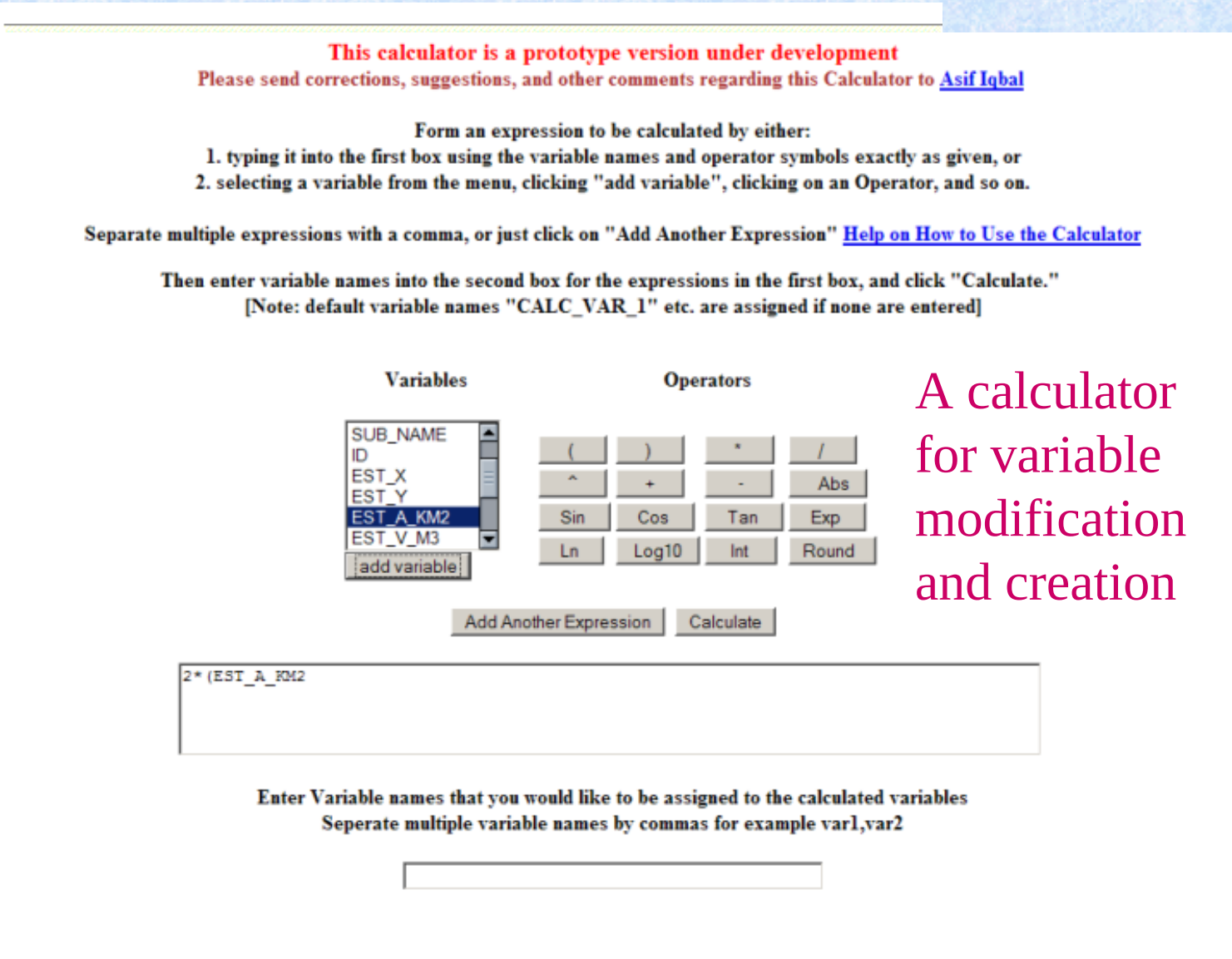
UMCES supports an information website with extensive links to other estuary-oriented sites, and with an online survey and data entry form for community contributions. (http://ian.umces.edu)



The KGS site serves data for on- or off-line analysis, and supports online tools – the usable prototype may be found at http://drysdale.kgs.ku.edu/estuary/hp_firststep.cfm



The on-line database front end offers the user tools for data evaluation, selection and editing



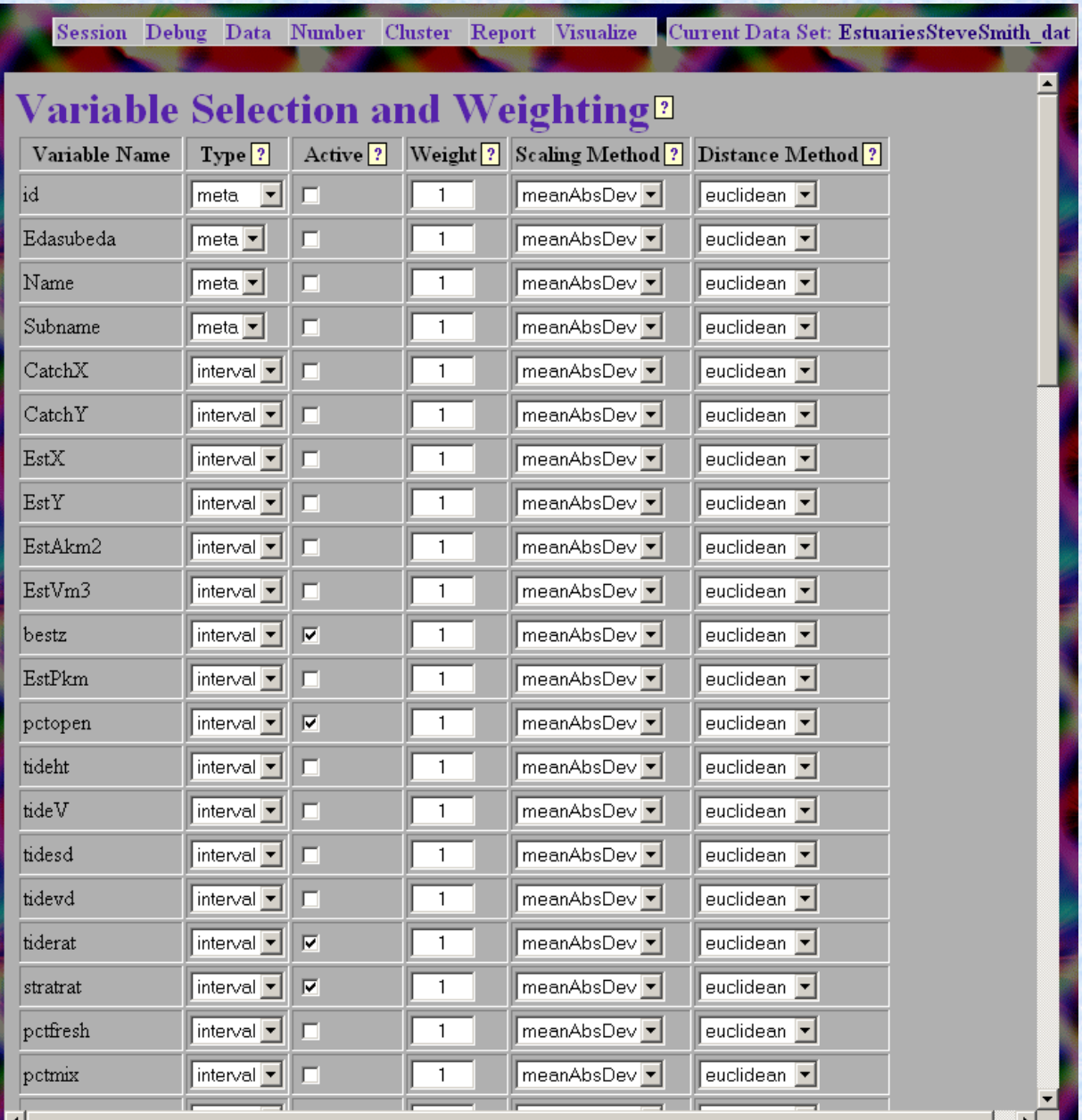
A calculator for variable modification and creation

The final step offers the user format and destination choices

	SUB_NAM	ID	EST_X	EST_Y	EST_A_K	EST_V_M	BEST_Z	EST_P_K	BEST_FW	DAILY_PR	EQUIV_P	PRECIP
an	Connectic	41	-72.5508	41.53724	42	93400000	2.22	230	1052.25	137000	22.9678	130.19
an	Long Islan	42	-72.8828	41.08323	3259	6.35E+10	19.47	1202	4.74	10300000	202.3192	21729
ou	Great Sou	43	-73.0486	40.70791	383	4.2E+08	1.1	694	1.23	1210000	69.35762	98373
Ri	Hudson Ri	44	-73.9906	41.53459	799	4.9E+09	6.13	1468	64.38	2490000	100.177	38676.
at E	Barnegat E	45	-74.1169	39.89528	182	1.18E+08	0.65	309	7.26	583000	47.8113	80303.
rse	New Jerse	46	-74.5452	39.31098	278	3.1E+08	1.11	940	4.79	834000	59.09044	174112
re I	Delaware I	47	-75.5552	39.50337	2070	1.27E+10	6.12	1015	20	6130000	161.2427	3065
re I	Delaware I	48	-75.085	38.62342	72	1E+08	1.39	164	3.3	218000	30.07191	66060.
d I	Maryland I	49	-75.0869	38.41908	54	1.04E+08	1.92	159	0.9	163000	26.04304	181111
ea	Chincotea	50	-75.2959	38.09612	335	6.48E+08	1.94	430	0.16	1010000	64.86602	63125
eal	Patuxent R	51	-76.5121	38.38493	142	5.37E+08	3.78	438	8.24	427000	42.23174	51820.
eal	Potomac F	52	-77.0943	38.39602	1260	6.47E+09	5.13	1350	27.06	3640000	125.7998	134515
eal	Rappahan	53	-76.8067	37.90541	377	1.41E+09	3.75	572	11.61	1120000	68.81221	96468.
eal	York River	54	-76.7458	37.47516	206	7.86E+08	3.82	447	19.55	646000	50.8661	33043.
eal	James Riv	55	-76.6446	37.12998	640	2.06E+09	3.22	921	33.74	2040000	89.65712	60462.
eal	Chester Ri	56	-76.2659	39.10704	196	6.81E+08	3.47	359	0.6	578000	49.61613	963333
eal	Choptank I	57	-76.269	38.69049	411	1.27E+09	3.09	815	1.38	1240000	71.84817	898550
eal	Tangier/Pc	58	-75.9848	38.18789	1057	3.48E+09	3.29	933	0.81	2920000	115.2212	36049
eal	Chesapeal	59	-76.176	38.23577	6974	5.11E+10	7.33	3581	15	20400000	295.9619	13600
aq	Passamaq	60	-67.0547	44.99488	148	6.74E+09	45.57	461	43.65	443000	43.11473	10148.
ma	Englishma	61	-67.4152	44.59307	225	2.57E+09	11.44	395	15.74	763000	53.16014	48475.
ag	Narraguag	62	-67.7483	44.50743	206	2.03E+09	9.85	409	7.56	708000	50.8661	93650.
B	Blue Hill Ba	63	-68.4575	44.34721	317	7.25E+09	22.87	365	3.52	1040000	63.09929	295454
cot	Penobscot	64	-68.8636	44.40772	992	2.44E+10	24.64	997	36.08	3230000	111.6222	89523.
gu	Muscongu	65	-69.3171	43.98063	201	2.47E+09	12.28	382	1.71	645000	50.245	3771
sc	Damariscc	66	-69.5838	43.94174	53	6.79E+08	12.82	189	0.04	168000	25.80078	42000
cot	Sheepscot	67	-69.6822	43.91883	107	1.92E+09	17.94	396	5.73	336000	36.65951	58638.

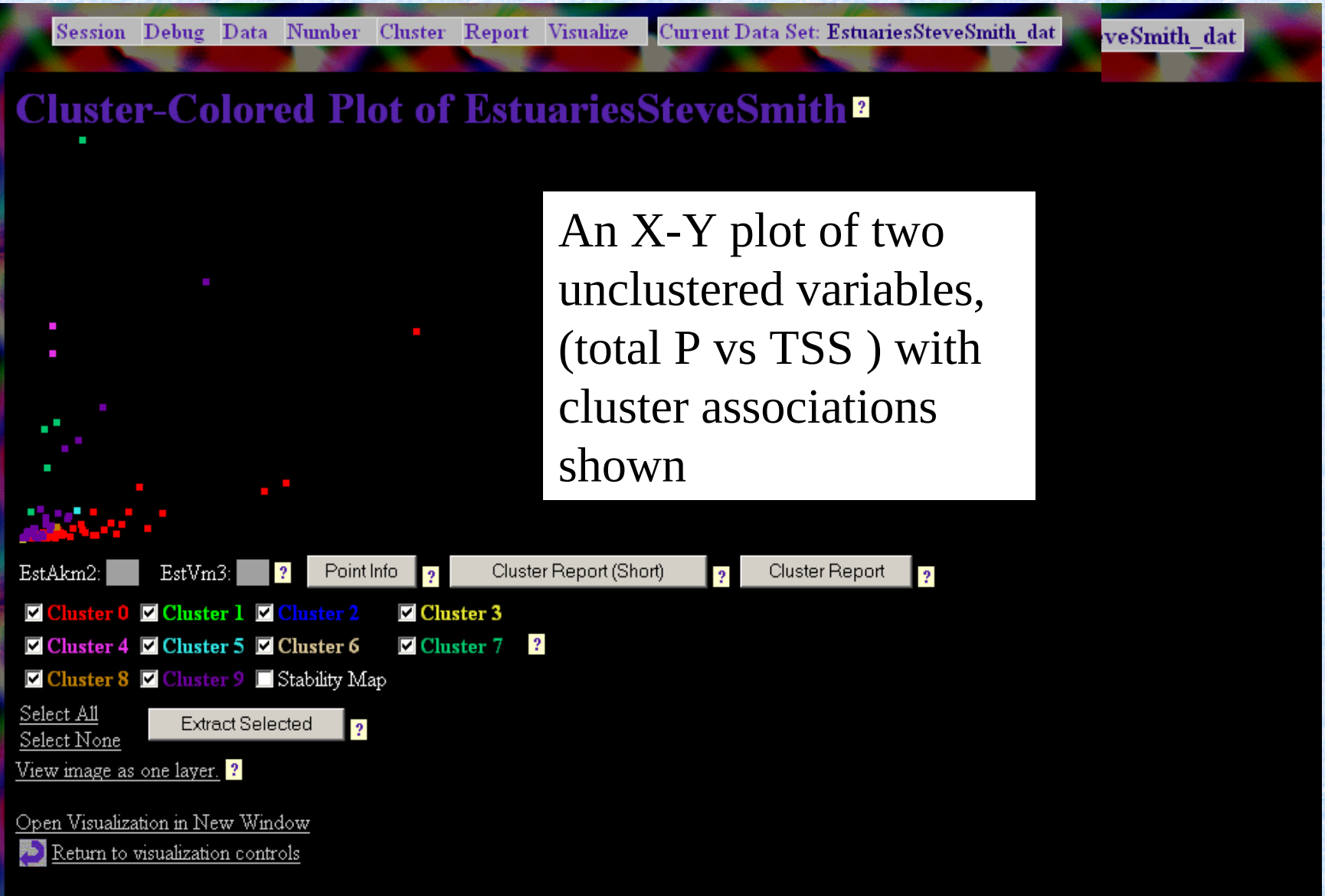
Producing a dataset that can be down-loaded, or

…. sent to the geospatial clustering tool, DISCO



Where you can select variables and types of analyses

The user controls not only the clustering parameters, but can also select sub-populations of points as well as variables, and can use the tool for non-geographic data visualizations

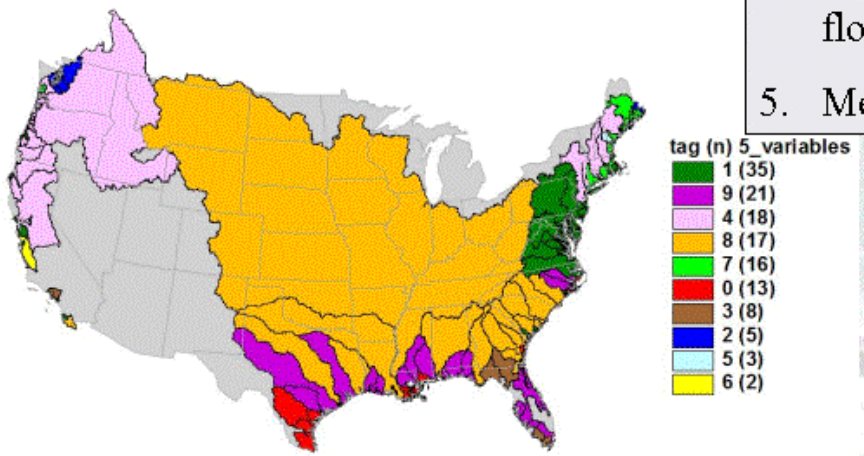


Cluster results in GIS provide not only additional visualizations and maps at various scales, but also additional tools for analysis.

Providing the user with enhanced data sampling through ArcIMS will expand cluster inputs, comparisons, and modeling.

One of the most promising versions is based on 5 simple physical descriptors

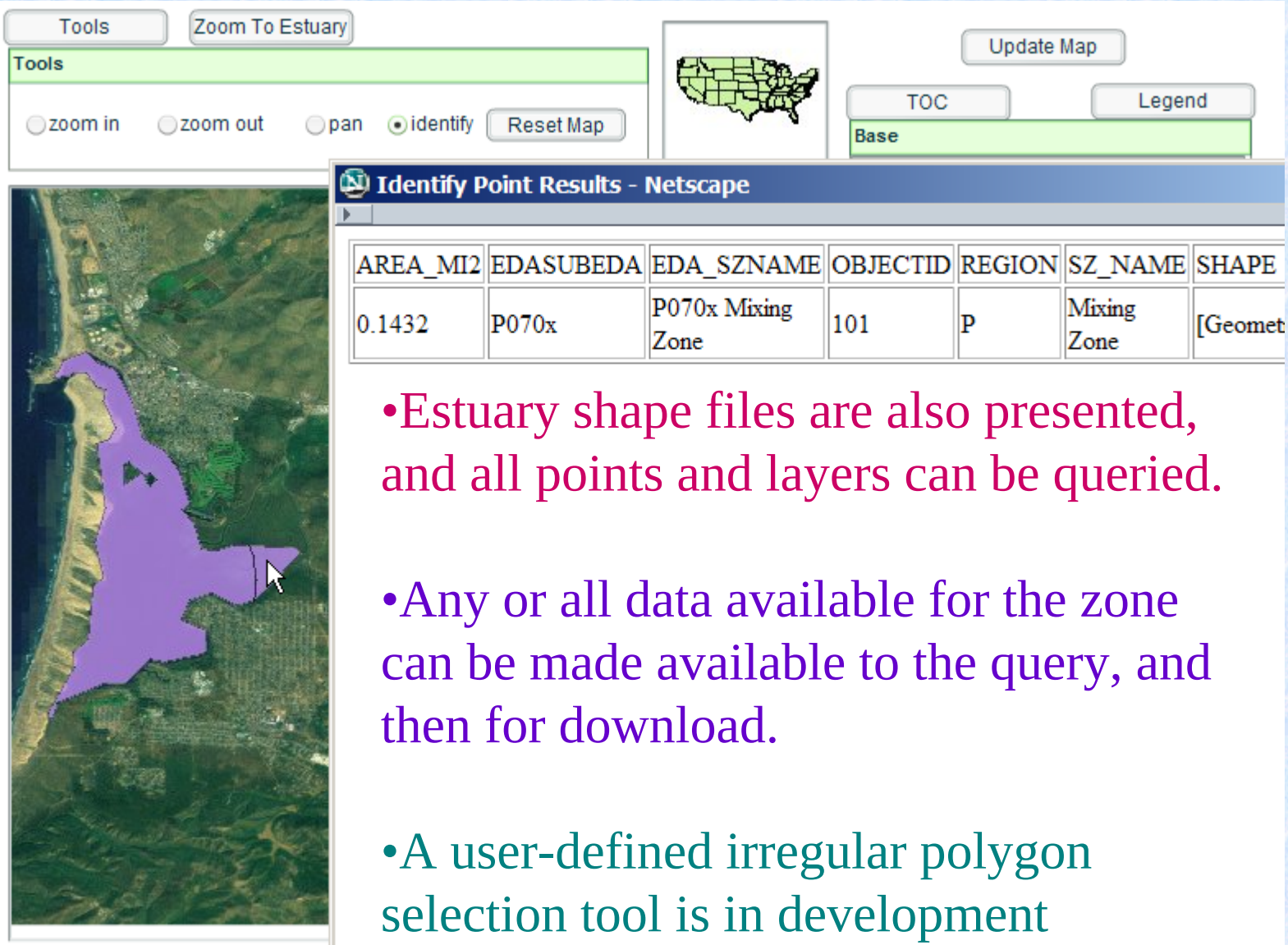
1. Mean depth;
2. % open mouth;
3. Tide height;
4. log (freshwater flow/area);
5. Mean air temperature.



System classification with means or static values provides encouraging results, but we still need:

- Better data on time-dependent processes (over a range of scales);
- Easier integration of data with different native resolutions; and
- ESPECIALLY, better definition of and data on eutrophication status.

A prototype visualization and data selection tool has been developed and will be linked to the database within the coming month



- Estuary shape files are also presented, and all points and layers can be queried.

- Any or all data available for the zone can be made available to the query, and then for download.

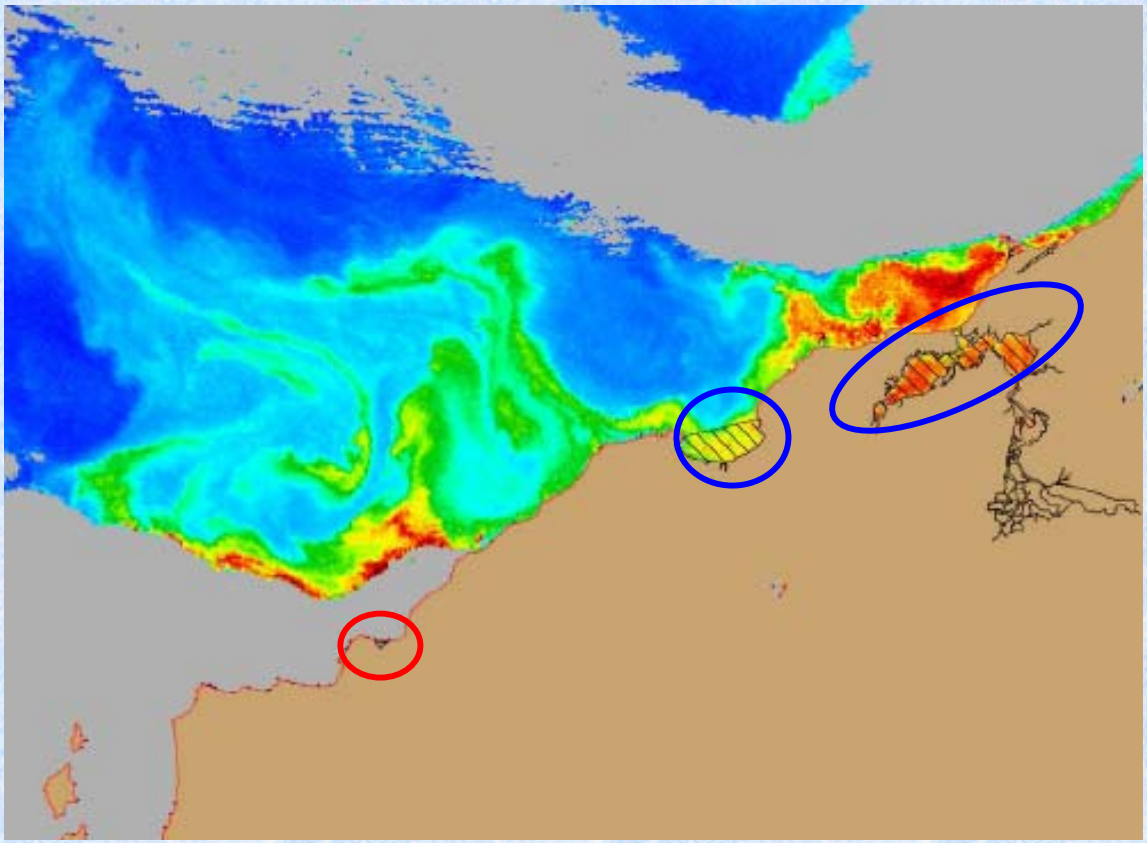
- A user-defined irregular polygon selection tool is in development

Remaining needs:

Quantitative data on responses and status

Additional datasets with better resolution in space and time

Expert judgment applied to hypotheses and analyses



Quantitative Chl-a data (seasonal and annual climatologies as well as time series) are being provided by NOAA (R. Stumpf, S. Dunham), but resolution limits the data to the larger estuaries.

Summary and Conclusions

A new generation of data management and analysis tools is being applied to estuary assessment and classification

Additional data are being added to the inventory, but more are needed

New pathways for two-way information flow and participation by a larger community are available

The biggest barriers to rapid progress are cultural and organizational

Thank you