

Lassen Volcanic National Park Comparative Mapping Project

The Design and Implementation of an Accuracy Assessment to Test Different Maps of the Same Area at the Same Time -Preliminary-

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Develop Two Map Data Sets

- **Project Initiated in 2006 under the management of USGS Fort Collins Science Center and funded by DOI National Mapping Program.**
- **Two teams develop two map data sets**
 - Photo Interpretation (PI) Map
 - Image Classification (IC) Map
- **Determine the accuracy of each data set**
- **Evaluate and compare the data sets**



Results ...

- Represented by incorporating Map Accuracy into the Map data Set attributes
 - Photo-Interpreted Map
 - Image Classification Map

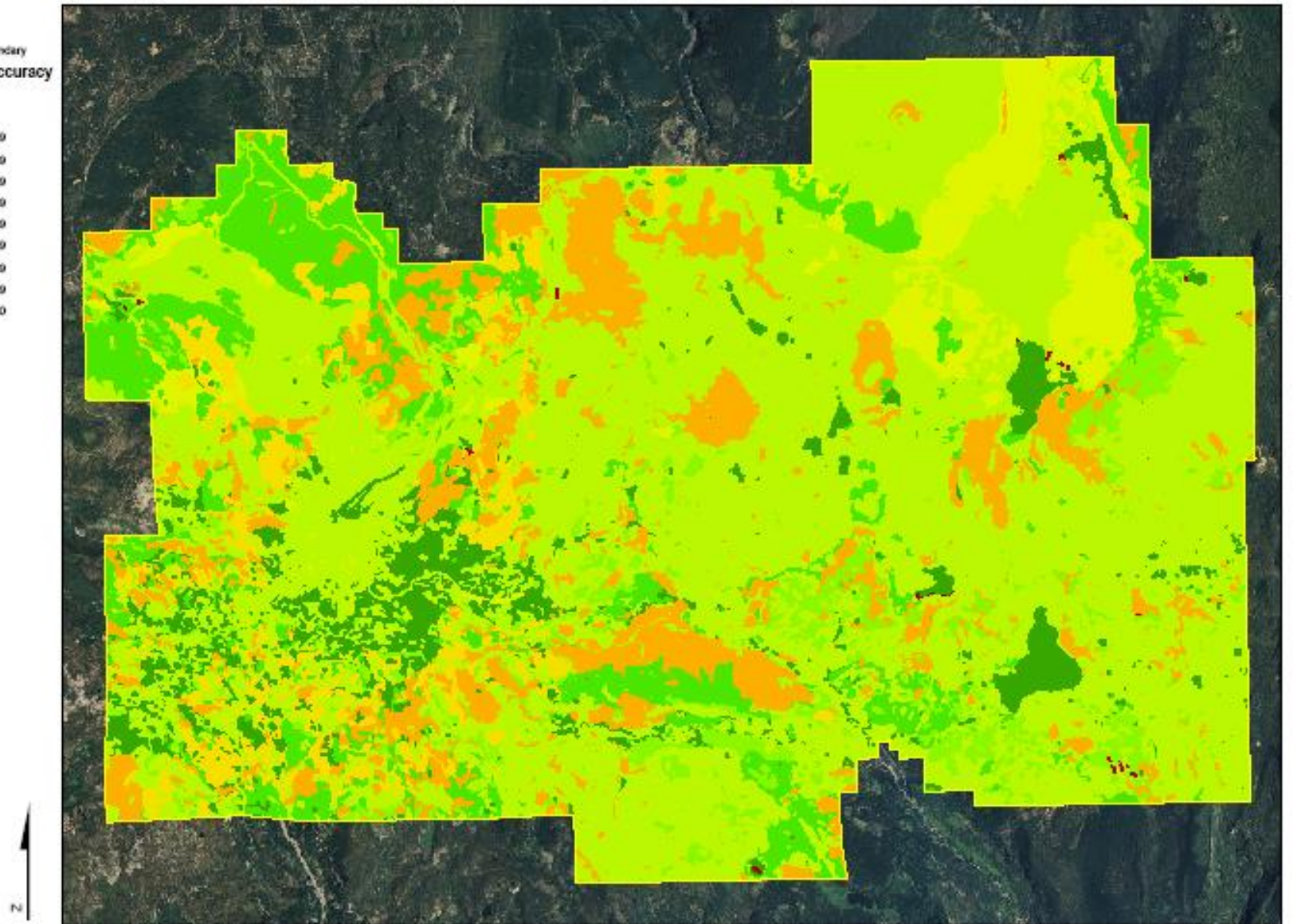
Lassen Volcanic National Park Comparative Mapping Project

Legend

LAVO Boundary

lavoPhotoMap - Accuracy

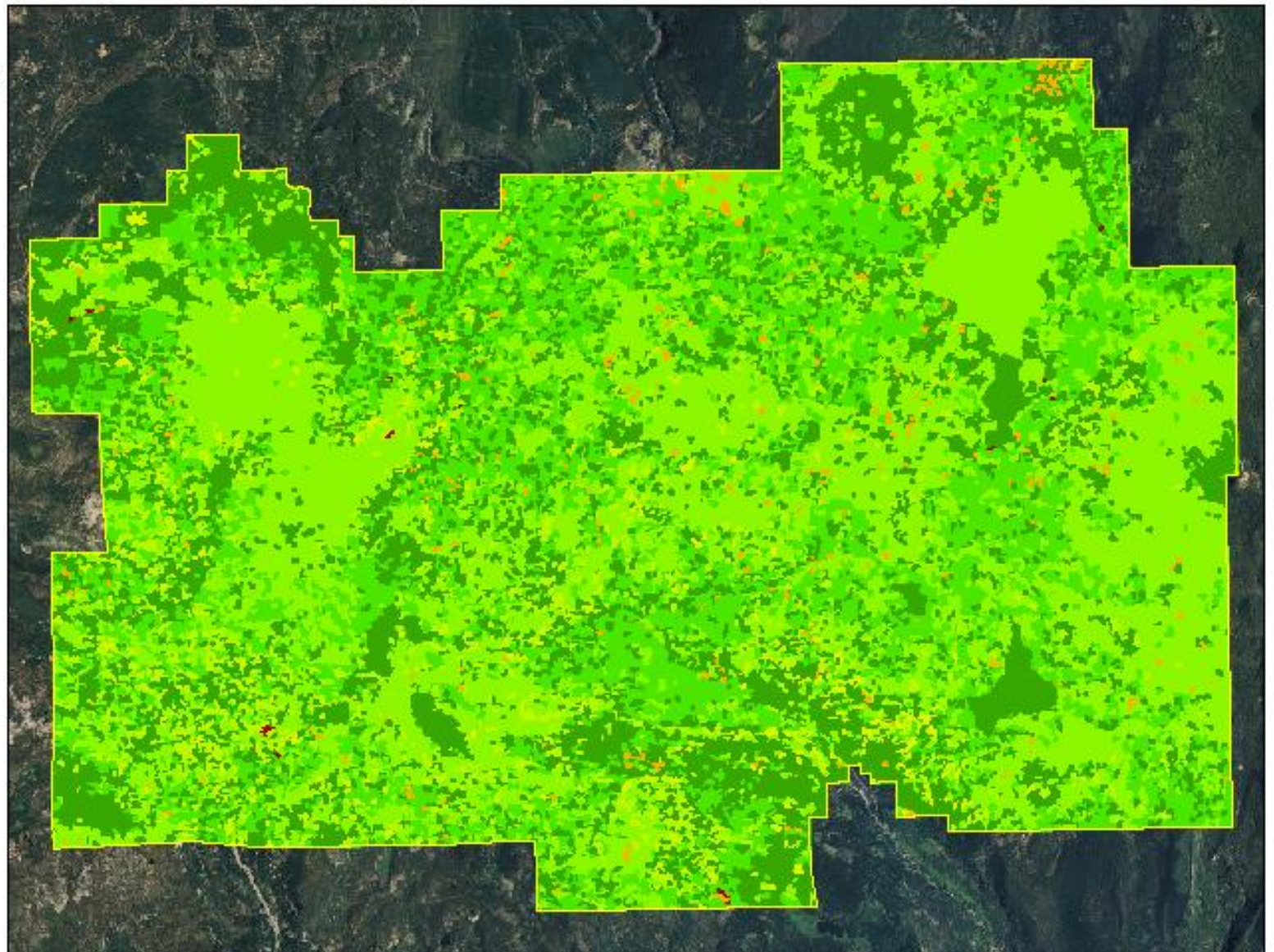
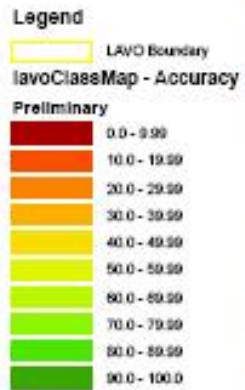
Preliminary



0 0.5 1 2 3 4 Miles

Lassen Volcanic National Park - Photo Interpretation Map

Lassen Volcanic National Park Comparative Mapping Project



0 0.5 1 2 3 4 Miles

Lassen Volcanic National Park - Image Classification Map

Lassen Volcanic National Park





10/15/2008 10:01



07/05/2008 20:27



Project Guidelines

- **DOI National Mapping Program – NPS Guidelines**
 - Map National Vegetation Classification System (NVCS) Associations (types) developed through Vegetation Classification
 - Same Minimum Mapping Unit (MMU) for both maps
 - 0.5 hectares
 - Could be less for ‘park special’ features



Training Field Data Collection

- **Extensive Field Data Collection efforts**
 - Line-point transect sampling methodology
 - 444 field sites
 - Photo-interpreter field reconnaissance
 - 10 days of additional field work

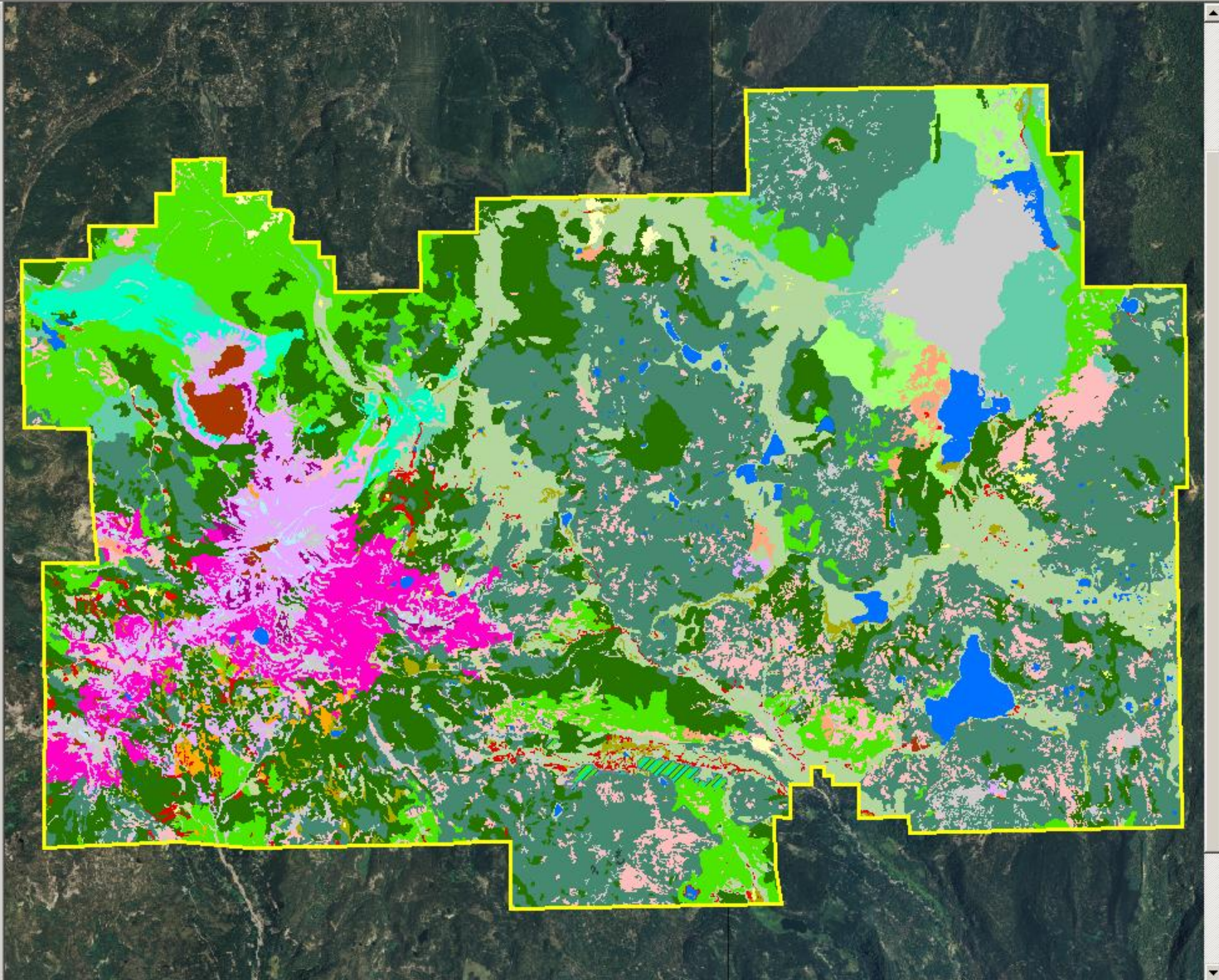


lavoPhotoMap - Generalized Alliance

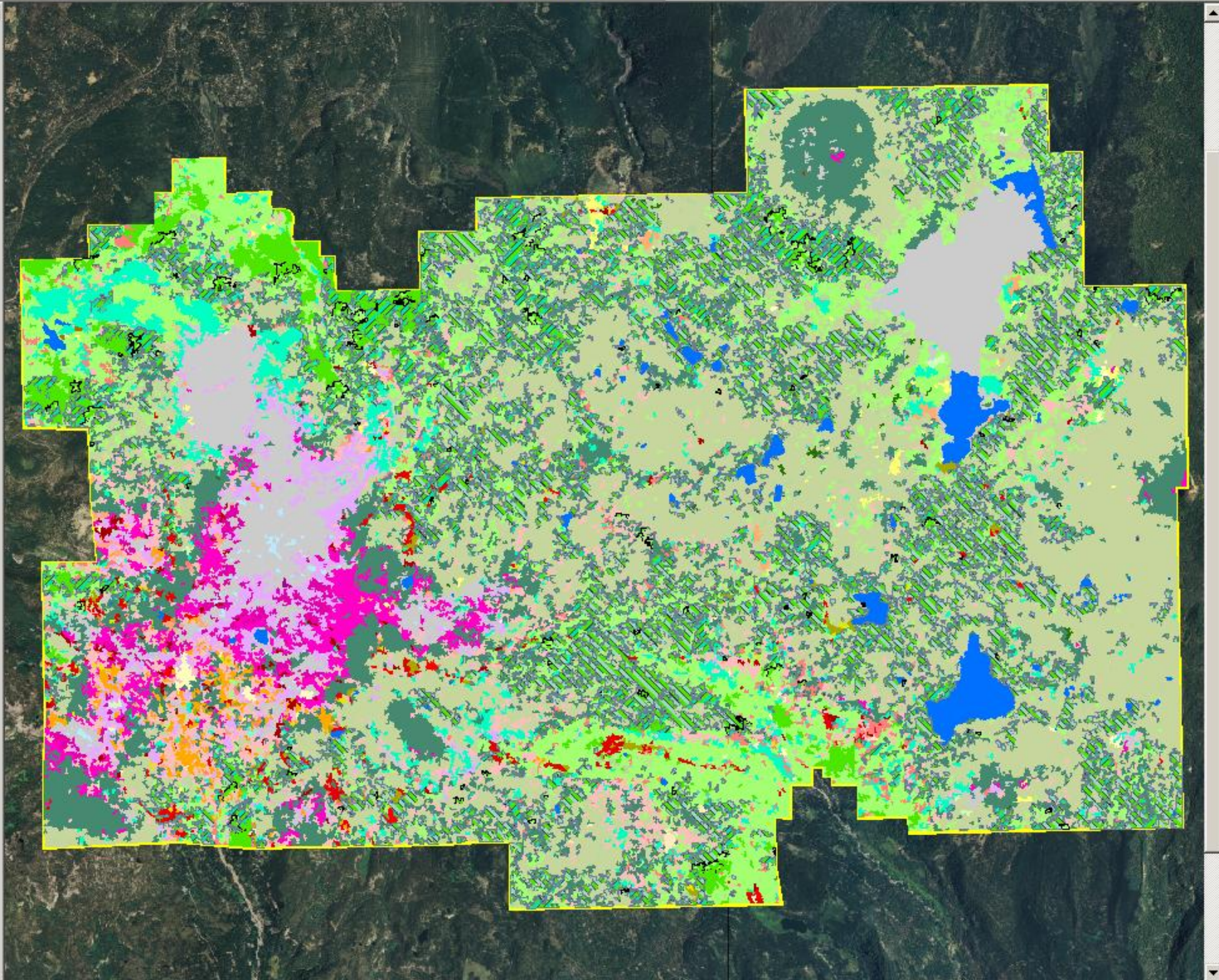
GENERALALLIANCE

- PA:tree
- Subalpine Mix:tree
- TM:tree
- AM-Mix:tree
- AM:tree
- AM-PC-Mix:tree
- PC:tree
- True-Fir Mix:tree
- True-Fir-Longneedle Pine Mix:tre
- True-Fir-Lodgepole Pine Mix:tree
- AC:tree
- AC-(PJ)-(Mix):tree
- PJ-Mix:tree
- PJ:tree
- NF Other:tree
- NHF Other:tree
- HF Other:tree
- AN-(Mix):shrub
- AP-(Mix):shrub
- QV-(Mix):shrub
- AI-(Mix):shrub
- Sal-(Mix):shrub
- EB-(Mix):shrub
- Dry:shrub
- Mixed:shrub
- Other:shrub
- AoEe:forb
- LupObt:forb
- WmBs:forb
- Herbaceous dry:forb
- Herbaceous mesic:forb
- Herbaceous wet:forb
- Herbaceous other:forb
- Svg:other
- Barren:other
- Snow:other
- Water:other

lavoClassMap - Generalized Alliance
 Herbaceous Cover
 Shrub Type Cover
 ShrubCover_PhotoMap
 ShrubTypeAssoc
 Shrub Cover
 Tree Type Cover



- lavoClassMap - Generalized Alliance
 - GENERALALLIANCE
 - PA:tree
 - Subalpine Mix:tree
 - TM:tree
 - AM-Mix:tree
 - AM:tree
 - AM-PC-Mix:tree
 - PC:tree
 - True-Fir Mix:tree
 - True-Fir-Longneedle Pine Mix:tree
 - True-Fir-Lodgepole Pine Mix:tree
 - AC:tree
 - AC-(PJ):(Mix):tree
 - PJ-Mix:tree
 - PJ:tree
 - NF Other:tree
 - NHF Other:tree
 - HF Other:tree
 - AN-(Mix):shrub
 - AP-(Mix):shrub
 - QV-(Mix):shrub
 - AI-(Mix):shrub
 - Sal-(Mix):shrub
 - EB-(Mix):shrub
 - Dry:shrub
 - Mixed:shrub
 - Other:shrub
 - AoEe:forb
 - LupObt:forb
 - WmBs:forb
 - Herbaceous dry:forb
 - Herbaceous mesic:forb
 - Herbaceous wet:forb
 - Herbaceous other:forb
 - Svg:other
 - Barren:other
 - Snow:other
 - Water:other
- lavo_park_polygon
- lavoClassMap - Accuracy
- lavoPhotoMap_Accuracy_Clip
- lavoclassxpiMap - Generalized Alliance
- lavoPhotoMap - Generalized Alliance_Cli
- lavoClassMap - Generalized Alliance



Accuracy Assessment Goals

- Perform one Accuracy Assessment effort that will test both maps on the basis of the same field sampling effort
- Project Plan specified
 - Random stratified sample for each map
 - Attempt to sample 30 sites per stratum
 - 600-800 sample sites anticipated
 - Sample “with replacement”



Sample Design & Strategy

- Create randomly located set of X,Y locations
- Relate locations to individual polygons in each map
- Select locations for map stratum using list sampling (e.g. first **n** samples where **n** is the desired number of samples(30))
- Visit all sites in field
 - Verify location
 - Perform field data collection and assessment
- Compare assessment info to map(s)



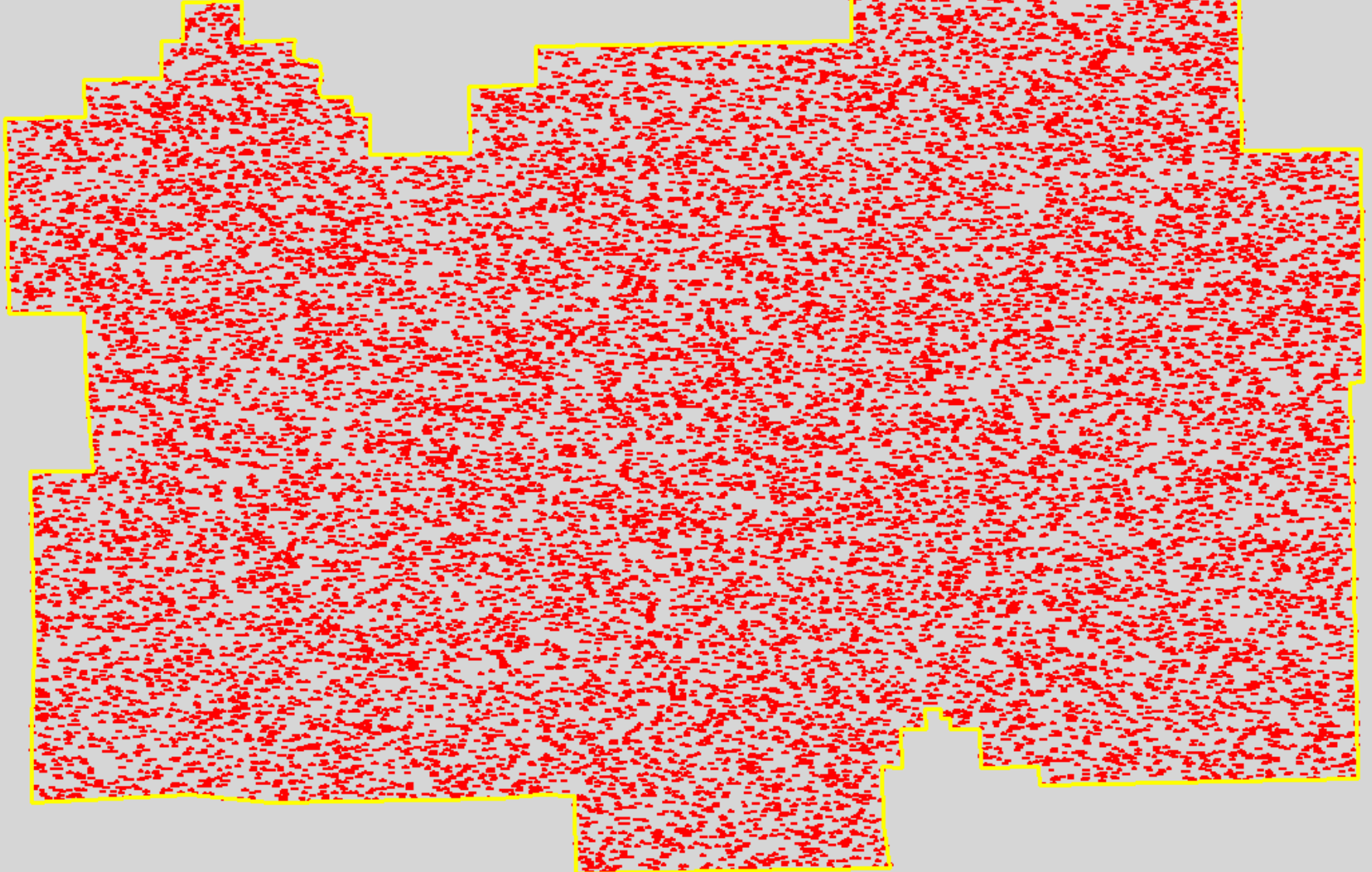
Create Set of Random Locations

- Place 25,000 points using a random number generator for individual X and Y coordinates
- Assign a unique sequential ID number to each X,Y point that signifies the order in which the points were placed
- Remove any points that fall outside the LAVO boundaries



LAVO AA Sites

Randomly Generated AA Sites

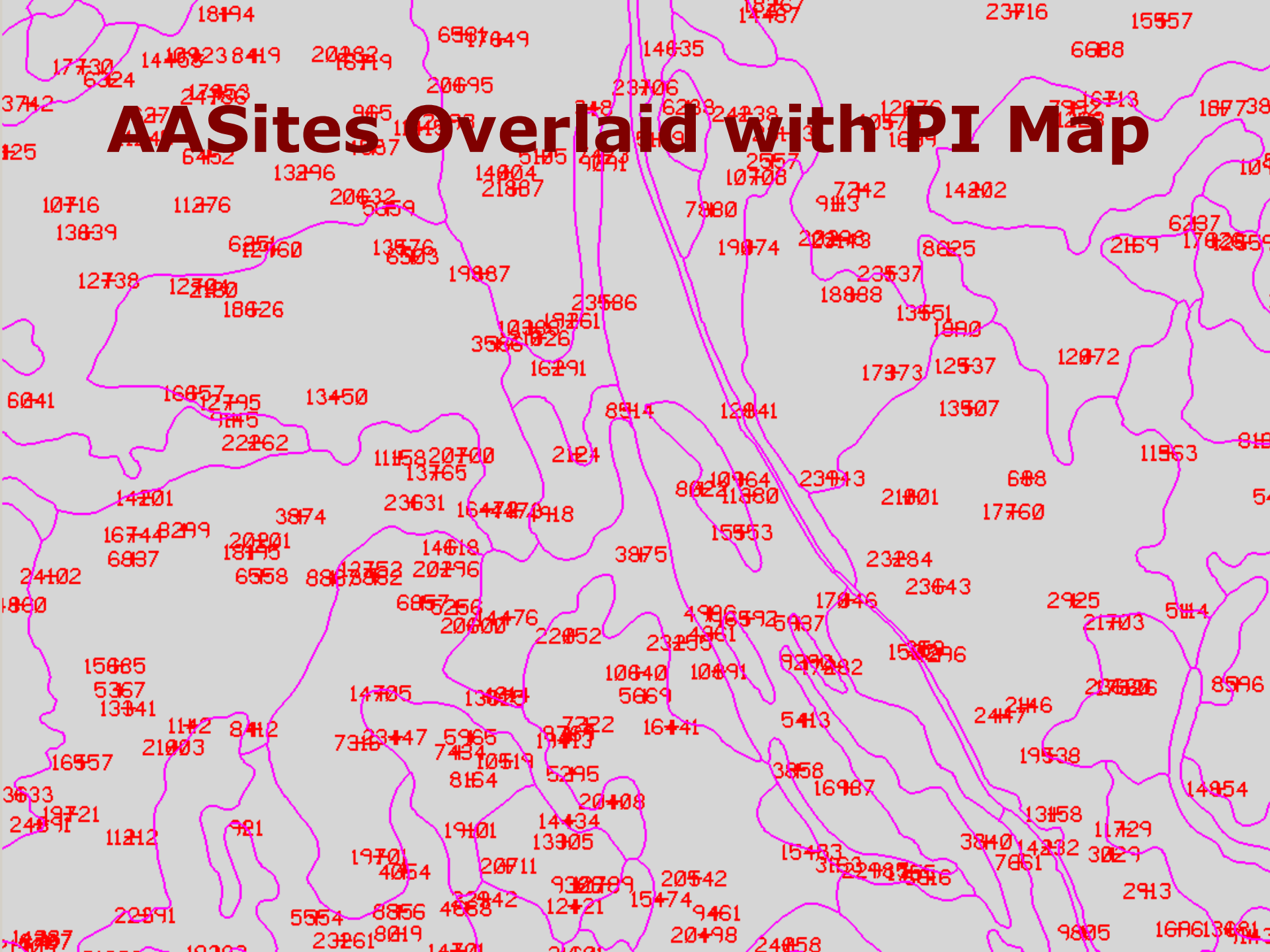


Relate Sites to Each Map

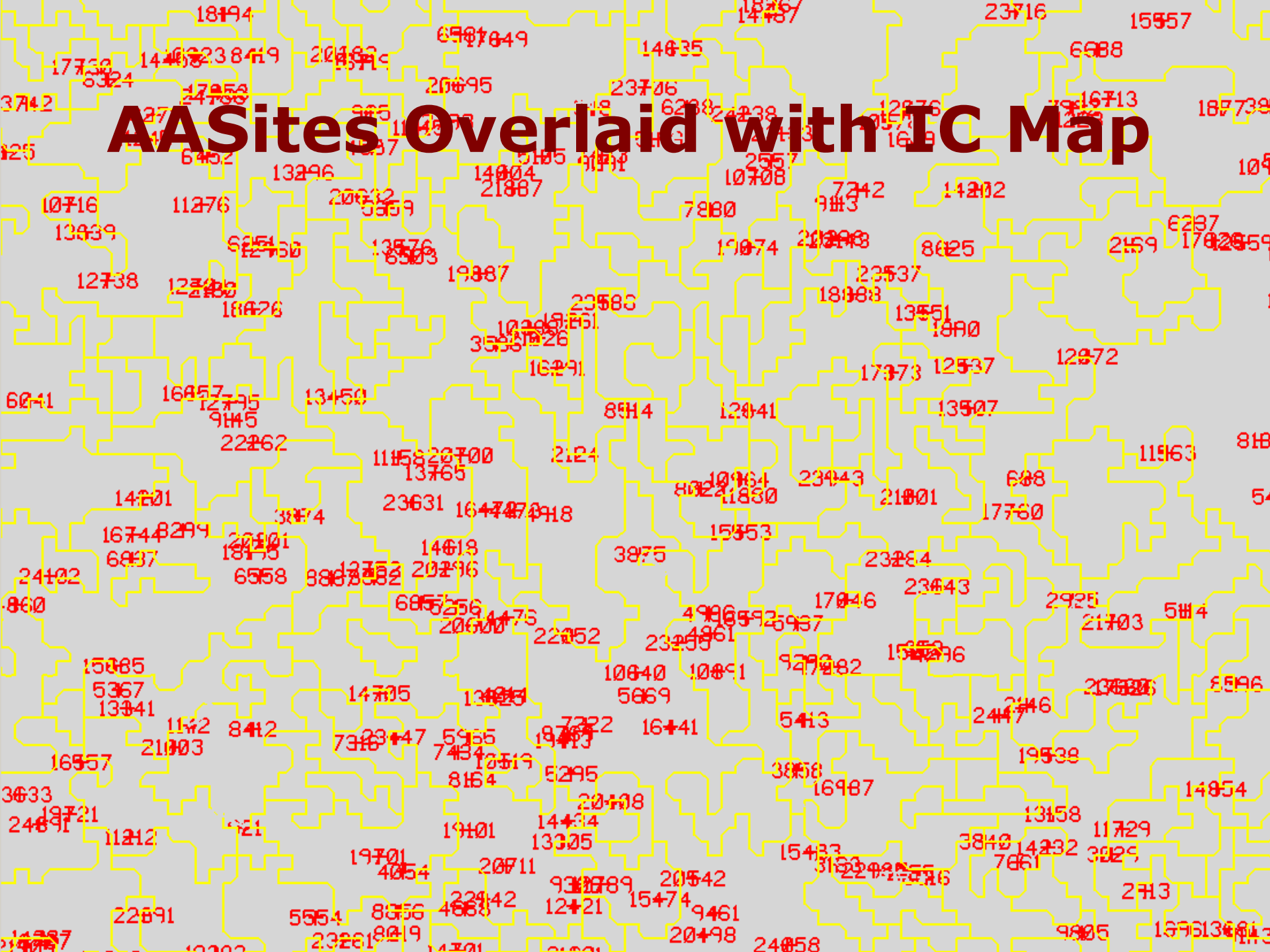
- Spatial Join in GIS creates relationship so each potential sample site knows in which polygon it falls
- Also know the NVCS Association of that polygon



AASites Overlaid with PI Map



AA Sites Overlaid with IC Map



Number of Strata per Map

Map	Detailed Associations	Generalized Associations
PI	34	25
IC	94	29

PI Map – 25 Generalized Strata

- **Tree types (11)**
 - PA, Sub-Alpine Mix, TM, AM, AM-Mix, True Fir-Mix I (LN), AC, AC-(PJ)-Mix, PC, PJ, PJ-(Mix)
- **Shrub types (5)**
 - AN-(Mix), AI-(Mix), Sal-(Mix), DMix, SOth
- **Herbaceous types (5)**
 - AoEe, LupObt, WmBs, HDx, Herb-Mesic/Wet
- **Other types(4)**
 - SVeg, Bar, NonForest, H2O



IC Map – 29 Generalized Strata

- **Tree types (15)**

- PA, PA-TM, Sub-Alpine Mix, TM, AM, AM-Mix, AM-PC-(Mix), True Fir Mix, True Fir-Mix I (LN), True Fir-Mix II (PC), AC, AC-(PJ)-Mix, PC, PJ, PJ-Mix

- **Shrub types (7)**

- QV-(Mix), AN-(Mix), AP-(Mix), AI-(Mix), Sal-(Mix), DMix, SOth-SMix

- **Herbaceous types (4)**

- AoEe, LupObt, WmBs, Herb-Mix

- **Other types (3)**

- Sveg, Bar, H2O



Use List Sampling to Select Sample Sites

- Can now query the Sample Sites data set and list sample sites (in order of unique id) for each NVCS sample stratum.
- Select first n sites to develop n samples within an NVCS sample stratum
- Update data base to indicate which sites are selected.
- Following slides show a sample of this process for the Water stratum (easiest !)



```
select aasite_num,candidate_aasites.ic_status,aa_group,visit_status,aa_status,calc_class
from candidate_aasites,classify_info,candaasitebyclass
where classify_info.mslink=candaasitebyclass.class_mslink and
candaasitebyclass.caasite_mslink=candidate_aasites.mslink and
(
classify_info.calc_class like 'H2o%'
)
order by aasite_num
```

aasite_num	ic_status	aa_group	visit_status	aa_status	calc_class
57	0	NULL	0	0	H2O:other
316	0	NULL	0	0	H2O:other
480	0	NULL	0	0	H2O:other
502	0	NULL	0	0	H2O:other
503	0	NULL	0	0	H2O:other
504	0	NULL	0	0	H2O:other
507	0	NULL	0	0	H2O:other
606	0	NULL	0	0	H2O:other
619	0	NULL	0	0	H2O:other
722	0	NULL	0	0	H2O:other
749	0	NULL	0	0	H2O:other
780	0	NULL	0	0	H2O:other
817	0	NULL	0	0	H2O:other
833	0	NULL	0	0	H2O:other
913	0	NULL	0	0	H2O:other
955	0	NULL	0	0	H2O:other
1089	0	NULL	0	0	H2O:other
1145	0	NULL	0	0	H2O:other
1302	0	NULL	0	0	H2O:other
1404	0	NULL	0	0	H2O:other
2016	0	NULL	0	0	H2O:other
2020	0	NULL	0	0	H2O:other
2034	0	NULL	0	0	H2O:other
2050	0	NULL	0	0	H2O:other
2113	0	NULL	0	0	H2O:other
2115	0	NULL	0	0	H2O:other
2117	0	NULL	0	0	H2O:other
2167	0	NULL	0	0	H2O:other
2177	0	NULL	0	0	H2O:other
2197	0	NULL	0	0	H2O:other
2257	0	NULL	0	0	H2O:other
2338	0	NULL	0	0	H2O:other
2409	0	NULL	0	0	H2O:other
2519	0	NULL	0	0	H2O:other
2539	0	NULL	0	0	H2O:other
2569	0	NULL	0	0	H2O:other
2581	0	NULL	0	0	H2O:other



```
update candidate_aasites set visit_status=200
where aasite_num <= 2113 and aasite_num in

(select aasite_num from candidate_aasites, classify_info, candaasitebyclass
where classify_info.mslink=candaasitebyclass.class_mslink and
candaasitebyclass.caasite_mslink=candidate_aasites.mslink and
classify_info.calc_class like 'H2O%')
```

25 records updated

```

select aasite_num,candidate_aasites.ic_status,aa_group,visit_status,aa_status,calc_class
from candidate_aasites,classify_info,candaasitebyclass
  where classify_info.mslink=candaasitebyclass.class_mslink and
        candaasitebyclass.caasite_mslink=candidate_aasites.mslink and
(
  classify_info.calc_class like 'H2o%'
)
order by aasite_num
    
```

aasite_num	ic_status	aa_group	visit_status	aa_status	calc_class
57	100	701	200	0	H2O:other
316	100	882	200	0	H2O:other
480	100	501	200	0	H2O:other
502	100	3304	200	0	H2O:other
503	100	501	200	0	H2O:other
504	100	303	200	0	H2O:other
507	100	700	200	0	H2O:other
606	100	700	200	0	H2O:other
619	100	501	200	0	H2O:other
722	100	2401	200	0	H2O:other
749	100	984	200	0	H2O:other
780	100	303	200	0	H2O:other
817	100	3304	200	0	H2O:other
833	100	302	200	0	H2O:other
913	100	503	200	0	H2O:other
955	100	700	200	0	H2O:other
1089	100	3304	200	0	H2O:other
1145	100	2551	200	0	H2O:other
1302	100	501	200	0	H2O:other
1404	100	501	200	0	H2O:other
2016	100	302	200	0	H2O:other
2020	100	2551	200	0	H2O:other
2034	100	501	200	0	H2O:other
2050	100	3304	200	0	H2O:other
2113	100	3304	200	0	H2O:other
2115	0	NULL	0	0	H2O:other
2117	0	NULL	0	0	H2O:other
2167	0	NULL	0	0	H2O:other
2177	0	NULL	0	0	H2O:other
2197	0	NULL	0	0	H2O:other
2257	0	NULL	0	0	H2O:other
2338	0	NULL	0	0	H2O:other
2409	0	NULL	0	0	H2O:other
2519	0	NULL	0	0	H2O:other
2539	0	NULL	0	0	H2O:other
2569	0	NULL	0	0	H2O:other
2581	0	NULL	0	0	H2O:other

```
select aasite_num,candidate_aasites.pi_status,aa_group,visit_status,aa_status
from candidate_aasites,photointerp_info,candaasitebypi
where photointerp_info.mslink=candaasitebypi.pi_mslink and
candaasitebypi.caasite_mslink=candidate_aasites.mslink and

photointerp_info.typename like 'H2O%'

order by aasite_num
```

aasite_num	pi_status	aa_group	visit_status	aa_status
316	0	882	200	10102
379	0	2551	0	103
480	0	501	200	10120
502	0	3304	200	102
503	0	501	200	10104
504	0	303	200	10101
507	0	700	200	10106
549	0	964	0	10105
606	0	700	200	10105
619	0	501	200	10120
657	0	700	0	103
722	0	2401	200	105
780	0	303	200	10100
817	0	3304	200	105
833	0	302	200	10102
913	0	503	200	10121
955	0	700	200	10104
1089	0	3304	200	103
1145	0	2551	200	101
1302	0	501	200	10120
1404	0	501	200	10120
2016	0	302	200	10103
2020	0	2551	200	102
2034	0	501	200	10120
2050	0	3304	200	104
2113	0	3304	200	101
2115	0	NULL	0	0
2117	0	NULL	0	0
2120	0	NULL	0	0
2167	0	NULL	0	0
2177	0	NULL	0	0
2197	0	NULL	0	0
2257	0	NULL	0	0
2338	0	NULL	0	0
2409	0	NULL	0	0
2519	0	NULL	0	0



```
update candidate_aasites set visit_status = visit_status+2000

where aa_status < 10000 and aasite_num <= 2050 and aasite_num in
(select aasite_num from candidate_aasites,photointerp_info,candaasitebypi
where photointerp_info.mslink=candaasitebypi.pi_mslink and
candaasitebypi.caasite_mslink=candidate_aasites.mslink and
photointerp_info.typename like 'H2O%')
```

25 records updated

```
select aasite_num,candidate_aasites.pi_status,aa_group,visit_status,aa_status
from candidate_aasites,photointerp_info,candaasitebypi
where photointerp_info.mslink=candaasitebypi.pi_mslink and
candaasitebypi.caasite_mslink=candidate_aasites.mslink and

photointerp_info.typename like 'H2O%'

order by aasite_num
```

aasite_num	pi_status	aa_group	visit_status	aa_status
316	100	882	2200	10102
379	100	2551	<u>2000</u>	103
480	100	501	2200	10120
502	100	3304	2200	102
503	100	501	2200	10104
504	100	303	2200	10101
507	100	700	2200	10106
549	100	964	<u>2000</u>	10105
606	100	700	2200	10105
619	100	501	2200	10120
657	100	700	<u>2000</u>	103
722	100	2401	2200	105
780	100	303	2200	10100
817	100	3304	2200	105
833	100	302	2200	10102
913	100	503	2200	10121
955	100	700	2200	10104
1089	100	3304	2200	103
1145	100	2551	2200	101
1302	100	501	2200	10120
1404	100	501	2200	10120
2016	100	302	2200	10103
2020	100	2551	2200	102
2034	100	501	2200	10120
2050	100	3304	2200	104
2113	0	3304	200	101
2115	0	NULL	0	0
2117	0	NULL	0	0
2120	0	NULL	0	0
2167	0	NULL	0	0
2177	0	NULL	0	0
2197	0	NULL	0	0
2257	0	NULL	0	0
2338	0	NULL	0	0
2409	0	NULL	0	0
2519	0	NULL	0	0

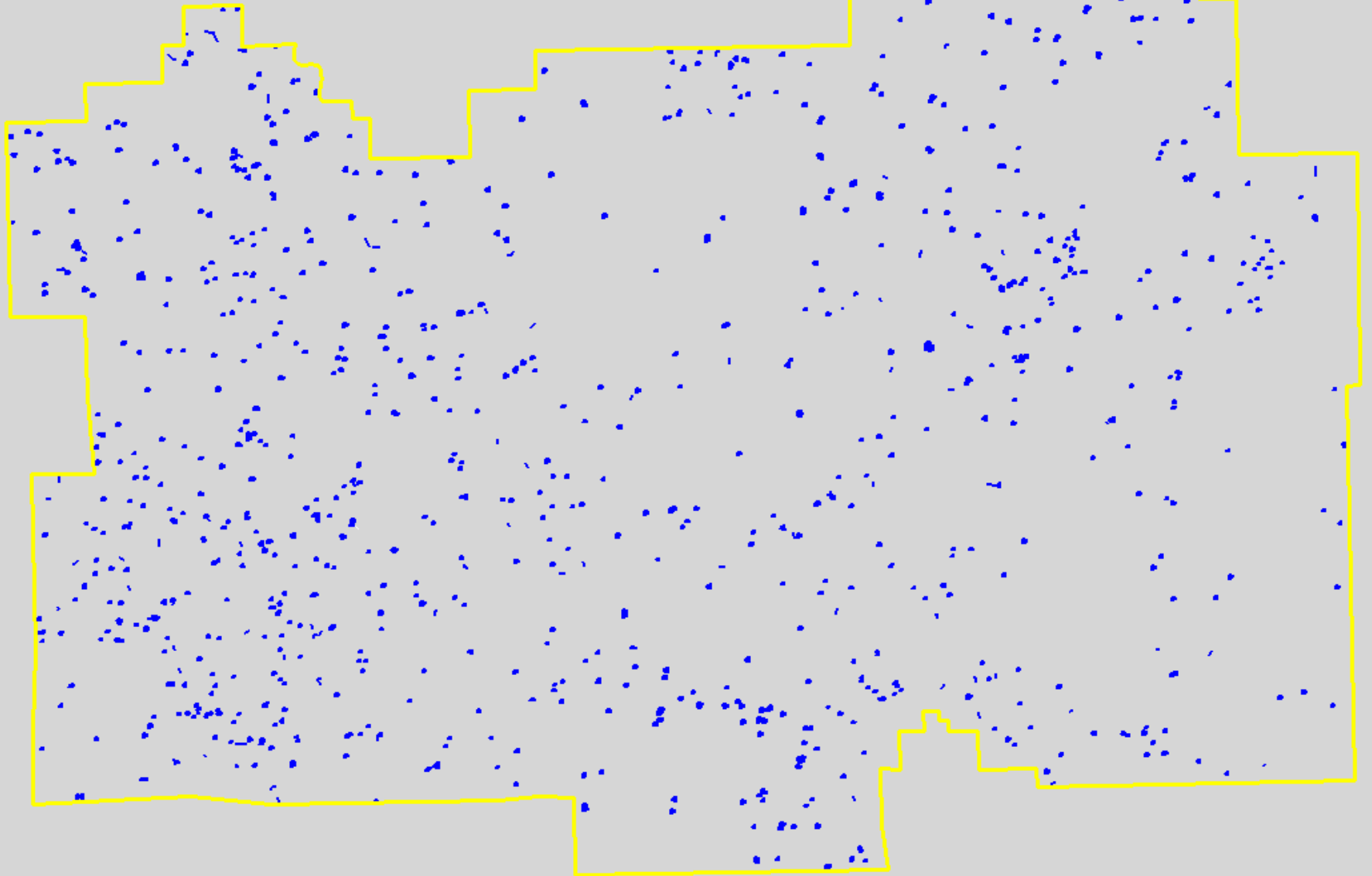


```
select visit_status,count(*) frequency from candidate_aasites
where visit_status in (200,2000,2200)
group by visit_status order by visit_status
```

visit_status	frequency
200	330
2000	301
2200	280

(3 row(s) affected)

The Resulting 'Selected' AA Sites



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Date:	13-Oct-08									By:	KS			
2	tr_group	aasite_id	aa_id#1	aa_id#2	lat	lat_min	long	long_min	aspect	slope	elev_ft	map	TRStart	TRInt	TRAz(s)
25	1064	AA3650			40	26:44.0	-121	33:47.9	209	67	8961	0			
26	1064	AA2770			40	26:43.3	-121	33:48.5	212	67	8879	0			
27	1064	AA508			40	26:30.0	-121	33:56.9	118	31	8346	0			
28	1064	AA1037			40	26:07.4	-121	33:28.0	142	31	8066	0			
29	1064	AA12590			40	26:02.4	-121	34:14.5	236	27	7636	0			
30	1064	AA202			40	25:29.9	-121	33:42.3	208	9	7429	0			
31	1065	AA353			40	30:43.4	-121	28:33.8	85	38	6832	0			
32	1065	AA4189			40	30:39.2	-121	28:32.0	83	40	6783	0			
33	1065	AA134			40	30:40.6	-121	28:24.9	336	18	6616	0			
34	1065	AA1282			40	30:49.2	-121	28:02.0	21	7	6478	0			
35	1065	AA978			40	30:49.2	-121	28:00.0	48	9	6472	0			
36	1065	AA17868			40	30:51.4	-121	27:50.3	165	22	6393	0			
37	1065	AA3274			40	30:50.3	-121	27:36.4	167	22	6353	0			
38	1065	AA1900			40	30:54.9	-121	27:43.2	111	7	6452	0			
39	1071	AA18354			40	32:28.3	-121	31:15.0	210	58	7092	0			
40	1071	AA11662			40	32:29.0	-121	31:10.4	185	67	7183	0			
41	1071	AA11345			40	32:32.4	-121	31:16.9	239	47	7160	0			
42	1071	AA3183			40	32:36.2	-121	31:19.0	265	36	7167	0			
43	1071	AA14706			40	32:37.6	-121	31:10.3	26	36	7223	0			
44	1071	AA3699			40	32:40.7	-121	31:18.2	304	22	7174	0			
45	1071	AA171			40	32:35.8	-121	32:00.6	297	24	6462	0			
46	1072	AA105			40	34:23.8	-121	20:46.4	309	33	8292	0			
47	1072	AA218			40	34:37.2	-121	21:00.1	330	29	7866	0			
48	1072	AA290			40	34:15.3	-121	21:04.9	13	16	7961	0			
49	1072	AA2000			40	34:02.4	-121	21:29.8	260	40	7587	0			
50	1072	AA1695			40	33:37.7	-121	21:44.0	227	33	7078	0			
51	1073	AA281			40	32:01.9	-121	16:52.4	292	16	6294	0			
52	1073	AA21			40	32:12.9	-121	17:15.1	38	11	6258	0			
53	1073	AA147			40	32:11.9	-121	17:18.3	326	9	6268	0			
54	1073	AA137			40	32:24.7	-121	17:44.3	349	4	6183	0			
55	1073	AA3473			40	32:29.0	-121	17:42.0	292	4	6180	0			
56	1073	AA4864			40	32:35.6	-121	17:40.3	301	2	6176	0			
57	1073	AA1354			40	32:37.0	-121	17:37.4	307	2	6180	0			
58	1074	AA3914			40	28:47.9	-121	30:37.8	203	44	9043	0			

Plan and Schedule

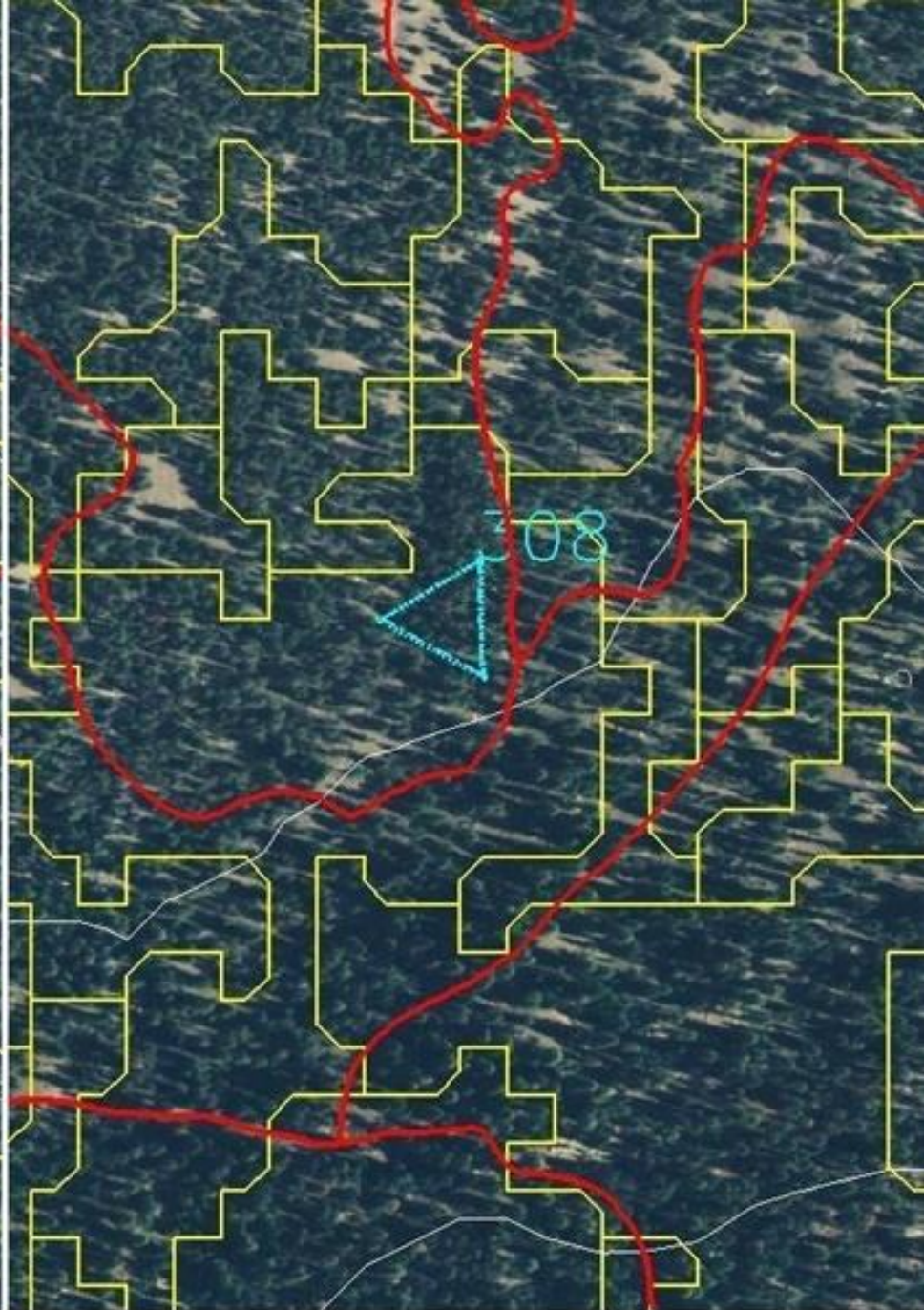
Sampling and Area Boundaries

- **Sample units are triangular shaped transects with first leg of triangle oriented North.**
- **Avoid crossing sample polygon boundaries**
 - Sample as close as possible as you cannot just sample the interior portions of a stand.
- **Adjust sample orientation, if necessary. Did not move points into sample areas.**
 - e.g. For AA, rotate sample element 60 degrees until it fits in the area
- **Adjust interval based on apparent lifeform of the sample polygon**





Unrotated single or double transect - fits in both polygons.



Rotated single transect - fits in red polygon.

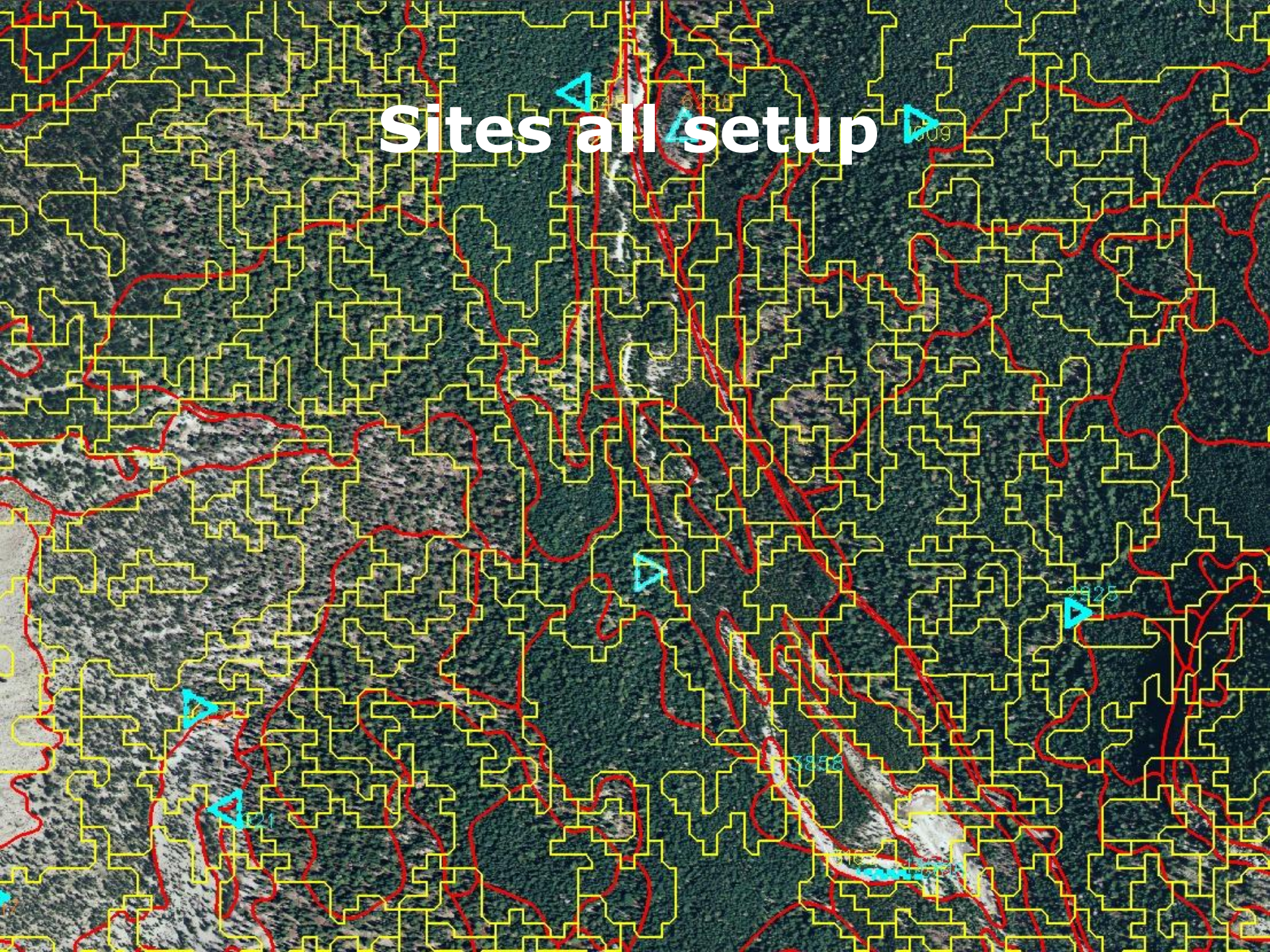


Double transects - one normal and one rotated to fit yellow.



Linear transect - triangle does not fit.

Sites all setup



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Date:	13-Oct-08									By:	KS			
2	tr group	aasite_id	aa id#1	aa id#2	lat	lat min	long	long min	aspect	slope	elev ft	map	TRStart	TRInt	TRAz(s)
25	1064	AA3650			40	26:44.9	-121	33:47.9	309	57	8961	0 SW			6 T-0
26	1064	AA2770			40	26:43.3	-121	33:46.5	212	67	8679	0 SE			9 T-300-60-180
27	1064	AA508			40	26:30.1	-121	33:56.9	183	38	8246	0 SE			9 T-300-60-180
28	1064	AA1037			40	26:17.4	-121	33:27.4	12	8	8016	0 SW			9 T-0
29	1064	AA12590			40	26:02.4	-121	34:14.5	236	27	7636	0 E			6 T-240-360-120
30	1064	AA202			40	25:29.9	-121	33:42.3	208	9	7429	0 W E			12 T-60 T-240
31	1065	AA353			40	30:43.4	-121	28:33.8	85	38	6832	0 NW			6 T-120-240-360
32	1065	AA4189			40	30:39.2	-121	28:32.0	83	40	6783	0 SE			6 T-300-60-180
33	1065	AA134			40	30:40.6	-121	28:24.9	336	18	6616	0 SW			9 T-0
34	1065	AA1282			40	30:49.2	-121	28:02.0	21	7	6478	0 sw			12 T-0
35	1065	AA978			40	30:49.2	-121	28:00.0	48	9	6472	0 sw			12 T-0
36	1065	AA17868			40	30:51.4	-121	27:50.3	165	22	6393	0 W			6 L-50@90
37	1065	AA3274			40	30:50.3	-121	27:36.4	167	22	6353	0 SE			6 L-50@330
38	1065	AA1900			40	30:54.9	-121	27:43.2	111	7	6452	0 SW			12 T-0
39	1071	AA18354			40	32:28.3	-121	31:15.0	210	58	7092	0 SW			12 T-0
40	1071	AA11662			40	32:29.0	-121	31:10.4	185	67	7183	0 NW			12 T-120
41	1071	AA11345			40	32:32.4	-121	31:16.9	239	47	7160	0 NE			6 T-180
42	1071	AA3183			40	32:36.2	-121	31:19.0	265	36	7167	0 SW			12 T-0
43	1071	AA14706			40	32:37.6	-121	31:10.3	26	36	7223	0 SE			12 L-25@285-25@355
44	1071	AA3699			40	32:40.7	-121	31:18.2	304	22	7174	0 SW			12 T-0
45	1071	AA171			40	32:35.8	-121	32:00.6	297	24	6462	0 SW			12 T-0
46	1072	AA105			40	34:23.8	-121	20:46.4	309	33	8292	0 NW SE			126 T-120-240-360 T-300(occ)
47	1072	AA218			40	34:37.2	-121	21:00.1	330	29	7866	0 W			12 T-60-180-300
48	1072	AA290			40	34:15.3	-121	21:04.9	13	16	7961	0 NW			12 T-120-240-360
49	1072	AA2000			40	34:02.4	-121	21:29.8	260	40	7587	0 W			6 T-60-180-300
50	1072	AA1695			40	33:37.7	-121	21:44.0	227	33	7078	0 E			6 T-240-360-120
51	1073	AA281			40	32:01.9	-121	16:52.4	292	16	6294	0 NE			12 T-180-300-60
52	1073	AA21			40	32:12.9	-121	17:15.1	38	11	6258	0 SW			12 T-0
53	1073	AA147			40	32:11.9	-121	17:18.3	326	9	6268	0 W E			12 T-0 T-240-360-120
54	1073	AA137			40	32:24.7	-121	17:44.3	349	4	6183	0 SW			6 T-0
55	1073	AA3473			40	32:29.0	-121	17:42.0	292	4	6180	0 SW			6 T-0
56	1073	AA4864			40	32:35.6	-121	17:40.3	301	2	6176	0 W			6 T-60
57	1073	AA1354			40	32:37.0	-121	17:37.4	307	2	6180	0 W			6 T-60
58	1074	AA3914			40	28:47.9	-121	30:37.8	203	44	9043	0	0		0 OCCULAR?
59	1074	AA2033			40	29:02.1	-121	31:05.9	252	44	8617	0 NW			9 T-120-240-360

Plan and Schedule Now Includes Sample Layout Info

AA Site Sampling

- **Positional Attributes**

- Unique ID (meaningful)
- GPS Data
 - Points
 - Track

- **Landscape features**

- Slope, aspect, and elevation
- Soils and exposed rock
- Hydrologic regime and other site modifiers ...



AA Site Sampling (2)

- **Sample Information – enables verification**
 - Type of sample
 - Transect type or ocular
 - Orientation
 - Interval or Distance
 - Digital photos
 - Horizontal into and/or along borders
 - Up towards sky and down towards ground

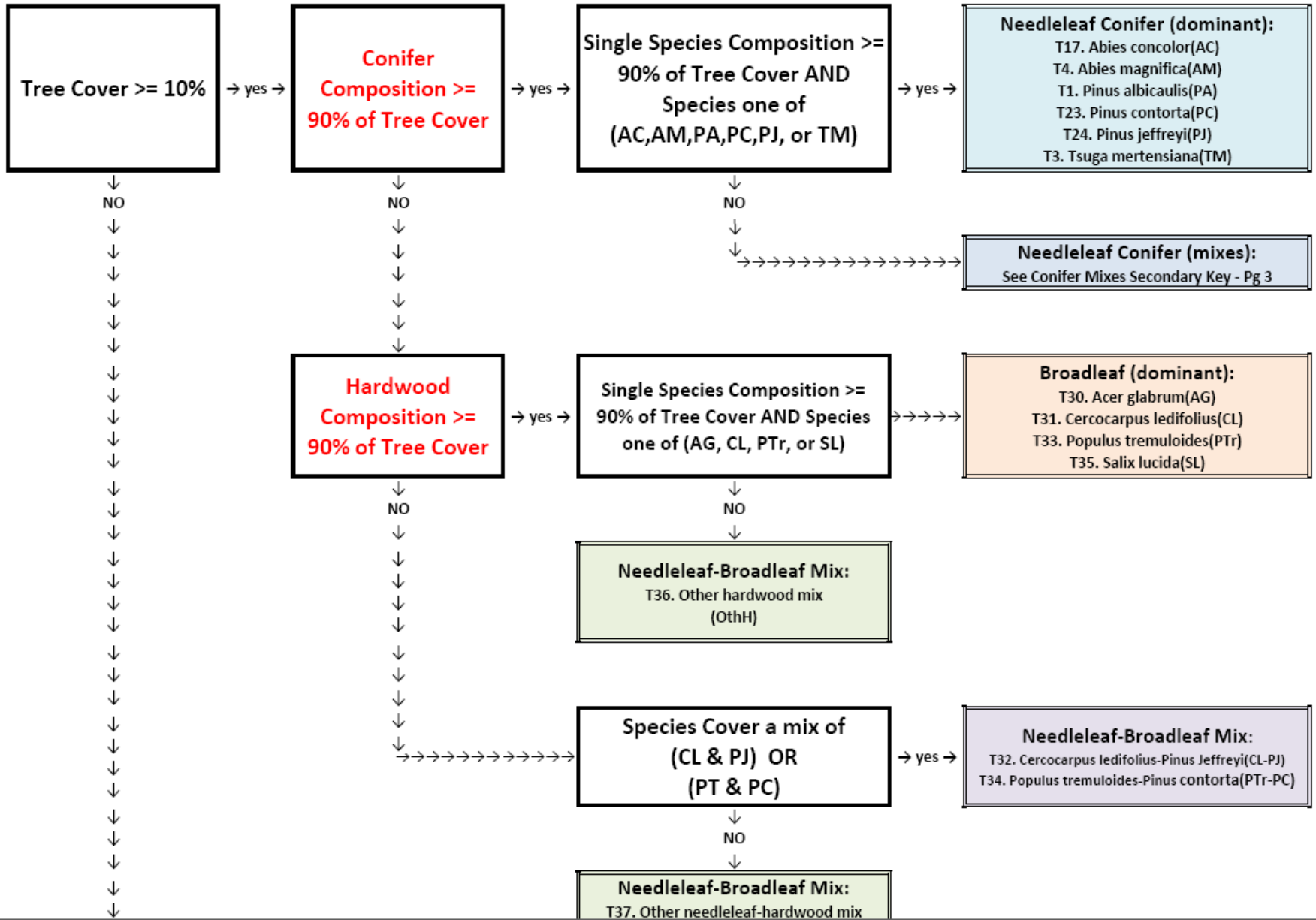


AA Site Sampling (3)

- **Site attributes - estimate before and after sampling**
 - Type based on interpretation of key/rules
 - Alternate values if near key threshold(s)
 - Complex of types
 - Cover/Density of major lifeforms
 - Size - QMD
 - Average and range
 - Height
 - Average, range, and base of live crown
 - Notes and comments



LAVO Land Cover Alliance/Assoc. - Primary Key



AA Transect Point Features

- **Cover**
- **Species**
- **Size**
 - Diameter (DBH)
 - Crown Size
 - Height
- **Canopy Position**
- **Status**



Data Collection Quality Control

- Use techniques that facilitate the collection of high quality data that yield consistent and reliable results by all field crew members regardless of level of experience
 - Tools
 - Software
 - Techniques



Tools

- **Compass**
- **Diameter tape**
- **Clinometer**
- **Spencer (linear) tape**
- **Densitometer (cover)**
- **GPS**
- **Digital Camera**



Tools(2)

- **Plant guides**
 - Collect and bag unknowns for later identification
- **NVCS type keys/rules**
- **High resolution photography**
- **Field data collector**



Field Data Collection Software

- **Handles data collection and output**
- **Error detection and correction**
 - Identify invalid data
 - Erroneous species codes
 - Erroneous layer specification
 - Identify incomplete data
 - Trees without diameter or crown size
 - Missing layer specification
- **Data backup**



Field Techniques

- **Follow data collection procedures and standards**
 - Top down approach, take pictures, use GPS properly, ...
- **Correctly locate and document sites**
 - Used two GPSES independently
- **Complete data collection in the field**
 - For ocular sites verify “Bird’s-eye” view totals 100%
- **Identify critical decision points in key(s) or rules that might result in different type assignments**
- **Know and identify all ‘key’ species**



An aerial photograph of a forested landscape with several lakes. Overlaid on the map is a network of white dashed lines representing tracks. Numerous small, multi-colored markers (red, blue, yellow, green) are scattered across the map, indicating specific sampling locations. The text 'Field Sampling GPS Data – Locations and Tracks of Field Crews' is centered in white, bold font.

Field Sampling GPS Data – Locations and Tracks of Field Crews

Results - Field Sampling Output

- **Types of information**
 - Cover by species, size, and layer
 - Relative cover composition
 - QMD and average crown size
 - Cover weighted
 - Frequency weighted
 - Frequency/unit area
 - Down woody debris counts
 - Trace species



Field Sampling Output(2)

- Land cover type (NVCS Association)
- Alternate type(s), if cover was near a critical decision point or threshold
- Predominant species
- Cover by lifeform
- Average size
- Structure
- Ground surface condition



Transect Cover Percent Density Summary for Top Layer:

Site/Polygon Id: 60212

Top Layer Results

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Non	Total
	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	Cover	Cover
Species						
Redwood	0.0	0.0	0.0	20.0	55.0	75.0
Doug-fir	0.0	0.0	0.0	7.5	7.5	15.0
West Hemlock	0.0	0.0	2.5	0.0	0.0	2.5
W. Hemlock dead	0.0	0.0	0.0	2.5	0.0	2.5
Totals	0.0	0.0	2.5	30.0	62.5	95.0

 Transect Tree Cover Composition Summary for Top Layer 95.0 Cover:

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree
	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	Cover
Species					
Redwood	0.0	0.0	0.0	21.1	57.9
Doug-fir	0.0	0.0	0.0	7.9	7.9
West Hemlock	0.0	0.0	2.6	0.0	0.0
W. Hemlock dead	0.0	0.0	0.0	2.6	0.0
Totals	0.0	0.0	2.6	31.6	65.8

Percent conifer composition= 100.0

Percent hardwood composition= 0.0

Most common specie is Redwood with 78.9 percent cover

 Transect Quadratic Mean DBH and TPA Summary for Top Layer:

Weighted by Cover

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree
	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	Cover
Species					
Redwood	0.0"	0.0"	0.0"	43.2"	106.1"
cov_wt	0.0	0.0	0.0	20.0	55.0
tpa	0.0	0.0	0.0	8.2	9.2
Doug-fir	0.0"	0.0"	0.0"	42.4"	54.3"
cov_wt	0.0	0.0	0.0	7.5	7.5
tpa	0.0	0.0	0.0	3.3	5.4

Transect Cover Percent Density Summary for Over-Topped Layer:

Site/Polygon Id: 60212

Over-topped Layer Results

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Cover	Non-Tree Cover	Total Cover
Species	<= 4.95"	<=10.95"	<=23.95"	<=49.95"			
Redwood	0.0	5.0	5.0	10.0	0.0	20.0	20.0
West Hemlock	2.5	7.5	2.5	0.0	0.0	12.5	12.5
W. Hemlock dead	0.0	0.0	0.0	2.5	0.0	2.5	2.5
Totals	2.5	12.5	7.5	12.5	0.0	35.0	35.0

 Transect Tree Cover Composition Summary for Over-Topped Layer 35.0 Cover:

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Cover
Species	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	
Redwood	0.0	14.3	14.3	28.6	57.1
West Hemlock	7.1	21.4	7.1	0.0	35.7
W. Hemlock dead	0.0	0.0	0.0	7.1	7.1
Totals	7.1	35.7	21.4	35.7	100.0

Percent conifer composition= 100.0

Percent hardwood composition= 0.0

Most common specie is Redwood with 57.1 percent cover

 Transect Quadratic Mean DBH and TPA Summary for Over-Topped Layer:

Weighted by Cover

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Cover
Species	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	
Redwood	0.0"	10.0"	20.0"	29.1"	23.4"
cov_wt	0.0	5.0	5.0	10.0	20.0
tpa	0.0	4.4	5.0	4.3	13.7
West Hemlock	3.0"	10.0"	11.0"	0.0"	9.3"
cov_wt	2.5	7.5	2.5	0.0	12.5
tpa	2.2	8.7	1.1	0.0	12.0

Transect Cover Percent Density Summary for Pole/Sapling Layer:

Site/Polygon Id: 60212

Pole/Sapling Layer Results

Dbh Size Class	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Cover	Non-Tree Cover	Total Cover
Species	<= 4.95"	<=10.95"	<=23.95"	<=49.95"			
West Hemlock	5.0	1.3	0.0	0.0	6.3		6.3
W. Hemlock dead	2.5	0.0	0.0	0.0	2.5		2.5
Tanoak	0.0	1.3	0.0	0.0	1.3		1.3
Gaulth Shallon						11.3	11.3
Rhodod Macroph						1.3	1.3
Vaccin Ovatum						43.8	43.8
Vaccin Parvifo						3.8	3.8
Totals	7.5	2.6	0.0	0.0	10.1	60.2	70.3

 Transect Tree Cover Composition Summary for Pole/Sapling Layer 10.1 Cover:

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Cover
Species	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	
West Hemlock	49.5	12.9	0.0	0.0	62.4
W. Hemlock dead	24.8	0.0	0.0	0.0	24.8
Tanoak	0.0	12.9	0.0	0.0	12.9
Totals	74.3	25.7	0.0	0.0	100.0

Percent conifer composition= 87.1

Percent hardwood composition= 12.9

Most common specie is West Hemlock with 62.4 percent cover

 Transect Quadratic Mean DBH and TPA Summary for Pole/Sapling Layer:

Weighted by Cover

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Cover
Species	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	
West Hemlock	2.3"	4.9"	0.0"	0.0"	3.0"
cov_wt	5.0	1.3	0.0	0.0	6.3
tpa	27.8	1.7	0.0	0.0	29.6

Transect Cover Percent Density Summary for Ground Layer:

Site/Polygon Id: 60212

Near and On-the-Ground Layers Including FWD and CWD

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Cover	Non-Tree Cover	Total Cover
Species	<= 4.95"	<=10.95"	<=23.95"	<=49.95"			
Gaulth Shallon						1.3	1.3
Oxalis Oregona						30.0	30.0
Polyst Munitum						32.5	32.5
Trilli Ovatum						1.3	1.3
Totals	0.0	0.0	0.0	0.0	0.0	65.1	65.1

NO TREE COVER/Quad Mean DBH TO REPORT

Transect Cover Percent Density Summary for Surface Condition Layer:

Site/Polygon Id: 60212

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	Tree Cover	Non-Tree Cover	Total Cover
Species	<= 4.95"	<=10.95"	<=23.95"	<=49.95"			
Coarse Wdydown						10.0	10.0
Fine Wdy Dbris						20.0	20.0
Litter						65.0	65.0
Cwd Dc5						5.0	5.0
Totals	0.0	0.0	0.0	0.0	0.0	100.0	100.0

FireMon Sample Averages:

FWD 1 hour =	4.7	CWD DC1 =	0.00	Soil Profile Depth =	2.90"
FWD 10 hour =	1.3	CWD DC2 =	1.70	Percent Litter =	82.80
FWD 100 hour =	0.0	CWD DC3 =	0.00		
		CWD DC4 =	0.00		
		CWD DC5 =	16.70		

NO TREE COVER/Quad Mean DBH TO REPORT

Percent Cover Summary for Bird's-eye Layer:

Site/Polygon Id: 60212

Number of Pixels: 1

Bird's-eye View Cover Totals

Dbh Size Class	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	> 49.95"	Total	Non-Totals	Total
Species						Cover	Cover	Cover
Redwood	0.0	0.0	0.0	20.0	55.0	75.0		75.0
Doug-fir	0.0	0.0	0.0	7.5	7.5	15.0		15.0
West Hemlock	0.0	0.0	2.5	0.0	0.0	2.5		2.5
W. Hemlck dead	2.5	0.0	0.0	2.5	0.0	5.0		5.0
Vaccin Parvifo							2.5	2.5
Totals	2.5	0.0	2.5	30.0	62.5	97.5	2.5	100.0

Tree Cover Composition Summary for Bird's-eye Layer 97.5 Cover:

Dbh Size Class:	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	> 4.95"	>10.95"	>23.95"	>49.95"	All Sizes
Species									
Redwood	0.0	0.0	0.0	20.5	56.4				76.9
Doug-fir	0.0	0.0	0.0	7.7	7.7				15.4
West Hemlock	0.0	0.0	2.6	0.0	0.0				2.6
W. Hemlck dead	2.6	0.0	0.0	2.6	0.0				5.1
Totals	2.6	0.0	2.6	30.8	64.1				100.0

Percent conifer composition= 100.0

Percent hardwood composition= 0.0

Most common specie is Redwood with 76.9 percent cover composition

Quadratic Mean DBH and TPA Summary for Bird's-eye Layer:

Weighted by Cov

Bird's-Eye Size and TPA

Dbh Size Class:	> 4.95"	>10.95"	>23.95"	>49.95"	All	
	<= 4.95"	<=10.95"	<=23.95"	<=49.95"	Sizes	
Species						
Redwood	0.0"	0.0"	0.0"	43.2"	106.1"	93.5"
cov_wt	0.0	0.0	0.0	20.0	55.0	75.0
tpa	0.0	0.0	0.0	8.2	9.2	17.4
Doug-fir	0.0"	0.0"	0.0"	42.4"	54.3"	48.7"
cov_wt	0.0	0.0	0.0	7.5	7.5	15.0
tpa	0.0	0.0	0.0	3.3	5.4	8.7
West Hemlock	0.0"	0.0"	11.0"	0.0"	0.0"	11.0"
cov_wt	0.0	0.0	2.5	0.0	0.0	2.5
tpa	0.0	0.0	1.1	0.0	0.0	1.1
W. Hemlck dead	3.0"	0.0"	0.0"	40.0"	0.0"	28.4"
cov_wt	2.5	0.0	0.0	2.5	0.0	5.0
tpa	9.6	0.0	0.0	1.5	0.0	11.2
	-----	-----	-----	-----	-----	-----
Conifer	3.0"	0.0"	11.0"	42.7"	101.2"	84.5"
cov_wt	2.5	0.0	2.5	30.0	62.5	97.5
tpa	9.6	0.0	1.1	13.0	14.6	38.4
	-----	-----	-----	-----	-----	-----
All Species	3.0"	0.0"	11.0"	42.7"	101.2"	84.5"
cov_wt	2.5	0.0	2.5	30.0	62.5	97.5
tpa	9.6	0.0	1.1	13.0	14.6	38.4

Transect Cover Percent Density Summary for All Layer:

Site/Polygon Id: 60212

All Layers Cover Summary and Traces

Species	Dbh Size Class:				Tree Cover	Non-Tree Cover	Total Cover
	<= 4.95"	> 4.95" <=10.95"	>10.95" <=23.95"	>23.95" <=49.95"			
Redwood	0.0	5.0	5.0	30.0	55.0	95.0	95.0
Doug-fir	0.0	0.0	0.0	7.5	7.5	15.0	15.0
West Hemlock	7.5	8.8	5.0	0.0	0.0	21.3	21.3
W. Hemlck dead	2.5	0.0	0.0	5.0	0.0	7.5	7.5
Tanoak	0.0	1.3	0.0	0.0	0.0	1.3	1.3
Gaulth Shallon						12.5	12.5
Rhodod Macroph						1.3	1.3
Vaccin Ovatum						43.8	43.8
Vaccin Parvifo						3.8	3.8
Oxalis Oregana						30.0	30.0
Polyst Munitum						32.5	32.5
Trilli Ovatum						1.3	1.3
Coarse Wdydown						10.0	10.0
Fine Wdy Dbris						20.0	20.0
Litter						65.0	65.0
Cwd Dc5						5.0	5.0
Totals	10.0	15.1	10.0	42.5	62.5	140.1	365.3

Traces found at site: Berber Nervosa, Rhamnu Purshia, Dispor Hookeri, Galium Trifidu,
Trient Latifol, Vancou Hexandr, Blechn Spicant

7 traces found

Site/Polygon Id: 60212

Transect Tree Cover Composition Summary for All Layer 140.1 Cover:

Species	Dbh Size Class:				Tree Cover
	<= 4.95"	> 4.95" <=10.95"	>10.95" <=23.95"	>23.95" <=49.95"	
Redwood	0.0	3.6	3.6	21.4	39.3
Doug-fir	0.0	0.0	0.0	5.4	5.4
West Hemlock	5.4	6.3	3.6	0.0	15.2
W. Hemlck dead	1.8	0.0	0.0	3.6	5.4
Tanoak	0.0	0.9	0.0	0.0	0.9
Totals	7.1	10.8	7.1	30.3	100.0

Percent conifer composition= 99.1

Percent hardwood composition= 0.9

Most common specie is Redwood with 67.8 percent cover

All Layers Size and TPA

Dbh Size Class	Dbh Size Class				Cover	Site
	<= 4.95"	<=10.95"	<=23.95"	<=49.95"		
Species						
Redwood	0.0"	10.0"	20.0"	39.0"	106.1"	83.8"
cov_wt	0.0	5.0	5.0	30.0	55.0	95.0
tpa	0.0	4.4	5.0	12.5	9.2	31.1
Doug-fir	0.0"	0.0"	0.0"	42.4"	54.3"	48.7"
cov_wt	0.0	0.0	0.0	7.5	7.5	15.0
tpa	0.0	0.0	0.0	3.3	5.4	8.7
West Hemlock	2.5"	9.4"	11.0"	0.0"	0.0"	8.2"
cov_wt	7.5	8.8	5.0	0.0	0.0	21.3
tpa	30.0	10.4	2.1	0.0	0.0	42.6
W. Hemlock dead	3.0"	0.0"	0.0"	40.0"	0.0"	32.7"
cov_wt	2.5	0.0	0.0	5.0	0.0	7.5
tpa	9.6	0.0	0.0	3.1	0.0	12.7
Tanoak	0.0"	4.9"	0.0"	0.0"	0.0"	4.9"
cov_wt	0.0	1.3	0.0	0.0	0.0	1.3
tpa	0.0	1.1	0.0	0.0	0.0	1.1

Conifer	2.6"	9.6"	16.1"	39.8"	101.2"	71.6"
cov_wt	10.0	13.8	10.0	42.5	62.5	138.8
tpa	39.6	14.8	7.1	18.9	14.6	95.1

Hardwood	0.0"	4.9"	0.0"	0.0"	0.0"	4.9"
cov_wt	0.0	1.3	0.0	0.0	0.0	1.3
tpa	0.0	1.1	0.0	0.0	0.0	1.1

All Species	2.6"	9.3"	16.1"	39.8"	101.2"	71.3"
cov_wt	10.0	15.1	10.0	42.5	62.5	140.1
tpa	39.6	15.9	7.1	18.9	14.6	96.2

Ready for Comparison

- **No Fuzzy Logic implemented as we have**
 - Data and statistics
 - Alternative names, if applicable
 - Comments regarding mixes and/or complexes
- **Did assign partial credit**
 - Correct naming of species in multi-species mixed types
 - 2 out of 3
 - 1 out of 3



Questions and Comments

