Bamboo Fly Rod Design and Analysis (RodDNA)

Presented by Chris Bogart

Purpose of Presentation

- Familiarize Rodmakers with:
  - John Bokstrom's Controlled Modification
  - Larry Tusoni's RodDNA program
- Demonstrate the capabilities of RodDNA

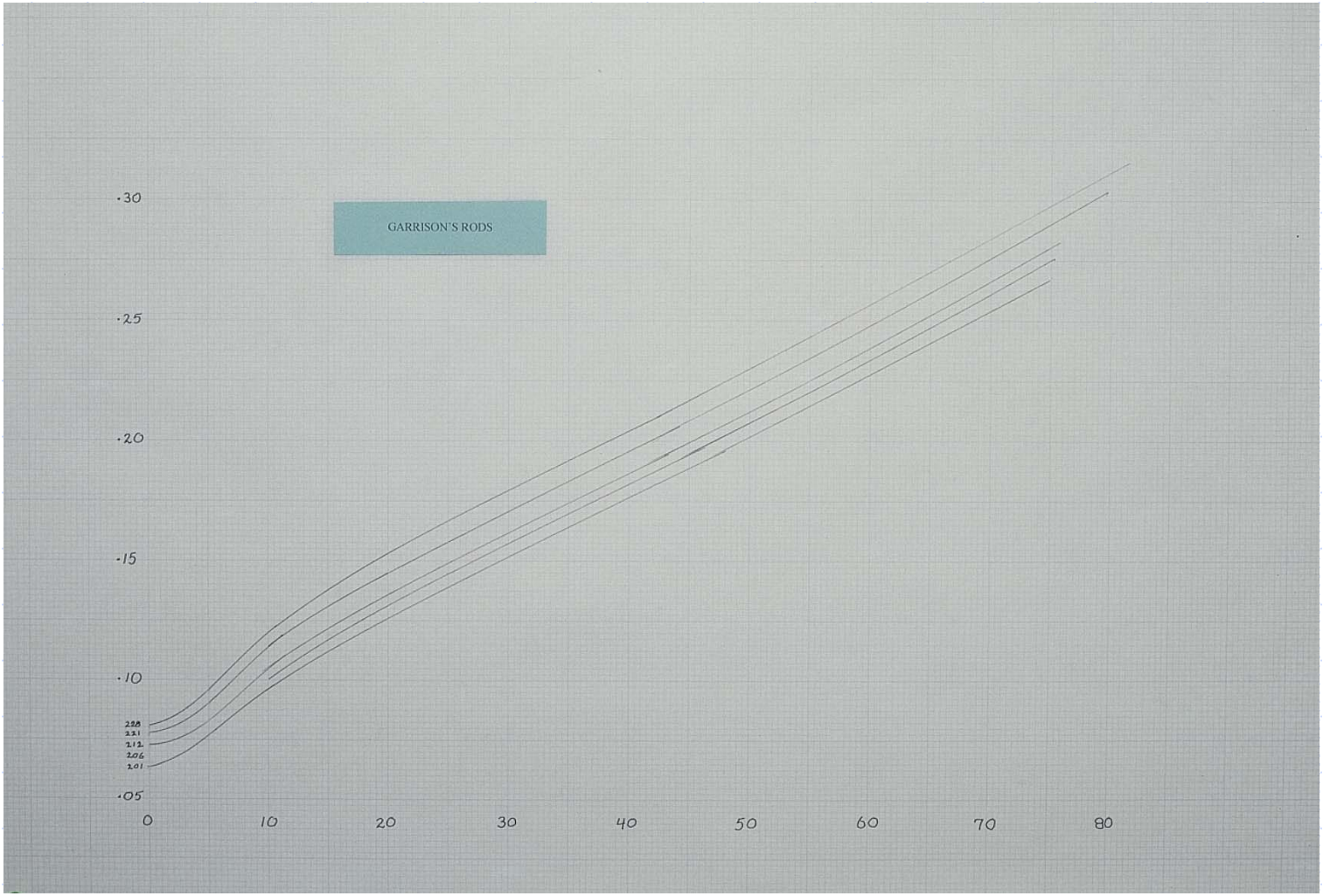
Controlled Modification

- First articulated by John Bokstrom
  - Minor insights by Letcher Lambuth
- Starts with a satisfactory rod taper
- Then characterizes that taper
- Then allows the modification of the taper (length, action, and line weight) to known principles

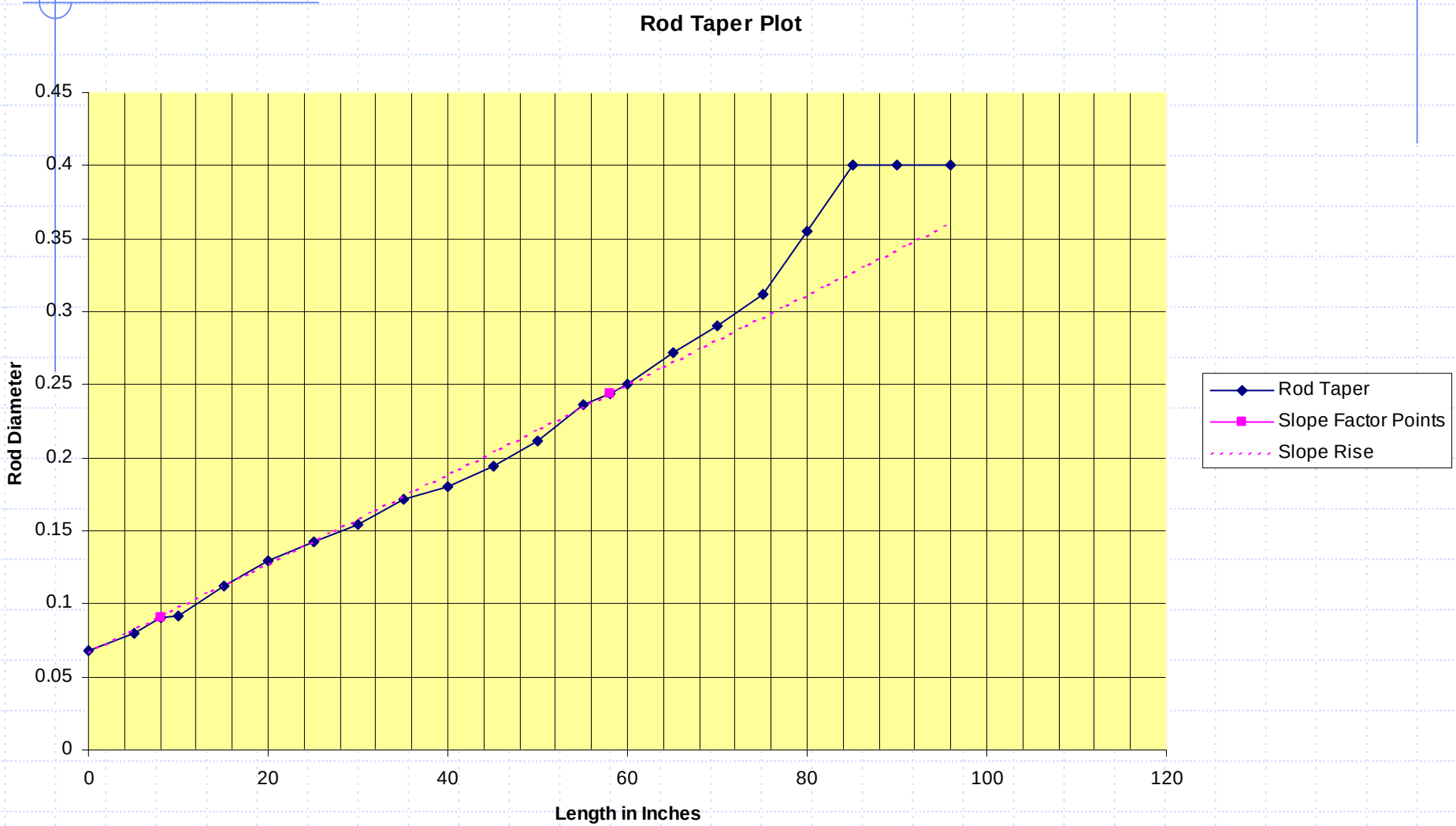
Rod Characterization

- Dimensions of 4 rods of similar action but different lengths were plotted on graph paper.
- The slope of each these Rods was found by drawing a line through the 10% and 60% values of the taper length.
  - 10% eliminates adjustments made at the tip
  - 60% is where the action (slow to fast) of the rod is revealed

Rod Graphs


GARRISON'S RODS
.30
.25
.20
.15
.10
.05
228
221
212
206
201
0
10
20
30
40
50
60
70
80

Rod Plot


Rod Taper Plot
Rod Diameter
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
20
40
60
80
100
120
Length in Inches
Rod Taper
Slope Factor Points
Slope Rise

Characterization Findings - 1

- Rods of similar action but different lengths and line weights had the same slope or rise (.268”/100”).
  - Slope is expressed in inches of rise per 100 inches.

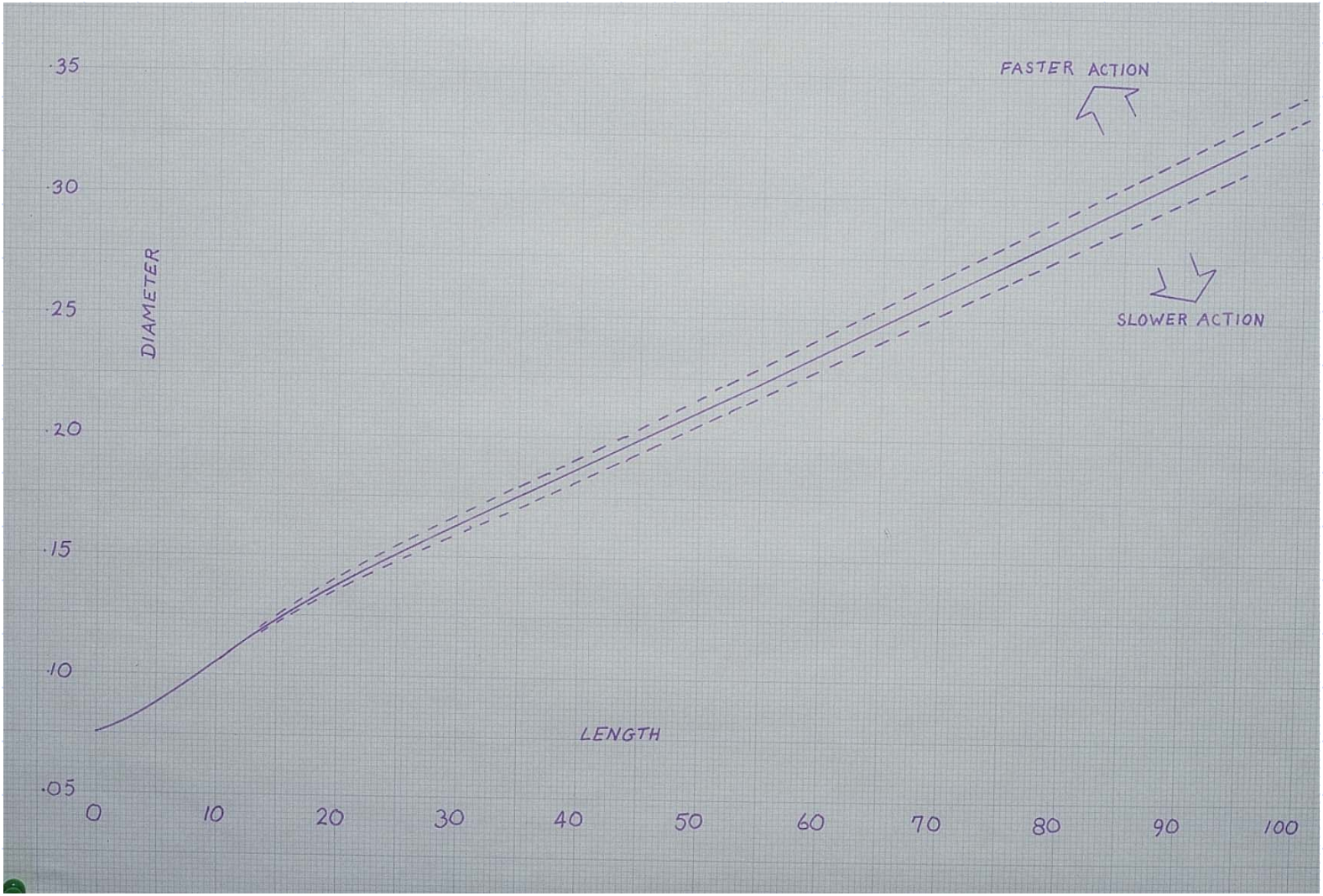
Characterization Findings - 2

- It was noted that the value of the slope rise lines at zero reflected the line weight:
  - 9wt - .094
  - 8wt - .088
  - 6wt - .078
  - 5wt - .072

Characterization Findings - 3

- When a nearly identical rod to the 5wt but that had a slower action was compared, the slope turned out to be .260”/100”.
  - Perception - Faster rods appear to have steeper slope rises than slower rods.

Rod Action


.35
.30
.25
.20
.15
.10
.05
DIAMETER
FASTER ACTION
SLOWER ACTION
LENGTH
0
10
20
30
40
50
60
70
80
90
100

Characterization Summary

- The result of the characterization of rod tapers are:
  - Rods of identical action have identical slope rises.
  - The zero inch value of the slope rise (regardless of what the taper actually has) determines line size.
  - The action of the rod depends on the slope rise.

Implementation

- Need to first plot the rod taper
- Find P1 - 10 % and P2 – 60% and
  - draw slope and find rise per 100 inches – now called Rod Action Value (RAV).
  - Note value of rise at zero inches – now to be called Line Weight Value (LWV)
- Now find the rod taper factor by calculating RD/RV at 1% increments of the taper
  - RD – rod diameter
  - RV – rise value
- The resultant 101 (0 to 100%) rod taper factor data points characterizes a specific taper independent of length.

Taper Modifications

- Change the rod length
- To change the line weight and keep action same – increase the LWV by a value of approximately .005” - .006” and recalculate the taper
- To quicken a rod increase the RAV
  - .003 change is barely detectable
  - .010 is definitely noticeable.
  - General rule – make shorter rods faster and longer rods slower.

Modified Taper

- Generated from the rod taper factor data points using the desired:
  - New length
  - RAV
  - LWV

Computer Program

- John Bokstrom's original computer program(s) were:
  - Rod factor data points were painstakingly calculated using manual methods.
  - Each program was for one specific rod taper.
  - Had no modern graphical user interface (windows).

Current Effort: RodDNA

- Capture the original concepts and provide a user friendly interface.
- Expand program capabilities:
  - Ability to input new rod tapers.
    - Include tapers taken at irregular intervals.
    - No manual charting required.
  - Maintain a database of “favorite” tapers.
  - Apply other modifications to a rod taper as desired.
  - Graphical plots of results.

RodDNA

- Larry Tusoni has written it in Java –
  - Will be able to run on Windows, Mac, Linux
- Includes an initial Taper Database of 443 tapers and allow easy input new tapers
- Includes an implementation of Garrison stress curves calculations
- Provides Graphical Plotting and Display of selected single or multiple tapers (both stress curves or dimensions)

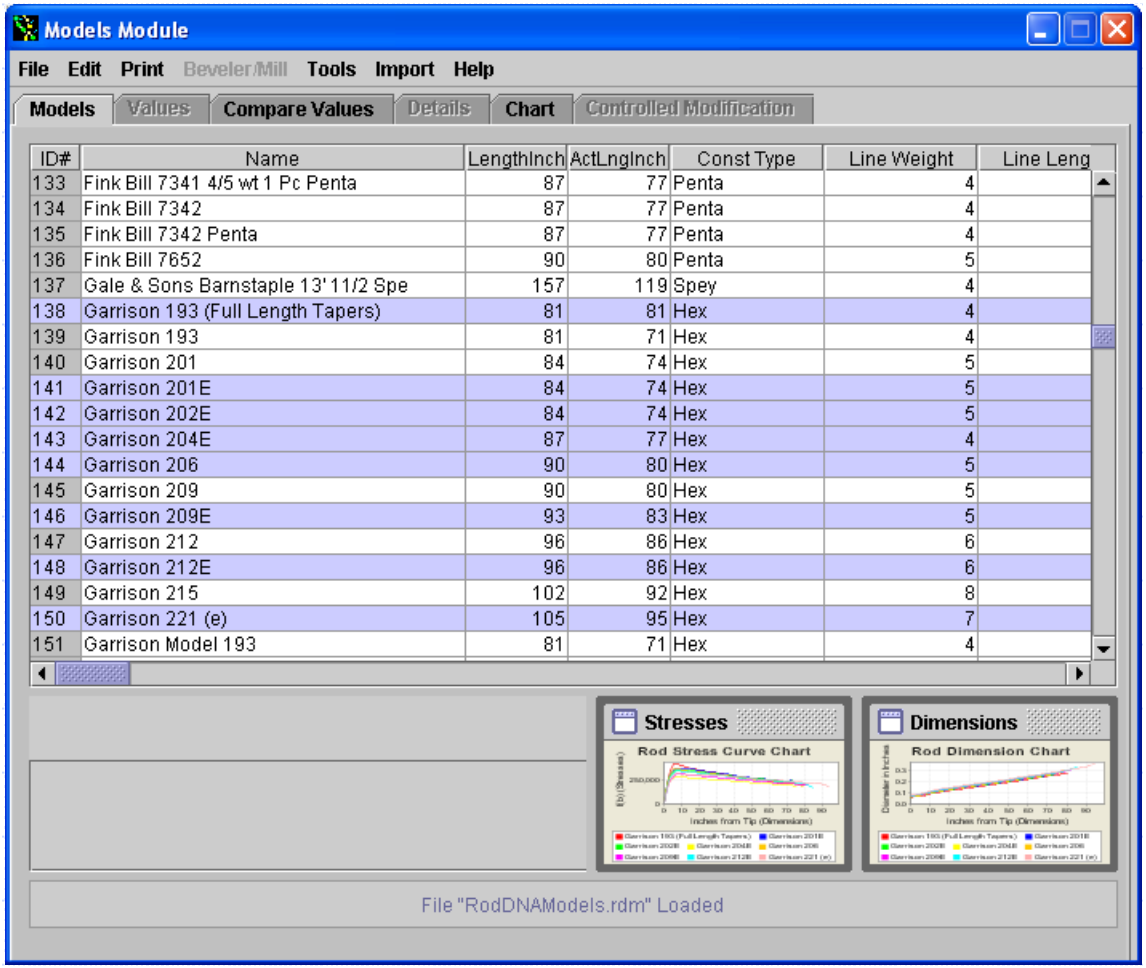
RodDNA - continued

- Performs Controlled Modification
- Calculate ferrule sizes / section lengths / tip top size
- Taper conversion from Hex – Quad – Penta
- Taper conversion for changing the number of sections in a rod

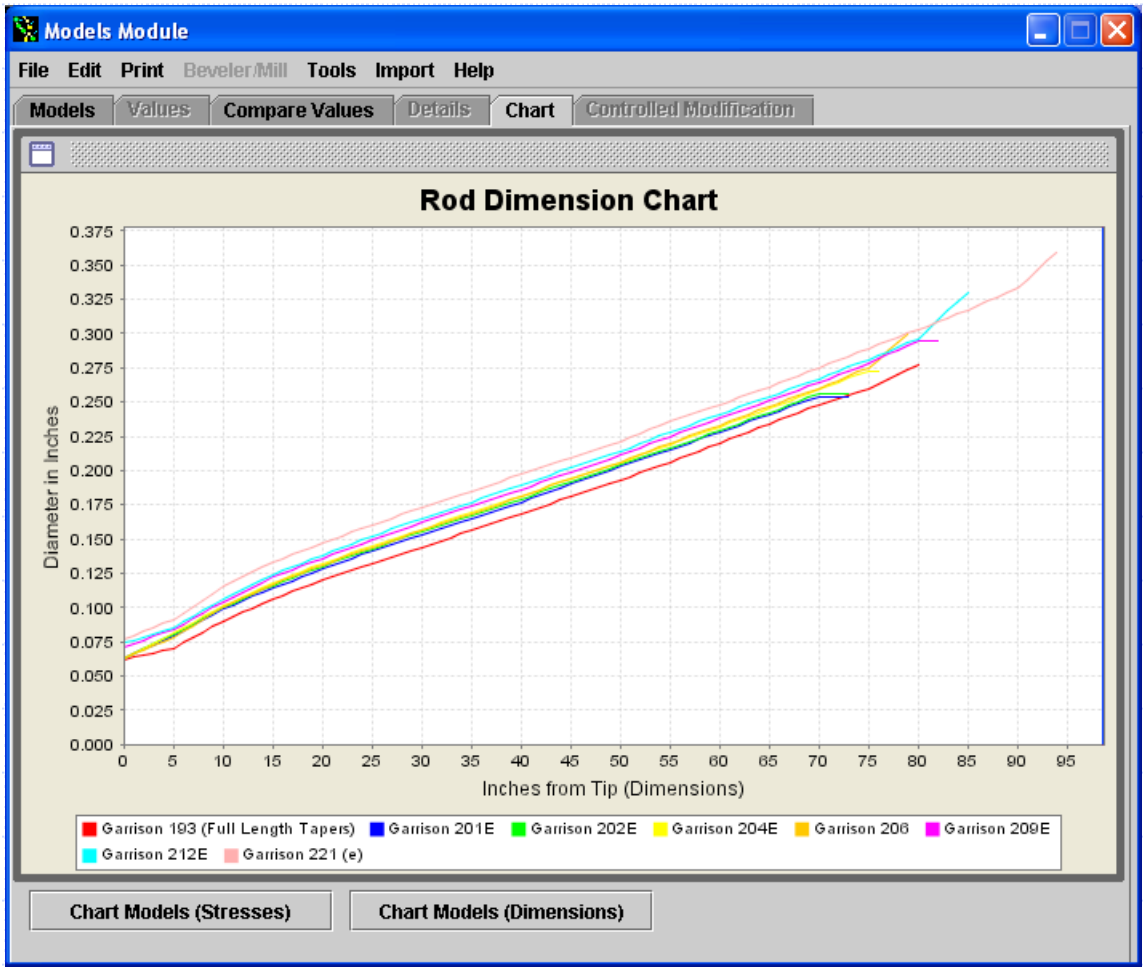
RodDNA - continued

- Save taper extracts to local disk or network
- Import tapers exported from Wayne Cattanach's HEXROD or Joe Byrd's Rodmakers Database program
- Sort tapers and save.
- User can modify default values in fields

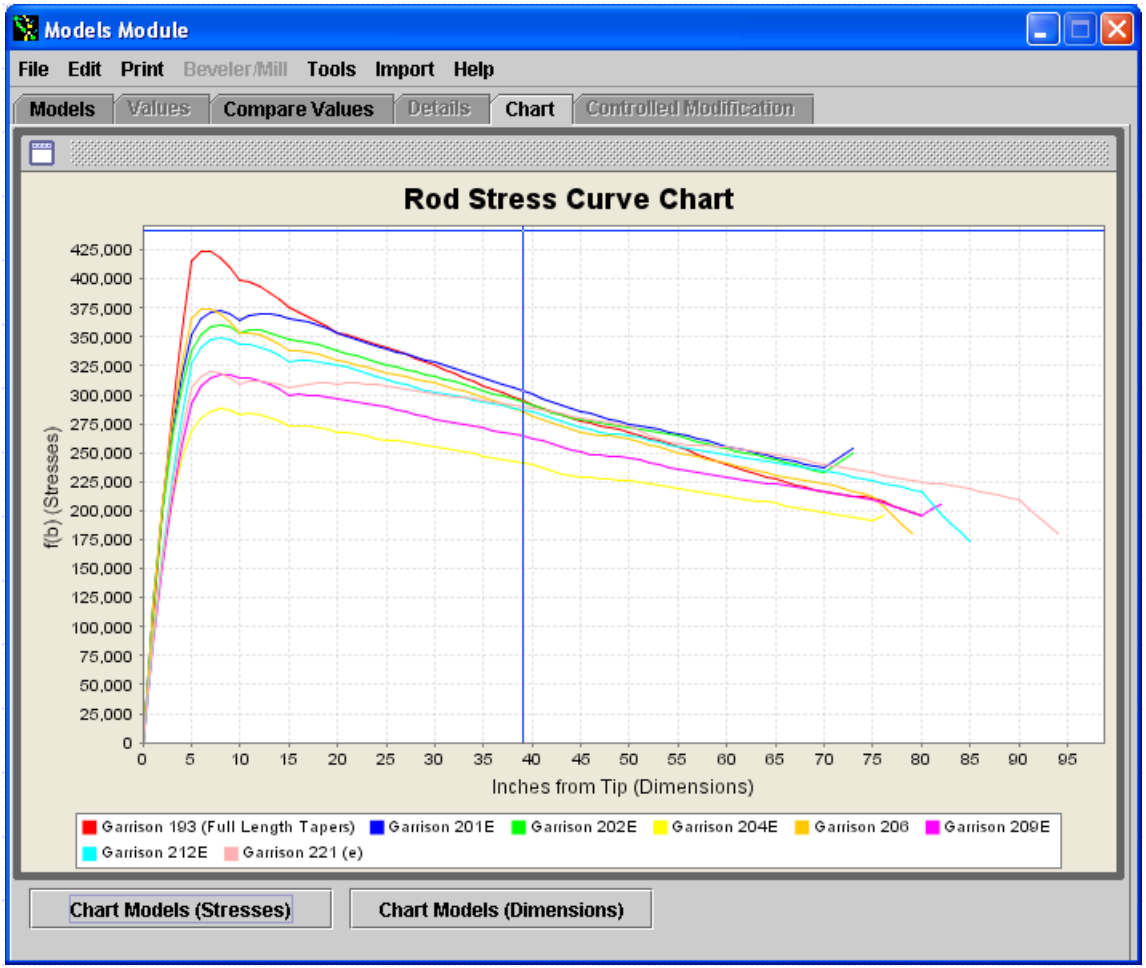
Garrison Rods: Selected



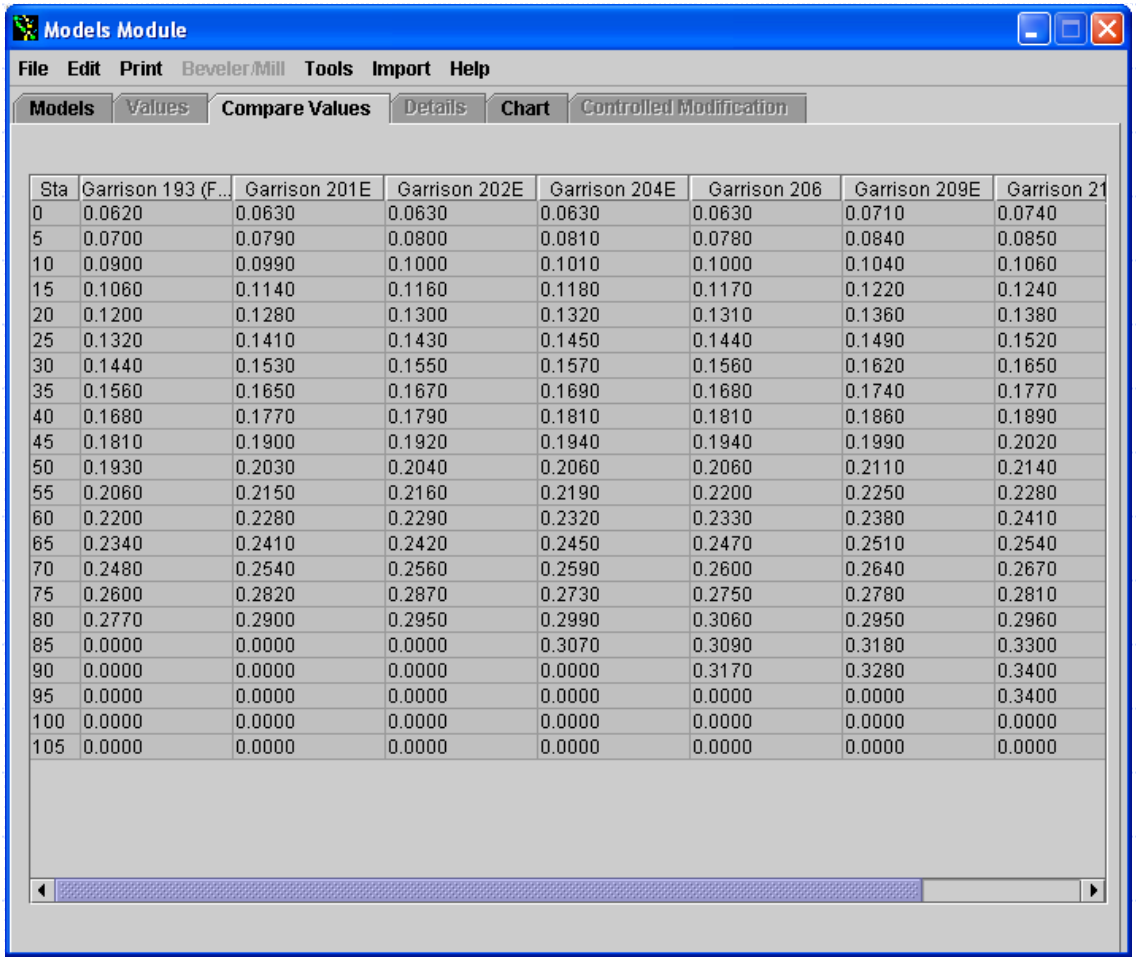
Garrison Rods: Dimension Plot



Garrison Rods: Stress Plot



Garrison Rods: Taper Values

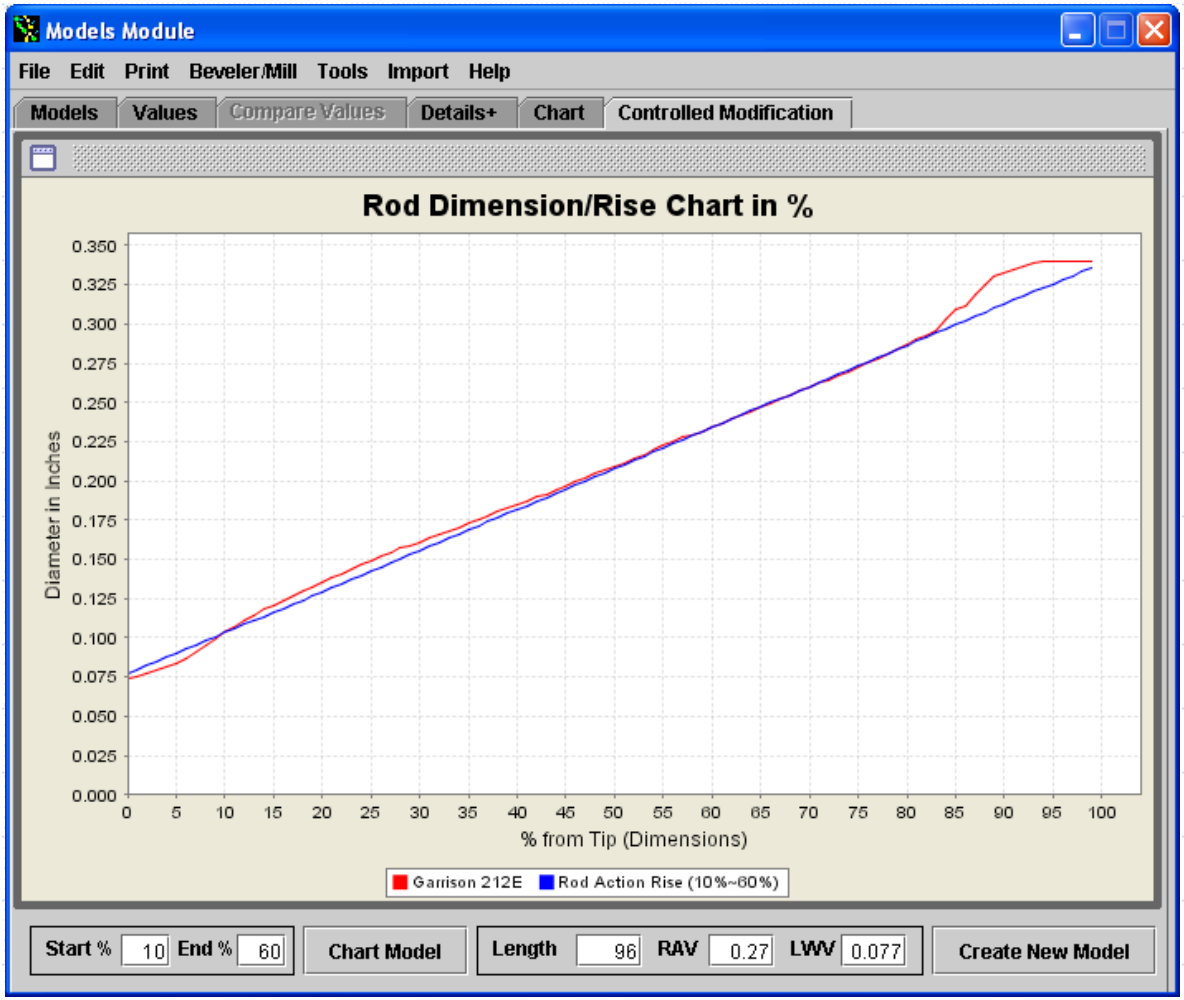


Sta	Garrison 193 (F...	Garrison 201E	Garrison 202E	Garrison 204E	Garrison 206	Garrison 209E	Garrison 21
0	0.0620	0.0630	0.0630	0.0630	0.0630	0.0710	0.0740
5	0.0700	0.0790	0.0800	0.0810	0.0780	0.0840	0.0850
10	0.0900	0.0990	0.1000	0.1010	0.1000	0.1040	0.1060
15	0.1060	0.1140	0.1160	0.1180	0.1170	0.1220	0.1240
20	0.1200	0.1280	0.1300	0.1320	0.1310	0.1360	0.1380
25	0.1320	0.1410	0.1430	0.1450	0.1440	0.1490	0.1520
30	0.1440	0.1530	0.1550	0.1570	0.1560	0.1620	0.1650
35	0.1560	0.1650	0.1670	0.1690	0.1680	0.1740	0.1770
40	0.1680	0.1770	0.1790	0.1810	0.1810	0.1860	0.1890
45	0.1810	0.1900	0.1920	0.1940	0.1940	0.1990	0.2020
50	0.1930	0.2030	0.2040	0.2060	0.2060	0.2110	0.2140
55	0.2060	0.2150	0.2160	0.2190	0.2200	0.2250	0.2280
60	0.2200	0.2280	0.2290	0.2320	0.2330	0.2380	0.2410
65	0.2340	0.2410	0.2420	0.2450	0.2470	0.2510	0.2540
70	0.2480	0.2540	0.2560	0.2590	0.2600	0.2640	0.2670
75	0.2600	0.2820	0.2870	0.2730	0.2750	0.2780	0.2810
80	0.2770	0.2900	0.2950	0.2990	0.3060	0.2950	0.2960
85	0.0000	0.0000	0.0000	0.3070	0.3090	0.3180	0.3300
90	0.0000	0.0000	0.0000	0.0000	0.3170	0.3280	0.3400
95	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3400
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
105	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Controlled Modification (CM)

- Can be done on any:
  - Existing taper in data base
  - New taper inserted by user
  - On any taper already generated using CM
- User can quickly modify any taper
- User can use CM to analyze and characterize tapers

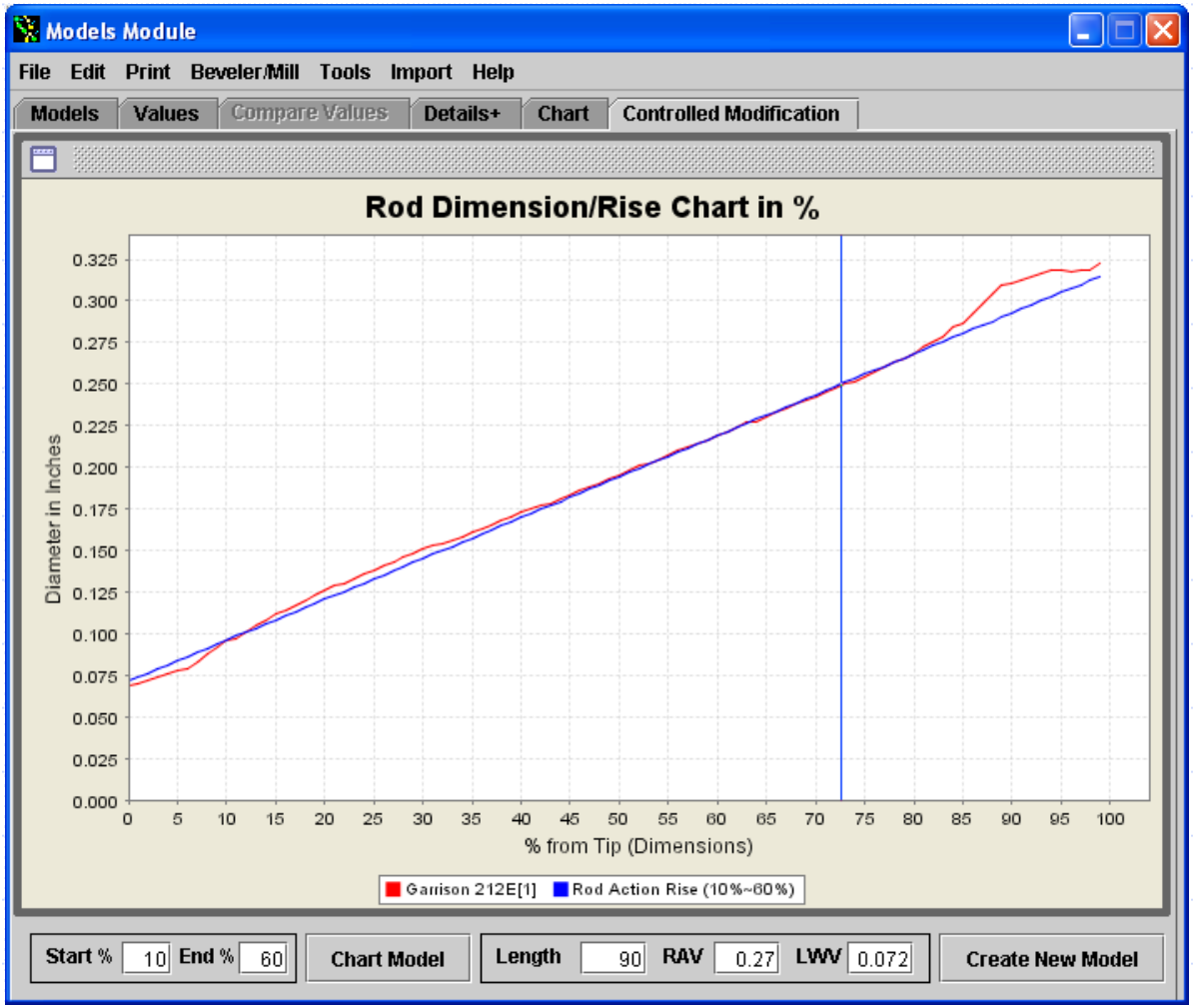
CM – Taper Plot for 212E



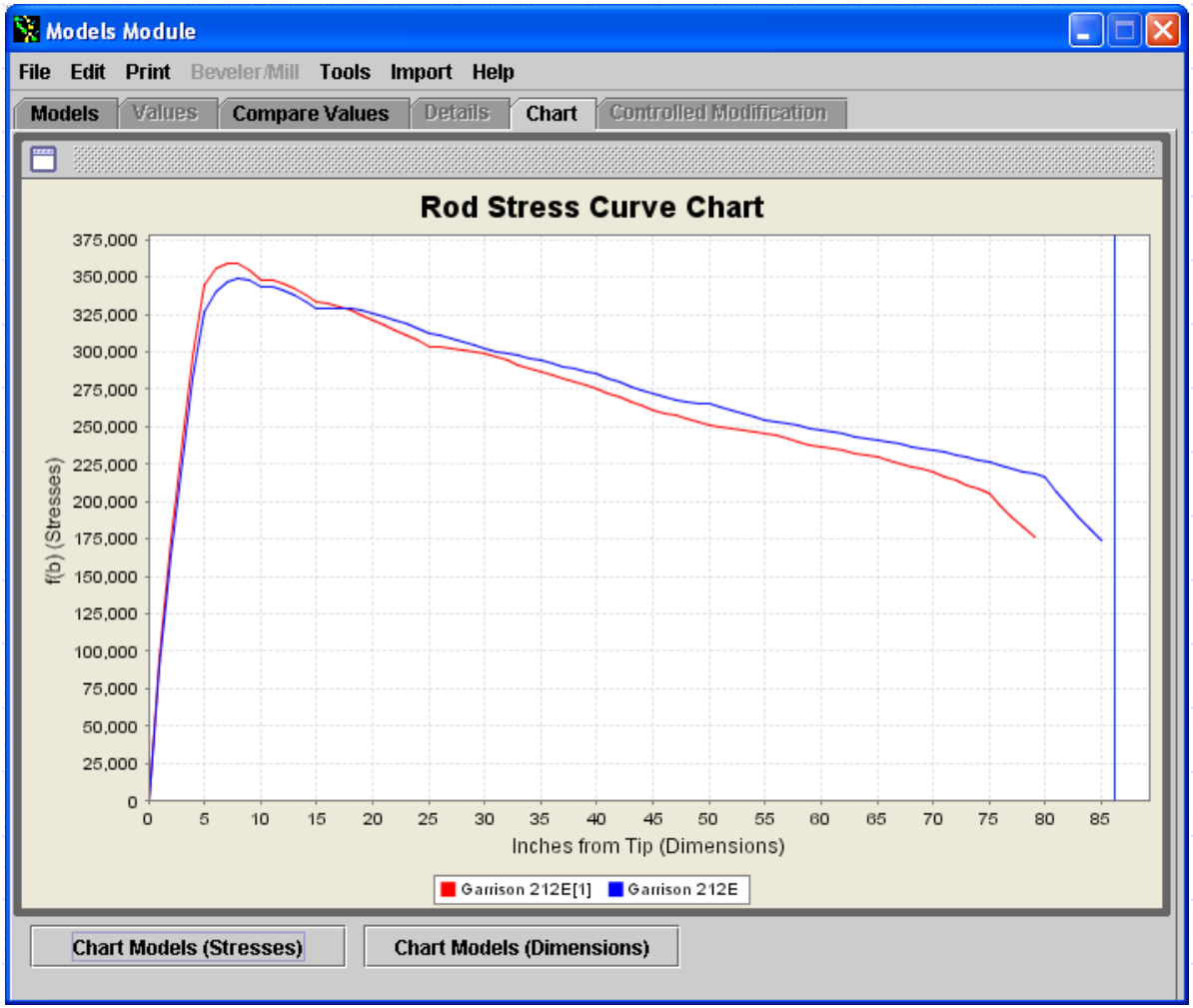
CM Example: Garrison 212E

- Original 212E CM Values
  - Length – 96”
  - RAV – 0.270
  - LWV – 0.077
- Desired New Rod CM Values
  - Length – 90 (shorten rod to 7’ 6”)
  - RAV – 0.272 (very slightly quicker)
  - LWV – 0.072 (decrease in line wt. (6 to 5)

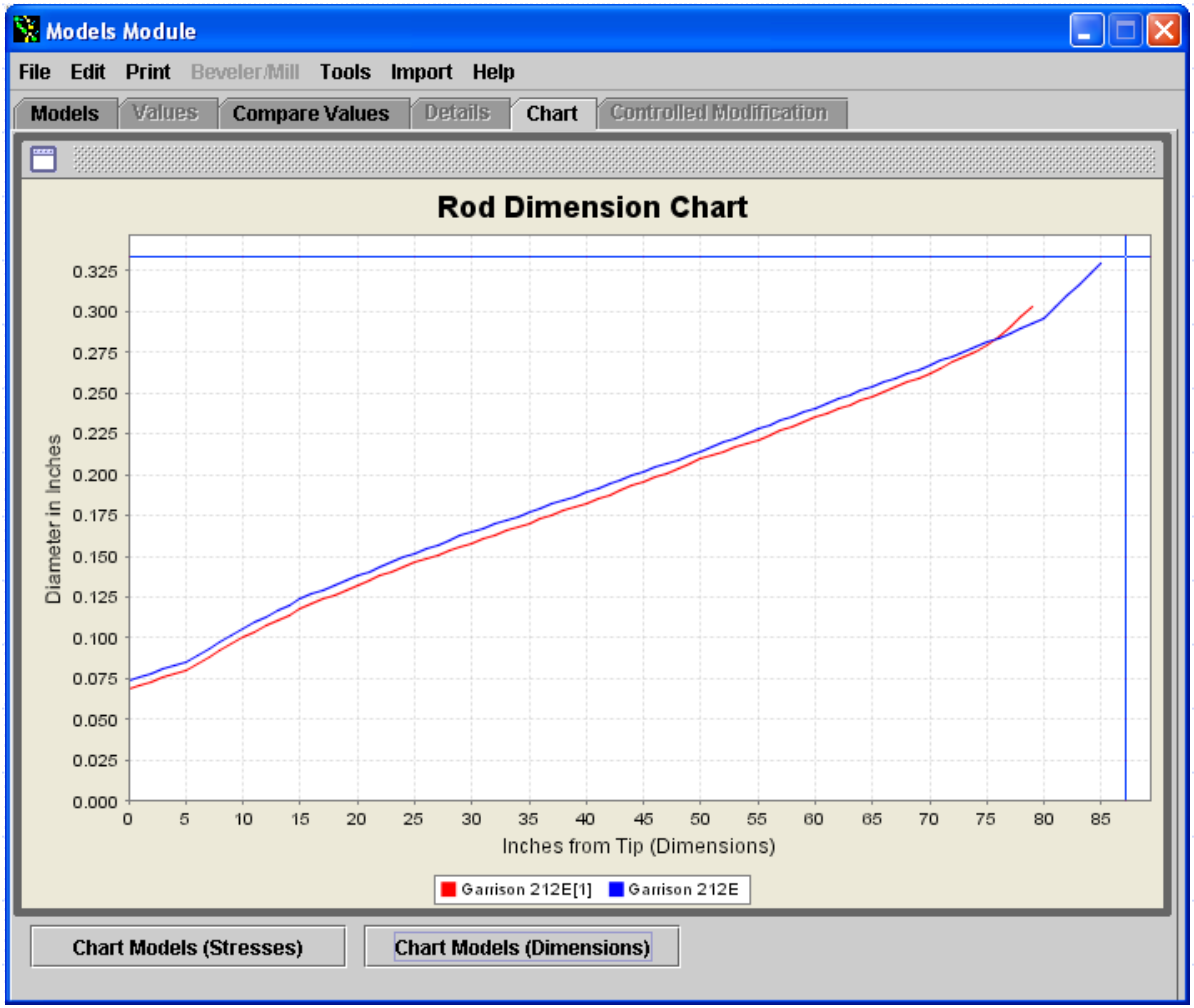
CM Result: New 212E[1]



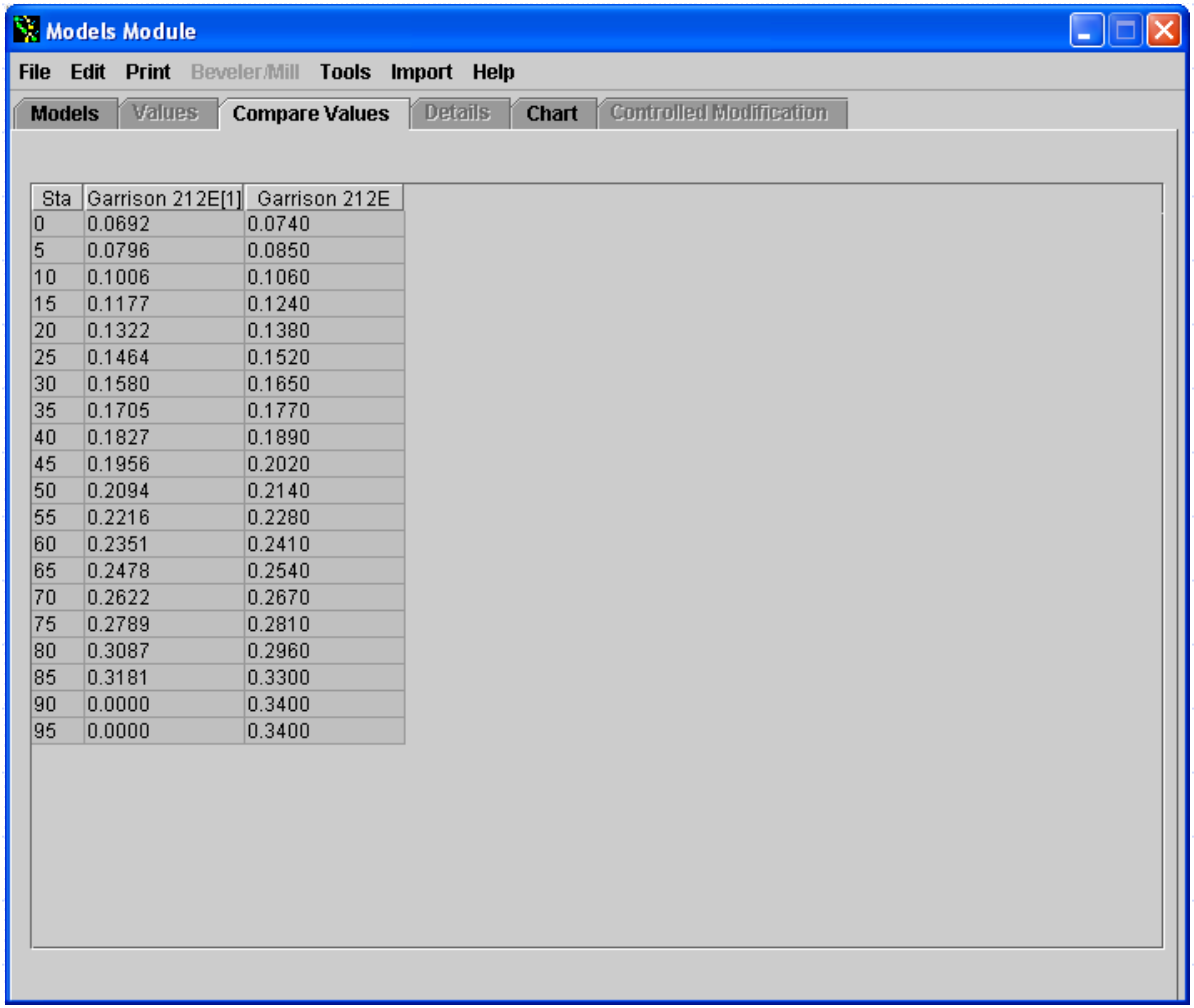
CM: 212E versus 212E[1] Stresses



CM: 212E versus 212E[1] Dimensions



CM: 212E versus 212E[1] values



Sta	Garrison 212E[1]	Garrison 212E
0	0.0692	0.0740
5	0.0796	0.0850
10	0.1006	0.1060
15	0.1177	0.1240
20	0.1322	0.1380
25	0.1464	0.1520
30	0.1580	0.1650
35	0.1705	0.1770
40	0.1827	0.1890
45	0.1956	0.2020
50	0.2094	0.2140
55	0.2216	0.2280
60	0.2351	0.2410
65	0.2478	0.2540
70	0.2622	0.2670
75	0.2789	0.2810
80	0.3087	0.2960
85	0.3181	0.3300
90	0.0000	0.3400
95	0.0000	0.3400

CM Result

- A new rod (212E[1]) that closely matches the original - but is entirely a new length, slightly faster action, and one line weight lighter.
- The stress curves are the essentially the same!
- All at the click of the mouse

CM: Summary

- CM provides a mathematically sound approach by which existing tapers can be modified to obtain a new taper with desired characteristics.
- CM characterizes the Rod's DNA to generate a new rod based upon it.
- CM is a transformation process (can go either way and end up with the same result)

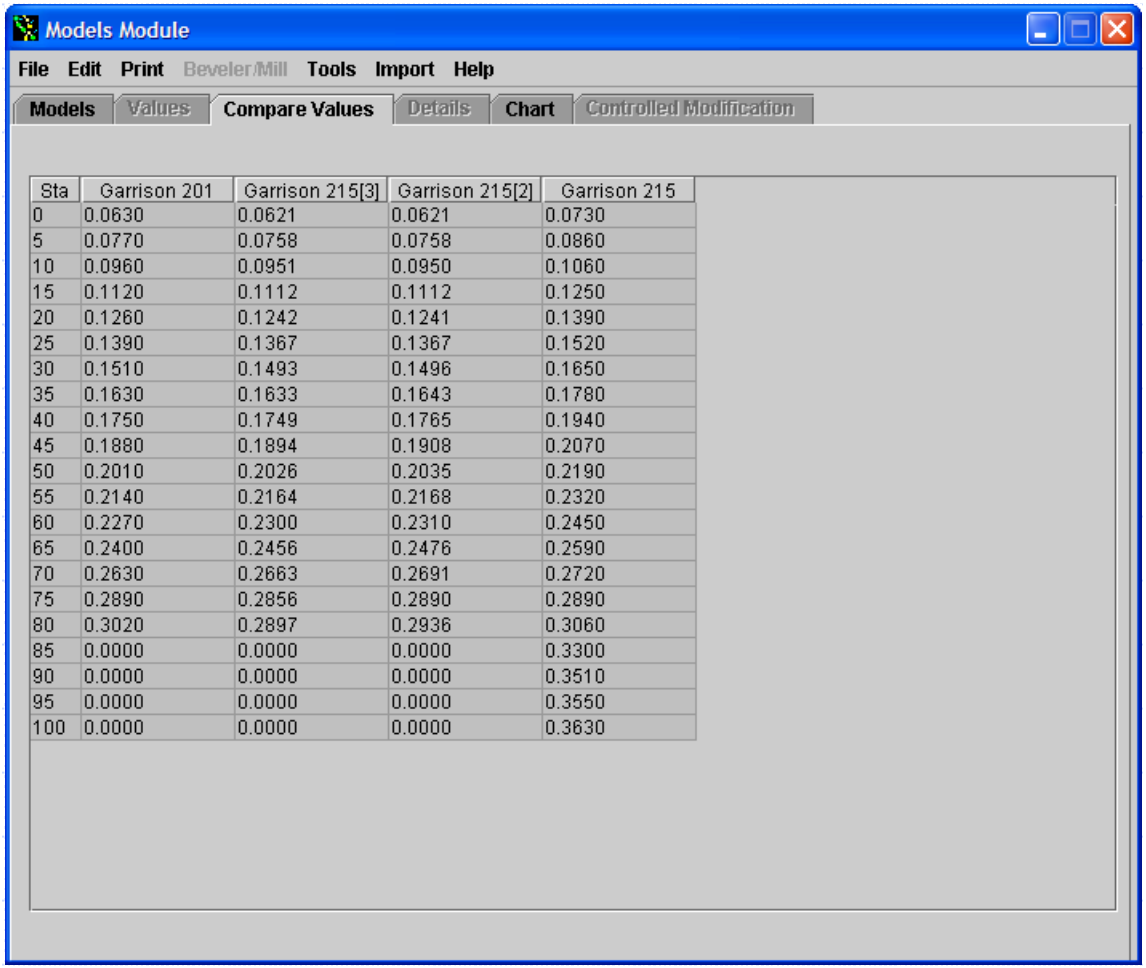
Consistent Tapers

- Tools allow the rodmaker to compare, modify, and perform taper conversions in ways never possible before
- RodDNA can provide the rodmaker with the tools by which to develop a set of consistent tapers across **ALL** their models, once they have determined the rod action they desire.

Consistent Tapers

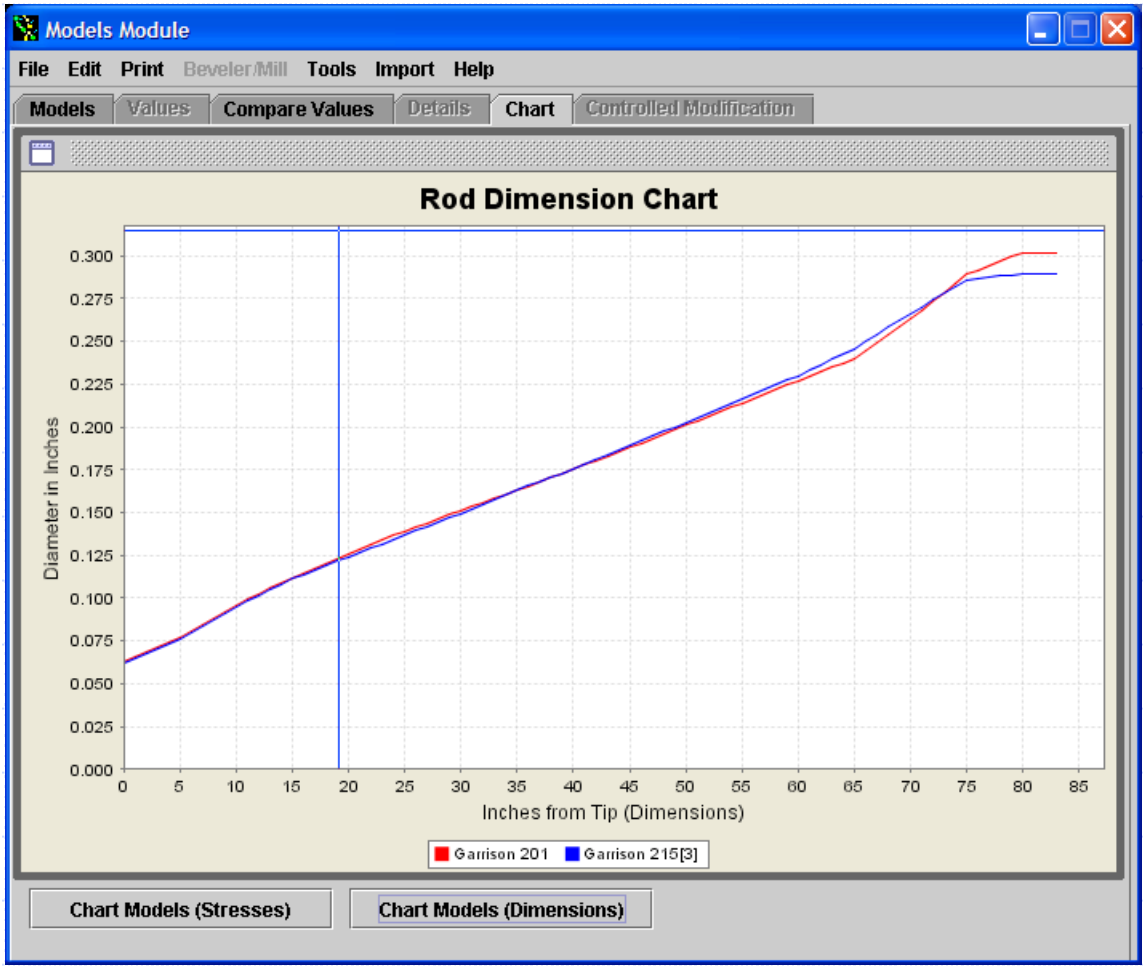
- Garrison Tapers were worked out mathematically according to Stress Curves and show remarkable consistency
- RodDNA shows that consistency
- I can now demonstrate using RodDNA and starting with the Garrison 215 Taper (8’ 6”, 8wt 3 piece) that I can end up with a taper extremely close to the Garrison 201 (7’ 5wt 2piece)

Garrison 215 => 201

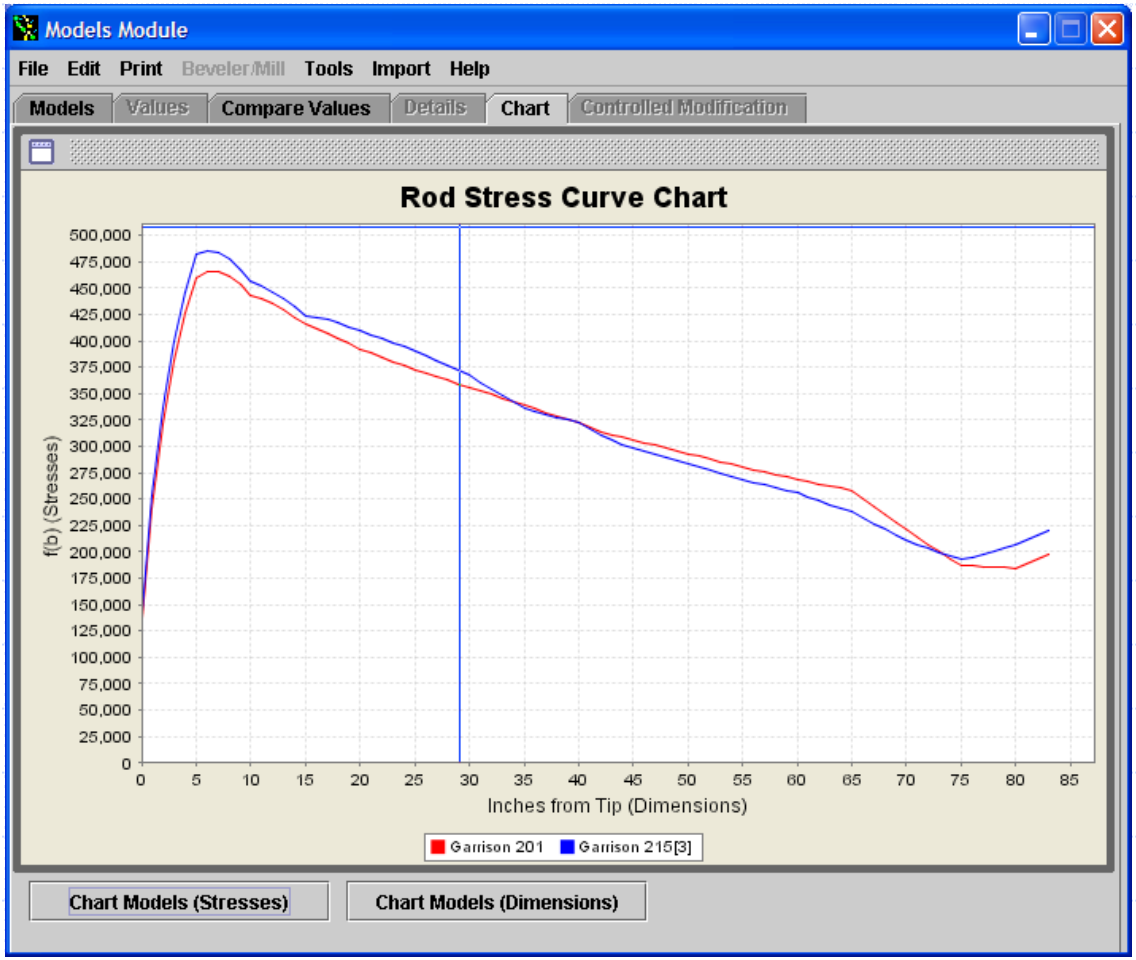


Sta	Garrison 201	Garrison 215[3]	Garrison 215[2]	Garrison 215
0	0.0630	0.0621	0.0621	0.0730
5	0.0770	0.0758	0.0758	0.0860
10	0.0960	0.0951	0.0950	0.1060
15	0.1120	0.1112	0.1112	0.1250
20	0.1260	0.1242	0.1241	0.1390
25	0.1390	0.1367	0.1367	0.1520
30	0.1510	0.1493	0.1496	0.1650
35	0.1630	0.1633	0.1643	0.1780
40	0.1750	0.1749	0.1765	0.1940
45	0.1880	0.1894	0.1908	0.2070
50	0.2010	0.2026	0.2035	0.2190
55	0.2140	0.2164	0.2168	0.2320
60	0.2270	0.2300	0.2310	0.2450
65	0.2400	0.2456	0.2476	0.2590
70	0.2630	0.2663	0.2691	0.2720
75	0.2890	0.2856	0.2890	0.2890
80	0.3020	0.2897	0.2936	0.3060
85	0.0000	0.0000	0.0000	0.3300
90	0.0000	0.0000	0.0000	0.3510
95	0.0000	0.0000	0.0000	0.3550
100	0.0000	0.0000	0.0000	0.3630

Garrison 215 => 201



Garrison 215 => 201



RodDNA Summary

- Larry Tusoni has done a great job in providing rodmakers a great new analytical software tool.
- Too many features incorporated into RodDNA then can be adequately demonstrated or covered in this presentation
- Available for download (Free) from http://www.highsierrarods.com
- I will be available latter to demonstrate the program for the small fee of a few cold beers.

Download Info for RodDNA

http://www.highsierrarods.com