Session 2 – Model Evaluation

Slide 1

Data – Two Primary "Types"

- **Single Point in time**
- **Multiple Points in time**

Analogy to Model Building

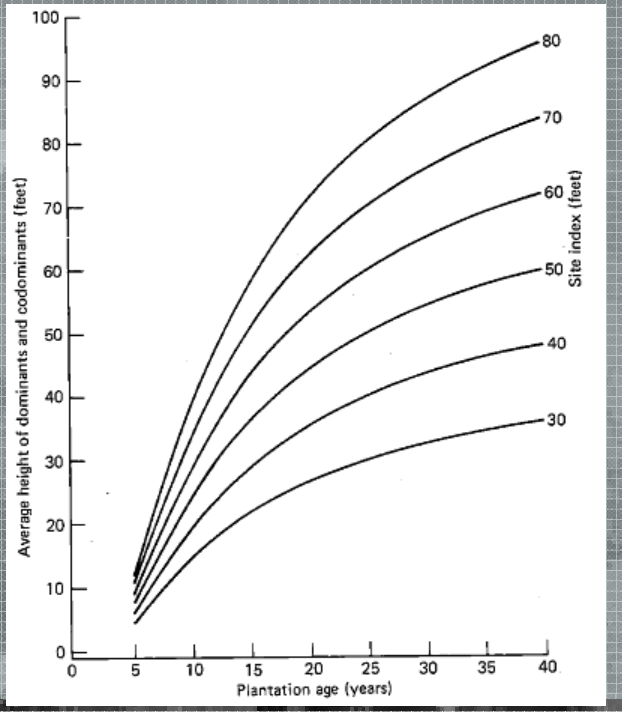
- **Guide Curves**
- **Difference Equations**

Session 2 – Model Evaluation

Slide 1

Data

- **Single point in time, multiple points in Space**

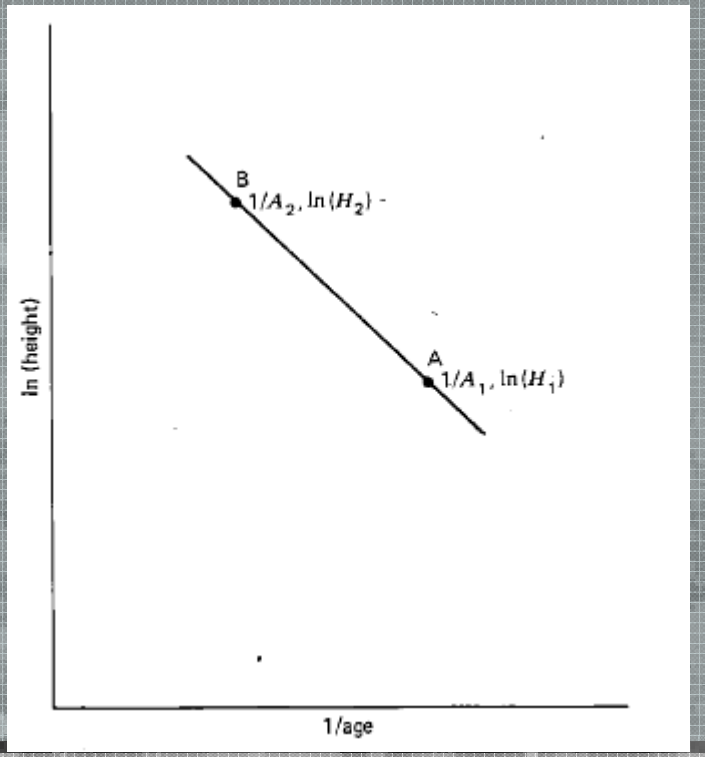


Session 2 – Model Evaluation

Slide 1

Data

- **Multiple Points in time, Single point in Space**



Session 2 – Model Evaluation

Slide 1

What Variables?

- **Tree**
  - **Diameter, Height, Crown Ratio, Live/Dead (Mortality)**
- **Class**
  - **Diameter, Height, Position classes**
- **Stand**
  - **TPA, BA, volume**

Session 2 – Model Evaluation

Slide 1

Basic Calculation:

Predicted - Truth

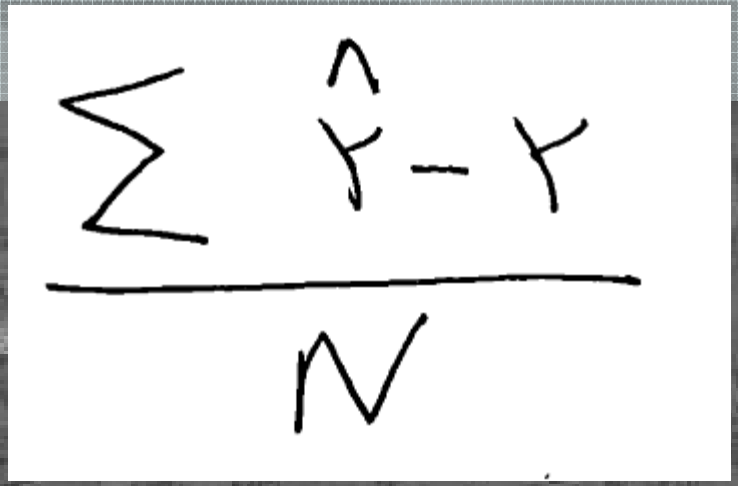
How to compare?

Two Very Simple Criteria are essentially what is needed

Session 2 – Model Evaluation

Slide 1

Bias



Expected Error when observations are combined. Observations could be trees, plots, stands, etc.

Session 2 – Model Evaluation

Slide 1

Accuracy

$$\frac{\sum |\hat{Y} - Y|}{N} \quad \text{OR} \quad \frac{\sum (\hat{Y} - Y)^2}{N}$$

Average error associated with the prediction of any one observation. Or, expected error in predicting one plot (stand, etc.)

Session 2 – Model Evaluation

Slide 1

What about the fit statistics shared by the Model Developer?

- **Not a Validation…Big difference between quality of fit and quality of prediction**
- **An R2 of .95 does not assure that a model will predict well. It assures that the equation explained the variation in the modelling data set reasonably well.**

Workshop Agenda:

Selecting/Obtaining Data

- Akin to stratification or
- Development of an experimental design
- Defining Important Variables
  - **Age, Site, Density**

Session 1 – Background and Model Description

Workshop Agenda:

Overviews

FPS

FVS

ORGANON

Summary

Data

Stand	Acres	Age	Site Index	TPA	DBH	CF/Acre	BF/Acre
1	15.85	0	126		-		
2	39.85	39	119	169	7.88	1,184	5,359
3	10.34	112	130	1,479	6.79	8,699	49,402
4	5.90	43	137	973	5.08	2,973	13,389
5	16.25	97	124	934	8.32	9,669	51,730
6	1.22	32	116	136	8.48	926	3,751
7	0.06	27	126	128	9.84	618	2,049
8	16.99	97	134	916	8.01	9,256	51,049
9	0.25	21	149	346	9.29	2,520	10,200
10	10.59	82	115	917	6.11	5,047	28,458
133711	6.44	79	122	424	10.69	8,055	44,638
133712	3.76	79	122	424	10.69	8,055	44,638
133713	17.60	61	131	409	10.87	7,706	39,734
133714	1.53	54	121	642	7.55	4,089	18,133

Workshop Agenda:

- Overviews
- FPS
- FVS
- ORGANON
- Summary

Classification

Stand	Acres	Age	Age Class	Site Index	Site Class	BF/Acre	Volume Class
1	15.85	0	00-09	126	II		00
2	39.85	39	30-39	119	II	5,359	01-05
3	10.34	112	100-999	130	II	49,402	40+
4	5.90	43	40-49	137	I	13,389	11-20
5	16.25	97	60-99	124	II	51,730	40+
6	1.22	32	30-39	116	II	3,751	01-05
7	0.06	27	20-29	126	II	2,049	01-05
8	16.99	97	60-99	134	II	51,049	40+
9	0.25	21	20-29	149	I	10,200	06-10
10	10.59	82	60-99	115	III	28,458	21-30
133711	6.44	79	60-99	122	II	44,638	40+
133712	3.76	79	60-99	122	II	44,638	40+
133713	17.60	61	60-99	131	II	39,734	31-40
133714	1.53	54	50-59	121	II	18,133	11-20

Session 1 – Background and Model Description

Workshop Agenda:

Overviews

FPS

FVS

ORGANON

Summary

Sample

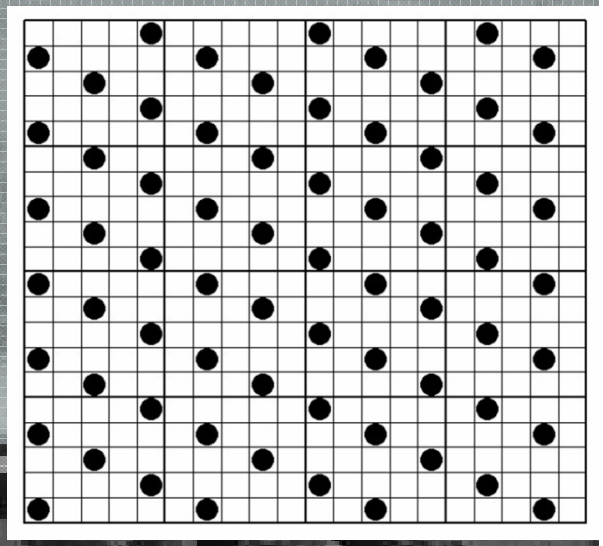
	Colun I		II		III		IV		V		Total Sum	Total N
Row Labels	Sum of Acres	N	Sum of Acres	N	Sum of Acres	N	Sum of Acres	N	Sum of Acres	N		
00-09	285.67	18	3329	192	1346.9	76	143.11	8	18.849	2	5,124	296
10-19	1348.8	78	7697.5	433	1746.5	93	96.378	5	98.05	6	10,987	615
20-29	1233.1	53	5846.9	246	1583.8	83	211.68	15	45.383	4	8,921	401
30-39	1097.4	50	8736.4	336	3949.6	146	400.83	16	73.395	4	14,258	552
40-49	1529.3	75	9817.2	384	5822.4	196	2191.6	71	47.923	5	19,408	731
50-59	1518.6	97	8562	389	6764	234	1730.2	63	4.551	1	18,579	784
60-99	3340	222	18315	1025	8961	416	1576.1	78	167.86	4	32,360	1745
No Age			30.817	2	17.201	2					48	4
Grand Total	**10353**	**593**	**62334**	**3007**	**30191**	**1246**	**6349.9**	**256**	**456.01**	**26**	**109,685**	**5128**

Session 2 – Model Evaluation

Slide 1

What about the Data?

- **Independence – not used in the development of the model**
- **Adequate but not extensive**
  - **More important to be allocated well.**



Session 2 – Model Evaluation

Slide 1

Big Difference between a "simple" model and a "growth and yield model".

- **Accurate quantitatively**
- **Accurate behaviorally….**

These suggest two RULES for data-based validation of a growth and yield model

- **Independent Data of a form compatible with the model**
- **Validate for a long enough time-frame to test/compare responses.**

In both cases, consider the use…relevance to the application